RESEARCH REPORTS
Clinical

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Cognitive Decline and Oral Health in Middle-aged Adults in the ARIC Study

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APPENDIX

Appendix 1: Definitions and Classifications

1. Oral health measures
   1.1. **Self-reported complete tooth loss:** Two screening questions were used to determine dental status: (a) "Do you have any of your natural teeth?" and (b) "Do you have any dental implants?" Participants' dental status was defined as complete tooth loss if they did not have any natural teeth and received dental implants.
   1.2. **Periodontitis:** For dentally examined people with no contraindications to periodontal probing, examiners measured probing pocket depth (PPD) and gingival recession (GR) at 6 sites for all teeth present. During data analysis, clinical attachment level (CAL) was calculated as the sum of PPD and GR, and severity of periodontitis was classified as none/mild, moderate, and severe based on a case definition developed by the Centers for Disease Control and Prevention and the American Academy of Periodontology (CDC/AAP) (Page and Eke, 2007). The case definition for moderate periodontitis requires that at least two sites on different teeth have an interproximal CAL > 4 mm or interproximal PPD > 5 mm. Severe periodontitis was defined as two or more interproximal sites with CAL ≥ 6 mm, not on the same tooth, and at least one interproximal site with PPD ≥ 5 mm.
   1.3. **Number of teeth:** The number of teeth present was recorded for dental study participants who underwent a periodontal examination.
   1.4. **Plaque deposits:** Plaque deposits for the buccal surface of each tooth were determined as absent, less than 1/3, less than 2/3, and more than 2/3 of the surface. During the analysis, the extent of plaque deposits was computed as the percentage of surfaces with visible plaque.
   1.5. **Gingival inflammation:** For each tooth, gingival inflammation was assessed according to the Silness and Löe (1964) Gingival Index (GI) as follows:
   0 = normal gingiva
   1 = mild (slight change in color, slight edema, no bleeding on probing),
   2 = moderate (redness, edema, glazing, bleeding on probing), and
   3 = severe inflammation (marked redness and edema, ulceration, tendency to spontaneous bleeding).

During the analysis, the extent of gingival inflammation was computed as the percentage of teeth with GI ≥ 1.

   1.6. **Oral hygiene care and dental utilization:** The following dental interview questions were used:
      a. "How often did you brush your teeth yesterday?" Frequency of toothbrushing was categorized as not at all, one time, or two or more times in the preceding day.
      b. "How often did you use dental floss last week?" Frequency of dental flossing was categorized as not at all, one time, or two or more times in the preceding week.
      c. "When was the last time you went to the dentist for any reason?" Time since last dental visit was categorized as < 12 mos, 12-36 mos, or > 36 mos.
      d. "Would you say that you use a dentist on a regular basis, or do you only go when you are in discomfort or when you need something fixed?" Reasons for dental visits were categorized as on a regular basis, when there is a problem, and do not see a dentist.

2. Covariates

Participants' education was classified as basic (< 12 yrs), intermediate (12-16 yrs), or advanced (≥ 17 yrs). Income was coded as < $25,000, $25,000-$50,000, >$50,000, or refused to answer. Five categories of the race-center variable were Forsyth/Black, Forsyth/White, Minneapolis/White, Washington/Black, and

Jackson/Black. Diabetic status was determined by fasting plasma glucose ≥ 126 mg/dL, non-fasting plasma glucose ≥ 200 mg/dL, self-reported history of physician-diagnosed diabetes, or current medication for diabetes. Hypertension was defined as a previous diagnosis of hypertension, taking hypertensive medication, or having a current systolic blood pressure of 140 mm Hg or higher or a diastolic blood pressure or 90 mm Hg. Stroke was defined as a self-reported history of physician-diagnosed stroke or a stroke validated by an ARIC clinician through a review of medical records. Coronary heart disease (CHD) was defined as adjudicated myocardial infarction on the electrocardiogram at baseline, prior self-reported history of myocardial infarction, coronary artery bypass surgery, or angioplasty. Smoking and alcohol drinking were self-reported as never, former, or current.

Appendix 2: Prevalence Difference Calculation

Odds = Prevalence / (1- Prevalence)
Prevalence = Odds/ (1+ Odds)
Odds ~ Prevalence if prevalence is relatively small (< 10%).
Prevalence difference = Prevalence among exposed group – Prevalence of unexposed group

In the present study, the exposure is one-unit increase in cognitive decline score; thus, prevalence difference is an absolute difference of the observed prevalence due to one-unit increase in cognitive decline score.

Example 1: Toothbrushing

Prevalence of not brushing teeth (Table 1; main paper)	= 1.6%
	= 0.016
Odds of not brushing teeth	= 0.016 / (1-0.016)
	= ~0.01626
Odds ratio of not brushing teeth (Table 3; main paper)	= 1.29
Thus, odds for one-unit increase in cognitive decline scores	
	= 1.29 x 0.01626
	= 0.02097
Prevalence of one-unit increase in cognitive decline score	= 0.02097 / (1+ 0.02097)
	= 0.0205
Prevalence difference	= 0.0205-0.016
	= 0.0045
	= 0.45%

Example 2: Complete tooth loss

Prevalence of complete tooth loss (Table 1; main paper)	= 12.6%
	= 0.126
Odds of complete tooth loss	= 0.126 / (1-0.126)
	= 0.14416
Odds ratio of complete tooth loss (Table 2; main paper)	~ 1.10
Thus, odds for one-unit increase in cognitive decline scores	
	= 1.10 x 0.14416
	= 0.15858
Prevalence of one-unit increase in cognitive decline score	= 0.15858 / (1+ 0.15858)
	= 0.13687
Prevalence difference	= 0.14416-0.13687
	= 0.00729
	= 0.73%

APPENDIX REFERENCES

Page RC, Eke PI (2007). Case definitions for use in population-based surveillance of periodontitis. *J Periodontol* 78(7 Suppl):1387S-1399S.

Silness J, Löe H (1964). Periodontal disease in pregnancy. II: Correlation between oral hygiene and periodontal condition. *Acta Odontol Scand* 22:121-135.

Appendix Table 1. Crude Associations between a Six-year Cognitive Decline[1] and Oral Health Measures

Dependent Variables	N	Delayed Word Recall	Digit Symbol Substitution	Word Fluency
		β (upper, lower 95% CI)		
Oral health conditions				
Mean number of remaining teeth	5,878	-0.37 (-0.56, -0.19)	-0.40 (-0.58, -0.21)	-0.24 (-0.42, -0.06)
Extent of dental deposit[2]	5,878	1.83 (0.85, 2.80)	2.04 (1.07, 3.02)	0.84 (-0.12, 1.80)
Extent of gingival inflammation[3]	5,638	0.48 (-0.55, 1.52)	0.45 (-0.59, 1.49)	-0.18 (-1.21, 0.85)
		OR (upper, lower 95% CI)		
OR for severe periodontitis[4]	5,878	1.05 (0.98, 1.13)	1.11 (1.03, 1.19)	0.99 (0.92, 1.06)
OR for complete tooth loss[5]	10,050	1.25 (1.18, 1.32)	1.20 (1.13, 1.27)	1.18 (1.11, 1.25)
Oral hygiene cares				
Toothbrushing[6]	8,782			
OR for no toothbrushing		1.03 (0.86, 1.22)	1.36 (1.17, 1.58)	1.26 (1.06, 1.48)
OR for brushing once per day		1.08 (1.03, 1.13)	1.03 (0.99, 1.08)	1.07 (1.02, 1.12)
Flossing[7]	8,782			
OR for no flossing		1.07 (1.03, 1.13)	1.04 (1.00, 1.10)	1.05 (1.00, 1.10)
OR for flossing once per week		1.01 (0.93, 1.09)	1.03 (0.95, 1.11)	1.05 (0.97, 1.14)
Dental utilization				
Last dentist visit[8]	8,782			
OR for last dental visit > 36 mos		1.07 (1.00, 1.16)	1.05 (0.98, 1.13)	1.06 (0.98, 1.14)
OR for last dental visit 12- < 36 mos		1.02 (0.96, 1.09)	1.04 (0.98, 1.11)	1.03 (0.96, 1.09)
Reasons to visit a dentist[9]	8,782			
OR for not visiting a dentist		1.11 (0.91, 1.35)	1.17 (0.97, 1.42)	1.17 (0.96, 1.43)
OR for visiting a dentist when problems occur		1.08 (1.03, 1.14)	1.08 (1.03, 1.14)	1.06 (1.01, 1.11)

OR, Odds ratios; β, regression coefficient; CI, Confidence intervals.
[1]A six-year change in cognitive scores was expressed as race- and gender-specific 'studentized' residuals.
[2]Extent of plaque deposit was a percentage of buccal surfaces with visible plaque.
[3]Extent of gingival inflammation was a percentage of teeth with Löe & Silness Gingival Index (GI) score ≥ 1.
[4]OR and 95% CI from binary logistic regression models estimated the associations between cognitive decline, and odds of severe periodontal disease *vs.* no/mild/moderate periodontal disease [The Centers for Disease Control and Prevention/The American Academy of Periodontology (CDC/AAP) classification].
[5]OR and 95% CI from binary logistic regression models estimated the associations between cognitive decline, and odds of complete tooth loss *vs.* dentate.
[6]OR and 95% CI from multinomial logistic regression models estimated the associations between cognitive decline, and odds of no toothbrushing and brushing once *per* day *vs.* brushing twice *per* day.
[7]OR and 95% CI from multinomial logistic regression models estimated the associations between cognitive decline, and odds of no flossing and flossing once *per* week *vs.* brushing twice *per* week.
[8]OR and 95% CI from multinomial logistic regression models estimated the associations between cognitive decline, and odds of last dental visit > 36 mos and 12- < 36 mos *vs.* < 12 mos.
[9]OR and 95% CI from multinomial logistic regression models estimated the associations between cognitive decline, and odds of not visiting a dentist and visiting a dentist only when problems occur *vs.* visiting a dentist on a regular basis.

Appendix Table 2. Associations between Selected Characteristics and a Six-year Cognitive Decline[1] for Dentally Screened Participants (n = 10,050)

		Delayed Word Recall		Digit Symbol Substitution		Word Fluency	
Characteristics	Col%	mean ± SE	*p* value	mean ± SE	*p* value	mean ± SE	*p* value
Age at examination 2							
> 65 yrs	7.4	0.34 ± 0.03	< .0001	0.27 ± 0.04	< .0001	0.097 ± 0.04	< .0001
55-65 yrs	53.2	0.04 ± 0.01		0.073 ± 0.01		0.03 ± 0.01	
46-54 yrs	39.4	-0.16 ± 0.02		-0.18 ± 0.02		-0.076 ± 0.02	
Study sites							
Forsyth	25.7	-0.11 ± 0.02	< .0001	-0.20 ± 0.02	< .0001	0.028 ± 0.02	< .0001
Jackson	16.2	-0.016 ± 0.02		-0.0062 ± 0.02		-0.016 ± 0.02	
Minneapolis	30.1	-0.0041 ± 0.02		0.13 ± 0.02		0.059 ± 0.02	
Washington	27.9	0.057 ± 0.02		0.0061 ± 0.02		-0.10 ± 0.02	
Education							
Basic	16.9	0.19 ± 0.02	< .0001	0.18 ± 0.02	< .0001	0.19 ± 0.02	< .0001
Intermediate	43.2	0.0009 ± 0.01		0.0031 ± 0.01		0.025 ± 0.02	
Advanced	39.9	-0.12 ± 0.02		-0.11 ± 0.02		-0.12 ± 0.02	
Income							
< $25,000	29.3	0.13 ± 0.02	< .0001	0.14 ± 0.02	< .0001	0.10 ± 0.02	< .0001
$25- < $50,000	35.4	-0.02 ± 0.02		0.0095 ± 0.02		0.0038 ± 0.02	
$50,000 or more	33.2	-0.15 ± 0.02		-0.18 ± 0.02		-0.13 ± 0.02	
Refused to provide	2.2	0.07 ± 0.07		0.084 ± 0.07		0.21 ± 0.07	
Cigarette use							
Current	19.1	0.0015 ± 0.02	.1157	0.023 ± 0.02	.1423	0.016 ± 0.02	.4860
Former	39.0	0.0021 ± 0.02		-0.0096 ± 0.02		-0.018 ± 0.02	
Never	41.9	-0.04 ± 0.01		-0.031 ± 0.01		-0.0063 ± 0.01	
Alcohol use							
Current	59.9	-0.047 ± 0.01	.0002	-0.038 ± 0.01	.0008	-0.047 ± 0.01	< .0001
Former	18.7	0.05 ± 0.02		0.06 ± 0.02		0.048 ± 0.02	
Never	21.4	0.017 ± 0.02		-0.0025 ± 0.02		0.059 ± 0.02	
Diabetes mellitus							
Yes	12.4	0.13 ± 0.03	< .0001	0.17 ± 0.03	< .0001	0.12 ± 0.03	< .0001
No	87.6	-0.04 ± 0.01		-0.039 ± 0.01		-0.025 ± 0.01	
Hypertension							
Yes	32.3	0.056 ± 0.02	< .0001	0.10 ± 0.02	< .0001	0.04 ± 0.02	.0013
No	67.7	-0.05 ± 0.01		-0.066 ± 0.01		-0.029 ± 0.01	
Coronary heart disease							
Yes	4.6	0.13 ± 0.05	< .0016	0.17 ± 0.05	< .0001	0.11 ± 0.05	.0125
No	95.4	-0.022 ± 0.01		-0.021 ± 0.01		-0.012 ± 0.01	
Stroke							
Yes	1.2	0.31 ± 0.09	.0003	0.21 ± 0.09	.0147	0.07 ± 0.09	.3976
No	98.8	-0.019 ± 0.01		-0.015 ± 0.01		-0.0075 ± 0.01	

n, total number of study group; SE, standard error.
[1]A six-year change in cognitive scores was expressed as race- and gender-specific 'studentized' residuals. In the analyses, 'studentized' residuals were reversed, namely, positive, negative, and zero values referred to poorer, better, or unchanged cognitive performance, respectively.

Appendix Table 3. Associations between Selected Characteristics and a Six-year Cognitive Decline[1] for Participants Who Received Comprehensive Dental Examination (n = 5,878)

		Delayed Word Recall		Digit Symbol Substitution		Word Fluency	
Characteristics	Col%	mean ± SE	*p* value	mean ± SE	*p* value	mean ± SE	*p* value
Age at examination 2							
> 65 yrs	6.4	0.33 ± 0.05	< .0001	0.22 ± 0.05	< .0001	0.027 ± 0.05	.0020
55-65 yrs	51.3	0.017 ± 0.02		0.031 ± 0.02		0.0062 ± 0.02	
46-54 yrs	42.3	-0.19 ± 0.02		-0.22 ± 0.02		-0.084 ± 0.02	
Study sites							
Forsyth	27.3	-0.14 ± 0.02	< .0001	-0.27 ± 0.02	< .0001	0.023 ± 0.02	< .0001
Jackson	15.1	-0.07 ± 0.03		-0.067 ± 0.03		-0.065 ± 0.03	
Minneapolis	35.4	-0.026 ± 0.02		0.11 ± 0.02		0.019 ± 0.02	
Washington	22.3	0.03 ± 0.03		-0.075 ± 0.03		-0.15 ± 0.03	
Education							
Basic	12.1	0.11 ± 0.04	< .0001	0.11 ± 0.04	< .0001	0.13 ± 0.04	< .0001
Intermediate	43.7	-0.017 ± 0.02		-0.026 ± 0.02		0.02 ± 0.02	
Advanced	44.2	-0.13 ± 0.02		-0.14 ± 0.02		-0.13 ± 0.02	
Income							
< $25,000	23.4	0.087 ± 0.03	< .0001	0.06 ± 0.03	< .0001	0.041 ± 0.03	< .0001
$25- < $50,000	36.1	-0.043 ± 0.02		0.0014 ± 0.02		-0.0016 ± 0.02	
$50,000 or more	38.4	-0.15 ± 0.02		-0.20 ± 0.02		-0.11 ± 0.02	
Refused to provide	2.1	0.0017 ± 0.09		-0.055 ± 0.09		0.12 ± 0.09	
Cigarette use							
Current	16.7	-0.041 ± 0.03	.3267	-0.015 ± 0.03	.1516	-0.0063 ± 0.03	.3708
Former	39.6	-0.031 ± 0.02		-0.057 ± 0.02		-0.052 ± 0.02	
Never	43.7	-0.073 ± 0.02		-0.085 ± 0.02		-0.02 ± 0.02	
Alcohol use							
Current	63.1	-0.071 ± 0.02	.1276	-0.076 ± 0.02	.2336	-0.053 ± 0.02	.0632
Former	16.5	-0.0098 ± 0.03		-0.015 ± 0.03		0.019 ± 0.03	
Never	20.4	-0.023 ± 0.03		-0.06 ± 0.03		0.0011 ± 0.03	
Diabetes mellitus							
Yes	10.7	0.066 ± 0.04	.0016	0.11 ± 0.04	< .0001	0.11 ± 0.04	.0003
No	88.3	-0.065 ± 0.01		-0.084 ± 0.01		-0.047 ± 0.01	
Hypertension							
Yes	28.9	0.0005 ± 0.02	.0106	0.042 ± 0.02	< .0001	0.023 ± 0.02	.0089
No	71.1	-0.072 ± 0.01		-0.10 ± 0.01		-0.052 ± 0.01	
Coronary heart disease							
Yes	3.0	0.065 ± 0.07	.1116	0.0064 ± 0.07	.3468	0.038 ± 0.07	.3580
No	97.0	-0.054 ± 0.01		-0.064 ± 0.01		-0.033 ± 0.01	
Stroke							
Yes	0.8	0.21 ± 0.14	.0666	0.28 ± 0.14	.0134	-0.021 ± 0.14	.9483
No	99.2	-0.053 ± 0.01		-0.065 ± 0.01		-0.03 ± 0.01	

n, total number of study group; SE, standard error.
[1]A six-year change in cognitive scores was expressed as race- and gender-specific 'studentized'. In the analysis, 'studentized' residuals were reversed, namely, positive, negative, and zero values referred to poorer, better, or unchanged cognitive performance, respectively.

Appendix Table 4. Comparison of Oral Health Behaviors and Dental Utilizations of Participants Who Were Edentulous and Those Who Were Dentate (n = 10,050)

Oral Health Behaviors and Dental Utilizations	Edentulous (n = 1,268)	Dentate (n = 8,782)
Toothbrushing, n (%)		
Not at all	528 (41.6)	137 (1.6)
Once a day	354 (27.9)	2,464 (28.1)
Twice a day or more	386 (30.5)	6,181 (70.3)
Flossing, n (%)		
Not at all	1,235 (97.4)	3,109 (35.4)
Once a day	10 (0.8)	725 (8.3)
Twice a day or more	23 (1.8)	4,948 (56.3)
Last dental visit, n (%)		
>36 mos	865 (68.2)	807 (9.2)
12- < 36 mos	207 (16.3)	1,114 (12.7)
< 12 mos	196 (15.5)	6,861 (78.1)
Reasons to visit a dentist, n (%)		
Do not visit a dentist	179 (14.1)	98 (1.1)
When problems occur	1,021 (80.5)	2,213 (25.2)
Regularly	68 (5.3)	6,471 (73.6)

Appendix Table 5. Self-reported History of Prosthesis Use among Study Participants Who Had Tooth Loss, by Dental Status

		Dentate Status (n = 10,050)	
		Edentulous (n = 1,268)	Dentate (n = 8,782)
Had false teeth, n (%)			
	Yes	1,238 (97.6)	3,996 (45.5)
	No	24 (1.9)	3,981 (45.3)
	Missing	6 (0.5)	805 (9.2)
Age when got first false teeth, yrs			
	Mean ± SD	36.2 ± 13.6[1]	39.5 ± 14.8[2]
	Range	73-12	74-8
Age at examination 2, yrs			
	Mean ± SD	58.3 ± 5.5	57.1 ± 5.5
	Range	68-47	68-47

n, total number of study group; SD, standard deviation.
[1]Of 1,238 edentulous participants, 1,186 (95.8%) reported age when they got first false teeth.
[2]Of 3,996 dentate participants, 3,794 (94.9%) reported age when they got first false teeth.

Appendix Table 6. Characteristics of ARIC Dentate Participants Who Received and Did Not Receive Dental Examination at Examination 4

Characteristics	Dental Examination		Odd Ratios (95% CI)
	Received (n = 6,676)	Did Not Receive (n = 3,050)	
Age at examination 2, row%			
> 65 yrs	64.6	35.4	0.78 (0.64, 0.91)
55-65 yrs	68.2	31.8	0.90 (0.82, 0.99)
46-54 yrs	70.4	29.6	Ref
Gender, row%			
Male	70.7	29.3	1.18 (1.09, 1.29)
Female	67.0	33.0	Ref
Race, row%			
African-American	61.9	38.1	0.68 (0.62, 0.76)
Whites	70.4	29.6	Ref
Study sites, row%			
Forsyth	71.0	29.0	1.18 (1.05, 1.34)
Jackson	61.8	38.2	0.78 (0.69, 0.89)
Minneapolis	72.0	28.0	1.25 (1.11, 1.40)
Washington	67.3	32.7	Ref
Education, row%			
Basic	61.9	38.1	0.70 (0.62, 0.79)
Intermediate	69.7	30.3	0.99 (0.90, 1.09)
Advanced	69.9	30.1	Ref
Income, row%			
Refused to provide	66.1	33.9	0.73 (0.55, 0.98)
< $25,000	63.3	36.7	0.65 (0.58, 0.73)
$25- < $50,000	70.3	29.7	0.89 (0.80, 0.99)
$50,000 or more	72.6	27.4	Ref
Cigarette use, row%			
Current	64.8	35.2	0.78 (0.69, 0.88)
Former	69.4	30.6	0.96 (0.87, 1.06)
Never	70.2	29.8	Ref
Alcohol use, row%			
Current	70.1	29.9	1.09 (0.98, 1.22)
Former	65.4	34.6	0.88 (0.76, 1.01)
Never	68.3	31.7	Ref
Diabetes mellitus, row%			
Yes	64.6	35.4	0.80 (0.70, 0.91)
No	69.5	30.5	Ref
Hypertension, row%			
Yes	63.9	36.1	0.72 (0.65, 0.78)
No	71.2	28.8	Ref
Coronary heart disease, row%			
Yes	51.6	48.4	0.46 (0.37, 0.56)
No	69.8	30.2	Ref
Stroke, row%			
Yes	53.5	49.5	0.52 (0.36, 0.75)
No	69.0	31.0	Ref
Cognitive function, mean ± SD			
DWR at examination 2	6.79 ± 1.46	6.71 ± 1.48	0.0193
DSS at examination 2	47.92 ± 12.95	45.73 ± 13.71	< 0.0001
WF at examination 2	35.08 ± 12.08	34.29 ± 12.24	0.7596
DWR at examination 4	6.66 ± 1.57	6.59 ± 1.59	0.0454
DSS at examination 4	45.52 ± 12.61	43.29 ± 13.69	<0.0001
WF at examination 4	34.67 ± 12.36	33.70 ± 12.46	0.0004

DWR, Delayed word recall; DSS, Digit symbol substitution; Ref, Reference; WF, Word fluency.

Appendix Table 7. Association between a Six-year Cognitive Decline[1] and Oral Health Conditions

	β (upper, lower 95% CI)			OR (upper, lower 95% CI)	
Cognitive Function	Mean Number of Remaining Teeth n = 5,878	Extent of Dental Plaque[2] n = 5,878	Extent of Gingival Inflammation[3] n = 5,638	Severe Periodontitis[4] n = 5,878	Complete Tooth Loss[5] n = 10,050
Delayed word recall[6]					
1st tercile	-0.13 (-0.54, 0.29)	1.96 (-0.093, 4.01)	0.39 (-1.50, 2.27)	0.92 (0.76, 1.10)	1.33 (1.13, 1.56)
2nd tercile	-0.11 (-0.50, 0.28)	-0.27 (-2.18, 1.64)	-0.18 (-1.93, 1.57)	0.88 (0.74, 1.04)	1.16 (0.99, 1.37)
3rd tercile	Ref	Ref	Ref	Ref	Ref
Digit symbol substitution[6]					
1st tercile	-0.42 (-0.83, -0.01)	1.25 (-0.77, 3.27)	1.81 (-0.045, 3.66)	1.06 (0.89, 1.28)	1.19 (1.02, 1.40)
2nd tercile	-0.088 (-0.48, 0.31)	-0.13 (-0.26, 1.80)	1.25 (-0.52, 3.03)	1.03 (0.86, 1.22)	1.16 (0.99, 1.37)
3rd tercile	Ref	Ref	Ref	Ref	Ref
Word fluency[6]					
1st tercile	-0.37 (-0.78, 0.03)	1.57 (-0.41, 3.54)	-0.11 (-1.92, 1.71)	0.90 (0.75, 1.08)	1.19 (1.01, 1.40)
2nd tercile	-0.23 (-0.63, 0.16)	1.24 (-0.70, 3.18)	0.38 (-1.41, 2.16)	1.03 (0.87, 1.23)	1.26 (1.07, 1.47)
3rd tercile	Ref	Ref	Ref	Ref	Ref

OR, Odds ratios; CI, confidence interval; β, regression coefficient; Ref, Reference.
[1]A six-year change in cognitive scores was expressed as race- and gender-specific 'studentized' residuals. Scores were categorized into three groups according to terciles. The first tercile consisted of people with the greatest cognitive decline.
[2]Extent of plaque deposits was a percentage of buccal surfaces with visible plaque.
[3]Extent of gingival inflammation was a percentage of teeth with Löe & Silness Gingival Index (GI) score ≥ 1.
[4]OR and 95% CI from binary logistic regression models estimated the associations between cognitive decline, and odds of severe periodontitis *vs.* no/mild/moderate periodontitis [The Centers for Disease Control and Prevention/The American Academy of Periodontology (CDC/AAP) classification].
[5]OR and 95% CI from binary logistic regression models estimated the associations between cognitive decline, and odds of complete tooth loss *vs.* dentate status.
[6]Adjusted for age, gender, race-center, education, cigarette use, alcohol use, and health history.

Appendix Table 8. Association between a Six-year Change in Cognitive Decline[1] and Oral Hygiene Care

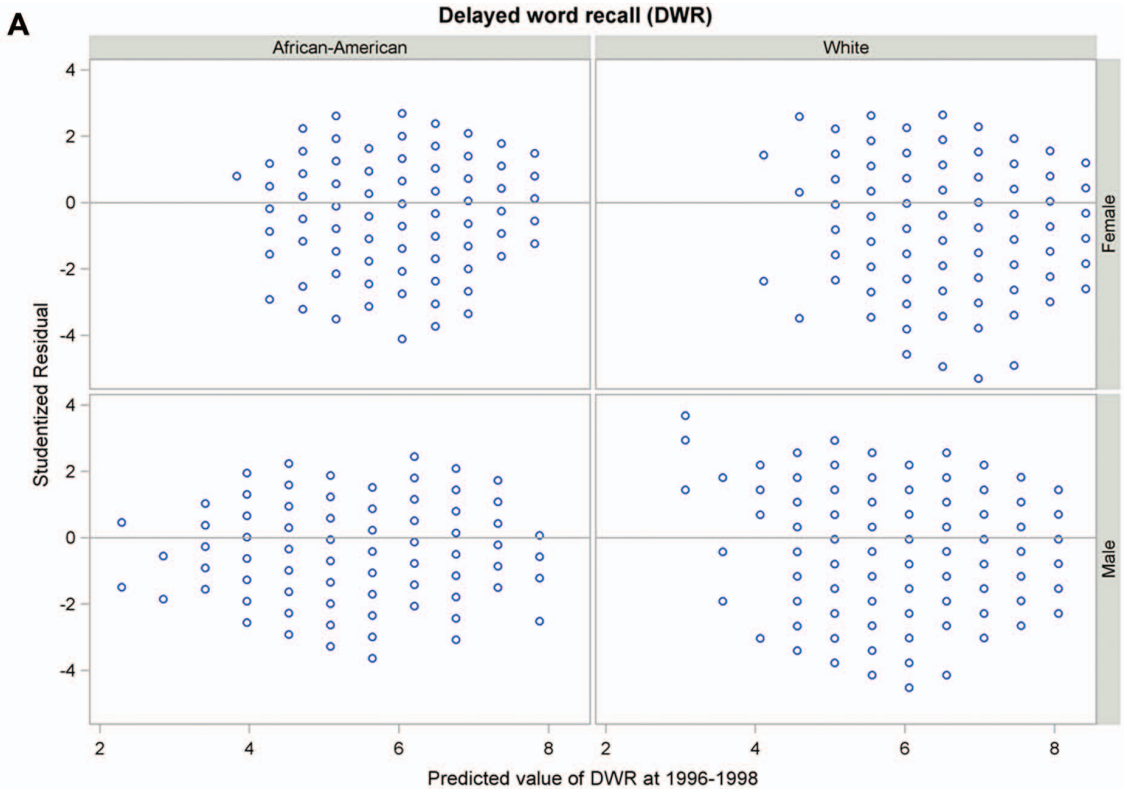
	OR (upper, lower 95% CI)			
	Toothbrushing[2] (n = 8,782)		Dental Flossing[3] (n = 8,782)	
Cognitive Function	No brushing	Brushing once a day	No flossing	Flossing once a week
Delayed word recall[4]				
1st tercile	0.90 (0.59, 1.38)	1.13 (1.00, 1.28)	1.09 (0.97, 1.24)	1.06 (0.86, 1.29)
2nd tercile	0.79 (0.52, 1.20)	1.03 (0.91, 1.15)	1.04 (0.92, 1.16)	1.05 (0.87, 1.27)
3rd tercile	Ref	Ref	Ref	Ref
Digit symbol substitution[4]				
1st tercile	1.41 (0.90, 2.21)	1.01 (0.90, 1.15)	1.03 (0.92, 1.17)	1.15 (0.94, 1.40)
2nd tercile	1.39 (0.89, 2.18)	1.08 (0.96, 1.22)	1.01 (0.90, 1.14)	1.15 (0.95, 1.39)
3rd tercile	Ref	Ref	Ref	Ref
Word fluency[4]				
1st tercile	1.63 (1.06, 2.51)	1.14 (1.01, 1.28)	1.13 (1.01, 1.23)	1.08 (0.88, 1.31)
2nd tercile	1.05 (0.66, 1.67)	1.05 (0.93, 1.18)	1.18 (1.05, 1.33)	1.18 (0.97, 1.43)
3rd tercile	Ref	Ref	Ref	Ref

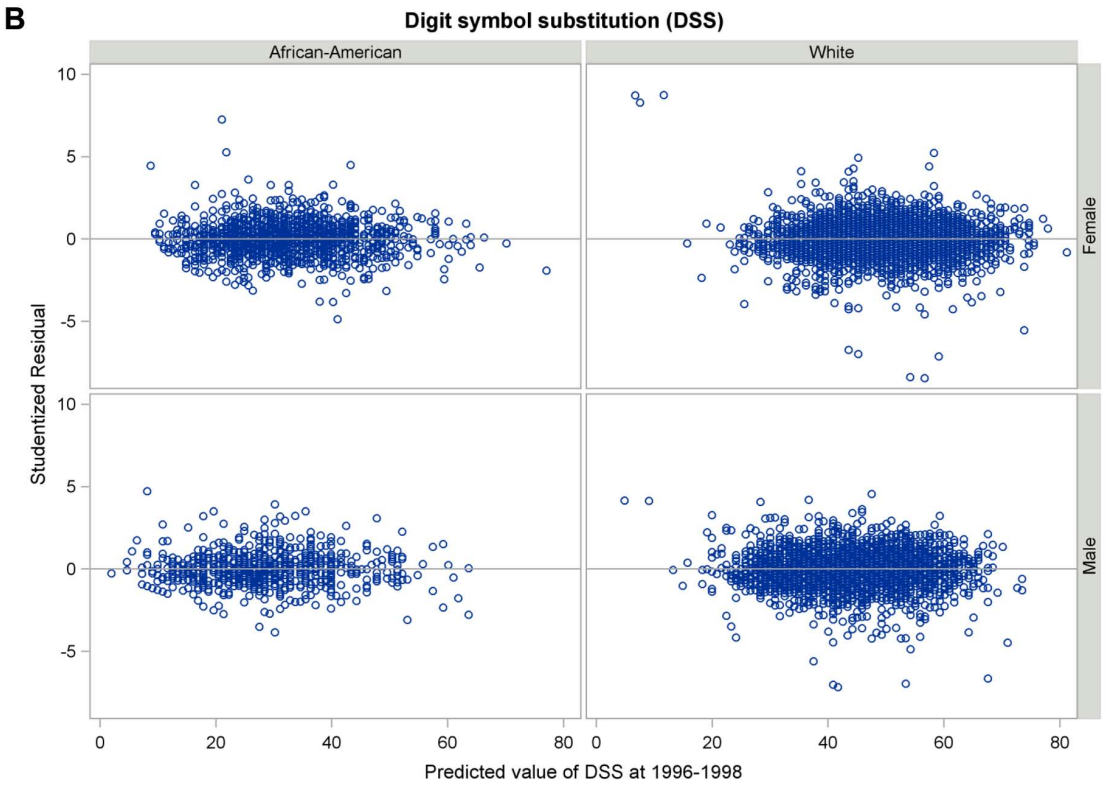
OR, Odds ratios; CI, confidence interval; Ref, Reference.
[1]A six-year change in cognitive scores was expressed as race- and gender-specific 'studentized' residuals. Scores were categorized into three groups according to terciles. The first tercile consisted of people with the greatest cognitive decline.
[2]OR and 95% CI from multinomial logistic regression models estimated the associations between cognitive decline, and odds of no toothbrushing and brushing once *per* day *vs.* brushing twice *per* day.
[3]OR and 95% CI from multinomial logistic regression models estimated the associations between cognitive decline, and odds of no flossing and flossing once *per* week *vs.* flossing twice *per* week.
[4]Adjusted for age, gender, race-center, education, cigarette use, alcohol use, and health history.

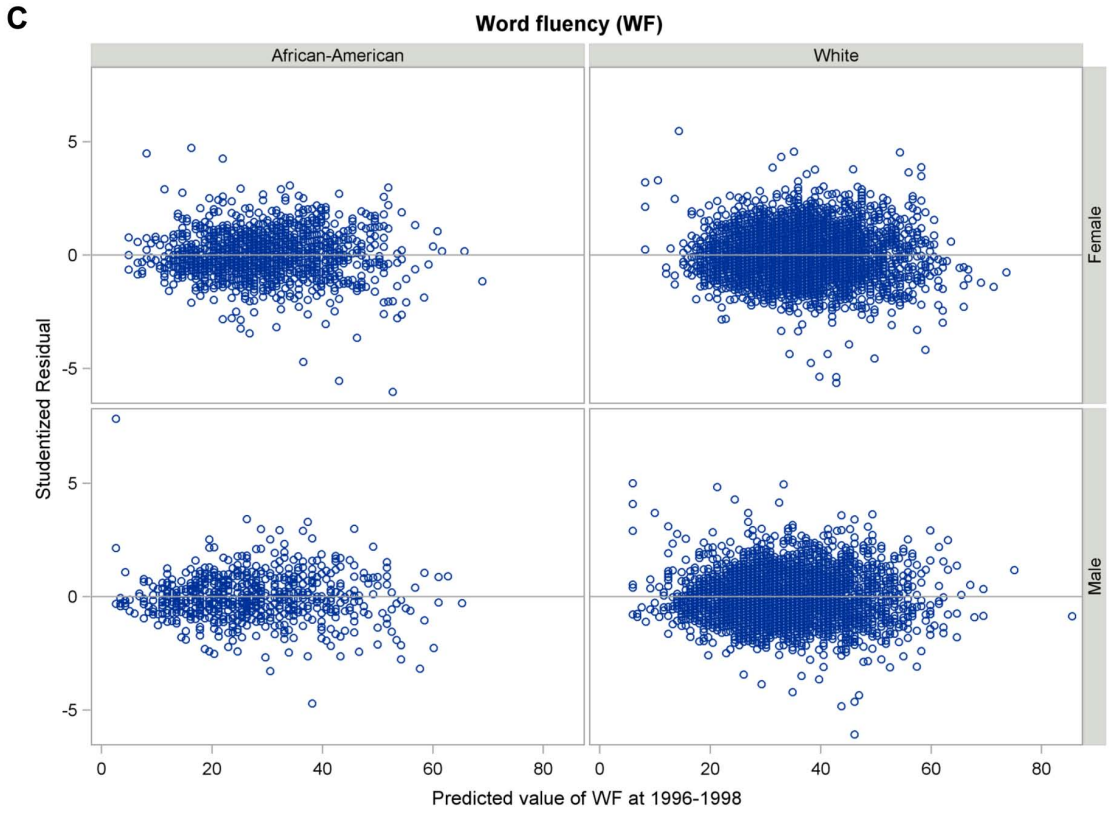
Appendix Table 9. Association between a Six-year Change in Cognitive Decline[1] and Dental Utilization

	OR (upper, lower 95% CI)			
	Last Dental Visit[2] (n = 8,782)		Reasons to Visit a Dentist[3] (n = 8,782)	
Cognitive Function	>36 mos	12- < 36 mos	Do not visit a dentist	When problems occur
Delayed word recall[4]				
1st tercile	1.05 (0.86, 1.28)	1.05 (0.89, 1.24)	1.14 (0.69, 1.90)	1.10 (0.96, 1.27)
2nd tercile	1.00 (0.83, 1.21)	0.87 (0.74, 1.02)	1.11 (0.96, 1.27)	0.97 (0.85, 1.11)
3rd tercile	Ref	Ref	Ref	Ref
Digit symbol substitution[4]				
1st tercile	1.02 (0.84, 1.24)	1.00 (0.85, 1.18)	1.17 (0.67, 2.02)	1.15 (1.00, 1.32)
2nd tercile	1.08 (0.89, 1.31)	0.97 (0.83, 1.14)	1.70 (1.03, 2.82)	1.15 (1.01, 1.32)
3rd tercile	Ref	Ref	Ref	Ref
Word fluency[4]				
1st tercile	1.10 (0.90, 1.34)	1.01 (0.86, 1.19)	1.23 (0.75, 2.00)	1.09 (0.95, 1.25)
2nd tercile	1.18 (0.97, 1.43)	1.01 (0.86, 1.19)	0.81 (0.48, 1.39)	1.08 (0.94, 1.23)
3rd tercile	Ref	Ref	Ref	Ref

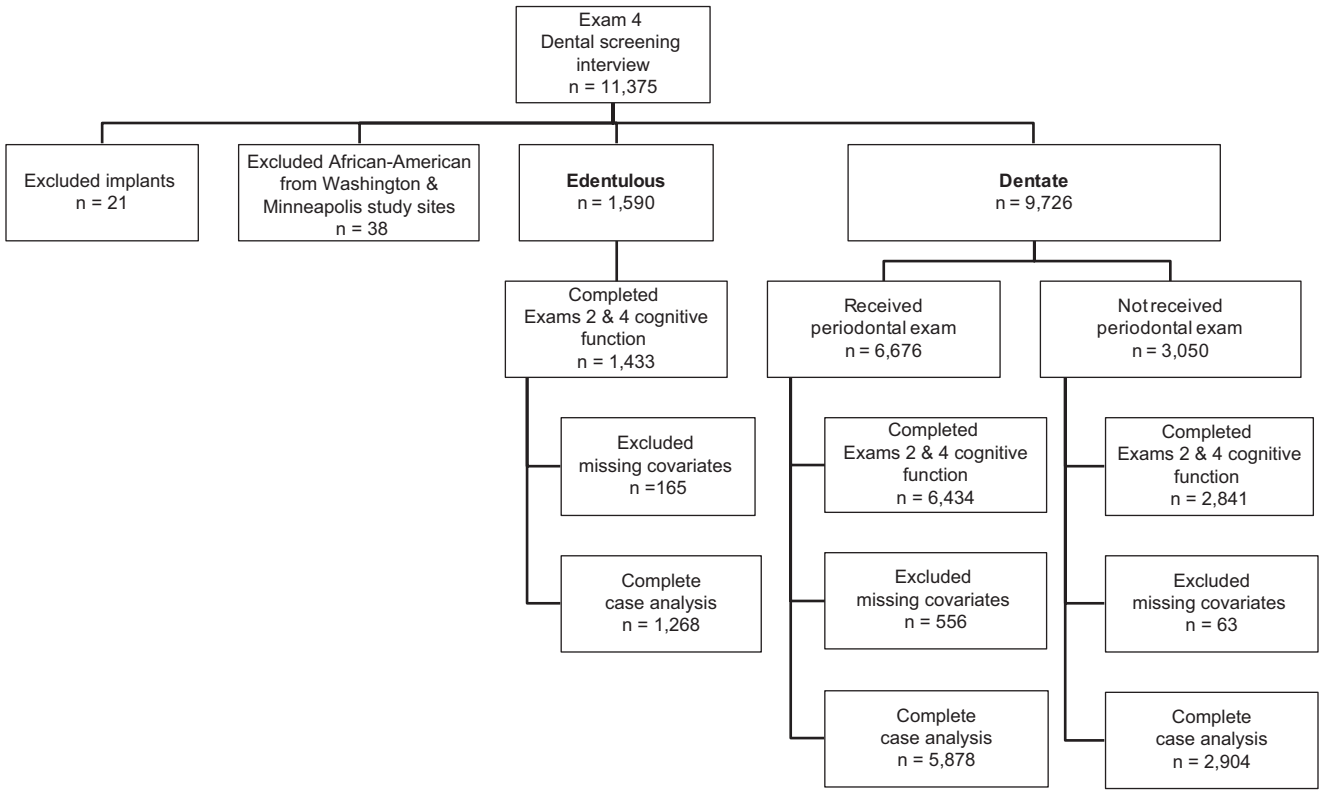
OR, Odds ratios; CI, confidence interval; Ref, Reference.
[1]A six-year change in cognitive scores was expressed as race- and gender-specific 'studentized' residuals. Scores were categorized into three groups according to terciles. The first tercile consisted of people with the greatest cognitive decline.
[2]OR and 95% CI from multinomial logistic regression models estimated the associations between cognitive decline, and odds of last dental visit > 36 mos and 12- < 36 mos *vs.* < 12 mos.
[3]OR and 95% CI from multinomial logistic regression models estimated the associations between cognitive decline, and odds of not visiting a dentist and visiting a dentist only when problems occur *vs.* visiting a dentist on a regular basis.
[4]Adjusted for age, gender, race-center, education, cigarette use, alcohol use, and health history.


A
Delayed word recall (DWR)
African-American
White
Female
Male
Studentized Residual
Predicted value of DWR at 1996-1998


B
Digit symbol substitution (DSS)
African-American
White
Female
Male
Studentized Residual
Predicted value of DSS at 1996-1998



Appendix Figure 1. 'Studentized' residuals and predicted values of delayed word recall scores.



Appendix Figure 2. Numbers of study participants for complete case analysis with respect to their dentition status.