

Rural-urban disparities in family physician practice patterns: A nationwide survey in Taiwan

Bo-Ren Cheng¹  | Hsiao-Ting Chang^{1,2} | Ming-Hwai Lin^{1,2} |
Tzeng-Ji Chen^{1,2}  | Li-Fang Chou³  | Shinn-Jang Hwang^{1,2}

¹Department of Family Medicine, Taipei Veterans General Hospital, Taipei, Taiwan

²School of Medicine, National Yang-Ming University, Taipei, Taiwan

³Department of Public Finance, National Chengchi University, Taipei, Taiwan

Correspondence

Tzeng-Ji Chen, School of Medicine, National Yang-Ming University, No. 155, Sec. 2, Linong Street, Taipei 112, Taiwan.
Email: tjchen@vghtpe.gov.tw

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Summary

Introduction: In a world with increasing urbanization, rural-urban disparities in health care utilization have been a long-term concern. However, the details regarding the practice patterns of family physicians in Taiwan have not received sufficient attention thus far.

Methods: The National Health Insurance Research Database of Taiwan offered 0.2% of the total ambulatory visit records for Taiwan in 2013. Records from community clinics of family medicine were collected, with the clinics categorized as rural, suburban, or urban area clinics according to their locations.

Results: Among 100 334 visits to family medicine clinics, the median patient age was 50 years for urban clinics, 51 for suburban clinics, and 58 for rural clinics. The distributions of patient ages differed in the three areas ($P < 0.001$). Four types of chronic diseases (cardiovascular diseases, diabetes, chronic respiratory diseases, and cancers) accounted for 10.8%, 11.3%, and 13.6%, of the visits to urban, suburban, and rural clinics, respectively. The most common procedure was wound treatment, and the pattern of the top 10 procedures was similar in the three areas.

Conclusion: Although rural patients in Taiwan were older and had more chronic diseases than urban and suburban patients, the pattern of procedures undertaken by rural family physicians did not differ from those of urban and suburban family physicians.

KEYWORDS

family physicians, practice pattern, rural-urban disparity, Taiwan

1 | INTRODUCTION

For decades, family physicians have played a critical role in public health worldwide. Whether in rural or urban areas, family physicians are the first line in providing comprehensive health care, engaging in public health promotion, managing acute or chronic illnesses in a population, helping patients go back to regular daily life after an acute illness, and providing long-term care in communities.^{1,2}

In a world with increasing urbanization, rural-urban disparities in health care utilization have been a long-term concern. Generally speaking, rural areas have more limited health care resources than urban areas.³ For instance, a previous study has shown that, for patients with respiratory illness in the last year of life, the number of physician visits and home care services (including palliative care and physiotherapy) received by patients in remote or rural areas was fewer than the number received by patients in urban areas.⁴ The inadequate number of physicians in rural areas is considered one of the major factors underlying such rural-urban disparities.⁵ In addition, these rural-urban disparities in health care may even influence the adherence of physicians to clinical preventive guidelines.⁶ Meanwhile, poverty is a factor that can influence the health of individuals in various ways, and poverty is more prevalent in rural or remote areas. Fewer physicians and nurses, higher prevalence rates of chronic diseases, and more difficulties in transportation make rural citizens less likely to visit a physician for their diseases and slower to do so when they do compare with urban citizens.^{7,8} Perhaps, unsurprisingly then, the outcomes of diseases in rural areas have been reported to be worse than those in urban areas.⁹

Rural-urban disparities in health care also exist in Taiwan and have been discussed in previous studies.¹⁰⁻¹² In the current study, we aimed to illustrate key details regarding the practice patterns of family physicians in Taiwan, a subject which has not received sufficient attention thus far.

2 | MATERIALS AND METHODS

2.1 | Background

The National Health Insurance (NHI) program of Taiwan is a single-payer health care system that was started in 1995 and currently covers more than 99% of Taiwan's citizens.¹³ Patients are not required to register with a specific family physician and can visit any specialist in community clinics or the outpatient departments of hospitals without a referral.¹⁴ For this study, we obtained research datasets from the National Health Insurance Research Database, which contains extensive electronic records of the NHI system insurance claims made since 1996.¹⁵ The institutional review board of Taipei Veterans General Hospital in Taipei, Taiwan, approved the study (2013-04-005E).

2.2 | Data processing

This was a retrospective, cross-sectional study. We retrieved two systemic sampling files regarding ambulatory visits (S_CD20130.DAT and S_OO20130.DAT) and two registration files (HOSB2013.DAT and PER2013.DAT) for the year 2013 from the National Health Insurance Research Database. The "CD" file contains all the outpatient visit records, and the "OO" file contains the ambulatory care orders for drugs, laboratory examinations, etc. A 0.2% sampling ratio was applied to derive data from the CD and OO files. The "HOSB" file has all the details of the contracted health facilities within the NHI program (including the levels, locations etc. of the health facilities), and the "PER" file contains information on individual physicians, such as their gender and age.

We were interested in rural-urban disparities among family physicians in the community, so we utilized records from clinics only while excluding those from hospitals (eg, academic medical centers, regional hospitals and local hospitals), basing on the facilities' records in the "HOSB" file.

From the files, we extracted patient age and gender data and physician age and gender data, as well as the data on care orders and first diagnosis codes as defined by the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM). Among the various kinds of orders, our attention was focused on orders related to disease screening/prevention or treatment. Furthermore, because the National Ambulatory Medical Care Survey (NAMCS) developed by the Bureau of the Census in the United States has proven useful in describing nationwide conditions of primary care,^{16,17} we further categorized diagnoses by the method used in the NAMCS. We specifically analyzed data regarding four kinds of chronic diseases (cardiovascular diseases, chronic respiratory diseases, cancers, and diabetes), the importance of which has been highlighted by the World Health Organization.¹⁸

For each eligible record, we classified the clinic in question as rural, suburban, or urban according to its location. The degree of urbanization of towns in Taiwan is stratified to seven levels based on their demographic characteristics, industrialization, and distribution of medical resources.¹⁹ Level 1 represents the highest population density, level of education, and medical resources density, whereas Level 7 represents the lowest levels of those indexes. We defined urban areas as towns at Levels 1 and 2, suburban areas as towns at Levels 3 and 4, and rural areas as towns at Levels 5, 6, and 7.

2.3 | Statistics analysis

The programming software Perl version 5.26.2 was used for data processing. The software SPSS version 20.0 was used for statistical analysis. The Kruskal-Wallis test was used for group comparisons. A *P*-value <0.05 was considered statistically significant.

3 | RESULTS

We extracted data regarding 100 334 outpatient visits to family medicine clinics, including 44 379 visits to urban area clinics, 39 565 visits to suburban area clinics, and 16 390 visits to rural area clinics (Supplementary Table 1). While patients aged 50 to 59 years constituted the largest percentages of urban (18.6%) and suburban (18.0%) area patients, patients aged 70 to 79 years made up the largest percentage of rural (20.5%) area patients (Figure 1). The median patient age was 50 years (range: 0-115, interquartile range = 33) for urban clinics, 51 years (range: 0-104, interquartile range = 34) for suburban clinics, and 58 years (range: 0-106, interquartile range = 31) for rural clinics. The distributions of patient ages differed in the three areas (*P* < 0.001). The portion of visits by patients aged 60 years or over was 32.0% in urban areas, 35.1% in suburban areas, and 47.6% in rural areas.

There were 2300 (49%) family physicians practicing in urban clinics, 1746 (37%) practicing in suburban clinics and 682 (14%) practicing in rural clinics in Taiwan in 2013 (Supplementary Table 2). The age and gender of four physicians were unknown. Physicians aged between 50 and 59 years old constituted the largest percentages of physicians in the three areas (Figure 2). The median physician age was 53 years (range: 27-93, interquartile range = 19) for urban clinics, 53 years (range: 27-97, interquartile range = 19) for suburban clinics, and 54 years (range: 27-91, interquartile range = 17) for rural clinics. The distributions of family physician ages did not differ in the three areas (*P* = 0.32).

"Acute upper respiratory infections of multiple or unspecified sites" (ICD-9-CM: 465) was the most common diagnosis in all three areas in Taiwan, accounting for 8789 (19.8%) visits to urban clinics, 6969 (17.6%) visits to suburban clinics, and 2416 (14.7%) visits to rural clinics. "Essential hypertension" (ICD-9-CM: 401) was the second most common diagnosis in the three areas, accounting for 2867 (6.5%) visits to urban clinics, 2834 (7.2%) visits to suburban clinics, and 1375 (8.4%) visits to rural clinics (Supplementary Table 3). After reclassifying the ICD-9-CM diagnoses into NAMCS diagnosis groups, "Other acute respiratory infections" (includes ICD-9-CM 460, 464-465) was the most common diagnosis in all the three areas, accounting for 10 995 (24.8%) visits to urban clinics, 9129 (23.1%)

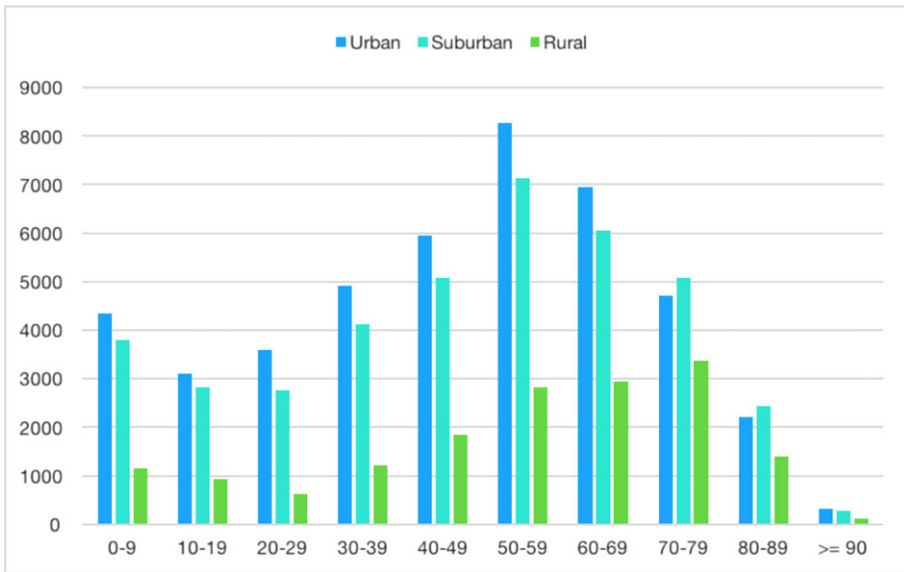


FIGURE 1 Numbers of outpatient visits by patient age to urban, suburban, and rural area clinics in Taiwan in 2013

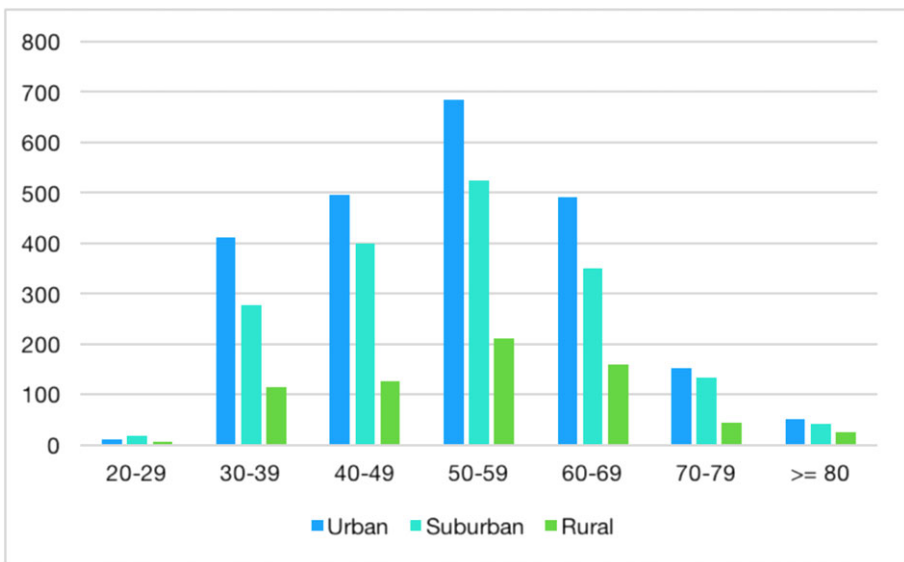


FIGURE 2 Distribution of family physicians by age in urban, suburban, and rural area clinics in Taiwan in 2013

visits to suburban clinics, and 3171 (19.3%) visits to rural clinics (Table 1). Meanwhile, “Essential hypertension” (only includes ICD-9-CM 401) was still the second most common diagnosis. Otherwise, the percentage of outpatient visits for the four main types of chronic diseases was 10.8% for urban clinics, 11.3% for suburban clinics, and 13.6% for rural clinics (Table 2).

The most common care order related to disease screening/prevention or disease treatment in all three areas was “wound treatment” (Table 3) (Supplementary Table 4). Furthermore, the top 10 most common orders were the same

TABLE 1 Top 10 most common diagnoses in urban, suburban, and rural area clinics as categorized by NAMCS diagnosis groups in Taiwan in 2013

| Diagnosis | Urban | | Suburban | | Rural | |
|---|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| | No. of visits (%, n = 44 379) | No. of visits (%, n = 39 565) | No. of visits (%, n = 44 379) | No. of visits (%, n = 39 565) | No. of visits (%, n = 39 565) | No. of visits (%, n = 16 390) |
| Other acute respiratory infections | 10 995 (24.8) | 9129 (23.1) | 10 995 (24.8) | 9129 (23.1) | 9129 (23.1) | 3171 (19.3) |
| Essential hypertension | 2867 (6.5) | 2834 (7.2) | 2867 (6.5) | 2834 (7.2) | 2834 (7.2) | 1375 (8.4) |
| Acute bronchitis and bronchiolitis | 2226 (5.0) | 1797 (4.5) | 2226 (5.0) | 1797 (4.5) | 1797 (4.5) | 617 (3.8) |
| Diabetes mellitus | 1409 (3.2) | 1305 (3.3) | 1409 (3.2) | 1305 (3.3) | 1305 (3.3) | 560 (3.4) |
| Noninfectious enteritis and colitis | 1251 (2.8) | 1025 (2.6) | 1251 (2.8) | 1025 (2.6) | 1025 (2.6) | 458 (2.8) |
| Other symptoms signs and ill-defined conditions | 1170 (2.6) | 1009 (2.6) | 1170 (2.6) | 1009 (2.6) | 1009 (2.6) | 426 (2.6) |
| Gastritis and duodenitis | 1032 (2.3) | 966 (2.4) | 1032 (2.3) | 966 (2.4) | 966 (2.4) | 399 (2.4) |
| Other diseases of the respiratory system | 944 (2.1) | 833 (2.1) | 944 (2.1) | 833 (2.1) | 833 (2.1) | 396 (2.4) |
| Acute tonsillitis | 942 (2.1) | 788 (2.0) | 942 (2.1) | 788 (2.0) | 788 (2.0) | 388 (2.4) |
| Other diseases of the digestive system | 893 (2.0) | 750 (1.9) | 893 (2.0) | 750 (1.9) | 750 (1.9) | 332 (2.0) |

TABLE 2 Distribution of four main types of chronic diseases in urban, suburban, and rural area clinics as categorized by NAMCS diagnosis groups in Taiwan in 2013

| | Urban (% , n = 44 379) | Suburban (% , n = 39 565) | Rural (% , n = 16 390) |
|---|------------------------|---------------------------|------------------------|
| Cardiovascular diseases ^a | 2966 (6.7) | 2919 (7.4) | 1422 (8.7) |
| Diabetes | 1409 (3.2) | 1305 (3.3) | 617 (3.8) |
| Chronic respiratory diseases ^b | 389 (0.9) | 229 (0.6) | 158 (1.0) |
| Cancers ^c | 21 (< 0.1) | 35 (0.1) | 34 (0.2) |
| Total | 4785 (10.8) | 4488 (11.3) | 2231 (13.6) |

^aCardiovascular diseases include "angina pectoris," "coronary atherosclerosis," "other ischemic heart disease," "essential hypertension," and "cerebrovascular disease."

^bChronic respiratory diseases include "chronic and unspecified bronchitis," "asthma," and "other chronic obstructive pulmonary disease and allied conditions."

^cCancers include "malignant neoplasm of colon and rectum," "malignant neoplasm of breast," "malignant neoplasm of prostate," "malignant neoplasm of lymphatic and hematopoietic tissue," and "other malignant neoplasms."

in all three areas, although they were ranked somewhat differently across the three areas. Disease screening/prevention orders, including "adult health examination," "influenza immunization," "children health exam," "colon cancer screening (stool occult blood test)," "oral cancer screening (oral mucosa examination)," and "cervical cancer screening (Pap smear)," accounted for 3.7% of all orders in urban clinics, 4.0% of all orders in suburban clinics, and 3.8% of all orders in rural clinics. Disease treatment orders, including "wound treatment," "ear, nose, and throat treatment," "steam therapy," and "cigarette cessation treatment," accounted for 2.8% of all orders in urban clinics, 2.9% of all orders in suburban clinics and 2.8% of all orders in rural clinics.

4 | DISCUSSION

In the current study, we found that there were some rural-urban practice pattern disparities in Taiwan: First, rural patients were older, on average, than urban and suburban patients; second, the percentage of outpatient visits for chronic diseases was higher for rural area clinics; third, the number of family physicians practicing in rural clinics was lower. However, there were no significant regional differences in terms of the care orders most commonly prescribed by community family physicians.

Among the outpatient visits to family physicians in Taiwan, the proportion of old patients accounting for visits to rural area clinics was higher than those for urban and suburban area clinics. The problem of aging populations in rural America has also been recognized for a long time. One of the reasons why rural populations are older might be that retirees move to rural areas, while young people find work or attend school in urban areas.^{20,21} Taiwan has encountered similar problems.¹² Several studies have shown that older rural patients are at greater risk of experiencing more chronic diseases, dementia, depressed mood, health care visits, and lower activities of daily living scores than their urban counterparts.²²⁻²⁵ Aside from the older age of rural citizens, the higher prevalence rates of chronic diseases in rural areas might also be due to obesity, lower socioeconomic status, and unhealthy lifestyles (eg, inadequate daily activities, high-calorie diets, higher rates of smoking).^{12,25,26} Relatedly, some studies have indicated that reductions in the inequality of health care workforces, enhancements of medical accessibility, improved evidence-based public health education, and the elimination of environmental barriers to good diets and exercise would make it possible to ameliorate rural-urban disparities.^{8,24}

The shortage of rural physicians is a major issue in many countries.^{27,28} The lack of physician manpower in rural areas might lead to exhaustion and early retirement among rural physicians.^{29,30} Meanwhile, the difficulties in recruiting and retaining rural physicians further worsen the situation.³⁰ One of the factors that affect physicians' decisions to practice in rural areas is the background of physicians, eg, growing up, living in, or studying in rural areas.³¹⁻³³

TABLE 3 Top 10 care orders related to disease screening/prevention or disease treatment in urban, suburban, and rural area clinics in Taiwan in 2013

| Urban | Suburban | | Rural | |
|---|----------------------------------|---|----------------------------------|---|
| | No. of visits (%, n = 44 379) | Orders | No. of visits (%, n = 39 565) | Orders |
| Wound treatment ^a | 905 (2.0) | Wound treatment ^a | 944 (2.4) | Wound treatment ^a |
| Adult preventive health services ^b | 518 (1.2) | Influenza virus vaccination for high risk population and elderly ^b | 471 (1.2) | Influenza virus vaccination for high risk population and elderly ^b |
| Influenza virus vaccination for high risk population and elderly ^b | 405 (0.9) | Adult preventive health services ^b | 414 (1.0) | Adult preventive health services ^b |
| Stool occult blood test ^b | 229 (0.5) | Stool occult blood test ^b | 220 (0.6) | Stool occult blood test ^b |
| Oral mucosa examination ^b | 206 (0.5) | Oral mucosa examination ^b | 197 (0.5) | Oral mucosa examination ^b |
| Ear, nose and throat treatment ^a | 145 (0.3) | Children health exam ^b | 172 (0.4) | Children health exam ^b |
| Pap smear ^b | 137 (0.3) | Ear, nose, and throat treatment ^a | 107 (0.3) | Pap smear ^b |
| Children health exam ^b | 119 (0.3) | Pap smear ^b | 103 (0.3) | Ear, nose, and throat treatment ^a |
| Steam therapy ^a | 111 (0.3) | Steam therapy ^a | 45 (0.1) | Cigarette cessation treatment ^a |
| Cigarette cessation treatment ^a | 98 (0.2) | Cigarette cessation treatment ^a | 53 (0.1) | Steam therapy ^a |
| | | | | No. of visits (%, n = 16 390) |
| | | | | 410 (2.5) |
| | | | | 215 (1.3) |
| | | | | 180 (1.1) |
| | | | | 89 (0.5) |
| | | | | 76 (0.5) |
| | | | | 41 (0.3) |
| | | | | 23 (0.1) |
| | | | | 19 (0.1) |
| | | | | 17 (0.1) |
| | | | | 6 (<0.1) |

^aOrders related to disease treatment.^bOrders related to disease screening/prevention.

However, a large portion of rural physicians did not grow up with a rural background.^{27,33} In any event, certain efforts, such as those relating to medical education (including training in medical school and postgraduate years), should be considered as potential means of promoting the willingness of physicians to practice in rural areas.^{27,28,33}

According to the data analyzed in this study, the care orders most commonly prescribed by community family physicians were similar in urban, suburban, and rural areas in Taiwan. The common orders related to disease screening/prevention are subsidized by the government. "Adult preventive health services" includes history taking, physical examinations, blood pressure measurements, and biochemistry tests of fasting glucose and lipid profiles. "Children health exam" includes physical examinations, children milestone assessments, and regular vaccinations. Cancer screening programs are based on the prevalence of domestic cancers and cost-effectiveness. In 2013, the cancer incidence rankings in Taiwan indicated that colorectal cancer ranked second, cervical cancer ranked fifth, and oral cancer ranked seventh.³⁴ The practice patterns of community family physicians in Taiwan were not different in rural or urban areas.

The major limitation of the current study was that some of the patients might have visited clinics located outside of the communities in which they lived. Taiwan is small and densely populated (646 people per km² in 2013; in the USA, the rate is 33 people per km² in 2018).^{35,36} Patients can easily move across the borders of administrative districts. Furthermore, patients can visit any specialist or outpatient department without a referral, and some specialists practicing in community clinics, such as otolaryngologists and pediatricians, might care for patients with diseases similar to those treated by family physicians. Hence, our study might not reflect the full health care utilization of patients. Finally, a patient might visit a clinic seeking treatment for several diseases at one time, eg, visiting for treatment of both hypertension and an acute upper respiratory infection. As such, analyzing only the first diagnosis might not accurately estimate the prevalence of diseases.

5 | CONCLUSIONS

Although rural patients in Taiwan were older and had more chronic diseases than urban and suburban patients, the pattern of procedures undertaken by rural family physicians did not differ from those of urban and suburban family physicians. Regular surveillance of rural-urban disparities is still needed, however, to identify the occurrence of any health care inequalities.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Bo-Ren Cheng and Tzeng-Ji Chen conceived and designed the study. Bo-Ren Cheng and Tzeng-Ji Chen computed the original data; Bo-Ren Cheng, Hsiao-Ting Chang, Ming-Hwai Lin, Li-Fang Chou, and Shinn-Jang Hwang analyzed the data; Bo-Ren Cheng wrote the paper; Tzeng-Ji Chen and Hsiao-Ting Chang revised the manuscript.

ORCID

Bo-Ren Cheng  <http://orcid.org/0000-0002-3205-9248>

Tzeng-Ji Chen  <http://orcid.org/0000-0002-8350-0232>

Li-Fang Chou  <http://orcid.org/0000-0003-0370-2991>

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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