

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

ScienceDirect

journal homepage: [www.e-jds.com](http://www.e-jds.com)

Perspective article

# The geographical distribution of physicians and dentists in the public health centers in Taiwan in 2022

Feng-Chou Cheng <sup>a,b,c</sup>, Li-Hua Tang <sup>d\*\*</sup>, Chun-Pin Chiang <sup>e,f,g,h\*</sup><sup>a</sup> Chia-Te Dental Clinic, New Taipei City, Taiwan<sup>b</sup> School of Life Science, College of Science, National Taiwan Normal University, Taipei, Taiwan<sup>c</sup> Science Education Center, National Taiwan Normal University, Taipei, Taiwan<sup>d</sup> Department of Nuclear Medicine, National Taiwan University Hospital, College of Medicine, National Taiwan University, Taipei, Taiwan<sup>e</sup> Department of Dentistry, National Taiwan University Hospital, College of Medicine, National Taiwan University, Taipei, Taiwan<sup>f</sup> Graduate Institute of Clinical Dentistry, School of Dentistry, National Taiwan University, Taipei, Taiwan<sup>g</sup> Graduate Institute of Oral Biology, School of Dentistry, National Taiwan University, Taipei, Taiwan<sup>h</sup> Department of Dentistry, Hualien Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, Hualien, Taiwan

Received 27 January 2024

Available online 5 February 2024

## KEYWORDS

Public health centers;  
Physicians;  
Dentists;  
Geographical  
distribution

\* Corresponding author. Department of Dentistry, Hualien Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation, No. 707, Section 3, Chung-Yang Road, Hualien, 970, Taiwan.

\*\* Corresponding author. Department of Nuclear Medicine, National Taiwan University Hospital, College of Medicine, National Taiwan University, No. 1, Chang-Te Street, Taipei, 10048, Taiwan.

E-mail addresses: [lttang@ntu.edu.tw](mailto:lttang@ntu.edu.tw) (L.-H. Tang), [cpchiang@ntu.edu.tw](mailto:cpchiang@ntu.edu.tw) (C.-P. Chiang).

The planning of Taiwan's modern health system began during the Japanese colonial period (1895–1945), and its main goal was to implement the prevention and control of infectious diseases. The health system includes the medical system and health administrative organizations. The Japanese colonial government established a modern medical system in Taiwan. It established modern medical institutions (such as hospitals) and cultivated local physicians to enrich Taiwan's medical personnel.<sup>1,2</sup> The public

<https://doi.org/10.1016/j.jds.2024.01.023>

1991-7902/© 2024 Association for Dental Sciences of the Republic of China. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

physician system was established in 1896. The public physicians were deployed throughout Taiwan to perform medical and public health work as the basic unit of health administrative organizations.<sup>1</sup> After the World War II, Taiwan continued the health system of new government with the “public health center” as the most basic unit of the community health care network. The public health center is not only a link in the medical system, but also a member of the township level among health administrative organizations. In 1946, thirty public health centers were first established in Taiwan. By the end of 2022, the number of the public health centers in Taiwan had reached 374.

For many years, the public health centers have been at the forefront of caring for people’s health, promoting primary health care, and providing public health care services.<sup>3</sup> However, it was not until 1975 that dentists were included in Taiwan’s new Physicians Act. Prior to this, a dentist could not legally participate in the public health center business as a clinician.<sup>4,5</sup> With the changes in the systems and laws, in addition to regaining the legal status of a clinician, a dentist can also legally become a supervisor of a public health center and participate in the public health center business. Although dentists have never been the main members in the public health centers, there are still some dentists participating in the primary care and health administration of the public health centers. In this article, we attempted to explore the geographical distribution of physicians and dentists in the public health centers in Taiwan in 2022, and compare the differences in the geographical distribution between physicians and dentists in the public health centers.

In this analysis, the number of the public health centers and the numbers related to physicians and dentists in the public health centers in Taiwan in 2022 were obtained from the Health Promotion Administration and each city/county health bureau. In addition, overall numbers of practicing physicians and dentists by cities/counties obtained from the Ministry of Health and Welfare. The results of further statistical analysis of the above-obtained data are shown in Table 1. In overall, there were 374 public health centers with 350 registered physicians and 21 registered dentists in Taiwan in 2022. The public health center physicians and dentists accounted for 0.66 % (350/53,014) and 0.13 % (21/15,996) of all practicing physicians and dentists, respectively. Among the public health center directors, there were 237 physicians and 3 dentists. Among the public health centers, there were 303 with registered physicians and 21 with registered dentists (Table 1).

The Taipei City had the largest numbers of overall physicians and dentists, accounting for 21.62 % (1,1463/53,014) and 21.54 % (3445/15,996), respectively. However, the Pingtung County had the largest number of the public health center physicians, accounting for 11.71 % (41/350). The Taitung County had the largest number of the public health center dentists, accounting for 23.81 % (5/21). The Lienchiang County had the highest proportion of the public health center physicians (31.25 %, 5/16), followed by the Penghu County (10.16 %, 13/128), the Kinmen County (8.99 %, 8/89), and the Taitung County (6.55 %, 22/336). The Lienchiang County also had the highest proportion of the public health center dentists (33.33 %, 3/9), followed

by the Taitung County (7.14 %, 5/70), and the Penghu County (2.56 %, 1/39) (Table 1).

For geographical distribution by municipalities/non-municipalities, the practicing physicians and dentists mainly worked in municipalities, accounting for 76.92 % (40,776/53,014) and 80.57 % (12,888/15,996), respectively. However, the public health center physicians and dentists mainly worked in non-municipalities, accounting for 60.86 % (213/350) and 76.19 % (16/21), respectively. For geographical distribution by cities/counties, the practicing physicians and dentists mainly worked in cities, accounting for 82.00 % (43,470/53,014) and 85.80 % (13,724/15,996), respectively. However, the public health center physicians and dentists mainly worked in counties, accounting for 59.71 % (209/350) and 76.19 % (16/21), respectively (Table 1).

For geographical distribution by regions, the practicing physicians and dentists mainly worked in the northern region, accounting for 47.01 % (24,920/53,014) and 53.33 % (8531/15,996), respectively. However, the public health center physicians mainly worked in the southern region (31.71 %), followed by the central region (26.29 %) and the northern region (20.00 %). The public health center dentists mainly worked in the eastern region (38.10 %), followed the central region (23.81 %) and outlying islands (19.05 %) (Table 1).

Furthermore, the comparisons between physicians and dentists were analyzed based on the ratios of the related numbers of dentists to those of physicians. In overall, the ratio of the number of the practicing dentists to that of the practicing physicians was 0.30, while the ratio of the number of the public health center dentists to that of the public health center physicians was 0.06. In municipalities, cities, and the northern region of Taiwan, the ratios related to all practicing practitioners became larger (0.32, 0.32, and 0.34, respectively), while the ratios related to the public health center practitioners became smaller (0.04, 0.04, and 0.01, respectively) (Table 1).

Previous researches have rarely linked the geographical distribution between physicians and dentists in overall as well as between physicians and dentists in the public health centers. This article tried to explore their geographical distribution and relationship. The number of all dentists (15,966) was about 30 % of that of all physicians (53,104). However, the geographical distribution of dentists was more concentrated in municipalities, cities, and the northern region than that of physicians. Although the number of the public health center dentists (21) was only 6 % of that of the public health center physicians (350), a higher proportion of the registered dentists in the public health centers located in non-municipalities, counties, the eastern region of Taiwan, and outlying islands. According to our clinical experience, in addition to working in the public health centers and directly participating in the public health center business, the practicing dentists are also invited to indirectly participate in the public health center business (such as oral cancer screening, dental examination, and children’s fluoride application).<sup>3</sup> Therefore, when planning dental care improvement in the remote areas of Taiwan, it is one of the feasible methods to consider establishing dental care stations in the remote public health centers of Taiwan on their original foundation.

**Table 1** Geographical distribution of physicians and dentists in the public health centers in Taiwan in 2022.

Public health centers		Numbers related to physicians					Numbers related to dentists				
Location	Number (A)	Bp	Cp	Dp	Ep	Fp (%)	Bd	Cd	Dd	Ed	Fd (%)
A. Physicians and dentists in the public health centers in overall											
Overall	374	237	350	303	53,014	0.66	3	21	21	15,996	0.13
B. Geographical distribution of physicians and dentists in the public health centers by city and county administrative districts <sup>a</sup>											
New Taipei City	29	29	30	29	6502	0.46	0	1	1	2803	0.04
Taipei City	12	1	0	12	1,1463	0.00	1	0	0	3445	0
Taoyuan City	13	11	25	13	4449	0.56	0	0	0	1400	0
Taichung City	30	22	30	25	7060	0.42	0	2	2	2088	0.10
Tainan City	37	27	29	28	4039	0.72	0	0	0	1189	0
Kaohsiung City	38	17	23	20	7263	0.32	0	2	2	1963	0.10
Keelung City	7	1	1	1	751	0.13	0	0	0	214	0
Hsinchu City	3	1	1	1	994	0.10	0	0	0	384	0
Chiayi City	2	1	2	2	949	0.21	0	0	0	238	0
Hsinchu County	13	13	13	11	761	1.71	0	0	0	285	0
Miaoli County	18	2	12	11	588	2.04	0	1	1	198	0.51
Changhua County	27	27	27	27	2226	1.21	0	0	0	612	0
Nantou County	13	10	15	12	658	2.28	0	0	0	162	0
Yunlin County	20	2	8	8	920	0.87	0	2	2	174	1.15
Chiayi County	18	10	16	15	902	1.77	0	0	0	98	0
Pingtung County	33	27	41	29	1270	3.23	0	1	1	254	0.39
Yilan County	12	0	14	11	737	1.90	0	2	2	197	1.02
Hualien County	13	11	15	12	913	1.64	1	1	1	154	0.65
Taitung County	16	5	22	16	336	6.55	1	5	5	70	7.14
Penghu County	11	11	13	11	128	10.16	0	1	1	39	2.56
Kinmen County	5	5	8	5	89	8.99	0	0	0	20	0
Lienchiang County	4	4	5	4	16	31.25	0	3	3	9	33.33
C. Geographical distribution of physicians and dentists in the public health centers by municipality and non-municipality groups											
Municipality	159	107	137	127	40,776	0.34	1	5	5	12,888	0.04
Proportion	42.51 %	45.15 %	39.14 %	41.91 %	76.92 %	—	33.33 %	23.81 %	23.81 %	80.57 %	—
Non-municipality	215	130	213	176	12,238	1.74	2	16	16	3108	0.51
Proportion	57.49 %	54.85 %	60.86 %	58.09 %	23.08 %	—	66.67 %	76.19 %	76.19 %	19.43 %	—
D. Geographical distribution of physicians and dentists in the public health centers by city and county groups											
City	171	110	141	131	43,470	0.32	1	5	5	13,724	0.04
Proportion	45.72 %	46.41 %	40.29 %	43.23 %	82.00 %	—	33.33 %	23.81 %	23.81 %	85.80 %	—
County	203	127	209	172	9544	2.19	2	16	16	2272	0.70
Proportion	54.28 %	53.59 %	59.71 %	56.77 %	18.00 %	—	66.67 %	76.19 %	76.19 %	14.20 %	—
E. Geographical distribution of physicians and dentists in the public health centers by regions <sup>b</sup>											
Northern	77	56	70	67	24,920	0.28	1	1	1	8531	0.01
Proportion	20.59 %	23.63 %	20.00 %	22.11 %	47.01 %	—	33.33 %	4.76 %	4.76 %	53.33 %	—
Central	108	63	92	83	11,452	0.80	0	5	5	3234	0.15
Proportion	28.88 %	26.58 %	26.29 %	27.39 %	21.60 %	—	0	23.81 %	23.81 %	20.22 %	—
Southern	128	82	111	94	14,423	0.77	0	3	3	3742	0.08
Proportion	34.22 %	34.60 %	31.71 %	31.02 %	27.21 %	—	0	14.29 %	14.29 %	23.39 %	—
Eastern	41	16	51	39	1986	2.57	2	8	8	421	1.90
Proportion	10.96 %	6.75 %	14.57 %	12.87 %	3.75 %	—	66.67 %	38.10 %	38.10 %	2.63 %	—
Outlying islands	20	20	26	20	233	11.16	0	4	4	68	5.88
Proportion	5.35 %	8.44 %	7.43 %	6.60 %	0.44 %	—	0	19.05 %	19.05 %	0.43 %	—
Comparisons between physicians and dentists		Ratios of dentists to physicians									
		Bd/Bp	Cd/Cp	Dd/Dp	Ed/Ep	Fd/Fp					
A. Comparison between physicians and dentists in overall											
Overall		0.01	0.06	0.07	0.30	0.20					
B. Comparison between physicians and dentists by municipality and non-municipality groups											
Municipality		0.01	0.04	0.04	0.32	0.12					
Non-municipality		0.02	0.08	0.09	0.25	0.30					

Table 1 (continued)

Comparisons between physicians and dentists	Ratios of dentists to physicians				
	Bd/Bp	Cd/Cp	Dd/Dp	Ed/Ep	Fd/Fp
<b>C. Comparison between physicians and dentists by city and county groups</b>					
City	0.01	0.04	0.04	0.32	0.11
County	0.02	0.08	0.09	0.24	0.32
<b>D. Comparison between physicians and dentists by regions<sup>b</sup></b>					
Northern	0.02	0.01	0.01	0.34	0.04
Central	0	0.05	0.06	0.28	0.19
Southern	0	0.03	0.03	0.26	0.10
Eastern	0.13	0.16	0.21	0.21	0.74
Outlying islands	0	0.15	0.20	0.29	0.53

Code description.

A: Number of public health centers (Data from the Health Promotion Administration).

Bp: Number of public health center directors with physician status (Data from each city and county health bureau).

Cp: Number of registered physicians in public health centers (Data from each city and county health bureau).

Dp: Number of public health centers with registered physicians (Data from the Ministry of Health and Welfare).

Ep: Overall number of practicing physicians (Data from the Ministry of Health and Welfare).

Fp: Ratio of Cp to Ep.

Bd: Number of public health center directors with dentist status (Data from each city and county health bureau).

Cd: Number of registered dentists in public health centers (Data from each city and county health bureau).

Dd: Number of public health centers with registered dentists (Data from the Ministry of Health and Welfare).

Ed: Overall number of practicing dentists (Data from the Ministry of Health and Welfare).

Fd: Ratio of Cd to Ed.

<sup>a</sup> The first 6 cities are municipalities directly under the central government, and the others are non-municipalities.

<sup>b</sup> In this analysis, the whole area of Taiwan was divided into five regions: the northern, central, southern, and eastern regions and offshore islands. The northern region (n = 6) included Keelung City, New Taipei City, Taipei City, Taoyuan City, Hsinchu City, and Hsinchu County. The central region (n = 5) included Miaoli County, Taichung City, Changhua County, Nantou County, and Yunlin County. The southern region (n = 5) included Chiayi City, Chiayi County, Tainan City, Kaohsiung City, and Pingtung County. The eastern region (n = 3) included Yilan County, Hualien County, and Taitung County. The offshore islands (n = 3) included Penghu County, Kinmen County, and Lienchiang County.

## Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

## Acknowledgments

None.

## References

1. Chang HJ. *Fifty years of Taiwan's medical public health under Japanese colonial rule (revised edition)*. Taipei, Taiwan: National Taiwan University, 2015 [In Chinese].
2. Cheng FC, Wang LH, Ozawa N, Chang JYF, Liu SY, Chiang CP. Dental education and special dental practitioner-cultivating system in Taiwan during the Japanese colonial period. *J Dent Sci* 2022;17:920–7.
3. Health Promotion Administration, Ministry of Health and Welfare. *The 2022 annual statistical report of public health centers in cities and counties in Taiwan*. Taipei, Taiwan: Health Promotion Administration, Ministry of Health and Welfare, 2023 [In Chinese].
4. Cheng FC, Wang YL, Wang LH, Chang JYF, Liu SY, Chiang CP. Overview of dental education system and gender distribution of undergraduate dental students in Taiwan. *J Dent Sci* 2023;18: 420–7.
5. Cheng FC, Wang LH, Wang YL, Chiang CP. Overview of the dental specialist system in Taiwan. *J Dent Sci* 2023;18:1909–11.