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Dental Scaling and Long-Term Care Insurance Entry among Older Adults: A Nationwide Retrospective Cohort Study in South Korea

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Abstract

Background

Preventive dental care is essential for maintaining oral health in later life. Dental scaling is a common preventive periodontal procedure; however, evidence linking it to later-life functional dependency or long-term care needs remains limited. Using nationwide claims and long-term care insurance (LTCI) records, we examined whether dental scaling is associated with subsequent LTCI entry among older adults in South Korea.

Methods

This retrospective cohort study used data from the Korean National Health Insurance Service Senior Cohort Database 2.0. Adults aged ≥ 65 years were classified based on the presence of at least one dental scaling claim during 2013–2014 and were followed up from 2015 to 2019. LTCI entry was defined as the first certification of grades 1–5. Fine–Gray models treat death before LTCI entry as a competing event. Sensitivity analyses included propensity score matching, inverse probability of treatment weighting, and a 1-year lag. The cumulative incidence and 5-year restricted mean time lost were estimated.

Results

Among the 99,218 participants, 6,987 entered the LTCI. In the fully adjusted model, dental scaling was associated with a lower sub-distribution hazard of LTCI entry (sub-distribution hazard ratio 0.69, 95% confidence interval 0.63–0.76). This trend was consistent across sensitivity analyses. The 5-year restricted mean time lost was 24.93 and 54.49 days in the scaling and no-scaling groups, respectively, indicating a lower cumulative LTCI burden of entry.

Conclusions

Dental scaling was consistently associated with a lower risk of subsequent LTCI. Dental scaling claims may serve as a population-level marker of preventive dental care use and the subsequent risk of LTCI entry. These findings support the clear role of preventive oral healthcare in healthy aging and long-term care strategies.

Background

Population aging has increased the global demand for long-term care. As older adults live with chronic conditions and functional limitations, healthcare systems face increasing pressure to support their daily care needs [1, 2]. In South Korea, the long-term care insurance (LTCI) system, which was introduced in

2008 as a national social insurance program, assesses older adults who require support in daily life and certifies their eligibility for long-term care benefits [3, 4]. By 2025, 1.24 million individuals were recognized as eligible under the LTCI system, and this increase from 0.95 million in 2021 reflects the growing demand for long-term care in an aging society [5]. Once certified, beneficiaries may receive home-based services, day and night care, assistive devices, or facility-based care according to their grade [6, 7]. Within this system, LTCI entry serves as an administrative marker of the transition from daily independence to certified long-term care need [3, 6].

Delaying this transition has become a key objective in geriatric care and health policy [8]. Oral health is relevant to this objective because maintaining natural teeth, chewing ability, and oral function has been associated with healthier aging and a lower risk of disability and long-term care need [9–11]. Poor periodontal health, tooth loss, and reduced mastication may affect nutrition, systemic inflammation, frailty, cognition, and physical function [12, 13]. Evidence from studies on oral frailty and dental service utilization suggested links between oral function, dental care use, healthy life expectancy, and disability-related outcomes [14, 15]. These findings place oral health within the broader context of functional aging [9, 10, 14].

Therefore, preventative dental care is essential. Dental scaling is a common preventive procedure that removes plaque and calculus, and supports periodontal health [13, 16]. In South Korea, dental scaling was reimbursable under the National Health Insurance Program in July 2013 [17]. Although previous studies have linked oral health status, oral function, oral frailty, and dental care use to disability, mortality, healthy life expectancy, and long-term care-related outcomes, few studies have examined dental scaling in relation to LTCI entry among older adults [9, 10, 14, 18].

Using the Korean National Health Insurance Service (NHIS) Senior Cohort Database 2.0, this study aimed to examine whether dental scaling was associated with incident LTCI entry among older adults. We considered this question in the context of broader efforts to maintain independence and delay care dependency later in life.

Methods

Data source and study design

This nationwide retrospective cohort study used the NHIS Senior Cohort Database 2.0, which is a de-identified research database of older adults in South Korea. The database includes eligibility and socioeconomic information, healthcare utilization claims, health screening results, healthcare provider information, LTCI applications, and service-use records [19, 20]. We used eligibility records, claims data, health-screening records, prescription records, LTCI applications, and assessment data. These records were linked using de-identified individual and claim identifiers that were provided by the NHIS.

Dental scaling exposure and baseline covariates were assessed from January 1, 2013, to December 31, 2014. The index date was January 1, 2015, and follow-up continued until December 31, 2019. For each

participant, the follow-up ended at LTCI entry, death before LTCI entry, or censoring on December 31, 2019, whichever occurred first. This study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement and its REporting of studies Conducted using Observational Routinely Collected Health Data (RECORD) extension, where applicable [21, 22].

Study population

To align with the initiation of exposure and covariate assessments in 2013, the target population was defined as older adults aged ≥ 65 years in 2013. Eligibility and health screening information were obtained from the NHIS eligibility and health screening databases, respectively. Individuals present in both the databases were included as the source population for cohort selection. We sequentially excluded individuals who did not meet the age criteria, whose covariate data were missing, who died before the index date, or who had evidence of LTCI history. To restrict the cohort to participants at risk of first-time LTCI entry, LTCI history included any LTCI application or grade 1–5 certification prior to the index date. Furthermore, we excluded participants whose first observed application during follow-up was coded as non-initial, indicating an earlier application that was not captured in the available LTCI records. These exclusions were intended to identify participants without evidence of LTCI history. Before finalizing the cohort, selection counts and participant identifiers were cross-checked against the final analysis dataset, and death dates and prior LTCI records were reviewed for consistency with the pre-specified cohort definitions. The final analysis cohort included 99,218 participants (Fig. 1).

Exposure assessment

Exposure was the receipt of full-mouth dental scaling, as identified by the procedure codes U2233 and UH233. Participants with at least one dental scaling claim were classified into the scaling group, whereas those without such claims were classified into the no-scaling group. Because dental scaling became reimbursable in July 2013, dental scaling claims were unavailable from January to June 2013 [17].

Outcome and follow-up

Outcome and follow-up

The primary outcome was incident LTCI entry, defined as the first certification of LTCI grades 1–5 [4, 6, 19]. The event date was defined as the start date of the certified LTCI eligibility period, that is, the date from which the approved LTCI grade became valid [4]. Applications that did not result in certification for grades 1–5, including non-eligible or outside-grade decisions, cognitive support grade, rejection, or dismissal, were not classified as LTCI entry [4, 6]. Data on death dates were obtained from the eligibility database. Participants who did not enter the LTCI or died during follow-up were censored.

Covariates

Data on age, sex, residential area, insurance eligibility type, and income level were obtained from the eligibility database. Residential areas were categorized as capital (Seoul, Gyeonggi-do, and Incheon) or non-capital [23]. The insurance eligibility type was categorized as regional subscriber, insured employee, or medical aid beneficiary [24, 25]. Income level was categorized according to insurance premium deciles as medical aid, 1st–2nd deciles, 3rd–4th deciles, 5th–6th deciles, 7th–8th deciles, and 9th–10th deciles [20, 26].

Based on the disease categories listed in the Enforcement Decree of the Long-Term Care Insurance Act [7], we considered five geriatric disease groups: dementia (F00, F01, F02, F03, and G30), cerebrovascular disease (I60–I69, U234), Parkinson's disease and Parkinsonism (G20–G23, R251), motor neuron disease (G12, G13), and multiple sclerosis (G35). Each group was classified as present if at least one corresponding primary or secondary diagnostic code was identified, and the number of present groups was used as a covariate.

Polypharmacy was defined as five or more distinct active ingredients, each prescribed for a cumulative total of at least 90 days per year from 2013 to 2014 [27].

Body mass index (BMI), smoking status, and alcohol consumption were obtained from health-screening records that were available in both 2013 and 2014; the most recent records were used. BMI was categorized as underweight (< 18.5 kg/m^2), normal weight (18.5–22.9 kg/m^2), overweight (23.0–24.9 kg/m^2), or obesity (≥ 25.0 kg/m^2) [28], and smoking status as nonsmoker, former smoker, or current smoker. Alcohol consumption was categorized using the National Institute on Alcohol Abuse and Alcoholism thresholds as non-drinker, moderate drinker (≤ 7 standard drinks per week and ≤ 3 drinks per occasion), or risky drinker (exceeding either threshold) [29].

Statistical analysis

All statistical analyses were conducted using SAS version 9.4M8 (SAS Institute Inc., Cary, NC, USA). Baseline characteristics were summarized as mean ± standard deviation or number (%), and between-group balance was assessed using absolute standardized mean differences (SMDs). The clinical outcomes were summarized using event counts, person-years, crude incidence rates, and cumulative incidence.

The primary analysis used Fine–Gray proportional sub-distribution hazard models to estimate sub-distribution hazard ratios (sHRs) and 95% confidence intervals (CIs) for LTCI entry, while treating death before LTCI entry as a competing event. We fit the crude, sociodemographic-adjusted, and fully adjusted models. The sociodemographic-adjusted model included age, sex, residential area, insurance eligibility type, and income level. Furthermore, the fully adjusted model included the number of geriatric disease groups, polypharmacy status, BMI category, smoking status, and alcohol consumption.

Propensity score methods were used for the sensitivity analyses. The propensity scores were estimated using the same covariates as those used in the fully adjusted model. For propensity score matching (PSM), participants were matched 1:1 using greedy matching on the logit of the propensity score, with a caliper width of 0.2 standard deviations. The PSM Fine–Gray model accounts for matched pairs using robust variance estimation. The Inverse probability of treatment weighting (IPTW) weights were truncated at the 1st and 99th percentiles. The IPTW Fine–Gray model used truncated weights with a robust variance estimation. Covariate balance was assessed using SMDs.

To reduce potential reverse causation, we conducted a 1-year lag sensitivity analysis by excluding participants who entered LTCI or died before LTCI entry within the first year after the index date. E-values were calculated to assess the robustness of the observed associations with potential unmeasured confounding factors. The proportionality assumption for dental scaling was assessed using a scaling-by-log-time interaction term and a Schoenfeld residual-based assessment.

Cumulative incidence functions for LTCI entry were estimated according to dental scaling status and compared using Gray's test. The restricted mean time lost (RMTL) to LTCI entry was calculated as the area under the cumulative incidence function for up to 5 years, with bootstrap percentile 95% CIs for group-specific estimates and between-group differences.

Results

Baseline characteristics

Of the 99,218 participants, 84,657 (85.3%) and 14,561 (14.7%) were in the no-scaling and scaling groups, respectively. Compared to the no-scaling group, the scaling group had a lower proportion of mean age (71.2 ± 3.9 vs. 72.9 ± 4.6 years; SMD = 0.384), a higher proportion of women (30.8% vs. 35.7%; SMD = 0.104), and a higher proportion of women residing in the capital area (48.9% vs. 36.7%; SMD = 0.248). Moreover, the scaling group had a higher proportion of participants in the highest-income category (9th to 10th deciles: 40.2% vs. 34.1%). Other notable baseline differences were observed in smoking status, alcohol consumption, and BMI category (Table 1).

Table 1
Baseline characteristics by dental scaling status

Characteristic	Total (N = 99218)	No scaling (N = 84657)	Scaling (N = 14561)	SMD
No. of participants	99218	84657	14561	
Age at index date, years	72.6 ± 4.6	72.9 ± 4.6	71.2 ± 3.9	0.384
Sex				0.104
Male	64472 (65.0)	54402 (64.3)	10070 (69.2)	
Female	34746 (35.0)	30255 (35.7)	4491 (30.8)	
Residential area				0.248
Non-capital area	61033 (61.5)	53588 (63.3)	7445 (51.1)	
Capital area	38185 (38.5)	31069 (36.7)	7116 (48.9)	
Insurance eligibility type				0.034
Regional subscriber	28194 (28.4)	23946 (28.3)	4248 (29.2)	
Employee insured	70324 (70.9)	60085 (71.0)	10239 (70.3)	
Medical aid beneficiary	700 (0.7)	626 (0.7)	74 (0.5)	
Income decile group				0.134
Medical aid	2370 (2.4)	2057 (2.4)	313 (2.1)	
1st-2nd deciles	15121 (15.2)	13092 (15.5)	2029 (13.9)	
3rd-4th deciles	11772 (11.9)	10223 (12.1)	1549 (10.6)	
5th-6th deciles	13473 (13.6)	11772 (13.9)	1701 (11.7)	
7th-8th deciles	21770 (21.9)	18650 (22.0)	3120 (21.4)	
9th-10th deciles	34712 (35.0)	28863 (34.1)	5849 (40.2)	
Number of geriatric disease groups				0.042
0	82028 (82.7)	69879 (82.5)	12149 (83.4)	
1	14511 (14.6)	12415 (14.7)	2096 (14.4)	
2	2433 (2.5)	2143 (2.5)	290 (2.0)	
3	246 (0.2)	220 (0.3)	26 (0.2)	
Polypharmacy				0.098
No	88709 (89.4)	76083 (89.9)	12626 (86.7)	

Characteristic	Total (N = 99218)	No scaling (N = 84657)	Scaling (N = 14561)	SMD
Yes	10509 (10.6)	8574 (10.1)	1935 (13.3)	
Body mass index category				0.118
Underweight	2759 (2.8)	2505 (3.0)	254 (1.7)	
Normal weight	33809 (34.1)	29252 (34.5)	4557 (31.3)	
Overweight	27447 (27.7)	22991 (27.2)	4456 (30.6)	
Obesity	35203 (35.5)	29909 (35.3)	5294 (36.4)	
Smoking status				0.203
Nonsmoker	57082 (57.5)	48976 (57.9)	8106 (55.7)	
Former smoker	26454 (26.7)	21637 (25.6)	4817 (33.1)	
Current smoker	15682 (15.8)	14044 (16.6)	1638 (11.2)	
Alcohol consumption				0.132
Non-drinker	40267 (40.6)	34970 (41.3)	5297 (36.4)	
Moderate drinker	23239 (23.4)	19169 (22.6)	4070 (27.9)	
Risky drinker	35712 (36.0)	30518 (36.0)	5194 (35.7)	

Data presented are mean ± standard deviation or count (%). Percentages in the No scaling and Scaling columns are column percentages. SMDs are absolute standardized mean differences. For age, the SMD was calculated as the difference in the mean divided by the pooled standard deviation. For binary variables, the SMD was calculated as the difference in proportions divided by the pooled standard deviation of the proportions. For categorical variables with more than two levels, generalized SMDs were calculated from category-specific proportions using a pooled multinomial covariance matrix. *P*-values are not shown because trivial differences can yield very small *P*-values in large cohorts. Baseline differences were assessed using SMDs. The capital areas include Seoul, Gyeonggi-do, and Incheon. Geriatric disease groups included dementia, cerebrovascular disease, Parkinson's disease, motor neuron disease, and multiple sclerosis. BMI, body mass index; SMD, standardized mean difference.

Clinical outcomes and follow-up

During follow-up, 6,987 participants entered the LTCI, including 6,457 (7.6%) in the no-scaling group and 530 (3.6%) in the scaling group. Death before LTCI entry occurred in 5,708 (6.7%) and 535 (3.7%) patients, respectively. Crude comparisons showed that both LTCI entry and death before LTCI entry were less frequent in the scaling group. The crude incidence rates of LTCI entry were 16.3 per 1,000 person-years in the no-scaling group and 7.5 per 1,000 person-years in the scaling group. The unadjusted 5-year

cumulative incidence of LTCI entry was 7.63% (95% CI, 7.45–7.81) in the no-scaling group and 3.64% (95% CI, 3.34–3.95) in the scaling group (Table 2).

Table 2
Clinical outcomes and follow-up

Clinical outcome	Total (N = 99218)	No scaling (N = 84657)	Scaling (N = 14561)
No. of participants	99218	84657	14561
Mean follow-up duration, years	4.71	4.69	4.84
Total follow-up, person-years	467240.9	396739.1	70501.7
LTCI entry, n (%)	6987 (7.0)	6457 (7.6)	530 (3.6)
Death before LTCI entry, n (%)	6243 (6.3)	5708 (6.7)	535 (3.7)
Censored, n (%)	85988 (86.7)	72492 (85.6)	13496 (92.7)
Crude incidence rate of LTCI entry per 1000 person-years	15.0	16.3	7.5
Unadjusted 5-year cumulative incidence of LTCI entry, % (95% CI)	7.04 (6.88–7.20)	7.63 (7.45–7.81)	3.64 (3.34–3.95)

Data presented are count (%), mean, total, or rate, as appropriate. Percentages are presented as column percentages. The follow-up duration was calculated from the index date to LTCI entry, death before LTCI entry, or censoring, whichever occurred first, and was converted from days to years by dividing by 365.25. Crude incidence rates were calculated as the number of LTCI entry events divided by the total person-years and presented per 1,000 person-years. The unadjusted 5-year cumulative incidence was estimated using the cumulative incidence function, which treats death before LTCI entry as a competing event. CI, confidence interval; LTCI, long-term care insurance.

Results from the Fine–Gray model

Dental scaling was consistently associated with a lower sub-distribution hazard of LTCI entry across the Fine–Gray model specifications. In the fully adjusted model, the scaling group had a lower sub-distribution hazard of LTCI entry than the no-scaling group (sHR, 0.69; 95% CI, 0.63–0.76; $P < 0.001$).

PSM yielded 29,122 matched participants, with 14,561 in each group, and the absolute SMDs ranged from 0.0027 to 0.0691 after matching. IPTW substantially improved the covariate balance, although age remained marginally above the conventional threshold of 0.10 (SMD = 0.1001; Additional file 1: Fig. S1 and Table S1). The association was consistent in the PSM analysis (sHR, 0.78; 95% CI, 0.69–0.87) and the IPTW analysis (sHR, 0.63; 95% CI, 0.58–0.69). For the fully adjusted model, the E-value was 2.25 for the point estimate and 1.98 for the CI limit were closest to the null (Fig. 2).

In the 1-year lag sensitivity analysis, the association remained essentially unchanged (fully adjusted sHR, 0.69; 95% CI, 0.63–0.76; $P < 0.001$; Additional file 1: Table S3). Proportionality assessment showed no clear evidence that the association between dental scaling and LTCI entry varied over the follow-up period (Additional File 1: Table S4).

Cumulative incidence and restricted mean time lost

The cumulative incidence remained lower in the scaling group than in the no-scaling group throughout the follow-up period. Gray's test indicated a difference in cumulative incidence functions according to the dental scaling status ($P < 0.001$; Fig. 3).

Up to 5 years, the RMTL to LTCI entry was 54.49 (95% CI, 52.97–56.08) days in the no-scaling group and 24.93 (95% CI, 22.62–27.58) days in the scaling group. The between-group difference was 29.56 (95% CI, 26.62–32.32) days, indicating a lower cumulative burden of LTCI entry in the scaling group over the 5-year horizon (Additional file 1: Table S5).

Discussion

To our knowledge, this nationwide cohort study provides the first population-level evidence linking dental scaling to subsequent LTCI entry among older adults. This inverse association was robust across multiple analytical approaches, including the primary fully adjusted Fine–Gray model, PSM, IPTW, and 1-year lag sensitivity analysis. Cumulative incidence curves and RMTL analyses also demonstrated a lower 5-year cumulative burden of LTCI entry in the scaling group. Together, these findings suggest that dental scaling is a useful marker for the risk of LTCI entry.

Previous studies have reported associations between oral frailty, poor oral status, impaired mastication, and tooth loss with frailty, disability, mortality, and healthy life expectancy [9, 10], Research on dental visits has linked dental care use with healthy life expectancy among older adults [14]. Our study used a nationwide cohort to examine a reimbursed preventive periodontal procedure, dental scaling, in relation to subsequent LTCI entry, whereas previous studies have largely used broader markers of oral health or dental care use. As LTCI entry is determined through a standardized eligibility assessment, this outcome provides a measure of formally assessed care dependency rather than functional status alone.

The observed link between dental scaling and LTCI entry can be interpreted from both the clinical and behavioral perspectives. In South Korea, dental scaling is widely used [30] and reimbursed under the National Health Insurance program [31, 32], allowing its receipt to be identified in the claims data. Clinically, dental scaling removes plaque and calculus and supports periodontal health [16]. These clinical pathways are relevant because oral function is linked to nutrition, swallowing, frailty, cognition, and physical function [12], while periodontal inflammation is linked to systemic inflammation and broader health deterioration [13]. Behaviorally, dental scaling may indicate a broader preventive care orientation, as dental care use among older adults has been reported to co-occur with other preventive health services and health-promoting behaviors [33]. This may also reflect access to dental care, health

awareness, and socioeconomic resources [34]. These clinical and behavioral factors may partly explain the observed association between dental scaling and LTCI entry.

From clinical and public health perspectives, these findings support the integration of preventive oral healthcare into healthy aging and long-term care strategies. Oral health has often been treated separately from mainstream health policies and healthcare systems, although healthy aging frameworks emphasize maintaining functional ability [8, 35]. Some older adults may be less aware of future oral health deterioration than general health decline, and may not perceive a need for dental care [36, 37], indicating that greater oral health awareness is needed among older adults and geriatric healthcare professionals [38]. Future policy evaluations and intervention studies should assess whether adding preventive dental services to healthy aging programs improves oral function and preserves functional independence with LTCI entry as a long-term outcome. Dental claims data could also be evaluated for their predictive value in identifying older adults at higher risk of LTCI entry.

This study has some limitations. First, the observational design does not establish causality. Second, no active comparator was used; the no-scaling group was defined by the absence of a dental scaling claim rather than the receipt of another dental service. The main finding may, therefore, partly reflect broader patterns of dental care use and underlying health-related characteristics rather than a dental scaling-specific association alone. Third, LTCI entry depends on the application of LTCI as well as the underlying care needs. Differences in application behavior between the scaling and no-scaling groups could, therefore, affect outcome ascertainment. Fourth, death precludes later LTCI entry; therefore, more competing deaths can lower the cumulative incidence of LTCI entry [39]. In this study, however, the crude frequency of death before LTCI entry was lower in the scaling group, and a lower LTCI incidence occurred despite fewer competing deaths. This joint pattern may reflect unmeasured baseline health or social differences that the Fine–Gray model does not remove. Fifth, age remained marginally imbalanced after IPTW (SMD = 0.1001); therefore, the IPTW estimate should be interpreted alongside the fully adjusted and PSM results. Finally, although this study included a large nationwide cohort, eligibility required health screening records and complete baseline covariate data, which may limit the generalizability to older adults without such information.

Conclusions

In a nationwide cohort of older adults, dental scaling was consistently associated with a lower risk of subsequent LTCI entry and a lower cumulative burden over five years. Preventive oral health care should have a defined place in healthy aging and long-term care policies. The next research priorities are to test preventive dental services in healthy aging programs and evaluate dental claims data as a tool for identifying certified care-dependency risk.

Abbreviations

BMI: body mass index

CI: confidence interval

IPTW: inverse probability of treatment weighting

IRB: institutional review board

LTCI: long-term care insurance

NHIS: National Health Insurance Service

PSM: propensity score matching

RECORD: REporting of studies Conducted using Observational Routinely-collected health Data

RMTL: restricted mean time lost

sHR: sub-distribution hazard ratio

SMD: standardized mean difference

STROBE: Strengthening the Reporting of Observational Studies in Epidemiology

Declarations

Ethics approval and consent to participate

The Seoul National University Bioethics Committee exempted this study from ethical review (IRB No. E2606/002-004; June 8, 2026) because it used existing de-identified data from the NHIS Senior Cohort Database 2.0. Informed consent was not required because only de-identified secondary data were analyzed. This study was conducted in accordance with the principles of the Declaration of Helsinki.

Consent for publication

Not applicable.

Clinical trial number

Not applicable.

Availability of data and materials

Data supporting the findings of this study are not publicly available and can only be accessed through the NHIS application and approval processes. Researchers have been able to access and analyze data

through a secure remote analysis system operated by the NHIS. Individual-level data cannot be downloaded or shared. Only non-identifiable research outputs can be exported after NHIS review and approval. The SAS code used for statistical analyses is available from the corresponding author upon request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

DYK: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. YBY: Formal analysis, Software, Validation, Writing – review & editing. DHH: Conceptualization, Writing – review & editing. YHP: Conceptualization, Funding acquisition, Methodology, Project administration, Resources, Supervision, Validation, Writing – review & editing. All authors read and approved the final manuscript and agreed to be accountable for all aspects of the work.

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Figures

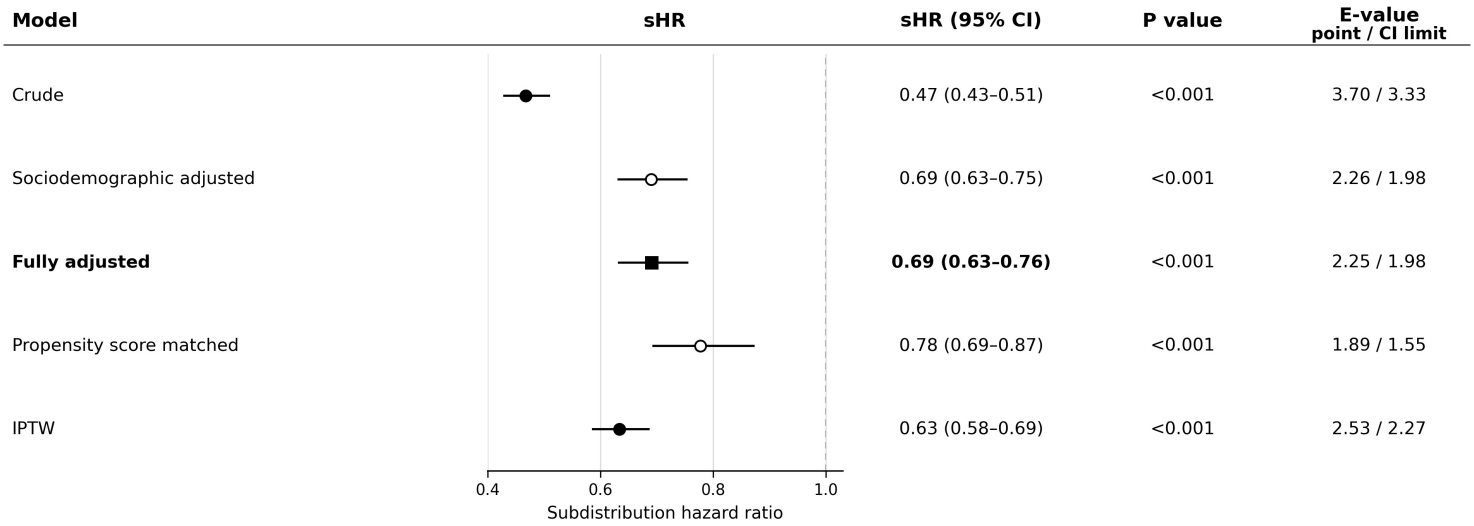


Figure 1

Fine–Gray models for LTCI entry

Points indicate sub-distribution hazard ratios (sHRs), and horizontal lines indicate 95% confidence intervals (CIs), for the association between dental scaling and long-term care insurance (LTCI) entry across Fine–Gray model specifications. Death before LTCI entry was treated as a competing event. The dashed vertical line indicates an sHR of 1.0. E-values are shown for the point estimate and the CI limit closest to null. The fully adjusted model was used as the primary model. CI, confidence interval; IPTW, inverse probability of treatment weighting; LTCI, long-term care insurance; sHR, sub-distribution hazard ratio.

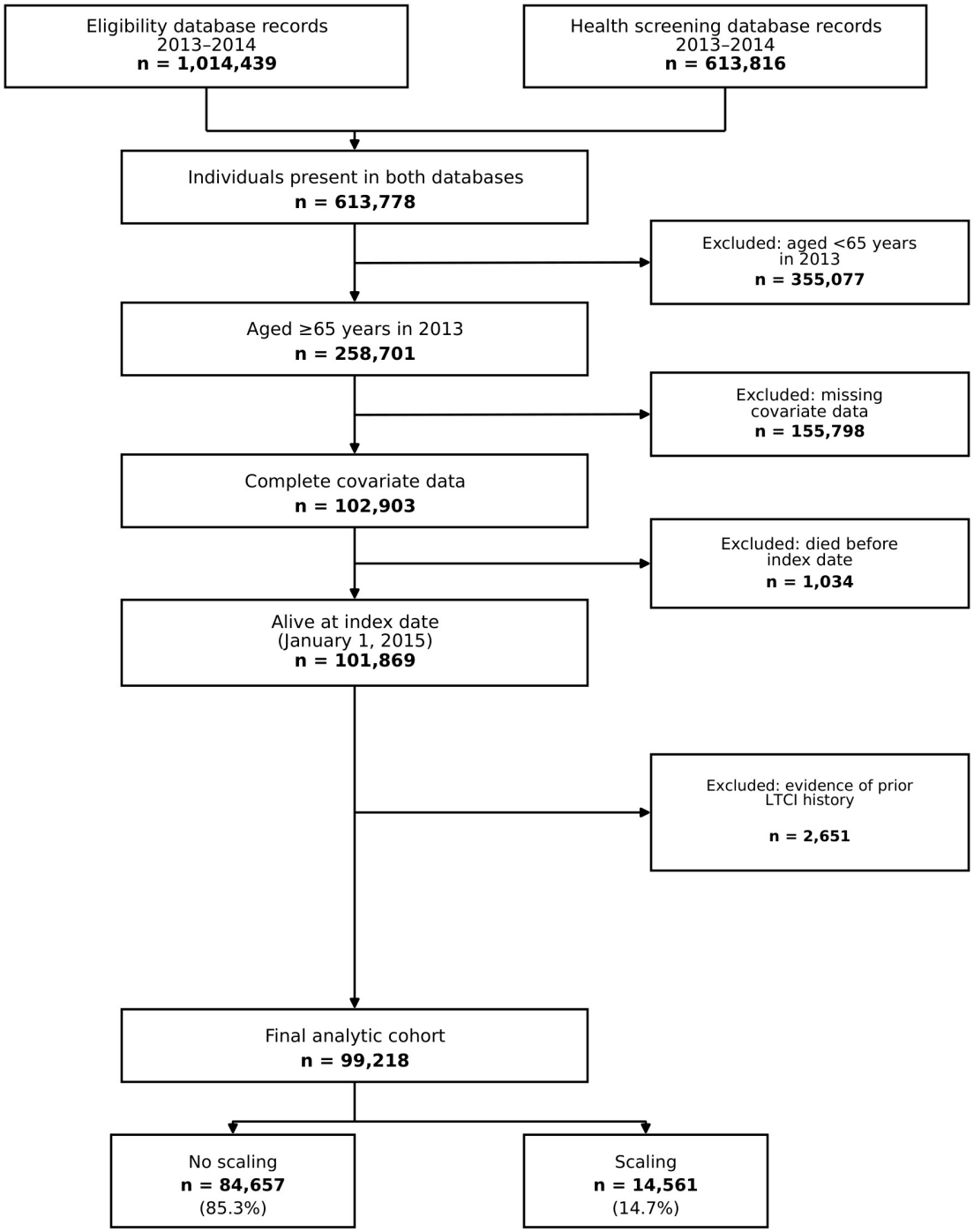


Figure 2

Study population selection flowchart.

Eligibility and health-screening database records from 2013 to 2014 were used to define the source population. Participants were sequentially excluded if they were aged <65 years in 2013, their covariate data were missing, they died before the index date, or they had evidence of LTCI history. LTCI history

included any LTCI application or grades 1–5 certification before the index date and the first application observed during follow-up, which was coded as non-initial. The final analysis cohort included 99,218 participants: 84,657 and 14,561 in the no-scaling and scaling groups, respectively. LTCI, long-term care insurance.

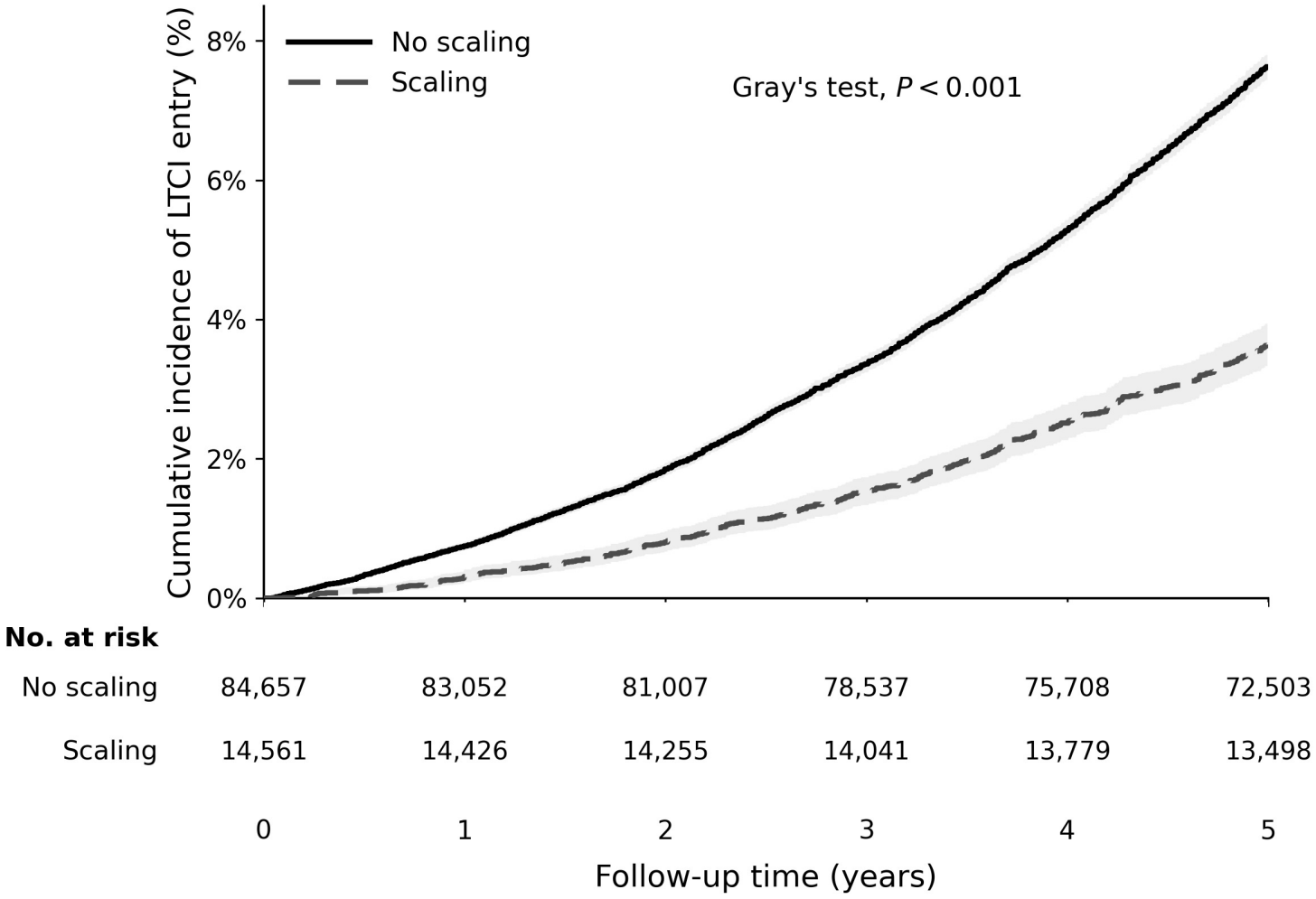


Figure 3

Cumulative incidence of LTCI entry

The curves show unadjusted cumulative incidence functions for long-term care insurance (LTCI) entry by dental scaling status, while treating death before LTCI entry as a competing event. The shaded areas indicate 95% confidence intervals. The numbers below the x-axis indicate the number of individuals at risk immediately before each time point. LTCI, long-term care insurance.

Supplementary Files

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