

Original Article

Are city population and the number of emergency medical facilities correlated?

Akira Ehara

Department of Public Health, Hokkaido University Graduate School of Medicine, Hokkaido, Japan

Abstract *Background:* The shortage of physicians is reported in the small cities in Japan, but the mal-distribution of physicians and emergency medical facilities has not been fully investigated

Methods: Survey of Medical Institutions, 2005, Survey of Physicians, Dentists and Pharmacists, 2004, and 2005 Population Census of Japan were used. The relationships between city population and the numbers of medical resources such as emergency medical facilities, physicians and pediatricians were analyzed.

Results: The population and the number of emergency medical facilities of 895 cities were strongly correlated ($r = 0.800$, $P = 0.000$), and the numbers of the physicians and pediatricians had strong relationships to city population.

Conclusion: All the cities cannot provide 24 h emergency services, therefore access time to medical facilities should be shortened by the construction of a transportation network instead of dispatching physicians to remote districts.

Key words emergency, mal-distribution, pediatricians, physicians, shortage.

The shortage of physicians is reported in small cities in Japan, but the mal-distribution of physicians and emergency medical facilities has not been fully investigated. Do most physicians have a propensity to live in large cities? Are 24 h medical services provided by all the cities in Japan? In the present study the relationship between population and number of emergency medical facilities in 895 cities was analyzed.

Methods

The number of emergency medical facilities and the population of each city in Japan were quoted from Survey of Medical Institutions on 1 October 2005¹ and 2005 Population Census of Japan investigated on the same day,² respectively. Each ward of big cities such as Sapporo, Sendai, Saitama, Chiba, Tokyo metropolitan area, Yokohama, Kawasaki, Shizuoka, Nagoya, Kyoto, Osaka, Kobe, Hiroshima, Kitakyushu, and Fukuoka was regarded as a city. The Population Census described 900 cities,¹ but the Survey of Medical Institutions did not report the medical facilities in five of the 900 cities because they were lost due to the municipal mergers on the investigation day.² Therefore, the analysis was done about 895 cities.

The number of physicians was quoted from Survey of Physicians, Dentists and Pharmacists investigated on 31 December 2004.³ The relationship between the number of physicians and the population was also analyzed for the 849 cities reported by both the Survey³ and the Population Census.¹

The statistical analysis was done using SPSS version 15 for Windows (SPSS Inc., Chicago, IL, USA).

Correspondence: Akira Ehara, MD PhD, 6-3-15-201 Tsukisamu-nishi 1Jo, Sapporo 0620021, Hokkaido, Japan. Email: akira.ehara@nifty.com

Received 3 December 2007; accepted 18 April 2008; published online 6 October 2008.

Results

The median of the number of emergency medical facilities and city population were three and 79 587, respectively. A total of 39 cities (4.4%) had no emergency hospital and 841 cities (94%) had ≤ 10 facilities providing emergency services (Fig. 1).

The relationship between the population and the number of emergency medical facilities of 895 cities is shown in Figure 2. They were strongly correlated ($r = 0.800$, $P = 0.000$). Regression is described as follows: No. emergency medical facilities = $0.556 + (\text{city population}) \times (2.76/100\ 000)$.

Furthermore, the numbers of physicians and pediatricians had a strong relationship to city population; the regressions are described as follows: No. physicians = $-10.95 + (2.2/1000) \times (\text{city population})$, $r = 0.738$; and No. pediatricians = $-0.477 + (9.2/10,000) \times (\text{city population under 15 years old})$, $r = 0.762$.

Discussion

City population had a strong relationship to the numbers of emergency medical facilities, physicians, and pediatricians.

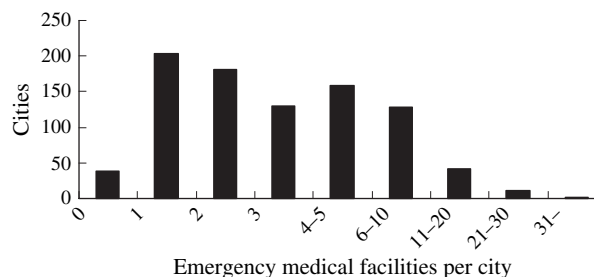


Fig. 1 The number of emergency medical facilities.

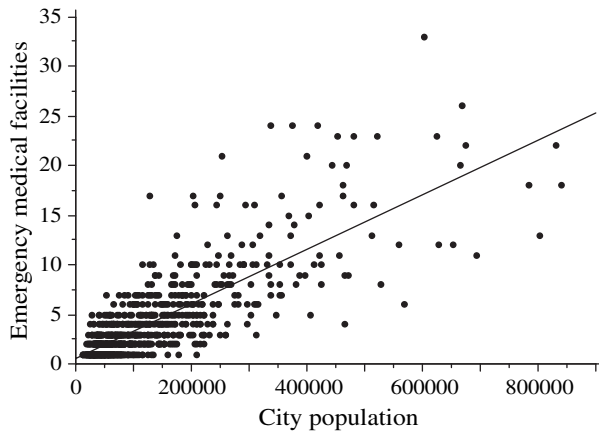


Fig. 2 City population and emergency medical facilities ($r=0.800$, $P=0.000$).

The median of the city population was 79 587. When the regressions described in the previous sections were used, the cities with the median population have 2.7 emergency medical facilities, 164 physicians including 9.5 pediatricians (13.7% of the population of 895 cities was under 15 years of age²).

Fatigue-related death can be authorized by Japanese government if the overtime work of victims is ≥ 80 h per month. The legal limit of normal work is 171 h per month (40 h a week),⁴ and work hours should be restricted to ≤ 251 h per month ($171+80$) (≤ 58.6 h per week) to prevent fatigue-related death even if a contract is made to extend them. In order to station only one physician at a hospital for 24 h a day, it is necessary to employ at least 2.9 ($24 \times 7 / 58.6$) full-time physicians. Ten or more full-time doctors should be employed only to provide 24 h pediatric emergency services.⁵ In order to run an emergency medical facility providing care in all specialties, 40–50 full-time physicians are required.

A city with 79 587 people (median population) had only 9.5 pediatricians, which is not enough to provide 24 h medical services. Furthermore, 112 of 849 cities (13%) had ≤ 49 physicians

and 477 of 849 (56%) had ≤ 9 pediatricians.³ All the cities cannot provide 24 h emergency services, especially in pediatrics. Several cities, towns and villages should run an emergency medical facility cooperatively in the areas with few physicians, and the access time to medical facilities should be shortened by the construction of a transportation network.

The Japanese government is considering the dispatch of physicians to remote districts.⁶ City population, however, had a strong relationship to number of emergency medical facilities and of physicians including pediatricians. There may be few patients in an area with few physicians, and the management of emergency medical facilities may not be financially realized. A transportation network should be constructed instead of the dispatch of physicians to rural places.

References

- 1 Ministry of Health, Labour, and Welfare. *Survey of Medical Institutions in 2005*. Ministry of Health, Labour and Welfare, Tokyo, 2006.
- 2 Ministry of Internal Affairs and Communications, Statistics Bureau. *2005 Population Census of Japan*. Ministry of Internal Affairs and Communications, Tokyo, 2005.
- 3 Ministry of Health, Labour, and Welfare. *Survey of Physicians, Dentists and Pharmacists in December in 2004*. Ministry of Health, Labour and Welfare, Tokyo, 2005.
- 4 Ministry of Health, Labour, and Welfare. About revision of the authorization standard of a brain and heart disease, 12 December 2001. Ministry of Health, Labour and Welfare, Tokyo, 2001. Accessed 6 August 2008. Available from URL: <http://www.mhlw.go.jp/houdou/0112/h1212-1.html> (in Japanese).
- 5 Japan Pediatric Society. The design for the pediatric providing system in Japan. Japan Pediatric Society, Tokyo, 2004. Accessed 6 August 2008. Available from URL: <http://www.jpeds.or.jp/pdf/kyukyu.pdf> (in Japanese).
- 6 Ministry of Health, Labour, and Welfare. About the official announcement of "The investigative commission report about the supply and demand of physicians", 28 July 2006. Ministry of Health, Labour and Welfare, Tokyo, 2006. Accessed 6 August 2008. Available from URL: <http://www.mhlw.go.jp/shingi/2006/07/s0728-9.html> (in Japanese).