Translating Imaging-based Brain Age Models for Predicting Accelerated Brain Ageing in African Populations: A Pilot Study on a Nigerian Cohort.

Supplementary

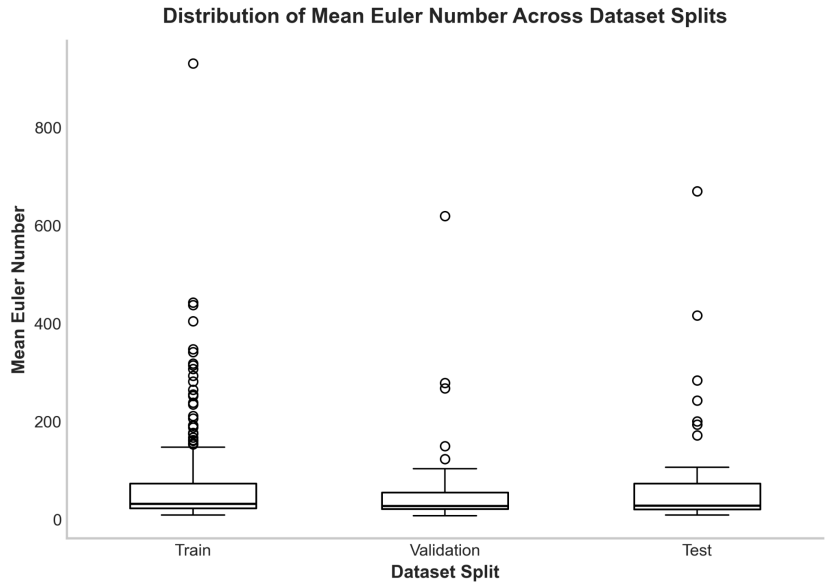
Supplementary Table 1: Nigerian Participants demographics per data split

Data Split	N	Sex (male/female)	Age range	Mean (SD)
Train	216	102/114	18 - 85	41.15 (18.45)
Validation	46	24/22	18 - 84	38.72 (16.56)
Test	47	19/28	18 - 88	40.34 (18.74)
Total	309	145/164	18 - 88	40.66 (18.19)

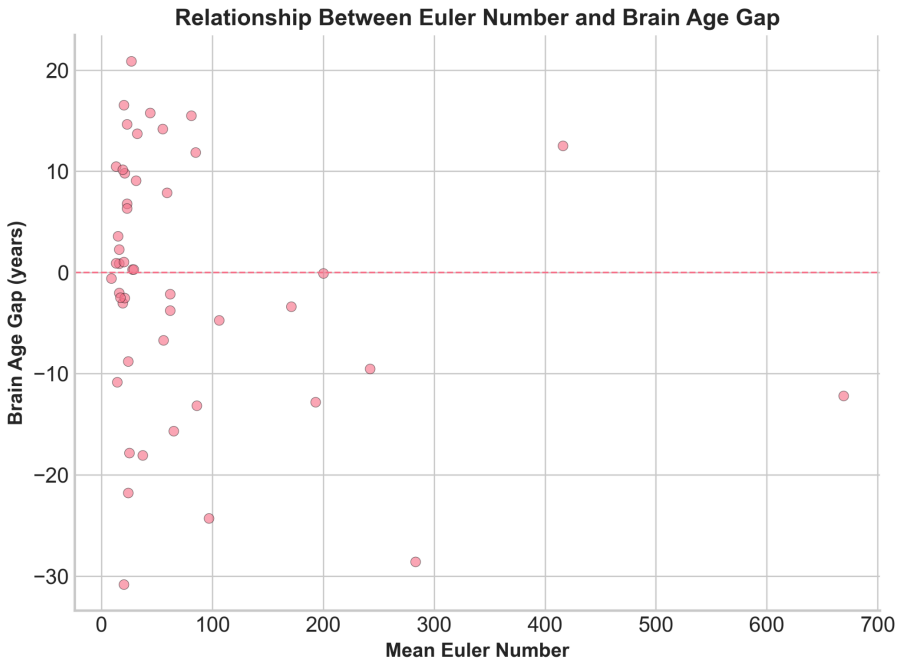
Supplementary Table 2: Euler Number distribution per data split in the Nigerian cohort

Data Split	Mean Euler Number			
	< 51	**51 - 100**	**101 – 200**	**> 200**
Train (216)	144 (66.7%)	25 (11.6%)	29 (13.4%)	18 (8.3%)
Validation (46)	31 (45.7%)	9 (19.6%)	3 (6.5%)	3 (6.5%)
Test (47)	29 (61.7%)	10 (21.3%)	4 (8.5%)	4 (8.5%)
All (309)	204 (66.0%)	44 (14.2%)	36 (11.7%)	25 (8.1%)

Supplementary Figure 1: Euler Number distribution plots



Supplementary Figure 2



Spearman ρ = -0.228; p-value = 0.1240

Supplementary Table 3: Sex-stratified Model performance on the Internal Nigerian dataset (N=44)

Model	Sex	N	Age (years)	MAE (years)	R^2	r	BrainPAD (years)
PyBrainAge	M	19	46.00 (18.90)	11.14	0.48	0.72	-2.86 ± 13.30
	F	25	37.72 (18.64)	10.06	0.49	0.72	-2.59 ± 13.06
	All	44	41.29 (18.99)	10.52	0.51	0.73	-2.71 ± 12.86
ENIGMA BrainAge	M	19	46.00 (18.90)	26.98	-1.56	0.77	-26.98 ± 12.1
	F	25	37.72 (18.64)	10.31	0.50	0.73	-3.09 ± 13.34
	All	44	41.29 (18.99)	17.51	-0.35	0.47	-13.41 ± 17.24
SynthBA	M	19	46.00 (18.90)	15.48	-0.13	0.36	-7.57 ± 18.53
	F	25	37.72 (18.64)	9.93	0.37	0.64	-3.10 ± 14.39
	All	44	41.29 (18.99)	12.33	0.19	0.54	-5.03 ± 16.07
SPARROW	M	19	46.00 (18.90)	7.72	0.73	0.86	-1.32 ± 9.72
	F	25	37.72 (18.64)	7.98	0.66	0.83	-0.01 ± 10.83
	All	44	41.29 (18.99)	7.87	0.71	0.85	-0.58 ± 10.15

PS-GPR	M	19	46.00 (18.90)	11.18	0.44	0.71	-4.36 ± 13.40
	F	25	37.72 (18.64)	9.52	0.56	0.78	0.87 ± 12.27
	All	44	41.29 (18.99)	10.24	0.53	0.74	-1.39 ± 12.74

Supplementary Table 4: Models performance on entire Internal Nigerian dataset (N=47).

Model	Reported results					Nigerian-data results					
	N	Age (SD) (years)	MAE (years)	R^2	r	N (M/F)	Age (SD) (years)	MAE (years)	R^2	r	BrainPAD (years)
PyBrainAge (M/F)	29,175 (14,267/14,908)	46.9(24.4)	4.7	0.42	0.66	47 (19/28)	40.34 (18.53)	10.00	0.53	0.74	-2.57 ± 12.47
ENIGMA BrainAge (M/F)	2188 (952/1236)	43.09 (15.32) / 39.37 (15.69)	6.5/6.8	0.72/ 0.69	0.85/ 0.83	47 (19/28)	40.34 (18.53)	16.70	-0.30	0.46	-12.48 ± 17.11
SynthBA (M/F)	4105 (1929/2176)	42-95	4.9	-	-	47 (19/28)	40.34 (18.53)	12.29	0.18	0.51	-4.06 ± 16.29
SPARROW (M/F)	40,497 (18,766/21,548)	66(8.23)	2.56	0.98	0.95	44* (19/25)	41.29 (18.77)	7.87	0.71	0.85	-0.58 ± 10.15
PS-GPR (M/F)	216 (101/115)	41.15(18.41)	-	-	-	47 (19/28)	40.34 (18.53)	9.82	0.55	0.76	-1.07± 12.40

**3 scans failed SPARROW processing steps and were not included in the model evaluation.*

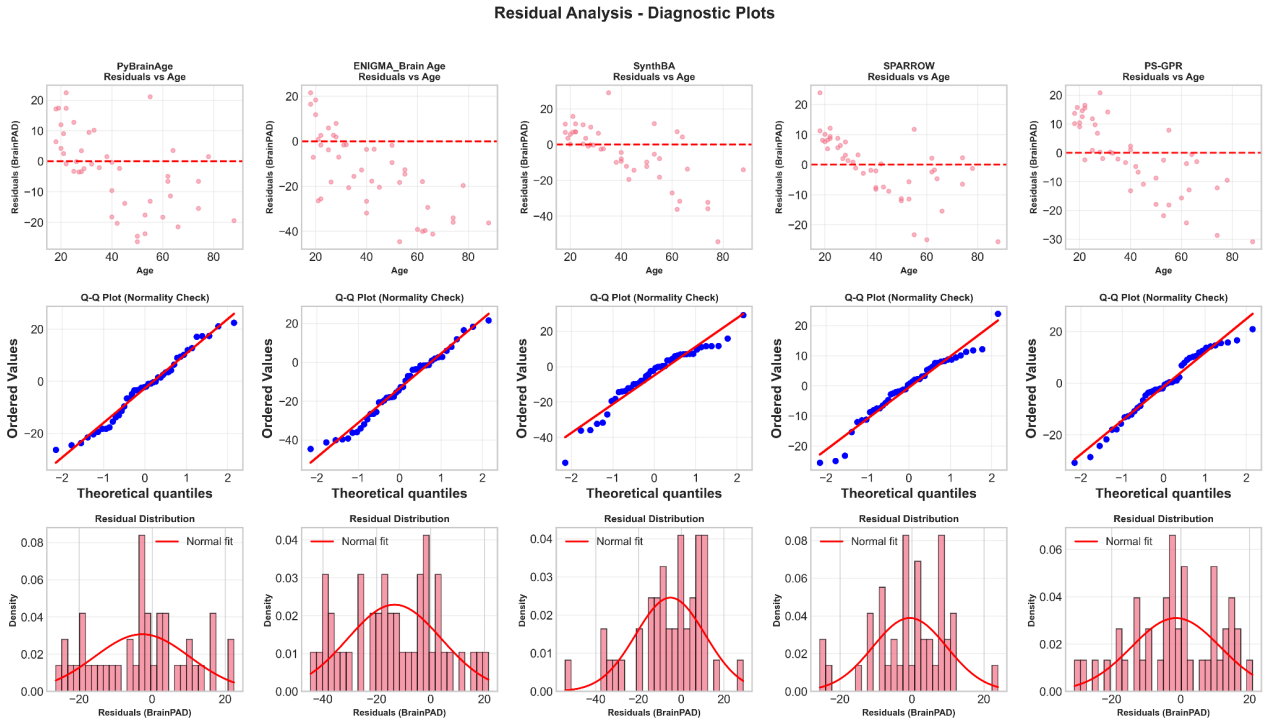
Supplementary Table 5: PS-GPR performance on the Internal and External Nigerian Test sets

PS-GPR	N	Age (years)	MAE (years)	RMSE (years)	R^2	r	BrainPAD
Internal test (Before bias correction)	47	40.34 ± 18.74	9.82	12.45	0.55	0.75	-1.07 ± 12.40
Internal test (after bias correction)	47	40.34 ± 18.74	6.39	7.71	0.83	0.93	-1.22 ± 7.61
External test (before bias correction	25	36.36 ± 11.45	13.29	15.82	-0.99	0.23	9.75 ± 12.71
External test (after bias correction)	25	36.36 ± 11.45	8.78	11.52	-0.05	0.71	7.35 ± 9.04

Supplementary Table 6: Models Performance on external Nigerian test set (25 participants)

Model	Age (SD) (years)	MAE (years)	RMSE (years)	R^2	r	BrainPAD (years)
PyBrainAge	36.36 (11.45)	13.87	18.22	-1.64	0.02	8.48 ± 16.46
ENIGMA-BrainAge	36.36 (11.45)	33.25	42.36	-13.25	0.53	31.02 ± 29.44
SynthBA	36.36 (11.45)	12.76	15.98	-1.03	0.51	-6.75 ± 14.78
SPARROW	36.36 (11.45)	10.52	12.43	-0.23	0.60	6.86 ± 10.57
PS-GPR	36.36 (11.45)	13.29	15.82	-0.99	0.23	9.75 ± 12.71

Supplementary Figure 3: Residual Diagnostics of brain age predictions across all models



Residuals (BrainPAD; predicted age minus chronological age) are shown against chronological age (top row), with the dashed red line indicating zero residual. All models demonstrate an age-dependent residual pattern, with predominantly positive residuals in younger participants and increasingly negative residuals with advancing age, indicating systematic age-related prediction bias. Q–Q plots (middle row) show approximate

agreement with a normal distribution in the central range but deviations at the distributional tails. Residual histograms with fitted normal density curves (bottom row) further demonstrate non-Gaussian features and substantial dispersion in prediction errors across models.

Supplementary Table 7: Model Performance, Internal and External test sets

Model	MAE (int_test n=44)	BrainPAD (years)	MAE_adults (ext_test n=25)	BrainPAD (years)
PyBrainAge	10.52	-2.71 ± 12.86	13.87	8.48 ± 16.46
ENIGMA	17.51	-13.41 ± 17.24	33.25	31.02 ± 29.44
SynthBA	12.33	-5.03 ± 16.07	12.76	-6.75 ± 14.78
SPARROW	7.87	-0.58 ± 10.15	10.52	6.86 ± 10.57
PS-GPR	10.24	-1.39 ± 12.74	13.29	9.75 ± 12.71