Health of Migrant Factory Workers in Shenzhen, China: Mobility, Self-reported Health and Healthcare Utilisation

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English Abstract

Internal migration has become a more and more prominent societal and economic phenomenon in mainland China since the country started to initiate economic reform and opening-up strategies in late 1970s. In this historic epoch, peasant workers (*Nongmingong*) or rural workers, or rural-urban migrants constitute the main stream of China's internal migration, with most of them ending up taking jobs in factories in east and south coastal metropolitan areas, of which Shenzhen is one of the most frequently selected locales.

Migration and the concomitant urbanization have been greatly challenging healthcare system and health policies of migrants' destination governments. Accompanied by many adverse social, economic, occupational, psychological and behavioural risk factors, rural-urban migration may result in poor health outcomes and inferior healthcare utilisation.

A better understanding of rural-urban migrants, especially regarding their health, risk factors of health and healthcare service utilisation pattern, is needed in order to provide them with more equitable, efficient, cost-effective and accessible healthcare services, as well as to evaluate and rectify the evolving health insurance scheme that caters for migrant workers in Shenzhen under the current healthcare reform background in mainland China.

The objectives of this thesis are to:

(1) Assess **socio-demographic characteristics** and **patterns of mobility** amongst migrant factory workers;

(2) Measure migrant factory workers' **health status** that include self-rated health (SRH), mental health status (Depressive Symptoms, DS), infectious disease risks, behavioural risk factors and self-reported short-term and long-term sickness/symptoms;

(3) **Explore association** between socio-demographics and socio-economic factors and migrant factory workers' health status;

(4) Describe patterns of **healthcare utilisation** amongst Shenzhen migrant factory workers;

(5) **Follow up** a sample of the original migrant factory workers **over 6 months** period to compare differences in the pattern of health status, health needs and utilisation, as well as the impact of health insurance participation on professional health service utilisation and health expenditures; and to

(6) **Assess the impact** of these findings on **health policies.**

This research project is mainly based on questionnaire survey in a representative probability sample from factory workers in Shenzhen. A pilot using convenient sampling was done in August 2008 to test validity and reliability of the questionnaire, which adopted its main components from the China National Health Service Survey (CNHS) questionnaire, the Center for Epidemiologic Studies Depression (CES-D), and the EuroQol 5D (EQ-5D). The baseline study was conducted during April to May 2009 and a follow-up study was subsequently carried out during October to December 2009 in Shenzhen, China.

Summary of the major findings

STUDY 1: I. General description of socio-economic status (SES) of the migrant factory workers

Information on basic demographic factors (sex, age, ethnicity, education, marital status, etc.), mobility (accumulated working time in the city, migration history, being accompanied by family members, origins and personal plan of stay in Shenzhen) economic factors, and working-related characteristics (with/without job contract, health insurance participation, average working hour per day, working days per week, work-related physical activities, etc.) of factory migrant workers are presented, giving out a general portrait of the migrant factory workers of Shenzhen regarding the most relevant key characteristics of this special group.

Generally speaking, migrant factory workers in Shenzhen represent a troop of rural-to-urban working class and a broad combination of geographic complexity and various ethnicities across mainland China. There were more female than male in our sample and worker's average age was 27.36 years at baseline. Many of the workers had finished secondary education, lived in factory dorms, worked on assembly lines, were without family accompaniment and were unsure about their stay plan in Shenzhen. Long working hours per day and low payment depicted their economic status.

Study 1: II. Description of migrant factory workers' self-rated health (SRH)

Quantitative results focused on association between SRH and SES are described, as the former has been shown to be a sensitive and stable proxy for morbidity and mortality *even long after the original measurement takes place*. Ordinal 5-scale SRH that falls into 5

categories, i.e., excellent, good, fair, poor, very poor, is presented. We show for the first time that the EuroQol Visual Analog Scale (VAS) that measures SRH on a 0 to 100 continuing Likert scale is closely related to the ordinal scale SRH and both are associated with migrant factory workers' SES, increased mobility, job-related factors, and increased behavioural risk factors. Most importantly clinically relevant depressive symptoms and self-reported two-week illness are also associated with SRH. Sex-specific models taking dichotomized 5-scale SRH showed that those who were with lower education attainment, having less sleeping hours per day, with clinically relevant DS and self-reported illness in the previous two weeks were more likely to report less optimistic SRH independent of age and sex.

Study 1: III. Analyses on migrant factory workers' mental health status as measured by CES-D

The CES-D scale simplified Chinese version was adopted to screen for clinically relevant depressive symptoms amongst migrant workers. The total scores of CES-D and prevalence of clinically relevant DS are analyzed. Results brought an insight into the mental health status of migrant workers that were associated with and shaped by their SES, mobility, behavioural risk factors, and job-related characteristics. Association between DS and SRH was also explored and presented, which showed that those who rated their general health as poor or very poor had higher CES-D total scores compared with workers with excellent, good or fair health and female workers with poor or very poor SRH had higher CES-D scores compared with male workers in the same SRH categories.

The key findings of the study have specified some major correlates of DS amongst migrant factory workers, particularly in relation to their social support, mental health, SRH and working and living conditions. No gender association was found in migrant factory workers. Such implications signal to local public health officials that initiatives targeted at reducing mental health risks of this substantially large and growing population may need to focus on modifiable factors that are of relevance. This study also suggests that mental health of Shenzhen migrant workers is a significant public health issue which needs to be addressed, as highlighted by the recent publicity on suicides in Shenzhen.

Study 1: IV. Infectious disease risks of migrant factory workers: taking rubella as an example

In Shenzhen, there are a large percentage of childbearing age women amongst the migrant factory workers and their immunity to rubella is critical to vaccination programs for rubella. This study investigated the seroprevalence of antibodies to rubella and evaluated potential associates of rubella immunity in female migrant factory workers.

Serum samples of 518 female migrant workers recruited from the original 2110 female workers were tested for Rubella Immunoglobulin G (IgG). The test used was a commercial Enzyme-linked immunosorbant assay kit. The population sample covered women aged 18-55 years of age. Self-reported vaccination histories were also collected.

Of 518 female workers, 402 (77.6%) were immune to rubella. Significant differences in seropositivity were dependent on region of origin, job contract, age group, marital status and seroprevalence of antibodies to measles.

The seroprevalence of antibodies to rubella in Shenzhen, China amongst female migrant workers is not high enough to provide immunity in the population. Given the high numbers of women of childbearing age amongst the migrant factory workers, who come from many provinces across China, local health authorities in Shenzhen should consider immunization or rubella programs combined with measles vaccination amongst this population.

Study 1: V. Behavioural risk factors of migrant factory workers

Cigarette smoking, alcohol consumption and internet use were the three behavioural risk factors measured in the cross-sectional study. Of all, 69.2% described themselves as never smokers, whilst 5.6%, 11.4% and 2.1% reported themselves as current casual smokers (non-daily smokers), current daily smokers (< 1 pack per day) and heavy daily smokers ($\geqslant$ 1 packs per day), respectively. Females had much lower smoking rates than males in all current smoking categories and their smoking pattern was very different from that of male peers. To clarify associations of smoking status in male and females, eight logistic regression models were constructed (with the female-heavy-smoking model being excluded due to insufficient subjects and insignificant statistical results). In general, sex, age, education, sleeping hours per day and internet use were associated with being a current smoker. However, in the sex-specific models, smoking in females was also associated with clinically relevant DS, accumulated working time in Shenzhen of 2 to 3 years (as compared with more than 5 years), being without a job contract and being a frequent drinker. In the male-only model, current smoking was related to being accompanied by their family, being without health insurance,

shorter sleeping time per day, being a frequent drinker, and being unsure about the time to stay.

Of all, 46.3% described themselves as never drinkers and only 0.54% thought that they were frequent or daily drinkers. Sex differences in drinking frequency and occasions of being drunk in the previous year were significant.

There were 26.2% of the migrant workers who had never used internet with a higher proportion of female workers falling into the non-user category than males. Education attainment was positively related to internet use independent of sex. Smoking, drinking, clinically relevant DS, SRH and disease neglecting were all associated with frequent internet use amongst migrant factory workers. However, this study did not investigate or define pathological or excessive internet use amongst migrant workers.

Study 1: VI. Two-week illness and patterns of healthcare utilisation of migrant factory workers

This study collected self-reported data on (i) two-week and long-term illness, (ii) health seeking behaviours (seeing a doctor/health professional, self-treatment/medication and neglecting), (iii) their preferred health facilities and reason for neglecting illness, (iv) use of traditional Chinese medicine (TCM) and over-the-counter drugs amongst migrant factory workers (v) inpatient care utilisation and rejection of suggested inpatient care in the previous year.

(i) The crude two-week illness rate was 21.6%. We found that migrant workers who were male, without insurance, with senior high or above education and higher-than-average

monthly income, daily smokers, had ever been to other cities, reported very poor, poor or fair SRH, and clinically relevant DS were more likely to report illness in the previous two weeks. Whilst those who worked as an assembly line worker or lived in dorms were less likely to report illness in the past two weeks. Patterns of two-week illness report by age group and accumulated working time in Shenzhen were explored.

The logistic model indicated that adjusted ORs for two-week illness report were above 1 for workers who had been to other cities, worked long hours per day, were daily smokers, reported very poor, poor or fair SRH and had clinically relevant DS, whilst ORs of those who had senior high or above education and worked as assembly line workers were below 1.

The top three longstanding illnesses were: 1) eyesight problems, 2) sleeping problems and 3) gastritis or ulcer. However, other severe but scarce diseases such as uremia and nephritic syndrome were also reported.

(ii) Via two major routes we investigated the workers' health service utilisation. Pattern of last-doctor-visit revealed that 1) more than half of the workers' time of last-doctor-visit was half a year ago or earlier and 2) level of preventive services utilisation was insufficient and low.

For those who reported illness in the past two weeks, 34.8% (7.5% of the whole sample) had visited a doctor, of whom slightly less than three quarters used the health service only once and only 1.8% had used the service for more than 3 times. Health insurance participation was not associated with *occasions* of doctor visit in the past two weeks. Overall, sick males were less likely than sick females to access professional healthcare and the age effects were inverse for males and females. Analyses indicated that those who were without a job contract,

had been to other cities, were frequent internet users and current heavy smokers were less likely to seek professional health services when they were sick. Health insurance, again, did not impact significantly on their *decision* to see a doctor.

(iii) Migrant factory workers' were most likely to choose Community Health Centres (CHCs) as the healthcare facility of choice, followed by private clinics and health centres affiliated to their companies/factories. Geographic convenience and whether it was a designated health provider (DHP) were major considerations for choosing health facilities.

Still, more than half of sick migrant workers chose self-treatment or self-medication and 11.6% neglected their sickness. The top three subjective reasons for neglecting disease included: 1) self-perception of illness not being severe, 2) lack of spare time for doctor-visit and 3) economic difficulties.

(iv) Utilisation of TCM services and TCM drugs was common in migrant workers who either visited a professional or self treated.

A combined model of professional care utilization and over-the-counter (OTC) drug use was found in 16.9% of all who had visited doctors. Data from the insured showed that some workers were unsure about the reimbursement or thought reimbursement was impossible, an inaccurate perception given the articles of the Shenzhen's health insurance for migrant workers-The Medical Insurance System for Migrant Employees (MISM).

Of all, 893 person times reported long-standing or chronic diseases and only 13.7% of the conditions were treated by doctors, of which around one third were treated by TCM doctors.

(v) Inpatient care was used by 3.1% of the 4088 workers and was rejected by 1.4% of all (30.7% of all who needed inpatient care as suggested by their doctors). Self-perception of disease being not severe, lack of time and economic difficulties were the major explanations for not taking the advice of doctors.

Study 2: I. Cohort profile of migrant workers: SES, health status and health utilisation of those who left and those who stayed

A one-third random sample (n = 1363) of the 4088 workers was selected and followed. Of the 1363, 37.34% had left their jobs before study 2, i.e. within the 6 month follow up period and 62.66% remained employed by the original factory.

Comparative study between the one-third subsample and the original whole sample revealed no statistic differences in all key SES variables. However, substantial and statistically significant differences were found between leavers and stayers in several major SES and health-related factors. Workers who were female, younger, single, accompanied by family members, had shorter time of staying, living in dorms, working as assembly line workers, without job contract and without health insurance in study 1 were more likely to have left.

In addition, we compared SRH, clinically relevant DS prevalence rates, self-reported two-week illness and dichotomized professional healthcare utilisation rates between leavers and stayers in study 1 and found that those who were heavier users of professional health services, reported two-week illness, with poorer SRH and mental health in study 1 were more likely to have left their jobs.

Study 2: II. Cohort profile of migrant workers: changes over time for those who had stayed

Data from study 1 and study 2 for the 833 successfully followed migrant factory workers were combined and analyzed. Results were built on two perspectives:

1) The longitudinal trend of two health status indicators: mental health status (CES-D total score) and SRH amongst those migrant workers who stayed, by their baseline SES, migratory histories, income change and baseline health status.

2) Impacts of health insurance, baseline SES, and health status on healthcare utilisation and out-of-pocket health expenditures. It indicated that increased age, lower income, existence of longstanding illness (which included chronic diseases) and poorer SRH at baseline increased migrant workers' healthcare expenditures that were paid out-of-pocket over the 6-month period of our study.

Being insured and having longer exposure of health insurance significantly increased migrant workers' likelihood to use professional healthcare in Shenzhen (RR_1 = 1.619; RR_2 = 1.421), decreased their total occasions of professional healthcare utilisation (RR_3 = 0.867; RR_4 = 0.790), and were causally associated with a decrease in professional healthcare expenditures which were paid out-of-pocket in the 6 months of follow-up by migrant workers.

This study is the first to follow a cohort of migrant factory workers working and living in Shenzhen. Migrant factory workers represent an important social and economic class in contemporary China. Their rural background, high mobility, specific gender ratios, comparatively young age, limited education, low income, unique working-living lifestyle and lack of social support characterize their outer environment, creating specific issues for health care provision. The health needs of migrant factory workers are multifaceted, though not

necessarily higher or more complicated than those of the urban residents in the destination city. Our study selected SRH, mental health, infectious disease risks, risk behavious and self-reported two-week illness as markers of their health status indicators. This study also described patterns of health service utilisation, barriers to accessing professional care and the trend for care utilisation. Focusing on health status indicators and health service utilisation, we investigated risk factors that may adversely impact on migrant factory workers' health indicators and prevent them from accessing professional healthcare.

Shenzhen's unique MISM scheme was shown to improve migrant factory workers' likelihood to use professional healthcare utilisation whilst also decrease their out-of-pocket total health expenditures. However, those who were more mobile, uninsured, with poorer health indicators were largely overlooked and their needs difficult to be understood because evidence was hard to be collected and proved as they were either difficult to be caught by any opportunity sampling method or easy to be lost due to their very high mobility.

Health inequality amongst migrant factory workers deserves further recognition. The inverse care law appears to hold for migrant factory workers in Shenzhen.

Our results suggest that health strategies to strengthen health education, health promotion and promote more accessible healthcare services should take into consideration the specific health needs of the highly mobile migrant workers. Through insurance coverage, local health authorities may be able to help improve rural-urban migrant workers' health by improving services at community level and incorporating psychological services in the CHC-provided services. However, during this process, the most invisible migrants with very high mobility need to be fully considered and their health needs substantially evaluated.

Abstract (in Chinese) 中文摘要

自上世紀 70 年代末中國大陸開始改革開放以來，國內人口遷移逐漸成爲一個日益突出的社會和經濟現象。在這一歷史時期，農民工，勞務工或稱鄉-城流動工人構成了中國國內人口遷移的主流。他們中的很多人在東南沿海大城市的工廠就業，而深圳是其中農民工最爲常選的居留地之一。

移民流和與其相伴的城市化極大地挑戰著移民者聚居地的衛生服務體系和政府醫療衛生政策。農村-城市移民過程常伴隨著不利的社會、經濟、職業、心理及行爲的危險因素，易於導致不良健康結局和衛生服務利用低下。

爲了給農村城市移民提供更加公平、高效、成本效果和可及性良好的醫療衛生服務，深入瞭解鄉城流動人口，尤其是他們的健康狀況、健康危險因素及醫療衛生服務利用的模式很有必要。在當前中國大陸新醫療體制改革的背景下，深圳專門針對外來勞務工設計的、不斷發展的醫療保險計畫亦需要評估和更新。

本研究的目的主要包括：

1）評估工廠外來工人社會人口學特徵及流動性模式；

2）測量工廠外來工人一般健康狀況包括自評健康狀況、精神衛生（抑鬱症狀），傳染病風險、行爲危險因素和自報兩周患病及慢性化疾病和症狀；

3）探討人口學因素、社會經濟因素、自評健康結果、精神健康、行爲危險因素及兩周患病報告等健康狀況指標之間的相關性；

4）描述工廠外來工人的衛生服務利用模式；

5）對工廠外來勞務工樣本的三分之一子樣本進行 6 個月的隊列隨訪，研究影響他們流動性的因素，留下者的健康指標的變化趨勢，他們的衛生服務需求、利用，以

及參與深圳勞務工醫療保險和其它因素對於工人正規衛生服務利用及自付醫療費的影響；和

6）爲衛生政策的制定提供依據。

本研究室採用深圳工廠的概率性抽樣工人樣本，主要基於問卷調查。2008 年 8 月，利用一個工廠的方便樣本進行了預試驗。所使用的問卷的主要部分由來自於中國國家衛生服務調查、抑鬱症狀自評量表和歐洲五維度健康量表等內容選取構成。基線調查於 2009 年 4-5 月期間在深圳進行，追蹤調查在 2009 年 10-12 月期間進行。基線調查共調查了 4088 名來自深圳 44 家工廠的外來工人，而追蹤調查則使用了基線樣本的三分之一單純隨機樣本。

本研究主要的發現如下：

研究 1：1. 工廠外來工人一般社會經濟學特徵

本研究分析了外來工基本人口學特徵（性別、年齡、民族、教育、婚姻等），流動性（在深圳累積工作時間，移居史，是否與家人一起在深圳，來源地和在深居留意願），經濟學因素以及工作相關特徵（有無工作合約、醫療保險參保情況、每天工作時長，每週工作天數，工作相關體力活動，等），給出了這一特定人群關鍵特徵的概括性的描述分析。

總體而言，在深圳的工廠外來勞務工代表了由農村移居至城市的工人階級，他們具有地理上和民族上的廣泛代表性。樣本中女性人數多於男性，初次調查時的平均年齡爲 27.36 歲 。許多工人受過中學教育，從事流水線生產，沒有家人陪伴並且也不清楚將在深圳停留多久。工作時間長、報酬低是他們經濟上的顯著特徵。

研究 1：2. 工廠外來工人自評健康

自評健康被證實是能夠預測發病和死亡相關的一個靈敏和穩定的指標，其效應甚至在初期測量之後的很多年仍然存在。本研究給出了自評健康與社會經濟學狀態變量的量化關聯性。結果中列出了原始的五維度（極好，好，尚可，差，很差）自評健康水準，同時也分析了歐洲五維度健康量裱中的將自評健康作爲 0 到 100 之間的連續性裡克特式可視模擬量錶（VAS）對 SRH 進行測試的結果。分析證實，有序五維度量錶與 VAS 量錶結果之間是緊密相關，並且均與工廠外來工的社會經濟學特徵、流動性、工作相關因素、行爲危險因素、臨床相關抑鬱癥狀以及自報兩周患病相關，且後兩者對自評健康的貢獻度尤其重要。分性別模型使用啞變量化後的五維度自評健康爲因變量，發現受教育程度較低者、日均睡眠時間較短者，出現臨床相關抑鬱癥狀以及報告 2 周患病者更易於報告較差的自評健康。這一結果獨立於年齡和性別而存在。

研究 1：3. 使用 CES-D 量錶對工廠外來勞務工精神健康狀況的分析

本研究採用了 CES-D 中文簡體版來篩查工廠外來工的臨床相關抑鬱癥狀， 分析了 CES-D 總分以及臨床相關抑鬱癥狀的流行率。研究揭示工廠外來勞務工精神健康狀況與工人的社會經濟學指標、流動性、行爲危險因素以及工作相關特徵有關聯。另外也分析了抑鬱癥狀與自評健康的關係。結果顯示，自評健康爲差或極差的工人的 CES-D 總分較自評健康爲極好、好和一般的工人更高；而自評健康爲差或極差的女性工人的 CES-D 總分較自評健康相同的男性工人爲高。

研究 1：4. 以風疹爲例評估工廠外來勞務工的傳染病風險

深圳工廠外來勞務工中有很大比例是育齡婦女，而她們對風疹病毒的免疫狀況對于風疹疫苗策略十分關鍵。本研究調查了外來勞務工婦女的風疹抗體的血清流行病學現狀，並評估了她們風疹免疫狀態的相關因素。

共選取了來源於橫斷面調查的2110個女性樣本的518名女性工人，採取血清，以商品化的酶聯免疫吸附法測試風疹IgG。此子樣本年齡介於18至55歲之間。同時還調查了她們的免疫史。在518名女工中，402（77.6%）對風疹病毒有免疫。IgG抗體陽性率與工人來源地、是否有工作合同、年齡組、婚姻狀況以及麻疹抗體血清流行率相關。

深圳工廠外來女工中風疹保護性抗體水準較低，不足以提供足夠的保護。考慮到女工中育齡婦女較多，來源於不同省份等特點，建議衛生部門在工廠外來育齡段女工中啓動風疹強化免疫專案或將風疹疫苗接種與麻疹強化接種捆綁實施。

<u>研究1：5. 工廠外來勞務工行爲危險因素</u>

在橫斷面調查中研究了吸煙、飲酒和網路使用三種行爲危險因素。全部樣本中，69.2%的工人是一直以來的非吸煙者，而5.6%，11.4%和2.1%的工人分別報告自己是當前的偶爾吸煙者（非每日吸煙者），當前每日吸煙者（每天吸煙小於1包）和當前重度吸煙者（每天吸煙大於等於1包）。在所有吸煙狀態中，女性的吸煙率均遠低於男性，同時她們的吸煙模式也與男性工人大相徑庭。爲了探索男性與女性外來勞務工上述三類吸煙狀態的相關因素，我們構建了8個不同的logistic回歸模型（由於樣本過少，除外了女性重度吸煙者模型）。總體而言，性別、年齡、教育程度、每天睡眠時間和網絡使用與工人的當前吸煙行爲相關。然而在分性別的模型中，女性的吸煙行爲還和臨床相關抑鬱癥狀、在深累計工作時間介於2年和3年之間（與大於5年者相比）、未簽訂工作合同以及頻繁飲酒行爲等相關。在男性模型中，當前吸煙行爲與有家庭陪伴、沒有醫療保險、每天睡眠時間較短、頻繁飲酒行爲以及在深圳的停留時間不確定等相關。

全部樣本中有46.3%的工人描述自己爲從不飲酒者，僅有0.54%認爲自己是經常飲酒者或每日飲酒者。飲酒頻率和過去一年內的醉酒次數在男女性別間存在有統計學意義的差異。

樣本中有 26.2%工人從不使用英特網，女性不上網的比例較男性高。無論性別，受教育程度均與頻繁的網絡使用呈正向相關。吸煙、飲酒，臨床相關抑鬱癥狀、自評健康及疾病忽視行爲與工廠外來勞務工的頻繁網絡使用相關。由於調查時間限制，本研究並未就勞務工中的網絡成癮行爲進行明確的界定和研究。

研究 1：6. 工廠外來勞務工兩周患病及衛生服務使用模式

本研究調查了工人自報的 i）兩周患病以及長期疾病，ii) 就診行爲（看醫生、自我醫療/用藥，以及疾病忽視行爲），iii) 喜歡使用的醫療機構類別及忽視疾病的主觀原因，iv) 使用中醫藥以及非處方藥的狀況， v) 勞務工在過去一年內住院醫療服務的使用以及拒絕醫生所建議的住院醫療服務的情況。

i) 總的兩周患病率爲 21.6%。單因素分析發現在外來勞務工中男性、沒有醫療保險、高中或以上教育程度、收入超過樣本平均月收入者、每日吸煙者、曾經去過別的地方工作過者、自評健康爲差、很差或尚可者以及有臨床相關抑鬱癥狀者較有可能報告兩周患病。而流水線生產工人和住集體宿舍的工人較少可能報告兩周患病。本研究也探討了不同年齡組合及累計在深工作時間與兩周患病的關聯。

Logistic 模型顯示工人中去過其他城市工作的、每天工作時間較長的、是每日吸煙者的，自評健康爲很差、差或尚可的以及有臨床相關抑鬱癥狀的，兩周患病報告的校正比值比大於 1；而高中或以上受教育水準及流水線工人的兩周患病的校正比值比小於 1。

三種最常見的長期疾病報告是：1）視力問題，2）睡眠問題，3）胃炎或胃潰瘍。但是其他一些嚴重但少見的疾病例如尿毒癥和腎炎綜合癥也有報告。

ii) 我們通過兩個途徑瞭解工人們的衛生服務利用。最近一次看病的模式顯示：1）超過一半工人的最近一次看病時間在半年以前或者更早；2）預防性衛生服務的利用不足、利用水平低。

那些報告了兩周患病的工人中，使用專業醫療服務的比例爲 34.8% （占全樣本的7.5%），而使用者中略低於四分之三患病後隻使用了一次專業醫療服務，僅有 1.8%使用了超過 3 次。勞務工醫療保險的醫療保險參保與否與過去兩周內的使用醫療服務的次數並無關聯。總體上來說，生病的男性外來勞務工使用專業醫療衛生服務的可能性較生病的女性勞務工更小，而且男性女性在專業的衛生服務利用水準上的年齡趨勢是相反的。分析結果顯示，那些沒有簽訂工作合約、曾經在別的城市打工、是頻繁的英特網使用者及當前重度吸煙者的工人，當他們患病時使用專業的醫療服務的可能性也較小。同樣的，醫療保險參保也未對患病工人是否去專業機構就診產生有統計學顯著性的影響。

iii) 在所有的衛生服務機構中，外來勞務工最經常使用的衛生服務機構是社區健康服務中心（社康中心），其次是私立診所和工廠或公司附屬的醫務室。勞務工選擇醫療服務機構的主要考慮因素是地理上的方便性，以及該機構是否是否是勞務工醫療保險定點醫療機構。

同時，超過一半的患病外來勞務工選擇了自我醫療或自服藥物而 11.6%的患病者什麼也不做。對中醫服務和中醫藥的使用在外來工人中十分普遍，無論工人選擇的是專業的醫療服務還是自我醫療。選擇忽視疾病什麼也不做的三個主要主觀理由是：1）自覺病輕，2）沒有時間看醫生，以及 3）經濟困難。

iv) 在外來勞務工中使用中醫和中藥的情況很普遍，無論工人是看醫生或自我醫療。我們還發現 16.9%看過醫生的工人同時也使用購買非處方藥的方式處置他們的病患，存在醫療服務的混合利用模式。而來自參保勞務工的數據表明仍然有相當比例的參保工人不清楚醫療費用報銷程式或者認爲醫藥費不可能報銷。這反映了工廠外來勞務工中存在對深圳市外來勞務工醫療保險辦法的錯誤或不足認識。

全部樣本中，收到了 893 人次的長期病患或者慢性病報告，其中僅有 13.7%的情況得到了醫生處理，而這其中大約三分之一是由中醫醫師處理的。

v) 在調查前的一年內，4088 人中有 3.1%利用了住院醫療服務，1.4%的工人拒絕了醫師住院的建議（占全部需要住院治療工人的 30.7%）。自我感覺疾病不嚴重、缺乏時間和經濟困難是工人拒絕醫師建議住院的主要解釋。

研究 2：1. 外來勞務工的隊列資料：離開者和留下者的社會經濟學特徵、健康狀況和衛生服務利用

本研究從 4088 的原始樣本中挑選三分之一子樣本（1363 人）進行隨訪。在這 1363 人當中，37.34%在隨訪開始前已經離開了原有的工作，62.66%的工人繼續留在原來的工作崗位。

比較發現，所選的三分之一隨訪隊列子樣本與原始工人樣本在主要的社會人口學特徵上沒有顯示出有統計學意義的差別。然而，離開者和留下者的社會人口學特徵卻存在明顯的、有統計學意義的差異。工人中的女性、較年輕的、單身的、有家人同在深圳的，在深工作時間較短的，住工廠宿舍的，是流水線工人的，沒有工作合同和沒有醫療保險的更可能成爲離開者。

此外，我們還檢查了離開者和留下者在橫斷面研究中的自評健康、臨床相關抑鬱癥狀流行率、自報兩周患病以及專業衛生服務利用率方面的差異，發現在橫斷面研究中使用專業衛生服務多的、報告兩周患病的、自評健康較差的、精神衛生較差的更容易成爲研究 2 中的離開者。

研究 2：2. 外來勞務工的隊列資料：留下者的時間縱向改變

我們合併了研究 1 和研究 2 的資料，對 833 名成功隨訪到的工人資料進行了分析。分析主要基於兩個角度：

1）留下的外來工廠勞務工的兩個健康狀態指標的縱向改變：精神衛生狀態（CES-D總分）、五維度自評健康，分析它們的變化与基綫時的社會經濟學特徵、移居史、收入變化以及基綫的健康狀態指標之間的關聯性。

2）醫療保險、基綫社會經濟學特徵以及健康狀況對衛生服務利用水平和自付醫療費用的影響。研究髮現，年齡增加、低收入、有長期存在的病患（包括慢性病、）較差的基綫自評健康會增加 6 個月內外來工人的自付的醫療費用。

有醫療保險及被保險時間覆蓋時間長顯著地提高了外來工在深圳使用專業醫療服務的可能性 （相對危險度分別爲 1.619 和 1.421）， 降低了他們總的看病次數 （相對危險度爲 0.867 和 0.790），而且与 6 個月內工人自付的專業醫療服務醫療費的降低有關聯。

本研究的結論及政策啓示

本研究是第一個關注生活和工作在深圳的工廠外來勞務工的流動性、衛生服務需求與利用的隊列研究。本研究的結果顯示工廠外來勞務工代表了當代中國一個重要的社會和經濟階層。他們的農村背景、高流動性、特殊的性別比例、相對年輕的年齡、有限的受教育水準、低收入、特殊的工作-生活模式以及社會支援的缺乏概括了他們的外部環境。工廠外來勞務工的健康需求是多方面的，儘管不一定較那些他們居留地當地的城市居民更高或更複雜。我們的研究選擇了自評健康、精神衛生、傳染病風險、行爲危險因素以及兩周患病情況作爲代表性指標來研究他們的健康狀況。同時本研究還觸及外來勞務工的衛生服務利用、獲得專業衛生服務的障礙以及服務利用的時間縱向趨勢。以健康狀況和衛生服務的利用爲中心，我們調查了可能對工廠外來勞務工健康指標和專業衛生服務利用造成負面影響的危險因素。

深圳獨特的勞務工醫療保險體系被證實可以提高工廠工人對專業醫療服務的利用，同時降低工人自付的總的醫療費用支出。然而那些流動性較強、未參保、健康指標較差

的工人卻被忽視了，他們的衛生保健需求因而難以被測算。工廠外來勞務工內部的健康不平等性應引起注意，而逆照顧法則在深圳的工廠外來勞務工中是存在的。

旨在加強健康教育、健康促進及提高衛生服務可及性的衛生政策應該將高度流動的外來工人以及他們特殊的衛生服務需求納入考量範疇。通過提高保險覆蓋、提高社區衛生服務水準及將精神衛生服務納入社康中心的服務之中，本地的衛生行政部門才有可能幫助提高鄉城流動工人的健康水準。然而，在這一過程中，那些最容易被忽視的、高流動的外來工應該得到充分的重視，而他們的健康需求能夠得到較好的評估。

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This research aims to understand several related aspects of public health issues amongst rural-urban migrant factory workers working and living in Shenzhen, which we believe to be the first one in the history of Shenzhen. These outputs are thanks to the dedication and commitment of all those working with me and my supervisors, on the field of all the factories, in the serological laboratories, by computers helping with data entry, questionnaire testing, and data analyses. As the core member of the research team for this study, I truly appreciate many facilitators either from the factories or from health organizations at different levels in Shenzhen. Without their efforts, this project could not be successfully fulfilled with such an amazing efficiency.

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*Note: * Equal contribution*

Abbreviations

AWT	Accumulated working time in Shenzhen
BHPS	The British Household Panel Survey
CASP	The Critical Appraisal Skills Programme
CATI	Computer-assisted telephone interview
CDC	Centre for Disease Control & Prevention
CES-D	Centre for Epidemiological Studies-Depression Scale
CHCs	Community Health Centers
CHSMW	Cooperative Healthcare Service System for Migrant Workers
CNHS	China National Health Service Survey
CNSB	The Chinese National Statistic Bureau
CPC	Communist Party of China
CRS	Congenital Rubella Syndrome
CSSRI	China Social Science Research Institute
CUHK	Chinese University of Hong Kong
DHP	Designated healthcare providers
DS	Depressive Symptoms
ELISA	Enzyme-linked immunosorbant assay
EPI	Expanded programme on immunization
EQ-5D	EuroQol 5D
GDP	Gross Domestic Product
GIS	Government employee insurance scheme
GLM	Generalized Linear Model
GPs	General practitioners
GPs	General practitioners
HIE	Healthy Immigrant Effects
HIS	Hospital Information System
HRQOL	Health related quality of life
HRS (*Hukou*)	Household Registration System

ICTs	Information communication technologies ,
IFLS	Indonesia Family Life Survey
IgG	Immunoglobulin G
IOS	Intention of stay
LIS	Labour insurance schemes
LIS	Labour Insurance Schemes
MISM	The Medical Insurance System for Migrant Employees
MOA	Ministry of Agriculture
MOH	Ministry of Health of China
MOLSS	Ministry of Labour and Social Security
MMR	Measles-Mumps-Rubella
MR	Measles-Rubella
MW/MFW	Migrant worker/Migrant factory worker
MWHHUS	Migrant Factory Worker Health and Health Utilisation Study
NEPI	National Expanded Program of Immunization
NRCMS	New Rural Cooperative Medical System
OD	Optical density
ORs	Odds Ratios
OTC	Over-the-counter
PRD	Pearl River Delta
QOL	Quality of life
RCS	Resident Card System
RHCR	Rural Household Contract Responsibility
RMB	*Renminbi*
RR	Relative Risk
SBREC	Survey and Behavioural Research Ethics Committee
SES	Socio-demographics and economic factors
SEZ	Special Economic Zones
SHS	Second-hand smoking
SPI	Severe physical illness
SRH	Self-rated health

SSB	Social Security Bureau
STIs	Sexual Transmitted Infections
SZSB	Shenzhen Statistic Bureau
TCM	Traditional Chinese medicine
TPMS	Temporary Population Management System
UK	The United Kingdom
UNPD	United Nations Population Divisions
U.S.	The United States of America
VAS	The EuroQol Visual Analog Scale
VIF	Variance inflation factor
WHO	World Health Organization

CHAPTER ONE INTRODUCTION AND BACKGROUND

1.1 Shenzhen city and its health care system: general description

Shenzhen, once a remote fishing village by the South China Sea with less than 30,000 population [1] is now one of the fastest growing cities in the world and southern mainland China's major financial centre [2]. Its location near to Hong Kong creates a unique context for its citizens. It has a high GDP which reached 780.65 billion Yuan (76.43 billion UK sterling) in 2008 with growth ranked the 4th highest in China. Financial revenue for 2008 was more than 80 billion Yuan (7.83 billion UK sterling), representing an annual growth of 21.6%. Every year, the revenue contributed to the Central Government reaches more than 200 billion Yuan (19.58 billion UK sterling).

There are 2440 health and medical organizations in the city, and among them there are 100 hospitals. Currently, 634 Community Health Centres (CHCs) employ more than 50,000 health workers. This is a rapid growth from less than 300 CHCs in 2005. The total annual investment in health in 2008 was 2.8 billion Yuan (equivalent of 270.5 million pounds sterling), an increase of 25% compared with 2007 but accounting for only 3.16% total municipal spending. The gross investment for health per capita in 2008 was 323 Yuan. Traditional Chinese Medicine and hospital based health services account for 48.67% of the budget, while 9.98% is allocated to the CHCs, 13.31% designated for disease prevention and control, 5.68% for public health supervision which includes monitoring food and environmental hygiene, 0.07% for traditional Chinese medicine, 4.23%for health administration fee, 2.69% for health

insurance subsidies and 10.68% for other supplementary health services. The remaining 4.70% was allocated for health centre based maternal and child health services [3].

1.2 Migrant and migrant workers in the city of Shenzhen: a special group to study

1.2.1 Migrants and the impacts on Shenzhen's healthcare system

The population of Shenzhen is unique, with the majority of those in the city being migrant workers [4]. Accurate population figures can be difficult not only because of the mobility associated with migration but also because of the fluctuations linked to economic circumstances. The majority of residents in Shenzhen are not born locally, are young and tend to keep close social and economic links with their hometowns and families [5]. Population estimates for those requiring services in 2009 vary between 9 and 13 million, 80% of whom were migrant workers, some officially registered and others described as 'floating' [6].

This large migrant workforce reflects the rapid expansion of Shenzhen and the population is highly mobile. This poses problems for developing and implementing legislation and policy to support the healthcare system, particularly for action to guarantee the equity and equality of health services delivery. Unsurprisingly the standard formulae used for central resource allocation do not reflect this unique demographic complexity and health resources are severely constrained. Although comparison of health indicators between Shenzhen and other developed regions of

China or industrialized countries show progress is being made, gaps still exist. For example, the maternal mortality rate in Shenzhen was 30.16/100,000 in 2007, compared with 25.57/100,000 in Shanghai [7], 4/100,000 in Germany and 8/100,000 for the UK [8]. However, if only *HuKou* population (residents who holds a formal household registration in Shenzhen) is considered, the maternal mortality rate was only 14.79/100,000 (as compared with 15.58/100,000 in Shanghai as of 2007). These figures highlight the differences in health outcomes experienced between the different groups in our population.

1.2.2 Estimation of the size of the migrant population

It is important to understand the migrant population from various perspectives, which include but are not limited to: magnitude of the population, mobility, accurate demographic features and the changing characters of these features.

Although no standard and coherent data are available on magnitude of migrants in Shenzhen, the most developed Pearl River Delta (PRD) metropolitan area in Guangdong Province of China, the estimation is at least 6.49 million official migrants in 2007 are living and/or working in this city according to official data by the Shenzhen Statistic Bureau (SZSB) [8]. However, estimates in 2008 are 6.48 official and 4.52 million unofficial, and in 2009 the total number of migrants in Shenzhen was reported as more than 11 million or 12 million according to different government news release conference. Changing figures are due to economic circumstances [9, 10].

1.2.3 Necessity and targets of this study

This mobile population makes Shenzhen a unique city with the highest proportion of migrants nationally and internationally, challenging the local public health system and health authorities in their efforts to monitor and improve health of Shenzhen people.

Former international experience shows that patterns of health and disease of international immigrants tend to be different from that in people of their destination communities. Some but limited literature in mainland China has also shown that migrants have a degree of specificity in behavioral risk factors [11], health outcomes [12], diseases models and healthcare utilisation [13]. Evidence gained elsewhere especially that in industrialized countries may not apply to Shenzhen migrant communities due to the obvious differences in social, cultural, economic and demographic characteristics between international immigrants and China's internal migrants.

To simplify rural-urban migrants as the most vulnerable, fragile and inferior population is questionable; however, the adverse environmental and social factors that have been molding them, from their births in the Chinese rural areas to the current mobile experience in big cities like Shenzhen, make the Healthy Immigrant Effects (HIE) disputable amongst the Shenzhen migrant population. This thesis focuses on health-related behavioral risk factors, self-rated health, pattern of diseases and healthcare utilisation amongst Shenzhen migrants working in the factories, and examines potential correlates in demographics, socio-economic and work-related

aspects. To highlight their high mobility, differences between those who stayed and those who left over a half-year period was tracked and presented.

1.3 Rural-urban migration: history and implications

To fully understand the origin of rural-urban migration and the specific features of mainland China's internal migration and its possible implications to public health and the health system, and to explore the background of migrants in Shenzhen city, we reviewed the history of China's population management system and its evolution , definition and drives of rural-urban migration, the population involved, the profile of Shenzhen regarding its development and characteristics of population constitution, as well as the healthcare system and health insurance schemes designed for migrant workers in Shenzhen.

1.3.1 General Introduction of Mainland China's Household Registration System and Population Movement

1.3.1.1 History and roots of the Household Registration System

The Household Registration System (HRS, *Hukou*) has been one of China's political characteristics in population management since 1958 when China's development strategy relied obviously on the growth of capital-intensive heavy industries, dividing the whole Chinese society into the urban and the rural sectors. In order to support the heavy industry development, products prices were shifted by a

centrally-controlled price system and peasants were thus tied to the land in rural areas. HRS determined accessibility to privileges for social welfare in state socialist China. Transforming one's agricultural *Hukou* status to a non-agricultural status represented an upward social mobility and was especially difficult to achieve [14]. Education, serving the army, and membership in the Chinese Communist Party were the major determinants of this social mobility. Via the above routes, individuals made themselves either legal migrants or transferred *HuKou* holders. The HRS was very successful in halting rural influxes into Chinese cities before 1980s [15]

During the Chinese Cultural Revolution, mainland China's agricultural output dropped sharply, however the employment structure and the rate of urbanization did not change very much. As reform progressed, patterns emerged that favored eastern coastal development, lifting the curtain on one of the most significant Chinese migration in China's history.

1.3.1.2 Migration: cause and magnitude

Inconspicuous before 1978, internal migration has become an important phenomenon in China since early 1980's when as a result of economic reform and transition to the market economy HRS was relaxed to allow populations to move to the economically productive areas and food rationing systems were phased out [16].

More specifically, rural residents witnessed the breakup of the commune system and in the urban areas the supply systems for food and housing were reduced thereby removing two major obstacles to migration.

Other than economic growth and market development facilitated by reform and opening-up, literature suggests that the following factors could also be explanatory to higher rates of population movement after 1980s: the original unbalanced population distribution pattern, an uneven industrial structure, and the gap in income between urban and rural areas, which has widened since reforms in the mid-1980s [17].

This urban-rural income discrepancy together with the emergence of private or joint venture enterprises that were in great need of labour exerted great impact on the urban and the rural societies, two worlds that were polarized at different social and economic sides of the country, creating pull strengths on rural-to-urban migration. Whilst the push power came from several factors including but not limited to: labour surplus with the introduction of the Rural Household Contract Responsibility (RHCR, *Lianchan Chengbao Zeren Zhi*), more abundant provision of food on the market that diminished the relevance of food rationing and use of coupons as main means of purchasing food (hence gradual cancellation of grain coupons that were tied on individuals' *HuKou*), the loosened HRS that allowed a higher degree of moving, new norms and legislative permissions that put personal fortune in a more legitimate position, and finally the long standing philosophy in the Chinese culture to move and seek better lives.

In conclusion, rural-to-urban migration, as the major type of internal population movement in China, reflected a trend of rapid industrialization, urbanization and the need for surplus labourers from the rural areas to meet the needs

of the fast changing economic models which were moving from the planned economy to a modernized market economy.

1.3.1.3 Description of the main characteristics of migrants and floating population in China

According to the Chinese population statistics, during 1983~1988, 63 million peasants were working in enterprises run by villages or towns (*Xiangzheng qiye*) and this is seen as the rudimentary rural migrant workforce moving initially to small towns not so far from home. In 1989, the number of peasants who left their hometowns for jobs increased sharply from less than 2 million in early 1980s to 30 million in 1989. Chinese people witnessed the first wave of national transportation tension (*Chunyun*) due to the moving of peasant workers from cities back home at lunar New Year (*Chunjie,* The Spring Festival). Later in 1990 there were nationally 34.128 million migrants, of whom 32.42% were inter-provincial and 42.99% involved job-related shifts within province. In 1992, 8.1% of the urban population was not having been registered in the public security department as *Hukou* holders of the locale thus considered floating population defined as not registered. In 1993 the total number hit 62 million, of which 22 million were inter-provincial migrants. In 1995, number of floating population in China reached 80 million according to a research report [9]

According to the national population census of China in 2000 data, number of urban-rural migrants was 88.40 million, which accounted for 73.0% of the total number of internal migration (12.107) [18].

Based on the Report on Chinese Peasant Workers by the State Council of China, in the first five years of 21st century, the annual increment of peasant workers was estimated to be around 6 to 8 million. The Chinese National Statistic Bureau (CNSB) estimated in 2003, based on an investigation covering 31 provinces/autonomous regions/municipalities, 68 thousand households and 7100 villages that 114 million (23.2% of China's total rural labour) migrants were living/working in the urban areas and that in 2004 23.8% of rural residents of that year (118 million) were living or working in urban areas. Though there have been different sources of estimation and projection, consensus has been achieved at the national level by CNSB, the Ministry of Agriculture (MOA) and the Ministry of Labour and Social Security (MOLSS) [19] that there are round 120 million rural-urban migratory peasants, and if those who are working at the local enterprises are counted, the total number is nearer 200 million. In 2010, China's National Commission of Population and Family Planning claims in Beijing in June that the newest national estimation of China's floating population has reached 211 million and is projected to be 350 million in 2050 [20].

Earlier internal migration was not restricted only to the secondary industry, but also to tertiary industry related to housework, security, and hotel or restaurant services. According to the State Council's report, in 2004 30.30% of the rural-urban migrants worked in productive industry, and 22.90% in construction industry. Others included

10.40% in services, 6.70% in food, restaurant and hotel services, and 4.60% in wholesale or business. Currently in Shenzhen, where the majority of its residents are not local *HuKou* holders, rural-urban peasant factory workers represent the majority of internal migrants.

Regarding region of origins, central provinces accounted for 40.0%, western regions accounted for 26.7% and other regions 33.3%. Eastern and coastal urban regions and city groups such as those in Pearl River Delta (PRD) including Guangzhou, Dongguan and Shenzhen were, *inter alia*, major destinations for migrants from impoverished western and central inland areas of mainland China.

Appellations for rural-urban migrants include: peasant workers (*Nongmin Gong*) which was firstly used by the China Social Science Research Institute (CSSRI) in 1984, labour workers (*Laowu Gong* in general, *Dagong Zai* for male, *Dagong Mei* for female). Two indicators of internal migration that have been frequently used in mainland China's statistics are: floating population (*liudong renkou*) and temporary population (*zanzhu renkou*). By strict definition, the former refers to migrants who have lived in a locale for less than one year and without holding a permanent household registration in that locale whilst the latter refers to migrants who have lived in a locale for one or more than one years thus are required by the local public security departments to register in a system called Temporary Population Management System (TPMS) which is independent of the local HRS system. Practically and by management definition, local residents and migrants are distinguished by whether a local *Hukou* identification card is given; and the division

between temporary and floating populations depends solely on the situation whether an individual holds a temporary resident card. From the policy and population management perspectives, these practical differentiations provide local government with certain evidence for resources allocation, economic and social statistics, and most importantly, in the early times when population move between the rural-urban dualistic societies just started, crime control and order of public security maintaining. However, to explore the accurate components of migration in mainland China is challenging because (1) Defects exist in the above definitions. For example, there are migrants who never or are reluctant to report their destination to the public security department either because of not being willing to pay the yearly registration fees or because the registration process itself is complex, especially if they have lived in a city for several years or are illiterate. Some migrants, if hired by legitimate employers, are registered and given a temporary identity card once they start to work, but the real duration of stay may last for only a few months; and (2) welfare such as medical insurance, education, housing, retirement and unemployment pension that is tightly linked with urban HRS was not integrated in the migrant management system until recent years when more and more cities began to enlarge their social welfare systems to cover migrants on the condition that they are registered and employed. To reduce the mismatch between the migrant management system data and the real number of and information about migrants, some pioneer cities like Shenzhen started to implement a new Resident Card System (RCS). Initiated in August 2008 and free of charge, the RCS in Shenzhen is linked to migrant health insurance, occupational

safety insurance, and the retirement pension system and it is anticipated it will be linked with low-rent/low cost housing. According to newly released statistics from the Shenzhen Public Security Bureau, RCS has covered 10.71 million migrants in the city of Shenzhen up to December 2009. However, RCS may face the difficulty of excluding those who move out of Shenzhen since no measure has been taken to record migrants' departure, long term or short term [21].

The number of migrants (120 million, approximately 9% of the population) is increasing by an average rate of 10% per year [22]. Amongst this huge number of Chinese peasants, a very small percentage can finally relocate permanently in urban areas. In fact, 20% of the migrant move bidirectionally, meaning they come to and leave the city on a regular basis according to the farming rhythm. Their occupation switches between being a peasant and being a worker. This seasonal floating phenomenon has been reflected by an annual transportation tension at Spring Festival usually in January or February and by early March's shortage of labour (*Mingong Huang*) in almost all enterprises and service businesses due to unbalanced labour supply and demand over the time [23, 24].

As a gigantic societal and economic phenomenon, rural-urban migration has been a focus of research from several different perspectives including those of the rural migrants themselves, of their urban employers, and of the government [15, 25-31]. A main point in research of this field has been that the migrants are vulnerable and marginalized [32] in many aspects, however, as quantity and quality of migrants increases, there is considerable evidence from empirical studies that rural-urban

migrants have more sophisticated features [33-36] beyond their originally disadvantaged-only image and thus mechanisms and implications for this population are needed when considering any social, economic and health service policy decisions and evaluations.

On the one hand compared with urban residents, they are at disadvantage in the urban labour market concerning job opportunities, skill training, salary, and employer or government-provided benefits including housing, healthcare insurance and retirement or unemployment pensions. In general, migrants without *HuKou* and living in the cities often take jobs unwanted by local residents, are paid less, are excluded from Labour Insurance Schemes (LIS) and Government employee Insurance Scheme (GIS), two major insurance systems for employed urban residents. Whereas rural populations were covered by the New Rural Cooperative Medical System (NRCMS) migrants were not due to being away and not able to access their designated rural healthcare system. Other major concerns include education of migrant children, with parents living in the cities or left behind in rural villages, and issues related to family, emotional attachments and sexual behaviours. On the other hand, compared with other rural residents left behind, migrants may be healthier; many of them are fairly satisfied with their migration experience, and have long term plan for staying in the city. As a bridge between city and rural lives, migrants make significant contributions to their home families economically and pass new information from the more advanced cities to the less developed rural areas. The remittance sent home and skills they learnt in the cities are of importance to the rural

society [26, 31, 37, 38]. In year 2005, China's urban migrants sent home the equivalent of US$65.4 billion. In addition, sub-classes exist amongst the migrants. Those who evolve through certain routes and are at management level differ substantially from those who lose their jobs and are not easy to be caught by studies that use normal representative sampling frameworks. To fully understand rural-urban migrants in China is challenging in that the more marginal groups are more invisible hence harder to be sampled in any study by any method.

1.4 Profile of Shenzhen: Data from Routine Statistics and Census

1.4.1 History and development of Shenzhen

Special Economic Zones (SEZs) are small areas demarcated within a country's territory and suitably insulated for adopting special and flexible policies to attract and encourage foreign investment in industrial and other economic activities [1, 39].

As one of the earliest SEZs and a Window of Reform, Shenzhen has been transformed from a small and remote fishing village with a population of 30,000 in late 1970s to a modern metropolitan area and a mega-city of 2,022 sq km with an estimated population of 14 million. Being southern China's major financial centre, Shenzhen is home to the Shenzhen Stock Exchange as well as the headquarters of numerous high-tech companies. Shenzhen is also the second busiest port in mainland China, ranking only after Shanghai. In 2008, the total value of Gross Domestic Product (GDP) reached 780.65 billion Yuan, a 12.1% growth compared with that in

2007 and in 2009 local GDP of Shenzhen reached 820.12 billion Yuan which was a 10.7% increase compared with that of 2008. Shenzhen has attracted foreign investments not only from Hong Kong but from many other countries like Japan, South Korea, the United States and Canada. Even as it developed into a compact urban region, it has served to energize surrounding urban nodes like *Dongguan, Foshan, Zhongshan* and *Huizhou*. It has also sparked visions of a southern China megalopolis linking it with Hong Kong, Macau, *Zhuhai and Guangzhou* [40].

Amongst all other factors that contributed to the booming economy in this young city, a cheap and very available migrant peasant workforce is one of the most important factors [24]. Adjoining Hong Kong across the Shenzhen River, Shenzhen city hosts 10 to 12 million internal migrants among whom more than 60% [41] are working in factories producing garments, electronic products, toys, glasses and the like, traditional and chief exports of China.

Due to the fact that Shenzhen is one of the fastest developing metropolitan areas and the largest migratory cities in the world, it is very difficult to give an accurate estimation of its population size. Various estimation methods have been explored and studied but none of them can truly answer the question. According to the United Nations Population Divisions [42], Shenzhen was the 11th largest city population in the world, following Shanghai in China (the 10th largest with 12.7 million). If the floating population is excluded and only *Hukou* population and registered temporary population are counted, Shenzhen ranked the 7th largest city in mainland China [43].

1.4.2 Population structure of Shenzhen

The structure of the population in Shenzhen together with its development in the past 30 years deserves close attention and reflects a typical path through which many other cities evolve. The characteristics of Shenzhen's population can be summarized as the following:

1.4.2.1 Increase of migrants overran natural population growth

Shenzhen's population increase can be divided into 3 stages. Stage 1, between 1982 (the Third National Census, 351,900) and 1990 (the Fourth National Census, 1667,400) [43], population in Shenzhen had an average annual increase of 21.47%, whilst stage 2, between 1990 and 2000 (the Fourth National Census, 7008,800), the average increase rate was 14.96%. However, the absolute population increment was 5.34 million during 1990-2000, four times of that during 1982 to 1990. Moreover, the proportion of migrants in stage 2 increased from less than 50% in 1990 to 82.6% in 2000. Stage 3, after 2000, population size in Shenzhen has been kept increasing and till 2009 the number of population doubled that in 2000.

1.4.2.2 Age structure of the population

Shenzhen is a young city with a young population. The average age was 30.8 years and the median age was only 25.37 years in 2000. Children and juveniles (0-14 years) accounted for 8.49% (6.16% decrease compared with that in 1990 and 15.68% less than that of Guangdong province in the same year). Elderly people who are 65

years or above accounted for only 1.22%, and 15-59 years accounted for 90.29%. Of these in between 15 to 59, one fourth (1752,000) belonged to age group of 20-24 years. This age structure is unique in that non-working age populations accounted for less than one tenth (9.71%) of the whole population. Compared with the national census data in 2000 and 1% population sampling census in 2004 (above 65 years: 6.96% in 2000, 7.6% as of year 2004; 0~14 years: 22.89% in 2000, 19.4% as of 2004), Shenzhen has an especially low percentage of elder people and young children over time. This reflects the trend that young labourers at working ages move out of villages and move into big cities, leaving the elder people and very young children back in the countryside [44].

1.4.2.3 Sex ratio of population

In 2000, the sex ratio (defined as the ratio between the number of males and the number of females, expressed in number of males per 100 females, at birth, it was 105 boys for 100 girls). In Shenzhen the sex ratio of its population is 97.19 in 2009, a 2.61% decrease compared with 99.80 in 1990. Compared with that of *Hukou* residents (111.75) [8], migrants had much lower sex ratio, illustrating that in general more female than male migrants live in Shenzhen while the number of males exceeds that of females in local residents.

However, the gender ratio varied across age groups for migrants. In the age group 15-19, the gender ratio was 48.2; in age group 20-24 years, it was 72.5 and this suddenly rose to 113.02 in age group 25-29 and kept rising in the older groups due to

the fact that many young female migrants would choose to depart permanently for rural homes to get married when they reached certain age. This can be interpreted as the following: in late teens there are twice as many women as men, in early working ages the ratio changed to 7 men for every 10 woman, whilst for older workers there are more men than women. This age-dependent changing of sex ratio may result from a tradition in Chinese rural areas that females have fewer years of education, migrate at younger age and start working younger than males, and that once they reach certain ages for marriage they have to leave for rural homes, temporarily or permanently; whilst men's migratory experience is independent of their marriage status, if not age. The high proportion of young girls in this migrant population signifies some specific public health priorities for the local government, as having been shown by former studies in Shenzhen [5, 43, 45-47].

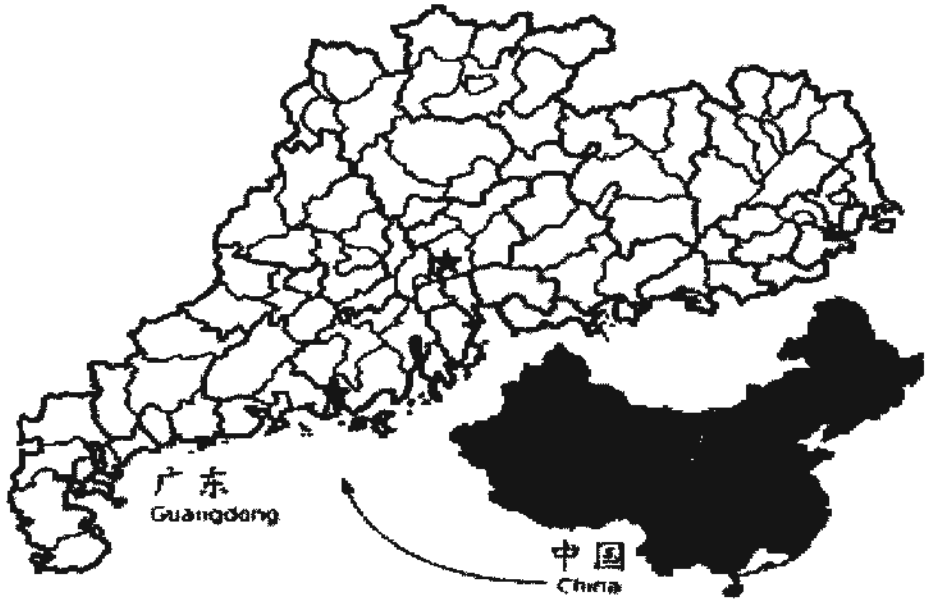

Figure 1- 1 Geographic location of Shenzhen and Guangdong Province in mainland China

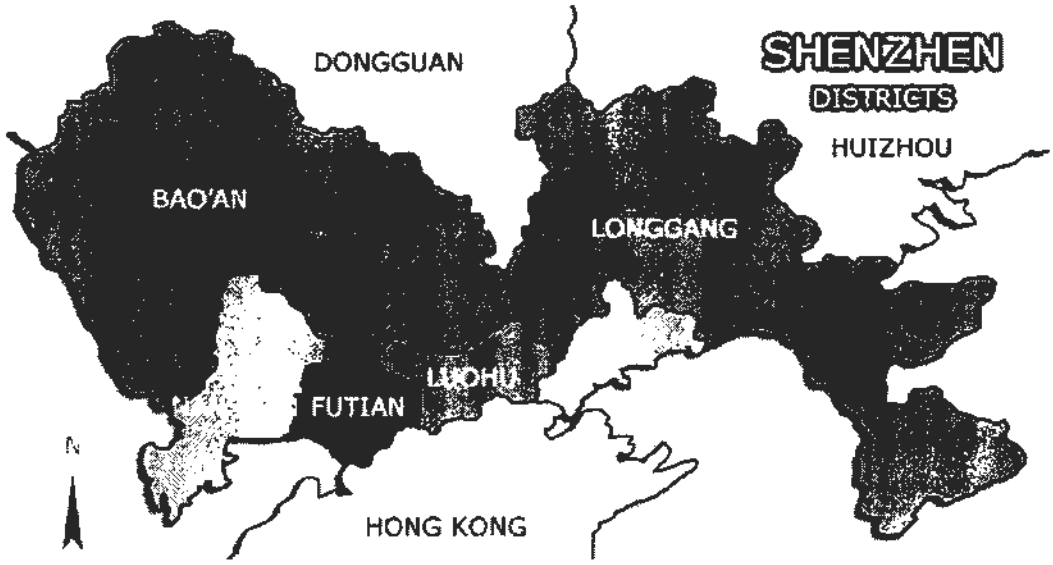

Figure 1- 2 Administrative districts of Shenzhen

1.4.2.4 Education attainment and quality of the population

Though 14.07% [43] of the Shenzhen population were illiterate, the majority had had senior high school education (54.26% of all who had ever entered schools) and the percentage of those who had senior high school education reached 23.29% and 8.38% had college or above education attainment. Differences were found between population who live within SEZ (District of *LuoHu*, *FuTian*, *Nanshan* and *Yantian*) and those who live outside of SEZ (District of *Bao'an* and *Longgang*) (Table 1-1), the main locations for many factories, showing less education.

The educational differences between residents living within SEZ and outside of SEZ reflected, to a certain extent, unbalanced distribution of migrant workers and local residents, since migrant factory workers account for a very high percentage of the population living outside of Shenzhen SEZ and their comparatively low educational attainment diluted the average education level in the two districts.

Table 1-1 Education attainment by whether living within SEZ (Year 2000)

Education	Lived within SEZ (%)	Lived outside of SEZ (%)
Junior high or below**	51.12	78.08
Senior high or above**	48.88	21.92
College or above**	17.26	3.35

*Note: ** $p < 0.01$*

1.4.2.5 Employment status of the population

Shenzhen is famous for its productive industries. The employment status of its population reflected this in 2000, when census data showed that 55.4% of the whole population was employed in the productive industries and of those who were hired in these industries whilst 64.1% of migrants were employed in productive industries. This number is followed by population employment percentage in realty industry (12.1%), wholesale and retail (7.9%) and construction (5.3%) [48].

Of those employed migrant workers in productive industries, 66.3% were of junior high school education level, accounting for 73.9% of all individuals with secondary education in the city of Shenzhen. Still there were many workers who only had primary school education (7.5% for both sexes, 4.6% of male workers and 9.8% of female workers) or who were illiterate (0.3% for both sexes, 0.1% of males and 0.4% of females). In factories or production industries, only 0.2% held post graduate degrees and 1.6% had degree of university or above. Though Shenzhen ranked the second regarding the proportion of employees with senior professional titles (10.32% of all employed individuals) in Guangdong Province, very few were working in

productive industries. According to the 2005 1% population census report of Shenzhen, amongst permanent or *hukou* residents of Shenzhen, 12.70% had university education or above, 23.64% and 47.15% had junior high or senior high school education, respectively. Less than 10% of the permanent populations were engaged in productive industry jobs [8].

1.4.2.6 Ratio of hukou holders and non-hukou holders

The inversion of the ratio of *hukou* holders to non-hukou holders in Shenzhen is striking. More than 95% of the population living in Shenzhen were not locally born. Currently, *hukou* holders (1.82 million) accounted for only 22% of officially registered (*hukou* population, temporary populations and migrants) and 14.9% of estimated populations practically managed (*guanli renkou*). This percentage was especially high and higher than all other mega cities in mainland China (the ratio varies between 70-78% in Beijing, Shanghai and Guangzhou), and those in other famous migratory countries (Canada and Australia both were 80%, Kuwait was around 50%) [43].

Based on the above evidence and data, it can be concluded that Shenzhen has a large proportion of migrant workers working in production industries, with an average age of 25 years and an average education level of junior high. The impact of ongoing industrialization and urbanization process has significant impact on the population as reflected by the polarized socio-demographic distribution, unbalanced gender ratio and fast developing population size. The two districts in which factories are

-concentrated outside of SEZ were major destinations for rural-urban migrants with limited education and skills. Shenzhen is a typical city where restriction by Hukou has least impact so as not to stop people from moving to where the jobs are.

1.5 Healthcare services and health insurance for migrants in Shenzhen: evolution, obstacles and reform

1.5.1 Evolution of the Shenzhen health system and improvement in health indicators

The establishment of a formal, modernized healthcare system in Shenzhen dates back to 1979, when the State Council and Guangdong Province issued the proposal to promote inclusion of the Bao'an County to create Shenzhen City. Founded in the same year, Shenzhen Health Bureau, formerly Bao'an County Health Department, played a major role in shaping the city's health system. In the past 30 years, health investment and input have increased enormously. The total financial investment in health rose from 2 million Yuan *Renminbi* (RMB) in 1980 to more than 3 billion Yuan in 2008 with an average increase rate of 30.9%. By 2007, the city had 2385 healthcare units, 18086 hospital beds and 59170 health workers. In 2007 the Shenzhen healthcare system provided 59535 thousand person times of outpatient (annual increase rate in the past 30 years was 13.1%) and 681 thousand inpatients (annual increase rate in the past 30 years was 16.5%) services. Health indicators in 2007 were all much better than those in 1980. Infant mortality decreased from 30 per

1000 live births in 1980 to 3.18 per 1000 live births in 2007. The maternal mortality ratio per 100000 live births decreased from 50 in year 1991 to 14.79 in 2007 (only *HuKou* populations are considered for this figure) and the notifiable infectious disease incidence rate per year sharply decreased from 5000/100,000 in 1980 to 258.36/100000 in 2007. Life expectancy at birth in 2007 in Shenzhen was 77.53 (76.34 for male and 78.84 for female) [3].

1.5.2 Healthcare and health insurance reform

1.5.2.1 Rationale of the reform in Shenzhen

The city has witnessed great advancement in many aspects of its economy and health system. All these big jumps and improvements were, however, disturbed by continuous conflicts and contradictions that arose inside and outside the local healthcare system. *Kanbing nan* (difficult to see a doctor) and *Kanbing gui* (expensive to see a doctor) were two examples that described the common healthcare service problems in Shenzhen as in all other places in China. Insurance system renovation and reform, human resources management and financial investment in health are but three major bottlenecks that were widely discussed and talked about, under the national new health system reform background. Shenzhen health authority and social security department had been put under pressure to solve health insurance for all school age children and migrant employers working in Shenzhen and both of these populations were entitled to be covered by health insurance schemes specifically designed after 2004. Though continuing evaluation and upgrade of the schemes are needed to

facilitate higher coverage and better efficiency, these two schemes were second to none nationally as innovations to bring down barriers to access care for these who need it and help reduce health inequity and inequality at a local level. In addition prominent reforms such as health insurance for those who were traditionally not covered by LIS or GIS and were not practically insured by NRCMS, more changes have been targeted and initiated including the foundation of several hundred community health centers (CHCs) that are affiliated to big hospitals or medical centers coupled with assignment of trained clinicians to newly built CHCs in the hope of providing the general public with a more accessible (physically and financially), primary care based service that caters for more public health contents. The rationale of the series of recent reforms in Shenzhen comes from:

(1) The practical difficulties big public hospitals have encountered, which are rooted in a comparative shortage of health service supply especially in primary care services;

(2) The healthcare payment system that cannot guide individuals through the system from the very basic, general or preventive services up to the secondary and tertiary services and thus there is a waste of resources and health gradients have emerged;

(3) The highly mobile, young and quantitatively large numbers of migrants who were often ignored by the local government and excluded from local welfare systems but may have a decisive impact and reverse health indicators of their destination city;

(4) Transitional disease model characterized by high incidence and prevalence of selective infectious diseases (HIV/AIDS, sexual transmitted infections, tuberculosis, vaccine-preventable diseases, and the like) and rising challenges from degenerative, life-style-or-behavior-related, chronic diseases (such as diabetes, cardiovascular diseases, injury and cancer) and mental health problems (including suicide and suicidal intention) that needs to be addressed by the local health authority of Shenzhen through a widely accepted and internationally successful primary care guided solution; and

(5) Political requirements and pressure originated from the national new healthcare reform scenario.

In China, with fast economic and social transition, changes have been found in growing inequality in access to health services, increases in the cost of medical care, and the deterioration of preventive programmes [49, 50]. Being unequal and too expensive are two major arguments that have made the Chinese health system under criticism. To provide fair and affordable health services for all 1.3 billion citizens in China and after long time discussion, the Chinese government has initiated its health reform since 2009, which was symbolized by the dispatch of the most important document: Opinions of the Communist Party of China (CPC) Central Committee and the State Council on Deepening the Health Care System Reform.

The Central Committee of the Communist Party of China and the State Council jointly endorsed and issued the tone-setting document after about three years of intense debate and repeated revision. The target is that by 2020, China will have a

basic health-care system that can provide "safe, effective, convenient and affordable" health services to urban and rural residents by 2020. The core framework proposed by the Ministry of Health of China (MOH) for a reformed health system is based on "four beams and eight pillars" -- four major systems supported by eight mechanisms [51].

There are various indications that the government is preparing to inject a major amount of funds to create a full public health system, setting up a system to provide basic health services, establishing a basic drug system and a comprehensive health insurance system for guaranteed healthcare.

1.5.2.2 Targets of Shenzhen health reform

To echo the national reform theme, a health blue print of Shenzhen has been drafted and finalized, which sets 3 categories and 34 items of health outcome indices for accomplishment by year 2010. These three categories are health indicators, health resources allocation indicators, and key management and practice indices.

Out of all health reform targets in Shenzhen, establishment of the hospital-based Community Health Centres (CHCs) network that can provide quality and basic medical and public health services at community level is of the highest priority. However, many barriers need to be conquered that include training of qualified general practitioners (GPs), data sharing supported by a stable information system, insurance schemes covering the majority of the people and a financial mechanism that links payment with quality assurance of the health services.

1.5.2.3 Health Insurance Scheme for migrant workers in Shenzhen

Early in 2004, the Shenzhen government issued a regulation concerning the development of a healthcare system to cater for migrant workers, recognizing that failure to provide adequate healthcare increases the risk of deepening health and social inequalities. From March 1st 2005, an experimental Cooperative Healthcare Service System for Migrant Workers (CHSMW) was initiated to provide coverage for services by contracting specific designated healthcare providers (DHP) in all 6 districts in our study. In June 2006, CHSMW formally developed into the Medical Insurance System for Migrant Employees (MISM). This new system was open to all migrant workers in the city and is compulsory for employers.

According to the Ordinance of Labour Workers for the Shenzhen Special Economic Zone, migrant workers who are eligible for the scheme are those employed by legal employers but who live in Shenzhen without *HuKou*. The monthly contribution to CHSMW per individual worker is 12 RMB, 8 RMB paid by employers and 4 RMB paid by the workers themselves. Half of the fund (6 RMB) is designated for out-patient services and 5 RMB for in-patient services. A further 1 RMB is saved as an optional pool for further utilisation. The CHSMW scheme applies to designated healthcare providers which include hospitals and community centers that are designated through a formal accreditation process undertaken by the municipal or district Health Bureau and licensed by the city's Social Security Bureau (SSB). Payment to each DHP is based on the number of migrant workers for whom

the DHP provides outpatient services. Inpatient service reimbursement and referral is managed by the SSB through standardized procedures.

Since June 2006, MISM has become compulsory in all 6 districts of the city and is open to all migrant workers in the city. The new scheme changed the collection requirements to 0.45% of the previous year's average monthly salary per capita for employed workers. Employers contribute 0.3% and individual workers contribute 0.15%into the fund. Both CHSMW and MISM ensure 60% to 80% reimbursement for category I and category II medicines, treatments, examinations and consultations in outpatient services while covering 60% to 100% reimbursement of inpatient services utilised depending on the price per item and level of DHP concerned. A very minimum registration fee is charged each time the insured workers access DHP. By the end of 2006, the MISM reported coverage of 3 million migrant workers in Shenzhen. MISM has a significantly higher percentage of insured migrant workers compared with the CHSMW, although both schemes have been subsidized by the city government. Although all employers are now required to pay health insurance fees for employed migrant workers, the scheme has failed to include all enterprises due to difficulties in enforcement. The decision to join the MISM scheme is largely in the hands of the employers and not the employees, which itself raises questions about equity and the each individual's right to health and health care services.

1.6 Migration and health: from an international perspective

Macro analysis on internal migration and health in China addresses some major aspects [52] that include but are not limited to infectious diseases, maternal health, occupational health and injuries, mental and behavioural health, poor risk perception of migrants due to youth mining, and the double self-selection of migration which embarrassed the Chinese countryside in the long run.

From the micro perspective, literature on migration and its impact on health focused on the following fields:

(1) Healthy immigrant effect;

(2) Discrepancy, inequity and inequality of health outcomes and health service utilisation between migrants and the general population/local people/non-immigrants, and the reasons explaining these differences;

(3) Health of the most vulnerable subgroups in the migrants: health and healthcare of children (including children left behind), women and the elderly.

We reviewed the first two aspects as they closely relate to the current study in Shenzhen on health and health utilisation of migrant factory workers.

1.6.1 Definitions and explanations of healthy immigrant effect

The healthy immigrant effect (HIE) is a widely documented and accepted phenomenon and is defined as "immigrants are on average healthier than the native-born" in their new countries (the US, Canada, Western European countries and

Australia, etc.) or "the relatively good health of recent immigrants to developed countries" [53]. HIE is also cited as the "immigrant health gap" or "the healthy migrant phenomenon" [54].

Though health status is expressed by a series of complex indices, when talking about HIE specifically, measures of health risks, chronic conditions, and mortality are the major indicators that make immigrants generally better off.

The most interesting point in immigrant health gap between immigrants and the native-born population is that most of the immigrants are from developing countries where health systems are more fragile and health indicators are poorer than those of the counties to which they are migrating. China's rural-urban migrants share very similar changes with international immigrants as they move out of the poor rural areas where healthcare resources are insufficient and rough and health indicators are far worse than those in the urban destinations to which they are moving.

Explanations to HIE included: health screening of the immigration process, healthier behaviors prior to immigration and self-selection which refers to a phenomenon that the healthiest and wealthiest individuals are the people most likely to migrate. Literature largely declined the first reason as the major determinant of healthier immigrants, however gave the second and the third explanations varied estimation and confirmation. We assume typical lifestyles of the Chinese rural-urban migrants prior to migration involve high level of daily physical activities and low fat/calorie diets, the same as the international immigrants might have had in their source countries. These healthier behaviors contribute to their general health. The

famous "Hispanic paradox" in the United States (or "epidemiological paradox" in other places [55], characterized by the health advantage (often better life expectancy and lower mortality rate) of Hispanic immigrants over the non-immigrants in the United States in despite of their poorer socio-economic and educational factors might have to be multifactorial and social in origin [56]. However, some scholars tended to explain this paradox by the cultural impact on favorable or beneficial health behaviours solely. Self-selection refers to at least three aspects of selection: the first is that those who were healthy may be more dynamic and motivated to migrate; secondly, more unhealthy immigrants are more likely to return home; and thirdly, those who are more economically successful are more likely to stay in the destination and in general people with higher income are more healthy [57]. Having not yet been fully tested and studied in mainland China, this self-selection amongst the Chinese internal migrants deserves further exploration because if HIE can be explained by self-selection and contribute to the immigrants' destination countries, the health gap may actually deteriorate health indicators in China's poor rural areas over time thus may have far-reaching implications for the whole country's health policies.

Scholars have noted that in the long run, given the immigrant cohorts remain in the destination countries, other explanations for health status of immigrants emerge, which include acculturation, healthcare accessibility, and income assimilation. These factors may help improve or reduce good health outcomes of immigrants depending on duration of stay in the developed countries and indicators adopted. For example, better healthcare access may improve the chance of disease screen hence cause poorer

self-reported health status whilst impart early diagnosis and treatment of chronic diseases thus decrease mortality rate of this population. Furthermore, one study has illustrated [57] that although HIE can be seen on arrival, the health superiority erodes over time and a converging health disadvantage has been observed by using national data in the United States for obesity, a prominent risk factor for all-cause mortality and many chronic diseases.

1.6.2 Possible implications for China's rural-urban migrants

In the context of fast urbanization and industrialization in China, western lifestyles and common risk factors including obesity, sedentary habit and western diet have emerged quickly in big cities of China [58], causing fast increasing morbidity and mortality in its urban populations. It is conceivable that rural-urban migrants in this country may sooner or later experience similar decrease in reported health and increase in risk behaviours as well as morbidity and mortality especially those related to chronic diseases. Furthermore, if deficient health care services for rural-urban workers and dual self-selection effect are taken into consideration, we would anticipate a much steeper convergence curve than that has been observed in the developed countries for international immigrants.

1.7 Discrepancy, inequity and inequality of health outcomes and health service utilisation between migrants and the local population

Health policy research in the field of migration and health has a long tradition to address equity in health and health service utilisation. The concept of "health inequities" was defined by Whitehead [59] as "differences in health that are unnecessary, avoidable, unfair and unjust". In the recent years, researchers have endeavored to give health inequity some more conceptually rigorous and concise definitions. Braveman and Gruskin defined health equity as "the absence of systematic disparities in health or its social determinants between more and less advantaged social groups" and pointed out that health inequity put disadvantaged groups at further disadvantage with respect to health, diminishing opportunities to be healthy, which is linked to distributive justice and human rights [60].

Practically, health outcomes and healthcare utilisation have been taken as two main measurements for health inequity. Despite the internationally prevailing HIE theories and evidence, health and healthcare access inequities have been found in many empirical studies that involved epidemiological modeling techniques to exclude potential confounders amongst rural-urban migrants of mainland China [61-64], given the significant differences in socio-economic factors especially those for non-income welfare indicators such as access to health insurance programs between migrants and local residents [50]. Besides, focus on explanatory factors evolves from the migration process that comprises different patterns of mobility (regular v.s. irregular), psychological adaptation and stress, exposure to risky working environment. Hu

Xiaojiang and colleagues considered that infectious diseases, maternal health, occupational health were three priorities for Chinese government to take action for rural-urban migrants. Others included mental and behavioural health and the negative consequences of migration in the countryside of China due to dual self-selection [52]. The poorer mental health of migratory people has widely been validated internationally and within China. Though some studies believed that duration of migration, sex, and educational attainment may all contribute to the occurrence of mental problems, dorm living, unbalanced emotional attachments and long working hours may independently have adverse impact on Chinese internal migrants [36, 65, 66]. Regarding infectious incidence, HIV/AIDS, Sexual Transmitted Infections (STIs), malaria and vaccine-preventable diseases are prominent public health issues in migrant community [67]. In terms of healthcare access, inequity is seen throughout China disclosed by four national health surveys in that migrants often lack access to existing health services due to several reasons: financial constraints (uninsured and underinsured thus need to pay out-of-pocket for medical bills), geographic inaccessibility, time constraint for care, increased medical costs rooted in rapid commodification of hospitals since 1990s [68], lack of primary care guided approaches, poor perception of the diseases and finally the long standing self-treatment practice in the Chinese communities [69, 70]. The health discrepancy does not exist only between migrants and local residents, but also within the migrant community. For example, Li X and colleagues proved that increased mobility in young rural-urban migrants in China were associated with poorer perceived health status, depressive symptoms and

inferior health seeking behaviours [71]. Based on the truth that although loosened, the Chinese HRS is not easily transferable and hence HRS-based health welfare system is strictly limited to local people in many cities to avoid financial crisis caused by extension of government-subsidized healthcare to cover migrants.

Scholars also suggested that to minimize or even fully eradicate barriers to health care and socio-economic discrepancies between disadvantaged migrants and better-off local residents, various structural and institutional factors far more fundamental than medical care or designated health insurance are required, making the health inequity and inequality issue in Chinese society a long term reform target [68]. From the perspective of sociology, Lin [72] gives further portrait and description of social exclusion and vulnerability in the contemporary transitional China. Intellectual recognition and academic efforts in exploration of the inequity between migrants and local counterparts, however, may technically help facilitate barrier elimination once certain reform practice is to happen.

To give a contextual reference concerning health status and healthcare utilisation in general Chinese population, results from the most recent National Health Service Survey of China (The 4th, Year 2008) released by the MOH of China have been collected. The survey investigated 200,000 rural and urban residents in 31 provinces/autonomous regions, finding that 1) Smoking prevalence of those on or above 15 years was 48.0% for male and 2.6% for female; 62% of the current smokers were heavy daily smokers (smoking more than 20 cigarettes per day); 2) Two-week illness rate was 8.9% (22.2% for urban, 17.7% for rural), which included 39% of new

morbidity and 61% of long-term sickness that existed in the past two weeks; Gross rate for healthcare utilisation was 14.5% (12.7% for urban areas and 15.2% for rural residents), whilst Gross inpatient care utilisation rate was 6.8%; 3) 38.2% of those who reported two-week illness did not utilise professional health services (47.9% for urban and 35.6% for rural areas); 4) 73.7% of the professional health seeking behaviours occurred in the community (CHCs in the cities or village/commune health centres); and 5) 70% of the patients who claimed not having visited a doctor used self-treatment or self-medication.

The survey did not investigate mental health or self-rated health and findings from other studies using similar indices will be presented in the discussion session.

CHAPTER 2 REVIEW HEALTH AND HEALTHCARE UTILISATION OF RURAL-URBAN MIGRANTS

2.1 Introduction

2.1.1 General description and background of the literature review

This chapter reviews and critically assesses available evidence from mainland China and the international literature on health and healthcare utilisation by rural-urban migrants with the focus being put either on those in countries with fast urbanization and industrialization or on under-developed countries. We also address methodological problems and settings of the studies which may profoundly influence interpretation of the results of each study. Literature on international migration/immigration and cross-boundary migration were excluded in order to address the single theme of internal/subnational migration, which differs in many ways from international migration.

Several terms and concepts were used to search related literatures on the subjects, which included: Transients and Migrants, Indigenous Population, Ethnic Groups, Residential Mobility, Internal Migration, Rural-urban Migration, Rural-to-urban Migration, Settlement and Resettlement, Labor Migration and Destination. These terms are all closely related and are referred to under the health and healthcare or health service themes in this chapter.

Rural-urban migration is a prominent social and economic phenomenon in contemporary China and has been proved to be related to rural-urban migrants' physical health, mental health, health care utilisation and other health indicators as having been discussed in Chapter one. Contemporary perspectives on health and healthcare of migrants have tended to address health disparities/inequities, health service inequity and inequality, socio-economic and socio-cultural gradients that prevent migrants from accessing affordable and quality health services and enhancing or maintaining their health during or after the migration process, comparing with local populations of the locales where they migrate to or/and peer rural residents who stay behind from different angles and at various levels.

Physical health, mental health, health awareness and health risk behaviours have all been widely studied in different settings. Other than common and traditional health and disease indicators such as morbidity and mortality, quality of life (QOL) or health related quality of life (HRQOL) as a central concern in evaluative studies [73] has been applied in migrant health and healthcare research and has been taken as a persuasive proxy for health outcomes both physiologically or psychometrically [35, 74].

Data sources for migrant health studies come from routine health surveys at national level, utilisation data from hospitals, clinical or other health care settings as well as health and disease registration information. Specific questionnaire surveys or investigations amongst migrants are another source. However, data are not always readily available for migrants due to severe selection bias that may have hidden in the "representative" samples or even "complete" individual profiles in a health system of

any country. In this case, high physical mobility, low SES status, low health benefits, poor health access and awareness may have all been major considerations for the reasons of selection bias.

Following two major paths (descriptive and explanatory), migrant health studies are undertaken mainly for two major reasons:

The first is for *policy reasons* because literature has shown that migrants are more exposed to adverse social and environmental factors once migration starts and hence more susceptible to a wider variety of health problems compared with local populations at their destination, even after adjusting for important demographic and SES factors. To identify high risk groups and disease/health priorities makes these evaluations valuable. Health policy analysis aiming at combating social inequities in health in some fully-developed modern societies depends on these studies to overcome the relative neglect of population groups and the societal forces that create health gradients so that meaningful and effective measures can be suggested and adopted for health or societal planning. However, in many developing or underdeveloped countries where internal migration produces increasing health disparities between populations with various SES identifications and where economic booming desires to overlook "non-emergent issues" including health of rural-urban migrants' health and healthcare, studies on this topic are comparatively limited and scarce, especially in the field of health service utilisation though social economists, sociologists and anthropologists all have long started their exploration into the internal migration topic. Studies in this category emphasize SES related risks,

preexisting and accumulating vulnerabilities and susceptibilities of migrants that may have mediated the well-known epidemiological paradox (Healthy Immigrants Effect, HIE) [55, 56, 75], socio-cultural discrepancies, policy context especially that of health benefits, disease behaviours and health beliefs that shape migrants' utilisation of health services. In this category a sense of justice that takes health as basic human rights is critical to the research philosophy [50, 60, 76]. Barriers in transforming findings from these studies to policy interpretation and further policy change by stakeholders lie on resources available and the depth and width of the problems that need to be dealt with.

Another reason is driven by a purely *epidemiological perspective* which originates from scientific curiosity to understand disease etiology. Comparison between disease patterns and health status of migrants and local population, and that between migrants and their left-behind peers may contribute to the explanation and clarification of roles of generalized environmental and biological factors in disease formulation. This motivation is clearly stated in some studies involving immigrants and health, particularly immigrants with ethnic background and cross-boundary moving to countries with very different natural, social, economic and cultural environment [77-80].

To highlight the complex health and healthcare issues amongst migrants, especially rural-urban migrants, this chapter will, by searching the most updated literature, address rural-urban migrants' health indicators and the determinants in the following aspects:

1) Rural-to-urban migration process (lives of migrant workers);

2) Health behaviours of rural-urban migrants;

3) Mental health of migrants;

4) Self-rated health and QOL;

5) Disease patterns of rural-urban migrants;

6) Social benefits, particularly health insurance scheme for migrants; and

7) Healthcare utilisation of migrants: what prevented migrant workers from visiting a doctor?

2.1.2 The local problem of rural-urban migrants

The recent revolution in technology and transportation together with marketization of the national economy have contributed to increased population mobility and resulted in the largest rural-to-urban migrant population transition in the history of China. Shenzhen, as one of the most populous metropolitan areas in the PRD of South China, attracts millions of additional rural labourers annually. These people are often unskilled and minimally educated and migrate to the city in the hope of seeking employment. They end up taking jobs far removed from their agricultural backgrounds. The local government estimated that by 2007, the overall population size of Shenzhen had reached 14 million people, of which around 70% were internal rural migrants and 60% were migrant labour workers from other regions of China [41]. The majority of rural-urban migrants were engaged in the secondary industry, i.e., the factories.

Being socially and economically deprived, rural-urban migrants generally have a lower income and poorer socio-demographic characteristics compared with the permanent residents of the city. Major health disparities also exist between migrants and the local population as has been observed elsewhere. The incomplete social security system and lack of health insurance makes the situation even worse [63].

The literature suggests that migration is associated with increased health risks related to occupational safety, infection, reproductive health, mental health and health behaviours. These risks and vulnerabilities, together with low capacity to pay medical bills, poor access to healthcare, and resulting unsatisfactory health outcomes have been described by other researchers. Politicians have also noted the potential societal and health consequences with regards to the ever-widening disparities. One evolving concern in mainland China regarding rural-urban migrants and their health lies in the fact that healthier rural peasants leave for urban areas and less healthier or sick migrants return hometown years later. This social phenomenon may have contributed to ill health or will keep deteriorating health of the rural population of China, making a vicious cycle [52].

Since newly arrived migrants tend to be young and are presumed to have fewer chronic conditions when compared with their elders or peers left behind in the countryside, studies argue that the health-seeking behavior plays the most important and decisive role in their health outcomes [63, 81, 82]. However, some other international literature suggest that as intensive and unfavorable environmental (including living and work-related) factors adversely affect migrants' health, time accumulated after

arriving at the destination may play an important role of forecasting health outcomes of migrants. Other possible explanations and determinants of immigrants' health include acculturation, social networks, lifestyles, health care benefits, working conditions, stress, and housing [52, 83-86]. But whether this applies to Shenzhen migrants from rural area, in particular, rural-urban migrant factory workers, is still unknown.

Cross-sectional surveys, cohort profiles and systematic reviews are available internationally regarding health and healthcare utilisation of immigrants and migrants, with few addressing this issue using trials. This is basically because migration is based on personal choice. As most developing and underdeveloped countries are undergoing economic and societal changes in the 21st century, we anticipate that literature in this field will be further enriched in the coming years.

2.1.3 The task and researcher's role

I worked at the Division of Epidemiology, Shenzhen Centre for Disease Control & Prevention before I became a PhD student in the School of Public Health and Primary Care, The Chinese University of Hong Kong. Health disparities, poor health and health service utilisation of some rural-urban migrants have caused severe concerns from the city government, the academic world in the field of public health and the society as a whole. It is now an urgent task for public health professionals to clearly understand health indicators and service utilisation of rural-urban migrants as well as the health correlates so that efficient public health strategies can be built upon and directed to those with the highest risks amongst rural-urban migrants in the near

future. As research in this area in Shenzhen and other big cities in mainland is comparatively scarce, information reviewed in this study will be used as an entry step to assist shaping a background picture for the study on migrant factory workers other than a specific evaluation of certain morbidity, risk prevalence or intervention practice amongst rural-urban migrants.

2.2 Objective of the literature review

Given the rapidly increasing trend of rural-urban migration in mainland China and the rising numbers and proportion of rural-urban migrant workers in the population, this review searched the literature on health and healthcare/health service utilisation of rural-urban migrants to study the prevalent health problems in rural-urban migrants and potential factors that may have caused these problems.

2.3 Search strategy and results

2.3.1 Basic search

Key words describing three major features of the literature were combined accordingly at certain stages. Duplications were excluded in the end. These three major components were:

1) Key words that describe the population: adult NOT child NOT infant (subject headings); rural-to-urban migra$ OR rural-urban migra$ OR internal migra$ OR subnational migra$ (abstract);

2) Key words that describe the indicators or outcomes of the study: health OR utilisation OR utilization OR disease pattern OR risk OR health insurance;

3) Key words that describe types of the study: cohort OR longitudinal OR prospective OR trial.

Basic search was conducted by using electronic databases under OvidSP at CUHK online library for primary studies. These datasets used included: CUHK Full Text Journals, Journals@Ovid Full Text (to April 2010), AMED (1985-April 2010), British Nursing Index & Archive (1985-April 2010), CINAHL (1985-present), Cochrane Central Register of Controlled Trials (CENTRAL), ALL EBM Reviews (CDSR, ACP Journal Club, DARE, CCTR, CMR, HTA and NHSEED), EMBASE (1980-April 2010), Global Health (1973-March 2010), Health and Psychosocial Instruments (1985-April 2010), Inspect (1969-April 2010), Mental Measurements Yearbook 9th to 17th Yearbooks (to January 2010), Ovid Medline (R) and Ovid Medline (R) Daily, Ovid Medline (R) In-Process & Other Non-Indexed Citations (1950-present) , PsycINFO (1967-present).

2.3.2 Extended search

I cross checked with all available references of the studies found in basic search process to look for any missing publication on this topic and of the same research category. Conference proceedings were searched through ISI Proceedings, which contains the most complete collection of abstracts from papers accepted by various international or regional academic conferences. The web site I used was the conference proceedings citation index:

(http://apps.isiknowledge.com/WOS_GeneralSearch_input.do?product=WOS&search_mode=GeneralSearch&SID=Y251LN1I6Ne5o8i9PpI&preferencesSaved=&highlighted_tab=WOS)

The searching key words I used was:

TI=(rural-urban migra$ OR rural-to-urban) AND TS=(health OR disease OR risk) AND TS=(cohort OR longitudinal OR trial)

Limitation was put for English abstracts only and on humans as research subjects.

2.3.3 Inclusion and exclusion criteria

Certain inclusion and exclusion criteria were adopted for the review. Since the study focused on rural-urban migrants regarding several aspect of their health, disease pattern, health insurance and health service utilisation, literature review tends to be broader than most of others, with internal migrant population group being put as the core. Table 2-1 lists inclusion and exclusion criteria.

Table 2-1 Inclusion and Exclusion Criteria for Including Studies in Literature Review

Components	Inclusion Criteria	Exclusion Criteria
Subjects of the Study	Rural-urban migrants; Internal migrants; Adults.	Cross-border migrants; Immigrants or emigrants; International migrants;

		Refugees; Children or infants or adolescents.
Comparison	Yes, between migrants and local/indigenous people; Yes, between migrants and their left behind peers; Yes, between communities or groups; Yes, pre-and-post comparison.	No comparison.
Outcome and Indicators	Health: SRH, physical health and mental health; Health risks: socio-economic, demographic, behavioural factors; Disease: patterns; Health insurance; Health care utilization.	Change of indicators NOT included or assessed.
Features of the studies	Trials; Cohort study; Longitudinal or prospective study.	Qualitative study; No controls; Cross-sectional study; Case-control study.

2.3.4 Quality assessment and data extraction

All the studies chose were trials or cohort study or of longitudinal design. I have check potential appraisal tools for literature review and took comparison of the available tools listed on http://www.unisa.edu.au/cahe/CAHECATS/. Among all potential appraisal tools, I adopted the Critical Appraisal Skills Programme (CASP) 2004, of which one component was designed using 12-question framework to assess cohort study [87]. CASP was developed by Public Health Resource Unit, NHS and is made of a series of methodological checklist that provides key criteria for literature appraisal. The cohort study tool of CASP is composed of general comments, screening questions and detailed questions, following a logic way of assessing a study of this type.

2.4 Results

2.4.1 Flowchart of the procedure

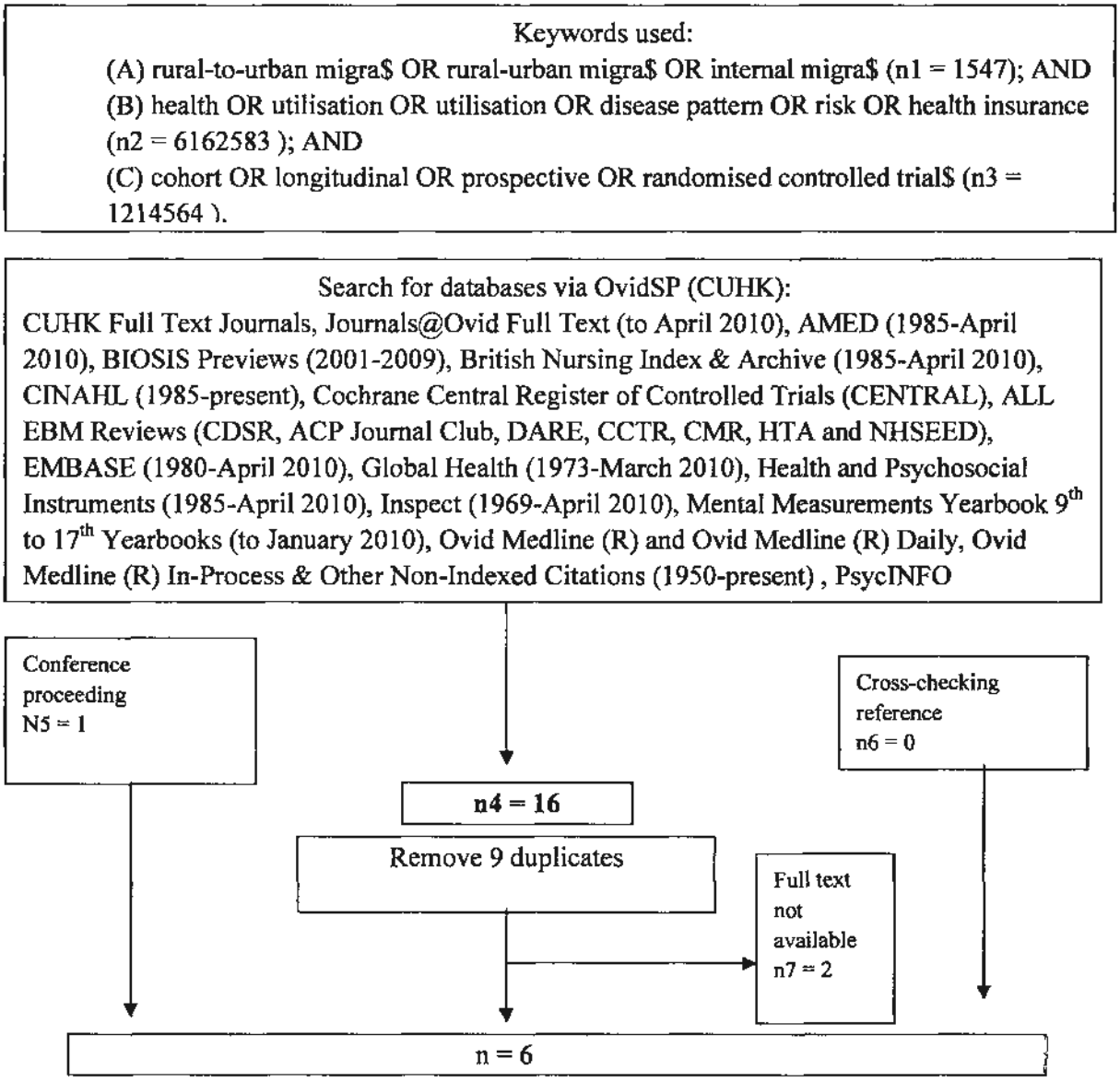

Figure 2-1 Flowchart of literature search process

2.4.2 Descriptive summaries of the studies

Health of rural-urban migrants has attracted growing interest worldwide. But there are no agreed outcome indicators. The disparities between non-migrants and

migrants are noted in many cross-sectional studies as well as longitudinal studies as I show here above. The most interesting outcomes of rural-urban migration, in terms of health, are mainly in 5 domains:

1) Quality of life and self-rated health,

2) Physical health such as physiological indicators that tell chronic disease or disease risks, mortality and morbidity (very scarce) including that of specific infectious disease such as HIV/AIDS and TB,

3) Mental health, within this category, anxiety and depressive symptoms are two of the most looked at domains,

4) Health risks, especially behavioural risk factors including smoking, excessive drinking and unsafe sex bahaviours,

5) Health seeking or healthcare utilisation.

These domains, however, are often overlapping and simultaneously observed in one single study. Data sources for some of the focused studies used national-wide survey [88], but most others [89-92]are at a much smaller scale. Selection bias, low response rate during follow ups, small sample size and representativeness are all of concern.

Table 2-2 Summary of study design: settings, sample size, subject selectivity, duration, data collection methods, results (measurement), and limitations.

Author, Year, Study design	Settings	Sample size	Subject selectivity	Duration	Data collection methods	Results or Conclusions	Limitations
1.Mundandi et al., 2006, HIV incidence and sexual bahaviour study, Prospective Study	in 12 communities in east Zimbabwe	Baseline: 9843 adults (4419 males, 5424 females); Follow-up: 5552 (56%) (males, 2292, females 3260); Age:15y-54y for male; 15y-44y for female at baseline.	1. Original cohort enrolled in a stratified household census in four different community types in Manicaland, east Zimbabwe 2. Out-migrants to the national capital (Harare), the provincial capital (Mutare) and other study areas	July 1998 and February 2000, and followed-up after 3 years	A structured questionnaire and an HIV test; Voting box used to improve the reliability of sensitive information on sexual behaviour; Blood sample tested by immunoassay	After adjusting for age, education, marital status and location, there were no differences in HIV prevalence and sexual risk behaviour between future migrants and residents at baseline, for either sex. No significant differences in HIV incidence or sexual behaviour during follow-up were detected between rural-to-urban out-migrants and residents.	Low follow-up rate; representativeness; died persons excluded; Underestimation of HIV infection and risk sexual behaviours.

Author, Year, Study design	Settings	Sample size	Subject selectivity	Duration	Data collection methods	Results or Conclusions	Limitations
2. Lu, 2010 Longitudinal study, physical and psychological health of rural-urban migrants	13 out of 27 provinces in Indonesia	IFLS1: 83% of the population; 7224 households and 22,347 IFLS2: reinterviewed 94% households over 90% of target individuals, over 1500 respondents who had moved out in IFLS1; IFLS3 over 90% of the households and over 80% of the individuals in both IFLS1 and IFLS2	Indonesia Family Life Survey (IFLS); contrasting rural-to-urban migrants with rural non-migrants; prior to and after migration comparison to adjust for possible selection bias.	The first round (IFLS1) in 1993 , IFLS2 In 1997, IFLS3 in 2000.	individuals provided detailed household demographic and socioeconomic information; a few members interviewed on a broad range of topics. Self-reported general health, physical functioning, several physical assessment measures; mental health status with respect to depressive symptoms	rural-urban labor migration increased the risk of psychological disorder as measured by depressive symptoms; Migration had little impact on physical health in the medium term. This was largely attributed to the multiple offsetting influences of migration: migration improved economic status and living standards but led to increased work-related stressors and barriers to health utilisation.	relative small sample size of migrants; return migrants excluded to avoid "Salmon Bias".
3. Lix, 2006, Residential Mobility and Severe Mental Illness Study, longitudinal	Manitoba, a province in Canada.	cohort diagnosed with schizophrenia (SMI) n = 3384; 2 matched cohorts consisted of 16,920 individuals, and the	Individuals >= 19 y in 1999/00 who were continuously resident in Manitoba for the	1996/97-2001/02	longitudinal postal code information; population registry, hospital abstracts, and medical claims	No statistically significant differences regarding health care utilisation measures in rural-to-rural or rural-to-urban migration among the cohorts. Marital status, income quintile,	Not in the developing or underdeveloped country; Rural-urban migration was not

		severe physical illness (SPI) cohort contained 1267 individuals.	study period, fiscal years 1996/97 to 2001/02; Individuals moving in or out of province or dying in this 5-year period excluded.			and use of physicians are consistent determinants of mobility.	the major independent variable. Representativeness: not general population.
4. Long et al., 2008, accessing TB diagnosis study. Prospective cohort study+ qualitative study.	From 23 randomly selected general health facilities in 3 districts of Chongqing, China.	1005 TB suspects (776 local residents, 229 rural-urban migrants); for the follow up: 528 local residents and 152 migrants (<70%)	migrants and permanent urban residents TB 'suspects' (>15 years old) experiencing chronic cough for more than 3 weeks or sputum with blood or hemoptysis	Not specified. Interval between baseline and follow up: 3 months	patient survey in a proportion of 1:4,: Two standardised questionnaires on health care seeking experiences, and on pathway to seeking care	Sixty eight percent of migrants delayed for more than two weeks before seeking care for symptoms suggestive of TB, compared to 54% of residents ($p < 0.01$); Migrants were 1.5 times more likely than residents to use less expensive, community-level health services; In the follow up survey, 61% of the migrants and 41% of the residents who still had symptoms gave up continuing	Low follow-up %; No randomization measures for sample selection; Small sample size for migrants. No confounding control measure used.

						to seek professional care ($p < 0.05$).	
5. Larson et al., 2004, the 'Women's Health Australia project (ALSWH), Longitudinal	Australia	N = 9955, including 264 rural-urban migrant women.	a nationally representative study of women in three age cohorts, 18–23, 45–50 and 70–75y (in 1996)	Survey 1: 1996; Survey 2: 1998	Link between health variables with subsequent local moves, longer distance moves and inter-regional migration from rural to urban. Health indicators included: SRH, chronic diseases, recent symptoms, mental health by SF-36, smoking, health service need.	After adjusting for socio-economic and marital status, short and longer distance mobility was positively associated with long-term and chronic poor health and being a smoker. Moves between postcodes and rural-to-urban migration were positively associated with multiple recent visits to a medical specialist.	Industralized country, Comparatively small proportion of rural-urban migrants in the whole sample, only female, only middle-aged.
6. Gregory et al., 2005, lifestyle cardiovascular disease risk factors study, Longitudinal	1997-1999, in four villages in Guatemala.	789 women (229 urban, 560 rural) and 698 men (158 urban, 540 rural), age 27-42 y, born in 4 Guatemalan villages	Based on 1969-1977 INCAP project in four villages 40-110km away from Guatemala city; Mixed Spanish-Mayan descent,		Data on birth weight, growth for the first year of life and maternal nutrition for 789 people obtained from the 1969-1977 study in the same area; Standardized face-to-face interview and anthropometry	BMI >= 25 kg/ m^2 was greater among urban than rural respondents. Women's physical activity level did not differ by residence, but urban men had lower PAL than rural men Differences were noted between urban and rural men in dietary energy, fiber and cholesterol, and	Sampling does not involve any randomization, but relies on the 1969-1977 baseline name list of the babies.

			Adults, all who could be invited were asked to come		measuring.	between urban and rural women in dietary energy, fat density, fiber, fruits and vegetables, and animal source foods. Urban and rural men reported similar alcohol consumption (7.3% vs. 8.5% > 1 drink/d). Rural-to-urban migration has complex effects on levels of obesity, physical activity, dietary intake of both high quality and low fiber foods, and alcohol.	

2.4.3 Assessment of qualities by using CASP 2004: 12 questions to help you make sense of a cohort study

Since no trial was found through basic and extended search on this topic and all the found publications are cohort studies, I adopted CASP 2004 (12 questions to help you make sense of a cohort study) as the instrument to examine quality of these 6 studies. As the tool stated at the end that:

> *"One observational study rarely provides sufficiently robust evidence to recommend changes to clinical practice or within health policy decision making. However, for certain questions observational studies provide the only evidence. Recommendations from observational studies are always stronger when supported by other evidence."*

As mentioned before, taking migration as an independent factor which involves many social, behavioural, economic, emotional and complex personal reasons and which is not possibly to be manipulated or "controlled", it is almost impossible to have a study using randomized controlled trial (RCT) methodology or any method of trials to set up the study group and the control group. Another factor for consideration is that migrants are in general very hard to follow due to the often changeable contact method, address and job location (high mobility), which makes the longitudinal study hard to complete or achieve a satisfactory response rate in the following up stage. This is especially true in non-industrialized countries like China where a unified social security system and health insurance scheme has yet to be established. Without a single identifier number that all individuals can use for their daily lives, there is no way to properly keep a track for migrants. The lack of up-to-date accurate statistics on rural-urban migrants is a proof. Instead, numbers of migrants in many regions of this world count on estimation or reasonable projection. Based on what I have found in literature search in a wide range of available resources, it has been proved that very few

studies focusing on rural-urban migrants and their health/disease patterns/health risks/health service utilisation are perspective studies.

Table 2-3 Critical appraisal based on CASP for cohort studies
Note: 1: Yes; 2: Can't tell; 3: No.

Questions	Mundandi et al., 2006	Lu, 2010	Lix, 2006	Long et al., 2008	Larson et al., 2004	Gregory et al., 2005
A) Are the results of the study valid?						
1. Did the study address a clearly focused issue?	1	1	1 mobility was dependent variable.	1 rural-to-urban migrants v.s. local residents. Mixed methods used	1 the question was put into the context of Australian migration.	1
2. Did the authors use an appropriate method to answer their question?	3 Very low follow-up rate	1	1	1 cohort study is an appropriate way to address the question.	1	2 no randomization at all.
3. Was the cohort recruited in an acceptable way?	1	2 retrospective cohort: National Family Life Survey, but no details for sampling framework.	1 patients cohort identified by ICD-9-CM 295. 1:5 design for controls.	2 2 districts selected without randomization procedure; no stratification used for step 2 and 3 of the sampling process.	2 rural-to-urban movers were one subset of migrants; middle-aged women only; disproportionate stratified sampling framework.	3 no description regarding recruitment of the sample.
4. Was the exposure accurately measured to minimize bias?	2 no clarification of the moving direction, and no definition of "migration".	1 clear definition of rural-to-urban migrants.	1 newly diagnosed and previously diagnosed groups signified 2 levels of exposure.	2 no definition or detailed information given on how to identify migratory status.	1 two methods to measure mobility; used three variables of mobility.	1 rural-urban migration, however, was taken as one of several aspects

						of nutrition transition
5. Was the outcome accurately measured to minimize bias?	2 no description on questionnaire except for the voting box system.	1 specified measures of health and intermediate factors.	1 objective measurements used (hospital claims or medical claims); 3 definitions of mobility used.	2 questionnaire was not specified and only one quality control measure was mentioned (10% re-interviewed).	1 clearly defined; a series of health indicators were adopted.	1 cardio-metabolic risk factors were core indicators of health concern.
6. A. Have the authors identified all important confounding factors? List the ones you think might be important, that the authors missed. B. Have they taken account of the confounding factors in the design and/or analysis?	A 3 the duration of stay in big cities B 1 But not enough	A 1 B 1 Intermediate factors used: socioeconomic, psychosocial and behavioral	A 2 mainly socioeconomic factors, but job and education were not included. Also, co-morbidity other than IBD and SMI was not counted. B 1 Yes, by using regression, and four control cohorts	A 3 no modeling, no stratification, no sensitivity analysis in the patient-based cohort study. B no confounding control measures at all.	A 2 major socioeconomic factors were observed but duration of migration was not counted. B 1	B 2 migration experience for example time spent in the urban area was not considered B 1
7. A. Was the follow up of subjects complete enough? B. Was the follow up of subjects long enough?	A 3 only those who moved to Harare or Mutare or within were followed; moving in and leaving the cohort not described and	A 1 1993-1997-2000, 3 waves, high follow-up rate reduced data concerns arising from selective attrition.	A 1 Good follow up because of quality data source; B 4-year period from 1996/97 to 1999/00: long enough to reveal outcomes;	A 2 32% of residents and 34% of migrants were not followed and no analyses reported on those who vanished. B 3 with 3 months	A 1 acceptable response rate B 1 acceptable time interval (2 years) to record the potential changes.	A 2 small numbers of migrants B 1 two years interval

	analyzed. B 1	B 1, 3 years as the study used data of 1997 and 2000.	outcomes other than mobility were also observed.	interval-not long enough.		
B) What are the results?						
8. What are the results of this study? (Description)	bottom line results and follow-up results reported	proportions of several health indicators reported; Strong OR	proportions and odds ratio reported; Absolute risk reduction not reported.	only proportions used.	proportions, odds ratios and adjusted odds ratios were reported without CI	proportions only
9. How precise are the results?	3 large confidence intervals	1 acceptable 95%CIs	1 acceptable CIs	2 not applicable	2 not applicable	2 2 not applicable
10. Do you believe the results?	2	1 Time sequence was addressed, sensitivity analysis was adopted.	2 confounding not fully addressed.	2 no confounding factor analyzed, low follow up rates-obvious selection bias.	1 models were used to help control potential confounders.	2 randomization problem may cause difficulties in generalization
C) Will the results help me locally?						
11. Can the results be applied to the local population?	3 local population and epidemic setting are sufficient different.	1 similar social development setting and rural-urban migrants.	3 developing country vs. developed country settings; different meaning and purpose of moving.	2 not sure because of the obvious bias and lack of quality control.	3 developing country v.s. developed country settings; only middle-age women included	2 not sure because of the sampling problem
12. Do the results of this study fit with other available evidence?	2	1	1	2	1	1

2.5 Discussion and interpretation

Based on the above findings and appraisal results, it is clear that 3 studies were of poor quality. For the three that had met the majority of criteria of CASP for cohort studies, 2 were done in developed countries (Canada and Australia) and their findings may not be applied to or repeatable in China. Of all studies appraised, variation on study design and analytic methods was substantial though all took a longitudinal (prospectively or retrospectively) method and involved rural-urban migrants as subjects or subset of the subjects. Sampling methods were mainly of two kinds, which were either by using already existing survey data at national or local level, or by direct recruitment. However, randomization and stratification were not adopted as the appropriate way in direct sampling of prospective cohort studies whilst in retrospective cohort studies and those using national data such as the Indonesia study sampling methods were of better quality.

The Manitoba study did not take the migration as the exposure factor; instead put it as an output observation, which is contrary to my study design for exposure and output. Some others [91, 92] differed because they specified patients or suspicious patients as their observing subjects. For output of health, indicators varied from specific disease mortality and health risks, to health utilisation, self-rated health and mental health problems, etc., which accorded to my study as it used these health indicators for output.

The best study of all is the Indonesia study that tested multiple aspects of health and evaluated how various socioeconomic, psychosocial, and behavioral risk factors

may meditate the migration effect. This study shares a series of similarities with my study in that the study settings of the two were both in developing countries in Asia by taking the rural-to-urban migrants as the only subject, and observing socioeconomic, psychosocial, and behavioral risk factors as potential associates of health of migrants. This study used high quality data from two waves of national level family life survey in 1997 and 2000 by the RAND Corporation and assumed that health (physical health and psychological health) acted as a function of migration status and intermediate factors (socioeconomic, psychosocial, and behavioral risk factors). The theoretical framework of analysis can be used as reference for subsequent and similar studies. It also showed good management of statistic modeling and control of bias and confounding through proper use of analytical skills. We figure out that a few flaws still existed in this study because, for example, no description on the original sampling framework, return migrants were excluded, and some possible confounding factors such as working conditions, health-related perceptions and lifestyles other than current smoking status were unavailable. Results of the Indonesia study showed that the "potential health gains from migration" may be hindered by increased stressor and other adverse factors that were associated with migration experience and that psychological health was more inversely affected by migration than physical health in the medium term. The study also admitted that long term observation might be crucial to clarify the long term results as the migrants age and face deterioration in physical health.

Another study that I would like to address is the Women's Health Australia Project (ALSWH) although it is different from our current study in many ways from study setting to the very limited subjects and comparatively small numbers and proportion of rural-urban movers; it observed the most complete and comparable health indicators to our study. The indicators used in the ALSWH included SRH, chronic diseases, recent symptoms, mental health by SF-36, smoking, and health service need. These indicators signified some of the most prioritized areas within the academic concern on the health of internal migrants. The results, though not as "multifaceted", succeeded in linking internal mobility with chronic poor health and more visits to specialists in mature adults.

2.6 Conclusions

From the above analyses, there is a lack of RCTs on migration and health, which was somehow, though insufficiently, offset by evidence gaining from well-designed longitudinal studies in this area. In countries facing quick industrialization and urbanization driven by socioeconomic booming, where great population migration has been and will continue to be seen, good research focusing on this topic is needed.

CHAPTER 3 AIMS, OBJECTIVES AND HYPOTHESIS

3.1 The null hypothesis:

1) Migration history and socio-economic status (SES) have no impact on health status indicators and healthcare utilisation amongst an official migrant community (i.e., factory workers in registered factories) in Shenzhen, China.

2) Health insurance has no impact on healthcare utilisation amongst an official migrant community in Shenzhen, China.

3) There is no difference between those who have stayed and those who have left concerning SES, health needs and healthcare utilization in the cross-sectional study.

4) Baseline health status indicators have no impact on migrant factory workers' health needs indicators and healthcare utilisation over 6 months.

3.2 The main aims of the study

3.2.1 To understand socio economic characteristics, migratory histories, behavioural risk factors, self related health, mental health, infectious disease risk and healthcare utilisation of migrant factory workers and associations amongst them and to explore the implications for health policies and strategies in Shenzhen, China.

3.2.2 To understand health status indicators and healthcare utilisation of migrant factory workers and associations amongst the above parameter groups, and to explore the implications for health policies and strategies.

3.2.3 To identify differences between workers who have stayed and those who have left over a time of 6 months.

3.2.4 To describe associations between and changes in SES, health indicators, and health insurance on migrant factory workers' health and healthcare utilisation over a time period of 6 months.

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3.3 Objectives

3.3.1 Definitionof migratory histories

Migration history in this study is defined using a series of demographic factors of the migrant factory workers mainly including the following 12 categories:

1) age and gender

2) region of origin

3) mobility

4) marriage and family

5) education

6) income and remittance

7) job contract

8) intention to stay

9) being accompanied by family member(s)

10) dorm living

11) length of accumulated working time in Shenzhen

12) work-related factors

From this specified definition of migratory history, it is clear that migratory history combined core SES parameters that are often adopted by public health research with migrant-specific work-and-living factors which are seldom used in other studies. However, migratory history does not exhaust all SES factors; instead SES and migratory history in our study overlap. The purpose to give out this definition is to recapitulate a generalized idea capturing all necessary features that can depict migrant factory workers in Shenzhen.

3.3.2 Objective 1

The first objective of the study is to describe "migration history" of factory migrant workers in Shenzhen:

To describe SRH amongst factory migrant workers with different migration histories.To understand the impact of migration history on mental health of migrant factory workers.

To explore infectious disease risk through studies of seroprevalence for common vaccine-preventable infectious diseases amongst factory migrant workers with different migration histories.

To describe health behaviours amongst factory migrant workers with different migration histories, with focus being put on smoking, the most recognized single risk factors of many diseases and mortality cause.

To describe reported two-week illness (or two-week morbidity that includes any sickness or physical discomfort in the past two weeks, as defined by the National Health Survey China) amongst factory migrant workers with different migration histories and different health needs indicators.

To understand health care utilisation patterns amongst factory migrant workers with different migration histories and health insurance status.

3.3.3 Objective 2

The second objective is to describe relationships between workers' migration histories, mental health, health behaviors, SRH, health insurance, patterns of two-week illness and their patterns of healthcare utilization.

3.3.4 Objective 3

The third objective is to, through a follow-up project, analyze the migration pattern of the workforce over a 6-month period. Migratory histories between those who remained in their jobs and those who were no longer in their jobs were compared along with other relevant factors. Concurrently, impacts of SES, migratory histories, health needs and insurance status at baseline on their healthcare utilisation and healthcare expenditures were studied.

CHAPTER 4 METHODOLOGY

This chapter presents the methodology applied in this study.

4.1 General study approach

The Shenzhen Migrant Factory Worker Health and Health Utilisation Study (MWHHUS) was financially supported by the Chinese University of Hong Kong (CUHK) Postgraduate Grants for Overseas Academic Activities (application form number: 088094), Fund for Research Postgraduates to Conduct Academic Activities from the School of Public Health and Primary Care, and the 2009 Research Fund of Shenzhen Scientific and Technology for Health (Grant number: 200902079).

MWHHUS was approved by the Survey and Behavioural Research Ethics Committee (SBREC), Research Administration Office of the Chinese University of Hong Kong on 10 April 2008.

Taking migrant factor workers' migration history, health and healthcare utilisation patterns as the main focus, a series of studies used a cohort study design and was composed of three major phases:

1) *Pilot Study:* aims at validation of the cross-sectional questionnaire and the logistics of the survey;

2) *Study one:* is the baseline cross-sectional study of factory workers that uses self-reporting, paper-and-pencil based survey approach at the worksites of the selected factories workers. A serological study taking rubella as an example of

infectious disease risks of factory workers, especially those in female workers, was also carried out at this stage; and

3) Study two: is the follow up study which is follows up a random subsample of the one third of the original migrant factory worker cohort using a shortened version of the same questionnaire at an interval of 6 months repeating the core outcome measurements (self-reported health and health outcomes) unchanged.

4.2 The pilot study

4.2.1 Purpose of the pilot

Purposes of the pilot study were to:

1) Test logistics and gather information prior to the formal survey, in order to improve the quality and efficiency of the study;

2) Check culture-suitability, readability, validity and reliability of the questionnaire;

3) Assess the efficiency of data entry tool and logic control of data entry;

4) Rectify and modify any inappropriate procedure/questions; and

5) Obtain preliminary insight to the potential results

4.2.2 Sampling of the pilot study

The pilot study adopted a non-probability sampling method that drew subjects by convenient recruitment of eligible factory workers (mainland Chinese, without

Shenzhen *Hukou*, on or above 16 years given the regulation by the National Congress in 1997 regarding the minimum legible age for working and providing independent informed consent (Appendix A)).

The process of choosing factory sites was supported by the Division of Epidemiology, Longgang District Centre for Disease Control & Prevention (CDC). The venue of the study was the *Yajun* Optical Company (YOC, 雅駿眼鏡廠) under the Arts Group (雅視集團, Web site of the company: http://www.artsgroup.com/) at *HuangGeKeng* Community, *Longcheng* Street, *Longgang* District. Arts Group is a wholly-owned Hong Kong company that started its business in mainland China since 1985 and moved to its current Shenzhen site in 1992. Its business involves design, manufacture and distribution of all kinds of optical products. YOC has more than ten complete production lines and over 1500 workers, most of whom live in dorms close to the workshops and provided by their employers. This factory is of typical Shenzhen productive enterprises with typical labour size and economic scale in 2008. Its management of human resources, dormitory hierarchy discipline, working shift rules and wage counting system are also representative of its kind, outside of SEZ.

All together 40 workers were chose by simple random sampling according to the order of their *Pinyin* surnames followed by given names.

4.2.3 Process of the pilot study

All sampled workers successfully finished the questionnaire surveys on both 4 Jun, 2008 (the 1st time) and 11 Jun, 2008 (the 2nd time), respectively. The time interval was set as one week to estimate test-retest reliability.

The draft questionnaires used on the two occasions were the same, of which core items and questions have not been changed and were built into the final version of the cross-sectional study questionnaire. The time span for individual workers to finish all items varied from 7 to 32 minutes under supervisions from on-site trained facilitators (average time spent was 11.8 minutes per worker per time).

Reports of difficulties in understanding the questions/expressions/terms were recorded by facilitators to help revise culture-adaptability of the questionnaire amongst the migrant factory workers and increase the readability, given the fact that many of the workers had had less than college education.

4.2.4 Logistics of the pilot

To avoid institutional and cultural barriers such as worries about potentially adverse impact on production and concerns of releasing confidential management data to the employers, as well as apprehension from migrant factory workers concerning the release of private information that might be sensitive, several strategies were constructed and used including:

1) Used good communication with the employers, convincing them that the study will benefit the future health policy shaping for migrant workers thus benefit the general health of their workforce in the long run;

2) Hired experienced district centre for disease control and prevention (CDC) staffs to introduce the project and explain each item of the questionnaire explicitly before the first round of pilot survey;

3) Facilitators from inside the factory were introduced to help workers with minimum education to finish the survey and get a clear idea of the project stated on the informed consent form (Appendix A); and

4) Promised that individual cases will not be presented in any case at any time, instead, anonymous and group data will always be guaranteed. Facilitators and helpers were given 50 *Renminbi* incentives afterwards.

To facilitate the smooth process of the survey, identification information such as name, sex, permanent identity card number, region of origin, with/without job contract, and health insurance status was prepared and double checked by human resources manager in the factory before the questionnaires were distributed to each worker at the dining hall of the worksite. Raising questions by workers was encouraged during the process.

Upon finishing of all the questions, facilitators and the investigator carefully checked the logic and any missing places till no further updates were necessary.

4.2.5 Data entry test

Data entry is based on EpiData 3.2 Chinese Version (Odense, Denmark) using double entry method and transferred into SPSS dataset format. The pilot data entry was of importance because it provided raw information to permit us changing some of the logic control and limitation thresholds in the dataset structure.

4.3 Study 1: the baseline migrant factory worker survey

4.3.1 Time arrangements for surveys and rationales

Study 1 started on 15 April 2009 and ended on 15 May, whilst study 2 was during 7 Oct 2009 through 2 Dec 2009. Since migration is dynamic, the economic downturn in early 2009 created instability particularly during the first four months of year 2009 include the New Year (*Yuandan*), the Chinese Lunar New Year (*Chunjie*), and in many of the provinces the Spring Ploughing (*Chungeng*)[93]. We thus postponed the study to mid April. In the 6 months between the two studies, most factories in Shenzhen entered a more stable and balanced production period regarding demand and supply of rural-urban workers and products as the economy stabilized. Choosing this period to study migrant factory workers avoided the most substantial seasonal rotation of migrant workers and observe workers' mobility on a more regular and natural way.

4.3.2 The general process of study one and coding rules

In Shenzhen, many international corporations, companies from inside China and joint venture enterprises have set up their factories and employ migrants on a yearly or even seasonal basis. At baseline, a validated questionnaire survey was conducted in a representative sample of rural-to-urban migrant factory workers in Shenzhen. Blood was taken for serology from the selected factory workers after they successfully finished the questionnaire survey and tested in the Shenzhen Center for Disease Control and Prevention Laboratory. All participants were coded with a single identifier that signals the source factory, their original sampling number and their sex. For example, a female worker from factory number 4 with a within factory sampling number of 49 was coded as subject number 040490, whilst the male worker next to her was recorded as 040501. The five-digit number is also marked simultaneously on the first page of questionnaire as well as the same person's test tube. In the second stage when it comes to re-sampling in order to generate the one fourth subset of the follow-up sample, all workers who successfully finished the cross-sectional questionnaire survey will be sorted accordingly and randomized again.

Workers from the same factory were surveyed on the same day but at different time slots in accordance with individual factory's production arrangements. A second chance was given absent workers to guarantee better response rates in each of the factories.

4.3.3 Sampling options and sampling method adopted

We used a multistage random sampling method to select factories and workers, the most practical way to draw samples without causing exorbitant costs and administrative inconvenience. Since migrant factory workers may not necessarily be registered as temporary residents and may choose very diverse ways of lodging, it is often hard to track them through local addresses (i.e., the local communities or residential gardens where most *HuKou* holders purchase or rent their flats). We did not use computer-assisted telephone interview (CATI) technology, which was set up and had been applied in the general population of Shenzhen for behavioural risk factors survey in 2005-2007 [94] and which had been proved to be cost-effective, quick and under a series of quality control over the investigation and data input process, because some barriers may exist and impede the study. Firstly, the proportion of migrant factory workers holding a mobile phone or resident phone is much lower than the general *Hukou* population. New arrivals, females who share a phone with male partners or other family member(s) and those with less income and/or who use public phones for communication will be largely excluded. Secondly, no available household telephone number lists or mobile number lists are available for the migrants and convenience sampling of telephone numbers hampers the representativeness of the subjects. Thirdly, 8-to-12 hour working shift rhythm and overtimes in factories makes it hard to estimate the most accessible dialing time if the researchers are not "on site".

However, factory employers who have the most powerful control over factory workers because of the "labour-and-capital" financial relationship [23, 25, 95] hold the

complete name list of all their employees, their region of origins and permanent identity card numbers. As a result, factories were used as our primary sampling frame, or first-stage cluster.

In Shenzhen, there are altogether 19575 factories located within the municipality. Step one, among all factories within the municipality, a sample of 58 factories on the name list of the Shenzhen Tax Bureau 2008 was randomly selected. To do so, we categorized all the factories into 58 street administrative units (Shenzhen has 58 sub-district street administrative units in its 6 districts, i.e., *LuoHu, FuTian, NanShan, YanTian, LongGang* and *Bao'an*) based on the address of registration. In all and each of the unit, we used phoneticizational (*Pinyin*) order to assign numbers to the factories and randomly select one out of all. Number of factories was also partly decided within the project budget constraint.

The second step was to contact the persons in charge of all 58 selected factories and introduce the project to them. During this process, assistance was sought through the Shenzhen Health Bureau and its supervised Health and Sanitation Monitoring Institutions (*Weisheng Jiandu Suo*) at sub-district level that have health enforcement right empowered by the Food Hygiene Law of People's Republic of China and the Law of Occupational Health and usually keep routine working relationships with employers in the industrial complex of their precincts.

Fourteen factories out of the 58 selected declined the invitation to be involved and 44 (75.9%) agreed to participate in the current study. For those factories that refused to participate, 8 (57.1%) declined because they were moving, about to move

or closing due to the economic downturn, 4 (28.6%) were dealing with large numbers of worker relocation activities, and 2 (14.3%) quoted the reason as being "not interested". Comparisons were made on the characteristics of factories that agreed and declined to participate in the current study and there is no significant difference in factory characteristics (i.e. type of factories, average number of workers, age and distribution of workers in general and workers' average monthly income estimates as reported by human resources department of each factory).

The mean number of migrant factory workers in each factory exclusive of the following three groups: 1) local *Hukou* holders, 2) foreigners, Hongkongese or Taiwanese, and 3) shareholders of the enterprises and their relatives who hold senior positions in the factories, was 876, ranging from over 20,000 to 80. In each participating factory, a pre-determined number of workers was randomly selected depending on the size of the factory workforce (i.e., having more than 2000 employers is scale 1, 1000~1999 employers is scale 2, and less than 1000 is scale 3). For all scale 1 factories (altogether 10 of them), 120 workers were selected; for all scale 2 factories (altogether 18 of them), 100 workers were selected and for all scale 3 factories (altogether 16 of them), 80 were drawn. All individuals were picked randomly in each factory based on random digits and their rank numbers of *PinYin* surnames. Those below age of 16 or above 60 were also excluded. These three steps generated 4280 potential participants in total. In the end, 4088 eligible migrant workers accepted and finished all the questions successfully (response rate was 95.51%). In the 192 persons who quit in the beginning or amidst of the process, 35

were reluctant because of "inadequate time" (18.23%), 22 thought this survey might be "of no help to my situation" (11.46%), 26 were back home or on business trips out of Shenzhen (28.26%), 51 (26.56%) did not finish more than one section of the whole 4 sections of the questionnaire and left no contact number, and 58 (30.21%) declined with no reason. Comparisons were done to test basic demographic homogeneity of the finished samples and the unfinished and found that no gender or age difference was statistically significant but the latter tended to extremes - to be either illiterate/almost illiterate or very well educated with degrees after senior high school when compared to the finished sample.

4.3.4 Training of Trainers, Quality Control, Survey Settings and informed consent

On-site helpers and facilitators were recruited from factories' managers, administrative officers and medical college students who were doing their internship at Shenzhen CDC. Training content was focused on measurement classifications, possible misunderstanding of questions and given options, how to explain the purpose of the project to the workers with minimum education and how to check the questionnaire on the internal logicality and missing values when workers hand in.

The migrant workers selected for the study were organized in small groups by facilitators in each factory (usually human resources managers or administrative officers) to participate in the survey in a public area (dining hall or meeting room) at the work place during their rest times through April 15, 2009 to May 15, 2009. The group size ranged from 10 to 30 workers. The questionnaire was basically self-administered. However, in each MW group, student helpers with a major in

public health or medicine as well as factory facilitators were present to help read questions to the illiterate/hardly literate or those in need of any assistance during the process. Consent was obtained through explanation of the study, emphasizing anonymity of results. A catch-up opportunity was given to those who were absent or refused first time, recorded as non response if they failed to attend on two occasions. Telephone numbers were collected based on voluntary agreement to allow validation of responses if queries arose.

4.4 Study Two

4.4.1 Time arrangement

Study 2 began in Oct. 2009, and time interval between study one and study two is 6 months. This interval was chosen because of the routine moving dynamics of the migrant factory workers to avoid higher loss of the subjects (see above in 4.3.1). During most of October and November, orders for Christmas pile up and migrant workers are kept busy thus no large-scale relocation or dismissal is seen. This fits with our purpose of finding rural-urban migrant factory worker's spontaneous mobility and moving trend instead of forced or institutionalized moving dynamics.

4.4.2 Sampling

In study two, a one in 3 subsample (n = 1363) was drawn from the original successful 4088 subjects in study one by simple randomization method. All 4088

workers were sorted in order according to individual worker's unique identifier that has been described in section 4.3.2 and random digits were used to pick the subjects for study two. All 44 original factories had not moved or closed, making a simple randomization feasible.

4.4.3 Process of follow up

All 1363 re-sampled workers were contacted through the original factory managers or administrative staffs who worked in study one as our on-site facilitators. Individual name list of selected workers in each factory was sent to the facilitator to check the current availability of the workers.

Workers who were chosen for the second time but had left the original factory were marked with time of leaving and reasons for leaving (if facilitators had the information). Follow up was facilitated by student helpers and factory facilitators in the same factory in study one, except for one factory in which its only facilitator left before study two. In this case, the investigator and students helped workers with the survey. All questionnaires were carefully checked upon handing in by the workers. The same identifier that had been used in the cross-sectional study was given to each and all of the successfully finished questionnaires to allow data merging.

4.4.4 Questionnaire adaptation for study 2

The questionnaire used in study 2 was a shorter version of the questionnaire used in study one, which is described in detail in the following 4.5 section. We reduced all measurements that were subject to be unchangeable over 6 months, such as height, region of origin, average monthly income and many other migration history parameters. Also, we maintained the majority of questions as they were stated in study 1 survey questions (SRH and DS question and measurements were kept the same as they were in study 1), with some of the formats of the questions being changed and questions regarding change being added. The attitudes toward health services questions were deleted assuming that their attitudes had not changed substantially over the past 6 months (Appendix C).

4.5 Questionnaire design, validation and categories of measurements

4.5.1 Questionnaire design

The questionnaire for the cross-sectional part of MWHHUS has five sections (Appendix B):

1) Basic information on migrant histories, other socio-demographics and economic factors, and work-related factors;

2) Health needs indicators: self-reported health status, infectious disease risks, mental health (DS), behavioural risk factors including cigarette smoking, drinking, and internet use, two-week illness, long term or chronic illness;

3) Health insurance status;

4) Healthcare utilization: last doctor visit, outpatient service utilization in the past two weeks, inpatient service utilisation, disease neglect, TCM use, and barriers of utilization; and

5) Attitudes towards healthcare service and health insurance scheme.

These five sections were adopted from several components including:

1) Newly designed SES questions that specifically focused on features of Shenzhen migrant factory workers' migrant histories and job characters. This part had been mainly tested and validated through the pilot study.

2) The National Health Service Survey questionnaires that had been validated, upgraded and used in general mainland Chinese populations in 1993, 1998, 2003, and 2008 respectively [96-98], which addresses a) disease patterns, b) health needs as reflected by self-reported incidence of two-week illness and long-term sickness/diagnosed chronic diseases, c) healthcare utilisation, d) health insurance and e) social expectations for health services and general attitudes toward utilisation. We kept most of the five categories of questions in the final version of the study 1 questionnaire with minor changes on wording and combined or reduced some others to shorten the potential time to answer;

3) Behavioural risk factor questions were adopted from "The 4th Round of Thematic Household Survey in 2007, Hong Kong" [99]. However, we constructed a new internet question in accordance with the existing using habits that were of popularity amongst Shenzhen migrant factory workers.

4) A 0-100 scale SRH measurement adopted from EuroQol 5D (EQ-5D) Visual Analog Scale (VAS) was used [100] to help workers to evaluate their current health status in addition to the 5-scale SRH question which has often been used by social and public health studies. [101]This EQ-5D VAS scale sets 0 as the worst health and 100 the best health that one can imagine and the evaluation requires the individuals draw a line to signal his/her current feeling for his/her own health.

5) Depressive Symptoms (DS): To assess depressive symptoms, we used the validated Chinese Version of the Centre for Epidemiological Studies-Depression Scale (CES-D), a commonly used measure of depressive symptomatology possessing good psychometric properties, CES-D has been shown to not only have good concurrent validity with other DS measurements but also have ability to discriminate between general populations and patients with clinic diagnosis [102-107]. CES-D was firstly translated into Chinese in 1980s and validated in different Chinese populations of various locations such as the US [108], Singapore [109], Hong Kong [102], Taiwan [55] and mainland China [106, 110, 111].

Answers to each of the 20 items of CES-D were in a 4-scaled format according to the participants' feelings in the past week:

1) rarely or none of the time (less than 1 day);

2) some or a little of the time (1-2 days);

3) occasionally or a moderate amount of the time (3-4 days); and

4) most or all of the time.

The possible total score of CES-D ranges from 0 to 60 (0 to 3 for each of the 20 items) with a higher score representing a higher frequency of DS. Four items out of 20 were worded in the positive way to break tendencies toward response inertia and test positive affect. These items were in italic in our questionnaire to highlight their difference and avoid ignorance-caused mistakes that were formerly seen in low-educated individuals. The cut-off of 16 was used in this study based on previous studies [112, 113].

4.5.2 Validation, validity and reliability

After being incorporated in a single unified questionnaire, the draft version was sent to professors and scholars in the field of public health, sociology, medical anthropologist, clinic doctors at the local hospitals, epidemiologists in the local CDC and labour union president in one anonymous factory for critiques and appraisal.

4.5.2.1 Validity: Criterion validity (concurrent validity)

After the review by all the above readers, changes were made accordingly to achieve the best face validity.

Parameters identified to be used in criterion validity quantification included height, monthly income, average working hours per day. The comparison was between the self-report and more objective records of the worker from either their yearly/entry health examinations or human resources profiles.

4.5.2.2 Test-retest reliability

Test-retest reliability was determined by comparisons between two sets of parameters in the self-reported answers collected from the same individual on time 1 and 2 of the pilot study. The economic income and costs section was chose and Pearson correlation was used.

The *Income and Costs* section has 6 major parameters (Qa131-Qa136). The following results show that Pearson correlation coefficients values of all 6 factors over 1 week were very high, indicating good reliability in economic factors.

Qa131 average month income: 0.984**

Qa132 annual family income: 0.979**

Qa 33 remittance sent home in previous year: 0.923**

Qa134 monthly living cost: 0.985**

Qa135 personal medical spending in previous year: 0.954**

Qa136 family medical spending in previous year: 0.921**

4.5.2.3 Split-half reliability

The Cronbach's alpha was used to test the reliability for the Chinese version CES-D scale. In the pilot study the Cronbach's alpha value was 0.84, reflecting a very high split-half reliability and good internal consistency of CES-D in migrant factory workers.

4.5.3 Measurements categories

1） General Socio-demographic factors and migrant histories;

2） Behavioural risk factors: Smoking, second-hand smoking (SHS), drinking, internet use;

3） Common infection risks reflected by immunity to rubella;

4） Work-related characteristics and economic status;

5） Self-rated health: 5 scale measurement and EQ-5D scale;

6） Me0ntal health: Measure the Depressive Symptoms by CES-D;

7） Self-reported illness in the past two weeks;

8） Self-reported longstanding illness/discomforts (which is defined as any illness or discomfort, including chronic disease, that has been lasting for one month or more);

9) Health insurance participation;

10) Outpatient and inpatient healthcare service utilization;

11) Attitudes toward service and health insurance;

4.6 Data Entry and Analysis

Data were double entered and cross checked by two student helpers independently using Epidata 3.0 software. Data were merged, cleaned and analyzed using SPSS 16.0 (Chicago, IL). Chi square tests were used for categorical variables and ANOVA for continuous variables. Frequency distributions and adjusted proportions of socio-demographic, economic, behavioural risk and environmental

factors were obtained. Univariate tests were conducted. To control for potential confounders, logistic models were applied to test association between the binary results and independent variable groups.

CHAPTER 5 RESULTS OF STUDY ONE

5.1 Demography: The baseline migrant factory worker survey (Study 1)

At baseline, during 15 April 2009 to 15 May, 4280 potential participants were invited and 4088 eligible migrant workers accepted and finished all the questions successfully (a response rate of 95.51%). Of the 192 persons who quit in the beginning or amidst of the process, 35 were reluctant because of "stringent time" (18.23%), 22 thought this survey might be "of no help to my situation" (11.46%), 26 were back home or on business trips out of Shenzhen (28.26%). Fifty one (26.56%) did not finish more than one section of the whole 4 sections of the questionnaire and left no contact number, and 58 (30.21%) declined with no reason.

Comparisons to test basic demographic homogeneity of the respondents and non respondents found that no gender or age difference was statistically significant but the latter tended to extremes: to be either illiterate/almost illiterate or very well educated with post-secondary degrees when compared to the finished sample.

For those factories that refused to participate in study 1, 8 (57.1%) declined because they were moving, about to move or closing due to the economic downturn, 4 (28.6%) were dealing with relocating large numbers of workers, also due to the economic downturn , and 2 (14.3%) quoted the reason as "not interested". Comparisons were made of the characteristics of factories that agreed and declined to participate in the current study and there is no significant difference in factory characteristics (i.e. type of factories, number of workers).

The economic downturn which has caused big problems in many economies around the globe since 2008 also had impact China's export-driven economy as reflected by the moves and closures of the sampled factories in this study. The study period coincided with THE time of the most severe global financial tsunami and some factories' closure revealed signs of a

slowdown, especially because of the very close business relationships between Pearl River Delta factories and China's largest export market, the United States of America. However, fortunately for these entrepreneurs, after Beijing announced a stimulus plan featuring infrastructure projects totaling US$580 billion to create jobs [114, 115], their situation stabilized thus our study was able to continue into study two. Throughout the studies (study 1 and study 2), only 2 factories downsized. However, less than 3% of their total numbers of hired workers were laid off. Since the economic cycle is beyond anyone's control, we believe these results are the best that can be achieved under such a crisis.

Demographic characters of migrant factory workers can be divided into several major parts including: 1) sex and gender; 2) education and marital status; 3) region of origins and ethnic groups; 4) living environment; 5) migratory experience (accumulated working times in Shenzhen; other places stayed for a job or work reasons; living with family members or not; intention to stay); 6) job-related features (contract, occupation specification, time working on the current job and number of jobs held for the preceding 5 years); and 7) economic factors. The following section describes these categorical characteristics and compares them with available data on rural-urban migrants thus a clearer scene can be drawn.

5.1.1 Sex and age distribution

Table 5-1 shows the description of socio-demographic, economic, work-related factors of the migrant factory workers. There were more females (2110, 51.6%) than males (1978, 48.4%) in the final sample of 4088. The age distribution ranged from 16-59 years with an average of 27.36 (SD = 7.166, 95% CI = 27.14-27.58) years. Male workers (mean age was 28.45yrs, SD = 7.196, 95% CI = 28.13-28.76 yrs) were comparatively older than females (mean was 26.34 yrs, SD = 6.987, 95% CI = 26.04-26.64; t = 9.504, df = 4086, p = 0.000). This fits with the general demographic profile of Shenzhen's migrant workforce [41]. All

workers were divided into 5 age groups: group 1 included all under 20 years, group 2 included those between 20 and 29 years, group 3 were between 30 and 39 years, group 4 were 40-49 years and group 5 were those on or above 50. The majority belonged to age groups 2 (56.2%) and 3 (26.3%). Female workers tended to concentrated in younger age groups than males, for example, 13.8% of all females were in group 1 whilst the proportion for males in this group is only 6.5%; 29.3% of females belonged to group 2 compared with 26.9% in male workers. Less percentage of females were seen in age groups 4 and 5 (6.0%) than that in males (8.6%). This difference of age trend across gender was statistically significant ($F = 80.613$, $df = 4$, $p = 0.000$). It reflected and validated a long standing Chinese culture that females migrated to cities for a job at younger ages to support the family and their male siblings, if any, for their education while leaving the city and returning home for marriage, reproduction responsibilities and agricultural obligations [116]. Also, age discrimination may have exerted a heavier impact on females migrants due to their comparatively lack of education and skills than males who were preferred for some more skilled jobs and less discriminated regarding age by employers [117-119].

Besides age structure, female workers tended to have stayed in Shenzhen for a shorter period of time, were less mobile as reflected by the percentage of having been to other cities for jobs, were less likely to plan to stay in Shenzhen for a longer time, were more likely to work as assembly-line workers, live in dorms and less likely to be insured.

Figure 5-1-1 shows the population pyramid of the factory worker sample in Shenzhen. Figure5-1-2 presents predicted age and sex distribution in China for the year 2010.

In conclusion, our migrant factory worker sample in this study was composed of more female workers than male workers and these women were younger than their peer male workers due to the socioeconomic and cultural background deeply rooted in the Chinese countryside where these rural-urban workers originated from. The sample, in this regard, well

represented the basic demographic structure of the contemporary Chinese manufacturing working class in the big cities.

5.1.2 Education and marital status

The mean education years of the migrant factory workers was 10.35 years (SD = 2.306), slightly higher than the current 9-year compulsory education requirement for all children, a policy that took effect on July 1, 1986 [120], covering all administrative regions in mainland. This can be translated as that those who were born after 1979, no matter where the birth place was, should have been given 9-year free education till they had reached junior high school graduation. As shown by figure 5-2, just over half of female workers had accomplished this requirement, but around 4.5% had lower than that level of education. In groups with higher than junior high school level of education, proportions were higher in male workers than in females (F = 98.688, df = 6, p = 0.000). No male worker reported their education as illiterate or almost illiterate as compared with 4 female workers in this group.

Table 5-1 Socio-demographic characteristics, mobility, living arrangement of migrant factory workers in Shenzhen, China 2009 (n = 4088)

Factors Mean (SD)	Total N (%)	Female N (%)	Male N (%)
Sex	4088(100)	2110(51.6)	1978(48.4)
Age (years) **	Mean 27.36	Mean 26.34	Mean 28.45
<20	419(10.2)	291(13.8)	128(6.5)
20~29	2299(56.2)	1199(56.8)	1100(55.6)
30~39	1074(26.3)	493(23.4)	581(29.4)
40~	296(7.2)	127(6.0)	169(8.5)
Marriage**			
Single	1967(48.1)	1102(52.2)	865(43.7)
Married	1869(45.1)	892(42.3)	977(49.4)
Other	252(6.2)	116(5.5)	136(6.9)
Accompaniment			
Living with family(member)	1502(36.7)	775(36.7)	727(36.8)
Living without family member	2586(63.2)	1335(63.2)	1251(63.2)
Ethnicity			
Han	3826(93.6)	1993(94.7)	1833(93.3)
Non-Han	244(6.0)	112(5.3)	132(6.7)
Un-specified	18(0.4)		
Origin			
Central	1691(41.4)	854(40.5)	837(42.3)
South	888(21.7)	524(24.8)	364(18.4)
Northwest	250(6.1)	102(4.8)	148(7.5)
Southwest	7529(18.4)	381(18.1)	371(18.8)
North	378(9.2)	192(9.1)	186(9.4)
Northeast	20(0.5)	9(0.4)	11(0.6)
East	80(2.0)	36(1.7)	44(2.2)
Unspecified	29(0.7)	12(0.6)	17(0.9)
Education			
Illiterate	4(0.1)	4(0.2)	0(0.0)
Primary school	137(3.4)	90(4.3)	47(2.4)

Secondary school	3615(88.4)	1860(88.1)	1755(88.7)
Post-secondary college	221(5.4)	111(5.3)	110(5.6)
University or above	111(2.7)	45(2.1)	66(3.3)
Accumulated time of stay**			
<= 1m	164(4.0)	116(5.5)	48(2.4)
1m~6m	253(6.2)	147(7.0)	106(5.4)
>6m, <=1y	376(9.2)	224(10.7)	152(7.7)
>1y, <=2ys	600(14.7)	337(16.0)	263(13.3)
>2ys, <=3ys	571(14.0)	329(15.7)	242(12.3)
>3ys, <=5ys	724(17.7)	388(18.5)	336(17.0)
>5ys	1383(33.8)	559(26.6)	824(41.8)
Unspecified	17(0.4)		
Having been worked elsewhere**			
Yes	1524(37.3)	707(33.5)	817(41.3)
No	2564(62.7)	1403(66.5)	1161(58.7)
Intention to stay *			
Less than 3m	43(1.1)	27(1.3)	16(0.8)
3m~less than 6m	57(1.4)	29(1.4)	28(1.4)
6m~less than 1y	131(3.2)	65(3.1)	66(3.3)
1y~	968(23.7)	482(22.8)	486(24.6)
Not sure at the moment	2889(70.7)	1507(71.4)	1382(69.9)
Feature of residence**			
self-owned apartment	83(2.0)	55(2.6)	28(1.4)
living rent free with relatives or friends	43(1.1)	29(1.4)	14(0.7)
rented	1134(27.7)	510(24.2)	624(31.5)
co-rented	524(12.8)	263(12.5)	261(13.2)
dorm provided by employer others	2245(54.9)	1222(57.9)	1023(51.7)
	59(1.4)	31(1.5)	28(1.4)
Job feature**			
Management/administration	244(6.0)	74(3.5)	170(8.6)
Senior profession	33(0.8)	4(0.2)	29(1.5)
Productive lines	2078(50.8)	1206(57.2)	872(44.1)

General clerk	1140(27.9)	581(27.5)	559(28.3)
Technician	502(12.3)	228(10.8)	274(13.9)
Security	54(1.3)	4(0.2)	50(2.5)
Others	37(0.9)	13(0.6)	24(1.3)
Numbers of jobs in the past 5 years			
1	1780(43.5)	940(48.6)	840(46.2)
2~4	1797(44.0)	937(48.4)	860(47.3)
5~6	126(3.1)	48(2.5)	78(4.3)
>6	50(1.2)	11(0.6)	39(2.1)
Not sure	335(8.2)	174(8.3)	161(8.1)
Job contract			
Yes	3980(97.4)	2050(97.2)	1930(97.6)
No	108(2.6)	60(2.8)	48(2.4)
Health Insurance**			
Yes	3100(75.8)	1511(71.6)	1589(80.3)
No	988(24.2)	599(28.4)	389(19.7)

Comparisons between male and female workers *: p <0.05, ** p< 0.01

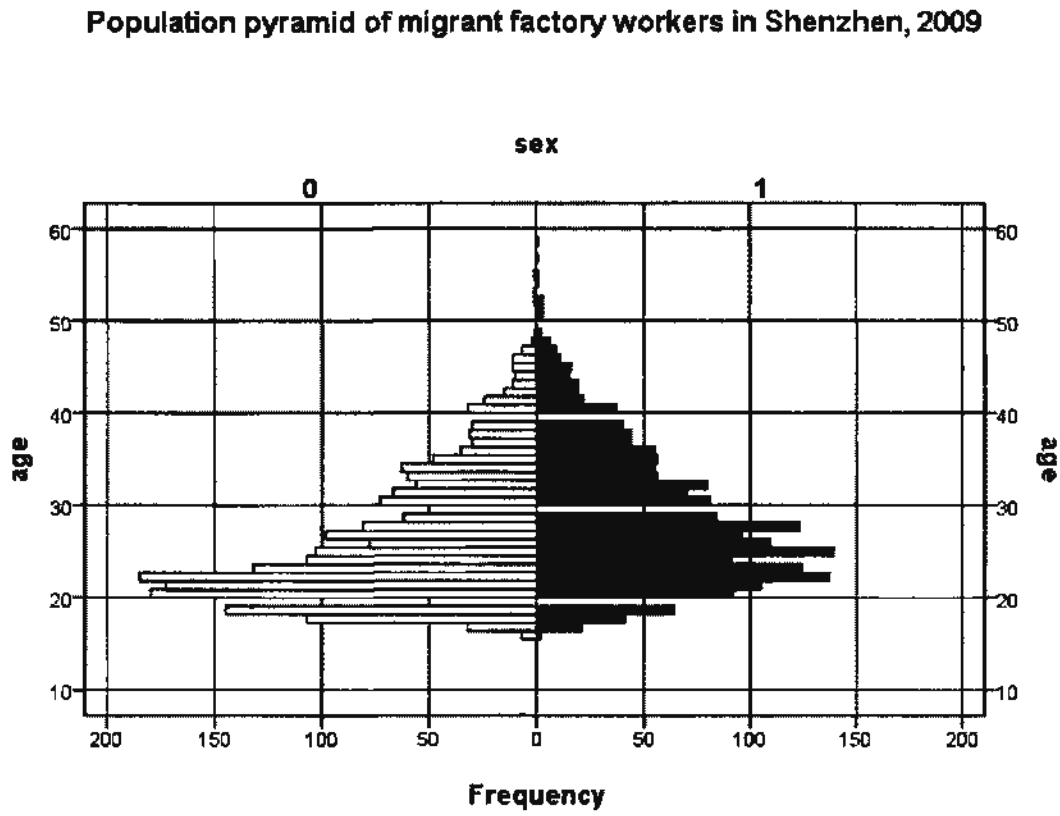

Figure 5 - 1 - 1 Population pyramid of migrant factory workers in Shenzhen, China, 2009
Note: 0: female; 1: male.

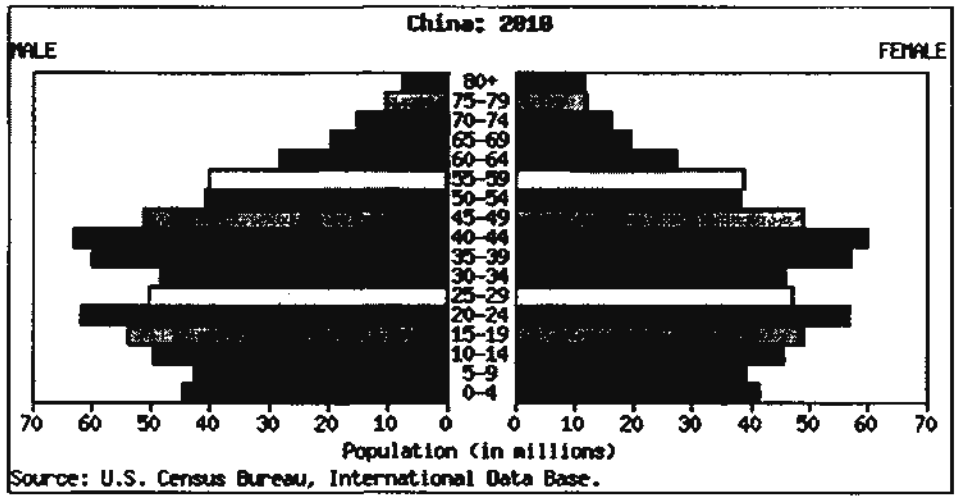

Figure 5 - 1 - 2 Predicted age and sex distribution of Mainland China in 2010

We categorized the marital status into 3: single, married and other. The reason to have "other" as an independent marital status is because of the existence of "illegal cohabitation" which is culturally accepted but is a form of illegitimate marriage, since cohabiting partnerships are established by some married people who are longtime separated by geographic distance, or living arrangements from their spouse. When responded to this question, workers were also told by facilitators that being widowed or divorced fit into "single" category and being separated or cohabitated with unmarried heterosexual partners should be treated as "other". Of all subjects, 48.1% (1967) were single, slightly less than half (45.7%, n = 1869) of the migrant factory workers were married and 6.2% (252) reported their marital status as "other". Female workers were more likely to be single, younger and below marriage age. Compared with female workers, males were more likely to be married or in the "other" category whilst females were more likely to be single ($\chi^2 = 29.777$, $df = 2$, $p = 0.000$).

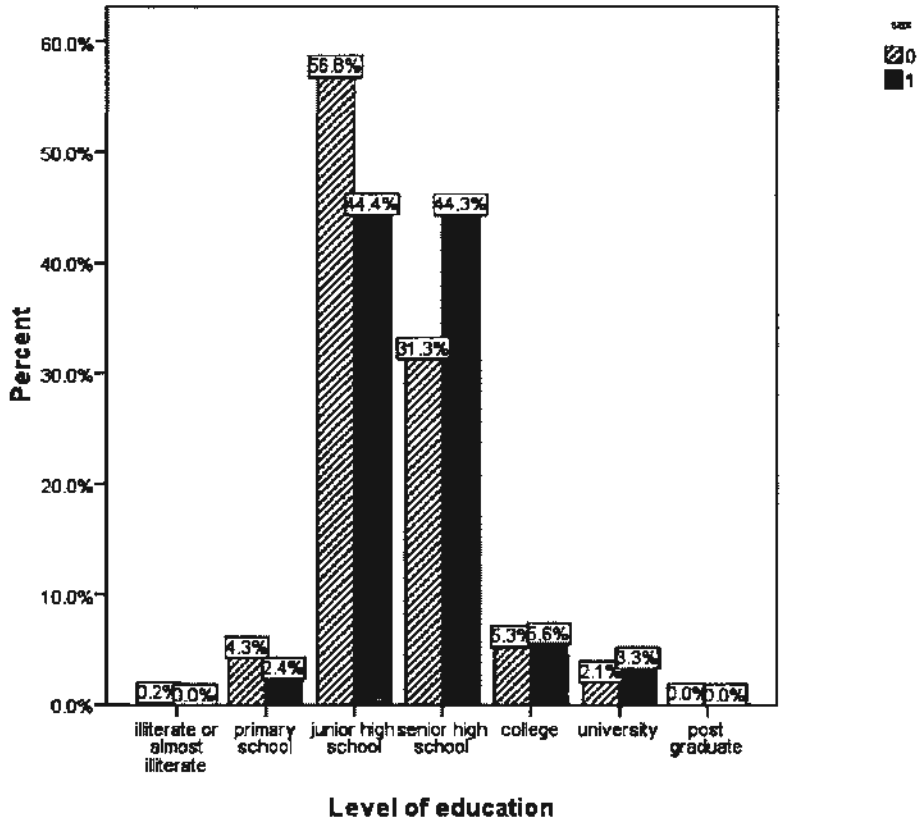

Figure 5-2 Level of education of migrant factory workers in Shenzhen, 2009 by sex

Figure 5-3 shows difference between genders on marital status. If taking education level into account, the highest proportion of being married was found in the group with primary school education (82.5%) and the highest proportion of being single was found in university or above group (83.7%). Age is clearly correlated with both marital status and education.

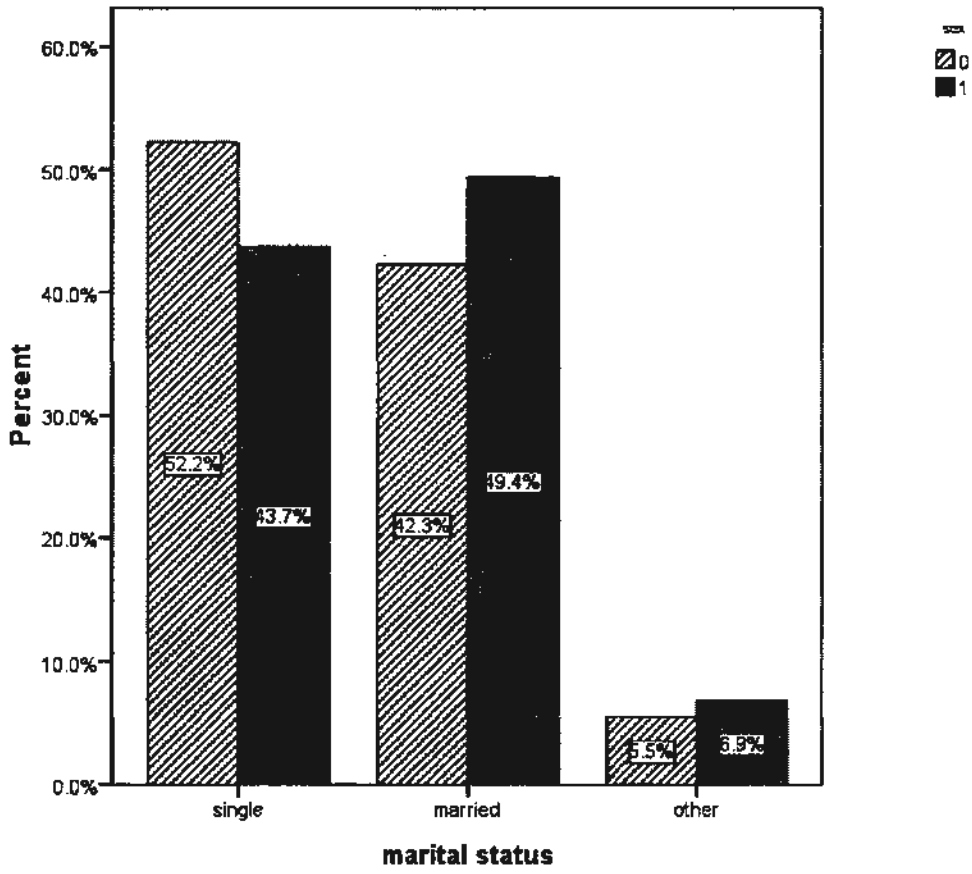

Figure 5-3 Marital status of migrant factory workers in Shenzhen, China 2009 by sex.
Note: 0 for female; 1 for male

5.1.3 Region of origins and ethnic groups

The migrant factory workers in our sample originated from 28 of the 31 administrative provinces/autonomous regions/municipalities in mainland China with only exceptions being Beijing, Shanghai and Tibet. They were more likely to come from the poorer parts of mainland China with 41.4% from the Central regions (Jiangxi, Hunan, Hubei, and Anhui

Provinces), 21.7%from the South (Guangdong and Hainan Provinces and Guangxi *Zhuang* Autonomous Region) and 18.4% from the Southwest (Sichuan, Yunnan and Guizhou Provinces and Chongqing Municipality). Table 5-1 has the distribution of the workers' region of origins and figure 5-4 gives out the geographic differentiation based on the subjects' HuKou locales. Our sample has included fewer from the north, northeast and northwest provinces, which was consistent with other available Shenzhen migrant worker surveys in the field of sociology or economics [3, 8, 41, 46, 48]. The reason lies mostly in cultural affinity and geographic convenience between the city and migrants' hometowns. Except for giant megacities like Beijing, Shanghai and Guangzhou, provincial capitals act as regional centers which attract many rural-urban migrants to work in different industries from rural areas of the city. However, personal preference and working experience and skills also play a role in moving and job hunting decision. Geographic convenience is important for rural-urban migrants to choose where to find a job because transportation limitations and the economic costs were the most restrictive factors. Other minor issues may include weather similarity of the locale to that of hometown, as well as food, dialect and social supports that can be found in fellow-townsmen groups.

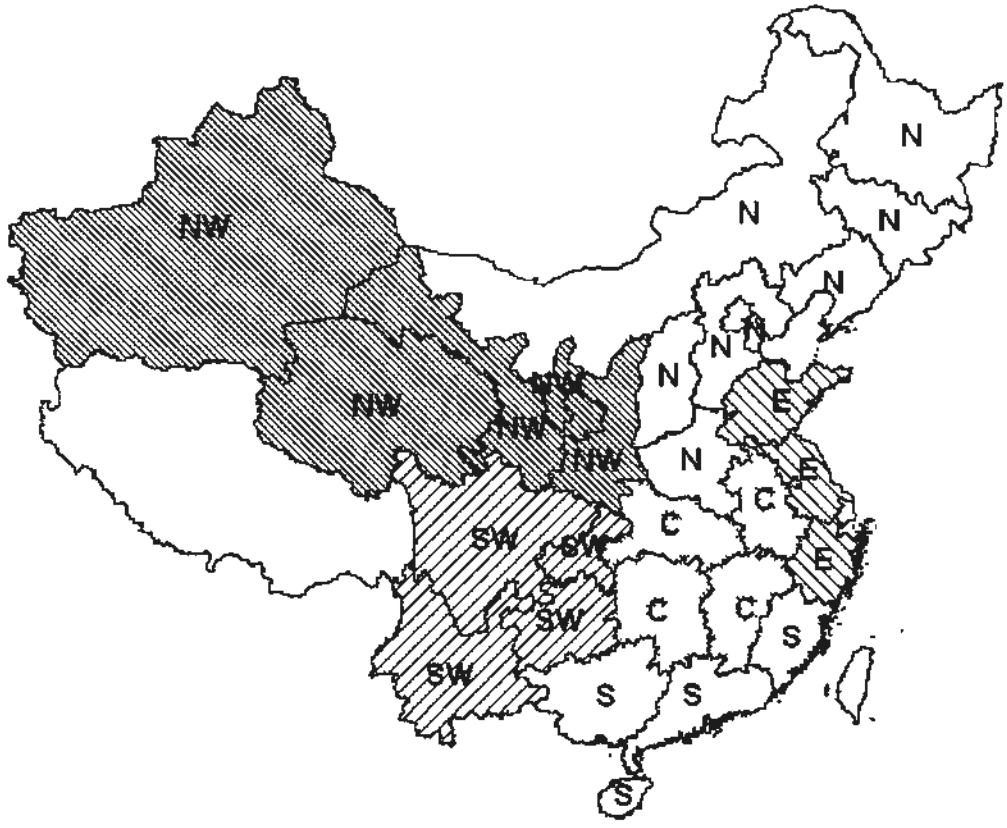

Figure 5-4 Geographic differentiation based on the subjects' HuKou locales
N: Northern provinces including Heilongjiang, Jining, Liaoning, Tianjin, Hebei, Henan, Neimenggu and Shan(1)xi

NW: Northwest provinces including Shan(3)xi, Qinghai, Gansu, Ningxia and Xingjiang

E Eastern provinces including Shangdong, Jiangsu and Zhejiang

SW : Southwest provinces including Sichuan, Chongqing, Guizhou and Yunnan

C: Central provinces including Hunan, Hubei, Anhui and Jiangxi

S: South provinces including Guangdong, Guangxi, Hainan and Fujian

Per capital Gross Domestic Product (US dollar) of each region, Year 2009: E (6094), S (3974), N (3883), NW (2653), C (2711), SW (1964).

Of all migrant workers, 244 (6.0%) were ethnic minorities (*Shaoshu minzu*). No difference was found between male and female workers ($p = 0.066$). Altogether, 18 minority groups were reported with the largest three being *Zhuang, Tujia and Miao*, three major ethnic minorities with long histories of living in Central and Southern China.

5.1.4 Living environment

Dorm living is the main accommodation arrangement for rural-urban migrant factory workers, as their legitimate and affordable residence in the city. Advantages for both the workers themselves and their employers are obvious from an economical perspective. It saves renting costs and cuts down living expenditures for migrant workers whilst for employers this makes their management easier and helps control the workers. Called by some sociologists and economists as "the dormitory labour system" [121-123], dorm living and the paternalist management practices that usually coexist or are combined have sophisticated disadvantages and adverse health impacts on migrant workers, short term or long term.

Of all workers surveyed, over half (54.9%) lived in dormitories provided by their employers. These dormitories are usually close to the factories and each room accommodates 6-10 workers on average. Females were more likely to report living on dorms than males (57.9% vs. 51.7%, $\chi^2 = 15.830$, $df = 1$, females as reference $OR = 0.778$, 95%CI = 0.688~0.881, $p = 0.000$). However, workers living in dorms were also younger (26.70 years in average) than those who lived elsewhere (28.63 years, $t = -4.163$, $p = 0.000$).

Relationships between dorm living and marital status have some special points worth further discussion. According to the general rules of having a factory dorm bed in almost all factories, we assumed that most single workers lived in dorms whilst most married live away from factories. However, results shows that proportions of dorm living for single, married and "other" marital status workers were 70.2%, 38.6% and 56.7%, respectively. More than half of

those who identified their marital status as "other" lived in dorms and 38.6% of married workers still lived in dorms. There in total were 792 (42.4%) of married workers who rented a flat independently. Co-renting was found in 524 (12.8%) migrant factory workers.

By taking both sex and age group into account, figure 5-5 depicts the trend of dorm living amongst 4088 workers. The middle-aged and older workers (30 years and above) had less percentage of dorm living compared with younger workers, independent of sex.

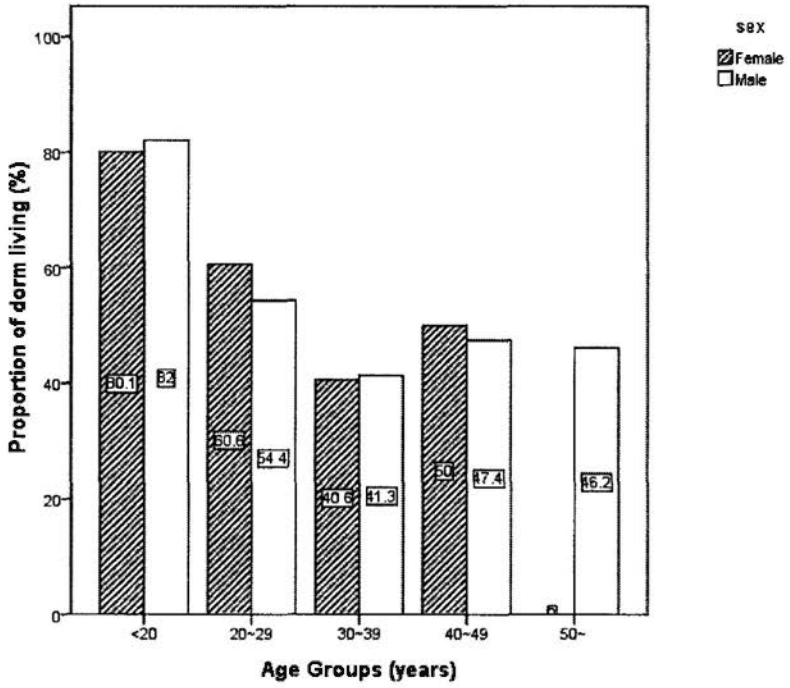

Figure 5-5 Proportions of dorm living amongst migrant factory workers by sex and age

5.1.5 Migratory experience

This section involves several aspects that are related to migrant factory workers' migratory experience, such as

1) Accumulated working time in Shenzhen;
2) Other places stayed for a job or work reasons;
3) Living with family members or not; and

4) Subjective intention of stay (IOS) in Shenzhen.

These factors reflect the stability of rural-urban manufacturing workforce and may help understand differentiation in health needs and service utilisation of migrant workers so that appropriate health planning can be framed.

In PRD factories in cities as Shenzhen and Dongguan, factory migrant workers follow their relatives or acquaintances to find a job. Since skills required for assembly line jobs are comparatively low and similar, it is not unusually to find workers rotate among different factories and locations. In our sample, more than one third of the workers had worked in cities other than Shenzhen whilst 33.8% had been living in Shenzhen for more than 5 years. Accumulated working time in Shenzhen was related to age. For example, 61.8% of workers younger than 20 years had been working in Shenzhen for less than 1 year, however accumulated working time in Shenzhen for workers older than 40 years this number was only 7.4% ($p = 0.000$).

Living with family is a typical arrangement for workers who had been working in cities for a while and had helped their family members successfully find a job in the same factory or a factory close to where he/she worked. Over two-thirds (63.3%) of all the workers were not accompanied by their family members, 56.1% of those who were married and 19.0% of the single workers ($\chi^2 = 570.3$, $df = 2$, $p = 0.000$). No difference was found on family accompaniment between genders ($p = 0.987$). Of the 1502 workers who were with family members in Shenzhen, 94.4% (1419) were accompanied by adult 18-60 years, 9.4% (142) were accompanied by elders over 60 years, 7.3% (109) were with relatives' child(ren) and over one fifth (21.9%, 329) were with their own child(ren), which represents 8.1% of the whole sample. Altogether, 9.5% of male workers and 8.0% of female workers were accompanied by their own child(ren).

We used the question "Have you ever worked in a city other than Shenzhen" as one of the

proxies to measure factory migrant workers' mobility. The women were less likely to have worked in other cities (33.5%) than men (41.3%) ($\chi^2 = 26.546$, $df = 1$, $p = 0.000$) but they moved jobs more frequently than compared with male workers ($p = 0.001$) (see below 5.1.6 for more details). For those who had worked in other cities, Beijing, Shanghai, other Pearl River Delta cities and core provincial capital cities were the most likely reported locales. However, more than 100 cities in total had been referred, showing a very diverse experience and preference.

Subjectively, many migrant factory workers were unsure about their stay time in Shenzhen. Over two thirds (70.7%) of all workers were not sure about how long they intended to stay, with no difference found between females and males. Of all surveyed, 5.6% planned to stay for less than a year, meaning one out of 20 planned to move in one year.

Main findings in this section implies that migrant factory workers rotate frequently between cities, with the younger having a higher mobility than the older workers. Comparison between genders shows that male factory workers' rotation is geographically distant (from city to city), whilst female workers prefer to change jobs. Family support amongst workers in our sample was limited in that less than one third of them lived away from any family members.

5.1.6 Job-related features

This section reports descriptive results of several parameters that are job-related including:

1) Contract, 2) occupation specification, 3) time working on the current job, 4) rest, and 5) number of jobs held for the preceding 5 years.

The majority (97.4%) of workers had formal and standard work contracts and no gender difference was observed ($p > 0.05$).

Around half (50.8%) of our sample worked on the production lines and more men were in higher positions in the factory hierarchy (only 3.5% of females were in management positions compared with 8.6% of their male counterparts). Less than half of all workers (43.5%) had been in the same job over the past 5 years and 44.0% had had between 2 to 4 different types of jobs. The average time working on the current job was 39.4 months, with female migrant workers having shorter average (31.3 months) than male workers (47.5 months) on the current job. We also found that time working on the current job was positively correlated with the current monthly income ($r = 0.236$, $p < 0.001$) and age ($r = 0.480$, $p < 0.001$) by using Pearson's correlation.

Of the total sample, 58.0% described their daily job as sitting for long period of time with no physical work needed whilst 30.7% described their job as "standing for long period of time or need to walk around". Job-related physical activity reflected both the subjects' job features and level of sedentary lifestyle because time spent on working, overtime and sleeping constituted the major parts of their lives, leaving a very small part to be their spare time.

Female factory workers and male factory workers differed in working hours per day (9.12 hours v.s. 9.50 hours, $p = 0.000$), working days per week (5.57 days v.s. 5.62 days, $p = 0.006$), overtime per day (2.097 hours v.s. 2.325 hours, $p = 0.000$) and sleeping hours per day (7.69 hours v.s. 7.59 hours, $p = 0.000$). Compared with most occupations that require 8-hour and 5-day working time in mainland China, migrant factory workers work longer hours per day and more days per month and this is severely serious in male factory migrant workers.

The above results help explain the stereotyped and marginalized work situation and lifestyles of migrant workers. Although work contract has largely been guaranteed, longer working hours and overtime are routine for them. Workers, especially female workers are mainly engaged in labour-intensive assembling jobs and job-changing is frequently seen. Prevalence of sedentary work style may pose negative health impact on them.

5.1.7 Economic factors.

We considered several aspects regarding migrant factory workers' economic factors, which included: monthly income, annual family income for the previous year, remittance sent home for the previous year, monthly living expenditure. The first items reflected personal and family's financial status whilst the third and the fourth measured their costs and spending in the city.

Table 5-2 describes distribution of the above economic factors and the difference between genders. This result was comparable to statistics on migrant workers' income in the Second Economic Census of Shenzhen in 2009 [48]. To verify and test for the validity of the individual report, average of personal monthly income of one factory was compared with that reported by individual factories' human resources department.

Table 5-2 Income and expenditure of migrant factory workers, by gender, Shenzhen, China, 2009

Economic factors (Yuan)	Female average (Yuan)	Male average (Yuan)	*t, p (2-tailed)*	Average for all (Yuan)
Monthly income	1415.63	1691.74	-9.271, 0.000**	1549.70
Annual family income for the previous year	26400	27700	-1.259, 0.208	27000
Remittance sent home for the previous year	5673.43	7827.99	-8.122, 0.000**	6722.37
Monthly living expenditure	754.27	871.78	-3.936, 0.000**	811.49

*Note: comparisons between female and male workers ** $p < 0.01$*

5.1.8 Key findings

Key findings of demography of migrant factory workers are:

1) The subjects are, in general, leading hard and maginalised lives, far away from their rural hometown, deprived of local *hukou* and *hukou*-related social warfare such as low rent apartment, working long hours and having poor income on average, independent of sex;

2) The factory rural-urban migrant workers in our sample represent a broad combination of geographic complexity and various ethnicities across mainland China;

3) The sample covers factory workers between 16 to 59 years, all at their legal working age, and more than half of them belong to age 20 to 29 years with around 14% of females being under 20.

4) Female workers outnumbered male workers in this study and they were also younger, with less education, had stayed and planned to stay in Shenzhen for an averagely shorter period of time, were more likely to be unmarried and uncovered by Shenzhen's health insurance scheme, as compared with male peers;

5) Over half of our respondents worked on production lines and a higher percentage of female workers took this kind of job than male workers;

6) Social support is low as reflected by the fact that more than half of our subjects live in dorms provided by employers and only a little more than one third of them live with their families;

7) Economically, female workers had even lower income and reported lower monthly living expenditure, than male workers;

The socioeconomic and demographic analyses of the sample stated above have outlined a basic frame that will be repeatedly used in the following parts.

5.2 Health needs and indicators: The baseline migrant factory worker survey (Study 1)

The right to health and healthcare is fundamental human right guaranteed by international conventions, including the constitution of the World Health organization [50, 60]. However to provide quality healthcare services, it is necessary to understand the health needs (or healthcare needs) of the people.

The definition of and method to assess health needs are evolving. Wright et al. argued that health needs assessment [124]:

"..... is a systematic method of identifying unmet health and healthcare needs of a population and making changes to meet these unmet needs. It involves an epidemiological and qualitative approach to determining priorities....."

In this section, we look within the population at certain things which we select as main representatives for their health needs. These aspects include:

1) **Self-rated health (SRH)** which has been found to be a good predictor of morbidity and mortality [125];

2) **Mental health** as measured by an psychological instrument that has long been tested and used in a variety of Chinese populations as amongst poor immigrants or migrants of other ethnicities [84, 126-129];

3) **Infectious disease immunization status**, using rubella seroprevalence amongst a subgroup of women in this sample, as an indicator; and

4) **Behavioural risk factors** including smoking, alcohol consumption and internet use.

5.2.1 Self-rated Health

5.2.1.1 Background and objective of the SRH study

From the perspective of health planning and policy making, finding a sensitive and feasible method to identify vulnerable persons with greater health needs is critical. The classic single item question which assesses general SRH has been widely accepted in social science and public health research due to its value in predicting mortality [125]. This predictive power on mortality, which has been proved through meta-analysis of a wide range of literature using several SRH response categories and various covariates throughout the world and in different populations, is proved be maintained even after adjustment for major covariates such as functional status, depression, and co-morbidity and it persists in studies with a long duration of follow-up, irresponsive of sex and origin. As a good and convenient screening tool, single item SRH question shows significant, graded relationship of higher relative risk of mortality and adds incremental value to the objective health measured in clinical setting of an individual [130]. The mortality predictive validity of SRH has also been proved in Chinese in Taiwan [131]. Moreover, literature has confirmed that the single-item measure of overall health is sufficiently sensitive to reveal relationships with a number of predictor variables [132]. A study in Canada has also indicated that SRH assesses a broad variety of factors, including physical health status, mental health status, health service/care utilisation, and health behaviours [133]. An increase of health service utilisation has been found in the U.S. military members who report poor or fair SRH [134]. However, determinants and mortality prediction capacity of SRH have not been adequately investigated in mainland China.

Since the SRH results are taken as an important proxy of general health needs which include underlying health problems that may go otherwise undetected in routine physical checkups or doctor visits, and due to the reason that single-item measures are quick and easy to administer in large-scale, community-based investigations, we used two types of

single-item SRH question *to help identify at-risk subgroups* who may have higher health needs in our migrant factory worker sample. This study also aims at *tracking change of SRH and identification of social determinants of adverse change within SRH* over time. Hence the single-item SRH measurements are used in study 1 and study 2, repetitively. The other objective of this study is *to compare two types of SRH tools within the same Chinese migrant population* including to: 1) identify the quantitative associates of VAS and 5-scale (5-point) SRH results; and 2) identify the most relevant factors that may impact on workers' SRH outcomes.

5.2.1.2 Method

As mentioned in Chapter four, self-rated health (SRH, or self-assessed health, SAH) was measured by two standard methods.

One is given by the question "Overall speaking, what do you think about your health condition? (1) Excellent, (2) Good, (3) Fair, (4) Poor, (5) Very poor". This is named as 5-scale SRH or 5-point SRH [135]. Rating methods for scaled SRH vary from 3 points to 5 points and words using to depict health status are slightly different. In our study, the scales and description for health used were similar to that in the British Household Panel Survey (BHPS).

Another was by using the EuroQol VAS with asking the respondents to "draw a line from the box below to whichever point on the scale indicates how good or bad your health state is today". The VAS scale looks like a ruler which was marked by numbers ranging from 0 to 100. We informed the workers before they took the self assessment with the following information:

"To help people say how good or bad a health state is, we have drawn a scale rather like a thermometer) on which the best state you can imagine is marked 100 and the worst

state you can imagine is marked 0. We would like you to indicate on this scale how good or bad your own health is today."

In analysis, we took the first type of SRH measurement (5-point question) as an ordinal variable and the VAS results as a scale level variable.

5.2.1.3 Results on the five-scale measurement of SRH

Of all workers, 89 persons (2.18%) reported their current health as poor or very poor using the first measurement. Differences were found between genders ($\chi^2 = 27.804$, $df = 4$, $p = 0.000$). Figure 5-6-1 shows the SRH distribution by gender.

Figures 5-6-2 and 5-6-3 show the SRH distributions by age group, sex, and accumulated working time in Shenzhen. In all age groups except for the ">= 50 years", female workers showed higher percentage of very poor, poor or fair health than their male counterparts, with females between 30 to 49 years having the highest proportion of reporting poor or fair health. However, male workers cumulatively reported very poor, poor or fair health as they became older. If taking the workers' accumulated working time (AWT) in Shenzhen into account, female and male workers presented different trends across AWT groups, although females in all AWT groups rated their health poorer than males, a finding accorded with the observation of many others [136-139]. We have noticed that females who had worked for one or less than one month or over 5 years represented the group at the highest risk of reporting poor or fair SRH. However in male workers, this risk gradually increased as time passed by.

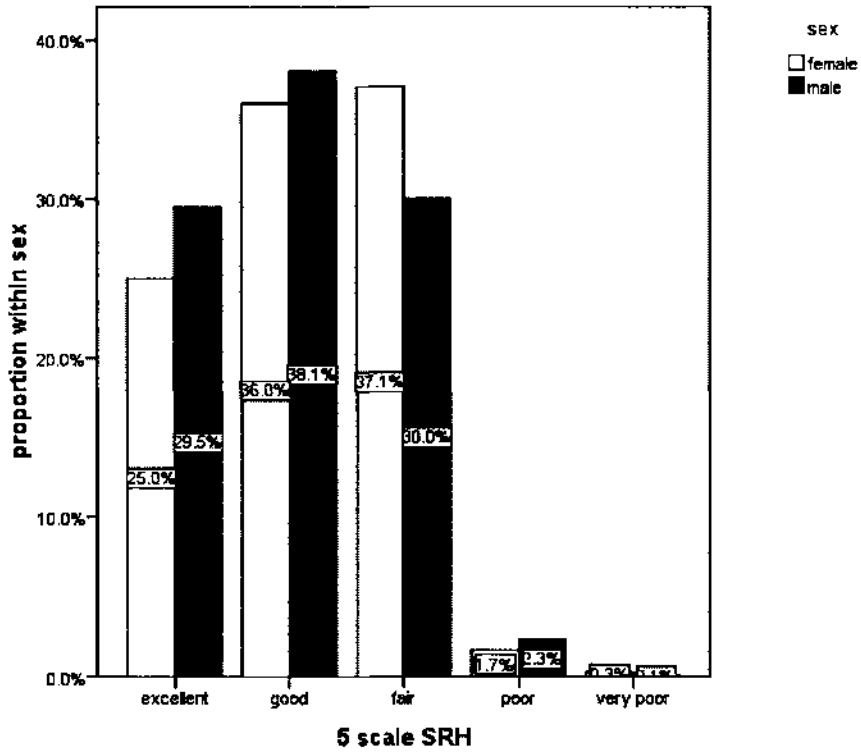

Figure 5-6-1 Self-rated health by gender in Shenzhen migrant factory workers

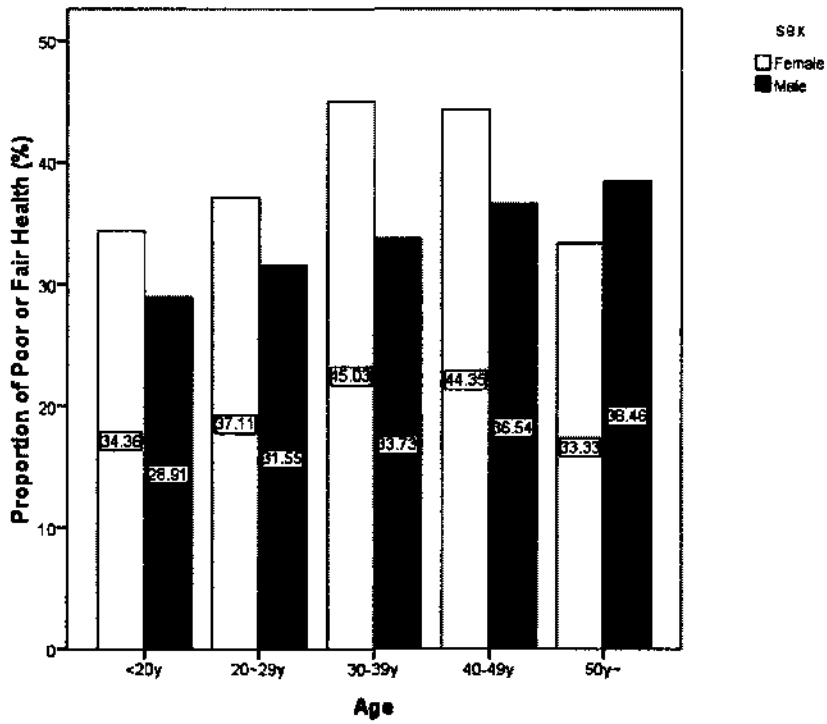

Figure 5-6-2 Self-rated health by gender and age group in Shenzhen migrant factory workers, Shenzhen, China, 2009

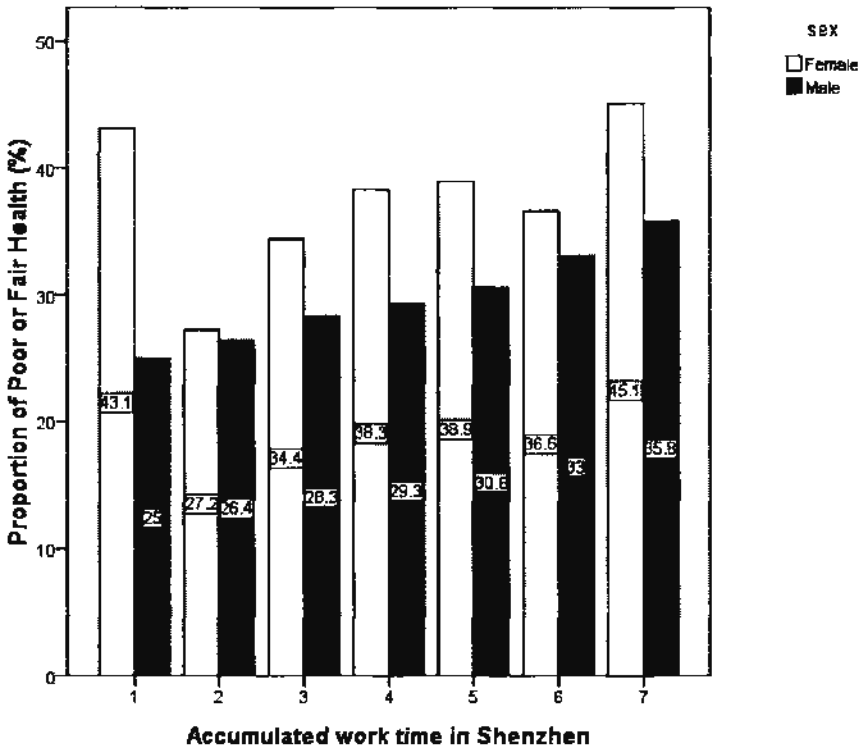

Figure 5-6-3 Self-rated health by gender and AWT in Shenzhen migrant factory workers, Shenzhen, China, 2009.

Descriptive statistics of SRH by SES is listed in Table 5-3-1, which also addresses potential associates between SRH and behavioural risk factors, mental health, job-related physical activities, self-reported sickness in the previous 2 weeks and health insurance. In this table, we found that if "fair" SRH is excluded, male workers had higher proportion of rating their health as poor or very poor (2.4%) than females (2.0%); however they also reported a higher percentage of good (38.1%) or excellent health (29.5%) than female workers (36.0% and 25.0%, respectively).

Table 5-3-1 Self-rated health as measured by the 5-point question, by age group, smoking status, drinking habit, internet use, income, clinically relevant DS, job-related physical activities and health insurance amongst factory migrant workers in Shenzhen

Variables		Excellent	Good	Fair	Poor	Very poor
Total		27.2%	37.0%	33.7%	2.0%	0.2%
Age*	<20	32.0%	35.3%	30.8%	1.9%	0%
	20-29	27.0%	38.6%	32.5%	1.8%	0.1%
	30-39	25.3%	35.8%	36.5%	2.0%	0.5%
	40-59	29.4%	31.8%	36.1%	3.7%	0%
Education**	Junior high school or below	27.8%	33.4%	36.8%	1.9%	0.1%
	Above junior high school	26.4%	41.3%	29.9%	2.1%	0.3%
Sex**	Male	29.5%	38.1%	30.0%	2.3%	0.1%
	Female	25.0%	36.0%	37.1%	1.7%	0.3%
Ethnic groups	Ethnic minorities	30.7%	37.7%	29.9%	1.6%	0%
	Han-Chinese	26.9%	37.0%	33.9%	2.0%	0.2%
Marriage**	Single	27.3%	38.3%	32.6%	1.7%	0.1%
	Married	25.5%	36.4%	35.5%	2.3%	0.3%
	Other	38.5%	31.3%	28.2%	2.0%	0.0%
Accumulated working time in SZ*	<1m	32.3%	29.9%	37.8%	0%	0%
	1-6m	36.8%	36.4%	26.5%	0.4%	0%
	>6m & <1y	30.1%	38.0%	30.6%	1.3%	0%
	1-2y	27.2%	38.5%	33.2%	1.0%	0.2%
	>2y-3y	25.9%	38.7%	32.9%	2.1%	0.4%
	>3y-5y	26.2%	38.8%	31.8%	3.0%	0.1%
	>5y	25.2%	35.3%	36.7%	2.5%	0.3%
Worked in other cities before	Yes	28.5%	37.9%	31.8%	1.7%	0.1%
	No	26.3%	36.5%	34.8%	2.1%	0.3%
Intention of stay*	<1y	29.9%	38.5%	29.0%	2.6%	0%
	>=1y	25.3%	42.0%	31.0%	1.4%	0.2%
	Not sure	27.6%	35.2%	34.9%	2.1%	0.2%
Family accompaniment	Yes	26.2%	38.0%	33.6%	1.9%	0.3%
	No	27.7%	36.4%	33.7%	2.0%	0.1%
Smoking status*	Never smoker	26.9%	36.3%	34.8%	1.8%	0.2%
	Ex-smoker	27.5%	38.8%	30.8%	2.7%	0.2%
	Casual smokers	30.4%	41.0%	26.4%	2.2%	0%
	Daily smokers	27.3%	37.8%	33.5%	1.5%	0%
	Heavy daily smokers	25.3%	35.6%	32.2%	6.9%	0%
Drinking Status*	Never drinker	27.4%	36.6%	34.0%	1.9%	0.2%
	Casual drinker	26.3%	38.9%	32.3%	2.2%	0.3%
	Frequent drinker	26.7%	35.0%	34.2%	4.2%	0%
Internet use**	Never user	26.7%	32.6%	38.6%	2.0%	0.2%

	Mild user	28.5%	38.1%	31.5%	1.6%	0.3%
	Frequent user	25.0%	39.5%	32.8%	2.7%	0.1%
Clinically	**No**	28.8%	38.4%	31.4%	1.3%	0.1%
relevant DS **	**Yes**	21.2%	32.1%	41.8%	4.4%	0.6%
Personal	**On or above average**	23.1%	40.6%	34.1%	2.2%	0.1%
income**	**Below average**	29.0%	35.4%	33.5%	1.9%	0.3%
Assembly-line	**Yes**	26.4%	35.9%	35.2%	2.3%	0.2%
worker	**No**	28.0%	38.2%	32.0%	1.6%	0.2%
Contract	**Yes**	26.7%	37.2%	33.9%	2.0%	0.2%
	No	24.4%	39.6%	34.1%	1.9%	0%
Job-related	**Sedentary**	25.2%	38.5%	34.3%	1.8%	0.2%
physical	**Standing or walking**	30.0%	35.0%	32.2%	2.4%	0.3%
activities **	**Some physical activities**	27.8%	43.1%	27.4%	1.8%	0%
	Physically demanding	32.0%	21.3%	44.9%	1.7%	0%
Self-reported	**Yes**	14.0%	37.0%	43.3%	5.1%	0.6%
sickness in the	**No**	30.7%	37.0%	31.0%	1.1%	0.1%
previous 2						
weeks**						
Health	**Yes**	26.1%	38.5%	32.8%	2.4%	0.2%
insurance**	**No**	30.6%	32.3%	36.4%	0.6%	0.1%

Note: Daily smokers (defined as smoking up to one pack of cigarettes per day) and heavy daily smokers (defined as smoking more than one pack of cigarettes per day).
***: Chi square tests $p < 0.01$, *: Chi square tests $p < 0.05$.*

According to the results of univariate analyses, some potential associations were identified. These include most of the factors that have been put into descriptive analyses: age, sex, education, marriage, accumulated working time in Shenzhen, intention of stay, internet use, clinically relevant DS, monthly income, job-related physical activities, sickness in the previous two weeks and health insurance participation. In particular, frequent drinking and heavy smoking were both presented as significant risk factors for poor or very poor SRH in migrant workers.

To facilitate multivariate analyses, the transformed SRH values were used to construct regression models, with "excellent" and "good" SRH being combined as good SRH (SRH' = 0) and "fair", "poor" or "very poor" SRH being combined as poor SRH (SRH' = 1). The binominal logistic regression models adopted included a general model and two sex-specific

models, which aimed at finding the gender differentiations in 5-point SRH. Table 5-3-2 presents the adjusted Odds Ratios (ORs) for poor SRH by associated factors. Table 5-3-3 shows the gender-specific models and the adjusted ORs of each factor for poor SRH.

Table 5-3-2 Relationship between poor SRH and socioeconomic status, lifestyle factors, job-related factors and mental health status (clinically relevant DS).

Associates	*Wald*	*p*	Adjusted OR (95%CI)
Sex			
Female†			
Male	23.083	0.000	0.709(0.616, 0.816)
Intention of stay			
<1y	2.811	0.094	0.768 (0.563, 1.046)
>=1y	4.940	0.026	0.830 (0.704, 0.978)
Not sure†			
Mobility			
Have been to other cities	3.918	0.048	0.866 (0.752, 0.999)
Haven't been to other cities†			
Health insurance			
Yes†			
No	4.092	0.043	1.204(1.006, 1.441)
Internet use			
Never	0.361	0.548	1.064 (0.869, 1.303)
Mild	3.148	0.076	0.856 (0.722, 1.016)
Frequent†			
Clinically relevant DS			
Yes	51.865	0.000	1.811(1.540, 2.128)
No†			
Education			
Senior high or above	17.589	0.000	0.729(0.629, 0.845)
Less than senior high†			
Job contract			
Yes	2.604	0.081	2.428(0.468, 4.015)
No†			
Sleep hours per day	19.222	0.000	0.839(0.776, 0.908)
Working time in Shenzhen			
<=1m	0.195	0.658	0.917(0.626, 1.345)
>1m, <= 6m	14.046	0.000	0.535(0.386, 0.742)
6m~12m	6.955	0.008	0.702(0.539, 0.913)
>1y~2y	5.801	0.016	0.768(0.620, 0.952)
>2y~3y	8.806	0.003	0.719(0.579, 0.894)
>3y~5y	6.049	0.014	0.781(0.641, 0.951)
>5y †			
Two-week illness			
Reported†			
Not reported	88.301	0.000	0.463(0.394, 0.543)

† reference category

In this model, the top two factors that are positively associated with poor SRH (SRH') include: having clinically relevant DS and having no health insurance. On the other hand, factors that reduce the likelihood of worker reporting poor SRH include: being male, having not reported illness in the previous two weeks, having longer sleeping hours per day, with an educational attainment of senior high school or above, having been to other cities for work, having a clear intention of stay and having been lived in Shenzhen for shorter period of times (as compared to more than 5 years). Within the last factor, each subgroup shows slightly different OR for poor SRH, with those who have stayed for "more than 1 months up to half a year" showing the least likelihood to report poor health. After this period, ORs gradually increases, hinting the existence of the adverse time effect on general health status or the U-shaped curve that are found in the DS analyses (see Figure 5-12) also exists in SRH.

Table 5-3-3 The relationship between poor SRH and socioeconomic status, lifestyle factors, job-related factors and mental health status (clinically relevant DS) by gender

Associates	Adjusted OR (95%CI) Female only model	Adjusted OR (95%CI) Male only model
Marital status		
Single	1.107(0.716, 1.711)	
Married	1.569(1.013, 2.432)*	
Other†		
Intention of stay		
<1y		0.485 (0.291, 0.809)**
>=1y		0.726 (0.567, 0.930)*
Not sure†		
Mobility		
Have been to other cities	0.736(0.606, 0.896)**	
Haven't been to other cities†		
Health insurance		
Yes†		
No		1.390(1.044, 1.850)**
Internet use		
Never		1.107(0.832, 1.472)
Mild		0.775(0.611, 0.983)*
Frequent†		
Clinically relevant DS	1.740(1.396, 2.168)**	1.879(1.480, 2.385)**
Yes		
No†		

Education		
Senior high or above	0.800(0.658, 0.974)*	0.716(0.579, 0.886)**
Less than senior high†		
Job contract		
Yes		0.790(0.625, 0.969)**
No†		
Sleeping hours per day	0.865(0.776, 0.964)**	0.812(0.724, 0.911)**
Working time in Shenzhen		
<=1m		0.574(0.273, 1.205)
>1m, <= 6m		0.461(0.276, 0.769)**
6m~12m		0.604(0.396, 0.921)*
>1y~2y		0.631(0.453, 0.878)**
>2y~3y		0.576 (0.410, 0.809)**
>3y~5y		0.750 (0.561, 1.004)
>5y †		
Two-week illness		
Reported†		
Not reported	0.461(0.367, 0.578)**	0.438(0.348, 0.552)**
Family accompaniment		
Yes		0.737(0.592, 0.918)**
No†		

*† reference category; *: $p < 0.05$; ** $p < 0.01$*

As many former studies [136, 138, 140, 141] found that gender differences exist in SRH of different populations including immigrants and migrants, we assume that health differentiation between females and males exists in this factory migrant worker population as well. In the above models, this variance is fairly sharp except for only a few factors that present similar influence on both male and females. Moreover, the significant effects which are shown in the both-gender model disappear, whilst some others, such as family accompaniment (for male workers) and marital status (for females) emerge into the gender-specific models.

We have noticed that there are four major factors which hold for all three models, i.e., education, sleeping hours per day, clinically relevant DS and two-week illness. Those who are 1) educated at senior high school or above, 2) without two-week illness, 3) without clinically relevant DS as judged by CES-D, and 4) have longer sleeping hours per day are less likely to report poor health. Other than these four factors, amongst female migrant workers, those who

are married are more likely to report poor health whilst those who have been to other cities are less likely to have poor health. In males, other significant factors that make poor SRH less likely are clear intention to stay in Shenzhen, mild level of using internet, less than 5 years of migratory history in Shenzhen, with family accompaniment. Without a job contract and health insurance make a male worker more likely to report poor SRH.

It is worth notifying that the age difference in poor or fair SRH which is explicitly shown in the descriptive analyses does not persist in any of the regression models and drinking, smoking are both exclude from the multivariate analyses.

The above findings indicated that Male and female MFWs showed no statistically significance in reporting fair, poor or very poor health. The both-sex model showed that poor mental health and being with out health insurance were the two most important factors that contributed to MFWs' poor 5-scale SRH, whilst having not reported two-week illness was the key factor related to less likelihood of reporting poor SRH. The sex-specific models, however, found being married and showing clinically relevant DS were associated with females' poor SRH and better education, longer sleeping hours, having been to other cities reduced their likelihood of reporting poor SRH. Male-only model was very similar, but male workers' SRH was not linked to DS or marriage. Instead, insurance, intension of stay, accumulated working time and family accompaniment were associated with their possibility of reporting poor SRH.

5.2.1.4 Results on the EQ-5D VAS measurement of SRH

5.2.1.4.1 Correlations between two types of SRH measurement

The mortality and clinical outcome prediction ability of SRH, which is one of the most frequently used health indicator tools measuring the respondents' self-perceived overall health, has been proved to be stronger than many other health indicators in numerous studies worldwide [101, 132, 133, 142, 143].

Of all the instruments which contain the global question of SRH, the single-item 5-scale (point) SRH question and EQ-5D VAS were two widely recognized and used tools. The EQ-5D VAS uses the 0-to-100-point scale asking the respondents to rate their health from the worst imaginable to the best imaginable. Although concerns, such as unfixed positioning of the questions in the instrument and unclear definition of possible comparisons that respondents may consider when answering the questions, do raise uncertainties, these two types of SRH question work well and serve in various fields of research, clinical practice and outcome evaluation [132, 144].

In this study, we compared the results from the 5-point question SRH and the EQ-5D VAS SRH, to test for their potential correlation. Figure 5-7 gives the EQ-5D VAS SRH mean scores and 95% CI by sex and by 5-point question SRH. In our sample, EQ-5D VAS scores and 5-point SRH are closely correlated independent of sex, except for male factory migrants reporting very poor health. This subgroup had higher mean VAS score than those who rated their health status as "poor". By using Spearman's correlation, 5-point SRH scores (from 1 to 5) were negatively correlated with the EQ-5D VAS score in this migrant factory worker sample (r = -0.668, p = 0.000). In general, except for the "very poor" 5-scale SRH subgroup, the better the 5-point question result, the higher the EQ-5D VAS score. We believe this is the first time this correlation has been shown in a Chinese adult population.

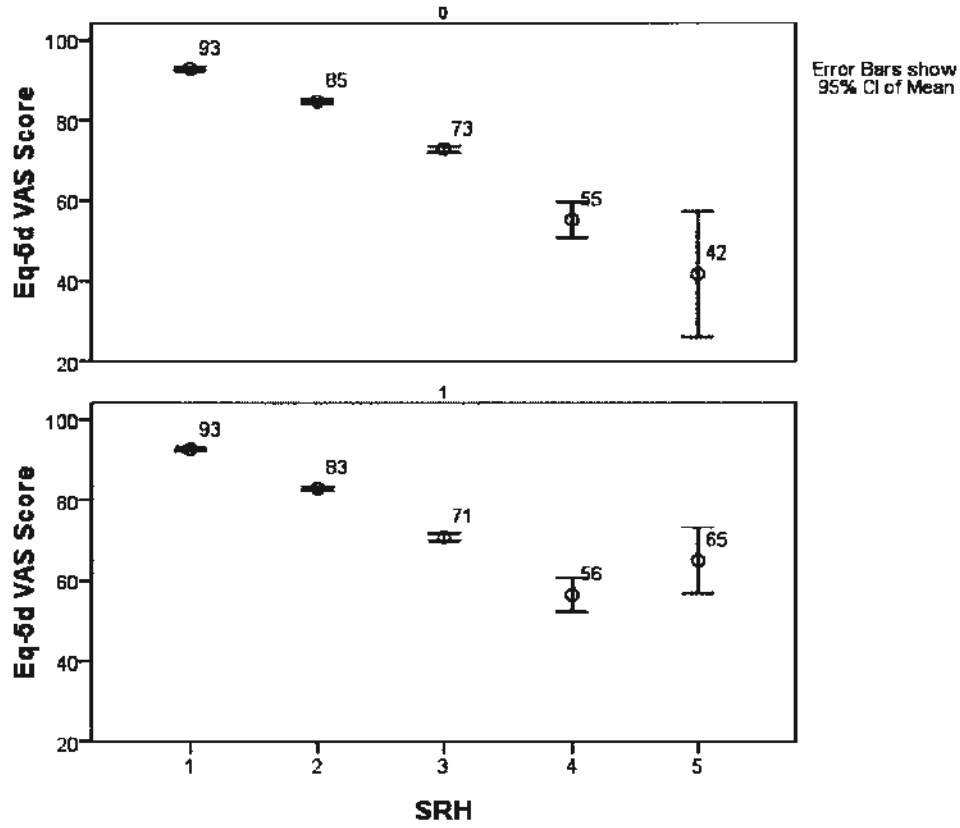

Figure 5-7 Eq-5d VAS mean scores and 95%CI of mean by 5-point SRH and gender, in migrant factory workers in Shenzhen.
Note: Gender: 1 = male; 0 = female; SRH: from 1(excellent) to 5 (very poor)
Eq5D VAS score: from 0 (worst imaginable health state) to 100 (best imaginable health state)

5.2.1.4.2 VAS SRH scores by socio-demographic factors

The EQ-5D VAS score of migrant factory workers is a scale-level continuous measurement. To understand if its distribution is in line with a normal distribution, we adopted a Kolmogorov-Smirnov test and the result showed that $p = 0.000$ thus H_0 (in this case, normal distribution) was rejected. Table 5-4 gives the outcome parameters of the Kolmogorov-Smirnov test for migrant factory workers' VAS scores.

Table 5-4 One-Sample Kolmogorov-Smirnov Test: EQ-5D VAS score of Shenzhen migrant factory workers.

N		4088
Normal Parameters[a]	**Mean**	81.63
	Std. Deviation	13.548
Most Extreme Differences	**Absolute**	0.165
	Positive	0.088
	Negative	-0.165
Kolmogorov-Smirnov Z		10.539
Asymp. Sig. (2-tailed)		0.000

Note: Test distribution is Normal.

Since the EQ-5D VAS is not normally distributed, we used median and range for description and Mann-Whitney U tests (2 independent samples) and MeKruskal-Wallis tests / median tests / Jonkheere-Terpstra tests (K independent samples) to determine any difference of the VAS score by sociodemographic and migratory experience factors. Factors recognized as statistically significant in the multivariate analyses for 5-point question SRH were used (except for sleeping time per day). Also, smoking and drinking status were added to test for difference in EQ-5D VAS scores. Table 5-5 gives the tests results.

Table 5-5 Non-parametric tests for EQ-5D VAS scores by factors associated with 5-point SRH and smoking and drinking status

Associates	***Median***	***Range***	***p value***
Sex			0.995(Mann-Whitney U)
Female	85	80	
Male	85	69	
Marital status			0.001(median)**
Single	85	65	0.000(MeKruskal-Wallis)**
Married	81	80	
Other	90	50	
Intention to stay			0.255(median)
<1y	80	65	
>=1y	85	85	
Not sure	85	70	
Mobility			0.084(Mann-Whitney U)
Have been to other cities	85	65	
Haven't been to other cities	83	80	

Health insurance			0.089 (Mann-Whitney U)
Yes	85	80	
No	80	60	
Internet use			0.067(MeKruskal-Wallis)
Never	85	80	
Mild	85	70	
Frequent	82	65	
Clinically relevant DS			0.000(Mann-Whitney U)**
Yes	80	80	
No	85	70	
Education			0.635(Mann-Whitney U)
Senior high or above	85	70	
Less than senior high	85	80	
Job contract			0.241(Mann-Whitney U)
Yes	85	80	
No	85	50	
Working time in Shenzhen			0.003(MeKruskal-Wallis)**
<=1m	85	60	
>1m, <= 6m	90	50	
6m~12m	85	60	
>1y~2y	85	80	
>2y~3y	80	65	
>3y~5y	85	70	
>5y	82	70	
Two-week illness			0.000 (Mann-Whitney U)**
Reported	80	80	
Not reported	85	70	
Smoking status			0.008 (MeKruskal-Wallis)**
Never smoker	85	80	0.004 (Median)**
Ex-smoker	81	60	0.030 (Jonkheere-Terpstra)*
Casual smoker	87	69	
Daily smokers	80	65	
Heavy daily smokers	80	65	
Alcohol consumption			
Never	85	70	0.099 (MeKruskal-Wallis)
< once a month	85	70	0.036 (Median)*
< once a week	85	80	0.452 (Jonkheere-Terpstra)
1-3 times a week	80	60	
4-6 times a week	80	45	
Daily	80	60	
Total	85	80	

Note *: $p < 0.05$, **: $p < 0.01$

The Mann-Whitney U test and median test were to confirm the statistically significant difference in median, whilst MeKruskal-Wallis test or Jonkheere-Terpstra test were for ordered differences among classes. It tests the null hypothesis that the distribution of the

response variable does not differ among classes. The results reveal that clinically relevant DS and two-week illness persist to be the most prominent factors associated with EQ-5D VAS scores, with those who had clinically relevant DS and/or any illness in the previous two weeks having lower scores of VAS SRH results than those who did not have depressive symptom or physical health problems.

Married migrant workers had lower VAS scores compared to single or those with "other" marital status. As migrant factory workers' accumulated work time in Shenzhen added up, their VAS scores fluctuated, reflecting a quite similar trend as the 5-point SRH result in that the score reached its highest median during 1 month to 6 months and finally dropped to its lowest when they had worked in Shenzhen for more than 5 years. Smoking and drinking both were identified as significant in the analyses. Ex-smokers, daily smokers and daily heavy smokers all had poorer VAS scores as compared to never-smokers. Non-drinker or individuals drinking less than 1 occasion per week had better VAS SRH results than those who reported more frequent alcohol consumption.

A linear model was adopted to adjust for sex, age, education and income. Table 5-6 presents the significant associates, standardized coefficients (beta), 95% CI for beta and collinearity statistics (tolerance and variance inflation factors, VIFs) of the model. Two figures that involve the standardized residuals show that the model is of good quality (Figure 5-8-1 and figure 5-8-2). Results also confirmed that CES-D total score, two-week illness, age and work time in Shenzhen were independent determinants of VAS score. For all factors, tolerance was above 0.1 and VIF was below 10, meaning the model did not have included collinearity.

Table 5-6 Summary findings from the linear regression model taking EQ-5D VAS score as the dependent variable.

Model	Standardized Coefficients Beta	*t*	*p*	95% Confidence Interval for beta		Collinearity Statistics	
				Lower Bound	Upper Bound	Tolerance	VIF
Constant		93.193	0.000	89.193	93.027		
CES-D total score	-0.175	-11.120	0.000	-.465	-.326	0.978	1.022
Two-week illness	-0.137	-8.668	0.000	-5.435	-3.430	0.976	1.024
Age (year)	-0.040	-2.225	0.026	-0.140	-0.009	0.754	1.326
Accumulated work time in Shenzhen	-0.039	-2.190	0.029	-0.554	-0.031	0.752	1.330

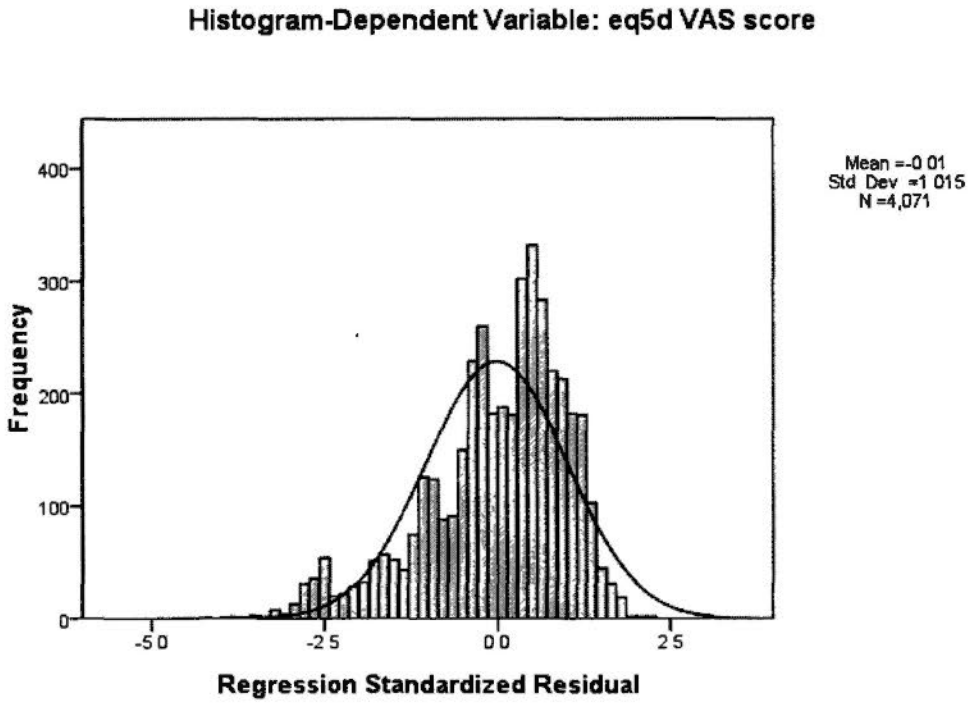

Figure 5-8-1 Model diagnosis: Standardized residual

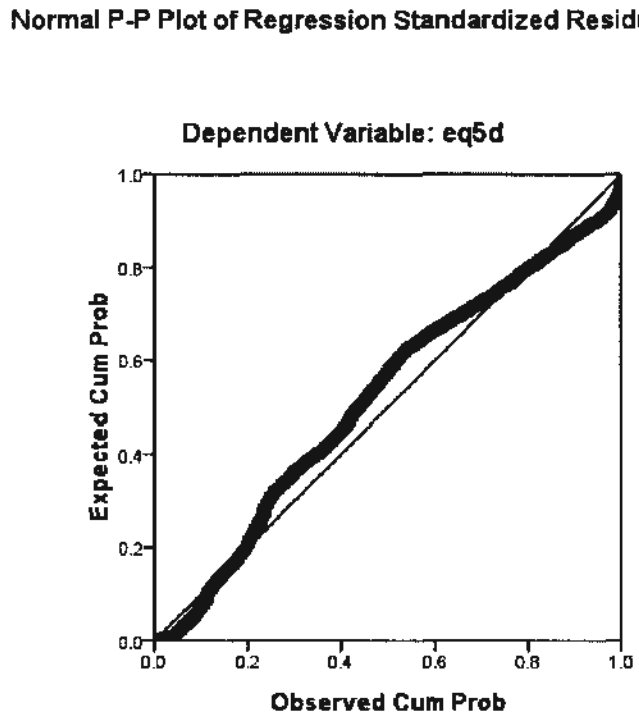

Figure 5-8-2 Model diagnosis: P-P plot

Since there does not exist a cut-off line on the EQ-5D VAS score for suboptimal SRH, we treated the score as a continuous, although not normally distributed, parameter. To increase the migrant workers' acceptance of the questionnaire, this study has not included the EQ-5D descriptive system, which comprises five dimensions of health, in the cross-sectional survey or the follow-up study. Despite the enormous body of empirical studies examining the single item 5-point SRH, very few checked its correlation with other SRH scales.

In this study amongst Shenzhen migrant factory workers, the two SRH items are closely correlated and share some determinants.

The common parameters that predict the two different SRH scales were time spent working in Shenzhen, mental health status as well as physical health as reflected by self-reported two-week illness. Though former evidence [145] indicated that females tended to report their health as poorer than their male peers, such an observation was not true for both

the 5-point SRH and the VAS SRH results in our migrant factory workers. While in sex-specified models for the 5-point SRH, accumulated work time in Shenzhen did not hold for females, mental health and two-week illness were both consistently associated with SRH results. This has at least disclosed that respondents' current mental and physical symptoms are two of the major components of the SRH despite of the scale we have used.

5.2.1.5 Key Findings

To summarize, our study indicated that the 5-scale SRH and EQ5D VAS SRH scales were closely correlated in an adult MFW population. No sex difference regarding proportion of poor 5-point SRH or score of VAS SRH was found in our study, although chi square test for univariate analyses detected difference of reporting "fair" SRH (Table 5-3-1) between male and female workers. The strong associations between SRH, DS and two-week illness deserves further exploration.

5.2.2 Mental Health

5.2.2.1 Objective of the mental health studies

The purpose of this study was to estimate the prevalence of clinically relevant depressive symptoms amongst migrant factory workers in Shenzhen, China and to describe its associated socio-demographic, economic, behavioral and mobility related correlates in this population.

5.2.2.2 Methods: Instrument

To assess depressive symptoms we used the validated Chinese version of the Centre for Epidemiological Studies-Depression Scale (CES-D), a commonly used measure of depressive symptomatology possessing good psychometric properties, CES-D has been shown to not only have good concurrent validity with other DS measurements but also have ability to discriminate between general populations and patients with clinic diagnosis [102-105, 107, 146; 106]. The cut-off of 16 was used in this study based on previous studies [112, 113].

CES-D was firstly translated into Chinese in 1980s and validated in different Chinese populations of various locations such as the US [108], Singapore [109], Hong Kong [102] and mainland China [106, 110, 111].

The scale was pilot tested and re-tested in a small group of migrant factory workers (n = 40, with a 1 week interval) in a glass manufacturing enterprise in *Longgang* District in the east part of Shenzhen city. The Cronbach's alpha for this scale in the pilot study was 0.84, reflecting a very high internal reliability.

5.2.2.3 Results

The mean score of CES-D was 12.03 (SD = 5.902, ranged from 3 to 51) and the prevalence of DS above the cut-off point (CES-D >= 16, as recommended by Weissman *et al.*,

1977) [113] was 21.4% (95% CI = 20.22-22.58%), implying that one fifth of the workforce had clinically relevant depressive symptoms.

The depressive symptoms scores between male and female were similar (11.94, *SD* = 5.839 for females, 12.13, *SD* = 5.968 for male workers), with no statistically significant difference in the prevalence of clinically relevant depressive symptoms between the two sexes overall (21.4% vs. 21.3%, $\chi^2 = 0.012$, $p = 0.915$).

Age was negatively correlated with CES-D scores although the association is weak (Pearson's $r = -0.062$, $p = 0.000$). The mean scores of CES-D in different age groups showed that the youngest (19 years or below) ($\overline{X} = 12.84$, *SD* = 6.111) and the oldest (50 years or above) ($\overline{X} = 12.32$, *SD* = 11.992) had higher mean scores than the middle-aged (20 to 49 years) ($\overline{X} = 11.47$, *SD* = 5.676) ($F = 4.829$, $df = 4$, $p = 0.001$). A "U" shape distribution of clinically relevant DS was also observed with the youngest and the oldest having higher prevalence rates (25.5% for those below 20 and 25.0% for those on or above 50) and the middle aged having the lowest prevalence (18.2%) ($\chi^2 = 11.244$, $p = 0.024$) (Figure 5-9).

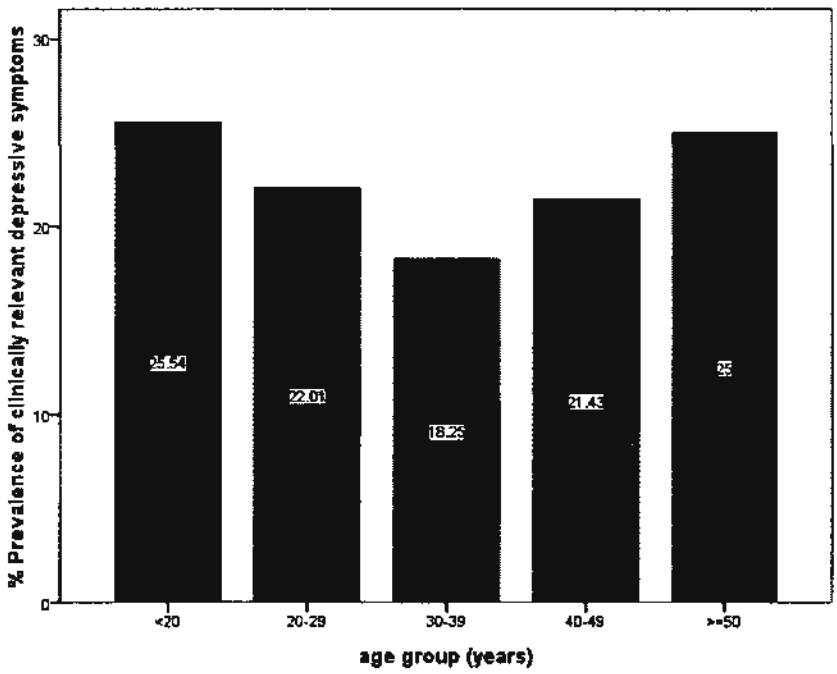

Figure 5-9 Prevalence of clinically relevant depressive symptoms amongst migrant factory workers by age group, Shenzhen, China, 2009

Depressive scores and DS prevalence rates were highest and second highest when the workers' accumulated working time in Shenzhen was less than one month ($\overline{X}$ = 12.92, *SD* = 5.653; 26.8%, 95% CI = 19.94-33.66%) and between one and two years ($\overline{X}$ = 12.56, *SD* = 5.989; 24.2%, 95% CI = 20.87-27.53%), respectively (Figure 5-10). This time effect was statistically significant ($F = 2.505$, $df = 6$, $p = 0.020$).

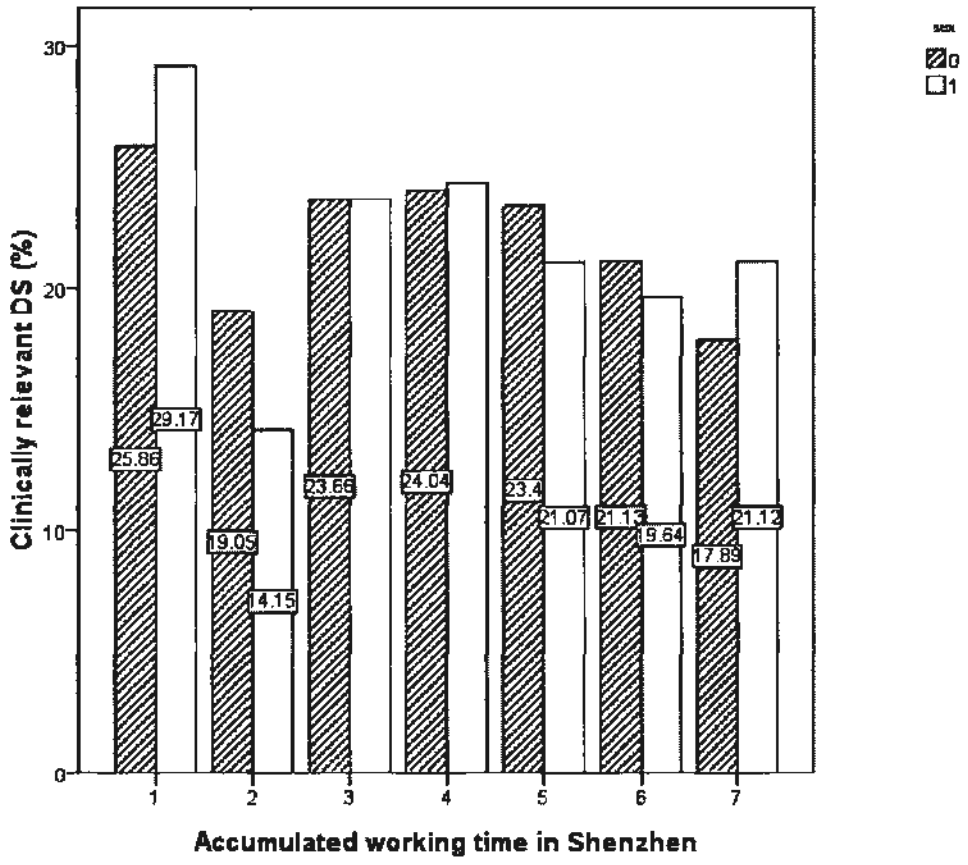

Figure 5-10 Clinically relevant DS prevalence by sex and accumulated working time in Shenzhen
Note: Sex: 1 male, 0 female; Accumulated working time in Shenzhen: 1 <= 1m, 2 1m~6m, 3 >6m, <=1y, 4 >1y, <=2ys, 5 >2ys, <=3ys, 6 >3ys, <=5ys, 7 >5ys

Taking current marriage status into account, those who described their marriage status as "other" and had been working less than a month in Shenzhen were at the highest risk of developing clinically relevant DS (CES-D score $\overline{X}$ = 17.40, *SD* = 4.330, prevalence rate 71.4%). The definition of other is taken to mean cohabitation without marriage certificate,

culturally accepted or factual marriage without legal marriage lines or any marital status that the respondent would not categorize as "single" or "married" (Figure 5-11).

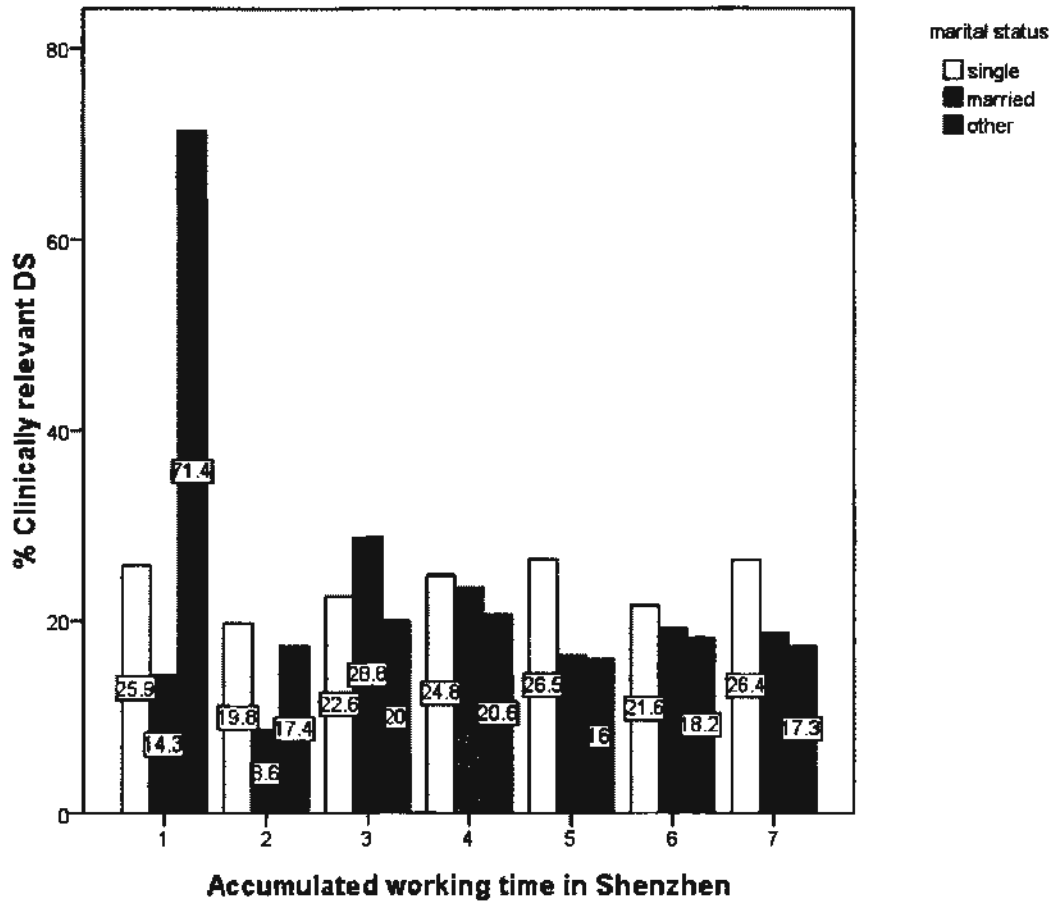

Figure 5-11 Clinically relevant DS prevalence by marital status and accumulated working time in Shenzhen

Note: Marriage: 1 single, 2 married, 3 other; Accumulated working time in Shenzhen: 1 <= 1m, 2 1m~6m, 3 >6m, <=1y, 4 >1y, <=2ys, 5 >2ys, <=3ys, 6 >3ys, <=5ys, 7 >5ys

We postulated that formal family accompaniment might play an important role in shaping mental health status of MWs. To explore this, we grouped the MWs using family accompaniment and accumulated working time in Shenzhen as control variables. Those coming to Shenzhen with family member(s) had better mental health independent of time they had spent in the city compared with those without accompaniment. However differences of clinically relevant DS prevalence between those with and without accompaniment were larger

in new migrants (accumulated time spent in Shenzhen was one year or less) than in old migrants (more than one years), demonstrating that family accompaniment played a protective role especially in the very early stage of migration to the city (Figure 5-12).

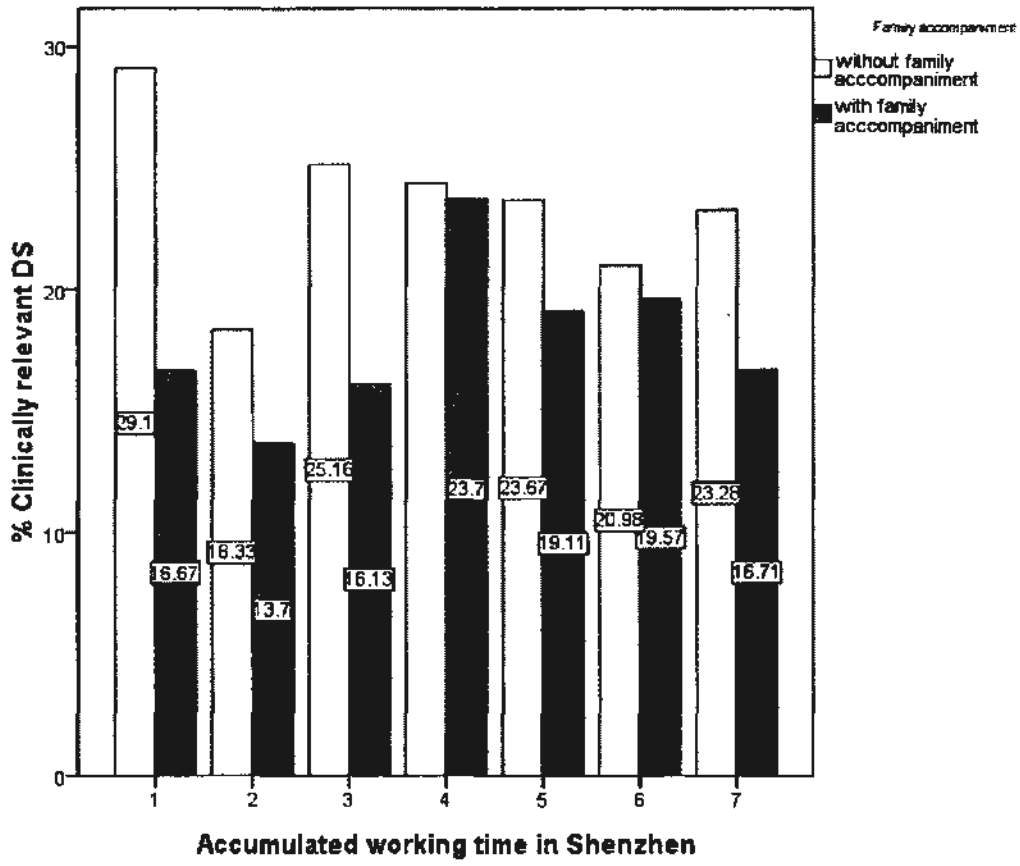

Figure 5-12 Clinically relevant DS prevalence by accompaniment and accumulated working time in Shenzhen

Note: Accumulated working years in Shenzhen: 1 <= 1m, 2 1m–6m, 3 >6m, <=1y, 4 >1y, <=2ys, 5 >2ys, <=3ys, 6 >3ys, <=5ys, 7 >5ys

Mean CES-D score was higher in migrant factory workers who reported having ever been drunk than that in those without having been drunk in the past year (11.84 v.s. 12.86, F = 18.829, df = 1, p = 0.000). The two groups also differed in prevalence rate of clinically relevant DS (24.3% v.s. 20.7%, χ^2 = 4.982, OR = 1.233, 95% CI = 1.026-1.481, p = 0.026). The same trend for mean CES-D scores was found between non-smokers and smokers (inclusive of abstained, ex-smokers) (12.35 for smokers and 11.89 for non-smokers, F = 5.282, df = 1, p = 0.022). However, the difference did not hold for clinically relevant DS prevalence

between non-smokers and smokers. We also found that increased frequency of internet use was positively associated with increased mean CES-D scores (F = 12.639, df = 2, p = 0.000) as well as higher clinically relevant DS prevalence from 18.6% in non-users to 21.1% and 24.8% in seldom users and frequent users, p = 0.002).

Self related health was inversely related to CES-D score and those with better self-rated health had lower CES-D scores thus less likely to have depressive problems. Female workers who evaluated their health as "poor" or "very poor" had higher CES-D scores than male workers with the same SRH (for poor SRH subgroup, female $\overline{X}$ = 18.38, SD = 8.605, male $\overline{X}$ =15.64, SD = 7.977, t = 14.76, df = 79, p = 0.000; for very poor SRH subgroup, female $\overline{X}$ = 21.06, SD = 8.886, male $\overline{X}$ =16.50, SD = 2.121, t = 6.840, df = 6, p = 0.000) (Figure 5-13).

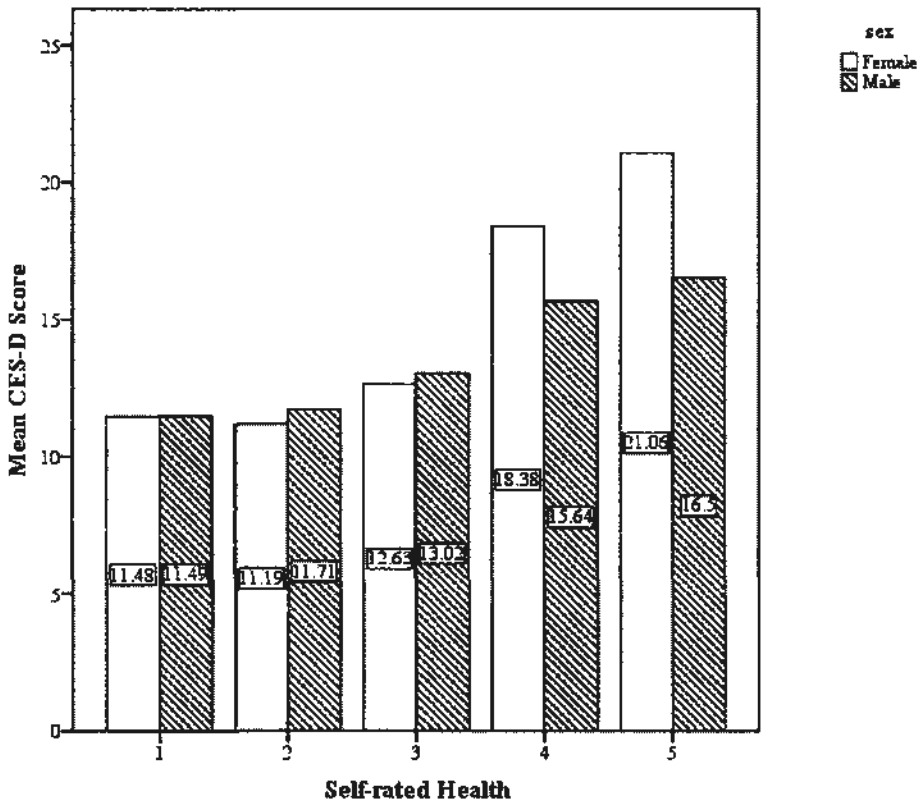

Figure 5-13 CES-D score by self-rated health and by gender of Shenzhen migrant factory workers
Note: Self-rated health: 1 very good, 2 good, 3 fair, 4 poor, 5 very poor

Higher clinically relevant DS prevalence rates were associated with physical activity within jobs. The more sedentary workers had higher DS risks. Nearly a quarter (23.3%) of those with the least physically demanding work scored above the cut off point for clinically relevant DS compared to those with most physical demand in their work (11.8%). Since physically demanding jobs were not evenly distributed across genders (χ^2 = 3.071E2, p = 0.000) and there were big differences between accumulated working time in Shenzhen between men and women (χ^2 = 1.216E2, p = 0.000), we analyzed both CES-D scores and the clinically relevant DS prevalence rates in various physical activity subgroups controlling sex and accumulated working time in Shenzhen. The results of the analysis, presented in Figure 5-14 and 5-15, showed significant associations between CES-D score, accumulated working time in Shenzhen, and job-related physical activities.

After controlling for accumulated working time and gender, the highest level of job-related physical activities was not necessarily related to the lowest average score of CES-D in some subgroups, and *vise versa* for sedentary workers. Amongst females, differences between manual and sedentary workers on the CES-D total score shrank as time passed by, however in men the mean CES-D score was the highest amongst those manual workers who had been working between above 2 and 3 years or less ($\overline{X}$ = 14.70, SD = 7.622, t = 2.014, df = 240, p = 0.045). We also found that manual male workers between year 1 and year 2 had higher mean CES-D score compared with their non-manual counterparts with the same working time in Shenzhen, though the difference was not significant ($\overline{X}$ = 14.20, SD = 8.864, t = 1.086, df = 261, p = 0.279). These findings revealed that numbers of depressive symptomatology may not necessarily related to levels of job related physical activities and that as accumulated work time was prolonged, manual workers' depressive symptoms also added up, nonetheless female and males responded differently to working time.

Figure 5-16, shows that taking physically demanding jobs may, still, be a protective factor for female workers since none in this group entered clinically relevant DS category with CES-D score on or above 16. For male manual workers, longer lengths of working years may put them at higher risk of developing DS if their working time in Shenzhen were no more than 3 years, but this risk was less than that of their sedentary male counterparts despite the accumulated working time in Shenzhen.

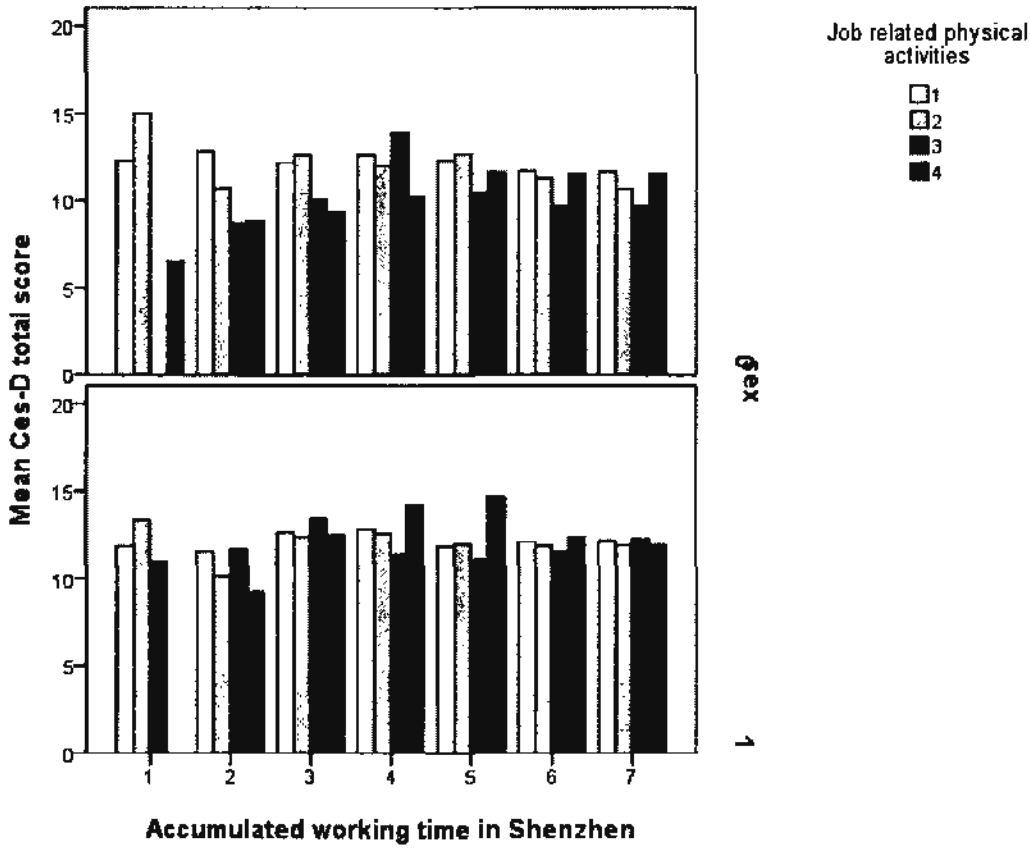

Figure 5-14 CES-D total score and accumulated working time in Shenzhen by gender.
Note: Job-related physical activities:
1 Sitting for long period of time and no physical work is needed
2 Standing for long period of time or need to walk around
3 Some physical work is needed, including assembling of tools or handling heavy objects
4 Physical work is highly demanded, including handling very heavy objects
Accumulated working time in Shenzhen:
1 1 month or below
2 over 1 month to half a year
3 over half a year to 1 year
4 over 1 year to 2 years
5 over 2 years to 3 years
6 over 3 years to 5 years
7 over 5 years
Sex: 1 male, 0 female

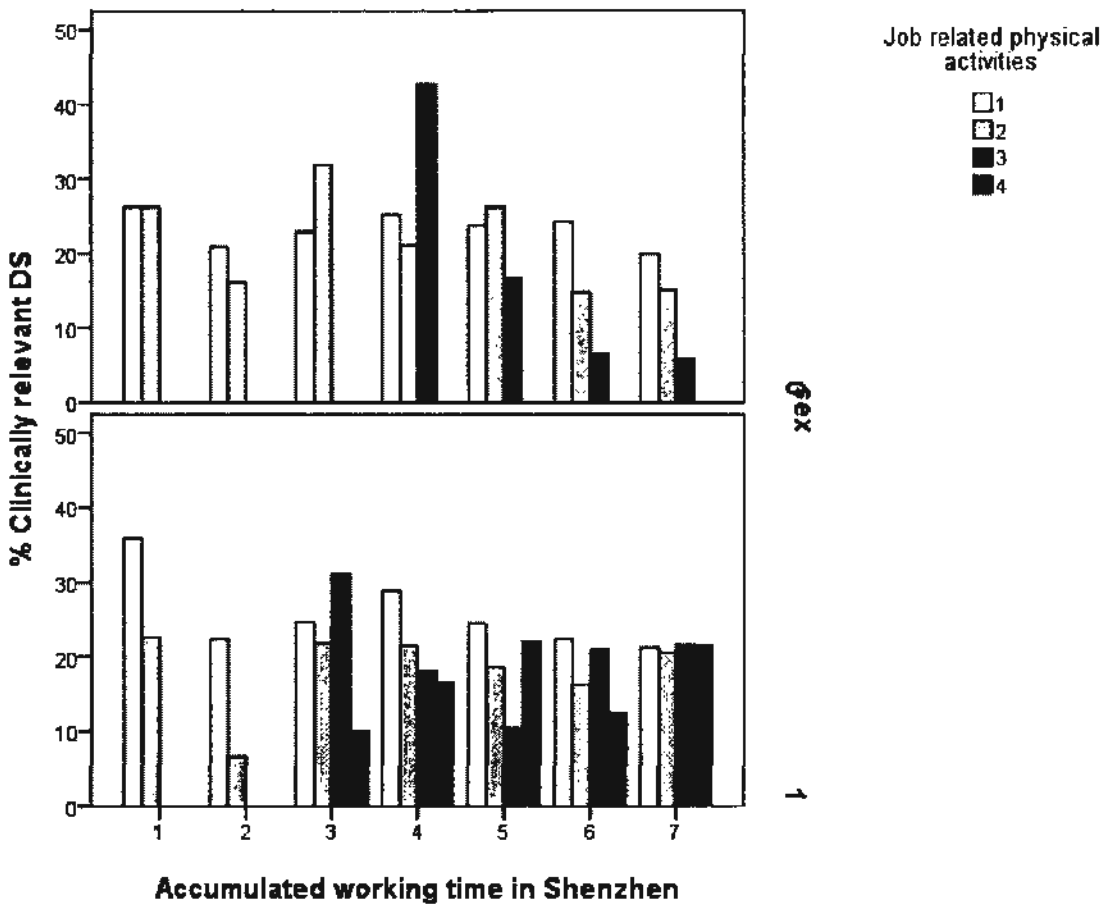

Figure 5-15 DS prevalence and accumulated working time in Shenzhen by gender.

Note: Job-related physical activities:
1 Sitting for long period of time and no physical work is needed
2 Standing for long period of time or need to walk around
3 Some physical work is needed, including assembling of tools or handling heavy objects
4 Physical work is highly demanded, including handling very heavy objects
Accumulated working years in Shenzhen:
1 1 month or below
2 over 1 month to half a year
3 over half a year to 1 year
4 over 1 year to 2 years
5 over 2 years to 3 years
6 over 3 years to 5 years
7 over 5 years
Sex: 1 male, 0 female

Table 5-7 shows the univariate analyses of CES-D and clinically relevant DS, highlighting important associations and groups at high risk of having clinically relevant DS. Table 5-8 shows the correlation between economic factors, working arrangements, SRH and CES-D total scores.

Table 5-7 Socio-demographic and behavioral risk factors and their relationship with CES-D score and DS prevalence

Variable	CES-D score (mean, *SD*)	Clinically relevant DS prevalence (%, *SE*)
Sex		
Male	12.13, 5.968	21.3, 0.009
Female	11.94, 5.839	21.4, 0.009
Feature of residence*		
In dorms	***12.23, 6.052***	**22.2, 0.009**
Other	11.73, 5.866	20.3, 0.009
Age		
<20	***12.90, 6.144***	***25.5, 0.021***
20~29	12.12, 5.986	22.0, 0.009
30~39	11.50, 5.781	18.2, 0.012
40~49	11.62, 5.593	21.4, 0.025
50~59	12.49, 12.867	25.0, 0.112
Marriage	*	*
Single	***12.45, 6.007***	***23.8, 0.010***
Married	11.49, 5.783	19.0, 0.009
Other	12.33, 6.852	19.4, 0.025
Accompaniment	*	**
Living with family member(s)	11.36, 5.618	18.1, 0.010
Living without family member	***12.39, 6.145***	***23.2, 0.008***
Ethnicity		**
Han	12.00, 5.988	21.1, 0.007
Non-Han	***12.07, 5.734***	***25.8, 0.028***
Origin		
Central	12.33, 5.980	23.4, 0.010
South	11.42, 6.026	21.4, 0.014
Northwest	***12.36, 5.679***	21.6, 0.026
Southwest	11.92, 5.977	18.2, 0.014
North	11.89, 6.186	17.2, 0.019
Northeast	10.45, 3.803	15.0, 0.082
East	11.80, 5.609	***25.0, 0.049***
Education		*
Illiterate	9.92, 2.832	0.0, 0.000
Primary school	10.52, 5.315	13.9, 0.030
Secondary school-junior	11.84, 5.903	19.8, 0.009
Secondary school-senior	***12.38, 6.031***	23.7, 0.011
Post-secondary college	12.10, 6.170	***24.4, 0.029***

University or above	11.09, 5.911	22.5, 0.040
Accumulated working time in Shenzhen	*	*
<= 1m	12.94, 5.539	***26.8, 0.035***
1m~6m	11.61, 5.550	17.0, 0.024
>6m, <=1y	12.28, 6.111	23.7, 0.022
>1y, <=2ys	***12.62, 6.086***	24.2, 0.017
>2ys, <=3ys	12.22, 6.032	22.4, 0.017
>3ys, <=5ys	11.77, 5.965	20.4, 0.015
>5ys	11.67, 5.964	19.8, 0.011
Having been worked elsewhere	*	*
Yes	***12.06, 6.088***	***22.2, 0.011***
No	11.97, 5.901	20.9, 0.008
Intention to stay in Shenzhen for	**	**
Less than 3m	***14.85, 6.154***	***48.8, 0.077***
3m~less than 6m	11.71, 5.610	19.3, 0.053
6m~less than 1y	12.87, 5.979	26.0, 0.038
1y~	11.49, 5.636	16.1, 0.012
Not sure at the moment	12.11, 6.068	22.5, 0.008
Numbers of jobs in the past 5 years	*	*
1	11.61, 5.867	19.3, 0.009
2~4	12.28, 6.026	22.9, 0.010
5~6	***13.41, 6.409***	27.8, 0.040
>6	12.43, 5.654	***32.0, 0.067***
Job contract	**	**
Yes	11.94, 5.883	20.5, 0.006
No	***15.36, 5.650***	***53.7, 0.048***
Health insurance	*	**
Yes	11.64(5.868)	19.5, 0.007
No	***13.18(5.828)***	***26.5, 0.015***
Job-related physical activities		**
Sitting for long period of time and no physical work is needed	12.03, 6.034	***23.3, 0.009***
Standing for long period of time or need to walk around	11.98, 5.915	19.9, 0.011
Some physical work is needed, including assembling of tools or handling heavy objects	11.67, 5.689	17.8, 0.023
Physical work is highly demanded, including handling very heavy objects	***12.37, 6.003***	11.8, 0.024
Internet use	**	**
Never	11.36, 5.607	21.1, 0.012

Sometimes	12.02, 5.860	21.1, 0.009
Often, not at Internet Cafe	12.34, 6.356	23.6, 0.015
Often, at Internet Cafe	***13.62, 6.694***	***29.0, 0.031***
Drinking Status	*	**
Never	11.83, 5.948	21.1, 0.009
less than once a week	12.05, 5.945	20.9, 0.011
2 to 3 times a week	12.02, 5.746	21.4, 0.015
3 times a week	14.34, 7.636	29.6, 0.046
4-6 times a week	14.94, 4.775	20.0, 0.107
Everyday	***15.15, 10.477***	***42.9, 0.202***
Smoking Status	*	**
Never	11.88, 5.874	20.9, 0.008
Quit in the past	12.56, 6.124	24.1, 0.019
Current smoker, not everyday	12.26, 6.923	***25.5, 0.029***
Current smoker, less than 1 package per day	11.31, 5.482	17.8, 0.023
Current smoker, 1 or more packages per day	***12.76, 6.204***	21.2, 0.026

*Note: Bold and italic groups are with the highest mean score of CES-D and/or clinically relevant prevalence. *: $p < .05$, **: $p < .01$*

Table 5-8 Correlation between economic factors, working and sleeping arrangements, Eq5d SRH and CES-D scores

Variables	Correlation with CES-D Score (Spearman's r)	*p*
Monthly personal income	-0.026	>0.05
Family income for the past year	-0.048	<0.01
Remittance for the past year	-0.051	<0.01
Average working hours per day	0.115	<0.01
Average overtimes per day	0.086	<0.01
Average working days per week	0.048	<0.01
Average sleeping hours per day	-0.063	<0.01
Eq5d VAS Score	-0.183	0.000

We adopted a logistic regression model to adjust confounding factors in this study. The final logistic regression model used clinically significant DS (score at or over 16 in CES-D) as the dependent variable. It showed that being from ethnic minorities (OR = 1.399,

95% CI = 1.023-1.914), Planning to stay less than 3 months (OR = 2.269, 95% CI = 1.1446-4.497), working longer hours per week (OR = 1.061, 95% CI = 1.005-1.120), being a casual smoker (OR = 1.466, 95% CI = 1.047-2.054) , having longer years of education (OR = 1.053, 95% CI = 1.012-1.096) and being either a frequent internet café user (OR = 1.560, 95% CI = 1.090-2.234) or frequent internet user at other places (OR = 1.314, 95% CI = 1.007-1.714) were all associated with higher odds of scoring on or above 16 in CES-D. Whilst having a formal working contract (OR = 0.211, 95% CI = 0.134-0.332), having a stay plan of more than a year (OR = 0.698, 95% CI = 0.5685-0.856), being engaged in physically demanding daily work (OR = 0.544, 95% CI = 0.327-0.907), having longer sleeping hours per day (OR = 0.895, 95% CI = 0.814-0.984), having better self-rated health (SRH) (OR = 0.972, 95% CI = 0.966-0.977) and being accompanied (OR = 0.797, 95% CI = 0.670-0.949) were associated with lower chances of DS (Table 5-9).

Table 5-9 Logistic regression model for association between socio-demographic factors, mobility, job arrangement, SRH, and clinically-relevant DS in Shenzhen, China, 2009 (n = 4088)

Variable	*Odds Ratios*	*95% C.I.*	*p*
Frequent Internet user-other than Internet Café (as compared with non-users of Internet)	1.314	(1.007, 1.714)	0.044
Frequent internet user-other than internet café (as compared with non-users of Internet)	1.560	(1.090, 2.234)	0.015
Casual smoker-not everyday (as compared with non-smokers)	1.466	(1.042, 2.054)	0.026
With accompaniment (as compared with those without)	0.797	(0.670, 0.949)	0.011
Stay plan for more than a year (as compared with less than a year or not sure)	0.698	(0.568, 0.856)	0.001
Stay plan for less than 3 months	2.269	(1.144, 4.497)	0.019
Year of education	1.053	(1.012, 1.096)	0.011
Minorities (as compared with Han ethnicity)	1.399	(1.023, 1.914)	0.035

With a job contract (as compared with those without a job contract)	0.211	(0.134, 0.332)	0.000
Average working hours per day	1.061	(1.005, 1.120)	0.032
Average sleeping hours per day	0.895	(0.814, 0.984)	0.022
Self-rated health (5: very good; 1: very poor)	0.972	(0.966, 0.977)	0.000
Physically demanding job	0.544	(0.327, 0.907)	0.020

5.2.2.4 Discussion on mental health

In China the pattern of migration is internal. Migrant workers come from rural areas of the same country and share cultural characteristics. However they tend to be poorer than local residents, to live and work in less favorable environments and have a marginalized lifestyle. Although these migrants contribute substantially to the welfare of their families back home as well as to the city's economy, they are deprived of many social welfare benefits given to residents such as occupational health protection, medical insurance, a retirement stipend, subsidized housing, compulsory education and free vaccination for their children. Moreover, social stigma stereotyping, separation, status loss, discrimination, unfair treatment and exclusion may be major stressors [66, 147], others may include family, financial and cultural issues that evolve in the adaptive process when these young rural adults move to the new urban locales. All of these factors may contribute to their mental health problems. Depression is one of the most frequently cited mental health problems, while others include schizophrenia, anxiety, sleeping disorders, panic and suicidal behaviours [148].

In contrast with findings of other international studies and Shenzhen-based studies [149] we found no gender differences in clinically relevant DS status. Previous studies found that females were at higher risk of developing depression compared with their male counterparts due to artefactual and genuine determinants of gender differences [150]. Some researchers suggest this stems from women's greater exposure to specific psychosocial stressors such as

family strain [151]. However, another study on mental health of migrant workers in Shanghai revealed that married male migrant workers had poorer mental health measured by the Brief Symptoms Inventory [65]. Their explanation was that male migrants had higher financial expectations from their families and thus had a higher level of stress. Stress on male migrants may not only originate from traditional rural Chinese cultures, but is accentuated by adverse living and work conditions that include crowded dormitories, long working hours, insecure job contract and being far away from family. The same disadvantageous conditions apply to female migrant workers and constitute the major and prevailing stressors, though there may be less financial anticipation on women themselves or from their families back home. In our study, mental health status as measured by CES-D between genders was very similar and no sex gradient was observed.

Being in the middle-aged group (20-49 years) and staying in Shenzhen for a medium period of time (1~6 months) were both protective of migrants' mental health for both genders. This is consistent with findings from other studies that reported an "U-shaped" mental health status as time of migration passed by. It appears that both shorter and longer duration of being away from home contribute to higher CES-D scores. Stratified analyses that controlled for martial status found those who reported their marital status as "other" were most likely to develop clinically-relevant DS, particularly during the very early period of migration to Shenzhen. Cohabitation with a temporal partner and separation from factual but not legitimate marriage are not uncommon [152] amongst migrants, especially when they are struggling to deal with the factory lives in a big city. Taking these factors into account, marriage itself did not appear to play an important role. Of greater importance was being accompanied by family member(s). Being married could be harmful to migrants' mental health simply because the status of being married brought with it expectations of heavier responsibilities for the family, particularly for children, as a major source of financial support [153]. Moreover, the strict

dormitory management in many factories excluded the possibility for married couples to live together, making relationships even more fragile amongst married migrants [121].

Our study found that higher education was associated with higher risk of having clinically relevant DS. This may be due to discrepancies between higher expectations that were either internally or externally-originated and the reality of being trapped as a migrant worker (expectation-reality discrepancy) [35]. It was not surprising that since the more mobile the workers were less likely to have health insurance, more likely to have stayed for less than a month, to have been working elsewhere with 5-6 jobs in the past 5 years, to be without a job contract, and having a stay plan of less than 3 months thus had higher CES-D total score and were more likely to be clinically depressed.

Although a few similar studies have shown that increased/higher/more stable personal income is associated with a lower depressive symptom score [154-157], these findings were not replicated in our current study. We did however find significant correlations between CES-D scores and the individual's family income and remittance sent home by MWs for the past year with those who reported higher levels of family income or remittances having lower chance of being depressed. Literature shows that remittances sent home by internal migrant workers in China are crucial to their families back in the rural areas [38], and thus may be associated with workers' better scores due to higher satisfaction with oneself.

Working time and sleeping time have both been found to have some impacts on the mental health of migrants. Those who worked longer hours and had less sleep may suffer poorer mental health. Overtime working is very common in most factories that hire migrants because the workers' income is basically composed of a very minimum base pay and a bigger part of overtime bonus[25], stimulating workers to accept long hours and multiple shifts per day. However, we did not study these aspects in detail. Behavioural risk factors which appear to be

related to higher CES-D scores and higher prevalence of DS included smoking status and internet use.

As suggested by other researchers in China, more information is needed on the mental health of internal migrants [52]. This study of migrant factory workers describes CES-D scores and clinically relevant DS prevalence among a representative sample of factory workers in a rapidly developing part of China. Compared to previous studies that used CES-D scale to assess mental health status, the prevalence of 21.4% clinically relevant DS in Shenzhen is higher than for the general population in China (9.5% for middle-age and elderly) [158] and that in Hong Kong (18.1% for middle-aged men) [157]. A recent cross-sectional study carried out in adults of four provinces in China using a Chinese version of the Structured Clinical Interview for Diagnostic and Statistical Manual (DSM)-IV-TR axis 1 disorders (SCID) found that the prevalence of mood disorders was 6.1% and the prevalence of adjusted major depressive disorder was 2.07% [159].

The key findings of the study have specified some major correlates of DS amongst migrant factory workers, particularly in relation to their social support and working and living conditions. No gender association was found in migrant factory workers. Ethnic minorities were more likely than Han workers to have clinically relevant DS. Those most likely to be depressed were younger than 20 or older than 49 years, with ambiguous description of marital status, with higher education. New arrival status, with shorter stay plans without family accompaniment and job contract were also more likely to have higher scores as were those living in dorms, working long hours with a sedentary job and reporting a history of alcohol intoxication, smoking or frequent internet use.

Such implications signal to local public health officials that initiatives targeted at reducing mental health risks of this substantially large and growing population may need to focus on modifiable factors that are of relevance. This study also suggests that mental health

of Shenzhen migrant workers is a significant public health issue which needs to be addressed, as highlighted by the recent publicity on suicides in Shenzhen. This is part of an ongoing study –future research will allow us to follow up some of this cohort.

5.2.2.5. Key findings

The key findings of the study have specified some major correlates of DS amongst migrant factory workers, particularly in relation to their social support, SRH and working and living conditions. No gender association was found in migrant factory workers. Such implications signal to local public health officials that initiatives targeted at reducing mental health risks of this substantially large and growing population may need to focus on modifiable factors that are of relevance. This study also suggests that mental health of Shenzhen migrant workers is a significant public health issue which needs to be addressed, as highlighted by the recent publicity on suicides in Shenzhen.

5.2.3 Common infection risks: Taking rubella as an example

5.2.3.1 Introduction

Rubella remains a common disease in mainland China with over 120,000 confirmed cases in 2008 [160]. Although typically a mild childhood disease, rubella infections create a heavy disease burden in countries where acquired infections have not been controlled at population level [161]. Not only can rubella cause the death of a fetus in pregnant women, but it is also a major cause of severe birth defects of Congenital Rubella Syndrome (CRS) in children born to infected mothers during child birth, leading to deafness, ocular damage, cardiac and brain defects, and mental retardation [162-165]. Based on sentinel screening, an estimated 40000 infants with CRS are born each year in China (2-3 per 1000 live births) [166]. It is predicted that without, or with limited, rubella vaccination availability, CRS incidence in China in the 30

years after 2020 will double compared to 2005 rates, causing a heavy disease burden in the country of 1.3 billion [167].

For more than 40 years, live attenuated rubella vaccines have demonstrated good clinical efficacy and are generally assumed to provide life-long protection in populations. The rubella vaccine is technically available in monovalent, bivalent (combined with measles vaccine or mumps vaccine), and trivalent (combined with measles vaccine and mumps vaccine, MMR) forms [168]. Despite its availability and inclusion in national vaccination programs in the majority of countries and territories throughout the world [161], rubella-containing vaccines were not included in China's National Expanded Program of Immunization (NEPI) until December 2007 [169], when the rubella vaccine was recommended by the Ministry of Health for children.

Albeit its policy changes to NEPI in 2007, the MOH also made recommendations of what to do in the case that the trivalent MMR vaccine was not available due to insufficient production. The policy suggestion was to replace the MMR vaccine with a measles vaccine or a measles-mumps vaccine. Therefore, even with the reform of vaccine policy suggesting children 0 to 14 years be protected against rubella, a childhood national rubella program has still not been universally available or implemented in China.

Though the whole effect of these policies on immunization uptake remains unknown, the WHO has provided evidence that inadequately implemented (<= 80%) childhood vaccination against rubella may increase susceptibility in childbearing age females because of the disturbed transmission dynamics [168]. In this circumstance, they recommend aligned surveillance/serological screening of young women's immune status to ensure immunity, without which mass immunization amongst children is not recommended [161]. Evidence from the WHO and other sources has also confirmed that it is essential to include vaccination of

women at childbearing age in any rubella control strategy because childhood vaccination alone may pose a risk of increased CRS cases [168].

Given its rapidly emergent economy as the second busiest port in China, and its geographical location neighboring the densely populated Hong Kong SAR, Shenzhen is a migrant city where rubella prevention is crucial for its growing population. Among its population of 14 million people, 11 million are migrants. The population of Shenzhen is exceptionally young, with an average age of 25.6 years. Over 65% of the migrant population in 2008 was made up of young women of conventional child-bearing age. In China, the conventional 'child bearing age' is 20 to 39 years of age due to legitimate marriage age (20 for females, *the Law of Marriage of People's Republic of China, amended on Apr.28, 2001*), proportionally low birth rates among women over 40 and comparatively low teenage pregnancy rate.

While reported cases of rubella amongst school-age and pre-school age children have declined since 2004, Shenzhen has shown a rapid increase in adult rubella cases. However, no serum screening programs are incorporated in local infectious disease surveillance system, and no compulsory reporting system exists for CRS at either national or local level. Thus, the magnitude of the disease burden, vaccine coverage in children, impact of the inadequately administered rubella-containing vaccination on CRS incidence, and public health implications for migrant women are yet to be fully understood. Among all high risk populations of rubella infection in Shenzhen, female migrant workers at childbearing age are one of the most vulnerable groups. This study takes a first step in improving our understanding of their need and the policy issues surrounding rubella prevention.

5.2.3.2 Method: Sampling and specimen collection

We used PASS 7 day free trial version (Kaysville, UT), confidence intervals for one proportion module to calculate the optimal sample size, assuming that 1) significance level equals to 0.05 (confidence level is 0.95), 2) statistic power equals to 0.90, 3) the estimated seroprevalence was between 50%~100%, 4) taking the result from migrants in Fuzhou City, p = 0.81, as reference for our sample [170] and 5) confidence interval width equals to 0.1 (two-sided). The result was n = 255.

Because this study recruited subjects using a multi-staged random sampling, to increase the statistic power of the study, we then scaled up the number of female subjects to over 500.

Of these 4088 workers, 1 out of 3 (n = 1363) workers were invited to undergo serology tests. Nineteen workers declined this invitation and leaving 1003 workers, 518 of whom were female workers (aged between 18-55 years) who had sera collected by trained nurses from local community health centers. Serum was stored at -70°C in district-level virology laboratories of Shenzhen city in May through June of 2009. A unique identifier number was assigned to each worker, linking questionnaire information with their serology test results.

Rubella IgG was measured qualitatively in 518 serum samples collected from female migrant workers with commercial Enzyme-linked immunosorbant assay (ELISA) kits. We also used ELISA kits to qualitatively determine antibodies to measles and mumps for each migrant worker, and both of the seroprevalence results were included in the analyses conducted using SPSS 16.0 (Chicago, IL).

5.2.3.3 Method: ELISAs

Three types of commercial ELISA kits for rubella, measles (*Haitai*, China) and mumps (*Serion*, Germany) were used to qualitatively measure the presence of specific IgG antibodies to rubella, measles and mumps. These three kits have been widely used and The

manufacturer's report on specificity and sensitivity of all three assays were all at least 98% except for the specificity of mumps which was 95.1% according to the manufacturer. Cut-off and final results were based on the qualitative criteria outlined by the manufacturer. For rubella, the optical density (OD) value was read at 450 nm in a microplate reader within 10-15minutes. The equivocal interpretation was given to those with an Antibody Index between 0.9-1.1, whilst those with Antibody Index < 0.9 and >1.1 were determined as non-immune and immune to rubella, respectively. The Antibody Index is calculated by using the following formula:

$$\text{Antibody Index} = (\text{Patient sample OD value}) / \text{Cut-off value} \quad (1)$$

$$\text{Cut-off value} = \text{Calibrate mean OD}^* \text{ Calibrate Factor} \quad (2)$$

As recommended, migrant workers with sera which proved to be equivocal were recalled within 1 week after the test and re-tested. In all, 3 sera (0.6%) were identified as equivocal for rubella test in the first round of test and all three were recalled to the local CDC laboratory to have an on-site re-sampling and retest. All three were seropositive on the second occasion. According to the manufacturer's guidance, we then defined these three as positive.

5.2.3.4 Measurement and statistic

Data were entered into EpiData 3.2 (Odense, Denmark) using double entry method and transferred into SPSS dataset format. Seroprevalence of rubella for females was calculated, with exact 95% confidence intervals (95% CI) for proportions. Education, age, origin of region, accumulated working time in Shenzhen, plan to stay and self-reported rubella vaccination was categorized into 2 or more groups whilst seroprevalence status of measles and mumps, ethnicity, having a job contract, living on dorms, mobility and health insurance

were kept as dummy variables (1 = yes, 0 = no). Marital status was grouped into 2 categories to illustrate whether their marital status was reported as in a confirmed situation (0 = single or married; 1= other). The definition of "other" is taken to mean cohabitation without marriage certificate, culturally accepted or factual marriage without legal marriage lines or any marital status that the respondent would not categorize as "single" or "married". Monthly income was the only scale parameter used. Chi square tests were used to test for association and odds ratio between rubella seroprevalence, demographic factors, self-reported immunization histories and susceptibility to measles and mumps.

We calculated positive and negative predictive values to determine whether female migrant workers' reports of vaccine history were predictive of seropositive status and whether reports of "no" rubella vaccination or "unsure" about rubella vaccination were predictive of being non-immune to rubella [171].

A multiple logistic regression model was adopted using stepwise method to control potential confounders. In the model, rubella seropositivity was taken as the dependent variable (seropositivity = 1, seronegativity = 0). Adjusted odds ratios and 95% confidence intervals for statistically significant associates were calculated.

5.2.3.5 Results

5.2.3.5.1 Demographics of subjects

The female workers in our sample were aged between 18-55 years (very few female factory workers above 55 years worked in factories and few were captured in the original sample of 4088. No female in age group 16-17 years and above 55 years were sampled and included in serologic study) The average age of subjects was 26.42 (*SD* = 6.758). Of all 518 women, those within the conventional child bearing age range of 20-39 years accounted for 86.3% (n = 447). Our population originated from 28 of the 31 administrative regions in

mainland China with the only exceptions being Beijing, Shanghai and Tibet. Subjects were more likely to come from the poorer parts of mainland China: 13.9% from the Southwest region (per capita GDP in 2009 was 1964 USD) and 40.2% from the Central regions (per capital GDP in 2009 was 2611 USD) (Figure 5-4). Single workers accounted for 57.1% (n = 296), married 38.8% (n = 201) and "unsure about their marriage" status 4.1% (n = 21).

The group was found to be very mobile. 38.6% had been to other urban areas for a job and 17.8% had only been working in Shenzhen for one year or less. Only a quarter (26.4%, n = 137) had been in Shenzhen for more than 5 years. The majority (95.6%) were Han Chinese. Just over half (54.2%) lived in a dormitory assigned by their employers. Whilst in Shenzhen 79.5% were covered by the local-level migrant worker insurance scheme and their average monthly income was 1518.26 (SD = 618.591) *Renminbi* (around 250 USD). Of all 518 workers, 9 (1.7%) were without a formal job contract, which was comparable with their male peers who accepted serologic tests (1.6%, $p > 0.05$). Table 5-10 gives descriptive statistics of the female migrant factory workers who had taken the serologic tests.

Table 5-10 Descriptive statistics of socio-demographic factors of 518 migrant factory workers

Factors	*n*	%
Age group		
Childbearing age	447	86.3
Non childbearing age	71	13.7
Ethnicity		
Han	495	95.6
Non-Han	23	4.4
Region of origin		
N	62	11.9
NW	21	4.1
C	208	40.2
E	11	2.1
S	139	26.8
SW	72	13.9
Not specified	5	1.0
Health insurance		
Yes	417	80.5
No	104	19.5

Education		
Senior high or above	252	48.6
Below senior high	266	51.4
Marital status		
Single	296	57.1
Married	201	38.8
Other	21	4.1
Living situation		
On dorms	281	54.2
Other	237	45.8
Income level		
1000RMB or above	489	94.4
Less than 1000RMB	29	5.6
Assembly line worker		
Yes	226	43.6
No	292	56.4
Contract		
Yes	509	98.3
No	9	1.7
Working time in Shenzhen		
More than 1 years	426	82.2
1 year or less	92	17.8
Mobility		
Have been to other cities	200	38.6
Haven't been to other cities	318	61.4

5.2.3.5.2 Seroprevalence and susceptibility to rubella, measles and mumps

Serological results showed that 22.4% were non-immune to rubella. Seroprevalence for rubella varied substantially across age groups. The pattern for rubella showed that those in the age groups 20-29 and 30-39 had the lowest and second lowest seroprevalence compared with younger or older peers (Figure 5-16). For those between 20-29 years of age, susceptibility to rubella was almost 1 out of 4 (24.9%). Of all women tested, 203 (39.2%) were non-immune to measles and 25 (4.8%) were on-immune to mumps. Figure 5-16 also shows seroprevalence of measles and mumps by age group amongst the female factory workers. The older the worker the more likely they were to be seropositive for measles and mumps.

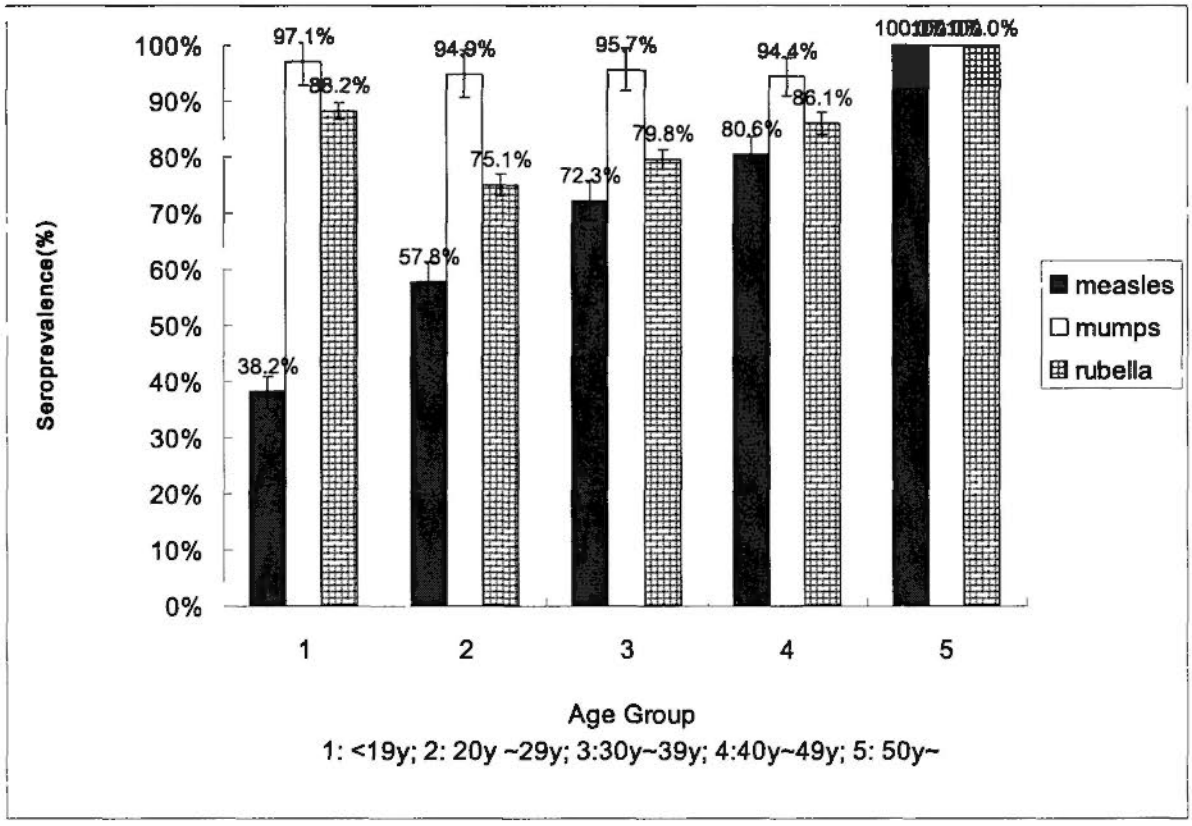

Figure 5-16 Prevalence of antibodies to rubella, measles and mumps by age group

5.2.3.5.3 Association among seroprevalence of rubella, susceptibility to measles and mumps, and self-reported immunization histories

Overall, 244 female factory workers (47.1%) were immune to all 3 antigens, 138 (26.6%) were seropositive to both mumps and rubella, while only 15 (2.9%) were seropositive to measles and rubella. For those who were non-immune to rubella, 55 were immune to both measles and mumps.

The majority (91.7%, n = 475) of migrant women reported having had no history of rubella immunization or were unsure.

We grouped self-reported vaccine history into 2 groups, i.e., (1) having had the rubella vaccine and (2) not having had the rubella vaccine or unsure about it. 8.3% (n = 43) of study subjects reported a vaccination history for rubella. Those who denied having the vaccine and were unsure of the vaccination history accounted for 25.3% (n = 131) and 66.4% (n = 344),

respectively. Of the total reporting no vaccination against rubella or were unsure about their histories (n = 475), 78.3% (n = 372) were immune to rubella, whilst 43 of those who had reports of rubella vaccination, only 69.8% (n = 30) were seropostive. ($\chi 2$ = 1.658, df = 1, p = 0.250), hinting no statistic significance was found on immunity results between those who thought they had rubella vaccine and those who reported no histories or were unsure about the immunization experience (Table 5-11).

Table 5-11 Distribution of seroprevalence of rubella, measles and mumps

Mumps	Measles	Rubella	Counts	%
immune	**immune**	**immune**	244	47.10
(n = 493)	(n = 299)	**non-immune**	55	10.62
	non-immune	**immune**	138	26.64
	(n = 194)	**non-immune**	*56*†	10.81
non-immune	**immune**	**immune**	15	2.90
(n = 25)	(n = 16)	**non-immune**	*1*†	0.19
	non-immune	**immune**	5	0.97
	(n = 9)	**non-immune**	*4*†	0.77
Total			518	100.00

†: non-immune to both rubella and at least one other virus

5.2.3.5.4 Univariate association analyses on seroprevalence of rubella and other socio-economic and socio-demographic factors of female migrant workers

Analysis of seroprevalence showed that 23.94% of women aged 20 to 39 years were seronegative whilst only 12.67% of the younger (below 20) or older (on or above 40) workers were non-immune to rubella ($\chi 2$ = 4.471, df = 1, p = 0.034) (OR = 0.461, 95%CI = 0.222-0.959).

Seroprevalence amongst those who were married was 75.7% whilst for those who were single or unsure about their marriage status 47.6% were seropositive ($\chi 2 = 11.325$ $df = 1$, $p = 0.001$ OR = 0.244, 95%CI = 0.101-0.589).

In the univariate analyses, specific region of origins, being of child-bearing age, being unsure about marital status, being without job contract having a monthly income of less than 1000 Yuan and being non-immune to measles were significantly related to a higher susceptibility to rubella. Table 5-12 shows seroprevalence of rubella by socio-demographic characteristics of female migrant workers and ORs for significant characteristics.

Table 5-12 Univariate analysis of seroprevalence and 95%CI of rubella by socio-demographic characteristics (unadjusted)

Socio-demographic characteristics	Seroprevalence	95% CI (%)	$\chi 2$	p	Crude Odds (95%CI)
Health insurance			2.883	0.090	0.655
Yes	79.1	75.2-83.0			(0.400, 1.070)
No†	71.3	63.1-79.5			
Education			0.263	0.608	1.114
Senior high or above	78.6	75.1-82.1			(0.737, 1.686)
Below senior high†	76.7	73.1-80.3			
Region of origin			33.266	0.000**	NA
N	85.2	82.1-88.3			
NW	85.7	82.7-88.7			
C	76.0	72.3-79.7			
E	100.0	100.0			
S	70.5	66.6-74.4			
SW	88.9	86.2-91.6			
Age group 1	76.1	72.4-79.8	4.471	0.034*	0.461
Childbearing age	87.3	84.4-90.2			(0.222, 0.959)
Non childbearing age †					
Age group 2			1.808	0.179	1.920
40 years or above	86.5	83.6-88.0			(0.731, 5.045)
Under 40 years†	76.9	73.3-78.8			
Marital status			11.325	0.001**	0.244
Sure †	78.9	75.4-82.4			(0.101, 0.589)
Not sure	47.6	43.3-51.9			
Income level			10.975	0.001**	2.617
1000RMB or above	79.7	76.2-83.2			(1.458, 4.698)
Less than 1000RMB†	60.0	55.8-64.2			
Ethnicity			0.006	0.939	1.041
Han†	77.6	74.0-81.2			(0.378, 2.866)

Non-Han	78.3	74.8-81.8			
Job contract			5.796	0.016*	4.482
Yes	78.2	74.6-81.8			(1.184, 16.972)
No†	44.4	40.1-48.7			
Assembly line worker			1.973	0.160	1.354
Yes	80.5	77.1-83.9			(0.886, 2.067)
No†	75.3	71.6-79.0			
Living situation			0.192	0.661	0.911
On dorms	76.9	73.3-80.5			(0.601, 1.381)
Other†	78.5	75.0-82.0			
Working time in Shenzhen			0.149	0.700	1.110
More than 1 years	77.9	74.3-81.5			(0.653, 1.888)
1 year or less†	76.1	72.4-79.8			
Mobility			0.069	0.793	0.945
Have been to other cities	77.0	73.4-80.6			(0.619, 1.442)
Haven't been to other cities†	78.0	74.4-81.6			
Immunity to Measles			9.855	0.002**	1.941
Positive	82.2	78.9-85.5			(1.278-2.946)
Negative †	70.4	66.5-74.3			
Self-reported Immunisation			1.658	0.198	0.639
Immunisation reported	69.8	65.8-71.8			(0.322, 1.269)
Not reported or unknown†	71.8	67.9-73.8			
Total	77.6	74.0-79.4			

† reference category

5.2.3.5.5 Multivariate analysis on seroprevalence of rubella and other associate factors of female migrant workers

Multiple logistic regression models were adopted to control potential confounders which may have an impact on the association between seropositivity and its correlates. The model showed that there was a significant association of rubella immunity with childbearing age, immunity to measles, marital status, region of origin and job contract status. Female migrant workers who were between 20~39 (as compared with those less than 20 or above 39), non-immune to measles (as compared with those who were immune to measles), reported their marital status as "other" (as compared with their married or single counterparts), came from southern or central provinces (as compared with those came from regions other than the south and the central) and had no formal job contract were most likely to be non-immune to rubella and were at a higher risk of getting infected (Table 5-13).

Table 5-13 Variables significantly associated with rubella seropositive results in Shenzhen female migrant factory workers (Logistic regression model, n = 518)

Variables	Regression Coefficient	Adjusted Odds Ratio	95% CI of Odds Ratio	*p* value
Childbearing age				
Yes	-0.802	0.448	0.202-0.794	0.048
No†				
Immunity to measles				
Positive	0.493	1.637	1.291-2.075	0.000
Negative†				
Marital status				
Single or married†				
Other	-1.457	0.233	0.077-0.707	0.010
Region of origin				
Southern provinces	-1.360	0.257	0.108-0.610	0.002
Central provinces	-0.853	0.426	0.184-0.989	0.047
Other provinces†				
Job contract				
Yes	1.460	4.304	1.055-17.554	0.042
No†				

†: reference category
Significance of the whole model: $p = 0.000$
$R^2 = 0.540$

5.2.3.6 Discussion on seroprevalence study amongst female workers

In China, rubella is currently a low level (type C) notifiable infectious disease, and it remains a common disease (1993 Beijing 176.62/100,000; 1994 Shanghai 451.57/100000) [166, 172]. In some cities like Shenzhen, the incidence of rubella in 2009 was 6.9 times higher than that recorded in 2004, although national incidence data for rubella in 2007 and 2008 were comparatively low (5.70/100,000 in 2007 and 9.11/100,000 in 2008)[173] .

The public health importance of rubella mainly relates to its teratogenic effects. CRS epidemics always followed rubella epidemics and that high levels of herd immunity to rubella, especially immunity in females of childbearing age, are critical to the prevention of CRS and fetal loss in the population [164, 164, 174]. Thus, in addition to prevention of rubella through childhood immunization, providing women of childbearing age with rubella vaccine is essential to any strategy meant to decrease the burden of CRS [168, 168]. Based on health

economic evaluation in various countries, the World Health Organization also recommends focusing on adolescent girls and women of childbearing age outside of childhood immunization.

Currently, the Chinese NEPI recommends one free shot of the Measles-Rubella (MR) vaccine to 8 month old infants and one free shot of MMR vaccine to children during 18-24 months. However, due to limited production capacity of rubella-containing vaccines by pharmaceutical companies and restricted resources in many provinces, the NEPI permits local health administrations to administer measles vaccines or measles-mumps vaccines if public supplies of the MR or MMR vaccine are insufficient. This strategy signifies a higher public health priority placed on measles. However, this may also result in an insufficient immunity to rubella, substantially changing rubella transmission dynamics in the future.

Moreover, in China, no mass immunization programs exist specifically designed for the prevention of rubella infection among adolescent girls or childbearing aged women. At these ages, the vaccine is only administered on the basis of physician recommendation or in response to personal requests in public or private sectors. Because of its only recent inclusion of rubella in NEPI, there are no guarantees that previous generations received the vaccine during childhood, or during "catch-up" periods in adolescence and young adulthood.

Several other obstacles also exist, especially for migrants. Firstly, since vaccination against rubella beyond NEPI in China is not covered by most health insurance plans, it must be paid for out-of-pocket [175], thus cost is often an issue. Secondly, rural-to-urban migrants who move regularly between their home villages and cities for work, and whose health utilization are generally lower than urban residents, are often excluded from vaccine catch-up immunization programs against rubella. For migrant populations, immunity is dependent mainly on natural infection. Thirdly, within the context of the one child policy, migrant women who are pregnant with the second or third child can still be non-immune to rubella,

because they may be excluded from health education campaigns, serological screening or catch-up outreaches related to rubella. This situation also interferes with a current WHO consideration suggesting the vaccination of all women in childbearing age postpartum [168].

Evidence in mainland China has showed that migrant workers are prone to outbreaks of respiratory infections such as pulmonary tuberculosis, measles, influenza because of living and working environments of high population density and poor hygiene [52, 176, 177]. The growing migrant population converging in Shenzhen from other parts of China, especially young migrant women, is a considerable factor in future rubella and CRS prevention policy. In Shenzhen, a booming urban area typical of many rapidly growing cities in China, increasing numbers of young migrant female workers arrive to work for factories, with rates of growth exceeding that of similar male cohorts. Many take jobs as assembly line workers, live in on-campus dormitories, have poor access to healthcare services, less education, and less income compared with male workers [5]. This group is also vulnerable to unprotected sex, unplanned pregnancy [178] and, because of insufficient prepartum screening and examinations, adverse pregnancy outcomes [7, 179-181].

Our study points towards a potential risk of transmission and CRS during pregnancy amongst migrant factory women. It has been found that female migrant factory workers have a high susceptibility to rubella since more than one fifth of them were non-immune. Most of these women are of childbearing age, and among them, the most deprived (i.e. those without job contract) were especially more vulnerable to rubella infection. Seroprevalence of female workers from southern and central provinces was lower than that of workers from other origins and further studies may be needed.

At community level, sentinel serological surveillance reported rubella susceptibility in childbearing age women ranging from 7.5% in Guangzhou [182] and 8.9% in Changchun [183] to 17.1% in 7 provinces of China [184], all of which were lower than the rate we found in this

migrant female population in Shenzhen (all the above studies used qualitative ELISA method and kits produced in mainland China). A study in Hong Kong using EIA (Enzyme Immunoassay, Axsym, Abbott) revealed higher non-immunity result in non-residents pregnant women (19.9%) than that of residents (8.1%) [185].

The analysis of the relationship between seroprevalence and self-reported vaccine histories showed no association, reflecting that the awareness of rubella vaccination by personal recall of vaccine is very poor. This could reflect low levels of knowledge about rubella, signaling that more health education campaigns, outreach initiatives and screenings for childbearing age migrant women in community health centers could be beneficial if considered by the local health departments. Former studies have found that awareness of migrants is critical to appropriate immunization coverage for their children [186]. However, studies concerning the impact of vaccine awareness on immunization uptake or vaccine coverage in rural-urban Chinese migrants are scarce and future efforts are needed.

From a systems level, the vaccine record card regulated by NEPI, is crucial in monitoring uptake rates and coverage of certain vaccines. However, this system is only implemented in urban areas or within local communities of the city where free and compulsory education systems set immunization record checks as an entrance requirement. Migrants who move on an annual or regular base are not under this system, thus only by serological screening can true immunization status be found.

Rubella and measles share very similar epidemiological and clinical characteristics and can cause outbreaks or epidemics concurrently in the same population [187] [188]. With measles already one of the more prioritized infectious diseases in China for migrant communities, rubella and CRS prevention may benefit from established measles control campaigns. In our study, 11.58% female workers were susceptible to both measles and rubella, highlighting that the combined vaccine should be considered as a practical policy option in the future if further

immunization program is to involve this group. Including rubella control strategies through combined immunization (MR or MMR) may be the most cost-effective way to provide immunity due to very small marginal costs and widely recognized efficiency [189, 190]. Technically, this is also achievable since the basic reproductive rate of rubella is much lower than that of measles.

If a strengthened rubella and CRS control program is to be adopted in Shenzhen, a thorough technical evaluation approach should be taken. This may involve appraisal of vaccines to be chosen, immunization procedures, sustainability, surveillance system/laboratory networks, and finally cost-effectiveness of the program which can help differentiate the costs and benefits [164], and mop-up or catch-up immunization programs. Last but not least, one practical concern is that strategies to increase coverage of vaccine may not reach poor people such as migrant factory women, due to the unequal distribution of coverage across wealth groups [191], thus one focus should also be put on the evaluation of target population selection, as well as health equality assurance.

Migrant women working in factories in Shenzhen have lower seropositive rates for rubella than documented elsewhere in China. Those most at risk appear to be those who were at childbearing age, non-immune to measles, with no formal job contract, came from southern or central provinces and unspecified their marital status. Self-reported immunization status is unreliable and the levels of seronegativity amongst this mobile group of women of childbearing age are significant. At the current time rubella immunization needs to be self financed and is not included in insurance schemes. However, since numbers of reported cases are increasing yearly and the risks of CRS appears significant, those responsible for health policy should consider immunization programs for children and for women of childbearing age that are in line with WHO recommendations. Rubella surveillance should be enhanced and further analysis on cost-effectiveness and economic feasibility initiated.

5.2.3.7 Limitations of the seroprevalence study

This study is cross-sectional and we did not include measurement of IgG titers. Since it was very difficult to collect migrant workers' immunization cards, no objective records of immunization for individuals were used. Also, the study did not cover subjects from small workshops not registered with the government. Further investigations need larger samples for better statistical power.

5.2.3.8 Key findings

Seroprevalence of antibodies to rubella in Shenzhen, China amongst female migrant workers is not high enough to provide immunity in the population. Given the high numbers of women of childbearing age amongst Shenzhen migrant factory workers coming from many provinces across China, local health authorities in Shenzhen should consider combining new rubella immunization programs with existing measles immunization efforts in this population.

5.2.4 Behavioural Risk Factors

5.2.4.1 Smoking

5.2.4.1.1 Background and purpose

Smoking is a significant cause of morbidity and mortality in China, home to more smokers than any other country in the world [192]. High overall trends mask significant gender disparities, with rates of 59.5% in men compared to 3.7% in women [193]. Despite evidence of declining smoking across all age groups and both genders, the prevalence of heavy smoking is increasing and the mean age of smoking initiation has decreased [194]. Smoking is more common in rural areas and in those with lower levels of education [195], and particularly high smoking rates have been found among rural-to-urban migrants.

With regards to smoking in particular, stress [196, 197], solitude and higher levels of disposable income [198] have been implicated as risk factors for migrant populations. However, other studies have found lower rates of smoking among migrants [199, 200].

While several studies of smoking behaviours in rural-to-urban Chinese migrants exist, none to our knowledge have focused on migrant factory workers in particular. Due to specific work patterns in factory settings, better understanding of smoking patterns is needed amongst this group, estimated to represent between 10% and 20% [201] of China's total rural-to-urban migratory population of 211 million [202], in order to tailor interventions in the future.

Purpose of this section of study intends to 1) estimate the smoking prevalence rate amongst rural-urban migrant factory workers in Shenzhen; 2) look for any socio-demographic, economic, migratory experience related factors that are associated with smoking and heavy smoking behaviours; 3) test for correlations amongst the three risk behaviours which are included in our study; and 4) verify the associations between smoking and SRH/mental health. Since the gender difference on smoking is substantial as having been proved by many studies, gender-specific models have been adopted during the analyses in order to discriminate between sexes on this issue.

5.2.4.1.2 Results

Table 5-14 shows smoking behaviours and associations with demographic, work, and behavioural factors. Smoking patterns varied significantly by gender: 4.3% of men compared to 0.1% of women described themselves as heavy daily smokers (smoking more than one pack per day), and 23.0% of men compared to 0.6% of women described themselves as daily smokers (smoking one pack or less per day).

Table 5-14 Univariate analyses of smoking status by socio-demographic, migration, work, and behavioural factors

	Never smoker *n* (%)	Ex-smoker *n* (%)	Casual smoker *n* (%)	Daily smoker < 1 pack *n* (%)	Daily smoker > 1 pack *n* (%)
Demographics					
Total	2828 (69.2)	480 (11.7)	227 (5.6)	466 (11.4)	87 (2.1)
Females	2040 (96.7)	31 (1.5)	25 (1.2)	12 (0.6)	2 (0.1)
Males	788 (39.8)	449 (22.7)	202 (10.2)	454 (23.0)	85 (4.3)
Mean age (years)					
Total	26.6	29.1	29	28.3	32.1
Females	26.2	30.1	29	29.8	31.5
Males	27.7	29.1	29	28.3	32.1
Age groups					
<20	353 (84.2)	23(5.5)	16 (3.8)	27 (6.4)	0 (0.0)
20-29	1637 (71.2)	257 (11.2)	111(4.8)	255 (11.1)	39 (1.7)
30-39	655 (61.0)	158 (14.7)	75 (7.0)	154 (14.3)	32 (3.0)
40-49	176 (62.9)	39 (13.9)	154 (8.2)	28 (10.0)	14 (5.0)
50-59	7(43.8)	3 (18.8)	2 (12.5)	2(12.5)	2 (12.5))
Marital status					
Single	1452 (73.8)	190 (9.7)	81 (4.1)	217 (11.0)	27 (1.4)
Married	1202 (64.3)	257 (13.8)	131 (7.0)	225 (12.0)	54 (2.9)
Other	174 (69.0)	33 (13.1)	15 (6.0)	24 (9.5)	6 (2.4)
Educational attainment					
Junior high school or below	1637 (73.8)	202 (9.1)	118 (5.3)	217 (9.8)	44 (2.0)
Senior high school	2605 (69.4)	429 (11.4)	213 (5.7)	426 (11.3)	83 (2.2)
Above senior high school	223 (67.2)	51 (15.4)	14 (4.2)	40 (12.0)	4 (1.2)
Family accompaniment					
Accompanied	990 (65.9)	189 (12.6)	99 (6.6)	181 (12.1)	43 (2.9)
Unaccompanied	1838 (71.1)	291 (11.3)	128 (4.9)	285 (11.0)	44 (1.7)
Ethnicity					
Han Chinese	2665 (69.3)	455 (11.8)	215 (5.6)	429 (11.2)	80 (2.1)
Non-Han	163 (66.8)	25 (10.2)	12 (4.9)	37 (15.2)	7 (2.9)
Migration and work patterns					
Time worked in Shenzhen					
<1 month	133 (81.1)	10 (6.1)	10 (6.1)	10 (6.1)	1 (0.6)
1-6 months	205 (81.0)	17 (6.7)	10 (4.0)	21 (8.3)	0 (0.0)
6-12 months	285 (75.8)	38 (10.1)	17 (4.5)	31 (8.2)	5 (1.3)
1-2 years	442 (73.7)	64 (10.7)	24 (4.0)	57 (9.5)	13 (2.2)
2-3 years	407 (71.3)	67 (11.7)	25 (4.4)	62 (10.9)	10 (1.8)
3-5 years	514 (71.0)	74 (10.2)	36 (5.0)	83 (11.5)	17 (2.3)
>5 years	825 (59.7)	210 (15.2)	105 (7.6)	202 (14.6)	41 (3.0)
Mean monthly income (RMB)					
Total	1483	1718	1582	1713	1794
Female	1416	1408	1423	1410	1400
Male	1660	1738	1600	1720	1804
Total remittances in previous year (RMB)	6221.9	8529.2	7224.1	7401.3	7780.6

Type of work					
Assembly line	1538 (74.0)	189 (9.1)	105 (5.1)	208 (10.0)	38 (1.8)
Clerical	773 (67.8)	143 (12.5)	70 (6.1)	133 (11.7)	21 (1.8)
Senior management/ professional	141 (50.9)	56 (20.2)	16 (5.8)	54 (19.5)	10 (3.6)
Other	380 (64.1)	92 (15.5)	36 (6.1)	72 (12.1)	18 (3.0)
Housing					
Dormitory	1616 (72.0)	248 (11.0)	113 (5.0)	226 (10.1)	42 (1.9)
Non-dormitory	1212 (65.8)	232 (12.6)	114 (6.2)	240 (13.0)	45 (2.4)
Other behavioural factors					
Alcohol consumption					
Never	1661 (87.8)	93 (4.9)	32 (1.7)	83 (4.4)	23 (1.2)
< once a week	841 (64.8)	182 (14.0)	88 (6.8)	166 (12.8)	20 (1.5)
2-3 times a week	321 (36.6)	201 (22.9)	103 (11.7)	212 (24.2)	40 (4.6)
4-6 times a week	3 (20.0)	3 (20.0)	3 (20.0)	3 (20.0)	3 (20.0)
Daily	2 (28.6)	1 (14.3)	1 (14.3)	2 (28.6)	1 (14.3)
Internet use					
Never	798 (74.6)	100 (9.4)	46 (4.3)	105 (9.8)	20 (1.9)
Sometimes	1408 (70.8)	227 (11.4)	111 (5.6)	204 (10.3)	40 (2.0)
Often	622 (60.4)	153 (14.9)	70 (6.8)	157 (15.3)	27 (2.6)

Never smokers (defined as those who has never smoked a single cigarette) were on average younger than casual (defined as those who currently smoke, but not on a daily basis), daily, heavy daily and ex-smokers (those who did not smoke in the past months but had been a daily or casual smoker in the past) ($F = 30.386$, $p = 0.000$), and the oldest age group (50-59 years) had significantly higher proportion of heavy daily smokers and lower proportion of never smoker than any other age group ($p = 0.000$).

Being married or accompanied by family members was associated with higher likelihoods of being a casual, daily, and heavy daily smoker.

The greatest proportion of never-smokers was seen among those with junior high school education or below. A greater proportion of non-Han Chinese than Han Chinese were daily (18.0% vs. 13.2%, $p = 0.034$, OR = 1.441, 95%CI = 1.027-2.024). However in terms of proportion of heavy daily smokers, *Han* or *non-Han* did not differ significantly (2.9% vs. 2.1%, $p = 0.310$).

The likelihood of daily and heavy daily smoking increased, and the proportion of never smokers decreased, with accumulated working time in Shenzhen. The proportion of daily smokers more than doubled over the course of five years (from 6.1% in those having worked in Shenzhen for less than a month to 14.6% in those having worked in Shenzhen for over five years), while the proportion of heavy daily smokers increased 5-fold (from 0.6% to 3.0%).

While in women the mean monthly income did not vary significantly with smoking status, male daily and heavy daily smokers reported higher monthly incomes than never smokers. Remittances sent home in the previous year were also higher among daily and heavy daily smokers than among never smokers. Those holding senior management or clerical positions within the factory were more likely to smoke than those working on the assembly line. Dormitory residents were less likely than non-dormitory residents to smoke.

Smoking and alcohol consumption were significantly and positively associated, with daily and heavy daily smokers more likely to consume alcohol frequently, for example, 87.8% of those who had never drunk alcohol were non-smoker whilst only one fifth of those who drank 4-6 times per week were non-smokers ($p < 0.001$), and vice versa. Never smokers were significantly more likely (58.7%) than any other smoking category to be never drinkers ($p = 0.000$). Heavy daily smokers were more likely than any other category of smokers to drink on average once or more than once a week (50.6%) ($p = 0.000$). Frequent internet users were more likely than occasional and never users to smoke.

Figure 5-17-1 shows how cross-sectionally a worker's migratory history has impacted his/her smoking habit. The continuous rising trend reveals that there might be a positive link between time spent in the urban factories and smoking, although age might also be a major covariate in between this ascending link. Figure 5-17-2 depicts the age effect for smoking, still on a cross-sectional basis.

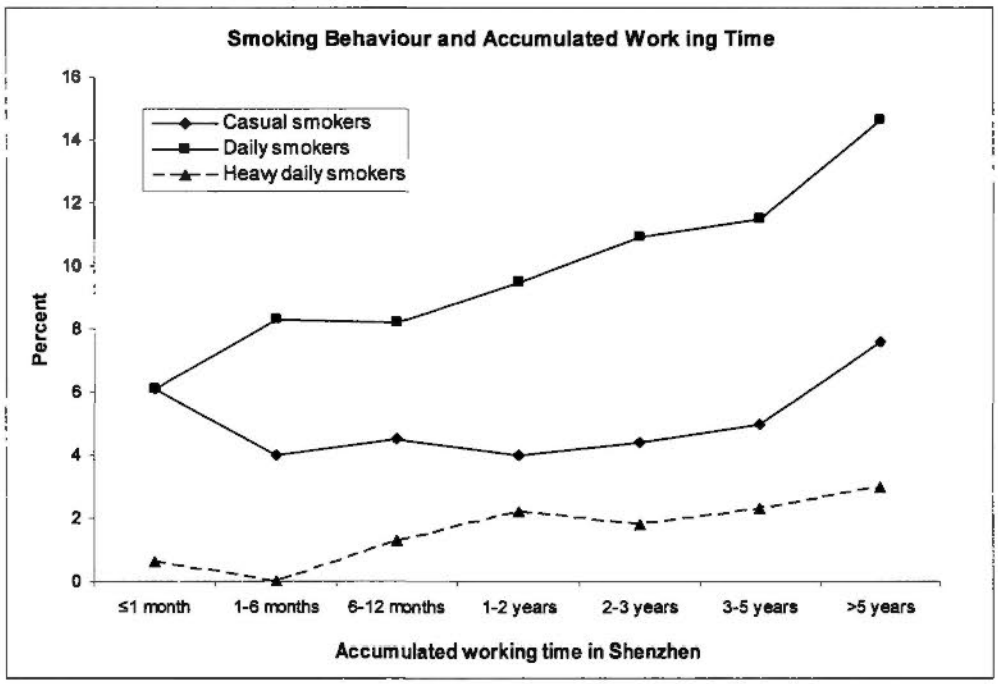

Figure 5-17-1 Trends of casual, daily, and heavy daily smoking among rural-to-urban migrant factory workers by accumulated working time in Shenzhen (male and female).

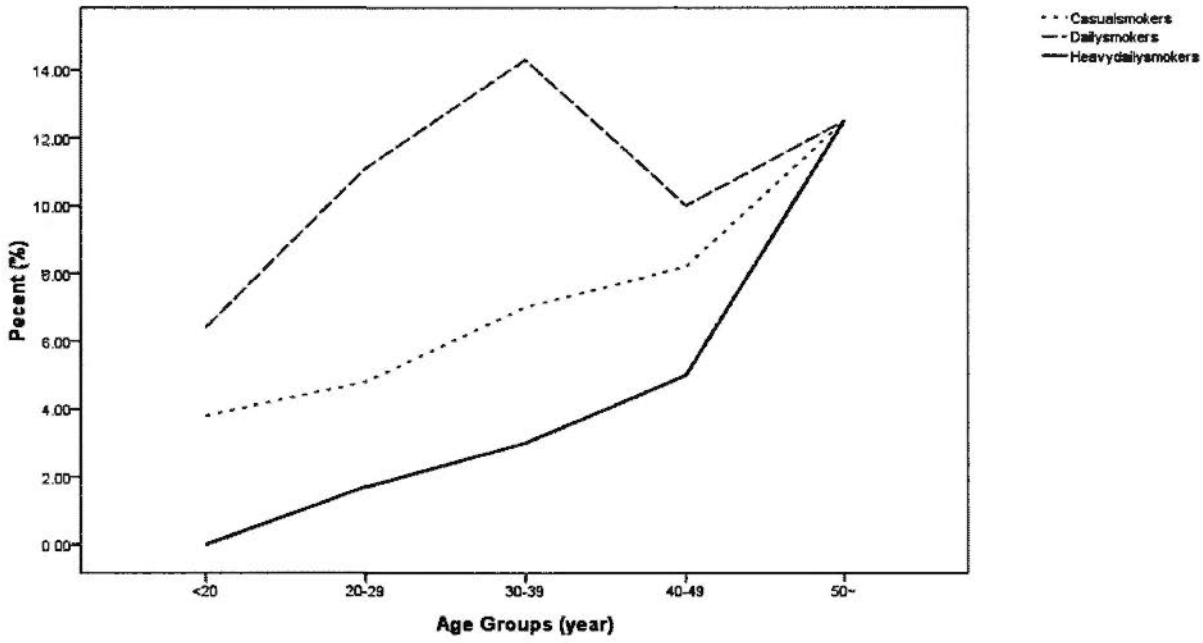

Figure 5-17-2 Trends of casual, daily, and heavy daily smoking among rural-to-urban migrant factory workers by age of migrant workers (male and female).

Chi square tests and correlation test confirmed that accumulated working time and age groups are closely correlated ($\chi^2 = 335.3$, $p = 0.000$; Spearman's $r = 0.451$, $p < 0.01$), thus

cautions should be taken in interpretation of the results. It is highly skeptical that the time effect and age effect simultaneously and independently exist if such a correlation is significant. The same problem is true for other correlated factors such as income and marital status and marital status and living status, and the like. Since univariate analyses were based only on a single factor each time and there were many factors that were closely related and females and males are very different regarding smoking in this rural-urban migrant group, we then adopted multivariate analyses using non-sex-specified and sex-specified models to identify any significant and independent predictor of smoking. The results, showing in Table 5-15, are split into three sections, of which the dependent variables were 1) all smoking (ex-smoking, casual smoking, daily and heavy daily smoking), 2) daily smoking (no matter how many cigarettes per day smoked by the respondent); and 3) heavy daily smoking (at least cigarettes or one packet per day) estimations were calculated.

The general model clarifies that sex is the single most powerful associated factor for all three level of smoking status, with male migrant workers being 33 times more likely to be a lifetime smoker, 40 times more likely to be a daily or heavy daily smoker than their female counterparts. Age only weakly predicts smoking and heavy daily smoking behaviours but does not correlated with daily smoking. Accumulated work time is totally excluded from the significant correlates list. Those with longer time of education, longer sleeping hours per day, migrant health insurance and those who are never internet users (as compared with sometimes users) are less likely to become a smoker, whilst heavy internet users are more likely to report that they have ever smoked. Numbers of factors correlated with daily smoking and heavy daily smoking are fewer. Migrant factory workers who are of *Han* ethnicity, have clinically relevant DS, have never drunk alcohol are less likely to be a current daily smoker whilst who have reported more occasions of being drunk in the previous year and long working hours per day are more likely to be a current daily smoker. Regarding risk factors for heavy daily

smoking, other than sex and age, being a never drinker (as compared with being a frequent alcohol user) is strongly correlated with less likelihood of becoming a heavy daily smoker.

When sex-specific models were adopted, the two female-specific models differ with the both-sex models in certain ways, although age, education years, drinking status and internet use seem to persist as in the both-sex models.

Firstly, ethnicity, having been drunk in previous year, health insurance participation, and working and sleeping hours per day are no longer significant in these two models;

Secondly, having clinically relevant DS adversely increases the possibility for a female migrant worker to be an ever smoker, though not necessarily a daily smoker; This finding is reverse to that in the both-sex daily smoking model in which clinically relevant DS reduces the likelihood to be a daily smoker by around 25%.

Thirdly, having a job contract and taking a sedentary job become significant in telling a migrant woman's smaller possibility to be a daily smoker as compared with those who do not hold a contracted job or the job requires them to be physically more active.

In the three very interesting male-only models, significant independent factors reduce from 7 in the all smoking model to 5 in the daily smoking model and only 4 in the heavy daily smoking model.

The smoking model is similar to that of the both-sex smoking model with only one exception: male worker with an intention to stay in the city for one or more than one years (as compared with those who are unsure) are less likely to be an ever smoker, and that being accompanied by family members increases male workers' likelihood to be an ever smoker. For the daily smoking model, one special factor that enters the model is the job-related physical activities with those who are required to walk or stand for long times being more likely to be a daily smoker.

Male heavy daily smokers are the most concerned high risk group in the section of study. Our last model confirms that older age, longer working hours per day and family accompaniment all contribute to higher possibility for male migrant workers to be heavy daily smokers. Non-drinkers, on the other hand, were way less likely (70%) to be heavy daily smokers.

In conclusion, this section analyzed migrant factory workers' smoking bahaviours. It was found that the total smoking prevalence was low, especially amongst female workers. However, internal disparities existed within our study populations. Better education, longer rest and health insurance were protective factors preventing workers from smoking, whilst heavy internet use, frequent drinking, longer working hours facilitated worker's smoking behaviours. Two findings may need more attention: 1) Amongst female workers, clinically relevant DS improved their likelihood to be an ever smoker; and 2) Family accompaniment was, contrary to our imagination, positively related to a male worker's daily heavy smoking bahaviours.

Table 5-15 General and sex-specific logistic regression models for smoking amongst migrant factory workers in Shenzhen, China

Significant Characteristics	All smoking		Daily smoking		Heavy daily smoking	
	Odds ratio(*p*)	95%CI of OR	Odds ratio(*p*)	95%CI of OR	Odds ratio(*p*)	95%CI of OR
General model	$R^2 = 0.561$		$R^2 = 0.328$			$R^2 = 0.215$
Sex (1=M, 0=F)	33.184(0.000)	24.184, 45.533	40.066(0.000)	20.985, 76.494	39.953(0.000)	5.333, 299.333
Age (year)	1.051(0.000)	1.035, 1.067			1.075(0.000)	1.040, 1.111
Education received (year)	0.942(0.010)	0.900, 0.986				
Sleeping per day (hours)	0.881(0.030)	0.785, 0.988				
Health insurance						
Yes	0.625(0.001)	0.478, 0.818				
No†	1.000					
Internet use						
Frequent users	1.328(0.018)	1.049, 1.680				
Non users	0.753(0.018)	0.595, 0.953				
Sometime users†	1.000					
Ethnic groups						
Han			0.615(0.022)	0.406, 0.932		
Non-*Han*†			1.000			
Clinically relevant DS						
Yes			0.747(0.044)	0.562, 0.992		
No†			1.000			
Drinking status						
Never			0.496(0.002)	0.316, 0.779	0.268(0.001)	0.123, 0.585
Frequent (>= 1			1.000		1.000	

times per week) †						
Time of Having been drunk in the previous year (occasions)			1.063(0.013)	1.013, 1.115		
Working time per day (hours)			1.307(0.001)	1.113, 1.534		
Sex-specific model: Female only		***R^2 =0.235***		***R^2 =0.251***	***Not applicable due to very small numbers of heavy daily smokers in female***	
Age (year)	1.061(0.017)	1.011, 1.114				
Education received (year)	0.793(0.002)	0.684, 0.919				
Clinically relevant DS Yes No†	 2.167(0.024) 1.000	 1.108, 4.240				
Accumulated working time 2-3 years 5 years or more†	 3.074(0.010) 1.000	 1.305, 7.237				
Job contract Yes No†	 0.178(0.007) 1.000	 0.051, 0.619	 0.082(0.032) 1.000	 0.008, 0.801		
Job-related physical						

activities Sedentary Highly demanding†			0.027(0.005) 1.000	0.002, 0.341		
Internet use Never user Frequent user†	0.305(0.002) 1.000	0.143, 0.652	0.174(0.016) 1.000	0.042, 0.725		
Drinking status Never Frequent (>= 1 times per week) †	0.080(0.009) 1.000	0.012, 0.531	0.013(0.001) 1.000	0.001, 0.157 1.000		
Sex-specific model: Male only ***R^2 =0.104***		***R^2 = 0.256***			***R^2 =0.251***	
Age (year)	1.038(0.000)	1.021, 1.054			1.072(0.000)	1.035, 1.110
Family accompaniment Yes No†	1.274(0.041) 1.000	1.010, 1.607			1.751(0.041) 1.000	1.024, 2.993
Health insurance Yes No†	0.722(0.026) 1.000	0.543, 0.962				
Working time per day (hours)					1.331(0.001)	1.131, 1.566
Sleeping per day (hours)	0.878(0.032)	0.779, 0.989				
Drinking status Never Frequent (>= 1 times per week) †	0.398(0.000) 1.000	0.242, 0.654	0.527(0.006) 1.000	0.335, 0.831	0.303(0.003) 1.000	0.131, 0.665
Time of Having been drunk in the	1.080(0.014)	1.016, 1.149	1.072(0.006)	1.020, 1.127		

previous year (occasions)						
Ethnic groups Han Non-Han†			0.587(0.013) 1.000	0.386, 0.893		
Clinically relevant DS Yes No†			0.704(0.018) 1.000	0.526, 0.893		
Intention to stay One year or more Not sure†	0.741(0.019) 1.000	0.577, 0.952				
Job-related physical activities Standing for long period of time or need to walk around Highly demanding†			1.966(0.030) 1.000	1.069, 3.615		

†: reference

5.2.4.1.3 Discussion on smoking bahaviour

We found that approximately a quarter (27.3%) of male and 0.7% of female migrant factory workers described themselves as daily (smoking up to one pack of cigarettes per day) or heavy daily (smoking more than one pack per day) smokers.

The overall smoking prevalence rate was 19.1%, which significantly was lower than the national rates (59.5% in males and 3.7% in females) and that of migrant workers in Beijing (28.4%) [198] and this was not expected. However, our sampling framework was different from that of the Beijing migrant worker smoking study in that the latter involved workers from the service sector whilst ours was based on factory workers only. This difference may have 1) illustrate the different risk profiles of migrant workers from different sampling sources; or 2) specific smoking regulations in factories and dorms of Shenzhen or PRD regions.

Higher smoking prevalence among males and higher heavy daily smoking rates with increasing age are consistent with other studies' findings [203], and reflect similar trends in the general population.

In general, except for age and sex, better SES amongst factory migrant workers seemed to have contributed to workers' smoking bahaviour with a few exceptions being the minority identity and years of education received. We found that the relatively wealthier are more likely to smoke contrasts with findings among the general population. However, other rural-to-urban migrant studies have also found positive associations between smoking and income [195], and it is likely that those earning less have less disposable income than their higher earning counterparts to spend on cigarettes. In addition, cheap cigarettes are less available in urban as compared to rural areas [204]. The finding that smokers send higher remittances home adds weight to the suggestion that it is those with more disposable income – and hence more to send home as remittances – who are most likely to smoke.

Education has been shown to have a protective effect against risk behaviours including smoking in the general population as well as in migrant populations in China. Although univariate study found higher proportions of casual and daily smokers in those with higher educational attainment, effect of education on all-smoking behaviours reversed in both-sex and female-only models and education received was not associated with daily or heavy daily smoking at all in multi-regression models.

Our univariate analyses have found that marriage, as well as family accompaniment, increased likelihood of smoking, results coincided with other studies [195]. Marriage has been inversely associated with smoking in China, and the centrality of family obligations and responsibilities to Chinese culture are thought to contribute to this [196]. Potential explanations may include: 1) Stress resulting from marital and family responsibilities may increase married migrants' risk of smoking; 2) Accommodation regulations often prohibit married couples from living together and result in emotional distress in these individuals; and 3) Accommodation also prohibits smoking. These effects may dampen the normally protective effect of marriage and family accompaniment on smoking in general populations. Lower smoking rates in dormitory residents are likely to be a result of smoking bans, though levels of ban enforcement can vary.

Regarding work-related factors, increased working time in the city, lack of job contract, longer working hours per day and non-sedentary working environment all contributed to a higher likelihood of smoking. The fact that smoking, frequent alcohol consumption and frequent internet use are closely linked, which has been reported in immigrants, was proved in this study, too.

Never drinkers were way less likely to be a smoker, a finding that consists with other studies [205, 206]. There was also a close association between internet use and smoking, suggesting that there is a small high-risk group of workers who smoke, consume alcohol, and

use the internet frequently, and who would benefit from targeted health promotion and smoking cessation interventions.

Other most interesting findings included: 1) smoking of males were associated with health insurance with the insured being less likely to smoke; 2) longer sleeping hours of male workers helped reduce the likelihood of smoking; 3) smoking of females, on the other hand, was responsive to mental health status and accumulated working times in Shenzhen, both of which were not seen in the male group.

The positive association between smoking and accumulated years worked in Shenzhen did not hold in multivariate both-gender models for all smoking status, although the proportion of daily smokers more than doubled from 6.1% in migrants working less than a month to 14.6% in those working for over five years and the proportion of heavy daily smokers increased five-fold (from 0.6% to 3.0%) in the univariate study.

The increasing trend of smoking in migrants as time of migration passes by has been described elsewhere [196]. However, whether this could be explained partially by the cohort effect of age or an initial healthy migrant effect giving way, with time, to an adoption of urban risk profiles, is still uncertain in literature. In China, rural people smoke more than urban residents but rural females smoke less than urban females [205]. Our univariate general models revealed that age effect held for all-smoking and heavy daily smoking models (but not daily smoking model) whilst time effect only persisted in the female all-smoking behaviour model, hinting that rural-urban migration may in fact increase female factory worker's likelihood of smoking as time accumulated.

This is the first study focusing specifically on rural-to-urban migrant factory workers in China, a subgroup with different risk profiles and different risk factors as compared to migrants in other work settings. This is also the first study to look at correlations amongst smoking, migration histories, work-related factors and other behaviour risk factors.

Our study had some important limitations. Firstly, causality between smoking and demographic, migratory and behavioural factors cannot be elicited through a cross-sectional study. Secondly, findings cannot be generalized to all rural-to-urban migrant populations as we focused on a single city (Shenzhen) and work sector (factories). Although factories were randomly selected from a comprehensive sampling frame of all listed factories in Shenzhen, unlisted factories were not represented. These unlisted factories may differ systematically from listed factories, raising the possibility of bias. Thirdly, data were derived from a larger survey on migrants' health and behaviours, and questions were neither specific nor limited to smoking behaviour. Fourthly, despite an assurance of confidentiality and anonymity, social desirability, compounded by tenuous work contracts, may have led to an under-reporting of risk behaviours [13]. Self-reported parameters are subject to respondent bias, and a tendency of respondents to under-report smoking has been described. However, the lack of stigma attached to smoking in China [198] leads us to believe that self-reported smoking status would not be significantly affected. Finally, the variety of definitions of smoking in use renders comparison of our findings with those of other studies difficult.

5.2.4.2 Alcohol consumption

Three questions were used to collect data on alcoholic beverage consumption: 1) drinking habit-frequency, 2) drinking habit-major type of alcohol beverage consumed, and 3) occasions of getting drunk in the past year.

Of all 4088 workers, 46.3% (67.4% female workers v.s. 24.0% of male workers, $p < 0.01$) said they never drank any kind of alcoholic beverage and heavy alcohol consumption was rare in both genders with only 22 persons (0.54%) described themselves as "frequent drinkers (drinking 4-6 times per week)" or "daily drinkers (drinking everyday)".

Regarding medium alcohol consumption, we found that men were significantly more likely than women to drink 1-3 times a week on average (4.7% v.s. 0.1%, $p = 0.000$) and 1-3 times a month (37.8% v.s. 6.2%, $p = 0.000$).

Of all surveyed workers, 19.2% reported having been drunk in the past year. Male migrant factory workers reported being drunk almost three times more often than women in the previous year (mean of 0.78 in men v.s. 0.23 in women; $p = 0.000$). Also, female had a lower percentage of reporting ever having been drunk in the previous year than their male peers ($p < 0.01$). However, if taking only those who had ever drunk alcohol into account (578 males and 204 females), the difference (2.65 for men v.s. 2.43 for women) of average numbers was not significantly different ($F = 0.741$, $p = 0.390$).

Concerning types of alcoholic beverage consumption, beer was solely the single most welcomed alcohol. In total, 61.4% of all drinkers reported beer to be their major consumption choice, whilst Chinese spirit accounted for 18.2%, which was second to beer.

5.2.4.3 Internet use

Very cheap and more and more convenient internet access has changed the spiritual and cultural environment in which migrant workers live and work in China's metropolises. As reported by Reuters [207]after a series of suicides of rural-urban workers in Foxconn, China's largest consumer electronics manufacturer and exporter, that "the emergence of a more assertive, confident young worker army could herald changes to China's industrial and political landscape". One most impressive approach for rural-urban migrant workforce to access information is information communication technologies (ICTs), amongst which internet is the well penetrated and recognized method in China's coastal cities, like Shenzhen. According to a series of investigative studies, a large percentage of migrant workers from factories in the PRD have become frequent users [208] and Internet Cafes were frequently visited by migrant workers, despite their low income [209].

In our study 1, an exploratory step was taken to understand the basic nature of migrant factory workers' behaviours on internet use. However, no follow-up steps were adopted to observe the change of these habits as we assume that these habits to be comparatively stable within 6 months. Also, no definition was used to define any kind of pathologic internet use or internet addiction as the major purpose was to explore both frequency of using and location of using. In fact, these two factors were intensively combined in one question, measuring simultaneously these two aspects. In the data clearance, we re-divided the data on this single question into 1) never user, 2) occasional user, and 3) frequent user in despite of the location of using it. A few major concerns were given to the investigation of migrant factory workers' internet using behaviour, of which the most interesting part was to understand relationships between frequent internet use and other ill risk behaviours, such as smoking and excessive drinking. We would also like to know whether internet use links to migrant factory workers' mental health, SRH and health care utilisation, on a univariate basis.

Of all respondents, 1069 persons (26.2%) claimed to be never users of internet and a higher percentage of women (644, 30.5%) than men (425, 21.5%) fell into this non-user category. Whereas, men were more likely than women (31.1% vs. 19.6%) to access the internet frequently ($\chi 2 = 81.486$, $p = 0.000$). Amongst those who reported to be frequent users (1029 persons), 221 (21.5%) chose Internet Café patronage as their main approach to access internet. In general, internet use was positively correlated with education level in dependent of sex, with males having higher proportions of frequent users at all educational groups except for the illiterate (females only) and post-graduate groups (females only) (Figure 5-18). If the average educational year was considered, frequent internet users had an average longer years of education (11.63 years) than mild users (10.38) and milder users had longer educational years than non-users (9.09 years) ($F = 376.882$, $p = 0.000$)

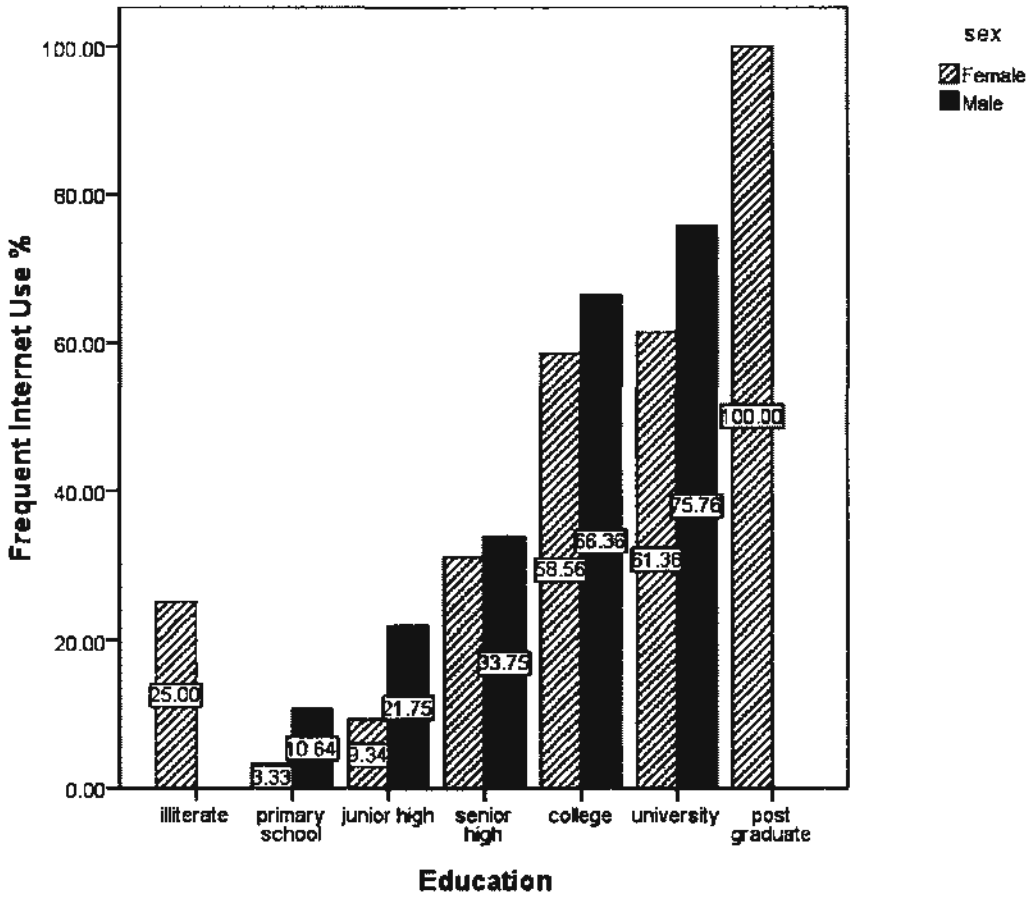

Figure 5-18 Proportion of frequent Internet user by education attainment.

Similar positive links were found between internet use and smoking behaviours in that a higher percentage of daily smokers (33.3%) reported themselves to be frequent internet users than ex-smokers (30.8%) and non-smokers (23.4%) (χ^2 = 30.970, p = 0.000). In additional, frequent drinkers defined as drinking at least 1-3 times per week were more likely to be frequent users of Internet (39.2%) than mild drinkers (drinking 1-3 times per month, 34.0%) and never-or-seldom drinkers (drinking less than 1 time per month, 22.5%) (χ^2 = 66.423, p = 0.000).

Amongst all respondents, those who were identified by CES-D as having clinically relevant DS were more likely to be frequent internet users (29.2%) than workers who did not have clinically relevant DS (24.1%, χ^2 = 12.076, p = 0.002). In terms of SRH, those who rated

their health as poor or very poor were more likely (32.6%) to be a frequent internet user than other workers (25.0%, $\chi^2 = 27.445$, $p = 0.001$).

Univariate analyses on relationships between internet use and two-week illness treatment options showed that frequent internet users were more likely to neglect their health problems (14.9%) than mild users (12.7%) or non-users (5.6%, $\chi^2 = 17.474$, $p = 0.002$).

5.2.4.4 Key findings

Overall, MFWs had lower rate of smoking than other populations in China, but there were uneven distribution of smoking and heavy smoking across SES, their migratory histories, job-related factors and mental health status, amongst other factors. The strong links between smoking, drinking, internet use and mental health are specific and studied in Shenzhen for the first time.

5.3 Pattern of healthcare utilisation: Study 1

Very little literature has focused on the pattern of healthcare access and health seeking behavious of Chinese rural-urban migrants. Because of the massive lack of health insurance schemes specifically designed for rural-urban migrants in mainland China, even more limited studied have had the opportunity to explore the true impacts of an insurance scheme on internal migrants' pattern of health seeking behaviours. However, Shenzhen's MISM, after a few years' trial and implementation, gives us a good chance to incorporate it as one of the major factors that may have changed healthcare access of those who have been insured by the scheme.

In this section, we start from description of the migrant factory workers' self-reported two-week illness (or two-week morbidity rate), an index that represents an individual's

general but acute health concerns/issues in the previous two weeks. This index has also been repeatedly used by the Ministry of Health (MOH) of China in the four National Health Surveys in mainland China [96, 97, 210, 211]. Information on long-standing health problems and formerly diagnosed chronic disease were collected. The purpose of the above two steps was to understand the prevailing medical problems amongst the rural-urban factory migrant workers thus the healthcare utilisation behaviours could be based upon and properly interpreted and understood.

To depict migrant factory workers' health seeking patterns, four information sources were obtained: 1) Last health visit including time and the purpose for the last health visit; 2) Health utilisation pattern for their health problems in the previous two weeks; 3) health utilisation pattern for longstanding and diagnosed chronic diseases; and 4) Inpatient health service utilisation. Focus was put on the second part and several interesting issues related to the current health reform themes, such as traditional Chinese medicine use, economic costs, relationships between MSM coverage and care utilisation, health facility preference and the various possibilities for healthcare, were addressed.

5.3.1 Self-reported two-week illness

The top five causes of self-reported diseases were acute upper respiratory infections, acute and chronic gastritis, acute nasopharyngitis, inflammatory diseases of female pelvic organs or non-inflammatory disorders of female genital tract, and injuries.

The crude self-reported two-week illness rate was 21.6% (881/4088). Chi square tests were used for univariate analyses odds ratios and 95% CI of ORs for two-week illness (Table 5-16).

Table 5-16 Odds ratio for two-week illness by SES and risk factors

Risk or protective factors for two-week illness	two-week illness (%)	$\chi 2$	p	Crude Odds Ratio (95%CI)
Health insurance		24.568	0.000**	1.615
Yes†	15.9			(1.334, 1.954)
No	23.4			
Education		16.080	0.000**	0.737
Senior high or above†	24.4			(0.635, 0.856)
Below senior high	19.2			
Sex		10.821	0.001**	0.779
Female	19.5			(0.671, 0.904)
Male†	23.8			
Smoking status				
Non daily smoker	18.1	7.533	0.006**	0.749(0.610, 0.921)
Daily smoker†	26.0			
Income level				
Above average†	25.5	17.255	0.000**	0.719(0.615, 0.841)
Less than average	19.8			
Ethnicity		0.342	0.559	1.101(0.797, 1.520)
Han	21.7			
Non-Han†	20.1			
Job contract				
Yes	21.4	3.331	0.068	1.480(0.969, 2.261)
No†	28.7			
Assembly line worker				
Yes†	18.4		0.000**	1.470(1.265, 1.708)
No	24.9			
Living situation			0.000**	1.317(1.134, 1.529)
On dorms†	19.5	25.072		
Other	24.1			
Mobility		83.036	0.000**	0.703(0.604, 0.818)
Have been to other cities†	25.4			
Haven't been to other cities	19.3			
SRH			0.000**	0.498(0.428, 0.580)
Good SRH	17.2			
Very poor, poor or fair SRH†	29.4			
Clinically relevant DS		40.565	0.000**	0.578(0.488, 0.685)
Yes†	29.4			
No	19.4			
Total	21.6			

† reference category

According to the above univariate analyses, those who were male, insured, with senior high school education, above average monthly income, non-assembly-line workers, daily smokers, without job contract, lived in an accommodation other than a dorm, had been to

other cities for a job and those who reported poor or fair health or showed clinically significant DS were at higher risk of reporting two-week illness.

We also calculated the two-week illness rate by age groups and accumulated working time in Shenzhen as both of the parameters were not dichotomized variables. Figure 5-19-1 shows sex-and-age-specified two-week illness. Male workers had significant higher prevalence rate of two-week illness than females independent of age groups and the rising trend as age added up was prominent in male workers below 50 years. However, the prevalence of female workers peaked in age group 30 to 39 years.

Workers older than 50 years had very low prevalence rate compared with workers of all other age groups. Figure 5-19-2 presents the prevalence of the two-week-illness by accumulated working time in Shenzhen. The highest prevalence (28.1%) was reported by male workers who had been working in Shenzhen for over 2 years to 3 years. In general, those who had worked longer times had higher percentage of reporting illness in the previous two weeks independent of sex. However, a few exceptions existed which included newly arrived female workers, male workers who had been working for 1-2 and 3-5 years in Shenzhen.

The univariate analyses may have hindered true associates between two-week illness, SES or other risk factors. By taking multivariate models, a clearer framework of associated factors was identified which is shown in Table 5-17. In this model, the dependent factor was set as the dichotomized self-reported two-week illness with those who reported TWI being 1 and those without TWI being 0.

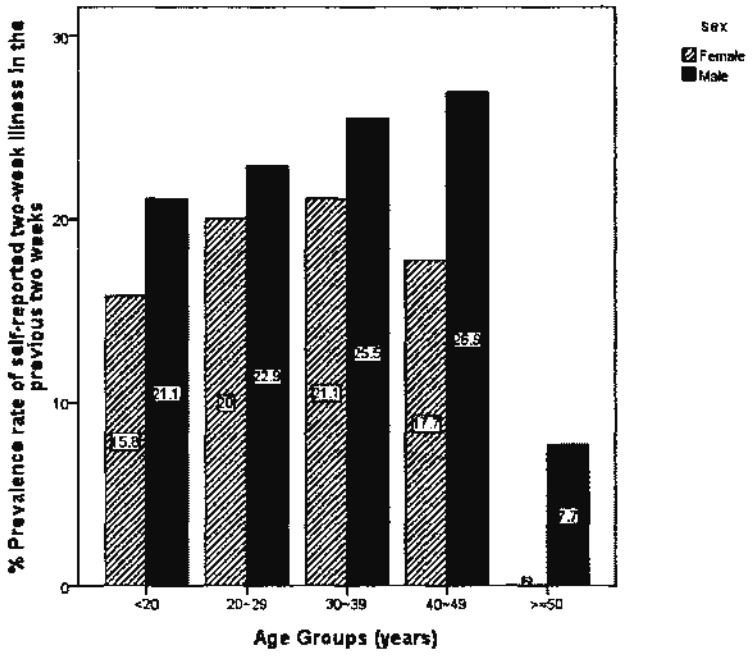

Figure 5-19-1 Self-reported two-week illness prevalence by sex and age groups

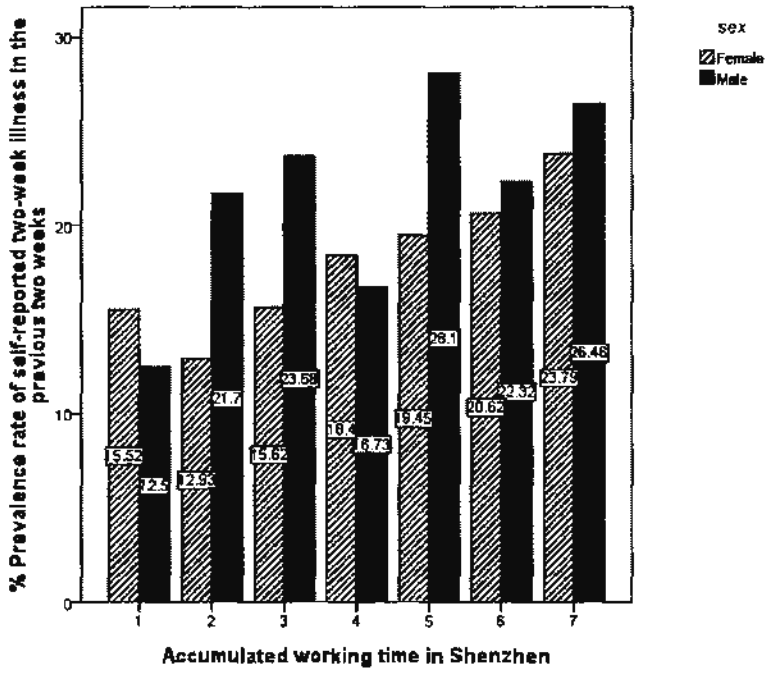

Figure 5-19-2 Self-reported two-week illness prevalence by accumulated working time in Shenzhen

Note: 1 month or below, 2 over 1 month to half a year, 3 over half a year to 1 year, 4 over 1 year to 2 years, 5 over 2 years to 3 years, 6 over 3 years to 5 years, 7 over 5 years

Table 5-17 Logistic regression of self-reported two-week illness

Characteristics	Exp(*B*)	95%CI for Exp (*B*)	*p*
Education			
Senior high or above	0.201	1.013, 1.476	0.036
Below senior high†			
Mobility			
Have been to other cities	1.257	1.050, 1.505	0.013
Haven't been to other cities†			
Family accompaniment			
Yes†			
No	1.706	1.404, 2.072	0.000
Work hours per day	1.100	1.038, 1.166	0.001
Assembly line worker			
Yes	0.684	0.567, 0.825	0.000
No†			
Health insurance			
Yes	0.632	0.498, 0.801	0.000
No†			
Smoking status			
Non daily smoker†			
Daily smoker	1.304	1.001, 1.698	0.049
SRH			
Good SRH†			
Very poor, poor or fair SRH	2.179	1.820, 2.607	0.000
Clinically relevant DS			
Yes	1.694	1.384, 2.074	0.000
No†			

†: ref

In this model, the most prominent factors that impacted on workers' self-report of two-week illness were SRH, mental health status as shown by clinically relevant DS, health insurance, assembly line workers and family accompaniment. Age and accumulated working time in Shenzhen did not enter the model. Another major change comparing with the former univariate analyses was that gender was not related to the worker's two-week illness report when other SES factors were controlled in the model. In addition, daily smoking, longer working hours per day, having been to other cities and higher education were all mild but

statistically significant risk factors for migrant factory workers to report sickness in the previous two weeks.

5.3.2 Longstanding Illness and formerly diagnosed chronic diseases

In the cross-sectional study, factory migrant workers were asked about their 1) formerly diagnosed chronic disease(s) /medical problems and 2) other longstanding illness or symptoms in the past 6 months. For the second category, a multiple-choice question and an open question were combined to collect data.

We defined seven chronic diseases or medical problems (cancer, diabetes mellitus, hypertension, any cardiac disease, stroke, asthma and high blood lipid) that were formerly diagnosed by a health professional in their lives. Of all, 64 (1.6%) reported hypertension, 26 (0.6%) reported asthma, 21(0.5%) reported high blood lipid, 18 (0.4) reported cancer or tumor, 12 (0.3%) reported cardiac diseases, 11 (0.3%) reported DM, and 8 reported stroke.

For other longstanding illness in the past 6 months, 18 major options were provided for migrant factory workers to choose (multiple choices were permitted, and 3 to the most) as well as an open ending was given to accommodate some other health situations. The 18 common illness or symptoms were based on and extracted from outputs of a cross-sectional migrant worker health insurance study in 2006 [5] in Shenzhen. In total, 893 reports were recorded. Table 5-18 lists counts and percentage of all longstanding illness reports. The top three major longstanding illness reports were 1) eyesight problems, 2) sleeping problems and 3) gastritis or ulcer. These results were quite similar to those from the 2006 migrant worker study in 2006 (Table 5-18). The bold items are health problems with more than 100 reports by our subjects.

Table 5-18 Self-reported longstanding illness or health problems: counts and percentage in the past 6 months.

Illness or symptoms	Counts	% of 4088	% of reports
hypertension	61	1.49	6.83
diabetes	5	0.12	0.56
arthritis	69	1.69	7.73
cardiac diseases	7	0.17	0.78
chronic bronchitis	58	1.42	6.49
asthma or other hypersensitive diseases	50	1.22	5.60
gastritis or ulcer	***101***	***2.47***	***11.31***
hepatitis/hepatocirrhosis	7	0.17	0.78
back pain	48	1.17	5.38
stroke	0	0.00	0.00
tumor	6	0.15	0.67
migraine	94	2.30	10.53
depression and anxiety	40	0.98	4.48
sleeping problem	***103***	***2.52***	***11.53***
eyesight problem	***109***	***2.67***	***12.21***
ear problem	35	0.86	3.92
deformity of limbs or body	4	0.10	0.45
decayed teeth/cavity	22	0.54	2.46
Other health problems	74	1.81	8.29
Total	893	21.9	100

Amongst other problems, common reports included gynaecological complaints, sinusitis, cholecystolithiasis, pharyngitis, neurasthenia, amygdalitis, anaemia and the like. Severe but scarce disease such as uremia and nephrotic syndrome were also reported by migrant factory workers.

5.3.3 Pattern of health service utilisation from different perspectives: Study 1

The following section 1) assesses migrant factory workers' outpatient and inpatient healthcare service utilisation pattern and the extent to which the health insurance designated for non-hukou or migrant employees (the Shenzhen MISM programme) has eliminated social-economic barriers for migrant factory workers in accessing local health services, especially; 2) addresses reasons for two prevalent options when migrant factory workers fell sick: disease neglecting and self-medication/self-treatment; and 3) barriers to designated or standardized health services are also discussed.

To understand the pattern of migrant factory workers' health service utilisation, the study adopted three perspectives and approaches: 1) last-doctor-visit approach which addressed the time and reasons for an individual's most recent doctor visit of each respondent, 2) two-week-illness based health utilisation approach, which explored not only the dichotomized utilisation status of those who reported illness(es) in previous two weeks but also their treatment choices, reasons for choosing that (those) specific option(s) and features of the health care facilities they utilized had any doctor visit happened, and 3) patterns of inpatient care utilisation.

5.3.3.1 Patterns of last doctor visit

Of all 4088 migrant workers, more than half (54.8%) reported their most recent doctor visit to be half a year ago or earlier. Only 11.8% of them had visited a doctor within two weeks. Female workers tended to have a higher proportion of utilizing health services within past two weeks than their male peers ($\chi^2 = 44.302$, $p = 0.000$). Separating all migrant workers into two groups by their current health insurance status, it is surprising to find that those who were insured reported low percentage of visiting a doctor both within 1 week and 1 to less

than 2 weeks ($\chi^2 = 88.888$, $p = 0.000$). Table 5-19 shows response to the question "when did you go to see a doctor last time?" by gender and current health insurance participation.

Table 5-19 Proportions of response to question "when did you visit a doctor last time?" by sex and current health insurance status amongst migrant factory workers

When	Sex		Health insurance		Total (%)
	Female (%)	Male (%)	Yes (%)	No (%)	
< 1 week	8.1	3.9	4.2	12.1	6.1
1 week~	6.4	5.0	5.5	6.5	5.7
2 weeks~	11.2	9.7	11.0	8.8	10.5
1 month~	22.7	23.3	23.9	20.0	23.0
6 months~	25.0	26.1	26.7	21.6	25.5
1 year~	26.6	32.1	28.7	31.1	29.3

The question following "when did you go to see a doctor last time?" was "What was the reason for your last doctor visit?" This question permitted the workers to have multiple (up to 3) choices. Of all respondents, 43.4% reported their last doctor visit was due to illness, disease symptoms or injuries; 35.1% reported medical check-ups and 10.7% were due to health administrative purposes. Very few migrant workers picked item 3 to 9, which were all related to preventive health care (Table 5-20). Compared with the prenatal care rate of 2.9% for last doctor visit, postnatal care utilisation was even lower (1.2%).

Table 5-20 Reasons for last doctor visit amongst migrant factory workers.

No.	Reasons for last doctor visit	Proportions (%)
1	Experienced discomfort, illness, injury or symptoms, incl. initial or follow-up visits	43.4
2	General medical check-up	35.1
3	Screening for a specific disease (e.g. cancers)	0.7
4	Routine follow-up for a chronic condition (e.g. diabetes, high blood pressure)	0.6
5	Immunization	1.1
6	Prenatal care	2.9(female only)
7	Postnatal care/Well baby visit	1.2 (female only)

8	Family planning	2.0
9	Counseling/medical advice	2.9
10	Administrative purpose (e.g. pre-employment examination, CSSA certification)	10.7
11	Others	6.7

5.3.3.2 Pattern of health service utilisation amongst migrant factory workers who reported two-week illness

Amongst 4088 workers, 881 (21.6%) reported illness in the previous two weeks. Of the 881 workers, there were more male (471 reports, 23.8% of male workers) than females (412 reports, 19.5% of all female workers) (see 5.3.1 for details). Analyses on the 881 migrant workers' health care utilisation in the past two weeks focused on several aspects including 1) dichotomized utilisation behaviours, 2) subjective reasons of not taking any measures and self-medication, 3) utilisation of Traditional Chinese Medicine (TCM) including TCM doctor visit and self-treatment using TCM drugs, 4) occasions of doctor visit, 5) features of health care facilities used and reasons for choosing them, and 6) medical costs and other related expenditures for those who had visited a doctor.

In addition to health insurance participation, socio-demographic, economic, migratory factors, behavioural risk factors as well as SRH and mental health situation were checked for their potential impacts on dichotomized health service utilisation.

5.3.3.2.1 Dichotomized utilisation bahaviours and disease neglecting

Of the 881 ever reported illness in the previous two weeks, 472 (53.6%) chose self-treatment, 307 (34.8%) visited a doctor or health professional and 102 (11.6%) did not take any measure. If we separate the sample into two groups using doctor visit as a standard, 65.2% of the workers belonged to non-users of health services in the previous two weeks though they understood that they felt sick. Of the non-users, still 82.3% (472/574) adopted

self-treatment as the major method to deal with their health problems, which may mainly involve purchasing over-the-counter (OTC) drugs and self-management of symptoms. Neglect of illness was closely related to younger age independent of sex as shown by Figure 5-20-1.

In Figure 5-20-2, on the other hand, we checked age and sex distribution of doctor visit amongst sick workers. It shows clearly that female and male migrant factory workers differ in professional health service utilisation in terms of not only total rates of visit (38.1% for female v.s. 32.3% for male) but also age-specific rates. It implies that as age adds up, female migrant factory workers are more likely to count on professional health services whilst male workers reduce the possibility of doing so.

Of those sick workers who were insured by MISM, 53.9% chose self-medication or self-treatment, 35.4% visited a professional doctor, 10.6% neglected the sickness, whilst these rates were 49.7%, 32.9% and 17.4%, respectively ($\chi^2 = 5.728$, $p = 0.057$) for the uninsured sick workers. This result, using univariate analysis, shows that MISM, Shenzhen's specific health insurance designed for migrant employees, did not make a statistically significant difference in shaping migrant factory workers' health seeking behaviours.

Figure 5-20-1 Proportion of sick migrant factory workers who neglected illness in the previous two weeks by age group and sex

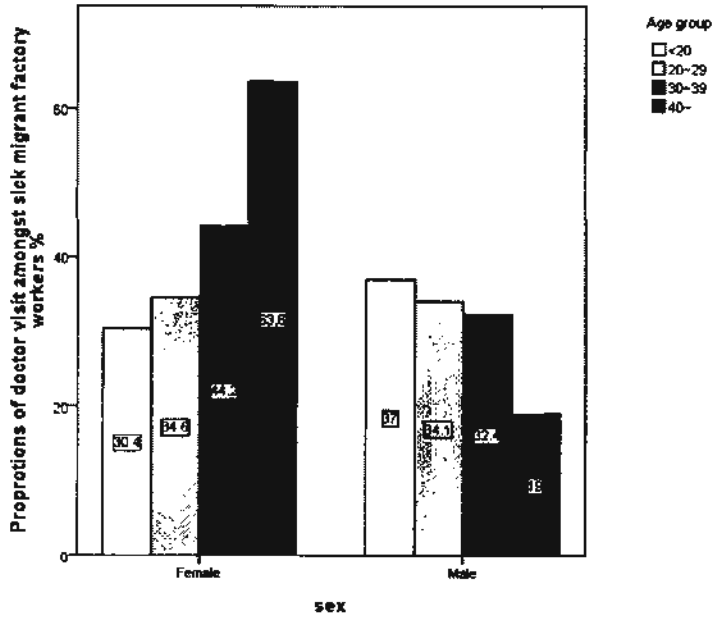

Figure 5-20-2 Proportion of sick migrant factory workers who used professional health services in the previous two weeks by age group and sex

Conclusively, female migrant workers were more likely to utilise health services than male workers (38.1% vs. 32.1%) when they felt sick ($p < 0.05$). Having an health insurance

slightly increased sick migrant factory workers' likelihood of visiting health professionals (35.5% vs. 32.9%, a 7.9% increase) and self-treatment (53.9% vs. 49.7%, an 8.5% increase), and decreased their likelihood of neglecting illness as compared with those without health insurance currently (10.6% vs. 17.4%, a 39.1% decrease). However these differences were not statistically significant in chi square test ($p > 0.05$). We have checked a few other potential associates of doctor visit and Odds Ratios by these factors are listed in Table 5-21.

Table 5-21 Unadjusted ORs of potential associated factors on dichotomized health service utilisation (utilized professional health services = 1; neglected or self-treated = 0) amongst migrant factory workers reporting two-week-illness.

Associates	OR (95% CI)	*p*
Health insurance		
Yes	0.869(0.601, 1.257)	0.456
No†		
Education		
Senior high or above	1.122(0.850, 1.481)	0.417
Below senior high†		
Marital Status		
Married	1.031(0.781, 1.360)	0.831
Other†		
Age group		
40 years or above	0.943(0.553, 1.607)	0.829
Under 40 years†		
Monthly income level		
Above average	0.903(0.677, 1.2040)	0.512
Less than average†		
Ethnicity		
Han†		
Non-Han	0.759(0.401, 1.437)	0.396
Job contract		
Yes†		
No	***0.430(0.209, 0.884)***	***0.018****
Assembly line worker		

Yes	1.072(0.810, 1.417)	0.627
No†		
Have been to other cities for a job		
Yes	***0.685(0.517,0.909)***	***0.009*****
No†		
Dorm living		
Yes	0.887(0.672, 1.171)	0.398
No†		
Frequent internet user		
Yes	***0.779(0.671, 0.904)***	***0.035****
No†		
Current heavy smoker		
Yes	***0.733(0.612, 0.878)***	***0.044****
No†		
SRH		
Fair, poor or very poor†		
Good or very good	0.849(0.644, 1.121)	0.249

*† reference; ** $p < 0.05$, ** $p < 0.01$*

The above univariate analyses showed that being without a job contract, having been to other cities for jobs and being an frequent internet user or current heavy smoker (as defined by smoking 1 or more packets per day) decreased the likelihood of visiting a health professional when a migrant factory worker felt sick in the previous two weeks. The above results support that dichotomized professional health service utilisation is not correlated with health insurance participation amongst those who reported illness in previous two weeks, and that migratory experience related factors such as job contract, having stayed in another city and behavioural risk factors, instead of socio-demographics, were potential associates of whether a Shenzhen migrant factory worker would use professional healthcare when he (she) falls ill. The insurance, though substantially had been extended to cover a larger percentage of migrant employees as compared with 2006 when a former similar health utilisation

cross-sectional study was taken, has not yet seen its goal of helping reduce barriers for migrants fully achieved, as has been described in the 2006 study.

5.3.3.2.2 Reasons of self-treatment and not taking any measures

We asked in the survey why the workers chose self-treatment/self-medication or did not take any measures. Results showed that the top three subjective reasons for self-treatment were: 1) convenience to purchase OTC drugs (10.9%), 2) cheaper price of drugs at the community pharmacies as compared with that in hospitals (4.8%) and 3) a certain degree of knowledge or self-perception on medicine, treatment or disease management. Other explanations for self-treatment included high prices of treatment in the hospitals, having no health insurance, being afraid of their poor affordability in health facilities, having no spare time to queue in hospitals, and the like.

For reasons of not taking any measures, migrant workers chose the following three items as their major subjective reasons: 1) self-perception of not being severe (12.2%), 2) having no spare time (5.9%), and 3) economic difficulties (3.2%). Other reasons they quoted were: difficulties in transportation arrangement, poor services in the hospitals, self-perception of having no effective measures for the treatment of the specific health problems.

From the above results, we could well divide migrant factory workers' subjective reasons for taking self-treatment or neglecting their illness into the following aspects:

(1) Self-perceived concepts on a) personal capacity to deal with the problems or b) degree or severity of the disease/symptoms or c) lack of efficient treatment for the illness;

(2) Accessibility-related issues such as convenience (pharmacies were more convenient compared with hospitals), time stringency (they prefer not to wait, they did not have spare time to take care of their sickness, and transportation (physical accessibility of health facilities);

(3) Economic concerns including lack of health insurance, out-pocket payment, concerns of higher price in the hospitals or health facilities; and

(4) Poor quality or services in the health facilities.

Though no elaborative information was collected in the survey, these findings gave some useful clues to a better understanding of migrant factory workers' health utilisation behaviours and how local health system should revise the services accordingly should further investigation on this specific topic be implemented.

5.3.3.2.3 Utilisation of Traditional Chinese Medicine (TCM)

This study measured whether the migrant factory workers utilised TCM by asking 1) whether they had consulted a TCM doctor if they reported a doctor visit in the previous two-weeks; and 2) whether they had used TCM medicines if they reported self-treatment.

Of all who reporting two-week-illness, 14.9% had ever used TCM medicine for self-treatment and 10.5% had consulted TCM doctors. These two proportions represent 27.8% of those who self-treated and 30.0% of those who utilized professional healthcare services. Chi square tests showed that male workers and female workers did not differ regarding TCM self-treatment or consultation utilisation.

5.3.3.2.4 Occasions of doctor visit

The majority of migrant factory workers who ever reported illness in the previous two weeks and had utilized health services had only visited a doctor for one time (74.3%). Slightly less than a quarter (23.9%) of those who used health services visited a doctor for two or three times. Very few of them (1.8%), however, utilised the service more than 3 times in the previous two weeks. Health insurance did not explain health disparities regarding occasions of health service utilisation ($p = 0.373$).

5.3.3.2.5 Settings of health care facilities used and reasons for choosing them

One question asked about where they respondents went for health services in the previous two weeks for those who reported professional health service utilisation on a multiple-option basis. In all, 558 choices were provided, which included private clinics (15.6%) , health centers affiliated to the company they work for (11.0%), community health centers (CHCs) (43.4%), sub-district or street level hospitals(14.2%), district hospital (6.9%), city-level hospitals/medical centers (6.3%), provincial hospitals (0.4%) and army hospitals (0.8%). No one had ever used services in private hospitals.

This preference for health service setting was not completely answered by every migrant worker who had used the services, however it provided us with some idea of how and where did they often go for professional treatment. Of those who answered the question, CHCs, which had been targeted as the major health investment direction to realize a series of health reform initiatives in Shenzhen, were their first choice. A little less than half of the respondents used CHCs in the past two weeks for health services.

Private clinics and company provided clinics, street-level hospitals and health centres provided by their employers were other major types of health facilities workers preferred to visit. Utilisation of health services for acute sickness in the past two weeks seldom happened in hospitals higher than street-level amongst the migrant respondents.

The questionnaire gave an 11-option question to ask the migrant factory workers about why they chose the services at the facilities and four-to-the-most choices were permitted. Referring to reasons of choosing the health facilities, "It's close to where I live" and "It is a DHP" topped as their main reasons. Table 5-22 listed counts and percentage of reasons telling respondents' subjective perception on reasons of choosing certain health facilities.

Table 5-22 Subjective reasons for choosing certain health facilities amongst migrant factory workers

No.	Reasons for last doctor visit	Counts	Proportions (%)
1	It is a DHP	130	28.9
2	It is close to where I live	140	31.2
3	Required by the disease situation	50	11.2
4	Services of the staffs are good	31	6.9
5	Good skills and technology	32	7.2
6	Reasonable price	15	3.4
7	Good environment	7	1.6
8	Simply procedure(s)	24	5.4
9	It can provide with health consultation	13	2.9
10	It can provide with preventive services	3	0.7
11	I am familiar with doctors there	5	1.2
	Total	450	100

The above perception-based results signify that geographic convenience or geographic accessibility of the health facilities is of the highest significance when a sick migrant worker decides to visit a doctor. Other major concerns include whether the facility belongs to the designated health practice and whether the disease itself requires the sick to choose it. Surprisingly, price was not claimed to be a major factor when sick workers choose a health facility to visit a doctor.

5.3.3.2.6 Existence of a mixed utilisation pattern

Beside, 16.9% of those who ever had visited a doctor also had purchased OTC at pharmacies outside of the health facilities. These findings signified a mixed health service utilisation model, which is a combination of formal healthcare services at different levels, as well as self-treatment mainly through taking OTC drugs and self-management of mild symptoms, if any measure was to be adopted in this migrant factory worker group.

5.3.3.2.7 Medical costs and other related expenditures

For the sickness in the two past weeks, the average expenditure on self-treatment or self-medication was 57.74 Yuan, ranging from 1 to 1000 Yuan (*SD* = 118.748), whilst the average expenditure on professional health services was 179.96 Yuan, ranging from 17 Yuan

to 4000 Yuan (SD = 118.748). We also investigated indirect costs of doctor-visit related transportation ($\bar{X}$ = 15.95, SD = 52.848, ranging from 1 Yuan to 600 Yuan) or other indirect payments ($\bar{X}$ = 59.77, SD = 152.274, ranging from 2 Yuan to 2000 Yuan). Some but not all workers (n = 93) who had visited a doctor in the previous two weeks reported salary or bonus deduction because of sick leaves ($\bar{X}$ = 117.54, SD = 314.094, ranging from 20 Yuan to 2800 Yuan).

Regarding health insurance, 96 (31.3%) of those (307) who used health services in the past two weeks reported medical bill deduction or reimbursement and 106 (34.6%) thought they could not get any financial compensation or insurance reimbursement. Still 105 (34.2%) individuals did not know whether they were entitled to any financial support for the health service they used. If taking MISM participation into account, only 44.8% of those insured thought they had been reimbursed or would be reimbursed by MISM; 37.1% thought reimbursement was not possible and 18.1% were unsure about the reimbursement for their medical bills. This finding may have signified 1) a big gap between the guidelines of MISM which aimed to cover almost all out-patient service care to a variety of degrees according to the level of care facilities, amount of total expenditures per capital per item and the perceived idea of reimbursement in migrant workers' mind; or 2) the massive use of private clinic, which was excluded from MISM coverage; or 3) a small percentage of insured workers forgot to bring their MISM card with them when they visited the doctor and did not know how to do the complain afterwards.

5.3.3.3 Health service utilisation for longstanding or chronic diseases

The survey asked migrant workers 1) whether and 2) how they dealt with the existing longstanding illness or diagnosed chronic diseases. Of the 893 reports of longstanding or chronic diseases, only 122 conditions (13.7%) have ever been professionally treated, 22

conditions (2.5%) were self-medicated. Amongst those professionally treated cases, 40 (32.8% of 122) were by TCM doctors. Other treatment included oral medicine and intravenous transfusion (drips as the answer given in the survey). The majority of longstanding health problems and chronic diseases were not properly treated and TCM was the major method migrant factory workers counted on to deal with longstanding health problems.

5.3.3.4 Inpatient care utilisation and rejection

5.3.3.4.1 Rates of inpatient care use and rejection

Of all 4088 respondents, 126 workers (3.1%) reported inpatient service utilisation in the past year, whilst 56 (1.4%, 30.8% of all who were asked to be hospitalized) reported that they had rejected inpatient care suggested by doctors. Of those who rejected hospitalization, 124 subjective reasons were given including:

1) The disease is mild and no need to be hospitalized (57, 46.0%);
2) No time (23, 18.5%);
3) Economic difficulties (29, 23.3%);
4) Services at the hospital are of poor quality (6, 4.8%);
5) No hospital bed available (1, 0.8%); and
6) Other reasons (7, 5.6%)

5.3.3.4.2 Cause and types of hospitals

Of all who reported inpatient care utilisation, 43 (34.1%) were due to diseases, 34 (27.0%) were due to injuries, 25 (19.8%) were for delivery. Other causes included: 3 for poisoning, 5 for family panning, 1 for rehabilitation and 15 for other causes.

The majority (91, 72.2%) of migrant factory workers chose township hospitals/sub-district hospitals for inpatient care, with second and third options being district level hospitals (12, 9.5%) and city-level hospitals (11, 8.7%).

5.3.4 Discussion on healthcare utilisation of Shenzhen migrant factory workers

5.3.4.1 National policy in China and why it needs to change

During the last 2 decades, the population health status in China significantly improved along with its dramatic economic development. In the 21st century, life expectancy at birth reached 71.4 years. However, large disparities among rural residents, urban dwellers and rural-to-urban migrants' health status exist. Although many factors, particularly socioeconomic status, account for such a large gap, access to the healthcare system is a pivotal factor. The Chinese healthcare system was reformed in the 1980s under the national climate of economic profit as priority.

A growing number of studies have been conducted to address access to healthcare services and outcomes and whether constructing general practitioner systems in the community can achieve the aim of a shift to preventive medicine in community health services,. The elimination of disparities in health, including healthcare access, has also been identified as a target to improve population health status in China as in other developing countries and the UK has a strong record in this arena

5.3.4.2 Local issues in Shenzhen

Shenzhen is the second largest city in Guangdong Province and Pearl River Delta of South China. It neighbours Hong Kong across the Shenzhen River. As one of the most populous metropolitan areas, it attracts millions of additional rural laborers annually. In 2007, the government of Shenzhen claimed that its population had exceeded 14 million and 60% of

the whole populations were young (average 26.7 years old) working class migrants from other regions of China. Recent studies by us have shown workers inability to pay is still unresolved whilst unsatisfactory primary health care quality is criticized by the public and researchers. As in other Chinese cities, convenient OTC pharmaceutical business and unlicensed but convenient private clinics accounted for large market share, and GP consultation and referral systems as well as standardized FM training systems are not in place Recognizing the challenges for the healthcare system new models of insurance have been introduced and a new building programme for community healthy centers has been initiated ,

Challenges of primary care in Shenzhen include good management of investment in a cost-effectiveness perspective, continuing FM training under an international framework, better reference system, convenient and accurate Hospital Information System (HIS) that captures prevention, surveillance, diagnosis, treatment and cost management, and education of general population in utilization of DHPs.

5.3.5 Key findings

The top three subjective reasons for neglecting disease included: 1) self-perception of illness not being severe, 2) lack of spare time for doctor-visit and 3) economic difficulties.

Health insurance participation was not associated with *occasions* of doctor visit in the past two weeks. Overall, sick males were less likely than sick females to access professional healthcare and the age effects were inverse for males and females. Analyses indicated that those who were without a job contract, had been to other cities, were frequent internet users and current heavy smokers were less likely to seek professional health services when they were sick. Health insurance, again, did not impact significantly on their *decision* to see a doctor.

CHAPTER 6 RESULTS OF STUDY TWO:

THE SIX MONTHS FOLLOW-UP STUDY

6.1 Brief introduction of the follow-up study

To clearly track the migrant factory workers' health status and healthcare utilisation patterns, a follow-up survey (study 2) was designed and implemented using a structured, self-administered questionnaire 6 months after study 1 amongst a one third subset of the original sample by simple random selection.

Coded by a unique number, questionnaires in study 1 and study 2 for the same worker were connected and combined into an unified record in our final SPSS dataset. More detailed information on methodology and questionnaire design is described in chapter 4.

Comparative baseline characteristics of those migrant factory workers who left and those who stayed focusing on demographic SES characteristics, SRH, DS, and healthcare utilisation were analyzed. We gave relative risk estimation for whether or not worker left in study 2 by their baseline SRH, DS, two-week illness report and dichotomized professional healthcare utilisation in study 1. The changing pattern of health status and health utilisation of those factory workers who stayed over 6 months was followed and described. Relative risk estimates of workers' health insurance status in study 1 on their patterns of healthcare utilisation were given, too.

6.2 Study 2: Flow chart of the follow up survey

Study 2 started 6 months after study 1. Of all 4088 respondents who successfully finished the survey, one third (n = 1363) of the migrant factory workers were selected by using random digits numbers. Source of the subjects in the follow-up study covered all and

each of the original factories (n = 44). Of the 1363 selected workers, 509 persons had left before study 2 and 854 had stayed. Amongst these 854 who had not left, 21 declined or did not finish the follow-up survey due to several reasons including reluctance without explanation (n = 7), no time to catch up (n = 5), being out of town for personal or job-related reasons (n = 5) and left the survey with unfinished questionnaire (n = 4). In the end, 833 successfully finished the survey. A flow chart below gives the sampling and follow-up process.

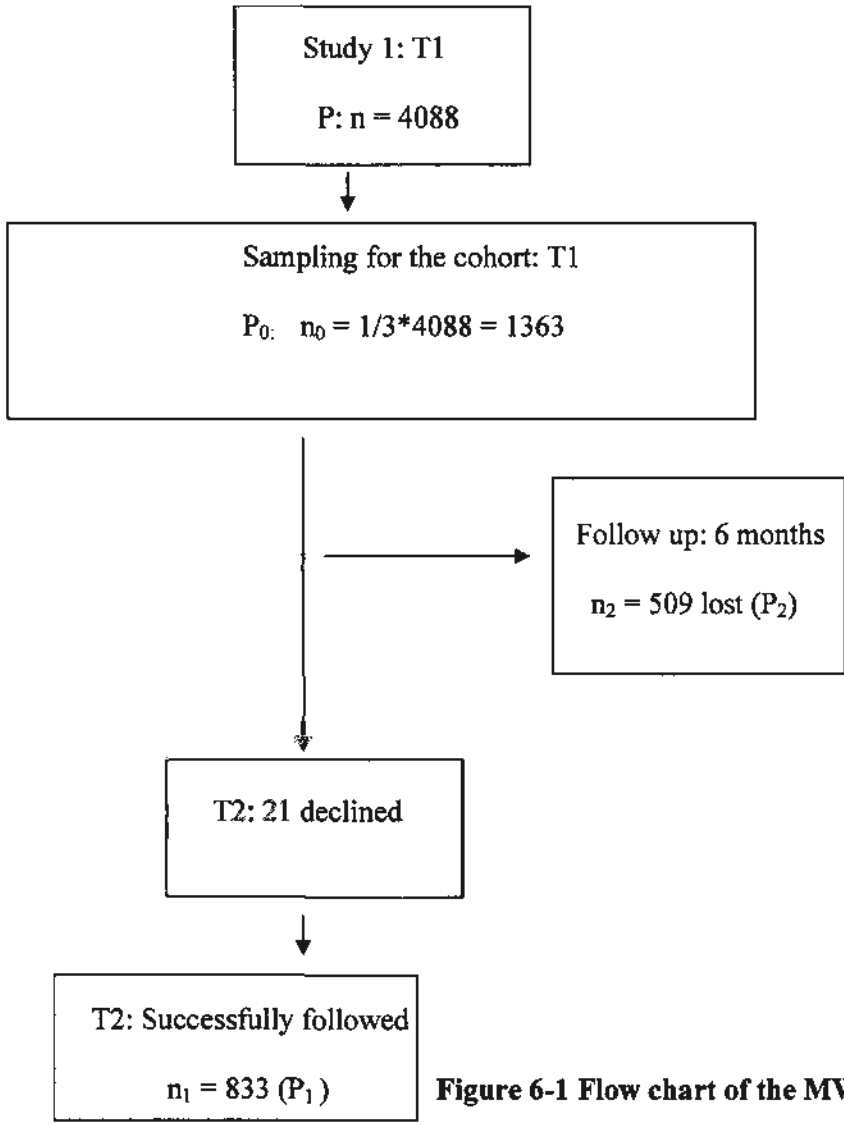

Figure 6-1 Flow chart of the MWHHUS study

6.3 Comparison of baseline characteristics between P1 and P2

Of all 1363 selected subjects, the successful response rate amongst stayers was 97.5% (833/854), higher than that of study 1. The proportion of staying was 62.7% ((833+21)/1363), meaning that more than one third of the workers in study 1 had left their original jobs.

To make the presentation of the studies clearer, we named the randomly selected subsample (n = 1363) as population 0 (P_0) and separated P_0 into P_1 (stayers) and P_2 (leavers). The original 4088 sample was named as P. We also named the time when study 1 and study 2 were conducted as T1 and T2, respectively.

Table 6-1 gives comparison between 1) P and P_0, and 2) P_1 and P_2 regarding baseline socio-demographic characteristics. Table 6-2 presents the baseline percentages of very poor, poor or fair SRH, clinically relevant DS, two-week illness report and dichotomized professional healthcare utilisation by whether the worker had left.

Table 6-1 Comparisons of socio-demographic characteristics, mobility, living and job arrangement of P and P_0 and comparison between P_1 and P_2 (T1)

Factors	Comparison: P v.s. P_0 (n, %)		Comparison: P_1 v.s. P_2 (%)	
	P(n = 4088)	P_0 (n = 1363)	P_1(n = 833)	P_2(n = 509)
Sex	4088(100)	1363(100)		**
Female	2110(51.6)	708(51.9)	48.4	55.8
Male	1978(48.4)	655(48.1)	51.6	44.2
Age (years)	Mean 27.36	27.65	31.86	22.36**
<20	419(10.2)	141(10.3)	7.7	14.7
20~29	2299(56.2)	773(56.7)	49.2	69.5
30~39	1074(26.3)	355(26.0)	34.3	12.6
40~49	296(7.2)	94(7.0)	8.8	3.2
Marriage				**
Single	1967(48.1)	652(47.8)	34.4	70.3
Married	1869(45.1)	612(44.9)	57.7	24.6
Other	252(6.2)	99(7.3)	7.9	5.1

Accompaniment				**
Living with family(member)	1502(36.7)	496(36.4)	14.3	72.7
Living without family member	2586(63.2)	867(63.6)	85.7	27.3
Ethnicity				
Han	3826(93.6)	1277(93.7)	95.8	94.1
Non-Han or un-specified	262(6.4)	86(6.3)	4.2	5.9
Accumulated time of stay				**
<= 1m	164(4.0)	51(3.7)	2.2	6.5
1m~6m	253(6.2)	86(6.3)	5.4	8.1
>6m, <=1y	376(9.2)	122(9.0)	6.8	12.8
>1y, <=2ys	600(14.7)	197(14.5)	11.9	19.3
>2ys, <=3ys	571(14.0)	189(13.9)	12.9	16.1
>3ys, <=5ys	724(17.7)	245(18.0)	19.3	16.5
>5ys	1383(33.8)	466(34.2)	43.6	20.2
Unspecified	17(0.4)	7(0.5)	0.5	0.6
Having been worked elsewhere				
Yes	1524(37.3)	513(37.6)	38.6	36.1
No	2564(62.7)	850(62.4)	61.4	63.9
Feature of residence				*
Dorm provided by employer	2245(54.9)	742(54.4)	49.4	62.3
Other	1843(45.1)	621(45.6)	50.6	37.7
Job feature				**
Productive lines	2078(50.8)	687(50.4)	40.5	66.7
Others	2010(49.2)	676(49.6)	59.5	33.3
Numbers of jobs (past 5 years)				*
1	1780(43.5)	587(43.1)	44.0	41.7
2~4	1797(44.0)	599(43.9)	42.3	46.7
5~6	126(3.1)	40(2.9)	1.3	5.6
>6	50(1.2)	22(1.6)	0.2	4.0
Not sure	335(8.2)	115(8.4)	12.2	2.0
Job contract				*
Yes	3980(97.4)	1320(96.8)	99.0	94.3
No	108(2.6)	43(3.2)	1.0	5.7

Health Insurance				**
Yes	3100(75.8)	1022(75.0)	86.8	55.6
No	988(24.2)	341(25.0)	13.1	44.4

*Note: * $p < 0.05$, ** $p < 0.01$*

The above results showed that at T1 the subgroup of the randomly selected 1363 migrants (P0) did not differ significantly in all major socio-demographic characteristics from the original sample (P), meaning the one-third partial cohort was a good representative of the original sample.

Comparisons between P1 and P2, however, showed that those who had stayed and those who had left the original factory/job were substantially different in almost all characteristics other than ethnicity and whether they had worked in another city. In general, the leavers tended to be younger and there were a higher percentage of female and single workers than in stayers. Also, leavers had lower percentage of being insured and having a job contract. Leavers were more likely than stayers to have worked in Shenzhen for less than five years, to live in dorms, to switch jobs more frequently, and to take jobs as assembly line workers than stayers at T1. One interesting finding was that those workers who were accompanied by relatives to Shenzhen were more likely to leave. This may be explained by, rural-urban factory workers in Shenzhen living in aggregations in neighbouring or the same factories where they lived in different dorms close to each other rather than independent accommodations. To properly explain this finding, further studies are needed. An additional explanation could be that when one worker moved, their relatives or family members, living in another dorm of the same factory may well follow.

Through the basic analyses, in conclusion, after around half a year, those who were more marginalized, vulnerable and showed higher mobility at T1 were more likely to have left the original job. This fact creates a serious concern by us in that these more fragile and unstable

leavers constitute the most risky group in terms of disease morbidity, health needs, and they may also represent a special group with special healthcare utilisation and in need of health insurance coverage.

Table 6-2 Age-and-sex adjusted percentages of selected health status and healthcare utilisation factors (scaled SRH, CES-D scores, two-week illness report and dichotomized professional healthcare utilisation) between P_1 and P_2 (T1) amongst migrant factory workers, Shenzhen, China

Factors at T1	%, *Standard Errors*		*p†*
	P_1(*n* = 833)	P_2(*n* = 509)	
Very poor, poor or fair SRH	28.7, 0.43	42.5, 0.41	< 0.01
Clinically-relevant DS	18.1, 0.09	25.8, 0.11	< 0.01
Two-week illness	17.4, 0.10	27.8, 0.07	< 0.01
Dichotomized professional healthcare utilisation (% of users)	7.90, 0.03	9.89, 0.02	< 0.01

Note: † using chi square tests

Table 6-2 confirmed that those who had left had higher proportions of 1) reporting very poor, poor or fair scaled SRH, 2) being categorized as having clinically relavent DS, 3) reporting illness in the past two weeks, and 4) using professional healthcare services when they were sick. Our findings demonstrated that those who had left reported substantially poorer overall health, higher health needs and heavier health service utilisation at baseline than those who had stayed. It was unsure whether the workers' baseline socio-demographic and job-related factors, or their health status and utilisation factors, contributed more to their leaving at T2. However, these findings shown above disclosed that firstly prominent and statistically significant health disparities existed between P_1 and P_2, and secondly leavers were most likely to be with adverse (except for a few characteristics such as family accompaniment) SES, migratory histories, to show poorer health status, to report higher care needs and heavier service utilisation. Since a higher percentage of workers who had left were uninsured, we

assume that when they used the health services in Shenzhen, they were more likely to pay out-of-pocket than their stayed peers, who were better covered by MISM thus spent less on medical bills.

However, one caution must be mentioned that if only those who had reported two-week illness at T1were counted, the proportions of healthcare utilization out of sick workers amongst P_1 and P_2 was 45.4% and 35.6%, respectively. This illustrated that although in general P_2 were heavier users of professional healthcare, the sick of P_2 utilised healthcare services less than the sick of P_1. When the workers who had left at T2 were sick at T1, they were less likely to seek professional healthcare as compared with the sick workers who had not left at T2.

6.4 Relative risk estimation for whether or not the migrant workers left

To better adjust for SES and migratory histories of P_1 and P_2 at baseline, we constructed four independent models to conduct multivariate analyses of stay-or-leave choice to specify impacts of workers' health status, health needs and professional healthcare utilisation at T1 on workers' leaving behaviours over 6 months. The models mainly evaluated the effect of health-related characteristics on the mobility beyond the part of the effect that was mediated by SES and baseline migratory histories of migrant factory workers. The reason we chose four independent models with only one concerned health-related factor being put in the model was trying to avoid multicollinearity as we know SRH was closely related with DS and two-week illness in our former analyses. The results are shown in Table 6-3.

Table 6-3 leaving original jobs amongst migrant factory workers in subjects with very poor/poor/fair SRH, clinically relevant DS, two-week illness and professional healthcare utilisation relative to subjects without them

Health-related factors	The *RR* of leaving the original jobs over 6 months		
	RR	95%*CI*	*p* value†
Very poor, poor or fair SRH	1.62	1.27, 2.03	**
Clincally-relavent DS	1.34	1.12, 1.59	**
Two-week illness	1.79	1.34, 2.11	‡
Professional healthcare utilisation	1.29	1.11, 1.43	*

Note: † all analyses adjusted for the workers' characteristics presented in Table 6-1
** $p < 0.05$, ** $p < 0.01$, ‡ $p = 0.000$*

Results from Table 6-3 shows that the presence of very poor/poor/fair SRH, clinically relevant DS, two-week illness and professional healthcare utilisation at baseline all significantly increased the probability of migrant workers' leaving within 6 months. These results were fully adjusted by all SES, migratory history and health insurance participation, factors listed in Table 6-1.

6.4.1 Key findings

The most mobile, defined in our study as those who had left within 6-month period, were not only of adverse socio-demographic characteristics, but also of poorer health status, higher healthcare needs and had heavier utilisation. Implication of these findings pointed to 1) social and health disparity amongst migrant factory workers, even this whole group was described by many scholars as "marginalized"; 2) issues related to uninsured heavy users of healthcare services and the practical way of involving the most invisible rural-urban workers in Shenzhen's MISM or any other urban health insurance schemes; and 3) the future research

needs to track those who had left in the hope of characterizing rural-urban industrial migrants' moving trend, which may suggest health insurance policies at a higher level.

6.5 Impacts of health insurance, baseline SES, and health status on healthcare utilisation and expenditures

6.5.1 Data and the problems

The stayers answered questions at T2 regarding 1) major SES changes that included moving of accommodations, family accompaniment, marriage, intention of stay, and recent monthly income; 2) health status: SRH and DS; 3) health insurance status; and 4) 6-month illness and healthcare utilisation in the past 6 months. The above main components were used to track stayed migrant workers' change in SES, SRH, DS, insurance and healthcare utilization over 6 months.

Since the health insurance status was a changing parameter for some workers and no accurate measurement of exposure in the 6-month period was given in our survey at T2 and no insured worker had quit the insurance over the 6 months, we then composed a new variable called new participants (1= newly insured any time in the past 6 months, 0 = still uninsured at T2). Of all who stayed, 723 (86.8%) reported being insured by MISM at T1, 17 became insured during the 6-month period (2.0%) and 93 were still uninsured at T2.

In addition, information on the total healthcare expenditures of the 6 month period between T1 and T2 were collected. The *healthcare expenditures were exclusive of reimbursement from MISM or any other financial support from the employers or the society.* The expenditure of healthcare also excluded any extra opportunity costs (i.e., deduction of bonus or salary), transportation or any other healthcare-related indirect spending. It can be

translated as direct, out-of-pocket healthcare costs in the past 6 months at T2. Personal costs on self-medication were included in the calculation of this item.

We also calculated the total occasions of doctor visits and *personal spending on professional healthcare utilisation* within the 6 months.

In this section, analyses are focusing on two issues: 1) Which of the major SES and health status factors accounted for higher personal healthcare expenditures of the migrant workers who had stayed, if impact of health insurance was controlled; and 2) How did health insurance statuses influence healthcare utilization and workers' personal healthcare utilization and health expenditures within the study period of 6 months.

6.5.2 Statistics and results

Of all who stayed, the median healthcare cost was 169 *RMB*, with no **sex** difference detected (female 151 RMB, male 174 RMB, $p > 0.05$, Kruskal-Wallis non-parametric test). However, those who stayed with different **health insurance** statuses showed statistically significant difference on personal healthcare expenditures between T1 and T2. Those who were insured at T1, those who were insured at T2 and those who had been uncovered by MISM during the whole study period reported a median healthcare expenditure of 104 *RMB*, 167 *RMB* and 193 *RMB*, respectively ($\chi^2 = 6.217$, $p < 0.05$, Wilcoxon non-parametric test, Table 6-4, the first row).

Differences in personal healthcare expenditure between workers with different SES and health status (sex, age group, education, monthly income at T2, existence of longstanding illness, clinically relevant DS and SRH) were tested by the *F*-test of the regression parameters in correspondence with each feature in a linear regression model, additionally adjusted for health insurance participation during the study period. This step was to evaluate the effect of

each SES or health status item on healthcare expenditures in the 6 months beyond the part of effect which was mediated by health insurance (Table 6-4).

Table 6-4 shows 6-month total healthcare expenditures by sex, age group, education, monthly income at T2, existence of longstanding illness at baseline, clinically relevant DS (T1) and SRH (T1), fully adjusted for insurance statuses during T1 and T2.

Table 6-4 Median healthcare expenditures (*RMB*) in the past 6 months at T2 by insurance status and selected characteristics of migrant factory workers in Shenzhen, China 2009.

Characteristics	Health Insurance participation			Significant level†
	Insured at T1	Insured at T2	Not insured	
Total	104	167	193	**‡
Sex				
Female	91	134	188	
Male	104	129	191	
Age group				**
<20	81	138	269	
20~39	94	145	271	
40~	117	179	365	
Education				
Junior high or below	104	151	191	
Above junior high	98	142	206	
Monthly income at T2				*
On or above average	101	122	162	
Below average	121	145	204	
Existence of longstanding illness				**
Yes at T1	144	162	321	
No at T1	85	114	196	
Clinically relevant DS				
Yes	142	150	161	
No	143	154	172	
SRH				**
Very poor, poor or fair	217	265	323	
Excellent or good	95	112	145	

*Note: * $p < 0.05$, ** $p < 0.01$*

† Significance of the regression parameter of the selected characteristics in a linear regression on total cost, adjusted for health insurance status.

‡ Wilcoxon non-parametric test

The above results indicated that increased age, lower income, existence of longstanding illness (which included chronic diseases) and poorer SRH increased migrant workers' healthcare expenditures that were paid out-of-pocket over the 6-month period of our study.

Other than the primary comparison using non-parametric test for all healthcare costs inclusive of self-medication expenditures, the impacts of health insurance participation on professional healthcare service utilisation was another major concern. To do so, we combined health insurance status at T1 and new participant at T2 both in the analyses as independent variables. We used professional healthcare related expenditures which were exclusive of self-medication or other costs such as transportation or salary deduction in the analyses.

Multivariate analysis of health service utilisation was conducted using a two-part model which separated the incidence of ustilisation (dichotomized professional healthcare utilisation) from the quantity (occasions) of health service use. The incidence model adopted a Poisson regression approach [212]and the parameters equaled to *log(RR)* of dichotomized professional healthcare utilisation (had ever used professional healthcare = 1, other options = 0) any time during the 6-month period between T1 and T2. For those who had ever used professional healthcare, the quantity of utilisation was analyzed in a generalized linear model (GLM) using a Gamma distribution and a logarithmic link function. Meaning of the output parameters can be interpreted as the log of a (multiplicative) factor how much more the service was used compared to a baseline class. A total effect of health insurance was straightforwardly calculated by multiplying the *RR* from model 1 and the factor values of model 2. To correct for multiple comparisons (false negative rate), *p* values were adjusted to show level of significance [213]. The results, showing in Table 6-5, gives an estimation of the differences in incidence and occasions of professional healthcare utilisation that are attributable to health insurance status independent of all major SES and health status factors listed in Table 6-4. Being insured and having longer exposure of health insurance significantly increased migrant

workers' likelihood to use professional healthcare in Shenzhen (RR_1 = 1.619; RR_2 = 1.421) in the 6-month period. However, concerning the impacts of health insurance on occasions of professional healthcare utilisation in the 6 months of follow-up, reduced occasions were found (RR_3 = 0.867; RR_4 = 0.790). The combined effects on professional healthcare utilisation for workers who reported having been insured since T1 was 1.404 and for workers reported being insured at T2 was 1.123, as compared to migrant workers who had stayed but had not been covered by MISM during the whole study period. Insurance coverage at T1 and T2 significantly increased worker's likelihood of using professional healthcare by 40% and 12%, respectively, if the occasions of visit were considered. These findings can be translated as those who reported being insured at T1 were most likely to use professional healthcare, followed by those who reported being insured between T1 and T2 whilst those who had never reported being covered by MISM were the least likely to see a doctor during the study period. Health insurance significantly increased migrant factory workers possibility to use professional healthcare in Shenzhen.

Analyses on professional healthcare expenditures indicated that insurance was significantly and causally associated with a decrease in professional healthcare expenditures which were paid out-of-pocket by migrant workers during the 6-month study period by 64% (all insured), 75% (insured at T1), and 46% respectively (Table 6-5).

In conclusion, health insurance (the MISM) was attributable to an increase in professional healthcare utilisation whilst a decrease in out-of-pocket payments related to the professional healthcare. Longer length of insurance coverage amongst migrant factory workers who stayed was significantly related higher likelihood of professional healthcare utilisation and lower personal costs; although no accurate measurement of exposure time had been adopted. This effect, independent of important SES and health status factors, only holds for those who

stayed. If personal spending on self-medication or treatment was counted, the insured (at T1) were also the subgroup that spent the least on healthcare.

Table 6-5 Professional healthcare utilisation and expenditures in migrant workers by health insurance status at T1 and T2 relative to workers without health insurance anytime during the study period, adjusted for major SES and health status parameters in Shenzhen, China.

Items	Relative Risks of any use of professional healthcare at all in 6 months between T1 and T2			Multiplicative factor how much more workers with different insurance status use professional service			Combined effect
	RR	*95% CI*	*p†*	*RR*	*95% CI*	*p†*	
Professional healthcare of the insured (T1)	1.619	1.316, 1.926	0.001	0.867	0.780, 0.942	0.013	1.404
All professional healthcare expenditures of the insured (insured at T1)	0.457	0.231, 0.687	0.000	0.542	0.412, 0.668	0.001	0.248
Professional healthcare of the insured (T2)	1.421	1.192, 1.651	0.014	0.790	0.655, 0.925	0.010	1.123
All professional healthcare expenditures of the insured (insured at T2)	0.668	0.378, 0.899	0.012	0.802	0.653, 0.951	0.013	0.536
Professional healthcare of the insured (anytime)	1.511	1.211, 1.784	0.011	0.823	0.667, 0.970	0.015	1.244
All professional healthcare expenditures of the insured (anytime)	0.543	0.374, 0.715	0.002	0.664	0.508, 0.823	0.006	0.361

Note: † To correct errors caused by multiple testing, the level of significance was set to 0.021

6.6 Differences over time amongst those who stayed

6.6.1 Question for this section and modeling

CES-D score and the single-item indicator assessing general SRH were recommended by former literatures as good proxies for health outcome measures [214]. Previous analyses on study 1 have shown that subjective intention to stay for a shorter time was associated with poorer mental health status (see Table 5-7) and that confirmed subjective intension to stay was less likely to be associated with poorer SRH (see Table 5-3-2 and 5-3-3) as compared with "unsure" status for subjective IOS. In study 2, we are concerned about changes in health outcomes over time and the corresponding SES factors or migratory histories that contributed to the changes, if any.

We tested the prospective relationships between baseline SES and depression symptoms and SRH using longitudinal models adopted from models suggested by Schulz et al. [214, 215]. The models used health outcomes (CES-D total scores and SRH) changes over time (T1-T2) as dependent variables whilst SES, migratory histories and health indicators at T1 (and change over time for income) were taken as independent variables. For SES and migratory histories, we chose sex, age (years), level of education, marital status (single, married or other), monthly income (*Yuan*, RMB), IOS, accumulated working time (AWT) in Shenzhen and dorm living (yes or no). The model can be expressed as the following equations:

$$CES-D_{T2}-\text{CES-D}_{T1}=\alpha+\beta_1 sex_{T1}+\beta_2 age_{T1}+\beta_3 education_{T1}+\beta_4 marital\_status_{T1}$$
$$+\beta_5 income_{T1}+\beta_6\ (income_1-income_2)+\beta_{7T1}AWT_{T1}+\beta_8\text{IOS}_{T1}+\beta_9 dorm\_living_{T1}+\beta_{10}CES-D_{T1}+\varepsilon_1 \quad \text{.....(1)}$$

$$SRH_{T2}-SRH_{T1}=\alpha+\beta_1\ sex_{T1}+\beta_2 age_{T1}+\beta_3 education_{T1}+\beta_4 marital\_status_{T1}$$
$$+\beta_5 income_{T1}+\beta_6\ (income_1-income_2)+\beta_{7T1}AWT_{T1}+\beta_8\text{IOS}_{T1}+\beta_9 dorm\_living_{T1}\beta_9 SRH_{T1}+\varepsilon_2 \quad \text{.....(2)}$$

We have not included job contract because amongst workers who stayed, very few were without job contract. The coefficients of the above two models can be interpreted as quantity of 1) cross-sectional effect of each baseline characteristics on a change in health outcomes; and 2) a change in economic income over time on a change in health outcomes of interest.

To assess multi-collinearity among the main independent variables, we tested bivariate correlations and variance inflation factors. It was found that sex was bivariately correlated with almost all other independent variables and age was correlated with marital status, dorm living and AWT at T1. Besides, level of education was correlated with income at T1 and T2, AWT, IOS and dorm living. Economic income at baseline was modestly related to income at T2 ($r = 0.58$, $p < 0.05$). SRH and CES-D at T1 were mildly correlated with sex, IOS, education and AWT. The results indicated that changes of CES-D and SRH were related to baseline CES-D ($r = 0.52$, $p < 0.05$) and SRH ($r = 0.61$, $p < 0.05$), respectively. However, the VIF values for all regression models that we conducted to combine different independent variables were all below 5 (VIFs = 1.04~3.89), threshold values recommended indicating concern about multicollinearity [216].

6.6.2 Results

Results of the perspective models are listed in Table 6-6. These findings clearly indicated that baseline health outcomes were positively related to ***positive changes*** of health outcomes over time (***positive changes*** here meant pessimistic/adverse change in our study on CES-D and SRH as both of the higher scores implied worse health status). Economic income at baseline and change of income over 6 months were both negatively related to ***positive changes*** of health outcomes, implying that better economic status at T1 or improvement in income between T1 and T2 resulted in better health outcomes as measured by CES-D and SRH. Being female, having lower educational attainment, being with shorter or unspecified AWT, living in dorms, and being not sure about IOS were all positively associated with poorer changes of CES-D and SRH within 6 months.

Table 6-6 Longitudinal effects of SES (T1, except for income (T2-T1)), migratory histories and baseline health outcomes on the change in health outcomes (CES-D total scores and SRH) (T2-T1) amongst Shenzhen migrant factory workers who had stayed (n = 833)

Independent factors	Model1 Change of CES-D		Model 2 Change of SRH	
	ß	95% CI for ß	ß	95% CI for ß
Sex				
Male¶	0.000	-	0.000	-
Female	0.243	0.211, 0.280**	0.143	0.088, 0.199*
Age (years)	0.068	0.051, 0.085**		
Education				
Senior high or above¶	0.000	-	0.000	-
Below senior high	0.485	0.456, 0.514**	0.256	0.138, 0.375**
Marital status				
Single	0.000	-0.005, 0.004	0.001	-0.002, 0.004
Married¶	0.000	-	0.000	-
Other	0.001	-0.004, 0.003	0.002	-0.007, 0.010
Income (*RMB Yuan*)	-0.256	-0.278, -0.230**	-0.131	-0.160, -0.101**
Change in income	-0.187	-0.199, -0.173**	-0.009	-0.002, 0.016*
AWT				
<= 1y	0.356	0.213, 0.500**	0.013	0.005, 0.022*
>1y¶	0.000	-	0.000	-
Unspecified	0.568	0.350, 0.789*	0.021	0.013, 0.030*
IOS				
Less than 3m	0.210	0.010, 0.033*	-0.023	-0.056, 0.005

3m~less than 1y	0.000	-0.002, 0.001	-0.001	-0.004, 0.002
1y~¶	0.000	-	0.000	-
Not sure	0.450	0.423, 0.478**	0.312	0.201, 0.414**
Dorm living				
Yes	0.132	0.050, 0.214**	0.141	0.110, 0.173**
No¶	0.000	-	0.000	-
CES-D scores at T1	0.650	0.320, 0.990**	NA	
SRH at T1‡	NA		0.705	0.511, 0.900**

Note: ¶ *reference groups;* * $p < 0.05$; ** $p < 0.01$; ‡ 5-scale SRH (1 = excellent, 5 = very poor)

6.7 Key findings of study 2

Our study successfully tracked 61.1% (n = 833) of the one-third subsample of 4088 migrant factory workers. The time span between study 1 and 2 was 6 months. No difference was found between P and P_0, however comparisons between P_1 and P_2 showed significant disparities in many aspects, implying that those who had left were of poorer SES (except for family accompaniment) and were more mobile.

Also P_2 had higher proportions of reporting poorer SRH, poorer mental health, higher health needs and heavier utilisation of professional healthcare services.

Results particularly indicated that increased age, lower income, existence of longstanding illness and poorer SRH at T1 increased migrant workers' healthcare expenditures that were paid out-of-pocket over the 6-month period.

Health insurance (the MISM), on the other hand, was attributable to an increase in professional healthcare utilisation when workers were sick, whilst a decrease in out-of-pocket payments related to the professional healthcare. Longer length of insurance coverage amongst migrant factory workers who stayed was significantly related higher likelihood of professional healthcare utilisation and lower personal costs for medical bills.

The last section of this chapter showed that migrant factory workers' baseline SES, change of income over time and their baseline health indicators (SRH and CES-D) were good references for their longitudinal health outcomes, with those of poorer SES, were more mobile and by poorer baseline health indicators showing less optimal health indicator change over 6 months.

Study 2 confirmed that some level of health inequity and inequality existed between P_1 and P_2 and within P_2 using various SES, migratory histories and workers' baseline health status. Holding inferior SES, being more mobile, less healthy, less likely to be covered by insurance, having higher healthcare needs, paying more for service and experiencing worse changes of health status over time seemed to be a vicious cycle. To break the inverse care law [217] existing amongst our research subjects, public health strategies focusing on migrant population are needed and called for.

CHAPTER 7 SUMMARY, POLICY IMPLICATIONS AND CONCLUSION

7.1 Summary of the study

7.1.1 Summary of all key findings

Table 7-1 presents all key points of our findings in studies one and two.

Table 7-1 Key findings of the study

Items	Findings
Demograpgy	▪ Geographic complexity ▪ Various ethnicities across mainland China ▪ More female than male ▪ Average age 27.36 years ▪ Many had finished secondary education, lived in factory dorms, worked on assembly lines, were without family accompaniment and were unsure about their stay ▪ Long working hours ▪ Low payment
SRH	▪ Major correlates of DS: social support, mental health, SRH and working and living conditions. ▪ No gender association found. ▪ Need to focus on modifiable factors ▪ 5-scale SRH and VAS SRH were closely correlated
Mental health	▪ Major correlates of DS, particularly in relation to their social support, mental health, SRH and working and living conditions. ▪ No gender association was found in migrant factory workers.
Rubella seroprevalence in female MFWs	▪ The seroprevalence of antibodies to rubella is not high enough to provide immunity in the population. ▪ Local health authorities in Shenzhen should consider immunization or rubella programs combined with measles vaccination amongst this population.
Behavioural risk factors	▪ 69.2% described as never smokers, 5.6%, 11.4% and 2.1% reported to be current casual smokers, current daily smokers and heavy daily smokers, respectively ▪ In general, sex, age, education, sleeping hours per day and internet use were associated with being a

	current smoker. ▪ Sex differences in drinking frequency and occasions of being drunk in the previous year were significant. ▪ Smoking and drinking were closely related. ▪ Smoking, drinking, clinically relevant DS, SRH and disease neglecting were all associated with frequent internet use
Two-week illness and patterns of healthcare utilisation	▪ The crude two-week illness rate was 21.6%. ▪ ORs for two-week illness report were above 1 for workers who had been to other cities, worked long hours per day, were daily smokers, reported very poor, poor or fair SRH and had clinically relevant DS, whilst ORs of those who had senior high or above education and worked as assembly line workers were below 1. ▪ More than half of the workers' time of last-doctor-visit was half a year ago or earlier. ▪ Migrant factory workers' were most likely to choose CHCs ▪ More than half of sick migrant workers chose self-treatment or self-medication and 11.6% neglected their sickness. ▪ A mixed health use model ▪ Self-perception of disease being not severe, lack of time and economic difficulties were the major explanations for not taking the advice of doctors
Cohort: SES and health indicators at T1	▪ Workers who were female, younger, single, accompanied by family members, had shorter time of staying, living in dorms, working as assembly line workers, without job contract and without health insurance in study 1 were more likely to have left. ▪ Those who were heavier users of professional health services, reported two-week illness, with poorer SRH and mental health in study 1 were more likely to have left their jobs.
Cohort: SES and health indicators at T2	▪ Being insured and having longer exposure of health insurance significantly increased workers' likelihood to use professional healthcare, decreased their total occasions of professional healthcare utilisation, and decrease their professional healthcare expenditures (out-of-pocket). ▪ Better baseline CES-D, SRH, and SES predicted better change in health indicators.
Key issues	Mobility, marginalized, internal inequity, health insurance evaluation, reconsideration of health service policy

7.1.2 Study background summary

Rural-urban peasant workers have played a key role in economic growth in China. Their presence in the cities creates national wealth, reduces labour costs, generates demand for goods and services, and placates rural society with their remitted income[31, 37, 38, 117, 218]; the workers' presence in the cities also reduces joblessness in the countryside.

Unfortunately, even the most optimistic estimate predicted that at least 20 million of the 130 million migrant workers had lost their urban jobs in 2009, with factories in the PRD particularly hard hit by the slump in export markets. Manufacturers in this area have already been severely affected by various policy developments in recent years, such as tightening of regulations over labor protection, an unfavorable *RMB* exchange rate, and forced relocation of production triggered by Guangdong Province's policy of technological upgrading. The untimely disappearance of orders from U.S. consumers is a body blow for many struggling factories in the south; temporary closures or massive layoffs have more or less become routine in the region since 2009 [114].

This study coincided with the economic downturn which started from 2008 and continued into 2009. During January to June 2009, factories moving to the western part of China hit the highest historical peak (study 1). This was followed by large-scale factory worker dismissal and factory closure throughout the rest of year 2009 (study 2), mainly seen in small factories, backyard workshops, and working units that were substantially excluded in our study due to a formal-registration based sampling frame at the baseline. No factory in our project moved, closed or massively reduced workers between study 1 and study 2, nevertheless not all of the disappeared migrant factory workers left because of their own free will (study 2 P_2).

Our study did not seek to compare between migrants and local residents or peasants in rural areas, and *Hukou* system and its related impacts on traditional Chinese society as well as lifestyle change of rural-urban workers have been described in other studies. Three major rationales supported our study design. These were that:

1) The living and working conditions of migrants, residents and left-behind peasants differ substantially, making sampling in these three types of populations difficult, less cost-effective and even impossible within limited time and financial resources;

2) The Shenzhen factory rural-urban workers had not been studied from a health policy perspective before, making our focus on them practical and meaningful, especially using partial cohort design which allowed a prospective study to be set up; and

3) Inequity and inequality amongst the migrant factory workers themselves may help local health authority understand any limitation or pitfalls of the health service planning specifically focused on rural-urban migrants of the city.

The study was a response to Shenzhen health authorities' recognition of the city's expanding migrant worker issue and needs to rethink, evaluate and revise its health policy including the health insurance renovation, for employed internal migrants, which was a pioneer of its kind in the country [4]. The health policy also refers to one of the most vital tasks, which is to establish CHCs, to link them with MISM regarding payment (high coverage and low economic barrier), and to link care in the communities (primary care, physical accessibility) with preventive medicine, health education and promotion (disease prevention), as well as secondary or tertiary care (reference system). Therefore, our study functions as a starting point to systematically

understand health and health service utilisation amongst migrant factory workers. It provides first-hand, empirical information on their SES, mobility, general health status, health seeking behaviors and major barriers to care, from the perspective of the local health authority.

However, we believe our study has further implications in terms of academic discussion. Social determinants of health (or health inequities) [219] is a widely accepted theoretic framework in the field of public health. Our study applies this framework to figure out health gaps within the community of migrant factory workers by different SES, migratory histories and work-related characters. Although indices used are not direct mortality or morbidity statistics, this study combined a serious of proxies including SRH, clinically relevant DS, infectious disease risks, smoking, two-week illness, health insurance and healthcare utilisation to measure migrant factory workers' health status, needs and service utilisation patterns. Since the mean age of the population of Shenzhen is only 30.8 and that of our study 27.4 we feel these indicators are more relevant since chronic disease is more characteristically found in older populations. Our findings elaborated Marmot's theories in an internal Chinese migrant worker community.

7.1.3 Summary of response rates and the lost migrant factory workers

The MWHHUS acquired a response rate of 95.51% in study 1 and of the 854 staying factory workers in study 2 the response rate was 97.5%. In total, 37.3% of followed workers left their original job within 6 months, reflecting a typical rotation rhythm of the rural-urban migrant factory workers in the legally registered factory settings in Shenzhen.

It is unsure whether those workers who left had moved to another job in Shenzhen or had left for other cities in China or had returned back to their hometown. Information on their next destinations is quite vital if a panoramic view is to be achieved, yet not available in our study.

Those who were lost in our follow-up study represented a troop of migrant workers with very high mobility (P_2 had stayed for a shorter time period than P_1 in study 2), though may not be as high as those working in small-scale, illegal, unregistered factories or those who were unemployed thus we could not capture in this study. From the perspective of national health policy planning, more research to explore the most invisible migrants and their health needs is imperative.

The concept of "the most invisible migrants" is important for understanding the very sophisticated internal migration phenomenon in mainland China and the gradients of migrants with different SES. Figure 7-1 shows a theoretical level of migrants' SES. In this figure, the most invisible migrants referred to are those who are the most difficult to be followed and studied. Although all are internal migrants, these different populations have their specific health profiles and implications for health policy thus further specific studies are necessary.

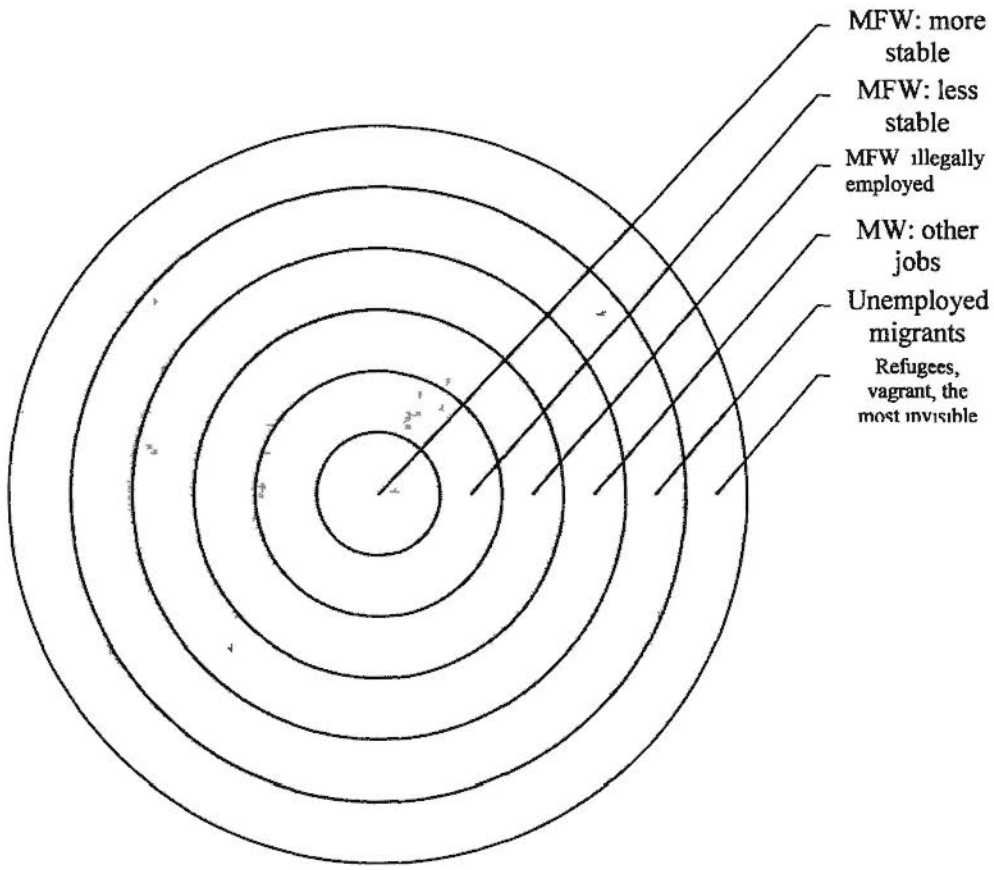

Figure 7-1 level of internal migrants by SES
Note: size of the cirque does not represent population size of each migrant subgroup

7.1.4 Summary of the potential implications for health strategies

At local level, analyses on the current available information are helpful in revising, shaping and evaluating health service and insurance policies. A good example was that in 2010 a few communities and CHCs began to initiate free combined measles-and-rubella mop-up immunization programme amongst migrant factory female workers at childbearing age on a voluntary basis, after the Chinese-version report of the rubella serological study had been released and

reviewed by the Commission of Health Shenzhen. Besides, current results may also help those metropolitan districts that face similar processes of urbanization and industrialization as Shenzhen as they revise their health strategies taking migrants as an important consideration. Given the enormous rural-urban migration in China and the very large proportion of rural-urban migrants employed in the factory in many urban settings, Shenzhen's experience and data can act as a good reference to understand migrant workers, their health needs and health service utilisation pattern, to draft health service supply plans and modify quality improvement of urban healthcare regarding rural-urban migrants' specific needs and characteristics.

7.2 Interpretation of the results

7.2.1 Migrants' health vulnerability and attributable factors

Although an initial *healthy immigrant effect* has been observed in migrant populations [13], the risk of poor health appears to rise with increasing length of migration [198].

Globally this has been attributed to contextual and situational factors such as poorer and less stable working and living conditions [199, 200] and adapting to and coping with changes in traditions, lifestyles, and pace of life [198]. The separation of migrant workers from family and home communities increases their vulnerability to peer and urban influences.

In China, the *Hukou* system acts as an additional barrier to rural-to-urban migrants in accessing education, health insurance, housing entitlements and other social welfare systems in urban areas [220]. Discrimination against migrant workers is also common [35, 147]. In terms of migrant factory workers' urban life experience, we are

inclined to describe it with four aspects: 1) high mobility; 2) prevailing working-living arrangement and lack of social support from family, especially in young and female workers; 3) low SES and heavy economic burdens from the rural family as reflected by remittance; 4) lack of health awareness, health insurance and living with high health risks in those of lower SES strata in this population. All the above factors impair their health with the poorer, more mobile, with the lower SES strata suffering more. Our study showed that these four aspects of adverse social and economic determinants concurred in making some migrant factory workers at an extreme marginalized situation and to result in their poor health, although these findings were not exactly in accordance with the framework of HIE. For example we have observed that male workers who had an accumulated working time less than 3 years were much less likely to report poor SRH as compared with those who had spent more than 5 years in the city. Whilst concerning mental health, longer subjective intension of stay instead of actual time spending in Shenzhen was predictive in telling a worker's risk of DS. Although in the univariate analysis, accumulated working time has been found to be related to prevalence of clinically relevant DS, poor SRH and smoking behaviours, evidence gained from our study is insufficient to defend or challenge the HIE theories. Firstly, no comparison between rural peasants/local residents and the factory migrant workers was available; Secondly, neither the study 1 nor the 6-month-long study 2 can provide persuasive support for the time effect of internal migration on health due to either the feature of the study (cross-sectional) or limited observation period (6 months only). Thus our analysis focused more on factory worker's living and working environment, and social support other than on the time of migration solely.

7.2.2 Health impacts of migratory histories and SES

Population migration is a common phenomenon in the twenty-first century. Estimates suggest that in 2050 there will be 230 million migrants internationally [221]. However, the newly released "Report on China's floating population development, 2010" claimed that in 2009, China's internal floating population has reached 211 million already [202].

In our study, 54.9% of the sampled MFWs lived in dorms and 63.2% of them were unaccompanied.

Alternative living arrangements may exist for married older couples, middle-level technicians or administrative workers who are economically more comfortable to afford flat rents or in those who need to take care of children and/or elderly thus are normally excluded from the dorm living name list.

The key nature of the Chinese *dormitory labour system* is to provide migrant labours cheap and almost identical accommodation rooms within the factory compound or close to it [123] so that this living-at-work arrangement under capitalism can be well fitted into the production rhythm of the employers. One report on an Asian research community [122] pointed out in May 2009 that:

"The political economy of providing accommodation close to the factory is the linkage it supports between state and the capital. Since the migrant working class is deprived of citizenship rights to stay in the city, the state through residency controls allows labour mobility, but workers must have employment to support temporary residence. Dormitories facilitate the temporary attachment or capture of labour by the companies, but also the massive circulation of labour, and hence the holding down of wages and the extensive lengthening of the working day, as working space and living space are integrated by the employer and state. A hybrid, transient workforce is created, circulating between factory and countryside, dominated by employers' control over housing needs and state controls over residency permits."

The adverse health impacts that dorm living has on migrant factory workers are complex, and there have been very few literature exploring the mechanism and health outcomes of dorm living. Yet, increased morbidity has been found for certain infectious diseases amongst factory workers who lived in dorms due to ill hygiene and intensive personal contacts [67, 176, 177]. Another most concerned issue was the increased mental health problems possibly by reason of high population density, increased interpersonal conflicts, and lack of family or partner's support. Suicidal ideation and successful suicide cases were observed in Shenzhen factories [222] and identified by the local health officials as a very important public health issue. However research focus on the links between mental health and dorm living is also scarce in this part of China. This study revealed that depressive symptoms are quite prevalent in the factory communities, with the more marginalized subgroups (except for education) suffering more.

In general, most of our sampled workers had an average education of junior high school. However, poor health awareness and insufficient information on health insurance (benefits, rules, and reimbursement guidelines) have been observed. Those who were with higher education were more likely to report depressive symptoms and two-week illness but less likely to have behavioural risk factors or infectious disease risks.

Impacts of other SES factors on health and health service utilisation varied. Sex, age and marriage showed different correlations with each other. The older the worker, the poorer their SRH, and the more likely they reported to be a smoker. Similar trends in deteriorating health were found as time working in the city accumulated.

The pattern for mobility showed that married male, older workers, those who had stayed longer in Shenzhen and those with a contract tended to be less mobile over the

6 months between study 1 and study 2 than female, younger, single workers, and workers with shorter migratory histories or without job contract. However, as this project only lasted for 6 month, the whole picture of migrant factory workers' moving trend needs further follow-ups and exploration over a longer time.

Whether the current sex-age distribution which shows the older workers to have a lower percentage of females in the group reflects the natural rural-urban migration selection (older female factory workers returned home or changed job) or selection bias because only formally registered factories were included (assuming more female with poor SES worked in small, illegal factories), or both, is still unknown.

Living with family and marriage were both important for migrants' mental health, whilst in male workers living with family increased workers' likelihood of being a current heavy smoker after accommodation and marriage were controlled. For both genders, living with family increased workers' likelihood to move over the period of study 1 and 2. It decreased workers' likelihood to report two-week illness after marriage, age, accommodation, insurance and SRH were controlled. The adverse health impacts of rural-urban migration with family may result from a heavier economic burden coming from the rural-urban living expenditure difference and more elderly/children to support, but the actual mechanisms are to be further clarified.

7.2.3 Migrant workers' health needs: illness report, health status, infection risks and risk behaviours

Generally good health was seen amongst the migrant factory workers of Shenzhen, of whom very few reported cancer, diabetes, cardiac diseases or hypertension. This fact was in contrast with the results found amongst the city's *Hukou* residents in 2008. For example, hypertension prevalence rate was 14.58% in

Shenzhen *Hukou* residents compared with 1.49% in our sample. Although the self-reporting method in this study may result in underestimation of the chronic diseases due to ignorance or neglecting of long-standing symptoms among workers, and although the age effect may be responsible for the discrepancy (median age of *Hukou* residents of Shenzhen was 35 years in 2000), this ten-fold effect signifies a strong information that difference may exist between local residents and factory migrant workers and that this difference can not be fully explained by under-reporting, given the comparable average age of the two populations.

Taking SRH as a globally-established and proved proxy for mortality and morbidity, this study found almost two thirds (64.2%) respondents had "excellent" or "good" answers to 5-scale SRH, better than that found amongst Beijing migrant workers (45.8%) [81].

However, the self-reported any two-week illness rate was 21.6%, which was comparatively higher than the Beijing study (12.5%). Considering the major differences of our study and the Beijing study in 2008 (insurance rate and sampling framework), jumping to a conclusion that Shenzhen migrants were having higher or lower health needs was insufficient and not objective. However, if taking the similar Shenzhen migrant factory survey in 2006 [5], which reported a two-week illness rate of 24.5% in migrant factory workers, as a reference, this study found a lower two-week illness rate, but it may not be statistically significant. Other than SES and migratory histories, working hours per day, clinically relevant DS, SRH, daily smoking and health insurance were prominently associated with two-week illness report. The negative relationship between two-week illness and health insurance could either illustrate inequality in health insurance coverage which had been discussed in our

former publication or heavier healthcare needs of the uninsured as compared with the insured which needs to be properly dealt with by the local health authority.

In addition, this sample had a higher two-week illness rate than the rate found in the 4th CNHS, although the difference was small. However, if taking the much younger average age of our sample into consideration, we assume the age standardized two-week illness rate would be much higher than that of the national survey results.

Mental health status measured by DS was poor in factory migrants, especially amongst those with shorter intention of stay, without job contract, with longer working hours per day and of ethnic origins and without family accompaniment. Recently, a total of 14-16 suicide attempts of migrant workers (resulting in 12 deaths) have taken place in just the first five months of this year (3 in the last 10 days of May), in a single giant factory complex, Foxconn in Shenzhen, the world's largest contract electronics manufacturer for major brand names such as Apple, Dell and Toshiba. These series of successful suicide cases have revealed to the world a great deal more about the harsh conditions experienced by young Chinese migrant workers [223]

Surprisingly, workers with higher education also fell into the high risk group of clinically relevant DS in our study. This reminded us that other than known classical stressors for poor mental health, certain factors induced from good education among rural-urban workers should be paid attention to and addressed in future's mental health intervention programmes. The hypothesis of fact-expectation gap [35], however, could not be fully established and tested in this study. A qualitative study may be considered to well support finding evidence in this aspect.

We investigated serological status of rubella IgG amongst a subset of our female worker subjects as marker for infectious disease and its prevention and found that

childbearing age (defined as 20-39 years), being without job contract, being non-immune to measles, reporting "other" marital status and coming from southern or central provinces were associated with higher risk of being seronegative to rubella, a virus that may cause CRS in babies born to infected mothers. Our study points towards a potential risk of transmission and CRS during pregnancy amongst migrant factory women. The analysis of the relationship between seroprevalence and self-reported vaccine histories showed no association, reflecting that the awareness of rubella vaccination by personal recall of vaccine is very poor. This could reflect low levels of knowledge about rubella, signaling that more health education campaigns, outreach initiatives and screenings for childbearing age migrant women in community health centers could be beneficial.

Regarding smoking and drinking behaviours this MFW sample showed better results as compared to the rural residents (57.1% of the males and 3.1% of the females) [224], rural-urban migrants in other cities of China (Beijing, Males 51.7% and females 10.9%, aged 18-30 years) [196], or local residents of PRD (56.1% in men and in women, Guangzhou) [225]or population in other Chinese data (49% for male and 28% for all, 2004) [226]. What interested us most was not the overall low prevalence of smoking, but the uneven distribution of smoking and heavy smoking across SES, their migratory histories, job-related factors and mental health status, amongst other factors. The strong links between smoking, drinking, internet use and mental health are specific and studied in Shenzhen for the first time, suggesting the future public health campaigns aiming to reduce risk behaviours or mental illness in migrants should consider the above associates to better identify high risk populations and locations for health promotion activities.

7.2.4 Healthcare utilisation and health insurance

Utilisation of professional healthcare by migrant factory workers was insufficient. Around 30% of the workers had not visited a doctor within 1 year in study 1. Of all who had reported sickness in two weeks, the utilisation pattern was a mixture of TCM, OTC drugs and doctor visits mainly at private or employer-provided clinics and CHCs. Self-medication, neglecting acute illness and rejection of inpatient care were common. Lack of healthcare for acute illness or long-standing illness and low rate of preventive medicine use was also common amongst migrant factory workers in Shenzhen.

Self-perception of the disease not being severe, economic difficulties and time stringency were three major complaints for neglecting disease or rejection of inpatient care. Sick female workers' professional health service utilisation increased as they became older whilst sick male workers used professional care less as they became older. Frequent internet users, current heavy smokers, assembly line workers, those without job contract and those who had been worked in other cities were less likely to use professional healthcare when they fell sick. These patterns need further exploration.

The cross-sectional study found that health insurance participation was not associated with healthcare utilisation. However, over 6 months the baseline insurance participation significantly predicted a worker's likelihood of doctor visit and reduces their personal healthcare expenditures.

In our study, 65.2% of sick MFWs did not utilise professional health service, as compared with 38.2% in the CNHS, showing a sharp discrepancy of health utilization between our sample and the national health survey sample. This could also be considered as indirect evidence for factory migrant workers' health vulnerability. Study two clearly revealed that workers with higher mobility were also less healthy

and heavier users of healthcare in general. Despite the fact that the higher gross healthcare utilisation rate (numbers of person time utilisation/numbers of subjects) of the lost MFWs as compared with that of those who had stayed, those with higher mobility were less likely to utilise professional care when they were sick as shown in table 5-21. Seemingly, these findings were contradictory, but may indeed be very interesting to suggest the differences between MFWs with different levels of mobility concerning their health service usilisation patterns. On the one hand, when MFWs with higher mobility were sick, they were less likely than workers with lower mobility to use healthcare; on the other hand, rate of their overall use of health services was still higher than that of workers with lower mobility, probably due to a comparatively high two-week illness prevalence (as shown in Table 5-17). Because of the limited time and data, this study did not explore the complex relationship between overall utilisation and utilisation after being sick, but these preliminary findings provide a guideline for potential research in the future. Given the situation of the insufficient health insurance coverage, limited spare time and education amongst MFWs, utilisation should not be used as a proxy or an approximation of sickness as it had been treated in research carried out in countries where full health insurance coverage had been achieved. Instead, health seeking behaviours of MFWs in Shenzhen may well be explained by a function that considers but not limits to sickness, insurance, mobility, SES and physical accessibility of the health service.

7.2.5 Cohort profile: inequities found

Study 2 was based on follow-up of a random subset of the baseline migrant factory worker sample. Of the 1363 followed 6 months later, 37.3% had left their jobs and 21 stayed workers declined the invitation to be surveyed again. Options for left

workers may include: to return home, switch jobs in Shenzhen, migrate to another urban areas or become unemployed in Shenzhen or other locations.

The profile of those followed up showed that the more mobile the worker was at baseline, the higher possibility that he (she) would have left the original job at T2. The results also indicated that young females, workers who lived in dorms, were without work contract and health insurance, took an assembly line job and had family accompaniment were at higher risk of moving in the 6 months between T1 and T2, although their new destination was not yet clarified within our study period and the research design. Leaving an old job or/and moving to a new place seemed to be supported by family decision when unaccompanied workers were more likely to stick to their old jobs. This family-related moving activity may be interpreted as a signal that rural-urban workers' mobility is heavily influenced by their family members who may also live in urban dorms nearby. Their shared information, values and emotional ties were decisive for their move behaviours. Thus, public health campaigns such as immunization, health education or promotion programmes should consider their specific emotional needs to combat barriers and to achieve better effectiveness.

In addition, analyses showed that those who had left had poorer SRH, mental health, higher two-week illness report and heavier health service utilisation at baseline as compared with workers who had stayed.

The baseline health disparity between those staying and leaving at least hinted that special attention should be paid to universal health insurance coverage at national level so as to protect the more vulnerable, mobile industrial workers who were also at higher health risks from disease, poverty and to help them achieve health on a vertical equity basis. Also, tracking the moving pattern of these migrant workers' and health

indicators may be crucial to better support the national health insurance reform in the coming future.

Health inequity existed amongst workers who had stayed, too. It indicated that 1) lower SES, poorer health status and being uninsured at baseline predicted higher out-of-pocket healthcare expenditures in 6 months amongst those who had stayed; 2) health insurance was attributable to workers' higher possibility to use professional care when they were sick whilst reduced their personal expenditures; and 3) higher SES sub-groups and those who had better baseline health indicators experienced better changes in health indicators (SRH and mental health) as compared with the lower SES and poorer health groups. These findings were based on controlling of important associates, which had been confirmed in the former sections.

These findings revealing positive impacts of health insurance seemed to be inconsistent with what we found in study 1 (health insurance was not a predictive factor for healthare utilisation). One possible explanation may exist in the different mobility (hence different SES, health insurance coverage and health needs) of subjects involved in study 1 and study 2. Providing insurance for MFWs might be helpful to improve their likelihood of professional healthcare utilisation, decrease their total occasions of utilization and out-of-pocket expenditures if they stay longer enough. This effect did not exist when those who were with very high mobility were involved in the analysis. Also, better understanding of the MISM guidelines may take some time amongst those newly covered workers before they started to appreciate, use and benefit from the health services in Shenzhen.

7.3 Discussion on methodology

7.3.1 Study design

This study is an observational study, with no intervention being given to the subjects. As discussed earlier, manipulation of migration or moving decision is impractical, so is the control over MFWs' health insurance status. Neither did the study intervene with any health education or promotion practice.

This study describes inequities within the selected official MFW communities and compares their health related issues in a prospective way. However, no control group outside of MFW population was set up. Our aims, as a result, do not point to rural-urban discrepancies in health, or health inequities between urban *Hukou* holders and rural-urban MWs, although references may have been applied to provide and describe some basic backgrounds. The study was also unable to provide evidence for any conclusion that may involve health or healthcare utilisation of MWs from industries other than production factories, such as service sectors and construction fields. Unemployed or under-employed rural-urban migrants, children, adolescents or elderly are all excluded from the sampling, thus generalization and interpretation of our study findings needs special cautions.

Study 2 was 6 months away from study 1. This time arrangement warranted there were enough MFWs to be kept in the cohort and avoided massive seasonal loss of the workers at calendar New Year and the Chinese New Year. However, lack of longer time lengths of follow-up is a pitfall and the full picture of the social ecology of these rural-urban MFWs is yet to be finalized. Luckily, no factory closure and substantial downsize were seen in the 6 months period. We then assumed that the mobility trend discovered by our study represented an approximate natural model with the least

impacts from seasonal labour supply-and-demand fluctuate or economic environment in Shenzhen.

7.3.2 Sampling framework and representativeness of the formal factory sample

This study adopted a multistage random sampling method. For stage 1, factories were selected from government registration list. This process excluded small, unofficial enterprises and their employed migrant factory workers and no estimation on SES of these unofficial MWs can be given due to a lack of statistics. The second stage of sampling was in fact a stratified sampling by proportionate allocation of subjects to factories with different size of workforce. By this way, estimates can be made with equal accuracy in different units, and that comparisons of sub-groups can be made with equal statistical power. One other concern was that although the majority of our subjects were of rural background there were a small percentage of them came from small towns, counties and newly established/transferred towns or that their original rural *Hukou* had been replaced by an urban one due to land remise recently. These variations do not interfere with the study's focused population, the migrant factory workers, if none of them held Shenzhen *Hukou*. Attention should, however, be made to the representativeness of the data when interpreting the results.

7.3.3 Non Response and coping strategies adopted

In study 1, factory response rate was 75.9%. Though comparisons have been made in terms of major factory characteristics and the total feature of workforce, no information was available regarding workers' health insurance participation rates. Since our facilitators at sampling stage 1 came from Health and Sanitation Monitoring

Institutions, this might have raised concerns amongst employers who refused to give subsidies to purchase MISM, which was claimed to be compulsory in Shenzhen. Fortunate enough, only two quoted "not interested" as the reason and others were all because of moving/relocation.

The true response rates for study 1 and 2 (exclusive of those who had left) were acceptable, given the mobile feature of the study subjects. Study1 gave all non-responding subjects in the first round of study 1, a second chance to be caught by facilitators. We also guaranteed information anonymity to improve response rates in these two studies.

7.3.4 Main sources of bias and confounding control in the study

Bias that might exist in the study included:

1) The Hawthorne effect, which refers to "Individual behaviors may be altered because they know they are being studied" [227]even though no intervention is given. In our study, this effect was seen on female workers who had serum sampled paying more attention to her immunization histories or status of certain infections, or workers who answered CES-D questions seeking psychological support from doctors or friends, or workers starting to use their MISM cards simply because they found it when they tried to fill in the computer number of the insurance card in the questionnaire survey.

2) Selection bias: please refer to 7.3.2.

3) Information bias: our study largely adopted self-reporting as the major way of information collection. The best efforts were tried to help with information validation, for example, a note book was given to each worker to help track down any sickness in

the 6 months, on-site facilitators were strictly trained to teach workers with limited education and some key information such as *Hukou* origins and income were cross-checked by human resources managers roughly to exclude extreme errors. Sexual behaviour questions, although typical for risk behavioural studies, were excluded. For those who reported diagnosed chronic diseases, medical certificate, hospital records or MISM reimbursement documents were sought, if any.

Our study has used randomization and multivariable analyses to reduce known and unknown confounding.

7.4 Conclusions

Due to the large and growing population of migrant workers, the small absolute figures translate into large population numbers. The migrant workforce is vital for China's continuing economic and industrial growth as well as the rural economy [13, 228].Besides the ethical and equity implications, there are thus politico-economic dimensions to the health status of this population group, and an improved understanding of risk factors for poor health and inadequate healthcare utilisation in MFWs is needed in order to effectively target this population. Our study revealed internal health inequity and inequality amongst Shenzhen' official MFW population, hinting that those who are at higher risk concerning health-related problems are also those who were with lower SES, more mobile, were less possible to have been covered by local health insurance schemes and those who heavily used healthcare system but paying more out-of-pocket medical bills.

Although this research only studied a section of China's internal migrants, we have realized how complicated and multidimensional the health affairs of internal migrants could be. We hope our findings have shed some lights on future directions of

research in this field, though Shenzhen's experience and situation may be different and our follow-up period is comparatively short.

7.4.1 Challenges and policy implications for policy makers

In March 2010, the Global Consultation on Migrant Health was organized by WHO with multiple objectives involving "to take stock of actions taking by Member States and other stakeholders". [229] This consultation was under four key themes, which included:

1) Monitoring migrant health;

2) Policy and legal frameworks affecting migrants' health;

3) Migrant sensitive health systems;

4) Partnerships, networks, and multi country frameworks.

Except for the fourth point, the other three can all be looked at by Shenzhen's health policy makers as challenges and a potential health focus to solve migrant health problems at local level.

Regarding monitoring migrant health, the local health authority may need to design an information system that keeps all important background information and medical documentation for individual migrants living in Shenzhen, despite age, sex, job contract or insurance status, based on a unique identifier coding system. Immunization and chronic diseases, for example, should be put into the same system. To access internal migrants' health, specific health survey or screening for specific risks should be considered to avoid certain public health problems, such as infectious disease epidemics and mental illness, using properly designed methods and tools.

In terms of policy and legal frameworks, it is strongly suggested that Shenzhen's health authority should intensively cooperate with local Social Security Bureau and Property Lease Management Office, who deal with health insurance issues and migrant population management through lease control, respectively. Other liaison may happen between Health Commission Shenzhen and non government organizations, and migrant workers' employers. But, most importantly, the Commission should realize that including migrant health issues in local health strategies, such as immunization programmes designed for migrant women, is of importance and urgency.

The third challenge is the most difficult one in that the whole Chinese healthcare system is under renovation [230] and to incorporate Shenzhen's plan into a national blueprint but also be aware of Shenzhen's special population character is especially difficult. Our study has focused on the so-called marginalized subgroups that include female, older, younger, those with "other" marital status but without contract and insurance. We've also noticed the most invisible and mobile migrants who may have escaped from our sight. These people deserve quality health services even more, if a vertical equity perspective is adopted as we have proved the existence of inverse care law in our sample over time.

The local health authority of Shenzhen is now initiate many public health programmes under the national, provincial and city-level health reform themes and gaining evidence to support policy drafting should be highly prioritized and before any significant movement. Implications generated from this thesis which solely focuses on internal MFWs at least can be used in the following public health initiatives:

1) Prevention and surveillance of behaviour risk factors including smoking and frequent internet use. Although our results reflected a very low smoking prevalence amongst MFW as compared with data from other sources in China, models suggested many interesting correlates of smoking, for example, the linkage between frequent internet use and smoking, long working hours and daily smoking, DS and smoking in females as well as long working hours and heavy daily smoking in males. These results gave a good support for specific health promotion programs design and implementation;

2) Strengthening of health insurance and awareness improvement in relation to the MISM amongst MFWs. It is important to increase MISM coverage to involve the most invisible migrants as they may have greater health needs and /or are more likely to be excluded as they transfer frequently between jobs and cities, making themselves the most marginalized group in the population. Joint efforts from all levels are needed to combat the technical (high mobility of the workers) and institutional (MISM is Shenzhen-based only) barriers. Enforcement of the MISM in all working units is critical, needing financial input and legislative pledge;

3) Screening of health problems using convenient SRH scales. We have proved that 5-point SRH scale and Euro Qol VAS are closely linked and both are associated with two-week illness, mental health and risk behaviours, thus can be used amongst MFWs as convenient instruments to track their general health and act as an evaluation index for health outcomes amongst this population. Still, further in-depth research programs are necessary to explicitly clarify potential relationships between SRH measurements and objective health; and

4) To incorporate migrant population sensitive public health practice into the primary care based health services is of importance. These may well include mental

health screening, consultation, TCM services, holiday or evening clinics, and special immunization mop-up programs, depending on the real situation of MFWs' health demand and needs.

7.4.2 Recommendations for future research

As having been mentioned before, a cohort that starts from the original rural society and uses three types of samples (rural peasants, peasants migrating to cities, local urban residents) with longer period of observation is ideal to generate more powerful evidence in health and healthcare utilisation of internal migrants in China. To track those with very high mobility is comprehensive and difficult, requiring some well-designed qualitative studies involving those invisible workers who were missed in study 1 and those who had been lost in our study 2 in the future, as well as some technical supports to keep information collection as time passes and they move around geographically.

Regarding analysis, more complex modeling is needed to mining relationships among parameters, such as two-week illness, SRH, overall utilisation rates and utilisation of those who fall sick. A good health economic study that caters exact exposure of health insurance, occasions of doctor visits, detailed health costs, expenditures and health benefits from longitudinal and comparative perspectives are highly welcome and more powerful in telling stakeholders why health insurance for MFWs is beneficial and how schemes can be improved.

A specific cohort to monitor mental health and suicide idea/suicide incidence using a large sample is needed as Foxconn's tragedy urgently challenges the local government, whilst our study, though touches mental health issue of MFWs, can not

provide sufficient proofs to support health strategies that aim to decrease suicide cases.

This study is at the very beginning stage of understanding migrant factory workers' health and healthcare utilisation issues, as well as the enlarging health disparities related to MWs. Future research may need to use population comparisons, and longer follow-up strategies. For mental health issues and risk behaviour studies, RCTs using appropriate intervention techniques are strongly recommended. Comparative studies in multiple urban settings/cities and following-ups starting from before the migration till workers' returning to hometown may help clarify some of our unsolved concerns and provide clues for the National Health Reform in China [49], as the country will continue experiencing population migration and urbanization in the coming decades.

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Appendix A: Consent form

深圳市外来务工人员健康与医疗情况横断面调查问卷

知情同意书 (Study 1)

为了更好地开展深圳市的社会医疗保险，找出工作中的不足，总结经验并改进服务，特提出一些相关问题，了解您现阶段的卫生服务使用情况以及对务工人员社会医疗保险的看法，请您根据亲身感受，在相应的备选项目号码上标记"√"，少数项目需要填写。我们将确保您所填信息的保密性，并保证所得到的信息只用于科学研究。我们将随机采取少量血液标本，用于相关疾病的筛查工作，结果会以保密的方式通知您本人。您是我们根据随机抽样的原则选上的，您的观点对我们的工作非常重要。感谢您的理解与支持！

我已经阅读并愿意参加此项目。

签名_____ 日期 2009 年____月____日

知情同意书 (Study 2)

前期的深圳市健康与医疗情况调查已经顺利完成，在第一次调查中我们根据随机抽样的原则选择您参与。现在，我们希望了解您近期（６个月以来）的新信息、新情况和目前的感受，以判断深圳市外来务工人员健康与卫生服务使用随时间变化的趋势。您的观点对我们的工作非常重要感谢您的理解与支持！

我已经阅读并愿意参加此项调查。

签名_____ 日期 2009 年____月____日

Appendix B: Questionnaire （Study 1）

姓名：_____ 身份证号码：□□□□□□□□□□□□□□□□□□

深圳市外来务工人员健康与医疗情况横断面调查问卷

地址：_____区 _____街道 _____社区

单位编号 □□□□ 单位名称：_____

个人编号 □□□□ 手机：□□□□□□□□□□□ 单位联系电话：□□□□□□□□

家庭联系电话：_____

知情同意书

为了更好地开展深圳市的社会医疗保险，找出工作中的不足，总结经验并改进服务，特提出一些相关问题，了解您现阶段的卫生服务使用情况以及对务工人员社会医疗保险的看法，请您根据亲身感受，在相应的备选项□号码上标记“√”，少数项目需要填写。我们将确保您所填信息的保密性，并保证所得到的信息只用于科学研究。我们将随机采取少量血液标本，用于相关疾病的筛查工作，结果会以保密的方式通知您本人。您是我们根据随机抽样的原则选上的，您的观点对我们的工作非常重要。感谢您的理解与支持！

我已经阅读并愿意参加此项目。

签名_____ 日期 2009 年____月____日

第一部分 基本情况

1 基本信息

1.1 年龄：_____岁 □□

1.2 性别：(1) 男 (2) 女 □

1.3 民族：(1) 汉族 (2) 少数民族（请说明）_____族 □

2. 身高 _____ 厘米 体重 _____ 公斤 □□□/□□□

3. 婚姻：(1) 未婚 (2) 已婚 (3) 其它 □

4. 文化程度：

4.1 您总共上了几年学？_____ 年 □

4.2 您的文化水平是 □

(1)不识字或识字很少 (2)小学 (3)初中 (4)高中/中专 (5)专科 (6)大学本科 (7)硕士及以上

5. 移民与居住

5.1 您第一次来深圳是什么时候？_____ 年 ____ 月 □□□□

5.2 您在在深圳累计工作了多长时间？ □

（1）1 个月及 1 个月以下 （2）1 个月以上至半年 （3）半年以上至 1 年 （4）1 年以上至 2 年

（5）2 年以上至 3 年 （6）3 年以上至 5 年 （7）超过 5 年

5.3 除深圳外，您有无在别的大中城市工作过：

（1）有 （请说明）_____ （2）无 □

5.4 您最近一次来深圳是什么时候？_____ 年 ____ 月 □□□□

5.5 您最近一次来深圳是 □

（1）由亲人朋友介绍工作（2）依靠自己找到工作（3）工作单位调动 (4) 其它原因

5.6 您这次来深打算呆多久？ □

（1）3 个月以下（2）3 个月或以上，半年以下（3）半年或以上，不到 1 年（4）一年或以上（5）不确定

5.7 目前，您有否与家人或伴侣居住在一起？ □

（1）有 （请说明）18-59 岁成人_____人 （2）无

18 岁以下您自己的孩子____人

18 岁以下亲朋的孩子____人

60 岁及以上老人____人

5.8 您的家庭成员数（包括在深圳和不在深圳的）共有_____人

6 户籍与住房

6.1 您现在的户口所在地 _____ 省 _____ 县（市） □□□□

6.2 您现在深圳住在 _____ 区 _____ 街道 _____ 社区

6.3 您住所的性质： □

（1）自购住房 （2）亲戚朋友自购住房 （3）自（己）家单独租房 （4）与他人合租房

（5）单位（工厂）提供集体宿舍 (6) 其它

7.1 关于吸烟，下面那种情况最接近你的现状？ □

（1）我从不吸烟（2）我曾经抽烟，但现在戒了

（3）我现在抽烟，但不是每天都抽

（4）我现在每天都抽烟，但少于 1 包，平均每天_____支

（5）我现在每天都抽烟 1 包或 1 包以上，平均每天_____支

7.2 和你同住的人中，总共有多少人吸（不包括已戒烟者和你自己）？ □

（1）没有人 （2） 1 人 （3）2 人 （4）3 人 （5）4 人 （6）5 人或以上

7.3 在过去 7 天内，有多少天当你在家时，有人在你旁边吸烟？ □

（1） 0 天 （2）1-2 天 （3） 3-4 天 （4） 5-6 天 （5） 7 天

7.4 在過去 7 天內，有多少天當你在家以外的地方時，有人在你旁边吸烟？ □

(1) 0 天 (2)1-2 天 (3)3-4 天 (4)5-6 天 (5) 7 天

8.1 关于饮酒习惯，下面哪种情况最接近你的情况？ □

（1）我从不喝酒（请跳 9 题） （2）我很少喝酒（平均每月不到 1 次）

（3）我偶尔喝酒（平均每月 1-3 次） （4）我平均每周喝酒 1-3 次

（5）我经常喝酒（平均每周 4-6 次） （6）我每天喝酒

8.2 您一般喝哪种酒（可多选，最多 3 项）？ □□□

（1）啤酒 （2）白酒（包括白酒制成的药酒） （3）米酒 （4）黄酒 （5）葡萄酒 （6）洋酒 (7)鸡尾酒

8.3 最近一年你喝醉过几次？_____次

9 你上网吗（可多选）？ □

（1）从不上网 （2）偶尔上网 （3）经常上网，用单位的计算机 （4）经常上网，用网吧的计算机

（5）经常上网，用自己或朋友的计算机 （6）经常上网，用手机

10 时间分配

10.1 您每天平均工作 _____ 小时，每周平均工作 _____ 天 □□/□

10.2 您每天平均睡 _____小时 □□

10.3 您每天平均加班 _____小时 □□

11. 工作性质

11.1 您在深圳从事什么性质的工作？ □□

（1）制造业 （2）建筑工程业（3）服务业/餐旅酒店等 （4）批发零售进出口等商业（5）交通运输业

（6）传媒广告 （7）文化教育 （8）卫生、保健业 （9）娱乐业 （10）农牧业、渔业 （11）治安行业

（12）金融保险 (13) 咨询业 （14）其它 请说明 _____

11.2 您现在属于： □

（1）管理人员/经理 （2）高级专业人员 （3） 初中级专业人员 （4）一般职员/技术员 （5）生产线工人

（6）保安员 （7）建筑工地工人 （8）服务行业人员（如商店促销、酒楼服务人员等）

（9）其它（请说明）_____

11.3 您的工作合同情况：（1）有签订工作合同 （2）没有签订工作合同 □

11.4 下面那种情况与你的工作情况相符合？ □

（1）长时间坐着，不需要太多体力劳动

（2）长时间站着或需要到处走动

（3）需要部分体力劳动，如装配机器或拿重物

（4）体力劳动为主，如装卸、背、扛、人工运很重的物品等

12.工作固定性

12.1 您现在这份工作已经干了多久？_____年_____月 □□/□□

12.2 过去 5 年您做过几种工作： (1)1 种 (2)2-4 种 (3)5-6 种 (4) 7 种或以上 □

13. 收入与开支

13.1 您自己的月平均收入大约是 _____（元） □□□□□□

13.2 去年，您的家庭年收入大约是 _____ （元） □□□□□□

如未婚，“家庭”包括您自己，您的父母及同样未婚的兄弟姐妹；

如已婚，则包括您们夫妻、孩子、同住的未婚兄弟姐妹和父母

13.3 去年，您总共带回和寄回老家多少钱？_____ （元） □□□□□

13.4 您平均每月的生活开支大约是_____（元） □□□□□

13.5 *您自己*每年的医疗费支出大约是（不包括报销， 仅自费部分） _____（元） □□□□□

13.6 *您在深圳的全部家庭成员*每年的医疗费支出大约是（自费部分） _____（元） □□□□□

13.7 在最近一年内看病借过钱吗？ （1）是 （2）没有 □

14. 医疗点

14.1 从您的住所步行到*最近*的医疗点需要多少分钟？ _____（分钟） □□

14.2 最近医疗点的类型 □

（1）个体诊所 （2）单位医务室 （3）社区健康服务中心或健康服务站 （4）街道医院 （5）区级医院

(6) 市级医院 （7）省级医院 （8）其它（请注明）_____

14.3 该医疗点目前是否为社会医疗保险的定点机构？ □

（1）是 （2）否 （3）不知道（请著名该医疗机构名称）_____

14.4 生病的时候您最愿意去的医疗点就是这个最近的医疗点吗？ □

（1）是 （2）不是 （3）不知道

14.5 生病的时候您最常去的医疗点就是这个最近的医疗点吗？ □

（1）是 （2）不是 （3）不知道

14.6 生病的时候您最常去的医疗点是 _____

15 医疗保险现状

15.1 您有没有参加深圳的劳务工/农民工/社会医疗保险？ (1)有 （2）没有（请跳 15.3） □

15.2 您什么时候拿到深圳医疗保险卡/社会保障卡的？_____/_____（年年/月月）卡号_____

15.3 您有没有参加家乡组织的新型农村合作医疗？

(1)有 (2)城镇人口不能参加农村合作医疗（请跳 15.5 题） （3）没有 □

15.4 您来深圳市后，是否愿意再参加家乡组织的新型农村合作医疗？ □

（1）愿意 （2）不愿意 （3）不好说

15.5 您在深圳市看病的医疗费是否能在家乡得到报销？ □

（1）能 （2）不能 （3）不知道

15.6 您目前还参加哪些保险（可多选，最多 3 个）： □□□□□

(1) 没有其它保险 (2) 养老保险 (3) 工伤保险 (4)住院医疗保险

(5) 综合医疗保险 (6) 商业医疗保险 （7）其它（请说明）_____

第二部分 健康状况和门诊服务

1 自评健康

1.1 您的总体健康状况是： □

（1）很好 （2）较好 （3）一般 （4）较差 （5）很差

1.2 为了帮助您反映健康状况的好坏，我们画了一个刻度尺（有点象温度计），在这刻度尺上，100 代表您心目中最好的状况，0 代表您心目中最差的状况。请从下面方格中画出一条线，连到右边刻度尺上最能代表您今天健康状况好坏的那一点。

您今天的
健康状况

心目中最好的
健康状况

心目中最差的
健康状况

1.4 请在以下表格中选择适合自己的情况，并打勾：

在过去一星期内	很少 (少于 1 天)	偶尔 (1-2 天)	大部份时间 (3-4 天)	经常 (5-7 天)
1. 就算家人或朋友帮忙，我也不能摆脱忧愁				
2. 我情绪低落				
3. 我的人生是失败的				
4. 我感到害怕				
5. 我感到孤独				
6. 我感到伤心				
7. 我曾哭过				
8. 我的胃口欠佳				
9. 我难于集中精神做事				
10. 我做每件事都很费力				
11. 我不能安睡				
12. 我难以生活下去				
13. 我比以前少说话				
14. 我受到事情所困扰				
15. 我与别人一样心情好				
16. 我对将来有信心				
17. 我很开心				
18. 我生活得快乐				
19. 别人并不友善				
20. 别人不喜欢我				

1.5 您打过（服过）以下疫苗吗？ 请在相应框内打 √

疫苗	打过/服过	没有	不清楚
甲型病毒性肝炎（甲肝）			
乙型病毒性肝炎（乙肝）			
白喉			
破伤风			
脊髓灰质炎（小儿麻痹症糖丸）			
麻疹			
风疹			
流行性脑脊髓膜炎（流脑）			
乙型脑炎（乙脑）			
流行性腮腺炎			

2. 两周患病情况

2.1 您上一次看医生是什么时候？ □

（1）一周内（2）一周至两周内 （3）两周至一月内 （4）一月至半年内 （5）半年至一年内 （6）一年以上

2.2 您上一次看医生的原因是 (请在后面画 √，可多选，最多 3 个)：

1 因病、伤、不适等，初诊或者复诊
2 一般体检
3 筛查（如肿瘤筛查）
4 慢性病(如糖尿病、高血压)的常规随访

5 预防接种或免疫
6 （孕妇）产前检查
7 产后访视
8 计划生育
9 医学咨询
10 管理目的 （如岗前体检，拿健康证等）
11 其它，请说明

2.3 在本次调查一周前的 14 天内，您是否觉得身体不适？ (1)是 (2)否(请跳到问题 6.1) □

2.4 在调查一周前的 14 天内主要有哪些不适？ （可多选，最多 4 个） □□□□

(1)胸痛 (2)腹痛/腹泻 (3)头痛 (4)外伤痛 (5)发烧

(6)咳嗽 (7)心慌/心悸 (8)妇科问题 (9)其它（请说明）_____

2.5 在调查一周前的 14 天内，您患的是什么病或伤？（填疾病名称）_____

2.6 在调查一周前的 14 天内患病是 （1）急性 （2）慢性病的急性发作 □

3 两周患病天数与次数

3.1 在调查一周前的 14 天内，病伤共持续了多少天？_____（天） □□

3.2 在调查一周前的 14 天内，是一次病（伤）还是多次病（伤）？

（1）一次 （2）多次 （请注明几次）_____次

4 因病休息

4.1 在调查一周前的 14 天内，您因病（伤）休工了多少天？_____（天） □□

4.2 在调查一周前的 14 天内，您因这次病（伤）卧床休息了多少天？_____（天） □□

以下 5.1—5.18 题仅针对 14 天内最后一次病/伤

5 治疗

5.1 您这次患病后主要采用什么方式进行治疗？ □

（1）自我医疗 （2）找医生看病治疗（请跳到问题 5.6） (3) 未作任何处理（5.18）

5.2 您采取自我医疗的最主要原因是什么？ （可多选，最多 3 个，按重要程度排列） □

(1)病情较轻 (2)到药店买药方便 (3)药品价格便宜 (4)购药手续简单

(5)具有一定的医药知识 (6)买药费用可以报销 (7)其它_____ （请填写）

5.3 您采取自我医疗，在这期间内花费 _____元？ □□□□

5.4 自我医疗有效吗？ □

（1）有效，痊愈 （2）有效，好转 （3）无效，恶化 （4）无效，和原来一样

5.5 这次患病后您是否使用过中药或中成药？ （1）是 （2）否

（回答后请跳到问题 6.1）

5.6 在调查一周前的 14 天内为该病看过几次医生？（填写具体次数）_____（次） □□

5.7 在调查一周前的 14 天内看过中医吗？（1） 是 （2） 否 □

5.8 您在14天内看的是同一个医生吗？（1） 是 （2） 否 □

5.9 您在哪儿看病？（如在不同的医疗卫生单位看过病，可以多选，最多4个） □

（1）个体诊所 （2）单位医务室 （3）社区健康服务中心或健康服务站 （4）街道医院 （5）区级医院 （6）市级医院 （7）省级医院 （8）部队医院 （9）民营医院 （10）其它

5.10 您选择上述就诊机构的原因是（可多选最多3个） □□□□□

(1)是社会医疗保险的定点机构 （2）就近方便 （3）病情需要 （4）医务人员服务态度好 （5）医疗技术好 （6）价格适宜 (7)就诊环境好 (8)就诊手续简单 (9)能提供健康咨询服务 (10)能提供预防保健服务 (11)与那里的医生比较熟 (12)其它 _____

5.11 看病后，是否拿处方到非就诊医院的药店（房）买过药？ (1)是 (2)否 □

5.12 您调查一周前的14天内为治疗该病看医生，总共花费了多少医药费用？ _____（元） □□□□

5.13 您为看病，在调查一周前的14天内花费多少交通费用？ _____（元） □□□□

5.14 您为看病，在调查一周前的14天内花费多少其它费用？ _____（元） □□□□

5.15 您为看病，在调查一周前的14天内因请假损失多少工资、奖金？ _____（元） □□□□

5.16 您这次生病能从社会医疗保险中得到报销吗？ □

（1）能 （2）否（请跳到问题6.1） （3）不知道（请跳到问题6.1）

5.17 约能从劳务工医疗保险中报销多少元？ _____（元）（答后请跳到问题6） □□□□

5.18 未治疗的最主要的原因：（可多选） □□□□

(1)自感病轻 (2)经济困难 (3)无时间 (4)交通不便 (5)服务差 (6)无有效措施 (7)其它

6 慢性疾病/慢性症状

6.1 *从前任何时候*你是否曾经被医生诊断出患有下列疾病/综合征？

疾病	是	否
1 癌症、肿瘤	□	□
2 糖尿病	□	□
3 高血压	□	□
4 心脏病	□	□
5 中风	□	□
6 哮喘	□	□
7 高血脂	□	□

6.2 *调查前半年内*，您是否有经医生诊断的以下慢性病/综合征（限选，最多3种）？ □□ □□ □□

(1)无（回答第三部分） (2)高血压 (3)糖尿病 (4)关节炎 (5)心脏病 (6)慢性支气管炎 (7)哮喘等过敏性呼吸疾病 (8)胃炎或溃疡 (9)肝炎/肝硬化 (10)背痛、腰椎间盘疾病 (11)中风脑出血脑血栓 (12)肿瘤 (13)偏头痛 (14)抑郁/焦虑 (15)睡眠困难 (16)视力问题 (17)听力问题 (18)肢体残疾

⑲龋齿 ⑳其它（请写出疾病名称）_____

7. 调查前半年内，您是否对上述慢性病进行了治疗？请在相应的空格内打勾 □

疾病	抗生素口服治疗	中医中药包括理疗针灸等	输液治疗	手术治疗	自我医疗	未治疗
1 _____						
2 _____						
3 _____						

第三部分 住院服务情况

1. 调查前一年内，您是否住过院？ □

(1)是 (2)否（请跳到问题 11）

2. 您住院的具体原因是： □□□□

(1)疾病 (2)受伤 (3) 中毒 (4)康复 (5)计划生育 (6)分娩 (7)其它

3. 具体原因名称：_____ □□

4. 调查前一年内，因这种病伤住过几次医院（填具体次数）_____（次） □□

（若回答的住院次数超过 1 次，下面问题填写最近一次出院的住院情况）

5.1 最近一次住院的入院时间：（ 年/ 月）

5.2 本次住院的医院类型： □

(1) 镇医院 (2) 区级医院 (3) 市级医院 (4) 省级医院 (5) 部队医院 (6) 民营医院 (7) 其它

5.3 本次住院在深圳吗？ (1) 是 (2)否（请跳到问题 5.5） □

5.4 该医疗点是否为深圳市社会医疗保险的定点机构？ □

(1) 是 (2) 否 (3) 不知道

5.5 本次住院的住院天数：_____（天）

6.1 您本次出院是由于： □

(1) 病未愈自己要求 (2) 病未愈医生要求（请跳到问题 7） (3) 病愈医生要求（请跳到问题 7）

(4) 其它原因（请跳到问题 7）

6.2 如您自己要求出院，原因： □

(1) 久病不愈 (2) 经济困难 (3) 医院条件所限 (4) 服务态度不好 (5) 其它（请说明）_____

7. 本次住院，住院、药品及材料等医疗费用总共是多少元？_____ 元 □□□□□

8. 约能从社会医疗保险中报销多少元？_____ 元 □□□□□

9. 约能从其它医疗保障制度中报销多少元？_____ 元 □□□□

10. 本次住院，所花费的车旅费、营养伙食费、陪护费是多少元？_____ 元 □□□□□

11. 调查前一年内，是否有医生诊断您需要住院，而您未能住院？ □

(1)是 (2)否（填第四部分）

12. 您那次未能住院的最主要原因是什么？ □

(1)没必要 (2)无时间 (3)经济困难 (4)医院服务差 (5)无床位 (6)办理了家庭病床 (7)其它 _____（请填写）

第四部分 社会医疗保险参加意愿情况

1. 您认为是否有必要参加社会医疗保险？ □

(1)有必要 (2)没有必要 (3)不知道

2. 您认为社会医疗保险对您看病有没有/会不会有帮助？ □

（1）有帮助 （2）帮助不大 （3）没有帮助 (4) 不知道

3. 社会医疗保险可以降低您的医疗费吗？(1) 是 (2) 否 (3) 不知道 □

4 您认为每人每月出超过多少钱参加社会医疗保险就不能接受？_____ 元 □□□

5.1 您愿意参加/继续参加社会医疗保险吗？（1）愿意 (2)不愿意（请跳到 5.3） □

5.2 您愿意参加社会医疗保险的原因是什么？（可多选，最多 3 个） □□□□

(1)个人看病需要 (2)报销费用合理 (3)免费享受的服务项目实用 (4)定点医疗机构服务质量好

(5)定点医疗机构服务态度好（6）看病方便（7）单位要求（8）单位给补贴（9）其它_____（请填写）

回答完后请跳到 6.1

5.3 您不愿意参加社会医疗保险的原因是什么？（可多选 3 个） □□□□

（1）很少得病不需要 （2）报销比例太低 （3）报销程序烦琐 （4）报销门槛太高 （5）定点医疗机构服务态度不好 (6)定点医疗机构医疗质量不好 (7)报销的服务项目不实用 (8)能报销服务项目太少

(9)有能力支付医疗费用 （10）工作地点不稳定 (11) 经济困难，不能缴保费 （12）看病不自由

（13）单位不允许 （14）其它 _____（请填写）

6 参保意见（以下由社保参保人员填写）

6.1 每月缴纳参保费会对您生活带来负担吗？（1）很有负担 （2）负担不重 （3）基本没有 □

6.2 您参加社会医疗保险是属于：（1）主动要求参加 （2）被动要求参加 （3）两者都有 □

6.3 您参加社会医疗保险后，是否已经受益？ □

（1）门诊得到报销 （2）住院得到报销 （3）门诊和住院得到报销 （4）参加免费体检 （5）没有受益

6.4 您觉得目前的医疗费用报销方式是否方便？ □

（1）很不方便 （2）不方便 （3）一般 （4）比较方便 （5）非常方便

6.5 总的来说，您对社会医疗保险是否满意？ □

（1）非常满意 （2）比较满意 （3）一般 （4）不满意 （5）很不满意

6.6 社会医疗保险有哪些地方令您不满意？（可多选，最多 3 个） □□ □□ □□

（1）无（2）在家乡看病的费用不能得到报（3）报销手续太烦琐 （4）报销比例太低 （5）报销门槛太高（6）虽然给报销，但自己看病出钱和以前一样多 （7）定点医疗机构服务态度不好 （8）定点医疗机构医疗质量不好 （9）定点医疗机构距离远 （10）报销的服务项目不实用 （11）能报销服务项目太少（12）看病不自由 （13）其它（请填写） _____

6.7 如果您对社会医疗保险还有什么意见和建议（比如报销程序、报销比例、缴费、服务等方面），请在下面填写：

_____

_____

调查员：_____ 调查日期：200__年___月___日 审核者：_____

深圳市外来务工人员健康与医疗情况调查问卷填写说明

深圳市外来务工人员健康与医疗情况调查问卷填写说明

1）卷头部分：请尽量核对劳务工姓名、身份证号码（18 位或者 15 位），据此核对 1.1 年龄的回答情况。单位编号和单位名称在调查前统一编制。个人编号由四位构成，在问卷完成之后统一编码。手机电话号码缺位的请核对补齐（如为市话通则填写 8 位即可）。

2）知情同意书：由劳务工自己阅读，如果有疑问，则进行解释。要求访问对象签名。

3）文化程度：4.1 指上学累计年数

4）移民与居住：5.1 第一次来深圳是什么时候？指第一次来工作或寻找工作的时间，不包含来旅游、探亲访友的时间。5.2 在深累计工作时间：所有在深圳工作时间相加所得，不包括深圳公司派驻外地、外国所占的时间。5.3 大城市包括所有直辖市、省会城市、计划单列市（大连、宁波、厦门、青岛）和其它副省级城市（苏州、齐齐哈尔、吉林、万州、烟台、温州、珠海、三亚、桂林、宜昌、洛阳、延安、格尔木、包头、大同等），中等城市指其它人口规模较大的地级市，但不包括较小三级城市和县级市。

5.5 依靠自己找到工作包括通过人材中介、人材市场、劳务输入等找到工作的情况

5.7 与家人或伴侣居住在一起指在同一套住房或同一个住宅单位内居住

5.8 家庭成员数（包括在深圳和不在深圳的）是指同一户主下户籍登记本中的人口数

6.2 您现在深圳住处：在问卷完成后进行核对，防止出现社区不在某街道的情况，如果不清楚，则填写确切住址。

5）危险因素 7.2 同住的人的吸烟者主要用于测量被动吸烟的情况，不包括偶尔、礼节性、已戒烟者和自己（如果访问对象是吸烟者）；8.3“喝醉”的定义，指饮酒后出现下列症状（之一）：意识障碍、意识模糊、极度兴奋、攻击和危害行为、无法独立行走、错觉、自控能力减弱、思维抑制或突然陷入睡眠状态等。

9 上网 多选题，如在多处上网，则多个选择。

6）收入 13.2 家庭年收入如访问对象未婚，“家庭”包括您自己，您的父母及同样未婚的兄弟姐妹；如已婚，则包括您们夫妻、孩子、同住的未婚兄弟姐妹和父母；平均每月的生活开支包括房租水电衣食住行，但不包括寄回家的钱。13.5 和 13.6 医疗费支出包括自购药品的花费

7）医疗点 14.3 该医疗点目前是否为社会医疗保险的定点机构？请参阅附件中深圳市社会医疗保险点名录

8）保险现状 15.6 您目前还参加哪些保险，参照“深圳市社会医疗保险管理办法”规定，农村户籍劳务工可参加农民工医疗保险。本次调查对象不包括城市户籍人口，不涉及综合医疗保险和住院医疗保险。

9) 自评健康 1.2 连线应连至有刻度线处，1.4 即 CES-D 问卷，注意解释 15，16，18 三题为反向问题。

10）两周患病 调查一周前的 14 天内患病是急性还是慢性病的急性发作，慢性病指既往已经诊断此次急性加重或再次发作的疾病。5.1—5.18 题仅针对 14 天内最后一次病/伤

11）两周患病的治疗 注意多选选项均可以选至多 3 个答案，本节跳问主要针对就医、自我医疗、未处理三种情况进行调查

12）慢性疾病/慢性症状 6.2 *调查前半年内*诊断的慢性病/综合征中“其它”的参考原因

其它原因可以包括下面一些主要的类别

血液系统疾病	贫血，先天性血液系统疾病（如地贫，血友病），免疫系统疾病（系统性红斑狼疮，类风湿性关节炎）
内分泌与代谢性疾病	甲状腺疾病
精神疾患	抑郁症，焦虑症，精神分裂，痴呆
神经系统疾病	癫痫，帕金森症，眼部疾病（青光眼，白内障,视力问题，失明),
耳鼻喉科疾病	过敏性鼻炎、鼻窦炎，听力障碍，耳鸣
心脏和循环系统疾病	
呼吸系统疾病	肺气肿，慢支炎、支气管扩张，结核
胃肠道疾病	胃溃疡
肝脏疾病	乙肝、丙肝、肝硬化
皮肤疾病	湿疹，银屑癣
骨骼肌肉系统疾病	关节炎，风湿病，下背部疼痛，痛风，高尿酸，骨质疏松
肾脏疾病	肾功衰竭，肾炎，需要透析治疗的肾病，
受伤后遗症	肢体残障等

13）4 调查前一年内，因这种病伤住过几次医院 若回答的住院次数超过 1 次，后面问题填写最近一次出院的住院情况

14）5.4 该医疗点是否为深圳市社会医疗保险的定点机构，请参见深圳市社会医疗保险定点机构名录

15）6 参保意见仅由社保参保人员填写，未参保人员此处即结束问卷。

16） 6.6 报销门槛 是指原来的劳务工医疗保险，现在的社会医疗保险中农民工医疗保险或者非农村户籍外来人员住院保险的起付线。

Appendix C: Questionnaire （Study 2）

深圳市外来务工人员健康与医疗情况追访问卷

姓名：_____ 个人编号□□□

地址：_____区 _____街道_____社区

单位名称：_____ 单位编号□□□

知情同意书

为了更好地开展深圳市的社会医疗保险，找出工作中的不足，总结经验并改进服务，特提出一些相关问题，了解你现阶段的健康和卫生服务使用情况，请你根据亲身感受，在相应的备选项目号码上标记"√"，少数项目需要填写。我们将确保你所填信息的保密性，并保证所得到的信息只用于科学研究。你是我们根据随机抽样的原则选上的，本次调查是在基于半年前的首次调查进行的追踪调查，你的观点对我们的工作非常重要。感谢你的理解与支持！

签名：

第一部分 基本情况

1.最近的体重_____公斤 □□□

2.婚姻：（1）未婚 （2）已婚 （3）其它 □

3.你还打算在深圳呆多久？ □

（1）3个月以下 （2）3个月或以上，半年以下 （3）半年或以上，不到1年

（4）一年或以上 （5）不确定

4.目前，你有否与家人或伴侣居住在一起？（1）有 （2）无 □

5.最近6个月你搬过家吗？ （1）搬过 （2）没搬过 □

6.最近你打算换工作吗？ （1）打算 （2）不打算 □

7.最近6个月你试过戒烟吗？ （1）我本来就不抽烟（2）试过（3）没试过 □

8.最近6个月你喝醉过几次？ 次 □□□

9.你每天平均睡 小时每天平均加班 小时，每周平均工作 天 □□/□□/□□

10.你上个月的全部收入是 （元） □□□

11.你过去6个月的医疗费支出大约是（不包括报销） （元） □□□□

12.在最近6个月内看病借过钱吗？ （1）是 （2）没有 □

13.你参加深圳的劳务工医疗保险了吗？

（1）6个月前就参加 （2）刚参加____/____（年年/月月）电脑号_____

（3）还没有参加 □

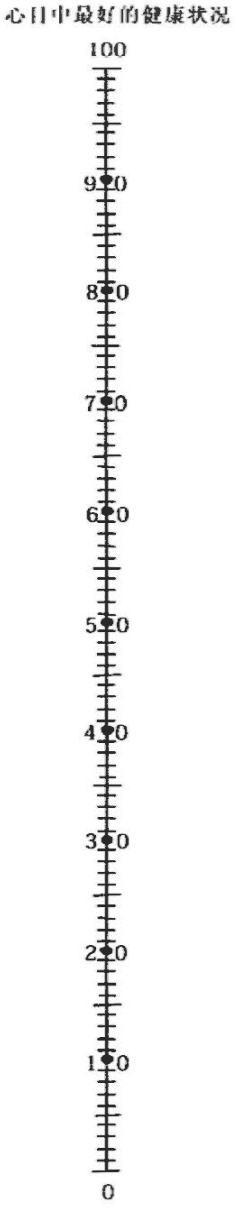
第二部分 健康状况和门诊服务

1.你的总体健康状况是：（1）很好（2）较好（3）一般（4）较差（5）很差 □

2.为了帮助你反映健康状况的好坏，我们画了一个刻度尺（有点象温度计），□□

在这刻度尺上，100代表你心目中最好的状况，0代表你心目中最差的状况。请从下面黑色方格中画出一条线，连到刻度尺上最能代表你今天健康状况好坏的那一点。

你今天的健康状况



3 请在以下表格中选择适合自己的情况，并打勾

在过去一星期内	很少（少于1天）	偶尔（1-2天）	大部份时间（3-4天）	经常（5-7天）
1 虽然家人或朋友帮忙，我也不能摆脱忧愁				
2 我情绪低落				
3 我的人生是失败的				
4 我感到害怕				
5 我感到孤独				
6 我感到伤心				
7 我情绪过				
8 我的胃口欠佳				
9 我难于集中精神做事				
10 我做每件事都很费力				
11 我不能安睡				
12 我难以生活下去				
13 我比以前少说话				
14 我受到事情所困扰				
15 我与别人一样心情好				
16 我对将来有信心				
17 我很开心				
18 我生活得快乐				
19 别人并不友善				
20 别人不喜欢我				

4 你上一次看医生是什么时候（1）一周内（2）一周至两周内 □

（3）两周至一月内（4）一月至十年内（5）十年至一年内（6）一年以上

5 你上一次看医生的原因是（请在后面划√，可多选，最多3个）

1	因病、伤、不适等，初诊或者复诊
2	一般体检
3	筛查（如肿瘤筛查）
4	慢性病(如糖尿病、高血压)的常规随访
5	预防接种或免疫
6	（孕妇）产前检查
7	产后访视
8	计划生育
9	医学咨询
10	管理目的（如婚前体检，拿健康证等）
11	其它，请说明

6 你觉得自己目前最主要的健康问题是什么？_____

7 1 在过去的6个月内，你是否有过任何的身体不适？(1)是 (2)否(结束) □

7 2 在过去6个月内，你生过几次病？____ 次 □□

7 3 请你回忆最近6个月的生病情况，并填写下表(在适合的地方划√，或者填写内容)

编号	是什么疾病及症状	是否请假休息 1是 2否	看过医生 请选择 并请继续做7 3表 大医院	私立医院/诊所	社区中心或卫生院	自我医疗请继续做7 3表	什么也没做请继续做7 6表
1							
2							
3							
4							
5							
6							

7 4 如果最近6个月你生过病 而且看过医生，请填写下表

（在适合的地方划√，或者填写内容）

编号	疾病名称	仅中医	仅西医	中西医结合	是否使用医疗保险卡 1是 2否	你自己出了多少钱(元)	治疗预后 1 好转 2 未好转
1							
2							
3							
4							
5							
6							

7 5 如果最近6个月你生过病，而且自我医疗，请填写下表

（在适合的地方划√，或者填写内容）

编号	疾病名称	仅使用了中药（中成药）	仅使用了西药	中药西药都用了	其它办法	花费（元）	效果 1好转 2未好转
1							
2							
3							
4							
5							
6							

7 6 你采取自我医疗的原因是(可多选，最多3个) □

(1)自感病轻(2) 在药店买药方便 (3) 药品买药较便宜 (4) 购药手续方便

(5) 自己具有医药知识 (6) 购药费用可报销 (7) 其它（请说明）

7.7 如果最近6个月你生过病，但没有采用任何方法处理，请填写下表

（在适合的地方划√，或者填写内容）

编号	疾病名称	病情较轻	经济困难	无时间	看病买药均交通不便	医院服务差	无有效措施	疾病结果 1好转 2未好转
1								
2								
3								
4								
5								
6								

8. 调查前半年内，你是被首次发现有以下慢性病/综合征(多选，最多3种) □□ □□ □□

(1)无（回答第三部分） (2)高血压 (3)糖尿病 (4)关节炎 (5)心脏病 (6)慢性支气管炎 (7)哮喘等过敏性呼吸疾病 (8)胃炎或溃疡 (9)肝炎/肝硬化 (10)背痛、腰椎间盘疾病 (11)中风脑出血脑血栓 (12)肿瘤 (13)偏头痛 (14)压抑与焦虑 (15)睡眠困难 (16)视力问题 (17)听力问题 (18)肢体残疾 (19)龋齿 (20)其它（请写出疾病名称）

9. 调查前半年内，你是否对上述慢性病进行了治疗？

疾病	抗生素口服治疗	中医中药包括理疗针灸等	输液治疗	手术治疗	自我医疗	未治疗
1 _____						
2						
3						

第三部分　住院服务情况

1. 调查前6个月内，你是否住过院？ (1)是 (2)否（请跳到问题11） □

2. 你住院的具体原因是： □□

(1)疾病 (2)受伤 (3)中毒 (4)康复 (5)计划生育 (6)分娩 (7)其它(请说明)

3. 具体疾病名称： □□

4. 调查前6个月内，因这种病伤住过几次医院（填具体次数） （次） □□

（若回答的住院次数超过1次，下面问题填写最近一次出院的住院情况）

5.1最近一次住院的入院时间：（　　年/　　月）

5.2本次住院的医院类型： □

(1)镇医院 (2)区医院 (3)市医院 (4)省级医院 (5)部队医院 (6)民营医院 (7)其它

5.3 本次住院在深圳吗？ (1) 是 (2)否（请跳到问题5.5） □

5.4 该医疗点是否为深圳市劳务工合作医疗的定点机构(1)是 (2)否 (3)不知道 □

5.5 本次住院的住院天数： （天）

6.1你本次出院是由于：(1)病未愈自己要求(2) 病未愈医生要求（请跳到问题7） □

(3) 病愈医生要求（请跳到问题7） (4) 其它原因（请跳到问题7）

6.2如你自己要求出院，原因： □

(1)久病不愈(2)经济困难(3)医院条件所限(4)服务态度不好(5)其它(请说明)

7. 本次住院、药品及材料等医疗费用总共是多少元？_____ 元 □□□□□

8. 约能从劳务工合作医疗中报销多少元？_____ 元 □□□□□

9. 约能从其它医疗保障制度中报销多少元？_____ 元 □□□□

10. 本次住院，所花费的车旅费、营养伙食费、陪护费是多少元？_____元 □□□□

11. 调查前6个月内，是否有医生诊断你需要住院，而你未能住院?(1)是 (2)否 结束 □

12. 你那次未能住院的最主要原因是什么？ □

(1)感觉没必要 (2)无时间 (3)经济困难 (4)医院服务差 (5)无床位 (6)办理了家庭病床 (7)其它 （请填写）

调查员： 调查日期：09 年11月 □ 审核者：