

Supplementary Online Content

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eTable 1. Association of Subsegmental Brain Region Size with Telomere Length Stratified by Gender

eTable 2. Association of Subsegmental Brain Region Size with Telomere Length Stratified by Age Group

eTable 3. Association of Subsegmental Brain Region Size with Telomere Length after Adjustment for Additional Covariates

eTable 4. Association of Subsegmental Brain Region Size With Telomere Length after Adjustment for *APOE* Genotype in Addition to Other Covariates

This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Association of Subsegmental Brain Region Size With Telomere Length stratified by Gender^a

Brain Region	Subsegmental Region	Men (n=807)			Women (n=1,153)			P-value for interaction	
		Beta (SE)	P-value	Partial R ²	Beta (SE)	P-value	Partial R ²		
Frontal	Pars Opercularis	0.08 (0.03)	0.06	0.84	0.06 (0.02)	0.04	0.53	0.40	
	Medial Orbito-Frontal	0.07 (0.03)	0.08	0.62	0.07 (0.03)	0.02	0.69	0.93	
	Lateral Orbito-Frontal	0.11 (0.03)	<0.001	2.11	0.04 (0.02)	0.09	0.34	0.03	
	Paracentral Lobule	0.07 (0.03)	0.09	0.58	0.05 (0.03)	0.07	0.38	0.63	
	Pars Orbitalis	0.06 (0.03)	0.11	0.50	0.04 (0.03)	0.15	0.24	0.56	
	Precentral	0.03 (0.03)	0.39	0.16	0.06 (0.02)	0.03	0.57	0.87	
	Superior Frontal	0.03 (0.03)	0.36	0.20	0.04 (0.02)	0.11	0.31	0.92	
	Rostral Middle Frontal	-0.01 (0.03)	0.91	0.01	0.06 (0.02)	0.02	0.73	0.09	
	Frontal Pole	0.02 (0.03)	0.73	0.04	0.03 (0.03)	0.42	0.08	NA	
	Caudal Middle Frontal	0.04 (0.03)	0.39	0.17	0.00 (0.02)	0.87	0.00	NA	
	Pars Triangularis	0.04 (0.03)	0.26	0.27	-0.02 (0.03)	0.46	0.06	NA	
	Parietal	Precuneus	0.11 (0.03)	<0.001	2.15	0.08 (0.02)	0.002	1.20	0.38
		Inferior Parietal	0.05 (0.03)	0.12	0.46	0.10 (0.02)	<0.001	1.43	0.40

	Posterior Central	0.07 (0.03)	0.06	0.73	0.08 (0.02)	0.006	1.00	0.73
	Superior Parietal	0.10 (0.03)	0.005	1.47	0.04 (0.02)	0.15	0.24	0.12
	Supramarginal	0.01 (0.03)	0.83	0.02	0.05 (0.02)	0.07	0.39	NA
Temporal	Hippocampus	0.07 (0.03)	0.06	0.74	0.09 (0.03)	0.006	0.95	0.65
	Amygdala	0.10 (0.03)	0.01	1.22	0.06 (0.03)	0.05	0.47	0.20
	Inferior Temporal	0.11 (0.03)	<0.001	1.93	0.05 (0.02)	0.07	0.38	0.02
	Fusiform	0.11 (0.03)	0.002	1.69	0.04 (0.02)	0.18	0.20	0.04
	Superior Temporal	0.04 (0.03)	0.25	0.29	0.06 (0.02)	0.03	0.59	0.93
	Transverse Temporal	0.03 (0.03)	0.50	0.11	0.07 (0.02)	0.03	0.63	0.24
	Middle Temporal	0.05 (0.03)	0.11	0.49	0.04 (0.02)	0.15	0.25	0.22
	Bank Sup Temp Sulcus ^b	0.01 (0.03)	0.92	0.01	0.06 (0.03)	0.05	0.48	NA
	Entorhinal cortex	0.06 (0.03)	0.16	0.4	0.02 (0.03)	0.52	0.05	NA
	Parahippocampal gyrus	0.04 (0.03)	0.39	0.16	0.01 (0.03)	0.71	0.01	NA
	Temporal Pole	0.06 (0.03)	0.16	0.38	-0.02 (0.03)	0.65	0.02	NA
Occipital	Lateral Occipital	0.07 (0.03)	0.06	0.73	0.03 (0.02)	0.24	0.16	0.13

	Cuneus Cortex	0.00 (0.03)	0.96	0.00	0.02 (0.03)	0.55	0.04	NA
	Pericalcarine	0.02 (0.03)	0.69	0.05	0 (0.03)	0.87	0.00	NA
	Lingual	-0.01 (0.03)	0.93	0.01	0.02 (0.03)	0.46	0.06	NA
Insular cortex		0.06 (0.03)	0.07	0.7	0.05 (0.02)	0.07	0.42	0.53
Cingulate	Posterior Cingulate	0.07 (0.03)	0.06	0.82	0.08 (0.02)	0.006	0.95	0.99
	Rostral Anterior	0.07 (0.03)	0.08	0.65	0.05 (0.02)	0.07	0.38	0.58
	Caudal Anterior	0.03 (0.03)	0.57	0.08	0.07 (0.03)	0.03	0.56	0.31
	Isthmus of Cingulate	0.06 (0.03)	0.10	0.53	0.04 (0.02)	0.22	0.18	0.42
Deep Nuclei	Thalamus	0.06 (0.03)	0.09	0.58	0.1 (0.02)	<0.001	2.05	0.50
	Ventral Diencephalon	0.02 (0.03)	0.55	0.09	0.1 (0.02)	<0.001	1.59	0.08
	Caudate	0.06 (0.03)	0.10	0.53	0.03 (0.03)	0.32	0.11	0.21
	Nucleus Accumbens	0.04 (0.03)	0.38	0.19	0.04 (0.03)	0.22	0.17	NA
	Putamen	0.03 (0.03)	0.50	0.11	0.03 (0.02)	0.25	0.14	NA
	Pallidum	0.00 (0.03)	0.99	0.00	0.05 (0.03)	0.11	0.30	NA
Cerebellum	White Matter	0 (0.03)	0.95	0.00	0.09 (0.03)	0.006	0.92	0.11
	Cortex	0.00 (0.03)	0.95	0.00	0.04 (0.03)	0.15	0.25	NA
Cerebrum	White Matter	0.00 (0.02)	0.95	0.00	0.07	<0.001	1.69	0.009

					(0.02)			
	Cortex	0.10 (0.02)	<0.001	1.94	0.06 (0.02)	0.03	0.59	0.04
Inferior Lateral Ventricle		-0.04 (0.03)	0.39	0.17	-0.07 (0.03)	0.05	0.49	0.75
Lateral Ventricle		-0.02 (0.03)	0.62	0.06	-0.03 (0.03)	0.25	0.15	NA

Abbreviation: NA, not applicable.

^aCovariates in the multivariable model include age, sex, race/ethnicity, telomere length, and total cranial volume. The effect size of telomere length (beta) is reported as the mean difference in each regional brain size associated with a 1-SD unit difference in telomere length. *P* values for telomere length have been corrected for multiple comparisons. *P* values for interaction are reported for those regions that were associated with telomere length in the combined cohort.

^bFreeSurfer (<http://surfer.nmr.mgh.harvard.edu/>) term for the banks of the superior temporal sulcus.

eTable 2. Association of Subsegmental Brain Region Size With Telomere Length stratified by Age Group^a

Brain Region	Subsegmental Region	Age ≤50 years (n=1,013)			Age >50 years (n=947)			P-value for interaction	
		Beta (SE)	P-value	Partial R ²	Beta (SE)	P-value	Partial R ²		
Frontal	Pars Opercularis	0.08 (0.03)	0.03	0.92	0.06 (0.03)	0.08	0.48	0.65	
	Medial Orbito-Frontal	0.06 (0.03)	0.06	0.53	0.08 (0.03)	0.02	0.86	0.74	
	Lateral Orbito-Frontal	0.06 (0.02)	0.03	0.80	0.08 (0.02)	0.005	1.17	0.67	
	Paracentral Lobule	0.05 (0.03)	0.15	0.32	0.07 (0.03)	0.04	0.65	0.53	
	Pars Orbitalis	0.03 (0.03)	0.39	0.11	0.08 (0.03)	0.02	0.81	0.27	
	Precentral	0.05 (0.02)	0.06	0.50	0.04 (0.03)	0.17	0.26	0.94	
	Superior Frontal	0.06 (0.02)	0.03	0.67	0.02 (0.02)	0.49	0.07	0.26	
	Rostral Middle Frontal	0.01 (0.02)	0.84	0.01	0.07 (0.03)	0.02	0.79	0.12	
	Frontal Pole	0.05 (0.03)	0.24	0.21	0.00 (0.03)	0.97	0.00	NA	
	Caudal Middle Frontal	0.07 (0.03)	0.03	0.69	-0.03 (0.03)	0.38	0.11	NA	
	Pars Triangularis	0.00 (0.03)	0.89	0.00	0.01 (0.03)	0.70	0.02	NA	
	Parietal	Precuneus	0.08 (0.02)	0.01	1.37	0.10 (0.02)	<0.001	1.81	0.57

	Inferior Parietal	0.02 (0.02)	0.51	0.07	0.13 (0.03)	<0.001	2.7	0.001
	Posterior Central	0.06 (0.02)	0.05	0.59	0.09 (0.03)	0.005	1.19	0.35
	Superior Parietal	0.01 (0.02)	0.71	0.02	0.11 (0.03)	<0.001	1.78	0.004
	Supramarginal	0.02 (0.02)	0.39	0.11	0.04 (0.03)	0.17	0.26	NA
Temporal	Hippocampus	0.05 (0.02)	0.07	0.48	0.10 (0.03)	0.004	1.27	0.04
	Amygdala	0.08 (0.03)	0.03	0.80	0.07 (0.03)	0.04	0.64	0.60
	Inferior Temporal	0.06 (0.02)	0.03	0.80	0.07 (0.02)	0.01	0.94	0.73
	Fusiform	0.03 (0.02)	0.31	0.15	0.09 (0.03)	0.002	1.43	0.03
	Superior Temporal	0.05 (0.02)	0.07	0.46	0.05 (0.02)	0.10	0.41	0.77
	Transverse Temporal	0.06 (0.03)	0.05	0.56	0.04 (0.03)	0.19	0.24	0.66
	Middle Temporal	0.04 (0.02)	0.14	0.34	0.04 (0.02)	0.13	0.34	0.85
	Bank Sup Temp Sulcus ^b	0.01 (0.03)	0.87	0.00	0.07 (0.03)	0.05	0.58	NA
	Entorhinal cortex	0.01 (0.03)	0.70	0.03	0.05 (0.03)	0.15	0.3	NA
	Parahippocampal gyrus	0.00 (0.03)	0.95	0.00	0.04 (0.03)	0.21	0.22	NA
	Temporal Pole	0.02 (0.03)	0.69	0.03	0.02 (0.03)	0.55	0.05	NA

Occipital	Lateral Occipital	0.04 (0.02)	0.17	0.29	0.05 (0.03)	0.10	0.39	0.76
	Cuneus Cortex	-0.01 (0.03)	0.84	0.01	0.03 (0.03)	0.31	0.14	NA
	Pericalcarine	-0.01 (0.03)	0.71	0.02	0.04 (0.03)	0.26	0.17	NA
	Lingual	-0.02 (0.03)	0.56	0.06	0.04 (0.03)	0.24	0.19	NA
Insular cortex		0.05 (0.02)	0.06	0.54	0.06 (0.02)	0.04	0.64	0.79
Cingulate	Posterior Cingulate	0.07 (0.02)	0.03	0.77	0.09 (0.03)	0.005	1.16	0.80
	Rostral Anterior	0.07 (0.03)	0.03	0.78	0.05 (0.03)	0.10	0.41	0.55
	Caudal Anterior	0.03 (0.03)	0.34	0.13	0.07 (0.03)	0.04	0.65	0.39
	Isthmus of Cingulate	0.03 (0.02)	0.29	0.18	0.05 (0.03)	0.10	0.41	0.69
Deep Nuclei	Thalamus	0.07 (0.02)	0.02	1.15	0.08 (0.02)	0.003	1.32	0.70
	Ventral Diencephalon	0.07 (0.02)	0.02	0.99	0.05 (0.02)	0.10	0.42	0.58
	Caudate	0.03 (0.03)	0.30	0.17	0.05 (0.03)	0.13	0.33	0.98
	Nucleus Accumbens	0.05 (0.03)	0.20	0.25	0.03 (0.03)	0.43	0.09	NA
	Putamen	0.07 (0.02)	0.03	0.71	-0.01 (0.03)	0.67	0.03	NA
	Pallidum	0.04 (0.03)	0.19	0.27	0.01 (0.03)	0.86	0.00	NA

Cerebellum	White Matter	0.04 (0.03)	0.21	0.24	0.06 (0.03)	0.12	0.35	0.32
	Cortex	0.03 (0.02)	0.39	0.11	0.03 (0.03)	0.42	0.09	NA
Cerebrum	White Matter	0.03 (0.02)	0.06	0.54	0.04 (0.02)	0.07	0.50	0.26
	Cortex	0.05 (0.02)	0.03	0.74	0.1 (0.03)	0.001	1.60	0.16
Inferior Lateral Ventricle		-0.05 (0.03)	0.17	0.30	-0.05 (0.03)	0.15	0.29	0.50
Lateral Ventricle		-0.04 (0.03)	0.31	0.16	-0.02 (0.03)	0.59	0.04	NA

Abbreviation: NA, not applicable.

^aCovariates in the multivariable models include age, sex, race/ethnicity, telomere length and total cranial volume. The effect size of telomere (beta) is reported as the mean difference in each regional brain size associated with a 1-SD unit difference in telomere length. *P* values for telomere length have been corrected for multiple comparisons. *P* values for interaction are reported for those regions that were associated with telomere length in the combined cohort.

^bFreeSurfer (<http://surfer.nmr.mgh.harvard.edu/>) term for the banks of the superior temporal sulcus.

eTable 3. Association of Subsegmental Brain Region Size with Telomere Length After Adjustment for Additional Covariates^a

Brain Region	Subsegmental Region	Model (n=1915)			
		Beta (SE)	P-value	Partial R ²	
Frontal	Pars Opercularis	0.06 (0.02)	0.006	0.51	
	Medial Orbito-Frontal	0.06 (0.02)	0.002	0.63	
	Lateral Orbito-Frontal	0.06 (0.02)	0.002	0.70	
	Paracentral Lobule	0.05 (0.02)	0.04	0.28	
	Pars Orbitalis	0.05 (0.02)	0.03	0.31	
	Precentral	0.04 (0.02)	0.04	0.26	
	Superior Frontal	0.03 (0.02)	0.10	0.18	
	Rostral Middle Frontal	0.03 (0.02)	0.11	0.17	
	Frontal Pole	0.04 (0.02)	0.16	0.13	
	Caudal Middle Frontal	0.01 (0.02)	0.59	0.02	
	Pars Triangularis	0.00 (0.02)	0.97	0.00	
	Parietal	Precuneus	0.08 (0.02)	<0.001	1.31
		Inferior Parietal	0.06 (0.02)	0.002	0.67
Posterior Central		0.06 (0.02)	0.002	0.66	
Superior Parietal		0.05 (0.02)	0.009	0.47	
Supramarginal		0.02 (0.02)	0.21	0.10	
Temporal	Hippocampus	0.08 (0.02)	<0.001	0.85	
	Amygdala	0.07 (0.02)	0.002	0.67	
	Inferior Temporal	0.06 (0.02)	0.002	0.71	
	Fusiform	0.05 (0.02)	0.007	0.50	
	Superior Temporal	0.05 (0.02)	0.02	0.40	
	Transverse Temporal	0.05 (0.02)	0.04	0.30	
	Middle Temporal	0.04 (0.02)	0.04	0.29	
	Bank Sup Temp Sulcus ^b	0.03 (0.02)	0.22	0.10	
	Entorhinal cortex	0.04 (0.02)	0.10	0.18	
	Parahippocampal gyrus	0.02 (0.02)	0.42	0.04	
Temporal Pole	0.01 (0.02)	0.59	0.02		
Occipital	Lateral Occipital	0.04 (0.02)	0.03	0.31	
	Cuneus Cortex	0.01 (0.02)	0.70	0.01	
	Pericalcarine	0.01 (0.02)	0.70	0.01	
	Lingual	0.00 (0.02)	0.83	0.00	
Insular cortex		0.04 (0.02)	0.02	0.35	
Cingulate	Posterior Cingulate	0.06 (0.02)	0.002	0.67	
	Rostral Anterior	0.05 (0.02)	0.01	0.42	
	Caudal Anterior	0.04 (0.02)	0.06	0.23	
	Isthmus of Cingulate	0.04 (0.02)	0.04	0.26	

Deep Nuclei	Thalamus	0.07 (0.02)	<0.001	1.02
	Ventral Diencephalon	0.05 (0.02)	0.004	0.57
	Caudate	0.04 (0.02)	0.08	0.20
	Nucleus Accumbens	0.04 (0.02)	0.12	0.16
	Putamen	0.03 (0.02)	0.14	0.14
	Pallidum	0.02 (0.02)	0.33	0.06
Cerebellum	White Matter	0.05 (0.02)	0.04	0.27
	Cortex	0.02 (0.02)	0.39	0.05
Cerebrum	White Matter	0.04 (0.01)	0.004	0.56
	Cortex	0.06 (0.02)	<0.001	0.91
Inferior Lateral Ventricle		-0.06 (0.02)	0.02	0.36
Lateral Ventricle		-0.03 (0.02)	0.14	0.14

^aCovariates in the multivariable model include age, sex, race/ethnicity, telomere length, total cranial volume, body mass index, systolic blood pressure, diabetes mellitus and smoking status. The effect size of telomere length (beta) is reported as the mean difference in each regional brain size associated with a 1-SD unit difference in telomere length. *P* values have been corrected for multiple comparisons.

^bFreeSurfer (<http://surfer.nmr.mgh.harvard.edu/>) term for the banks of the superior temporal sulcus.

eTable 4. Association of Subsegmental Brain Region Size with Telomere Length After Adjustment for APOE Genotype in Addition to Other Covariates^a

		Model + APO ε2		Model + APO ε3		Model + APO ε4	
		(n=1372)		(n=1372)		(n=1372)	
Brain Region	Subsegmental Region	Beta (SE)	P-value	Beta (SE)	P-value	Beta (SE)	P-value
Frontal	Pars Opercularis	0.04 (0.02)	0.12	0.04 (0.02)	0.12	0.04 (0.02)	0.12
	Medial Orbito-Frontal	0.07 (0.02)	0.005	0.07 (0.02)	0.005	0.07 (0.02)	0.005
	Lateral Orbito-Frontal	0.08 (0.02)	<0.001	0.08 (0.02)	<0.001	0.08 (0.02)	<0.001
	Paracentral Lobule	0.05 (0.02)	0.05	0.05 (0.02)	0.05	0.05 (0.02)	0.05
	Pars Orbitalis	0.07 (0.02)	0.005	0.07 (0.02)	0.005	0.07 (0.02)	0.005
	Precentral	0.05 (0.02)	0.02	0.05 (0.02)	0.02	0.05 (0.02)	0.02
	Superior Frontal	0.05 (0.02)	0.01	0.05 (0.02)	0.01	0.05 (0.02)	0.01
	Rostral Middle Frontal	0.06 (0.02)	0.007	0.06 (0.02)	0.007	0.06 (0.02)	0.007
	Frontal Pole	0.01 (0.03)	0.83	0.01 (0.03)	0.83	0.01 (0.03)	0.84
	Caudal Middle Frontal	0.03 (0.02)	0.22	0.03 (0.02)	0.22	0.03 (0.02)	0.22
Parietal	Pars Triangularis	0.02 (0.02)	0.50	0.02 (0.02)	0.49	0.02 (0.02)	0.49
	Precuneus	0.09 (0.02)	<0.001	0.09 (0.02)	<0.001	0.09 (0.02)	<0.001
	Inferior Parietal	0.06 (0.02)	0.007	0.06 (0.02)	0.007	0.06 (0.02)	0.007
	Posterior Central	0.08 (0.02)	<0.001	0.08 (0.02)	<0.001	0.08 (0.02)	<0.001
	Superior Parietal	0.06 (0.02)	0.02	0.06 (0.02)	0.02	0.06 (0.02)	0.02
	Supramarginal	0.05 (0.02)	0.03	0.05 (0.02)	0.03	0.05 (0.02)	0.03
	Temporal	Hippocampus	0.12 (0.02)	<0.001	0.12 (0.02)	<0.001	0.12 (0.02)
Amygdala		0.11 (0.02)	<0.001	0.11 (0.02)	<0.001	0.11 (0.02)	<0.001
Inferior Temporal		0.08 (0.02)	<0.001	0.08 (0.02)	<0.001	0.08 (0.02)	<0.001

	Fusiform	0.06 (0.02)	0.005	0.06 (0.02)	0.005	0.06 (0.02)	0.005
	Superior Temporal	0.08 (0.02)	<0.001	0.08 (0.02)	<0.001	0.08 (0.02)	<0.001
	Transverse Temporal	0.05 (0.02)	0.03	0.05 (0.02)	0.03	0.05 (0.02)	0.03
	Middle Temporal	0.05 (0.02)	0.02	0.05 (0.02)	0.02	0.05 (0.02)	0.02
	Bank Sup Temp Sulcus ^b	0.06 (0.02)	0.02	0.06 (0.02)	0.02	0.06 (0.02)	0.02
	Entorhinal cortex	0.06 (0.02)	0.02	0.06 (0.02)	0.02	0.06 (0.02)	0.02
	Parahippocampal gyrus	0.03 (0.02)	0.19	0.03 (0.02)	0.19	0.03 (0.02)	0.19
	Temporal Pole	0.04 (0.03)	0.11	0.05 (0.03)	0.11	0.05 (0.03)	0.11
Occipital	Lateral Occipital	0.03 (0.02)	0.13	0.03 (0.02)	0.13	0.03 (0.02)	0.13
	Cuneus Cortex	0.02 (0.02)	0.41	0.02 (0.02)	0.42	0.02 (0.02)	0.42
	Pericalcarine	0.03 (0.02)	0.30	0.03 (0.02)	0.31	0.03 (0.02)	0.31
	Lingual	0.02 (0.02)	0.41	0.02 (0.02)	0.42	0.02 (0.02)	0.42
Insular cortex		0.06 (0.02)	0.004	0.06 (0.02)	0.004	0.06 (0.02)	0.004
Cingulate	Posterior Cingulate	0.09 (0.02)	<0.001	0.09 (0.02)	<0.001	0.09 (0.02)	<0.001
	Rostral Anterior	0.06 (0.02)	0.01	0.06 (0.02)	0.01	0.06 (0.02)	0.01
	Caudal Anterior	0.04 (0.02)	0.11	0.04 (0.02)	0.11	0.04 (0.02)	0.11
	Isthmus of Cingulate	0.06 (0.02)	0.02	0.06 (0.02)	0.02	0.06 (0.02)	0.02
Deep Nuclei	Thalamus	0.09 (0.02)	<0.001	0.09 (0.02)	<0.001	0.09 (0.02)	<0.001
	Ventral Diencephalon	0.08 (0.02)	<0.001	0.08 (0.02)	<0.001	0.08 (0.02)	<0.001
	Caudate	0.05 (0.02)	0.03	0.05 (0.02)	0.03	0.05 (0.02)	0.03
	Nucleus Accumbens	0.06 (0.02)	0.03	0.06 (0.02)	0.03	0.06 (0.02)	0.03
	Putamen	0.05 (0.02)	0.03	0.05 (0.02)	0.03	0.05 (0.02)	0.03
	Pallidum	0.04 (0.02)	0.06	0.04 (0.02)	0.06	0.04 (0.02)	0.06

Cerebellum	White Matter	0.03 (0.02)	0.24	0.03 (0.02)	0.24	0.03 (0.02)	0.24
	Cortex	0.03 (0.02)	0.22	0.03 (0.02)	0.22	0.03 (0.02)	0.22
Cerebrum	White Matter	0.05 (0.01)	0.004	0.05 (0.01)	0.004	0.05 (0.01)	0.004
	Cortex	0.09 (0.02)	<0.001	0.09 (0.02)	<0.001	0.09 (0.02)	<0.001
Inferior Lateral Ventricle		-0.08 (0.03)	0.005	-0.08 (0.03)	0.005	-0.08 (0.03)	0.005
Lateral Ventricle		-0.06 (0.02)	0.03	-0.06 (0.02)	0.03	-0.06 (0.02)	0.03

^aCovariates in the multivariable models include age, sex, race/ethnicity, telomere length, total cranial volume, body mass index, systolic blood pressure, diabetes mellitus, smoking status and one of three different *APOE* genotypes (ϵ 2, ϵ 3 or ϵ 4). The effect size of telomere (beta) is reported as the mean difference in each regional brain size associated with a 1-SD unit difference in telomere length. *P* values have been corrected for multiple comparisons.

^bFreeSurfer (<http://surfer.nmr.mgh.harvard.edu/>) term for the banks of the superior temporal sulcus.