Received: 4 May 2023 | Revised: 29 September 2023 | Accepted: 27 November 2023

DOI: 10.1111/cdoe.12934

COMMUNITY DENTISTRY AND ORAL EPIDEMIOLOGY WILEY

ORIGINAL ARTICLE

# Does subsidizing the cost of care impact on dental attendance patterns among older adults?

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## Abstract

**Objectives:** To assess whether eligibility for an age-related universal (pioneer generation [PG]) subsidy incentivises dental attendance by older Singaporeans.

**Methods:** Data were collected between 2018 and 2021 from in-person interviews of Singaporean adults aged 60–90 years using a questionnaire and a clinical examination. The questionnaire included details of age, gender, ethnicity, education, residential status, socio-economic status, marital status, eligibility for subsidy (community health assistance/CHAS, PG or both) and frequency of dental attendance. The clinical examination recorded number of teeth (categorized as edentulous, 1–9 teeth;10–19 teeth; ≥20 teeth). To estimate the effect of the PG subsidy on dental attendance pattern, a regression discontinuity (RD) analysis was applied using age as the assignment variable.

**Results:** A total of 1172 participants aged 60–90 years (64.2% female) were recruited, with 498 (43%) being eligible for the PG subsidy. For those eligible for PG subsidy, there was a higher proportion of regular attenders than irregular attenders (53.6% vs. 46.4%). In age adjusted RD analysis, those eligible for the PG subsidy were 1.6 (95% CI: 1.0, 2.7) times more likely to report regular attendance than their PG non-eligible counterparts. The association remained strong (OR 2.1; 95% CI: 1.1–3.7) even after further controlling for demographics, socioeconomic factors, number of teeth and eligibility for the CHAS subsidy.

**Conclusions:** Being eligible for the PG subsidy substantially increased the odds of regular dental attendance.

KEYWORDS
dental care for elderly, government subsidies, health behaviours, health services research, health survey

## 1 | INTRODUCTION

There has been a well-documented trend of ageing across the globe.[1,2] In Asia, countries such as Japan have witnessed a 'super' ageing phenomenon, with a significant proportion of their population now aged 80 years or more. Along with the advanced age of large numbers of people, the rising burden of chronic disease and its sequelae in older people has become evident. This places significant

[Correction added on December 21, 2023, after first online publication: Affiliation 3 has been updated.]

organizational and financial challenges to healthcare systems, and led to calls for the healthcare paradigm to shift from treating to preventing disease.[3]

There is a need to encourage and empower individuals, including older adults, to adopt behaviours which reduce the risk of developing chronic disease, including dental disease.[4,5] This includes making healthy lifestyle choices and having dental check-ups at intervals tailored to their level of risk of disease. There is some evidence to suggest that dental service utilization decreases with age, and concern about the cost of care is a barrier to older adults seeking timely oral healthcare.[6] High out-of-pocket cost can be a barrier to oral health care for lower socio-economic status individuals, potentially contributing to oral health inequalities.[7] This can be particularly problematic for older retired individuals with reduced levels of income.

Currently, a variety of models have been implemented to reduce the burden of healthcare costs on individuals, including universal access funded through income taxation, income related insurance funded jointly by employer and employees and, government sponsored insurance schemes. Higher levels of public funding coverage are associated with higher overall use and lower inequalities in the use of dental care services.[8] In a recent example, following the introduction of the Affordable Care Act Medicaid in the USA, utilization of oral healthcare services has increased among low-income adults.[9–11] Whether subsidizing oral healthcare costs encourages the utilization of dental services by older adults is not well understood. A recent study in Japan indicated that government subsidies encouraged greater oral health services utilization, particularly for low-cost preventive services, when people over 70 years of age became eligible for a higher level of subsidy.[12]

When making eligibility for a subsidy based on age rather than means-tested, there is a risk of those individuals with higher level socio-economic status (SES) benefitting more than lower SES individuals, thereby further increasing inequalities. In Singapore, the means tested Community Health Assist Scheme (CHAS) was introduced in the past decade to subsidize the cost of care provided at private medical and dental clinics for Singaporean citizens from lower to middle-income households. Since 2014, all citizens with a monthly per capita household income of $1800 or less are eligible for subsidies through CHAS. In 2015, the pioneer generation (PG) scheme was launched for Singaporean citizens born on or before 31 December 1949 and obtained citizenship on or before 31 December 1986. Under this scheme (which is not means tested), eligible older adults receive additional subsidies for services and medication at public primary care clinics (polyclinics), public specialist outpatient clinics, private general practitioners and private dental clinics. With the introduction of CHAS and PG schemes, the expectation of the Ministry of Health is that access to care in the private sector is enhanced. Such policy interventions cannot be subject to the traditional experimental approach, but can be reliably evaluated through the use of natural or quasi experimental designs.[13,14]

The aim of this study was to use appropriate quasi-experimental methods to assess whether eligibility for the PG subsidy is associated with higher prevalence of regular dental attendance by older Singaporeans.

## 2 | METHODS

The data for this study were collected between 2018 and 2021 as part of the Community Health Intervention (CHI) study in Singapore. This study adopts a cohort multiple RCT design to recruit over 1000 community dwelling adults aged 60 years or over and included an oral health component. Participants were included if they were aged 60–90 years, and could understand/communicate in Mandarin, English, Malay or local dialects (e.g. Cantonese, Hokkien). Further details of this study design have previously been reported.[15] The study protocol received ethical approval by the National University of Singapore—Institutional Review Board (NUS-IRB Reference code: H-17-047). Written informed consent was obtained from all participants and participants were informed that they could withdraw from the research at any time.

Data were collected from in-person interviews using a validated survey questionnaire and a clinical examination was undertaken by calibrated examiners. Respondents were asked to indicate the frequency of dental visits with response possibilities being: every 6 months; less often than every 6 months but at least once per year; less often than once a year but at least every 2–3 years; only if there is a problem. For the purpose of analyses, as has been used elsewhere, dental attendance was used as the outcome and the variable was dichotomised as regular dental attendance (i.e. visiting the dentist at least once a year) and irregular dental attendance (i.e. visiting dentist less frequent than once a year).[16,17]

All respondents provided details of their eligibility for subsidized health care, including the CHAS and PG scheme. It is worth mentioning that some participants of the CHI study were not eligible for either the CHAS or the PG scheme. The survey included data on age, gender, ethnicity (Chinese, Malay, Indian), education (ranging from primary school only to university graduate), residential status (housing type) and marital status. Socio-economic status (SES) was determined using type of housing accommodation. In Singapore, social housing is classified according to the number of rooms, with fewer rooms indicative of lower SES. Residing in privately owned condominiums or landed houses indicate higher SES. The clinical examination recorded number of natural teeth (categorized as edentulous, 1–9 teeth;10–19 teeth; ≥20 teeth).

### 2.1 | Statistical analyses

Descriptive statistics (frequency and count for qualitative variables; median and interquartile range for quantitative variables) were used to summarize the characteristics of participants by PG subsidy eligibility.

To estimate the effect of PG subsidy on dental attendance pattern, a regression discontinuity (RD) analysis was applied.[18,19] In RD analysis, the assignment of intervention and control is not random, but rather based on some clear-cut threshold (cut-off point) of an observed variable (age, income, etc.). This analysis then assesses causal inference around the assigned 'cut-off' for an intervention, and differences between groups of individuals distributed around the cut-off are attributed to the intervention determined by the cut-off mark. The cut-off used in this study was age of eligibility for the PG subsidy, namely, age 70 years old in the year 2020. As the assignment variable does not completely determine eligibility for PG subsidy (which is based on birth year rather than age, as described above), a fuzzy design RD was incorporated. A derived age variable centred on the cut-off value was used in the analysis. A parametric approach which uses all available observations to estimate the RD effect was used. A variety of functional forms of the assignment variable (including linear and quadratic interaction forms) were tested to determine which fitted the data best. The linear form of assignment variable without interaction was the best fitting model based on the Akaike information criterion (AIC).

To further control for potential confounders, ethnicity, highest educational level attained, housing type, eligibility for CHAS and number of teeth were included in the models. The odds ratio (OR) of dental attendance pattern were estimated with 95% confidence interval.

Missing information about CHAS eligibility was observed in 19% of the participants. Multiple imputation using chained equations was carried under the assumption that data were missing at random conditional on the observed data. Twenty imputed datasets were generated from imputation models containing all covariates included in the regression analysis. Regression discontinuity analysis was conducted on imputed datasets on a final sample of $n = 1172$ adults and estimates were combined following Rubin's rule into a single estimate which is less biased.

Multiple sensitivity analyses were also considered, similar to that reported elsewhere.[20] First, a non-parametric approach (or local strategy approach) through local polynomial regression was also undertaken. Estimation of treatment effect was viewed as local randomization and it limited the analysis to observations that lie within the close vicinity of the cut-off point. Bias-corrected RD estimates with robust bias-corrected confidence intervals were computed and compared with conventional RD estimates from local polynomial regression. Second, falsification analyses on placebo outcome and placebo cut-off were performed. With a placebo outcome of gender, a null hypothesis of no treatment effect should not be rejected if the RD design is valid. With a placebo cut-off point at 68 years of age, no significant treatment effect should be observed. Third, RD estimates were evaluated with various covariates included and excluded in the model. Fourth, robustness of the result was checked with two further different specifications of the study outcome. Separate models were for regular dental attendance defined as once every half-year, and then as once every 2–3 years. Lastly, RD analysis was also conducted on complete case data only.

All statistical analyses were performed using R program 4.2 (R Core Team (2022). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. (https://www.R-project.org/).

## 3 | RESULTS

A total of 1172 participants aged 60–90 years (64.2% female) were recruited and classified according to their eligibility for the PG subsidy (Table 1). The sample characteristics in terms of age, ethnicity, educational attainment, housing type, concurrent eligibility for the CHAS subsidy and, number of remaining natural teeth are presented according to PG eligibility (Table 1).

Figure 1 shows the actual reported regular dental attendance plotted against age. This indicates that the likelihood of attending regularly for dental care decreases with age.

Figure 2 shows the regression discontinuity (RD) plot of subsidy (PG and CHAS) eligibility on regular dental attendance around the cut-off point of age 70. This shows a higher probability of regular attendance among those eligible for the PG subsidy. A RD plot presenting intention-to-treat (ITT) effect of PG eligibility on the regular dental attendance from complete case analysis is shown in Figure S1.

RD estimates and other covariate-related coefficients from logistic models run using the multiple imputation analytical sample are reported in Table 2. The first model is an age-adjusted model that estimates that PG eligible respondents are 1.6 (1.0–2.7) times more likely to be regular attenders compared to PG non-eligible respondents. Models 2–4 show the adjusted estimates with addition of covariates (sex, ethnicity, education, housing stats/SES and number of teeth) to the model. In the fully adjusted model (Model 5) that accounted for age, sex, ethnicity, education, housing/SES, number of teeth and CHAS eligibility, participants that were eligible for the PG subsidy were 2.1 (1.1–3.7) times more likely to report regular dental attendance compared to those that were not eligible for the PG subsidy.

Potential interactions in the model were tested to see whether the effect of the PG subsidy was modified according to different genders, or socioeconomic position categories, or categories for number of teeth. None of the interaction terms was significant.

Sensitivity analysis showed that results based on a non-parametric approach (Table S1) were consistent with those observed using a parametric approach. It showed that receiving PG subsidy resulted in a significant increase of 16.4 percentage points (with robust bias corrected 95% CI = 4.4–28.5) in the probability of regular dental attendance in the multiple imputation analysis. In the falsification analysis (Table S2), the RD estimate from the model with gender as placebo outcome was very close to null and showed no significant treatment effect, as expected (−0.028, 95% CI = −0.130 to 0.074). No significant RD effect was also observed

**TABLE 1** Characteristics of the sample by pioneer generation (PG) subsidy eligibility.

| | Ineligible $N = 674$ (%) | Eligible $N = 498$ (%) | Total $N = 1172$ (%) | $p$-Value |
|---|---|---|---|---|
| Age | | | | |
| Median (Q1, Q3) | 66.0 (63.0, 68.0) | 75.0 (72.0, 79.0) | 69.0 (65.0, 74.0) | <.001[b] |
| Ethnicity | | | | |
| Chinese | 582 (86.4) | 385 (77.3) | 967 (82.5) | <.001[a] |
| Malay | 52 (7.7) | 89 (17.9) | 141 (12.0) | |
| Indian | 31 (4.6) | 22 (4.4) | 53 (4.5) | |
| Others | 9 (1.3) | 2 (0.4) | 11 (0.9) | |
| Highest education level attained | | | | |
| Nil | 48 (7.1) | 144 (28.9) | 192 (16.4) | <.001[a] |
| Primary | 91 (13.5) | 63 (12.7) | 154 (13.1) | |
| Secondary/ITE | 162 (24.0) | 125 (25.1) | 287 (24.5) | |
| Pre-U/Poly | 160 (23.7) | 88 (17.7) | 248 (21.2) | |
| University | 213 (31.6%) | 78 (15.7%) | 291 (24.8%) | |
| Housing type[d] | | | | |
| HDB 1rm/2rm | 45 (6.7%) | 39 (7.8%) | 84 (7.2%) | <.001[a] |
| HDB 3rm | 69 (10.2%) | 70 (14.1%) | 139 (11.9%) | |
| HDB 4Rm/5rm/Exec | 331 (49.1%) | 244 (49.0%) | 575 (49.1%) | |
| Private Condominium | 126 (18.7%) | 60 (12.0%) | 186 (15.9%) | |
| Landed Property | 103 (15.3%) | 85 (17.1%) | 188 (16.0%) | |
| Community Health Assistance Scheme (CHAS) | | | | |
| Ineligible | 381 (56.5%)[c] | 246 (49.4%) | 627 (53.5%) | .013[a] |
| Eligible | 293 (43.5%) | 252 (50.6%) | 545 (46.5%) | |
| Number of teeth remaining | | | | |
| None | 21 (3.1%) | 84 (16.9%) | 105 (9.0%) | <.001[a] |
| 1 to 9 | 47 (7.0%) | 78 (15.7%) | 125 (10.7%) | |
| 10 to 19 | 103 (15.3%) | 124 (24.9%) | 227 (19.4%) | |
| 20 or more | 503 (74.6%) | 212 (42.6%) | 715 (61.0%) | |

[a]$p$-value by Pearson's chi-squared test.

[b]$p$-value by Mann–Whitney $U$-Test.

[c]Not eligible for PG scheme because they were born after 1949 or not citizens before 1986; did not meet CHAS eligibility because monthly income is too high.

[d]Housing Development Board (HDB), housing classification based on number of rooms.

when the placebo cut-off value of 68 years old was employed (−0.134, 95% CI = −1.918 to 1.650). Both results of the falsification analyses point towards a valid RD design. The inclusion of different covariates in the model (gender, ethnicity, education, housing type number of teeth remaining, and CHAS eligibility) resulted in certain estimates changes with a barely non-significant treatment effect observed in the model only adjusted by age (Table S3). Therefore, including the covariates in the model would remove some of this potential bias and estimates from the fully adjusted model should be used.

Other sensitivity analysis showed that the results were robust to different specifications on the outcome variable in both parametric and non-parametric RD analyses (Table S4). Although the magnitude of the estimates (ORs) slightly decreased with the alternative outcome specifications, they remained significant and showed associations in the same direction as the main findings. Moreover, analyses on complete case produced consistent results with those from imputed data (Tables S1–S4). A density test was also performed to examine continuity of score density around the cut-off value of 70 years old. The null hypothesis of the score density being continuous around the cut-off was not rejected ($p = 0.695$).

## 4 | DISCUSSION

As far as the authors are aware, this is the first study to quantify the impact of a universal access subsidy on dental attendance of older adults. As it is not feasible to randomly assign participants for such a study to treatment and control groups, a quasi-experimental study

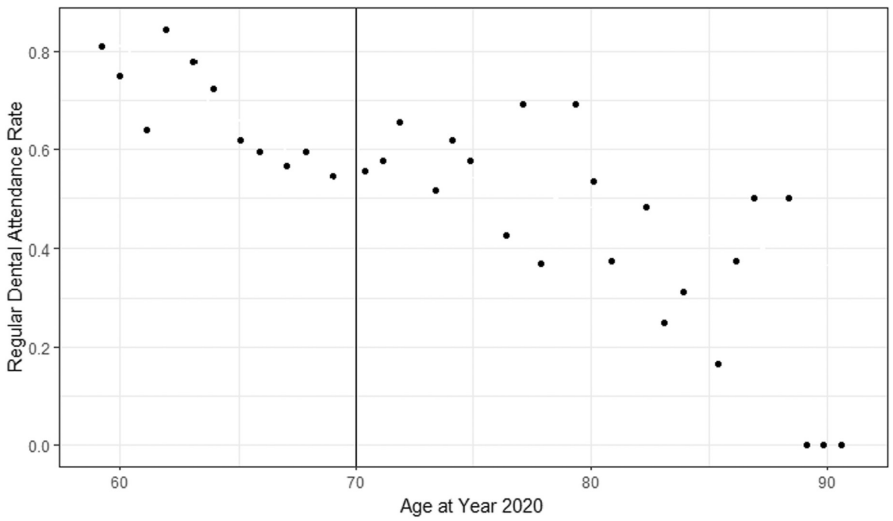


**FIGURE 1** Reported regular attendance plotted against age.

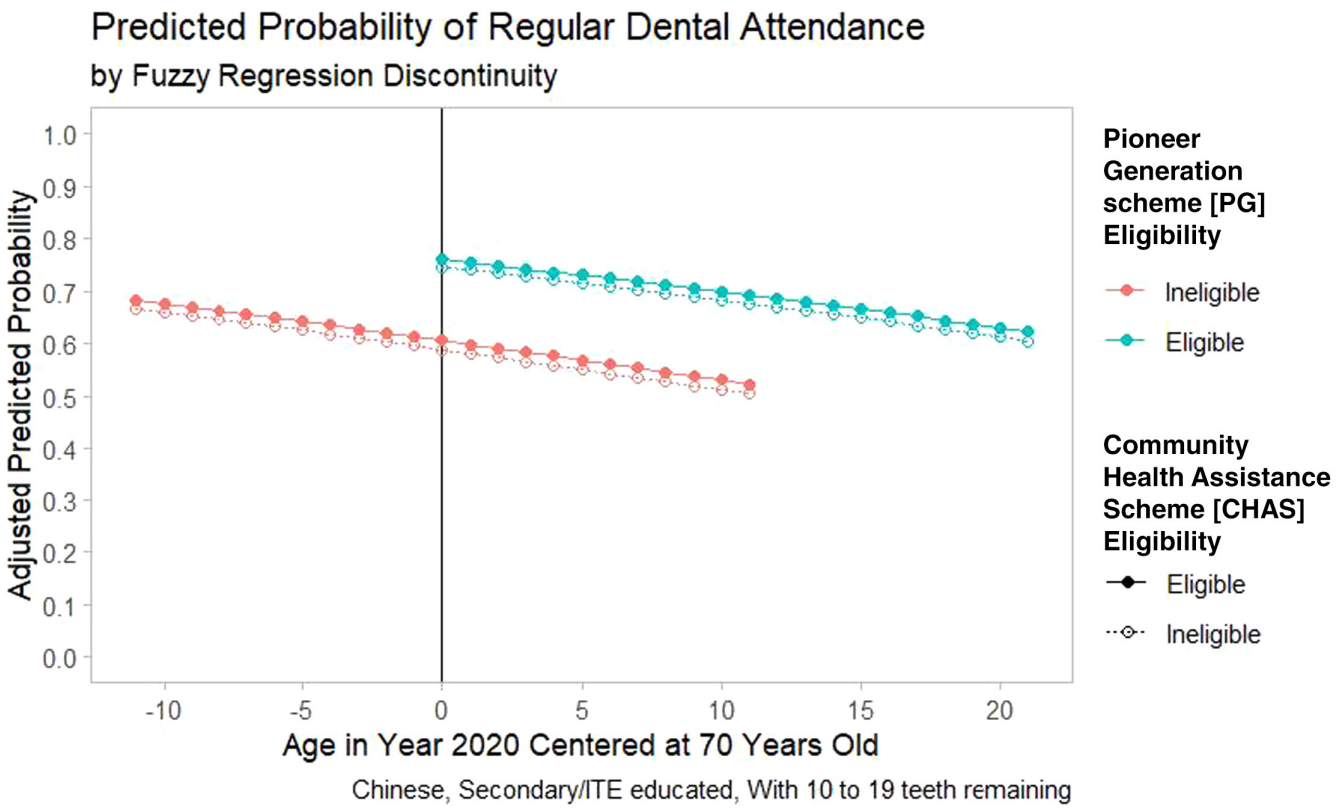


**FIGURE 2** Predicted probability of regular dental attendance. Abbreviations: [PG] Eligibility, Pioneer Generation scheme [PG] Eligibility; [CHAS] Eligibilit, Community Health Assistance Scheme [CHAS] Eligibility.

design was used. The RD analytical approach has been shown to be robust in determining unbiased assessment of intervention effects when random assignment cannot be used.[19] In addition, since pre-intervention data were not available, other approaches such as a difference-in-differences analysis could not be conducted. The data indicate that the PG subsidy, which is an age related universal subsidy, significantly contributed to regular dental attendance of adults over 70 years of age. Those eligible for the PG subsidy were twice as likely to report being regular attenders, even accounting for age, ethnicity, educational attainment, concurrent eligibility for CHAS subsidy and number of remaining teeth.

A recent systematic review assessed the impact of demographic, health-related and social factors on dental services utilization.[21] Utilization was significantly lower in participants with poor general and oral health, poor health literacy, limited family support structure and those who were edentulous. At systems level, regular/preventive use of dental services was more likely in more economically advanced countries, but age was not a significant predictor of dental

**TABLE 2** Logistic regression models predicting regular dental attendance according to pioneer generation (PG) eligibility.

| | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| RD estimate (PG subsidy) | | | | | | | | | | |
| No | 1.0 | (reference) | 1.0 | (reference) | 1.0 | (reference) | 1.0 | (reference) | 1.0 | (reference) |
| Yes | 1.6 | (1.0, 2.7) | 1.7 | (1.0, 2.9) | 1.8 | (1.0, 3.1) | 2.0 | (1.1, 3.7) | 2.1 | (1.1, 3.7) |
| Age | 0.0 | (0.0, 0.0) | 0.0 | (0.0, 0.0) | 0.0 | (0.0, 0.0) | 0.0 | (0.0, 13.5) | 0.0 | (0.0, 8.8) |
| Ethnicity | | | | | | | | | | |
| Chinese | | | 1.0 | (reference) | 1.0 | (reference) | 1.0 | (reference) | 1.0 | (reference) |
| Malay | | | 0.2 | (0.2, 0.4) | 0.5 | (0.3, 0.7) | 0.5 | (0.3, 0.8) | 0.5 | (0.3, 0.7) |
| Indian | | | 0.3 | (0.2, 0.6) | 0.4 | (0.2, 0.8) | 0.3 | (0.1, 0.6) | 0.3 | (0.2, 0.6) |
| Others | | | 1.1 | (0.3, 4.3) | 1.0 | (0.2, 4.0) | 0.8 | (0.2, 3.3) | 0.8 | (0.1, 3.2) |
| Gender | | | | | | | | | | |
| Male | | | 1.0 | (reference) | 1.0 | (reference) | 1.0 | (reference) | 1.0 | (reference) |
| Female | | | 1.1 | (0.9, 1.4) | 1.5 | (1.1, 1.9) | 1.3 | (1.0, 1.8) | 1.3 | (1.0, 1.8) |
| Highest education level attained | | | | | | | | | | |
| Nil | | | | | 1.0 | (reference) | 1.0 | (reference) | 1.0 | (reference) |
| Primary | | | | | 1.5 | (0.9, 2.5) | 1.1 | (0.7, 1.9) | 1.1 | (0.6, 1.9) |
| Secondary/ITE | | | | | 4.2 | (2.7, 6.5) | 2.8 | (1.7, 4.6) | 2.8 | (1.7, 4.6) |
| Pre-U/Polytechnic | | | | | 4.9 | (3.0, 8.0) | 2.6 | (1.5, 4.5) | 2.6 | (1.6, 4.5) |
| University | | | | | 5.7 | (3.4, 9.6) | 3.1 | (1.7, 5.4) | 3.1 | (1.7, 5.5) |
| Housing type | | | | | | | | | | |
| HDB 1rm/2rm | | | | | 1.0 | (reference) | 1.0 | (reference) | 1.0 | (reference) |
| HDB 3rm | | | | | 1.1 | (0.6, 2.0) | 1.0 | (0.5, 2.0) | 1.1 | (0.5, 2.1) |
| HDB 4rm/5rm/ Executive | | | | | 1.3 | (0.8, 2.2) | 1.1 | (0.6, 2.0) | 1.2 | (0.6, 2.1) |
| Private condominium | | | | | 1.7 | (0.9, 3.3) | 1.2 | (0.6, 2.5) | 1.4 | (0.6, 2.8) |
| Landed property | | | | | 2.5 | (1.2, 4.8) | 1.7 | (0.8, 3.5) | 1.9 | (0.9, 4.0) |
| Number of teeth remaining | | | | | | | | | | |
| None | | | | | | | 1.0 | (reference) | 1.0 | (reference) |
| 1–9 | | | | | | | 9.0 | (3.3, 24.5) | 9.0 | (3.3, 24.3) |
| 10–19 | | | | | | | 19.4 | (7.4, 50.7) | 19.7 | (7.5, 51.5) |
| 20 or more | | | | | | | 34.2 | (13.2, 88.7) | 34.8 | (13.4, 90.6) |
| Community Health Assistance Scheme (CHAS) | | | | | | | | | | |
| Ineligible | | | | | | | | | 1.0 | (reference) |
| Eligible | | | | | | | | | 1.2 | (0.8, 1.7) |

*Note*: Model 1: age adjusted. Model 2: age-sex-ethnicity adjusted. Model 3: age-sex-ethnicity-education-housing adjusted. Model 4: age-sex-ethnicity-education-housing-number of teeth adjusted. Model 5: age-sex-ethnicity-education-housing-number of teeth-CHAS eligibility adjusted.

service utilization among adults. In our study, which included relevant co-variates such as educational attainment and SES, being eligible for the PG subsidy predicted regular dental attendance of older adults regardless of socio economic and education status.

Singapore is one of the most economically advanced and also one of the most rapidly ageing nations in the world.[22,23] As part of the government's policy of reducing the financial burden of healthcare on its citizens, it has committed to co-payment of healthcare costs with an increasing number of citizens eligible for these supports. It has also re-focussed its health policy to encourage and empower citizens to adopt healthier lifestyles and thus improve population health.[24] There have been growing calls for greater financial supports for oral healthcare, primarily through universal health insurance, to enable older adults to access prevention focused care.[25,26] The introduction of government funded financial subsidies for dental care in Singapore is relatively recent. The nature of the two available subsidies is different, and some citizens born on or before 1949 are eligible for both PG and CHAS subsidies. Our findings suggest that the positive impact of the age-related universally applicable PG subsidy on dental attendance remained when eligibility for the means tested CHAS subsidy was included in the model. This suggests that a universal subsidy had a positive impact irrespective of whether a means tested subsidy was also available. Eligibility for this subsidy is not based on financial means,

and is universal to all Singaporean citizens born on or before 1949. Accordingly, the proportion of well-educated and higher SES participants eligible for this subsidy is higher than those eligible for the CHAS subsidy. This may explain the higher likelihood of dental attendance observed in PG eligible older adults when compared with CHAS eligible respondents. There is a downward trend in regular dental attendance with age, but this is attenuated by eligibility for the PG subsidy. It seems likely that reduction of the cost of care through the additional financial support provided under this scheme incentivises regular dental attendance. It would appear that higher SES adults are availing of dental services more frequently than those although no significant interaction between SES and eligibility for PG subsidy in the model was found. Further work is required to determine the impact of both subsidy schemes (PG and CHAS) on inequalities in dental attendance among older adults, and potentially model if increasing the quantum of subsidy to lower SES individuals, perhaps through universal health insurance, would further incentivize attendance.

As anticipated, there was a clear relationship between level of educational attainment and pattern of attendance; the higher the level attainment, the greater the odds of being a regular attender. Health literacy may mediate the relationship between education and dental attendance, but we did not specifically measure health literacy in this study. Confirming what has been reported elsewhere, the fewer the teeth the individual had, the less likely they were to be a regular attender.[27,28] Those with fewer teeth have a greater disease experience and accordingly a higher level of risk of future dental problems. Given the cumulative nature of dental disease across the life course, irregular attendance increases the likelihood of further tooth loss in older age for these individuals. From a public health viewpoint, this is not ideal and suggests that further interventions are required to encourage regular attendance in lower SES groups. A targeted approach to remove access barriers and encourage these individuals to seek preventive dental care could reduce this risk and help preserve a more functional dentition in older age. There are also ethnic variations in dental attendance patterns, with those of Chinese ethnicity more likely to be regular attenders. In Singapore, approximately 30% of citizens are not of Chinese origin [they are primarily of Malay or Indian ethnic origin], and the prevalence of chronic disease is higher in these ethnic groups.[29] Further research is required to investigate how to improve the awareness of the importance of preventing disease in these ethnic groups.

Being eligible for the means tested CHAS subsidy increased the likelihood of regular dental attendance, but nearly half of the CHAS eligible sample were irregular attenders. These individuals, like all those eligible for CHAS, are in the lower socio-economic groups (low monthly household income), and the data suggest that there are further barriers to regular dental attendance in this group. It is possible that the proportion of the out-of-pocket cost of dental care, even subsidized by co-payment from the government, may still be a barrier.

There are some limitations and strengths in this study. Information on the type of subsidized care provided to participants in the study was not available. It is possible that respondents who attend regularly are having regular curative treatment and not just prevention care. On the positive side, although not randomly recruited, this is a large sample of older community dwelling adults broadly representative of the ethnic and social demographic structure in Singapore. Accordingly, the findings are generalizable to Singapore and may be relevant to healthcare settings in other countries and jurisdictions. Finally, the comprehensive sensitivity analyses presented have ensured the results of this study are robust.

## 5 | CONCLUSIONS

Being eligible for the age-related universally applicable PG subsidy substantially increased the odds of regular dental attendance among older adults in Singapore, even when controlling for the effect of age, ethnicity, gender, SES, educational attainment and concurrent eligibility for a means tested subsidy (CHAS). The reduction in out of pocket expenses through subsidies appears to incentivize regular dental attendance.

### AUTHOR CONTRIBUTIONS

Finbarr Allen conceived the study and led the writing of the manuscript. Sim Yu Fan undertook the statistical analysis. Carol Guarnizo-Herreño and Georgios Tsakos contributed to the writing of the manuscript. All authors approved the final version.

### ACKNOWLEDGEMENTS

The authors thank the research team from the Community Health Intervention Project. Open access funding provided by IReL.

### FUNDING INFORMATION

This study was supported through a financial grant from the Hong Kong and Shanghai Bank Corporation for community projects.

### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

**How to cite this article:** Allen F, Guarnizo-Herreño CC, Fan SY, Tsakos G. Does subsidizing the cost of care impact on dental attendance patterns among older adults? *Community Dent Oral Epidemiol*. 2023;00:1-8. doi:10.1111/cdoe.12934