HEALTH INEQUALITIES IN THAILAND: GEOGRAPHIC DISTRIBUTION OF MEDICAL SUPPLIES IN THE PROVINCES

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Abstract. The purpose of this study was to analyze the regional characteristics and geographic distribution of the medical staffs (physicians and nurses) and the patient beds in relation to the population and average death rates in each of the provinces in Thailand, by using the Lorenz curve and Gini coefficients. Those data were obtained from surveys conducted by the Ministry of Public Health and the Office of the National Education Commission. It was demonstrated that there are certain clear uneven distributions in medical personnel, especially physicians (Gini index = 0.433), by province. For physicians, nurses, and patient beds, approximately 39.6%, 25.8% and 20.6% are concentrated in the Bangkok Metropolis. Specific ideas to solve those problems are discussed in order to overcome this health care crisis by the year 2025.

INTRODUCTION

Effectiveness, efficiency, and quality of care rely to a large extent on the human resource component of the health care system. In all countries where health care reforms are undertaken, it can be expected that these will have effects on the performance of health care providers, either directly when performance enhancement is addressed as such, or indirectly as a consequence of broader financial and organizational reforms. In general, most doctors are trained in, and wish to remain in, urban areas of the country. These areas offer good hospital facilities and lucrative opportunities for private practice (Fruen and Cantwell, 1982). Medical practice in rural areas is often financially unrewarding. As a result, there is a mismatch between the geographic distribution of health manpower and the perceived need for them (Anderson and Rosenberg, 1990). Therefore, there are certain national policies to increase the number of qualified health care personnel in primary care, and to equalize distribution of the health care resources (Benzeval and Judge, 1994).

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About 30 years ago, because of the overall shortage of doctors and because a substantial number of rural communities had no practicing physician, medical manpower policies were a matter of urgent debate in Thailand (Sriratanaban, 1974). During the last 20 years, the country's socio-economy transformation produced a group of systemically trained health care workers to serve the public at large. In earlier years, rural health care workers were sponsored by large organizations with large budgets (Ministry of Public Health, 2000). For many years, most of these workers were sent to regional areas that were challenging for setting up a permanent facility to help Thailand decrease its death rates from infectious diseases (Office of the National Economic and Social Development Board, 2000). However, at present, more than 80% of these health care workers are not up to date on current medical technology and knowledge, and are not able to function properly in a society that demands modern health care. For many years, Thailand's medical education system emphasized generating specialists but neglected the need for primary health care providers (Prueksaritanond and Tuchinda, 2001). As a result of this over-emphasis on specialty health care providers, the country has wasted significant amount of per capita revenue on training these specialists, that would have otherwise spent the

majority of their work in primary health care instead of on their allotted specialties.

There is still a shortage and uneven distribution of health manpower resources between the urban areas, predominantly Bangkok Metropolis, and the rural areas, although significant improvements have been achieved in the last decade. In 1996, there were 17,500 practicing medical doctors, with a national doctor/population ratio of 1:3,500. In spite of a steady increase in the number of doctors, the government estimates that 27,250 doctors are required, thus a deficit of approximately 10,000 doctors as a whole (Bureau of Health Policy and Plan, 1997). It is a priority for the government to quickly train more qualified health care personnel in primary care to handle the real tasks (Srivanichkorn and VanDormael, 1998).

We have analyzed the geographical distribution of physicians as well as nurses and patient beds in Thailand by a method that social scientists apply to show the distribution of income among the general population. The objectives of this study were to visualize the maldistribution with this method and to describe current inequalities that might be relevant for the design of appropriate health policy making.

MATERIALS AND METHODS

The Lorenz curve has been widely used by economists to assess the distributional properties of family income and wealth and by demographers to quantify the degree of population concentration (Ekelund and Tollison, 1986). The Gini coefficient, which is derived from the Lorenz curve, is a summary index of the degree of unequal distribution. Recently it has also been applied to analyzing physician distribution (Yang and Huh, 1989; Kobayashi and Takaki, 1992) as well as for detecting the temporal clustering of disease occurrences (Lee, 1996) and for characterizing exposure-disease associations in human populations (Lee, 1997).

Thailand has eight administrative divisions, and each has provinces. Since December 1, 1993, one and two provinces have been added to Eastern and Northeastern regions, respectively. Thus, there are 76 provinces in Thailand now. The Ministry of Public Health has been publishing data on the number of physicians, nurses, and patient beds by province (Ministry of Public Health, 2001a). According to Thai law, all deaths need to be reported to the authorities within 24 hours after detecting the death. The deaths registered in every province from 1990 to 2000 as recorded by the Ministry of Public Health are used in this study (Ministry of Public Health, 2001b). A national census of the population at the provincial level was taken from the Office of the National Education Commission's records on reported Population Projection (NESDB, 2001).

From these data, we calculated the number of physicians and nurses practicing and the number of patient beds, together with the size of the population in municipal bodies around Thailand in 2000. In addition, the average death rates from 1990 to 2000 were calculated in order to investigate mortality trends and its association with medical personnel by province. Since three provinces separated in 1993, we calculated the average death rate for these provinces in the seven years from 1994 to 2000. First, we compared the ratios of physicians, nurses, and patient beds per 100,000 population in each of the provinces in Thailand by the size of the population in 2000. Second, we calculated both the cumulative percentage of physicians, nurses, and patient beds, and the population, according to the ascending order of the physician/population, nurse/population, and bed/population ratio in each province. We then plotted all the points representing the provinces so that the vertical axis represents the share of physicians, nurses, and patient beds allocated by a percentage of the population. Finally, Gini coefficients for these distributions in 2000 were calculated. In the same way, the relationship between the ratio of physicians to average death rates were analyzed. All data was double entered and checked in Microsoft Excel 2000 (Microsoft Corporation, Redmond, WA, USA). The statistical data was analyzed using free statistical software 'R' (Comprehensive R Archive Network, http://www.r-project.org/).

RESULTS

The total number of physicians, nurses, and patient beds in 2000 were 18,025, 70,978 and

136,201, respectively. All of the maximum values for medical personnel by province were recorded in Bangkok Metropolis. For physicians, nurses, and patient beds, approximately 39.6%, 25.8% and 20.6% concentrated in Bangkok Metropolis. The ratios of population per physician, nurse, and patient bed are summarized in Table 1. The average population per physician was 6,716. Although the number of physicians has increased since 1996, it was found that huge differences exist between the maximum and minimum values of population per physician, nurse, and patient bed by province. We found approximately a twenty-four-fold of difference in the population per physician. The minimum values in population per physician and nurse were observed in the Bangkok Metropolis. The minimum value population per patient bed was recorded in the Nonthaburi province.

In Table 2, the median, first, and third quartiles for the physician/population, nurse/population and bed/population ratios in each of the provinces (n = 76) are shown, according to population in 2000. A median rather than a mean was taken for the analysis because the distributions of physician ratios were skewed to high figures. Except for two big provinces with a population of more than 2,000,000, Bangkok Metropolis and Nakhon Ratchasima, there were no clear associations between the population and medical personnel per 100,000 population. Provinces with fewer than 300,000 residents had the second best distribution for medical personnel. The middle sized provinces, those with a population of 1,000,000 to 1,500,000, had the severest shortage.

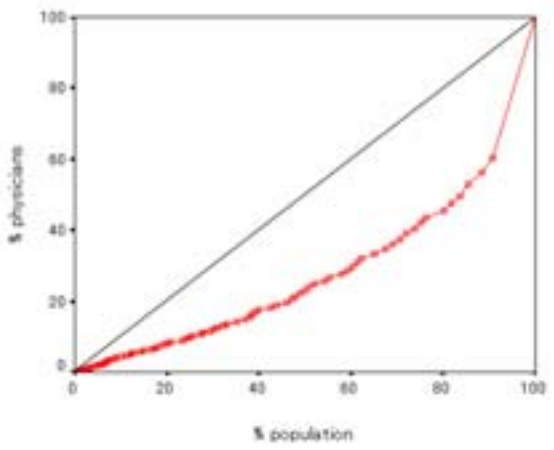
Table 1
Ratio of population per physician, nurse, and patient bed in Thailand (n = 76).

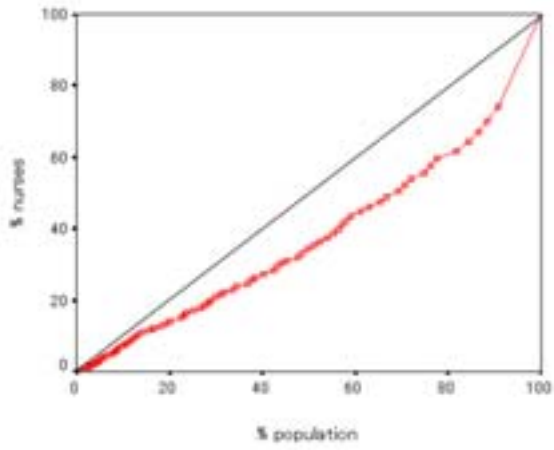
	Pysicians	Nurses	Patient beds
Average	6,716	1,171	584
Median	5,667	1,006	546
Maximum	18,996	3,169	1,114
Minimum	794	310	166
Maximum/Minimum	23.9	10.2	6.7

The Fig 1 shows the Lorenz curves of distribution for physicians, nurses, and patient beds in relation to the population in Thailand in 2000. In each curve, all provinces (n = 76) are represented. The straight line between the points of origin and the maximum represents a perfectly even distribution, although this is neither possible nor desirable (Morow, 1977). Health services should be determined not only by the size of the population but also by the population structure (age, morbidity, cross-boundary flows). These factors vary among communities. The accumulation of specialists in urban areas is unavoidable and is reasonably efficient in delivering services to the local population (Kobayashi and Takaki, 1992). According to the Lorenz curves, the distribution of physicians was worse than for nurses and patient beds. The Gini coefficients for physicians, nurses, and patient beds were 0.433, 0.239, and 0.213, respectively. The Gini index is defined as twice the area between the Lorenz curve and the diagonal line, and therefore represents the degree of

Table2
Physicians, nurses, and patient beds per 100,000 population in each of the Thai provinces, by size of population (n = 76).

Size of population	n	Median (25th percentile, 75th percentile)		
		Physicians	Nurses	Patient beds
<300,000	10	21.6 (20.5 - 24.3)	157.4 (128.6 - 171.2)	236.0 (208.9 - 261.8)
300,000-500,000	18	16.7 (12.9 - 19.7)	102.2 (93.0 - 120.9)	203.8 (167.3 - 235.1)
500,000-1,000,000	30	20.9 (10.5 - 25.3)	98.7 (67.9 - 127.7)	175.8 (121.5 - 240.0)
1,000,000-1,500,000	10	10.0 (7.3 - 20.8)	53.5 (45.7 - 79.8)	132.5 (103.8 - 169.7)
1,500,000-2,000,000	6	14.7 (11.8 - 29.7)	71.0 (67.1 - 91.3)	152.6 (138.0 - 189.7)
≥2,000,000	2	69.4 (41.1 - 97.7)	191.6 (125.9 - 257.2)	314.4 (224.4 - 404.5)





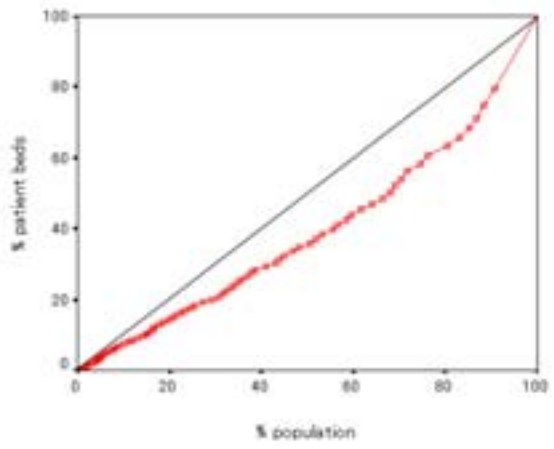


Fig1–Lorenz curves of distribution in physicians, nurses, and patient beds in Thailand. Each curve shows a relation between cumulative percentages of the population and the cumulative percentages of physicians, nurses, and patient beds. The Gini index is twice the area between the Lorenz curve and the diagonal line.

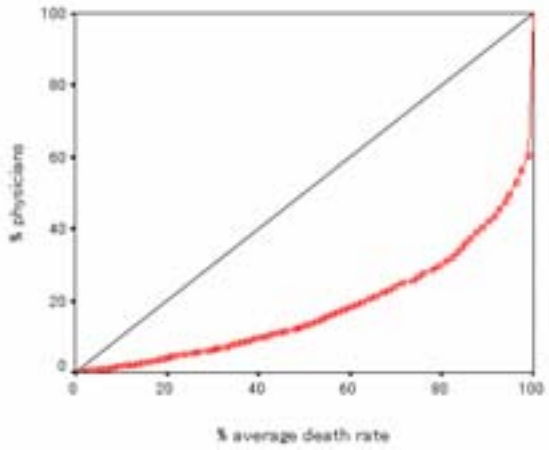


Fig 2–The relationship between average death rates and physician distribution.

the unequal distribution of physicians, nurses, and patient beds.

The maldistribution of physicians was also observed in relation to the average death rates from 1990 to 2000 (Fig 2). The Gini coefficient was 0.641. However, there was no clear statistical association between the number of physicians and average death rate by regression analysis.

DISCUSSION

In spite of the policy of increasing the number of medical doctors and equalizing the urban-rural disparities in the distribution of medical supplies, there still exists a maldistribution. Our study shows that there are certain clear uneven distributions in medical care, especially in physicians by province. Many of the physicians, nurses, and patient beds are clustered in Bangkok Metropolis and in the Central region. "Spreading out", in which physicians diffuse to rural areas when an urban sector reaches a saturation point in terms of competition (Newhouse *et al*, 1982), has not been observed. As a result, the quality of medical services and death rates could be different due to physician maldistribution.

Bangkok is the largest city in the country with an estimated 10 million people within the city limits. The concentration of economic power within Bangkok has brought in a huge amount of the country's health care resources, but has left the rest

of the country with less than enough resources (Ministry of Public health, 2000; Office of the National Economic and Social Development Board, 2000). There are several explanations of this phenomenon. The first reason is the country's inability to make expensive medical technology available throughout the population due to the cost resulting in an unequal distribution and a decreased effect on public health (Tonkerdmonkon and Yen, 2001). A goal of health care reform is to make these technologies more affordable and accessible to the majority of the population. Many medical students come from urban families with a higher socio-economic status (Chuncharas *et al*, 1997). The obstacles for rural students of middle and lower income are many. While the total number of doctors has been increasing, the trend towards specialization has been reinforced (VanDromael and Blaise, 1999). Specialization for most Thai doctors is considered as a normal step in their career. There exists several misunderstandings: a generalist is defined negatively as a doctor who did not specialize, and is thus less trained and is considered as less competent.

This geographical maldistribution is reinforced by the attraction of private practice. In order to limit the "brain-drain" from the public to private sector, a special non-private-practice allowance of 10,000 Baht/month was introduced in 1993 as an incentive for doctors in the private sector to devote all their professional time to the public sector (VanDromael and Blaise, 1999). This may have contributed to the reason why provinces with fewer than 300,000 residents had the second best distribution for physicians in our study. The benefits of this policy vary according to the size of the provinces. While those provinces with a population of fewer than 300,000 gained most, those provinces with over 300,000 residents gained less. Such a policy might be a costly method of solving physician maldistribution, since every government medical school is funded by the government, and every private one is to some degree subsidized. There may be other ways at the local level to equalize the distribution, such as providing generous annual vacation time and promising regular weekly work schedules (Thornton and Esposto, 2003), rather than increasing earnings, to correct the current perceived shortage of primary care physicians in rural areas.

The World Health Organization's data from population studies in Thailand during 1997 point out the likelihood that Thailand will face a health care crisis by the year 2025, if nothing is done (WHO, 1997). Socioeconomic changes, such as the dramatic increase in the elderly population, in a more health conscious population and the advent of new illnesses, are the likely culprits. Without equalization and changes in the current health care operation, there will be a severe lack of professionals to care for the population, and this problem can only be alleviated if more qualified primary care providers can be generated in time to serve such a purpose. To improve the geographical distribution of physicians, governments often have used combinations of compulsory service and incentives (Chomitz *et al*, 1997). Incentives for rural service have been used in the US (Corner *et al*, 1995), Canada (Anderson and Rosenberg, 1990), and Norway (Kristianaen, 1992). The evaluation, and optimal design, of incentive systems requires an understanding of the responsiveness of physicians to these incentives. In addition to appropriate incentives, it is important for Thailand to equalize resource distribution in medical technologies, to consider and improve the entrance criteria for medical students, and to intensify primary care education.

Our study has a limitation. Our study includes data that aggregate all practicing physicians because the distinction between generalists and specialists remains vague in Thailand, and correct data were not available at the municipal level. Although it is easily supposed that most health manpower resources outside Bangkok Metropolis are concentrated in provincial capitals, this was impossible to describe in detail. Further research is necessary, including a comparison of the distribution over time, to evaluate the impact of government policy. This methodology could easily be applied to other countries.

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