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Pongsin Pongsupatananon

pongsin.pon@thaimooc.ac.th

Thailand Cyber University

Pimlada Pongsupatananon

Walailak University

Deanram Reangsan

Sunpasitthiprasong Hospital

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Socioeconomic and Geographic Factors Influencing Dental Care Utilization Among Thai Adults and the Elderly: 2003–2013

Pongsin Pongsupatananon[1], Pimlada Pongsupatananon[2], Deanram Reangsan[3]

[1]Independent Researcher, Thailand Cyber University, Thailand

[2]Dentistry, Walailak University, Nakhon Si Thammarat, Thailand
[3]Medical Intensive Care Unit, Sunpasitthiprasong Hospital, Ubon Ratchathani, Thailand

Correspondence to Pongsin Pongsupatananon ; pongsin.pon@thaimooc.ac.th

Abstract

This study aimed to assess trends and determinants of dental care utilization (DU) among Thai adults and the elderly in 2003, 2009, and 2013. Data on DU among Thai adults aged ≥20 years, as reported in the Health and Welfare Survey (HWS), was analyzed in relation to independent variables including demographic, socioeconomic, and geographic characteristics. Supplementary analyses were conducted to examine disparities across socioeconomic strata, including type of dental facility utilized, health insurance entitlement, and type of dental treatment received. The results showed that DU remained low and showed a slight decline. Multivariate logistic regression confirmed significant associations between utilization and demographic, socioeconomic, and geographic determinants. Women had 1.5 times higher odds of utilization compared with men ($p<0.001$). Socioeconomic disparities were evident: individuals in the wealthiest quintile and those with tertiary or higher education reported approximately twice the utilization of their counterparts ($p<0.001$). Bangkok residents demonstrated greater utilization than those in other regions ($p<0.001$). The lowest socioeconomic status (SES) subgroup predominantly sought care at community hospitals, utilized the Universal Coverage Scheme (UCS), and received dental care primarily through tooth extraction, in contrast to wealthier groups. In summary, over the ten-year period, Thailand attempted to expand accessibility for dental care utilization by increased number of dental personnel and reduce financial barrier. However, there has been a slight change in rate of use. This finding suggests that reducing socioeconomic inequalities, geographic disparities, and differences in insurance benefits is essential to improving access to dental care.

Keywords: Dental care utilization, Socioeconomic disparities, Thai adults and the elderly, Universal Coverage Scheme.

Background

Oral health is a vital component of general health and quality of life[1-3], yet dental caries and periodontal disease remain among the most prevalent chronic conditions worldwide[4-6]. Regular dental care utilization, including preventive check-ups and frequency of visits, is essential to reducing the burden of oral disease and preventing progression to severe outcomes[7,8]. Thailand has promoted equitable access to health care through the Universal Coverage Scheme introduced in 2001. The health system was reorganized into primary, secondary, and tertiary levels, supported by a referral system to improve geographical access and address resource shortages[9]. In 2010, a dental fund was established to support prevention, promotion, and treatment services nationwide. By 2013, oral health was prioritized under the national service plan, emphasizing seamless care networks, integrated referral pathways across provincial health services, and strategic resource reallocation[10,11]. Despite these reforms, many individuals continue to leave oral diseases untreated. The 8th National Oral Health Survey revealed that working-age adults (35–44 years) commonly experienced untreated dental caries and gingival disease. Among the elderly aged 60–74 years, dental caries and periodontal disease were prevalent. Retention of at least 20 teeth was reported in approximately 40% of the elderly, but declined substantially among those aged 80–85 years[12]. Studies in Thailand further revealed poorer dental caries, gingivitis and periodontitis status among adults from disadvantaged social backgrounds[13,14].

Utilization patterns were confirmed to be influenced by socioeconomic factors[15]. Existing studies have addressed inequalities in DU among adult and the elderly; However, three critical gaps remain unaddressed. First, most studies have examined young and older adult populations separately[16-18], which may not adequately capture trends in DU across the life course, from early working-age through retirement. Second, existing research emphasized short-term outcomes following UCS implementation[19], or limited evidence on long-term trends in socioeconomic disparities[11]. Third, insufficient attention has been directed toward the influence of socioeconomic status on dental care-seeking behaviors, including choice of facility, insurance entitlement, and type of treatment received.

The purpose of this study was to examine DU within the evolving Thai health system. The 2003 HWS provides an early post-UCS baseline. The 2009 HWS captures utilization patterns around the establishment of the dental fund in 2010. The 2013 HWS reflects utilization during the period when oral health was prioritized under the national service plan. Together, these three waves form a coherent framework for assessing long-term trends and policy impacts, highlighting how successive reforms shaped equity and access in dental care.

Methods

Study Design

This repeated cross-sectional analytical study examined national patterns of DU in relation to the introduction of the UCS in 2001. Secondary data from three waves of the Health and Welfare Survey, conducted by the National Statistical Office (NSO) of Thailand in May 2003, May 2009, and March 2013, were analyzed.

Population and Sample Size

The sample of Thai adults aged 20 years and older covering the years 2003 (n = 47,061), 2009 (n = 52,537), and 2013 (n = 52,839) was selected in this analysis. Although traditional sample size calculations were not applicable due to the use of comprehensive national HWS data, the large sample size ensured robust statistical power and representativeness for population-level analysis.

Inclusion Criteria

Individuals aged 20 years and older were selected for inclusion in the analysis, as this age threshold captures adult, mid-life, and older populations.

Exclusion Criteria

Individuals with incomplete data were excluded from the analysis.

Research Instruments

Information on DU was collected using survey questionnaires that asked participants: "Have you utilized dental care during the past twelve months preceding the survey?" Responses were coded as a binary variable (yes/no) and treated as the dependent outcome in the analysis. Supplementary data were incorporated to examine disparities across socioeconomic strata, including type of health provider (private facilities vs. public facilities such as primary care units (PCUs), community hospitals, and general/central/university hospitals), health insurance entitlements (Universal Coverage Scheme: UCS, Civil Servant Medical Benefit Scheme: CSMBS, Social Security Scheme: SSS, private insurance, and out-of-pocket payment: OOP), and type of dental treatment received.

Independent variables were categorized into three main groups: (i.) demographic characteristics, including age (20–34, 35–59, and ≥60 years) and sex (male/female); (ii.) socioeconomic characteristics, comprising educational attainment (up to primary, secondary including vocational, and tertiary or higher) and an asset index of household possessions, computed from data on ownership of household items and appliances (e.g., television, mobile phone, computer, refrigerator, washing machine, air conditioner, car, motorbike, truck, and agricultural machinery). Household socioeconomic status was then assessed by constructing an index through principal component analysis (PCA)[20] applied to the complete national NSO dataset. Quintile rankings were then derived and merged into the adult sample, categorizing households from poorest (1st quintile: Q1) to richest (5th quintile: Q5); (iii.) geographic characteristics, defined by five regions (South,

Northeast, North, Central excluding Bangkok, and Bangkok) and residential area (municipal/non-municipal).

Validity and Reliability

The HWS questionnaire was developed by the NSO under the Generic Statistical Business Process Model (GSBPM) framework. Drafts were reviewed by experts, administered by trained interviewers, and monitored for accuracy through systematic supervision and validation prior to nationwide data collection.

Data Collection

Data were collected via face-to-face interviews with household heads and all members residing in sampled households across all provinces of Thailand with more than 70% of each year being self-response informants. The survey applied two-stage stratified sampling design and survey weights to represent the country's population profile. The primary sampling units in municipal and non-municipal areas in each year were residential blocks and villages respectively. The secondary sampling unit used households and randomly selected from a list of households in each sample block or village of the sampling frame.

Ethical consideration

Data collection for the Health and Welfare Survey was conducted under the legal authority of the National Statistical Office in accordance with the Statistics Act B.E. 2508 (1965) and the Statistics Act B.E. 2550 (2007)[21]. The dataset used in this study was secondary in nature, contained no identifiable personal information, and all results were presented in aggregate form to ensure strict confidentiality of respondents.

Statistical analysis

Data were analyzed using Stata 18 (Stata Corp LLC, College Station, TX, USA). The analysis was conducted in two main stages as follows:

i. Bivariate analysis

The Chi-square test was employed to assess differences in proportions across independent variables and DU, with statistical significance set at $p<0.05$. In addition, supplementary analyses were conducted within the DU respondent dataset to examine type of health provider, health insurance entitlements, and type of dental treatment received across socioeconomic strata.

ii. Multivariate logistic regression analysis

Variables that were significantly associated with DU in the bivariate analysis (Chi-square test) were subsequently entered into multiple logistic regression models to estimate adjusted odds ratios (AORs) with 95% confidence intervals (95% CIs). This approach was used to identify factors associated with DU and to evaluate trends in these associations over time.

Results

Bivariate Determinants of DU

Over the ten-year period following implementation of the UCS. The rate of DU among Thai adults and the elderly remained low and showed a slight decline (10.11% in 2003, 9.86% in 2009, and 8.51% in 2013 (Table 1). Chi-square analysis revealed statistically significant differences in DU across all examined variables ($p<0.05$). With respect to age, adults aged 35–59 years reported the highest levels of utilization in 2003 and 2009, whereas older adults (≥60 years) consistently reported the lowest utilization across all survey years. Females consistently utilized dental care services at higher rates than males across all survey waves with 11.48% in 2003, 11.58% in 2009, and 9.97% in 2013, compared to 8.49% in 2003, 7.83% in 2009, and 6.81% in 2013 among male, respectively ($p<0.001$). The utilization rate was consistently concentrated among the wealthiest household quintile (Q5) across all survey years (15.61% in 2003, 15.41% in 2009, and 14.20% in 2013) relative to the poorest quintile (Q1), respectively ($p<0.001$). This gradient was further reflected in educational patterns: adults with tertiary education or higher maintained the highest utilization in all survey periods ($p<0.001$). Geographically, residents of Bangkok and municipal areas reported greater DU than their counterparts ($p<0.001$).

Independent Predictors of DU

Multivariable logistic regression analyses indicated that disparities in utilization were significantly associated with demographic, socioeconomic, and geographic characteristics (Table 2). Female having 1.4 to 1.5 times higher odds of utilization than men ($p<0.001$). Compared with the poorest quintile (Q1), the odds of utilization increased progressively with each higher asset quintile in every survey year reaching an AOR of 2.0 (2003), 1.8 (2009), and 2.1 (2013) for the richest quintile (Q5), all statistically significant ($p<0.001$). Individuals with tertiary or higher level of education had roughly 1.9 to 2.1 times higher odds of utilization than those with primary education ($p<0.001$). Geographically, in 2009 and 2013 residents of all regions outside Bangkok generally had lower adjusted odds of DU than Bangkok residents ($p<0.001$). The traditional urban-rural gradient in DU reversed over the study period. In 2003 and 2009, municipal residents exhibited higher odds of utilization; however, by 2013, residing in a municipal area was associated with significantly lower odds (AOR = 0.90; 95% CI: 0.86–0.98; $p=0.011$) compared with non-municipal residents.

Type of healthcare facility, health insurance scheme, and type of dental treatment by Socioeconomic Strata

Figures 1, 2, and 3 illustrate the association between household wealth and the choice of healthcare facility, health insurance scheme utilized, and type of dental treatment received in 2009 and 2013. Utilization of PCUs and community-level

public facilities were highest among the poorest quintile, whereas utilization of private dental facilities and a more comprehensive care hospitals (general/central/university hospitals) increased with rising SES. The UCS constituted the principal source of dental care financing for the poorest quintile whereas out-of-pocket payment concentrated among wealthier individuals. Among individuals in the poorest quintile, tooth extraction accounted for the majority of dental visits in both survey years. Conversely, the proportions of dental check-up visits, scaling and filling procedures increased progressively with SES.

Discussion

This study provides nationally representative evidence on DU among Thai adults and the elderly over a ten-year period, enabling robust analysis of long-term trends. Despite the implementation of the UCS, dental care utilization remained flat, showing a marginal downward trajectory. Several systemic and workforce barriers during its first decade may explain this persistence. First, oral health services under the UCS emphasized curative treatments, while preventive packages at the population level fell short of expectations. Second, shortages in dental manpower, particularly the persistently high dentist-to-population ratio, (1:17,182 in 2003, 1:14,833 in 2009, and 1:8,395 in 2013)[22], have constrained service delivery. Although Thailand has made efforts to expand the dental workforce through the deployment of dental nurses, these efforts have focused mainly on health promotion and preventive care for schoolchildren, with limited impact on adult patients. Expanding their training to include treatment for adults and the elderly at PCUs could help redistribute utilization more equitably across the population. Third, oral health infrastructure, particularly dental units and equipment, has not been prioritized. Implementation of the service plan strategy, which emphasizes redistribution of manpower and materials, may help balance professional resources with facility capacity.

During the study period, Thailand was transitioning toward an aging society. DU among the elderly was the lowest and decreased from 8.93% in 2009 to 7.97% in 2013, reflecting sociodemographic and cultural determinants of care. Age-related barriers, including limited physical mobility, transportation challenges, and a reduced perceived need for treatment driven by progressive tooth loss and few remaining teeth[23], contributed to this decline. Cultural attitudes further reinforced acceptance of physical deterioration, with tooth loss often regarded as inevitable and rarely addressed through restorative treatment, leading many older adults to abstain from care[24]. To address these challenges, policymakers should prioritize reducing transportation barriers and strengthening oral health literacy by expanding mobile dental services and training dental nurses in basic geriatric oral health, thereby enhancing utilization among older adults at PCUs.

Furthermore, gender was a highly significant predictor. Females demonstrated much higher odds of utilizing dental care than males across all three survey waves. This finding aligns with established literature indicating that women demonstrate higher health literacy, and a higher propensity to seek timely medical interventions than men[25-27].

The multivariable logistic regression analysis highlight that socioeconomic and geographic factors are independent and powerful predictors of dental care visits, individuals with higher socioeconomic status, those with greater educational attainment, and residents of metropolitan Bangkok had higher odds of utilization compared to their counterparts. This pattern is similar to the previous studies among Thai adults, and elderly[16,17]. In 2013, the findings revealed a municipal reversal in dental care utilization, with non-municipal residents exhibiting higher use than municipal residents. This shift likely reflects the decentralized expansion of primary care unit networks, sub-district health-promoting hospitals, and community dental clinics nationwide, which enhanced service availability in rural areas and reduced geographic barriers to care. The reversal underscores how system-level investments in community-based infrastructure can reshape traditional urban-rural patterns of utilization, highlighting the importance of equitable resource distribution in advancing oral health access.

The study demonstrates that SES significantly influences dental care utilization through insurance schemes and provider choices. The UCS functioned as a critical safety net for the poorest populations, who primarily accessed services at PCUs and community hospitals. In contrast, wealthier groups covered under the CSMBS sought care at tertiary facilities such as general and central hospitals. Results also indicated that affluent individuals were often willing to pay out-of-pocket for more convenient private services. This evidence highlights the disparity whereby financially advantaged groups can afford multiple options for care, while disadvantaged populations face limited choices.

An additional finding of this study concerns disparities in the types of dental treatments received across wealth groups. In 2009 and 2013, preventive services, particularly teeth scaling and filling, were concentrated among the wealthiest individuals, whereas invasive, pain–driven treatments like tooth extraction were markedly common among the poorest. These differences indicate that wealthier individuals are more likely to attend dental clinics for regular checkups, professional cleaning, and early restorative care, while poorer individuals often delay seeking treatment until severe pain or advanced tooth decay occurs, at which point extraction becomes the most viable or affordable option.

Study Limitations

Several limitations must be acknowledged. First, data on specific types of dental care utilized were unavailable for the 2003 survey wave, preventing a

complete ten-year trend analysis of treatment patterns. Second, reliance on self-reported data introduces the potential for recall bias. Finally, while analyzed waves (2003–2013) provide a crucial historical assessment of the first decade following universal coverage, future studies should evaluate more recent waves to determine if these socioeconomic and geographic gradients persisted or narrowed during the second decade of the UCS.

Conclusion

Over the ten-year period, Thailand undertook efforts to improve access to dental care by expanding the dental workforce and reducing financial barriers through universal coverage. Nevertheless, utilization rates showed only slight change. These findings underscore that addressing socioeconomic inequalities, geographic disparities, and variations in insurance benefits is critical to achieving equitable access to dental care.

Suggestions for future study

Future studies should examine long-term dental care utilization trends following on-going UCS policy reform, particularly as the scheme expands to include both public and private facilities, in order to identify underlying utilization barrier.

Suggestions for practical implementation

As Thailand transitions into an aging society and this study revealed lower DU among the elderly, enhancing oral health literacy through mobile dental services and training dental nurses in basic geriatric oral health is essential to improve service uptake at PCUs. In addition, to reduce disparities among lower socioeconomic groups, access to care under the UCS should be strengthened across both public and private facilities. UCS dental benefits in private facilities should be expanded to match those available in public facilities, particularly treatments that promote tooth retention such as dental fillings, which prevent the progression of dental caries and, in turn, reduce the likelihood of tooth extractions.

Suggestions for policy

Policies to improve oral health among Thai adults and the elderly should place greater emphasis on non-financial barriers, including strengthening the distribution of dental personnel and facilities beyond Bangkok and other major cities, broadening the dental benefit package to prioritize preventive and restorative care, and implementing targeted outreach and health education programs for populations with lower levels of education and household wealth.

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Authors' contributions

PP and RD conceptualized the study, performed data cleaning and statistical analyses, drafted the initial manuscript, contributed to data interpretation, and substantially revised the final version

Conflict of Interest

The author declares no conflict of interest.

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Generative AI Application

The authors used Microsoft Copilot and Gemini Notebook to assist in language editing and to improve the clarity of the manuscript during the writing process. All substantive content, concepts, analyses, and conclusions remain the sole responsibility of the author who have thoroughly reviewed and verified the accuracy of the manuscript.

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Table 1 Proportionate distribution of dental care utilization across determinants among Thai adults aged 20 years and older

Determinants	**2003**	***p*-value[1]**	**2009**	***p*-value[1]**	**2013**	***p*-value[1]**
	n (%)		n (%)		n (%)	
Overall	4,758 (10.11)		5,181 (9.86)		4,494 (8.51)	
1) Demographic characteristics						
Age (years):		<0.001		<0.001		0.042
20–34	1,392 (9.78)		1,260 (9.41)		1,069 (8.78)	
35–59	2,664 (11.07)		2,903(10.46)		2,438 (8.62)	
≥ 60	702 (8.01)		1,018 (8.93)		987 (7.97)	
Sex:		<0.001		<0.001		<0.001
Male	1,824 (8.49)		1,879 (7.83)		1,667 (6.81)	
Female	2,934 (11.48)		3,302(11.58)		2,827 (9.97)	
2) Socioeconomic characteristics						
Asset index of household possession:		<0.001		<0.001		<0.001
Q1 (poorest)	473 (6.03)		658 (6.57)		628 (5.10)	
Q2	628 (7.39)		588 (7.44)		727 (6.47)	
Q3	788 (8.84)		765 (7.86)		728 (7.87)	
Q4	1,000 (10.18)		1,049 (9.44)		1,058 (10.06)	
Q5 (richest)	1,869 (15.61)		2,121 (15.41)		1,353 (14.20)	
Educational attainment:		<0.001		<0.001		<0.001
Primary [a]	2,473 (8.04)		2,431 (7.87)		2,104 (6.70)	
Secondary [b]	1,398 (11.66)		1,213 (9.68)		1,064 (8.23)	
Tertiary [c]	887 (20.49)		1,537 (16.89)		1,326 (15.57)	
3) Geographic characteristics						
Region of residence:		<0.001		<0.001		<0.001
South	824 (10.54)		811 (9.53)		785 (8.93)	
Northeast	1,053 (9.44)		1,122 (9.02)		963 (6.88)	
North	1,123 (11.11)		1,075 (9.46)		1,023 (8.95)	
Central [d]	1,404 (9.21)		1,680 (9.79)		1,276 (8.09)	
Bangkok	354 (12.99)		493 (16.06)		447 (15.67)	
Area of residence:		<0.001		<0.001		<0.001
Non-municipal	1,589 (8.22)		1,670 (7.92)		1,789 (7.72)	
Municipal	3,169 (11.43)		3,511(11.16)		2,705 (9.12)	

Note: n- dental care utilization in adults and the elderly, % - percentage of dental care utilization,[1] Chi-square test, [a] up to primary level; [b] secondary/vocational; [c] tertiary or higher; [d] excludes Bangkok, *p*-value <0.05

Table 2 Multiple logistic regression analysis of the association between dental care utilization and determinants among Thai adults aged 20 years and older

Determinants (=1 if yes, =0 if otherwise)	2003 AORs (95% CIs)	*p*-value	2009 AORs (95% CIs)	*p*-value	2013 AORs (95% CIs)	*p*-value
Demographic characteristics						
Age (years):						
20–34	0.95 (0.85,1.05)	0.328	0.78 (0.71,0.86)	<0.001	0.81 (0.73,0.90)	<0.001
35–59	1.18 (1.08,1.23)	<0.001	1.01 (0.93,1.09)	0.897	0.91 (0.84,0.99)	0.025
≥ 60	Ref.		Ref.		Ref.	
Sex:						
Male	Ref.		Ref.		Ref.	
Female	1.42 (1.33,1.51)	<0.001	1.55 (1.46,1.65)	<0.001	1.53 (1.43,1.63)	<0.001
Socioeconomic characteristics						
Asset index of household possession:						
Q1 (the poorest)	Ref.		Ref.		Ref.	
Q2	1.21 (1.07,1.37)	0.003	1.11 (0.99,1.24)	0.086	1.26 (1.12,1.40)	<0.001
Q3	1.40 (1.24,1.58)	<0.001	1.15 (1.03,1.28)	0.013	1.50 (1.34,1.67)	<0.001
Q4	1.53 (1.36,1.72)	<0.001	1.30 (1.17,1.45)	<0.001	1.75 (1.57,1.95)	<0.001
Q5 (the richest)	2.02 (1.80,2.27)	<0.001	1.79 (1.61,1.99)	<0.001	2.11 (1.89,2.36)	<0.001
Educational attainment:						
Primary [a]	Ref.		Ref.		Ref.	
Secondary [b]	1.39 (1.29,1.51)	<0.001	1.27 (1.17,1.38)	<0.001	1.23 (1.12,1.34)	<0.001
Tertiary [c]	2.14 (1.94,2.37)	<0.001	1.92 (1.76,2.09)	<0.001	1.99 (1.81,2.18)	<0.001
3)Geographic characteristics						
Region of residence:						
Bangkok	Ref.		Ref.		Ref.	
South	0.99 (0.87,1.14)	0.932	0.71 (0.63,0.81)	<0.001	0.70 (0.62,0.80)	<0.001
Northeast	0.94 (0.82,1.07)	0.370	0.69 (0.62,0.78)	<0.001	0.59 (0.52,0.67)	<0.001
North	1.09 (0.96,1.25)	0.181	0.71 (0.63,0.80)	<0.001	0.72 (0.64,0.82)	<0.001
Central [d]	0.85 (0.74,0.96)	0.011	0.73 (0.65,0.81)	<0.001	0.61 (0.54,0.69)	<0.001
Area of residence:						
Non-municipal	Ref.		Ref.		Ref.	
Municipal	1.08 (1.01,1.16)	0.028	1.08 (1.01,1.15)	0.028	0.92 (0.86,0.98)	0.011

Note: AORs: adjusted odds ratio, [a] up to primary level; [b] secondary/vocational; [c] tertiary or higher; [d] excludes Bangkok, *p*-value <0.05,

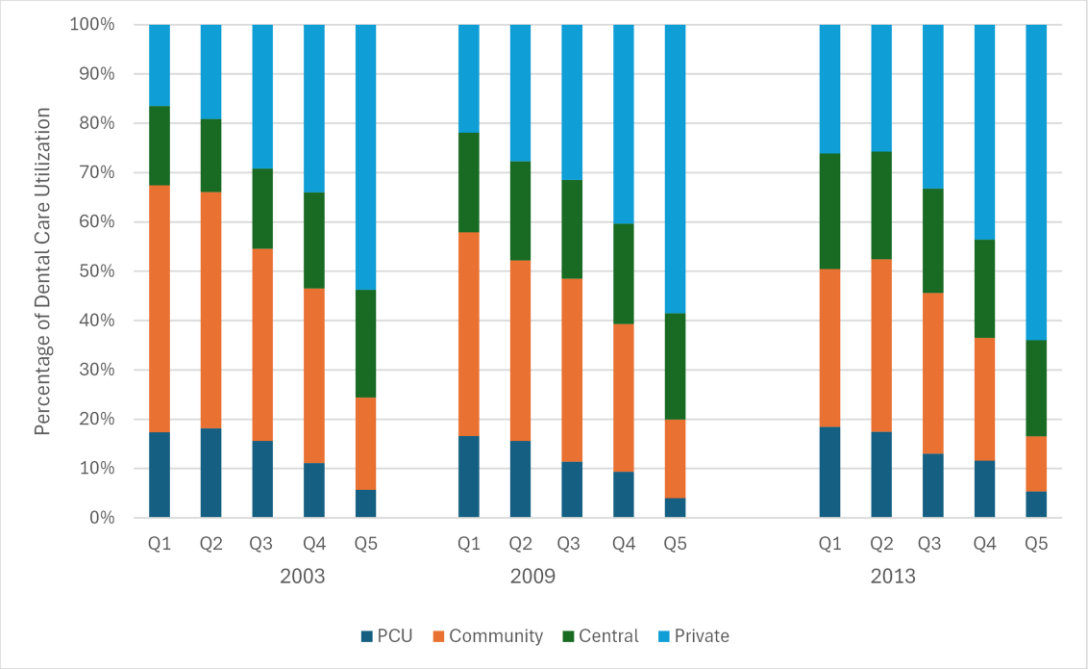


Figure 1: Distribution of dental care facility utilization across socioeconomic strata (Q1: poorest to Q5: richest, PCU: Primary care units, Community: Community hospitals, Central: General/Central and university hospitals, Private: Private clinics and hospitals)

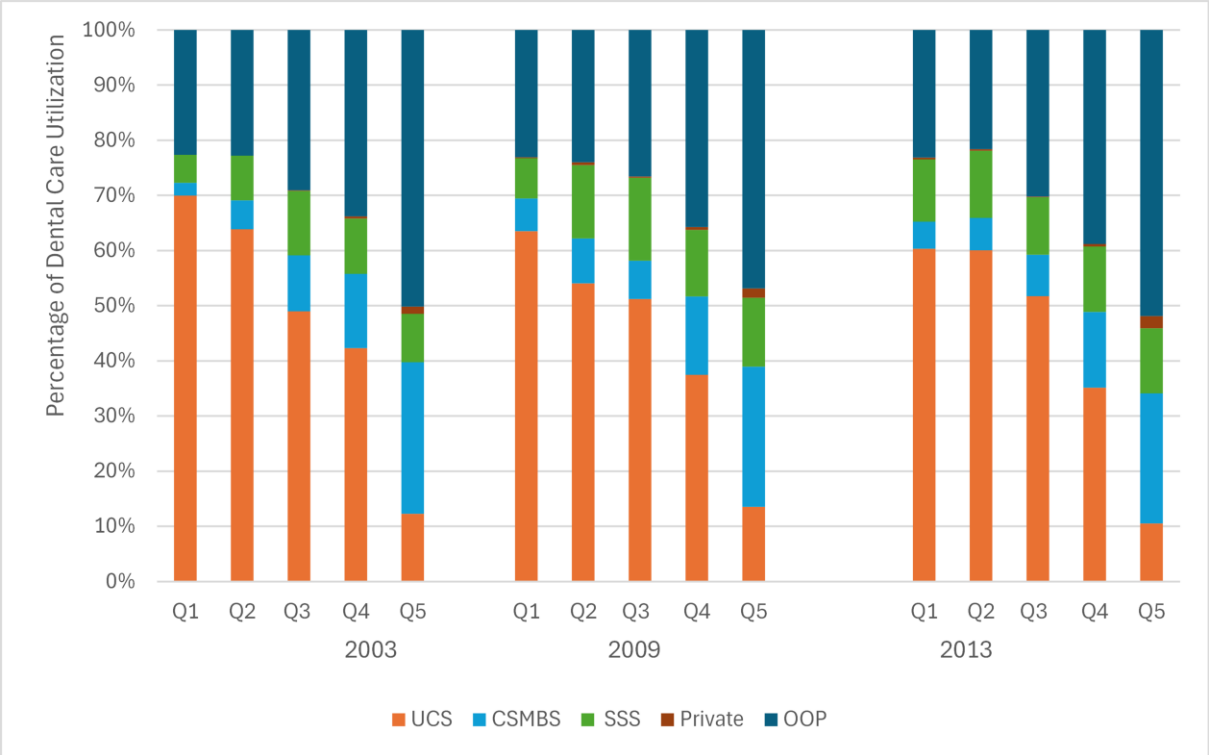


Figure 2: Distribution of dental care insurance entitlement across socioeconomic strata (Q1: poorest to Q5: richest, UCS: Universal Coverage Scheme, CSMBS: Civil Servant Medical Benefit Scheme, SSS: Social Security Scheme, Private: Having substituted private insurance, OOP: Out-of-pocket payment)

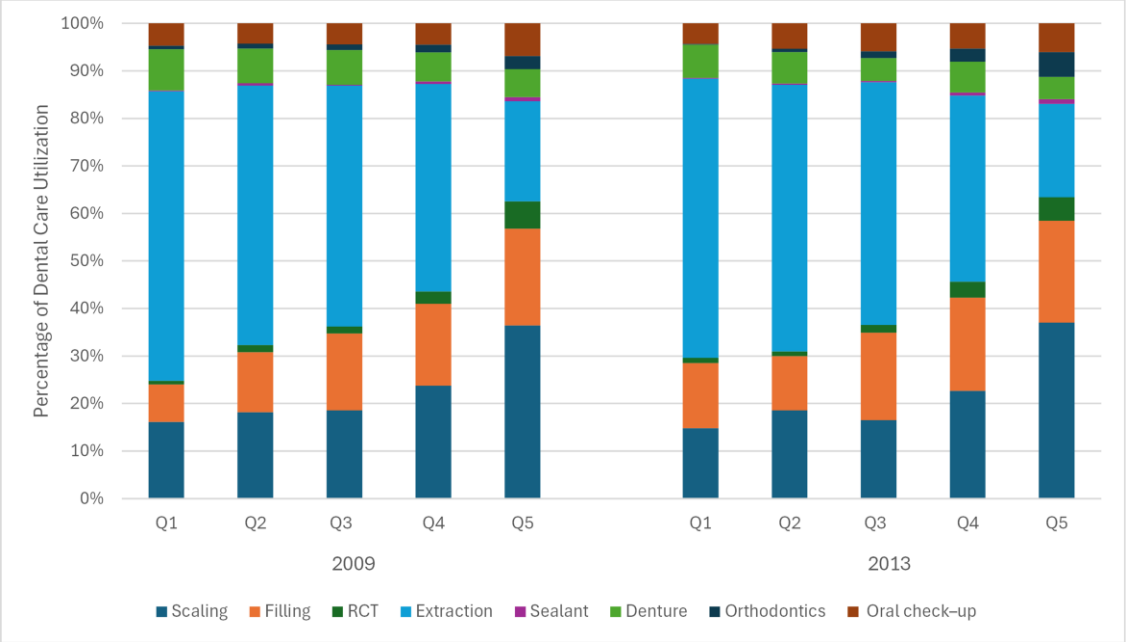


Figure 3: Distribution of dental care type across socioeconomic strata (Q1: poorest to Q5: richest, RCT: root canal treatment)