Web Supplement for "Association between body fat and body mass index from incomplete longitudinal proportion data: Findings from the Fels study"
by

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Web Supplement A: Study 1

		BMI		PBF	
		Parameter	Estimate	Parameter	Estimate
Fixed effects					
I	Intercept	β_{00}	25.593*	γ_{00}	-1.426*
	Sex	β_{01}	-0.574	γ_{01}	0.684*
$Time$	Intercept	β_{10}	0.357*	γ_{10}	0.017*
	Sex	β_{11}	-0.032	γ_{11}	0.002
Random effects					
Var(I)		$\boldsymbol{\Sigma}_\zeta(1,1)$	38.245*	$\boldsymbol{\Sigma}_\xi(1,1)$	0.123*
Var(S)		$\boldsymbol{\Sigma}_\zeta(2,2)$	0.083*	$\boldsymbol{\Sigma}_\xi(2,2)$	0.002*
Cov(I, S)		$\boldsymbol{\Sigma}_\zeta(1,2)$	1.432*	$\boldsymbol{\Sigma}_\xi(1,2)$	0.000
Precision		ϕ	-	ϕ	60.436*
Residual		σ_u^2	1.672*	σ_u^2	-

Table A.1: Results for the linear growth curve model for BMI and PBF. Values followed by an asterisk (*) have 95% credibility intervals that do not include 0.

		BMI		PBF	
		Parameter	Estimate	Parameter	Estimate
Fixed effects					
I	Intercept	β_{00}	25.319*	γ_{00}	-1.414*
	Sex	β_{01}	-0.578	γ_{01}	0.671*
$Time$	Intercept	β_{10}	0.152*	γ_{10}	0.033*
	Sex	β_{11}	-0.010	γ_{11}	-0.019*
$Time^2$	Intercept	β_{20}	-0.007*	γ_{20}	0.000
	Sex	β_{21}	0.002	γ_{21}	0.000
Random effects					
Var(I)		$\boldsymbol{\Sigma}_\zeta(1,1)$	26.994*	$\boldsymbol{\Sigma}_\xi(1,1)$	0.136*
Var(S)		$\boldsymbol{\Sigma}_\zeta(2,2)$	0.072*	$\boldsymbol{\Sigma}_\xi(2,2)$	0.005*
Var(Q)		$\boldsymbol{\Sigma}_\zeta(3,3)$	0.002*	$\boldsymbol{\Sigma}_\xi(3,3)$	0.001*
Cov(I, S)		$\boldsymbol{\Sigma}_\zeta(1,2)$	0.197*	$\boldsymbol{\Sigma}_\xi(1,2)$	-0.006*
Cov(I, Q)		$\boldsymbol{\Sigma}_\zeta(1,3)$	-0.041*	$\boldsymbol{\Sigma}_\xi(1,3)$	0.000
Cov(S, Q)		$\boldsymbol{\Sigma}_\zeta(2,3)$	0.000	$\boldsymbol{\Sigma}_\xi(2,3)$	0.000
Precision		ϕ	-	ϕ	66.130*
Residual		σ_u^2	1.353*	σ_u^2	-

Table A.2: Results for the quadratic growth curve model for BMI and PBF. Values followed by an asterisk (*) have 95% credibility intervals that do not include 0.

		BMI		PBF	
		Parameter	Estimate	Parameter	Estimate
Fixed effects					
I	Intercept	β_{00}	25.346*	γ_{00}	-
	Sex	β_{01}	-0.973*	γ_{01}	-
$Time$	Intercept	β_{10}	0.159*	γ_{10}	-
	Sex	β_{11}	-0.007	γ_{11}	-
$Time^2$	Intercept	β_{20}	-0.005	γ_{20}	-
	Sex	β_{21}	0.009	γ_{21}	-
$Time^3$	Intercept	β_{30}	0.000	γ_{30}	-
	Sex	β_{31}	0.000	γ_{31}	-
Random effects					
Var(I)		$\boldsymbol{\Sigma}_\zeta(1,1)$	30.772*	$\boldsymbol{\Sigma}_\xi(1,1)$	-
Var(S)		$\boldsymbol{\Sigma}_\zeta(2,2)$	0.049*	$\boldsymbol{\Sigma}_\xi(2,2)$	-
Var(Q)		$\boldsymbol{\Sigma}_\zeta(3,3)$	0.004*	$\boldsymbol{\Sigma}_\xi(3,3)$	-
Var(C)		$\boldsymbol{\Sigma}_\zeta(4,4)$	0.001*	$\boldsymbol{\Sigma}_\xi(4,4)$	-
Cov(I, S)		$\boldsymbol{\Sigma}_\zeta(1,2)$	0.347*	$\boldsymbol{\Sigma}_\xi(1,2)$	-
Cov(I, Q)		$\boldsymbol{\Sigma}_\zeta(1,3)$	-0.141*	$\boldsymbol{\Sigma}_\xi(1,3)$	-
Cov(I, C)		$\boldsymbol{\Sigma}_\zeta(1,4)$	-0.001	$\boldsymbol{\Sigma}_\xi(1,4)$	-
Cov(S, Q)		$\boldsymbol{\Sigma}_\zeta(2,3)$	-0.002*	$\boldsymbol{\Sigma}_\xi(2,3)$	-
Cov(S, C)		$\boldsymbol{\Sigma}_\zeta(2,4)$	0.000	$\boldsymbol{\Sigma}_\xi(2,4)$	-
Cov(Q, C)		$\boldsymbol{\Sigma}_\zeta(3,4)$	0.000	$\boldsymbol{\Sigma}_\xi(3,4)$	-
Precision		ϕ	-	ϕ	-
Residual		σ_u^2	1.109*	σ_u^2	-

Table A.3: Results for the cubic growth curve model for BMI and PBF. Values followed by an asterisk (*) have 95% credibility intervals that do not include 0. The cubic growth curve model didn't converge for PBF.

Web Supplement B: Study 2

	BMI		PBF	
	WAIC	LOO	WAIC	LOO
Linear GCM	10261.6	10480.0	-14717.9	**-14476.4**
Quadratic GCM	9964.0	10556.8	**-14841.4**	-14285.7
Cubic GCM	**9474.3**	**10436.2**	-	-

Table B.1: WAIC and LOO values for linear, quadratic, and cubic growth curve models that are fitted to the BMI and PBF data respectively

		BMI		PBF	
		Parameter	Estimate	Parameter	Estimate
Fixed effects					
I	Intercept	β_{00}	22.732*	γ_{00}	-1.379*
	Sex	β_{01}	0.960*	γ_{01}	0.493*
	BP	τ_1	0.177*	ν_1	-0.024*
	Bicep	τ_2	0.915*	ν_2	0.123*
	BCimped	τ_3	-0.818*	ν_3	0.156*
	Waist	τ_4	3.712*	ν_4	0.351*
$Time$	Intercept	β_{10}	-0.006	γ_{10}	0.005*
	Sex	β_{11}	0.016*	γ_{11}	-0.002
BP	DBP	λ	1.001*	λ	1.000*
	Residual	σ_e^2	0.327*	σ_e^2	0.327*
	Var(BP)	σ_{BP}^2	0.673*	σ_{BP}^2	0.674*
Random effects					
Var(I)		$\mathbf{\Sigma}_\zeta(1,1)$	2.502*	$\mathbf{\Sigma}_\xi(1,1)$	0.043*
Var(S)		$\mathbf{\Sigma}_\zeta(2,2)$	0.007*	$\mathbf{\Sigma}_\xi(2,2)$	0.002*
Cov(I, S)		$\mathbf{\Sigma}_\zeta(1,2)$	0.074*	$\mathbf{\Sigma}_\xi(1,2)$	0.000
Precision		ϕ	-	ϕ	72.066*
Residual		σ_u^2	0.369*	σ_u^2	-

Table B.2: Results for the linear growth curve model for BMI and PBF. Values followed by an asterisk (*) have 95% credibility intervals that do not include 0.

		BMI		PBF	
		Parameter	Estimate	Parameter	Estimate
Fixed effects					
I	Intercept	β_{00}	22.835*	γ_{00}	-1.447*
	Sex	β_{01}	0.882*	γ_{01}	0.563*
	BP	τ_1	0.170*	ν_1	-0.011
	Bicep	τ_2	0.933*	ν_2	0.109*
	BCimped	τ_3	-0.774*	ν_3	0.118*
	Waist	τ_4	3.686*	ν_4	0.401*
$Time$	Intercept	β_{10}	0.016	γ_{10}	0.028*
	Sex	β_{11}	-0.021	γ_{11}	-0.018*
$Time^2$	Intercept	β_{20}	0.000	γ_{20}	0.000
	Sex	β_{21}	0.001	γ_{21}	0.000
BP	DBP	λ	1.001*	λ	1.000*
	Residual	σ_e^2	0.327*	σ_e^2	0.327*
	Var(BP)	σ_{BP}^2	0.673*	σ_{BP}^2	0.674*
Random effects					
Var(I)		$\mathbf{\Sigma}_\zeta(1,1)$	2.332*	$\mathbf{\Sigma}_\xi(1,1)$	0.035*
Var(S)		$\mathbf{\Sigma}_\zeta(2,2)$	0.015*	$\mathbf{\Sigma}_\xi(2,2)$	0.004*
Var(Q)		$\mathbf{\Sigma}_\zeta(3,3)$	0.001*	$\mathbf{\Sigma}_\xi(3,3)$	0.001*
Cov(I, S)		$\mathbf{\Sigma}_\zeta(1,2)$	0.003	$\mathbf{\Sigma}_\xi(1,2)$	-0.001*
Cov(I, Q)		$\mathbf{\Sigma}_\zeta(1,3)$	-0.003	$\mathbf{\Sigma}_\xi(1,3)$	0.000
Cov(S, Q)		$\mathbf{\Sigma}_\zeta(2,3)$	0.000	$\mathbf{\Sigma}_\xi(2,3)$	0.000
Precision		ϕ	-	ϕ	80.557*
Residual		σ_u^2	0.320*	σ_u^2	-

Table B.3: Results for the quadratic growth curve model for BMI and PBF. Values followed by an asterisk (*) have 95% credibility intervals that do not include 0.

		BMI		PBF	
		Parameter	Estimate	Parameter	Estimate
Fixed effects					
I	Intercept	β_{00}	23.100*	γ_{00}	-
	Sex	β_{01}	1.028*	γ_{01}	-
	BP	τ_1	0.143*	ν_1	-
	Bicep	τ_2	0.912*	ν_2	-
	BCimped	τ_3	-0.751*	ν_3	-
	Waist	τ_4	3.657*	ν_4	-
$Time$	Intercept	β_{10}	-0.024	γ_{10}	-
	Sex	β_{11}	0.024	γ_{11}	-
$Time^2$	Intercept	β_{20}	-0.004	γ_{20}	-
	Sex	β_{21}	0.001	γ_{21}	-
$Time^3$	Intercept	β_{30}	0.000	γ_{30}	-
	Sex	β_{31}	0.000	γ_{31}	-
BP	DBP	λ	1.002*	λ	-
	Residual	σ^2_e	0.327*	σ^2_e	-
	Var(BP)	σ^2_{BP}	0.673*	σ^2_{BP}	-
Random effects					
Var(I)		$\mathbf{\Sigma}_\zeta(1,1)$	3.073*	$\mathbf{\Sigma}_\xi(1,1)$	-
Var(S)		$\mathbf{\Sigma}_\zeta(2,2)$	0.015*	$\mathbf{\Sigma}_\xi(2,2)$	-
Var(Q)		$\mathbf{\Sigma}_\zeta(3,3)$	0.002*	$\mathbf{\Sigma}_\xi(3,3)$	-
Var(C)		$\mathbf{\Sigma}_\zeta(4,4)$	0.001*	$\mathbf{\Sigma}_\xi(4,4)$	-
Cov(I, S)		$\mathbf{\Sigma}_\zeta(1,2)$	0.018	$\mathbf{\Sigma}_\xi(1,2)$	-
Cov(I, Q)		$\mathbf{\Sigma}_\zeta(1,3)$	-0.019*	$\mathbf{\Sigma}_\xi(1,3)$	-
Cov(I, C)		$\mathbf{\Sigma}_\zeta(1,4)$	0.000	$\mathbf{\Sigma}_\xi(1,4)$	-
Cov(S, Q)		$\mathbf{\Sigma}_\zeta(2,3)$	0.000	$\mathbf{\Sigma}_\xi(2,3)$	-
Cov(S, C)		$\mathbf{\Sigma}_\zeta(2,4)$	0.000	$\mathbf{\Sigma}_\xi(2,4)$	-
Cov(Q, C)		$\mathbf{\Sigma}_\zeta(3,4)$	0.000	$\mathbf{\Sigma}_\xi(3,4)$	-
Precision		ϕ	-	ϕ	-
Residual		σ^2_u	0.272*	σ^2_u	-

Table B.4: Results for the cubic growth curve model for BMI and PBF. Values followed by an asterisk (*) have 95% credibility intervals that do not include 0. The cubic growth curve model did not converge for PBF.

Web Supplement C: Software

Associated `R/JAGS` scripts for the LGCM model implementation using simulated data are available at the `GitHub` link: `https://github.com/bandyopd/GCM`