Journal of Dental Sciences 21 (2026) 551–561

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.e-jds.com

Original Article

# Domiciliary dental care coverage in Taiwan: An assessment of provider participation and geographic distribution using the universal health coverage framework

Chuan-Hang Yu [a,b*]

[a] School of Dentistry, Chung Shan Medical University, Taichung, Taiwan
[b] Department of Stomatology, Chung Shan Medical University Hospital, Taichung, Taiwan

Received 27 October 2025; Final revision received 5 November 2025
Available online 20 November 2025

**KEYWORDS**
Dental care for disabled;
Domiciliary dental care;
Health equity;
Health services accessibility;
Taiwan;
Universal health coverage

**Abstract** *Background/purpose:* Universal health coverage (UHC) ensures access to needed health services without financial hardship. While Taiwan has achieved near-universal coverage for most medical services, domiciliary dental care (DDC) for people with mobility limitations remains poorly integrated into the UHC framework. This study assessed DDC coverage in Taiwan using the World Health Organization UHC framework.
*Materials and methods:* Publicly available 2024 data were analyzed for dental institutions, practicing dentists, DDC providers, and long-term care populations across Taiwan's six National Health Insurance (NHI) regions and 22 administrative districts. Geographic distribution was examined using provider density metrics, Lorenz curves, and Gini coefficients.
*Results:* Among 7560 dental institutions, only 102 (1.3 %) provided DDC services, while 163 of 16,690 dentists (1.0 %) participated. Of 892,117 people who required long-term care, 23,379 (2.6 %) received DDC services. DDC represented 3.1 % of special needs dental services budget utilization. Geographic distribution demonstrated excellent equity with Gini coefficients of 0.064–0.082 and Lorenz curves above the equality line, indicating pro-rural distribution. However, service provision varied substantially: three districts had zero coverage, regional participation ranged from 0.5 % to 4.1 %, and provider density ranged from 0.7 to 3.9 per 10,000 people requiring care.
*Conclusion:* Despite comprehensive financial protection and equitable geographic distribution, critically low provider participation creates severe supply constraints that prevent most people requiring long-term care from accessing domiciliary oral health services. Taiwan has achieved equity in DDC distribution but not adequacy of supply, revealing substantial gaps in UHC achievement for vulnerable populations.

* School of Dentistry, Chung Shan Medical University, No.110, Sec.1, Chien-Kuo N. Rd., Taichung 402306, Taiwan.
*E-mail address:* tao2008@csmu.edu.tw.

https://doi.org/10.1016/j.jds.2025.11.005

## Introduction

Universal health coverage (UHC) represents a health system's commitment to ensure that all individuals have access to comprehensive and quality health services when and where needed, without suffering financial hardship.[1] The World Health Organization (WHO) conceptualizes UHC through a three-dimensional framework comprising population coverage (who is covered), service coverage (which services are covered), and financial protection (what proportion of costs are covered).[2] While significant progress has been made towards achieving UHC in many health sectors, oral health has been systematically neglected and inadequately integrated into comprehensive health coverage frameworks worldwide.[3,4]

The exclusion of oral health from UHC initiatives is particularly problematic for vulnerable populations, including individuals with disabilities, chronic illnesses, and mobility limitations who cannot access traditional dental clinic settings.[5] Domiciliary dental care (DDC), the provision of dental services in patient residences or care facilities, represents an essential service delivery model for these populations.[6,7] DDC addresses multiple barriers to access to oral healthcare, including transportation difficulties, physical disabilities, cognitive impairments, and institutional constraints faced by people in long-term care facilities.[8]

Despite its critical importance, DDC services face substantial implementation challenges globally. Studies have documented significant barriers to the provision of DDC, including inadequate remuneration systems, concerns about professional liability and infection control, complexity of the treatment of medically compromised patients, limited availability of portable equipment, and insufficient training in geriatric dentistry.[9–12] These barriers result in limited provider participation and inadequate service coverage, leaving many vulnerable individuals without access to essential oral health services.

Taiwan presents a particularly relevant context for examining DDC coverage through the UHC framework. The country has achieved near-universal population coverage through its National Health Insurance (NHI) system, with enrollment exceeding 99 % of the population. However, like many other countries, Taiwan faces challenges integrating oral health services, particularly specialized services such as DDC, into its comprehensive UHC framework. With Taiwan's rapidly aging population and transition to the status of a super-aged society, the demand for DDC services is increasing substantially.[13,14]

Recent research has documented the growth and distribution of DDC services in Taiwan. Yu and colleagues reported on implementing DDC from a university hospital in central Taiwan from 2010 to 2020, demonstrating the feasibility of providing domiciliary services.[15] Subsequently, Ng and Yu analyzed trends in DDC distribution throughout Taiwan from 2018 to 2023, documenting substantial increases in DDC facilities but persistent geographic disparities, with urban areas showing higher service availability, while some rural and offshore areas had limited or no access.[16] Educational initiatives have been developed to promote DDC awareness among healthcare professionals, with continuing medical education programs showing positive results.[13,14]

However, no comprehensive assessment of DDC coverage has been performed using the WHO UHC framework, examining population coverage, service coverage, and financial protection simultaneously, for Taiwan or most other countries. This study aimed to provide a comprehensive assessment of DDC coverage in Taiwan through the lens of the WHO UHC framework, examining the three dimensions of coverage in conjunction with considerations of geographic equity. The specific objectives were to assess service coverage through institutional and manpower participation rates, examine geographic equity in DDC distribution across Taiwan's regions and administrative districts, quantify population coverage by determining the proportion of individuals requiring long-term care who receive DDC services, and analyze supply-demand mismatches through provider density metrics. The findings provide baseline data to monitor progress toward UHC in oral health and inform evidence-based policy development to improve accessibility to DDC for vulnerable populations.

## Materials and methods

This cross-sectional study analyzed publicly available data from multiple government sources for the year 2024. Data included the number of hospitals and dental clinics, the distribution of practicing dentists, dental institutions, and dentists providing DDC services, the target population requiring long-term care, and the budget utilization for special needs dental services categorized by service delivery modality.[17–20]

The study examined two populations: DDC service providers and people who require DDC services. DDC providers included hospitals, dental clinics, and individual dentists participating in the DDC program under Taiwan's NHI. The target population consisted of people requiring long-term care, defined by the National Health Insurance Administration criteria as persons with specific disabilities (frailty, physical disabilities, intellectual disabilities, dementia, etc.), the elderly with Activities of Daily Living scores less than 60, or eligible for Long-Term Care 2.0. Taiwan's 22 administrative districts (counties/cities) were analyzed and grouped into six NHI service regions: Taipei, Northern, Central, Southern, Kao-Ping, and Eastern. The districts

were further classified by urbanization level into six special municipalities (Taipei City, New Taipei City, Taoyuan City, Taichung City, Tainan City, and Kaohsiung City) and 16 non-municipalities, reflecting Taiwan's administrative structure and urban-rural differences.

DDC coverage was assessed through institutional and manpower indicators. The institution coverage rate was calculated as the percentage of dental institutions (hospitals and clinics) providing DDC services relative to the total dental institutions. The dentist participation rate was calculated as the percentage of dentists providing DDC relative to all practicing dentists. Service utilization was measured by the number of people receiving DDC, total service visits, and average visits per person. UHC indicators were derived from the WHO UHC framework, which evaluates health system performance in three dimensions: population coverage, service coverage, and financial protection.[1,2] Population coverage was assessed as the percentage of people receiving DDC among the target population requiring care. Service coverage was calculated as the percentage of dental institutions and dentists providing DDC among all dental institutions and practicing dentists. Financial protection was assessed through NHI coverage status for DDC services. Service accessibility was further evaluated by examining the proportion of the special needs dental services budget allocated to domiciliary care versus facility-based modalities (hospitals/clinics and outreach dental teams in disability service institutions), since budget utilization patterns reflect service availability and model preferences within the covered benefit package.

Geographic distribution was analyzed by comparing coverage rates across the six NHI service regions, 22 administrative districts, and between special municipalities and non-municipalities. Service availability was measured by target population-to-provider ratios, calculated as the number of individuals requiring care per DDC institution and per DDC dentist in each district. Geographic visualization was created using QGIS version 3.44, Solothurn.

Geographic equity in the DDC distribution was evaluated using Lorenz curve analysis and Gini coefficient calculation. Administrative units were ranked by population size (people requiring long-term care). Lorenz curves were constructed by plotting the cumulative population share against the cumulative share of DDC resources (institutions or dentists). The Gini coefficient, which ranges from 0 (perfect equity) to 1 (complete inequality), was calculated using the trapezoidal integration method. Values closer to 0 indicate a more equitable distribution, while values closer to 1 indicate a concentration of resources. When the Lorenz curve lies above the line of perfect equality, it suggests that smaller administrative units receive proportionally more resources relative to their population size (pro-rural distribution pattern). To assess the impact of geographic aggregation, institutional coverage was analyzed at both the district level ($n = 22$) and regional level ($n = 6$), while manpower coverage could only be analyzed at the regional level ($n = 6$) due to data availability. All data were organized and calculations were performed using Microsoft Excel. Figures were generated using Python 3.11 with matplotlib library.

## Results

In 2024, Taiwan had 7560 dental institutions, of which 102 (1.3 %) provided DDC services. Among 16,690 practicing dentists nationwide, 163 (1.0 %) participated in the provision of DDC. Of the 892,117 people who required long-term care, 23,379 received DDC services in 2024, representing a population coverage rate of 2.6 %, with 61,532 service visits and an average of 2.6 visits per person. Budget utilization analysis revealed that domiciliary care represented only 3.1 % of the total special needs dental services budget in 2024. The remaining budget was hospital/clinic-based services (64.3 %) and outreach dental teams (32.6 %).

The distribution of DDC coverage across Taiwan's 22 administrative districts, grouped by six NHI service regions, revealed substantial geographic variation. The overall coverage of the DDC institutions varied considerably across regions, ranging from 0.8 % in the Southern region to 4.7 % in the Eastern region (Table 1, Fig. 1). The Eastern region showed the highest coverage with 6 out of 127 dental institutions (4.7 %) providing DDC services, followed by 1.8 % of the Northern, Central, and Kao-Ping regions (18/1052, 25/1480, and 20/1128, respectively) and the Taipei region (26/2873, 1.4 %). The Southern region showed an institution coverage rate of only 0.8 % (7 institutions). At the district level, considerable variation was observed. Among the 22 administrative districts, the coverage of the DDC institutions ranged from 0 % in several districts to 5.9 % in Kinmen County. Three districts did not have DDC-providing institutions, including Lianjiang County, Chiayi County, and Penghu County. The six special municipalities (Taipei City, New Taipei City, Taoyuan City, Taichung City, Tainan City, and Kaohsiung City) collectively represented 71 out of 102 DDC-providing institutions (69.6 %).

The hospital and clinic participation patterns varied markedly by region (Table 1, Fig. 2). In the Taipei and Northern regions, hospital coverage was 6.5 % and 6.1 %, while clinic coverage was 0.7 % and 1.4 % respectively. The Central and Kao-Ping regions demonstrated relatively balanced participation with hospital coverage at 2.9 % and 2.8 %, and clinic coverage at 1.6 % and 1.7 %, respectively. The Southern region showed hospital coverage at 3.2 % and clinic coverage at 0.6 %. The Eastern region exhibited 5.5 % clinic coverage and no hospital coverage. The geographical distribution of the DDC providers revealed pronounced spatial clustering (Fig. 3). Providers were predominantly concentrated in urban centers and western coastal areas of Taiwan, with little coverage in rural, mountainous, and offshore island regions. Despite its overall higher coverage rate, the Eastern region showed DDC providers clustered in Hualien City and Taitung City, with minimal coverage in remote townships. Similarly, central and southern Taiwan are concentrated in major cities such as Taichung, Tainan, and Kaohsiung, while the surrounding rural counties have limited or no DDC services.

Table 2 presents the distribution of dentists providing DDC services, the target population requiring long-term care, and the manpower coverage rates in the administrative districts and NHI service regions (Table 2, Fig. 4). The

**Table 1** Distribution of dental institutions providing domiciliary dental care (DDC) by administrative district and National Health Insurance (NHI) service region, 2024.

| NHI service area | Administrative District | Numbers of total hospital | Numbers of hospital providing DDC (percentage to total, %) | Numbers of total dental clinic | Numbers of dental clinic providing DDC (percentage to total, %) | Numbers of total dental institution | Numbers of dental institutions providing DDC (percentage to total, %) |
|---|---|---|---|---|---|---|---|
| Taipei | Yilan County | 9 | 1 (11.0) | 108 | 2 (1.9) | 117 | 3 (2.6) |
| | Keelung City | 9 | 0 (0) | 99 | 2 (2.0) | 108 | 2 (1.9) |
| | Taipei City | 35 | 2 (5.7) | 1399 | 9 (0.6) | 1434 | 11 (0.8) |
| | New Taipei City | 52 | 4 (7.7) | 1144 | 5 (0.4) | 1196 | 9 (0.8) |
| | Kinmen County | 1 | 0 (0) | 16 | 1 (6.3) | 17 | 1 (5.9) |
| | Lianjiang County | 1 | 0 (0) | 0 | 0 (0) | 1 | 0 (0) |
| | Subtotal | 107 | 7 (6.5) | 2766 | 19 (0.7) | 2873 | 26 (1.4) |
| Northern | Taoyuan City | 34 | 3 (8.8) | 587 | 9 (1.5) | 621 | 12 (1.9) |
| | Hsinchu City | 9 | 0 (0) | 155 | 1 (0.6) | 164 | 1 (0.6) |
| | Hsinchu County | 10 | 0 (0) | 125 | 1 (0.8) | 135 | 1 (0.7) |
| | Miaoli County | 13 | 1 (7.7) | 119 | 3 (2.5) | 132 | 4 (3.0) |
| | Subtotal | 66 | 4 (6.1) | 986 | 14 (1.4) | 1052 | 18 (1.7) |
| Central | Taichung City | 63 | 2 (3.2) | 1011 | 15 (1.5) | 1074 | 17 (1.6) |
| | Changhua County | 29 | 0 (0) | 278 | 4 (1.4) | 307 | 4 (1.3) |
| | Nantou County | 10 | 1 (10.0) | 89 | 3 (3.4) | 99 | 4 (4.0) |
| | Subtotal | 102 | 3 (2.9) | 1378 | 22 (1.6) | 1480 | 25 (1.7) |
| Southern | Yunlin County | 15 | 0 (0) | 115 | 2 (1.7) | 130 | 2 (1.5) |
| | Chiayi City | 11 | 1 (9.1) | 113 | 0 (0) | 124 | 1 (0.8) |
| | Chiayi County | 4 | 0 (0) | 54 | 0 (0) | 58 | 0 (0) |
| | Tainan City | 33 | 1 (3.0) | 555 | 3 (0.5) | 588 | 4 (0.7) |
| | Subtotal | 63 | 2 (3.2) | 837 | 5 (0.6) | 900 | 7 (0.8) |
| Kao-Ping | Kaohsiung City | 82 | 3 (3.7) | 847 | 15 (1.8) | 929 | 18 (1.9) |
| | Pingtung County | 23 | 0 (0) | 149 | 2 (1.3) | 172 | 2 (1.2) |
| | Penghu County | 3 | 0 (0) | 24 | 0 (0) | 27 | 0 (0) |
| | Subtotal | 108 | 3 (2.8) | 1020 | 17 (1.7) | 1128 | 20 (1.7) |
| Eastern | Hualien County | 10 | 0 (0) | 78 | 4 (5.1) | 88 | 4 (4.5) |
| | Taitung County | 7 | 0 (0) | 32 | 2 (6.3) | 39 | 2 (5.1) |
| | Subtotal | 17 | 0 (0) | 110 | 6 (5.5) | 127 | 6 (4.7) |
| Total | | 463 | 19 (4.1) | 7097 | 83 (1.2) | 7560 | 102 (1.3) |

percentage of dentists providing DDC services ranged from 0.5 % in the Southern region to 4.1 % in the Eastern region. The Taipei region had 69 out of 6919 (1.0 %) participating in DDC, the Northern region had 24 out of 2405 dentists (1.0 %) participating in DDC, the Central region had 31 out of 3055 dentists (1.0 %), the Southern region had 9 out of 1807 dentists (0.5 %), the Kao-Ping region had 21 out of 2287 dentists (0.9 %), and the Eastern region had 9 out of 217 dentists (4.1 %). At the national level, 163 dentists (1.0 % of all practicing dentists) provided DDC services. The ratio of the target population to dentists with DDC varied by region. The Taipei region had 299,076 people who required long-term care and 69 DDC dentists (4334 people per dentist). The Northern region had 124,694 people who required long-term care and 24 DDC dentists (5196 people per dentist). The Central region had 162,774 people and 31 dentists (5251 people per dentist), while the Southern region had 135,529 people and 9 dentists (15,059 people per dentist). The Kao-Ping region had 146,648 people who needed long-term care and 21 DDC dentists (6983 people per dentist), and the Eastern region had 23,396 people and 9 DDC dentists (2600 people per dentist).

When standardized by population need, the provider density varied between regions (Fig. 5). The Eastern region had approximately 3.9 DDC dentists per 10,000 people requiring long-term care. The Taipei region had approximately 2.3 per 10,000, the Northern and Central regions had approximately 1.9 per 10,000, the Southern region had approximately 0.7 per 10,000, and the Kao-Ping region had approximately 1.4 per 10,000.

Fig. 6 shows the Lorenz curve analysis for DDC institutional distribution at two geographic scales. At the district level ($n = 22$), the Gini coefficient was 0.064, while at the regional level ($n = 6$), it was 0.069. Both Lorenz curves lie

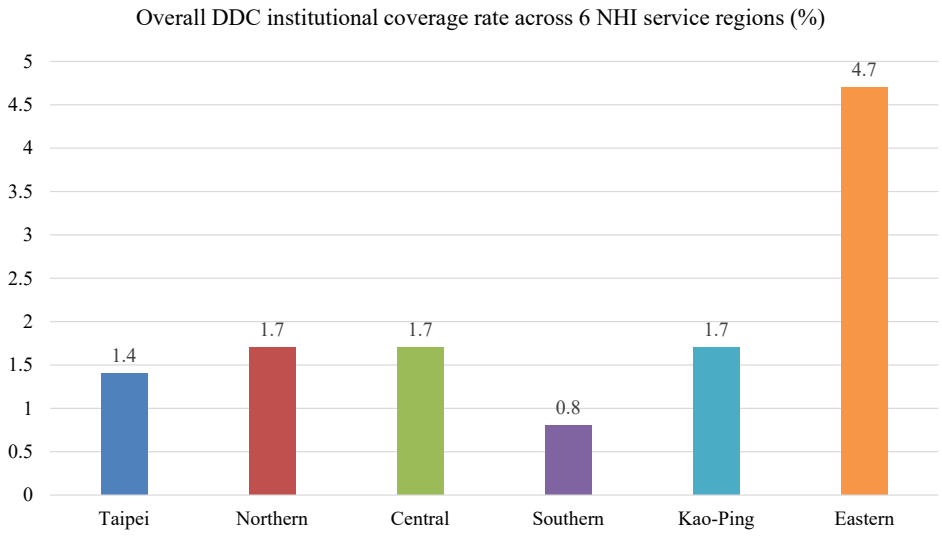


**Figure 1** Institutional coverage rates for domiciliary dental care (DDC) across six National Health Insurance (NHI) service regions in Taiwan, 2024. Institutional coverage represents the percentage of dental institutions (hospitals and clinics combined) providing DDC services relative to total dental institutions in each region. The Eastern region showed the highest coverage (4.7 %), followed by the Northern, Central, and Kao-Ping regions (1.7 % each), Taipei region (1.4 %), and Southern region (0.8 %).

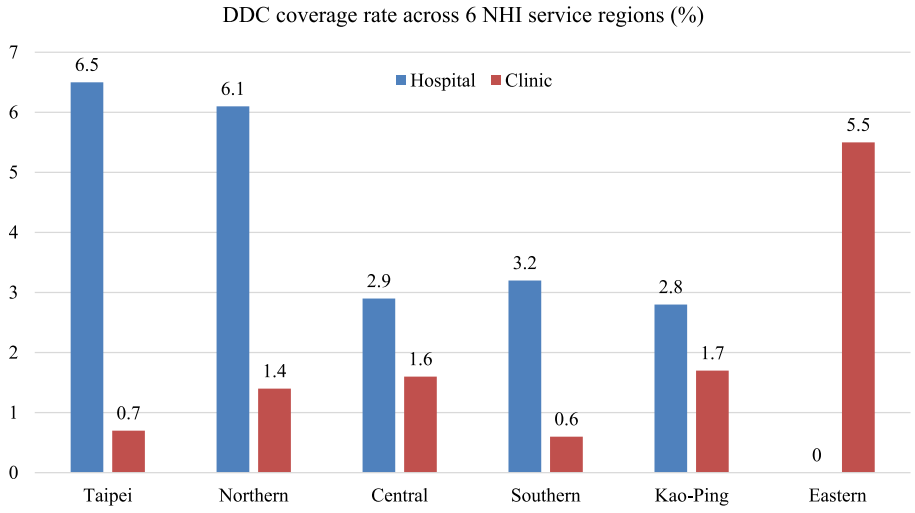


**Figure 2** Comparison of hospital and dental clinic participation in domiciliary dental care (DDC) provision across National Health Insurance (NHI) service regions, 2024. Hospital coverage represents the percentage of hospitals providing DDC services, while clinic coverage represents the percentage of dental clinics providing DDC services in each region. Hospital participation rates ranged from 0 % to 6.5 %, while clinic participation rates ranged from 0.6 % to 5.5 % across regions. The Taipei and Northern regions showed higher hospital participation (6.5 % and 6.1 %) than clinic participation (0.7 % and 1.4 %), while the Eastern region showed no hospital participation but 5.5 % clinic coverage.

above the line of perfect equality. Fig. 7 presents the Lorenz curve for the DDC dentist distribution across six regions, with a Gini coefficient of 0.082. The curve also lies above the equality line, showing a pattern similar to institutional distribution.

## Discussion

This study presents the first comprehensive analysis of DDC coverage in Taiwan using the WHO UHC framework. The findings reveal a critically low coverage in all UHC dimensions: population coverage (2.6 %), service coverage (1.3 % institutional, 1.0 % manpower), and budget utilization (3.1 % of special needs dental services). The geographic variation in provider participation was evident, with institutional coverage ranging from 0 % in three districts to 4.7 % in the Eastern region, and manpower coverage varying from 0.5 % in the Southern region to 4.1 % in the Eastern region. The supply-demand mismatch is particularly severe, ranging from 2600 people who require

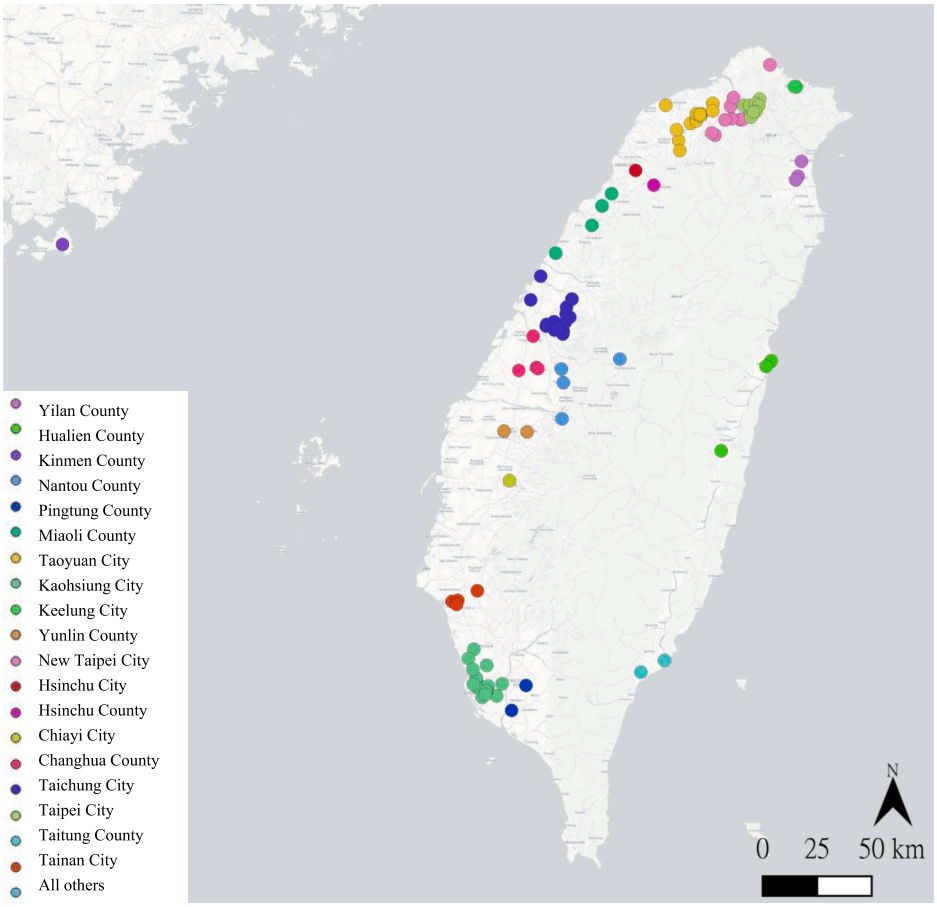


**Figure 3** Spatial distribution of dental care providers across Taiwan's 22 administrative districts. Each colored dot represents the location of a domiciliary dental care (DDC)-providing institution, with different colors indicating different administrative districts, as shown in the legend. The map reveals a pronounced spatial clustering of DDC providers in urban centers and western coastal areas, with sparse coverage in rural, mountainous, and offshore island regions. Three administrative districts (Lianjiang County, Chiayi County, and Penghu County) did not have DDC providers. The map demonstrates substantial geographic inequities in the availability of DDC services, with providers predominantly concentrated in the six special municipalities (Taipei City, New Taipei City, Taoyuan City, Taichung City, Tainan City, and Kaohsiung City). Map created using QGIS version 3.44, Solothurn. The scale bar indicates 0—50 km.

long-term care per DDC dentist in the Eastern region to 15,059 per dentist in the Southern region. These results indicate that while Taiwan has achieved almost UHC in most medical services, DDC remains severely underdeveloped with insufficient provider participation to meet population needs.

The 2.6 % population coverage rate contrasts starkly with Taiwan's 99 % NHI enrollment rate, underscoring systematic exclusion of vulnerable populations from accessible oral health services.[3] However, the critically low coverage reflects a service availability problem rather than a financial protection failure. Taiwan's NHI provides comprehensive coverage for special needs dental services through three delivery modalities, with 2024 budget utilization distributed as follows: hospital/clinic-based care (64.3 %), outreach dental teams care (32.6 %), and domiciliary care (3.1 %).[19,21] The 3.1 % DDC budget utilization indicates severe supply-side constraints rather than lack of insurance coverage. With only 102 institutions and 163 dentists providing DDC nationwide, capacity limitations prevent most eligible individuals from accessing this modality regardless of financial protection. This supply shortage fundamentally differs from international contexts where high out-of-pocket costs create demand-side barriers even when providers are available.[22] In Taiwan, financial barriers are largely absent due to NHI coverage, yet the insufficient provider participation creates access barriers for those requiring home-based care. The predominance of hospital/clinic-based care (64.3 % of budget) suggests that individuals with mobility limitations may be compelled to travel to hospitals or clinics despite substantial difficulties. Janssens et al. documented that care home managers preferred DDC specifically to avoid the logistical challenges and stress of transporting residents to facilities.[6] While not all individuals requiring long-term care need domiciliary services, the severely limited provider capacity means that those with significant mobility limitations face substantial access barriers. The current budget allocation pattern indicates that Taiwan's special needs dental services system remains oriented toward facility-based models

**Table 2** Dentist participation in domiciliary dental care (DDC) provision and target population by administrative district and National Health Insurance (NHI) service region, 2024.

| NHI service area | Administrative District | Numbers of practicing dentists | Numbers of people requiring long-term care | [a]Numbers of dentists providing DDC (percentage of total, %) |
|---|---|---|---|---|
| Taipei | Yilan County | 201 | 18321 | 69 |
| | Keelung City | 217 | 15102 | |
| | Taipei City | 3595 | 113710 | |
| | New Taipei City | 2878 | 146627 | |
| | Kinmen County | 20 | 4904 | |
| | Lianjiang County | 8 | 412 | |
| | Subtotal | 6919 | 299076 | 69 (1.0 %) |
| Northern | Taoyuan City | 1487 | 70889 | 24 |
| | Hsinchu City | 397 | 14186 | |
| | Hsinchu County | 318 | 17895 | |
| | Miaoli County | 203 | 21724 | |
| | Subtotal | 2405 | 124694 | 24 (1.0 %) |
| Central | Taichung City | 2256 | 92336 | 31 |
| | Changhua County | 641 | 49093 | |
| | Nantou County | 158 | 21345 | |
| | Subtotal | 3055 | 162774 | 31 (1.0 %) |
| Southern | Yunlin County | 190 | 29663 | 9 |
| | Chiayi City | 241 | 10137 | |
| | Chiayi County | 103 | 23277 | |
| | Tainan City | 1273 | 72452 | |
| | Subtotal | 1807 | 135529 | 9 (0.5 %) |
| Kao-Ping | Kaohsiung City | 1996 | 107980 | 21 |
| | Pingtung County | 256 | 34461 | |
| | Penghu County | 35 | 4207 | |
| | | 2287 | 146648 | 21 (0.9 %) |
| Eastern | Hualien County | 148 | 13950 | 9 |
| | Taitung County | 69 | 9446 | |
| | Subtotal | 217 | 23396 | 9 (4.1 %) |
| Total | | 16690 | 892117 | 163 (1.0 %) |

[a] Numbers and percentages of dentists providing DDC are available only at the regional level, not for individual districts.

that may inadequately serve populations with mobility constraints.

The critical challenge for DDC expansion is inadequate provider reimbursement rates that do not incentivize participation. Domiciliary care inherently involves higher costs related to travel time, equipment transport, longer appointment durations, and specialized portable equipment.[11,12] If NHI reimbursement rates do not adequately compensate providers for these additional costs compared to clinic-based practice, DDC becomes economically disadvantageous. The exceptionally low provider participation rates (1.3 % institutional, 1.0 % manpower) suggest that current reimbursement rates do not sufficiently compensate for the additional resources required to provide domiciliary services.

Lorenz curve analysis reveals excellent geographic equity in the distribution of DDC resources. At the district level (n = 22), institutional coverage demonstrated a Gini coefficient of 0.064, while regional analysis (n = 6) showed 0.069 for institutions and 0.082 for dentists. All Lorenz curves lie above the line of perfect equality, indicating that smaller administrative units receive proportionally more DDC resources relative to their population size, a pro-rural distribution pattern. This suggests that policy efforts to prioritize underserved areas have achieved equitable resource allocation. However, equity in distribution does not equal adequacy of supply. Despite fair geographic allocation, absolute provider participation remains critically insufficient, with only 102 institutions (1.3 %) and 163 dentists (1.0 %) nationwide providing DDC services. Geographic disparities in absolute service availability persist, with institutional coverage ranging from 0 % in three districts to 4.7 % in the Eastern region, consistent with access gaps documented from 2018 to 2023.[16] The concentration of 69.6 % of DDC providers in six special municipalities reflects well-documented urban-rural healthcare infrastructure disparities,[17] although the pro-rural distribution pattern suggests policy attempts to compensate for these structural inequalities. The supply-demand mismatch varies substantially across regions, ranging from 2600 people requiring long-term care per DDC dentist in the Eastern region to 15,059 per dentist in the Southern region, making meaningful service provision challenging regardless of equitable distribution. When standardized by population need, provider density ranges from 0.7 DDC dentists per 10,000 people requiring long-

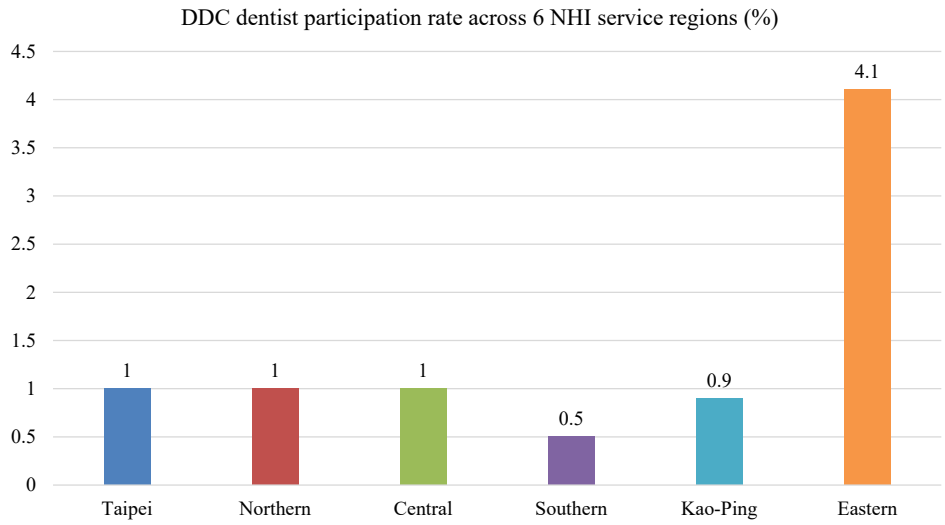


**Figure 4** Manpower coverage rates for domiciliary dental care (DDC) across National Health Insurance (NHI) service regions, 2024. The participation rate represents the percentage of practicing dentists providing DDC services relative to all practicing dentists in each region. Regional variation ranged from 0.5 % in the Southern region to 4.1 % in the Eastern region. Taipei, Northern, and Central regions each showed 1.0 % participation, while the Kao-Ping region showed 0.9 % participation.

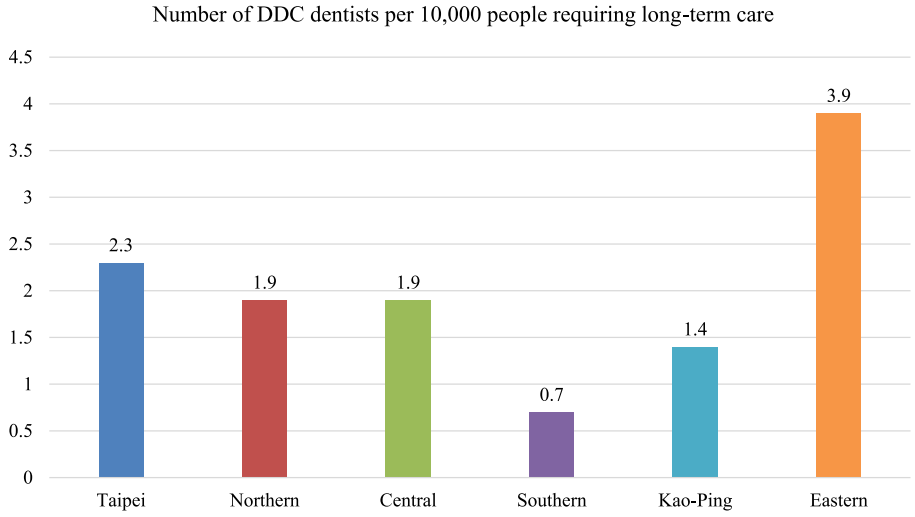


**Figure 5** Dentist-to-population ratios for domiciliary dental care (DDC) standardized by the target population requiring long-term care across National Health Insurance (NHI) service regions, 2024. The provider density was calculated as the number of DDC dentists per 10,000 people needing long-term care in each region. The Eastern region showed the highest provider density (3.9 per 10,000), followed by the Taipei region (2.3 per 10,000), Northern and Central regions (1.9 per 10,000), Kao-Ping region (1.4 per 10,000), and Southern region (0.7 per 10,000).

term care in the Southern region to 3.9 per 10,000 in the Eastern region, further illustrating the inadequate absolute supply across all regions despite equitable distribution patterns. Hosseinpoor et al. emphasized that equity-oriented monitoring across geographic dimensions is fundamental to achieving UHC.[2] Taiwan's DDC distribution demonstrates that while equitable allocation has been achieved, the fundamental challenge remains inadequate overall supply that leaves vulnerable populations, particularly in districts with zero coverage, without access to essential services.

Multiple interconnected barriers contribute to insufficient DDC provider participation. Beyond inadequate reimbursement, workforce training barriers exist as dental education traditionally focuses on clinic-based care with limited emphasis on managing medically complex patients or portable equipment use.[14] Othman et al. found that only 36.1 % of Malaysian government dentists had DDC experience, citing complex medical histories, unfavorable working conditions, and concerns about time, remuneration, infection control, and equipment portability as primary barriers.[11] Organizational barriers include limited integration between DDC and long-term care systems, lack of clear provider responsibility guidelines, professional liability concerns, and inadequate infection control protocols.[7,9] Equipment, logistical challenges, and limited awareness

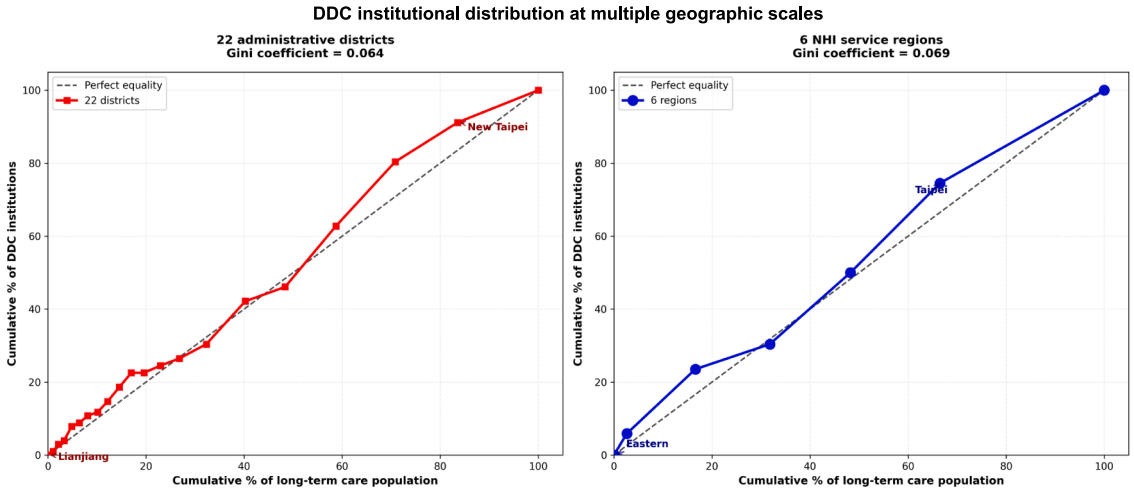


**Figure 6** Lorenz curves comparing geographic equity in institutional coverage for domiciliary dental care (DDC) at district versus National Health Insurance (NHI) service regional levels, 2024. The curves plot the cumulative share of the population requiring long-term care (x-axis) against the cumulative share of DDC institutions (y-axis). The diagonal equality line represents perfect geographic equity, where each area's share of institutions matches its population share. District-level analysis (n = 22, Gini = 0.064, left panel) and regional-level analysis (n = 6, Gini = 0.069, right panel) both demonstrate excellent equity. Both Lorenz curves lie above the equality line, indicating that smaller administrative units receive proportionally more resources relative to their population size, reflecting a pro-rural distribution pattern.

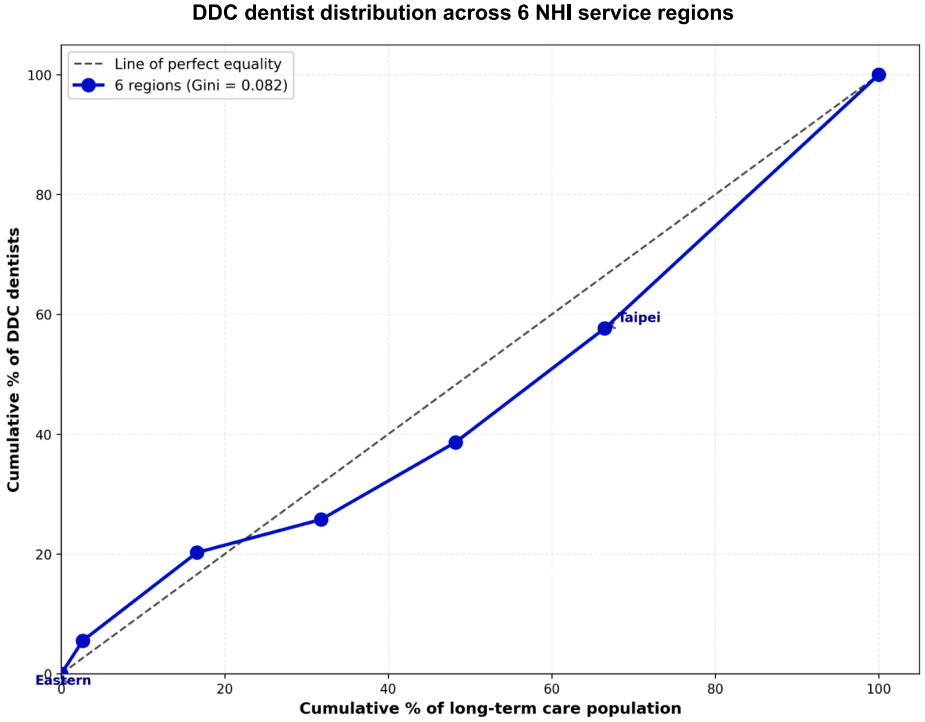


**Figure 7** Lorenz curve for domiciliary dental care (DDC) dentist distribution across six National Health Insurance (NHI) service regions, 2024. The curve plots the cumulative share of the population requiring long-term care (x-axis) against the cumulative share of DDC dentists (y-axis). The Gini coefficient of 0.082 indicates excellent geographic equity. The Lorenz curve lies above the line of perfect equality, demonstrating that smaller regions receive proportionally more dentist resources relative to their population size, consistent with the pro-rural distribution pattern observed for institutional coverage.

among potential beneficiaries and caregivers regarding DDC eligibility impede utilization.[6,9,12]

Educational initiatives show promise in promoting the participation of DDCs. Ma et al. reported that continuing medical education programs achieved high satisfaction rates (66.7 %) and contributed to increased participation of healthcare professionals in DDC.[13] Yu and colleagues documented positive outcomes from implementing the domiciliary dentistry curriculum over five years.[14] These initiatives demonstrate that targeted education can partially address workforce barriers, although systemic funding and organizational support changes are necessary.

These findings have important implications for improving DDC accessibility. The critical low utilization despite NHI coverage suggests that current reimbursement rates do not adequately compensate providers for the additional time, travel, equipment costs, and administrative burden inherent to domiciliary care. Comprehensive cost analysis is needed to develop reimbursement models that make DDC economically viable compared to clinic practice, addressing the primary barrier to provider participation and aligning with WHO recommendations for integrating oral health into UHC.[3,23] Geographic disparities could be reduced through targeted recruitment incentives for underserved areas, including loan repayment programs, mobile dental units, and region-specific support systems.[16] Workforce development must expand training in geriatric dentistry and domiciliary care delivery, building on successful educational models in Taiwan.[13,14] From a provider perspective, clear guidelines regarding clinical responsibilities, infection control protocols, emergency preparedness, and coordination with long-term care facilities would facilitate service delivery.[7,9] Exploring expanded roles for appropriately trained dental therapists and hygienists may help extend service capacity to meet growing demand.[8,12]

In conclusion, this study reveals a critical gap in Taiwan's otherwise comprehensive universal health coverage system. Despite the available financial protection for DDC, severely low provider participation and pronounced geographic inequities create supply-side constraints that prevent most people requiring long-term care from accessing domiciliary oral health services. Creating UHC in oral health requires improved reimbursement models to incentivize provider participation, targeted workforce development strategies, and policies addressing geographic disparities. As Taiwan and other countries work toward the UHC Sustainable Development Goal by 2030, ensuring that vulnerable populations with mobility limitations can access appropriate service delivery models, not simply financial coverage for facility-based care they cannot access, is essential for health equity.

## Declaration of competing interest

The author has no conflicts of interest relevant to this article.

## Acknowledgments

None.

## References


1. *Universal health coverage. World health organization.* Geneva: WHO, 2019.
2. Hosseinpoor AR, Bergen N, Koller T, et al. Equity-oriented monitoring in the context of universal health coverage. *PLoS Med* 2014;11:e1001727.
3. Winkelmann J, Listl S, van Ginneken E, Vassallo P, Benzian H. Universal health coverage cannot be universal without oral health. *Lancet Public Health* 2023;8:e8—10.
4. Marques Dos Santos SQ, Andrade RVS, Galvao MHR, da Costa Oliveira AGR. Oral health approach in universal health coverage. *BMC Public Health* 2024;24:2633.
5. Nascimento GG, Raittio E, Machado V, Leite FRM, Botelho J. Advancing universal oral health coverage via person-centred outcomes. *Int Dent J* 2023;73:793—9.
6. Janssens L, Phlypo I, Geddis-Regan A, Petrovic M, Janssens B. Care home managers' perspectives on domiciliary dental care: a qualitative study. *BMC Geriatr* 2025;25:323.
7. Rani H, Mohd-Dom TN, Meei TI, et al. Investigating the challenges and opportunities of domiciliary oral care for the older adults: a scoping review. *Healthcare (Basel)* 2024;12:2469.
8. Smith L, Smith M, Thomson WM. Recommendations for improving dental care for dentate home-based older people: a qualitative New Zealand study. *Gerodontology* 2022;39:187—96.
9. Kerr E, Watson S, McMullan J, Srinvasan M, McKenna GJ. General dentists' attitudes and perceived barriers in providing domiciliary dental care to older adults in long-term care facilities or their homes in Northern Ireland: a descriptive qualitative study. *Gerodontology* 2022;39:257—65.
10. Emanuel R, Quach J, Patel P, Witton R, Machuca-Vargas C, Taylor E. The attitudes of dental therapists, dental therapy educators and dental therapy students in the South of England towards domiciliary dentistry: a qualitative study. *Br Dent J* 2024 (in press).
11. Othman AA, Yusof Z, Saub R. Malaysian government dentists' experience, willingness and barriers in providing domiciliary care for elderly people. *Gerodontology* 2014;31:136—44.
12. Sweeney MP, Manton S, Kennedy C, Macpherson LM, Turner S. Provision of domiciliary dental care by Scottish dentists: a national survey. *Br Dent J* 2007;202:E23.
13. Ma KS, Chang HJ, Chen LW, Yu CH. Domiciliary dental care for medically compromised patients in aging and super-aged societies: policy and education. *Aging Dis* 2023;14:589—91.
14. Yu CH, Chou MY. Implementation of domiciliary dentistry curriculum in dental education: 5-year experience. *J Dent Sci* 2022;17:1083—4.
15. Yu CH, Wang YH, Lee YH, Chang YC. The implementation of domiciliary dental care from a university hospital: a retrospective review of the patients and performed treatments in central Taiwan from 2010 to 2020. *J Dent Sci* 2022;17:96—9.
16. Ng MY, Yu CH. Analysis of trends and disparities in domiciliary dental care distribution in Taiwan from 2018 to 2023. *J Dent Sci* 2025;20:77—82.
17. Medical care institution service volume survey. Department Statistics, ministry of health and welfare. Available at: https://dep.mohw.gov.tw/DOS/lp-5099-113-xCat-y113.html. [Date accessed: August 3, 2025].
18. Provision of domiciliary dental care services. National health insurance administration, ministry of health and welfare. Available at https://info.nhi.gov.tw/INAE1000/INAE1030S01. [Date accessed: August 3, 2025].
19. Dental Outpatient Global Budget Execution Report. National health insurance committee, ministry of health and welfare. Available at: https://dep.mohw.gov.tw/NHIC/cp-1664-83000-116.html.2025/07/08[Date accessed: August 3, 2025].

20. Lon-term care plan 2.0: long-term care service coverage. long-term care section. Ministry of health and welfare. Available at: https://1966.gov.tw/LTC/lp-6485-207.html [Date accessed: August 3, 2025].
21. National health insurance dental outpatient total special medical service plan. Taiwan dental association. Available at: https://www.cda.org.tw/cda/news_detail.jsp?nid=987 [Date accessed: August 3, 2025].
22. Ghanbarzadegan A, Balasubramanian M, Luzzi L, Brennan D, Bastani P. Inequality in dental services: a scoping review on the role of access toward achieving universal health coverage in oral health. *BMC Oral Health* 2021;21:404.
23. Listl S, Quinonez C, Vujicic M. Including oral diseases and conditions in universal health coverage. *Bull World Health Organ* 2021;99:407.