Private ownership of primary care providers associated with patient perceived quality of care
A comparative cross-sectional survey in three big Chinese cities

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Abstract
Ownership of primary care providers varies in different cities in China. Shanghai represented the full public ownership model of primary providers; Shenzhen had public-owned but private-operated providers; and Hong Kong represented the full private ownership. The study aims to assess the association of primary care ownership and patient perceived quality of care in 3 Chinese megacities.

We conducted multistage stratified random surveys in 2013 in the 3 cities. Quality scores of primary care were measured using the validated primary care assessment tools. Multivariate linear regression models were used to compare quality scores after controlling potential confounders of patient demographic, socioeconomic, and healthcare utilization factors.

Overall, 797 primary care users in Shanghai, 802 in Shenzhen, and 1325 in Hong Kong participated in the study. The mean total quality scores were reported the highest in Shanghai (28.39), followed by Shenzhen (25.82) and then Hong Kong (25.21) (P < 0.001). Shanghai participants reported the highest scores for 1st contact accessibility, coordination of information, comprehensiveness of service availability, and culture competence, while Hong Kong participants reported the lowest for these domains (P < 0.001). Hong Kong participants from rich households reported higher total scores than those from poor households (P < 0.05); however, this was not found in Shanghai and Shenzhen.

The study suggests that private primary care ownership may be associated with lower quality and less equitable care distribution. In China, it suggests that it may be beneficial to promote public-owned and nonprofit providers. Promoting privatization in primary care may be at the cost of quality and equity of primary care.

Abbreviations: CHC = community health center, PCAT = primary care assessment tools, RMB = Renminbi, the currency in Mainland China, USD = United States Dollars.

Keywords: China, ownership, primary care, public and private, quality
1. Introduction
Primary care in both developed and developing countries has experienced rapid expansion of private ownership and for-profit care delivery.[1–3] Those promoting the trend claim that private providers would bring better and more flexible access, higher quality, and greater responsiveness to patient needs; however, there is a concern that private providers often maximize care with a high profit margin and reduce services of low profit.[4] Studies in Sweden, US, and Eastern European Countries demonstrated that privatization of healthcare has reduced public health service and care accessibility for vulnerable populations, diverting money to profitable services, and eventually driving up healthcare costs.[5–7]

In Mainland China, community health centers (CHCs) are primary care facilities at the township or community level that covering a catchment area with a population of 30,000 to 100,000. CHCs employ a team of 20 to 100 staff of doctors, nurses, public health specialists, and administrators. A variety of ownership models of CHCs coexist in China, but private CHCs only account for a marginal share of primary care delivery in Mainland China.[8] Thus, we included Hong Kong where primary care is predominately provided by private doctors. Shanghai represents the full public ownership, as its CHCs are fully government owned and managed, and independent from the government while the government pays all the costs incurred by CHCs. In Shenzhen, primary care providers are publicly owned but privately operated. CHCs in Shenzhen are owned and managed by public hospitals, which operate as for-profit organizations. In China, public hospitals have to earn most of their revenues from service provision, while the government only provide 10% of their operation costs; thus, CHCs in Shenzhen have to earn most of their revenues from service provision.[9]

CHCs in Shanghai and Shenzhen provide similar clinical care, including consultation and treatment of common diseases in western medicine (internal medicine, general surgery, pediatrics, gynecology, and obstetrics) and traditional Chinese medicine. In both cities, public health services provided in CHCs are free to patients and entirely funded by the government, including diabetes and hypertension management programs, health education, immunization, maternal and child healthcare, mental health, and communicable disease prevention and reporting.[10] Consultation in CHCs is paid through fee-for-service, which cost Renminbi, the currency in Mainland China (RMB) 20 to 100 (United States Dollars [USD]3–17) per visit and is covered by health insurance schemes.[11] Hong Kong represents the highest level of private ownership because about 70% of its primary care is provided by for-profit private doctors, mostly solo practitioners with a nurse or medical clerk.[12] Private doctors provide consultation and treatment in western medicine, but not in traditional Chinese medicine. Public health services, such as immunization and chronic disease management, are provided at individual doctor’s discretion. Private doctors charge a consultation fee of Hong Kong dollars (HKD) 250 to 600 (USD32–77) per visit, which is paid 80% out-of-pocket and 20% by private health insurance schemes.[13] The rest (20%–30%) of the primary care in Hong Kong is provided by government outpatient clinics whose cost is heavily subsidized (Box 1).

**Box 1. Characteristics of primary care providers in Hong Kong, Shenzhen, and Shanghai.**

| Level of privatization | Ownership | Number of primary care physicians | Staff structure | Catchment area | Catchment population | Type of physicians | Government funding | Payment system | User characteristics | Service provision | Preventive care |
|------------------------|-----------|----------------------------------|-----------------|----------------|---------------------|-------------------|-----------------|----------------|-------------------|----------------|-----------------|
| Private                | Private-owned | Mostly solo-practice | General practitioner (GP), medical or nurse assistant | Not defined | NA | General practitioners but few received specialty training in family medicine | None | Out of-pocket; HKD250–600 (USD32–77) | General public | Limited |
| Public                 | Hospital Authority | Around 5–10 | GPs, nurses, medical assistants, administrative staff | Defined | NA | Government | Fully funded | Fixed consultation fee; HKD45 (USD6) | Elders and the poor | Limited |
| Shenzhen               | Holding public hospital | Around 5–10 | GPs, nurses, dentist, traditional Chinese Medicine (TCM) doctors, public health staff | Around 5 km² | Around 30,000 | General practitioners but few received specialty training in family medicine | Partially funded (around 45%) | Out of-pocket and insurance; RMB20–100 (USD3–17) | General public with a focus on elders | General practices, and general surgery service, general practices, general surgery service, gynecology and obstetrics, pediatric, TCM herbs or rehabilitation, limited chronic disease management, women and children health, vaccination; health education |
| Shanghai               | Low | Local Government | Around 5 km² | Around 50,000 | Special | Government | Fully funded | Out of-pocket and insurance; RMB20–100 (USD3–17) | General public with a focus on elders | General practices, and general surgery service, general practices, general surgery service, gynecology and obstetrics, pediatric, TCM herbs or rehabilitation, limited chronic disease management, women and children health, vaccination; health education |

Sources: 1. Shanghai Municipal Government. Three Year Implementation Plan for Strengthening the Public Health System Construction (2011–2013), 2011.
2. Shanghai Municipal Commission of Health and Family Planning. The Interpretation to the Family Doctor Registration Scheme, 2012.
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Comparing health system performance both within and across countries gives policy makers a benchmark that allows them to identify in which areas they are performing above or below expectations, and to understand factors such as ownership, delivery, and health financing that may influence reported performance, as well as guidance on where to look for potential solutions. Shanghai, Shenzhen, and Hong Kong lead economic development in China and also set the benchmark of primary care development for other cities. In this study, we aim to examine the impact of private ownership on quality of primary care in the three big cities, and to provide policy implications for health care reforms. This is particularly relevant to the recent policy debate in China. Despite the tremendous efforts to reestablish a public oriented health system since 2009, China government recently decided to promote private investment in CHCs and hospitals with a target of private providers reaching 20% market share by 2015. This study provides evidence advisers the future direction of primary care development in China and other developing countries.

2. Methods

2.1. Study design and participants

We measured quality of primary care using an internationally recognized and locally validated assessment tool.[15,16] In 2013, we conducted multistage stratified random surveys in the 3 big cities. The minimum sample size in each city was estimated as 614, based on a difference in the mean total primary care scores between any 2 cities of 0.8, with a standard deviation of 5, a 95% confidence interval, and a power of 80%. In Hong Kong, we employed a design effect of 2 to inflate the sample size to 1228 as the respondents may use either private or public primary care providers. At the 1st stage, all cities were stratified according to their geographical areas, that is, 4 areas in Shanghai and Shenzhen (north, south, east, and west) and 3 areas in Hong Kong (Island, Kowloon, and New Territory).

In the 2nd stage, on-site face-to-face random surveys were conducted in Shanghai and Shenzhen because population representative household telephone directories were not available. We used a computer generated random sequence to select 1 study district in each of the areas. Then again using a computer generated random sequence, we selected one CHC in each of the 4 study districts. In each CHC, every 5th care user aged at least 18 years was invited, until the sample size reached 200, to participate in the survey, and provided written informed consents before being interviewed.

In Hong Kong, we conducted a telephone survey among Chinese-speaking households randomly selected from a population representative up-to-date telephone directory containing a total of 475,635 residential telephone numbers. Calls were made between 6 and 22 hours to avoid over-representing the nonworking population. A household member aged 18 and above with his/her birthday closest to the day of interview was invited and given verbal consents before being interviewed. We made at least 4 attempts at different days and time periods before considering a number to be invalid.

2.2. Evaluating quality of care

We measured the quality of care in the 3 cities using the Chinese adult version of primary care assessment tool (PCAT), a validated tool developed by Johns Hopkins University,[15] and then translated, piloted, and validated in Hong Kong and Mainland China.[16,18,19] The reliability of the questionnaire between the 2 dialects of Chinese, Cantonese and Mandarin, has been tested in a previous study.[16] Rather than ratings of satisfaction, scores of PCAT objectively measures patient experiences of primary care.[15] Studies using PCAT have demonstrated that higher scores were associated with more effective primary care organization and higher quality of care.[15,20,21] We measured 10 domains of key features in primary care delivery: 1st-contact utilization, 1st-contact accessibility, continuity of care, coordination of information, comprehensiveness of the available service, comprehensiveness of the provided service, family centeredness, community orientation, and culture competence.[22] For each of these attributes, patients were asked how well they agreed with a statement that their regular provider of primary care was excellent in terms of the attribute. Using a 4-point Likert-type scale, each patient’s level of agreement with each statement was scored from 1, indicating that the patient definitely did not agree, to 4, indicating that the patient definitely did agree. The maximum total score for each patient was 40.

We collected information regarding sociodemographic characteristics and health care measures of the participants. We grouped employment status into 2 categories, employed, and not having a job that also included students, retired, and housewives. In Shanghai and Shenzhen, health insurance refers to any social insurance such as the Basic Medical Insurance Schemes and Migrant Health Insurance; while in Hong Kong, it refers to employer-provided or self-purchased health insurance. Income groups were classified according to the city’s poverty line and median household income level.[23–25] Household with a monthly income below the city poverty line, that is, RMB 3000 (US$484) in Shanghai and Shenzhen, and HK$ 10,000 (US$ 1282) in Hong Kong, were considered to have a low income; whereas households having a monthly income above the median household income, that is, RMB 10,000 (US$1613) in Shanghai and Shenzhen, and HK$ 25,000 (US$3205) in Hong Kong, were considered to have a high income. Households with an income between low and high income levels were considered middle income-level.

2.3. Analysis

We used multivariate linear regression models to compare the scores of quality of primary care recorded in the 3 megacities. We adjusted several potential confounding factors: gender, age, educational levels, employment status, household income levels, health insurance status, self-reported health status, presence of chronic diseases, number of visits to the primary care provider in the previous 12 months, and number of years since the patient’s first visit to the primary care provider. Shenzhen was employed as reference while its differences with Shanghai and Hong Kong were reported separately using adjusted beta with 95% confidence intervals. Equity was examined by comparing the quality of primary care among different household income groups within each megacity. All data analysis was performed using SPSS19.0 (Chicago).

2.4. Ethical approval

Ethical approval was obtained from the ethics committees of the Chinese University of Hong Kong and New Territories East Cluster Clinical Research (reference CRE-2012.441).
completed the questionnaire in Shenzhen. In Hong Kong, 2002 (67%) of the 2995 households completed the telephone questionnaire interview; among them, 1325 (66%) reported as private primary care users and were included in the analysis. In the 3 megacities, most participants were females and received education below college. However, significant differences were observed in other variables (Table 1). Most participants in Shanghai were 60 years or older, having health problems and not having a job. In contrast, most participants in Shenzhen and Hong Kong were younger than 45 years, employed and not reporting health problems. Less than half had health insurance in Hong Kong, compared with 64% in Shenzhen and 96% in Shanghai. The majority of participants in Shanghai and Hong Kong stayed with the same primary care providers over 5 years, but Shanghai participants visited their providers more frequently compared with those in Hong Kong. Although in Shenzhen, most participants stayed less than 2 years with their providers and also visited providers less frequently.

### 3.2. Quality scores

The mean total quality scores were 28.39 in Shanghai, 25.82 in Shenzhen and 25.21 in Hong Kong (Fig. 1). After controlling covariates, participants in Shanghai reported the highest total quality scores, while those in Hong Kong reported the lowest. In a supplementary Table ST1, http://links.lww.com/MD/B502, we reported similar trends of quality scores of the 3 cities where Hong Kong had all participants, both private and public primary care users, included. When individual domain scores were compared, Shanghai participants reported the highest scores for 1st contact accessibility, coordination of information, comprehensiveness of service availability, and culture competence, while Hong Kong participants reported the lowest scores for these domains. In addition, Shanghai participants reported significant higher scores for continuity of care and community orientation when compared with Shenzhen’s. However, Hong Kong participants reported the highest scores for 1st contact utilization,

| Characteristics | Shanghai (n = 797) no., % | Shenzhen (n = 802) no., % | Hong Kong (n = 1325) no., % | χ² | P |
|-----------------|--------------------------|--------------------------|-----------------------------|----|---|
| Gender          |                          |                          |                             |    |   |
| Female          | 540 (67.8)               | 522 (65.1)               | 722 (54.5)                  | 44.519 | <0.001 |
| Male            | 257 (32.2)               | 280 (34.9)               | 603 (45.5)                  |     |   |
| Age group       |                          |                          |                             |    |   |
| <44             | 48 (6.0)                 | 637 (79.4)               | 663 (50.0)                  | 1262.204 | <0.001 |
| 45–59           | 175 (22.0)               | 86 (10.7)                | 450 (34.0)                  |     |   |
| ≥60             | 574 (72.0)               | 79 (9.9)                 | 212 (16.0)                  |     |   |
| Education       |                          |                          |                             |    |   |
| College and above | 230 (28.9)           | 156 (19.7)               | 421 (31.8)                  | 122.749 | <0.001 |
| High school or equivalent | 263 (33.0) | 277 (34.5) | 586 (44.2) |
| Middle school and below | 304 (38.1) | 367 (45.8) | 319 (24.1) |
| Employment      |                          |                          |                             |    |   |
| Employed        | 115 (14.4)               | 553 (69.0)               | 734 (55.4)                  | 530.007 | <0.001 |
| Not having a job | 682 (85.6)              | 249 (31.0)               | 591 (44.6)                  |     |   |
| Household income|                          |                          |                             |    |   |
| Low             | 84 (10.5)                | 129 (16.8)               | 113 (8.5)                   | 511.239 | <0.001 |
| Middle          | 538 (67.9)               | 451 (56.2)               | 376 (28.4)                  |     |   |
| High            | 161 (20.2)               | 155 (19.3)               | 512 (38.6)                  |     |   |
| Not answered    | 14 (1.8)                 | 67 (8.4)                 | 324 (24.5)                  |     |   |
| Health insurance|                          |                          |                             |    |   |
| Insured         | 765 (96.0)               | 510 (63.6)               | 577 (43.5)                  | 589.330 | <0.001 |
| Uninsured       | 32 (4.0)                 | 292 (36.4)               | 748 (56.5)                  |     |   |
| Number of visits to the primary care provider in previous 12 months | | | | | |
| ≤3              | 73 (9.2)                 | 500 (62.3)               | 788 (59.5)                  | 1269.895 | <0.001 |
| 4–6             | 70 (8.8)                 | 178 (22.2)               | 375 (28.3)                  |     |   |
| ≥7              | 654 (82.1)               | 124 (15.5)               | 162 (12.2)                  | 873.889 | <0.001 |
| Time since first visit to the primary care provider, years | | | | | |
| ≤2              | 130 (16.4)               | 529 (65.9)               | 171 (12.9)                  | 835.336 | <0.001 |
| 3–4             | 87 (10.9)                | 131 (16.3)               | 170 (12.8)                  |     |   |
| ≥5              | 580 (72.8)               | 142 (17.7)               | 984 (74.3)                  |     |   |
| Health status   |                          |                          |                             | 155.649 | <0.001 |
| Good            | 223 (28.0)               | 450 (56.1)               | 590 (44.5)                  |     |   |
| Fair            | 490 (61.5)               | 309 (38.5)               | 686 (51.8)                  |     |   |
| Poor            | 84 (10.5)                | 43 (5.4)                 | 49 (3.7)                    |     |   |
| Diagnosed chronic disease | | | | | |
| Present         | 587 (75.0)               | 135 (16.8)               | 234 (17.7)                  | 835.336 | <0.001 |
| Absent          | 210 (24.1)               | 667 (83.2)               | 1091 (82.3)                 |     |   |

CHC = community health center, no. = number.

1 The indicated P-values came from χ² tests in which, for each megacity, the values recorded in 3 cities were compared.
2 Hypertension, diabetes, cardiovascular, chronic respiratory, pulmonary, liver, thyroid or skeleton–muscular diseases, gastrointestinal disorders, mental illness, and/or disability.
then followed by those in Shenzhen and Shanghai. Hong Kong participants also reported higher scores of continuity of care and community orientation than Shenzhen (Table 2).

We compared primary care scores among those who were 60 or older, a total of 865 participants in the 3 cities, as they have greater needs for primary care. The mean total scores for elders were 28.27 in Shanghai, 26.99 in Shenzhen, and 24.75 in Hong Kong. After adjustment of all confounders, Hong Kong participants reported significantly lower total scores when compared with those in Shenzhen, while no significant difference was found in participants between Shanghai and Shenzhen. Regarding individual domain scores, Shanghai participants reported the highest scores for 1st contact of utilization and coordination of services, but lower scores for 1st contact accessibility, comprehensiveness of service availability, and provided family centeredness and culture competence (Table 3).

Table 2
Primary care quality scores reported by all participants in Shanghai, Shenzhen, and Hong Kong, China in 2013.

| Attributes                  | Shanghai (n=797) score (SD) | Shenzhen (n=802) score (SD) | Hong Kong (n=1325) score (SD) | Adjusted β1 (95% CI)† | Adjusted β2 (95% CI)† |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------|-----------------------|
| First contact-utilization   | 2.64 (0.61)                 | 2.41 (0.58)                 | 3.15 (0.77)                 | -0.171 (-0.361, -0.081)*** | 0.696 (0.610, 0.782)*** |
| First contact-accessibility | 2.30 (0.54)                 | 2.25 (0.47)                 | 1.99 (0.55)                 | 0.172 (0.088, 0.255)*** | -0.266 (-0.330, -0.202)*** |
| Continuity of care          | 3.12 (0.63)                 | 2.69 (0.65)                 | 3.09 (0.60)                 | 0.216 (0.111, 0.320)*** | 0.340 (0.263, 0.418)*** |
| Coordination of services    | 2.71 (1.12)                 | 2.52 (1.07)                 | 2.48 (0.68)                 | 0.214 (0.033, 0.394)†  | -0.045 (-0.152, 0.003) |
| Coordination of information | 3.81 (0.41)                 | 3.11 (0.72)                 | 2.54 (0.51)                 | 0.505 (0.411, 0.599)*** | -0.659 (-0.734, -0.585)*** |
| Comprehensiveness-service availability | 3.33 (0.52) | 3.01 (0.60) | 2.50 (0.61) | 0.328 (0.235, 0.422)*** | -0.511 (-0.587, -0.435)*** |
| Comprehensiveness-service provided | 2.62 (0.59) | 2.48 (0.64) | 2.45 (0.65) | 0.088 (-0.014, 0.190) | -0.100 (-0.181, -0.020)† |
| Family centeredness         | 2.80 (0.83)                 | 2.82 (0.79)                 | 2.46 (0.79)                 | 0.015 (-0.120, 0.149)  | -0.419 (-0.519, -0.320)*** |
| Community orientation       | 2.18 (0.79)                 | 1.77 (0.61)                 | 2.00 (0.57)                 | 0.305 (0.2188, 0.423)*** | 0.154 (0.079, 0.229)*** |
| Cultural competence         | 2.89 (1.10)                 | 2.76 (0.88)                 | 2.56 (0.58)                 | 0.314 (0.149, 0.479)*** | -0.248 (-0.337, -0.159)*** |
| Total score                 | 28.39 (3.89)                | 25.82 (3.59)                | 25.21 (3.11)                | 1.985 (1.363, 2.607)*** | -1.058 (-1.469, -0.648)*** |

† P < 0.05; †† P < 0.001. CI = confidence interval, SD = standard deviation.
† The differences in individual and total primary care scores among the respondents were examined using multiple linear regression models, where the dependent variables were the domain and total scores, while independent variables included all patient characteristics, that is, gender, age, education, employment, household income, health insurance, number of visits to the primary care provider, and time since 1st visit to the primary care provider, health status and presence of chronic disease. β1 (Shanghai) and β2 (Hong Kong) were calculated with Shenzhen as reference.
## Table 3

| Attributes                        | Shanghai (n = 574) | Shenzhen (n = 79) | Hong Kong (n = 212) | Adjusted β1 (95% CI) | Adjusted β2 (95% CI) |
|----------------------------------|--------------------|------------------|----------------------|----------------------|----------------------|
|                                  | score (SD)         | score (SD)       | score (SD)           | (SD)                 | (SD)                 |
| First contact-utilization        | 2.79 (0.59)        | 2.65 (0.50)      | 2.99 (0.78)          | 0.077 (−0.132, 0.286) | 0.390 (0.124, 0.656)** |
| First contact-accessibility      | 2.25 (0.50)        | 2.36 (0.55)      | 2.01 (0.61)          | −0.077 (−0.279, 0.125) | −0.337 (−0.546, −0.127)** |
| Continuity of care               | 3.14 (0.63)        | 2.92 (0.66)      | 3.13 (0.67)          | 0.085 (−0.157, 0.326) | 0.192 (−0.047, 0.439) |
| Coordination of services         | 2.68 (1.14)        | 2.30 (1.06)      | 2.49 (0.80)          | 0.022 (−0.421, 0.465) | 0.324 (0.001, 0.647)** |
| Coordination of information      | 3.82 (0.38)        | 3.26 (0.78)      | 3.55 (0.53)          | 0.470 (0.301, 0.639)** | −0.667 (−0.895, −0.438)** |
| Comprehensiveness-service availability | 3.28 (0.53)        | 3.02 (0.61)      | 2.46 (0.64)          | 0.184 (−0.022, 0.391) | −0.550 (−0.783, −0.317)** |
|                                  | 2.60 (0.60)        | 2.74 (0.60)      | 2.42 (0.67)          | 0.025 (−0.213, 0.263) | −0.451 (−0.699, −0.203)** |
| Community orientation            | 2.74 (0.83)        | 2.97 (0.81)      | 2.35 (0.87)          | −0.207 (−0.537, 0.122) | −0.525 (−0.849, −0.201)** |
| Cultural competence              | 2.17 (0.79)        | 1.98 (0.67)      | 1.92 (0.57)          | 0.260 (−0.047, 0.567) | −0.048 (−0.287, 0.191) |
| Total score                      | 28.27 (3.89)       | 26.99 (3.46)     | 24.75 (3.34)         | 0.858 (0.649, 2.364)  | −2.081 (−3.297, −0.866)** |

† The differences in individual and total primary care scores among the respondents were examined using multiple linear regression models, where the dependent variables were the domain and total scores, while independent variables included all patient characteristics, that is, gender, age, education, employment, household income, health insurance, number of visits to the primary care provider, and time since 1st visit to the primary care provider, health status and presence of chronic disease. β1 (Shanghai) and β2 (Hong Kong) were calculated with Shenzhen as reference.

### 3.3. Scores among different income groups

We further compared primary care scores among households with different income groups within each city. Regarding the total quality scores, no significant differences were found among participants from different household income groups in Shanghai and Shenzhen; but in Hong Kong, participants from rich income households reported higher total scores than those of poor households. When compared with participants from poor households, those from rich households in Shanghai and Shenzhen reported high scores for 1st contact utilization and community orientation; while those from rich households in Hong Kong reported higher scores for 1st contact accessibility, comprehensiveness of service availability, family centeredness, and cultural competence (Table 4).

## Table 4

| Attributes                        | Shanghai (n = 84) | Shenzhen (n = 129) | Hong Kong (n = 113) | Shenzhen (n = 376) | Hong Kong (n = 512) |
|----------------------------------|------------------|-------------------|---------------------|-------------------|---------------------|
|                                  | score (SD)       | score (SD)        | score (SD)          | score (SD)        | score (SD)          |
| First contact-utilization        | 2.73 (0.62)      | 2.67 (0.59)       | 2.52 (0.64)         | 2.75 (0.52)       | 3.08 (0.77)         |
| First contact-accessibility      | 2.29 (0.56)      | 2.29 (0.53)       | 2.29 (0.55)         | 2.22 (0.44)       | 1.90 (0.51)         |
| Continuity of care               | 3.16 (0.66)      | 3.14 (0.61)       | 3.07 (0.68)         | 2.77 (0.65)       | 2.97 (0.68)         |
| Coordination of services         | 2.78 (1.09)      | 2.71 (1.15)       | 2.71 (1.05)         | 2.41 (0.94)       | 2.58 (0.72)         |
| Coordination of information      | 3.83 (0.38)      | 3.82 (0.38)       | 3.76 (0.52)         | 3.09 (0.78)       | 2.51 (0.53)         |
| Comprehensiveness-service availability | 3.25 (0.50)      | 3.32 (0.53)       | 3.40 (0.48)         | 2.78 (0.64)       | 2.31 (0.66)         |
| Family centeredness             | 2.60 (0.54)      | 2.61 (0.60)       | 2.69 (0.60)         | 2.61 (0.60)       | 2.47 (0.63)         |
| Community orientation            | 2.71 (0.80)      | 2.78 (0.84)       | 2.92 (0.81)         | 2.77 (0.82)       | 2.31 (0.82)         |
| Cultural competence              | 2.89 (1.12)      | 2.62 (1.10)       | 3.08 (1.05)         | 2.82 (0.89)       | 2.40 (0.63)         |
| Total score                      | 28.19 (3.75)     | 28.35 (3.90)      | 28.66 (3.88)        | 25.84 (3.70)      | 24.47 (3.08)        |

ANOVA = analysis of variance, SD = standard deviation.

* ANDA tests were conducted for comparison within each city while respondents of the low income group were used as reference. Statistically significant results were bolded.

6
4. Discussion

We assessed the quality of primary care in 3 big cities in 2013. The highest quality scores were reported in Shanghai, where primary care providers were fully public-owned, and then followed by Shenzhen, where primary care providers were owned by public hospitals but operated as private for-profit organizations. Although the lowest quality scores were reported in Hong Kong, where primary care providers assessed were fully private-owned. Our findings indicate that high levels of private ownership in primary care, if operated as for-profit, may be associated with lower quality of primary care. Another study compared the changes of primary care quality scores in Shanghai and Shenzhen between 2011 and 2013. It reported that quality scores improved in Shanghai, where specific policies regarding clinical and preventive care were implemented in CHCs to promote general practitioner team service, while quality of care declined in Shenzhen, where CHCs were more profit-driven.[26] Studies in China also showed that government owned CHCs provided higher quality of care, and reported higher blood pressure control rates among hypertensive patients managed in CHCs when compared with hospital-owned or private-owned CHCs.[18,27,28]

Studies in North America using the PCATs showed non-profit primary care providers achieved higher care quality. CHCs in the US, which are nonprofit and operated under the Public Health Service Act, were found to deliver a higher quality of primary care compared with outpatient clinics owned by for-profit Health Maintenance Organizations.[15] Recent studies of Medicaid patients with diabetes also demonstrated that CHCs provided superior quality of care to their patients compared with private physicians.[29,30] In Canada, non-profit CHCs, where primary care doctors received a fixed salary, provided better comprehensive care than private doctors receiving fee-for-service payments.[31] On the other side, private primary care providers in developing countries, mostly for-profit, were reported to be more responsive to patients, and delivering higher quality of care than public providers.[32] In Croatia, privatization of primary care was linked with improved patient access to doctors in the initial stage due to market competition.[33] But other studies showed that, if examined over a longer period, the improvement in privatization, as shown in hospitals in California, may be confined to services with high profit margins.[34]

Clearly, Shanghai participants reported the highest quality scores for 1st contact accessibility, coordination of information, comprehensiveness of service availability, and culture competence, while Hong Kong participants reported the lowest scores for these domains. In addition, Shanghai participants reported higher scores for continuity of care and coordination of services when compared with Shenzhen.[15] Ownership of primary care is related with for-profit or nonprofit care delivery, and may explain some of the differences; while other primary care policies, which may or may not be directly associated with ownership models, also influenced primary care service. For example in Shanghai, consultation fees in CHCs were waived, but a flat fee of RMB10 (USD1.7) applied in CHCs in Shenzhen,[14] while private doctors charge around HKD 300 (USD 39) per visit in Hong Kong which is often not insured. Financial costs would be a significant barrier for patient’s access to primary care. Regarding coordination of information, Shanghai has established a universal electronic health record system for patients visiting any public health providers, including CHCs, so patient information in the CHC can be easily seen by doctors in big hospitals when transferred. In Shenzhen, hospital owned CHCs lack the willingness to coordinate with hospitals other than their holding hospital due to the potential competition for patients among hospitals. In Hong Kong, patient information is not shared between private doctors and public hospitals except for a small number of private doctors who joined the public e-health program.[37] As part of the public health system, CHCs in Shanghai and Shenzhen provide a full range of preventive care free of charge to patients, which may improve their care comprehensiveness. For-profit primary care providers in Hong Kong are incentivized to provide more service with a high price margin, such as clinical care, but often at the cost of preventive care, which may result in decreased degree of care comprehensiveness. Private doctors in Hong Kong are usually only trained in western medicine, and received little training in Traditional Chinese Medicine, thus resulting in a lower score for culture competence. In addition, continuity of care may be enhanced in Shanghai where CHCs strengthened long-term patient doctor relationships.[18]

On the other hand, Hong Kong participants reported the highest scores for 1st contact utilization, while Shanghai participants reported the lowest. In Hong Kong, a referral letter from a primary care provider is needed to visit specialists in public hospitals, so patients have to visit their primary care providers first for any health problems.[16] In Shenzhen, such a referral letter is needed only for patients who are under the migrant health insurance scheme.[38] There are no restrictions to visiting big hospitals in Shanghai.

Equity is one of the most important goals of primary care.[39] Private providers may serve better for patients who can afford the care while excluding those who cannot. We found that private ownership in primary care is associated with inequity of quality score distribution. Another survey in 2011 reported similar results in Hong Kong showing that participants with higher household income reported higher quality scores for primary care.[40] In Hong Kong, patients who use public primary care providers are elders from poorer households and report lower quality scores compared with those using private providers.[19,40] A study in Sweden showed that privatization of primary care providers improved patient accessibility, but only among people of high income.[7]

Several limitations have to be considered. First, the study design prevents us from demonstrating any causal linkages between privatization and primary care quality scores. Second, other factors, such as health insurance schemes and health policies, may also influence care delivery. Some are directly related with ownership, but others may not. Third, we conducted a telephone survey in Hong Kong but on-site surveys in Shanghai and Shenzhen where population-based household telephone dictionaries were not available. We achieved a relatively high response rate in the telephone survey. Similar comparison was done in a previous study demonstrating that the research tools were valid in reflecting the difference of service qualities in between Shanghai and Hong Kong.[16] Fourth, though we have controlled possible confounding factors when comparing primary care qualities in the 3 cities, other unmeasured confounders, such as social contexts, may not be identified and controlled. In addition, we did not numerically measure the level of private ownership in primary care, while future studies may delineate it where possible.

5. Conclusions

The study suggests that private primary care ownership may be potentially associated with lower care quality and less equitable care distribution. In China, it indicates that it may be beneficial for the Government to promote public-owned and nonprofit CHCs as they deliver higher quality of care when compared with...
private or for-profit CHCs. At the international level, our findings imply that promoting privatization may be at the cost of quality and equity of primary care. Future studies should scrutinize the impact of private ownership using population health outcomes.

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