

SUPPLEMENTAL MATERIALS

Figure S1. Relationship between the index pregnancy being delivered preterm and presence of cervical length measure at each gestational age. Increased odds ratios observed in M4 can be explained by parity status which was included as a covariate in all mediation models.

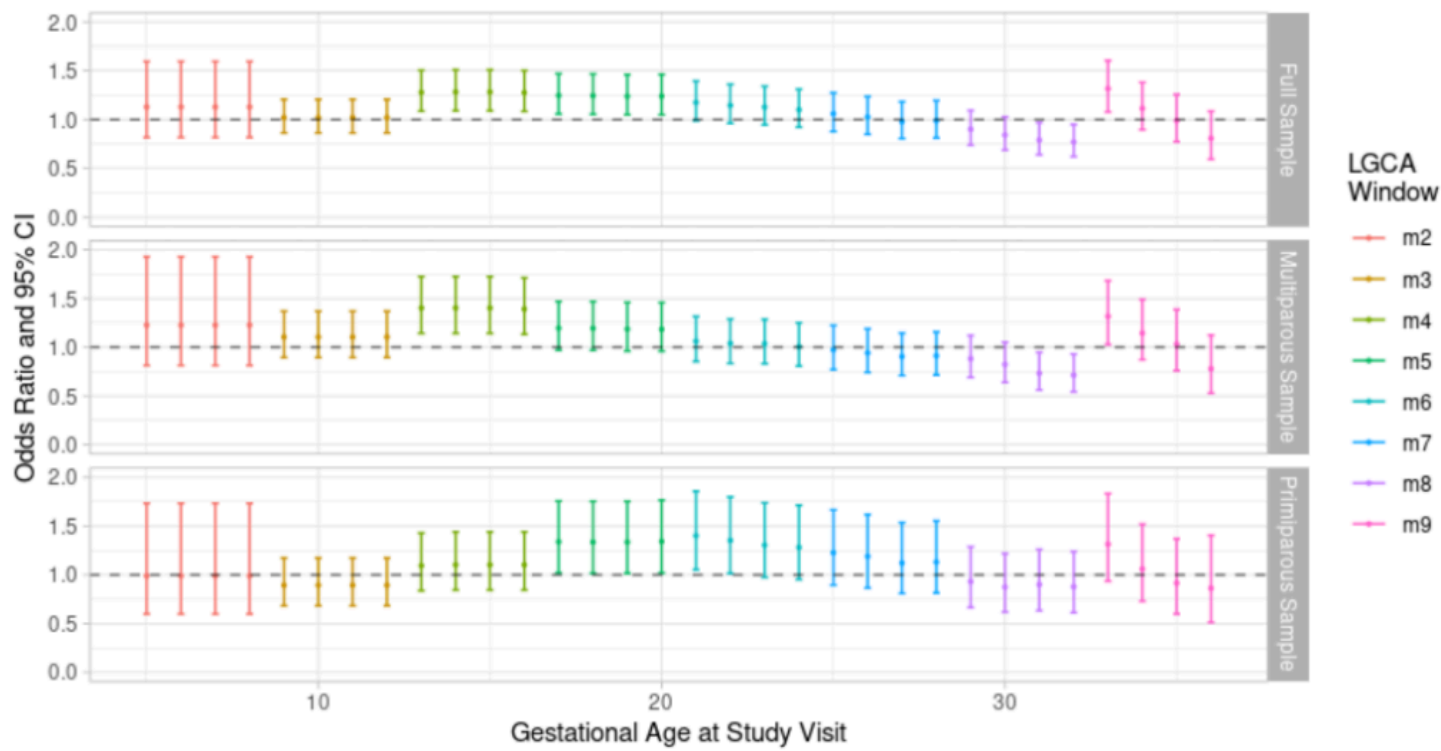


Table S1. Comparison of parameter estimates from Latent Growth Curve Analysis and Multilevel Models.

Modelling Method	I Estimate	L Estimate	Q Estimate
	Median (Range)	Median (Range)	Median (Range)
<i>Multilevel Model (R {lmer})</i>	35.9	2.23	-0.35
Non-binned data	(28.5, 43.9)	(-5.5, 8.8)	(-1.09, 0.49)
<i>Multilevel Model (R {nlme})</i>	37.0	1.87	-0.32
Binned data	(31.8, 49.0)	(-9.05, 11.1)	(-1.11, 0.79)
<i>Multilevel Model (Mplus)</i>	37.1	1.88	-0.33
Binned data	(31.2, 49.1)	(-10.3, 10.9)	(-1.09, 0.57)
<i>Latent Growth Curve (Mplus)</i>	38.5	1.30	-0.34
Binned data	(30.9, 46.8)	(-9.98, 8.14)	(-1.02, 0.66)

Table S2. Effect estimates of maternal predictors with cervical length mediators.

Predictor	Intercept (I) Mediator		Linear (L) Mediator		Quadratic (Q) Mediator	
	Coef _{Uni} / Coef _{Multi}	R^2_{Uni} / $\beta_{Importance}$	Coef _{Uni} / Coef _{Multi}	R^2_{Uni} / $\beta_{Importance}$	Coef _{Uni} / Coef _{Multi}	R^2_{Uni} / $\beta_{Importance}$
Maternal Age	0.064 (0.014)*** -0.031 (0.017)	0.005 1.000	0.016 (0.004)*** -0.003 (0.005)	0.004 0.142	0.000 (0.000) 0.002 (0.001)**	0 1.564
Maternal Depression	-0.186 (0.452) -0.338 (0.384)	0 0.106	-0.021 (0.121) -0.067 (0.117)	0 0.069	-0.005 (0.014) 0.011 (0.014)	0 0.057
Pre-pregnancy BMI	0.089 (0.009)*** 0.074 (0.008)	0.021 13.752	0.027 (0.002)*** 0.024 (0.002)***	0.027 20.888	-0.002 (0.000)*** -0.002 (0.000)***	0.008 2.876
Parity	0.515 (0.050)*** 0.712 (0.057)***	0.022 52.595	0.106 (0.013)*** 0.187 (0.017)***	0.014 42.703	-0.009 (0.002)*** -0.018 (0.002)***	0.007 12.948
Previous PTB	-0.810 (0.135)*** -1.528 (0.126)***	0.008 29.718	-0.291 (0.036)*** -0.483 (0.039)***	0.014 39.821	0.020 (0.004)*** 0.037 (0.004)***	0.005 7.392
Previous Abortion	-0.082 (0.054)* -0.162 (0.050)**	0 1.882	-0.049 (0.014)*** -0.072 (0.015)***	0.002 5.665	0.005 (0.001)*** 0.005 (0.002)**	0.002 1.000
Alcohol Use	0.476 (0.391) 0.132 (0.361)	0 0.004	-0.049 (0.105) -0.136 (0.104)	0 0.380	-0.023 (0.012)* -0.011 (0.012)	0.001 0.083
Smoking Status	0.366 (0.183)* 0.383 (0.174)*	0.001 0.837	0.066 (0.049) 0.103 (0.051)*	0 1.000	-0.010 (0.006)+ -0.007 (0.006)	0.001 0.135
Substance Use	0.338 (0.159)* 0.221 (0.147)	0.001 0.639	-0.008 (0.043) -0.013 (0.043)	0 0.021	-0.008 (0.005) -0.005 (0.005)	0 0.110

Coefficients are provided for both a univariate regression model with the specified mediator regressed on only a single predictor (Coef_{Uni}) or the coefficient from a multivariate regression model with the specified mediator regressed on all predictors (Coef_{Multi}). Variance inflation factor scores were below 2 for all predictors, indicating no multicollinearity concern. R^2_{Uni} is the adjusted r-square for the univariate model. $\beta_{Importance}$ is the contribution of the beta coefficient from a multivariate regression using standardize variables relative to the median beta value. For example, the relative contribution of Previous PTB to the Intercept Mediator is 4.811 times higher than the median contribution across all predictors. Standard errors in parentheses, t-tests are two-tailed, and p-values are unadjusted.

***p < 0.001. **p < 0.01. *p < 0.05. +p < 0.10.

Table S3. Association of cervical length mediators with gestational duration outcome.

Predictor	Mediator	Predictor Coef (SE)	Mediator Coef (SE)	Predictor x Mediator Coef (SE)	R ²
Maternal Age	I	0.023 (0.068)	0.185 (0.042)***	-0.001 (0.002)	0.071
	L	-0.036 (0.011)***	0.767 (0.155)***	-0.007 (0.006)	0.075
	Q	-0.026 (0.021)	-3.985 (1.425)**	0.013 (0.057)	0.043
Maternal Depression	I	-4.086 (2.532)	0.154 (0.009)***	0.096 (0.063)	0.062
	L	-0.195 (0.280)	0.583 (0.035)***	0.170 (0.230)	0.065
	Q	-1.029 (0.825)	-3.720 (0.311)***	-2.234 (2.301)	0.036
Pre-pregnancy BMI	I	-0.084 (0.045) ⁺	0.100 (0.033)**	0.002 (0.001)	0.064
	L	-0.013 (0.006)*	0.399 (0.126)**	0.006 (0.004)	0.069
	Q	-0.029 (0.014)*	-1.709 (1.108)	-0.068 (0.0347) ⁺	0.038
Parity	I	1.292 (0.276)***	0.187 (0.012)***	-0.031 (0.007)***	0.072
	L	0.037 (0.040)	0.666 (0.044)***	-0.083 (0.026)**	0.074
	Q	0.348 (0.091)***	-4.540 (0.399)***	0.770 (0.227)***	0.043
Previous PTB	I	-0.580 (0.563)	0.154 (0.010)***	-0.008 (0.015)	0.072
	L	-0.873 (0.106)***	0.583 (0.037)***	0.016 (0.055)	0.074
	Q	-1.076 (0.169)***	-3.626 (0.325)***	-0.257 (0.496)	0.043
Previous Abortion	I	-0.317 (0.252)	0.144 (0.012)***	0.007 (0.006)	0.064
	L	-0.014 (0.035)	0.549 (0.043)***	0.030 (0.024)	0.068
	Q	-0.214 (0.078)**	-3.125 (0.383)***	-0.511 (0.210)*	0.040
Alcohol Use	I	4.623 (1.901)*	0.148 (0.010)***	-0.111 (0.048)*	0.063
	L	0.231 (0.246)	0.556 (0.036)***	-0.413 (0.193)*	0.067
	Q	0.947 (0.539) ⁺	-3.584 (0.314)***	2.377 (1.547)	0.037
Smoking Status	I	0.073 (0.900)	0.153 (0.010)***	0.006 (0.023)	0.064
	L	0.336 (0.122)**	0.591 (0.039)***	0.062 (0.085)	0.069
	Q	0.290 (0.283)	-3.713 (0.339)***	-0.185 (0.786)	0.040
Substance Use	I	-1.315 (0.843)	0.159 (0.011)***	0.031 (0.021)	0.061
	L	-0.022 (0.104)	0.594 (0.040)***	0.061 (0.079)	0.065
	Q	-0.559 (0.256)*	-4.033 (0.351)***	-1.498 (0.712)*	0.037

Coefficients and standard errors are reported for the regression of the outcome on predictor, mediator, and predictor*mediator interaction terms. Model covariates included all other predictors but the R² value reported was from models with only the specified predictor, mediator, and their interaction to provide a relative measure of the effect size. Cervical length mediators correspond to *I* = intercept, *L* = linear slope, *Q* = quadratic slope parameter values. All t-tests are two-tailed and p-values are unadjusted.

***p < 0.001. **p < 0.01. *p < 0.05. +p < 0.10.

Table S4. Causal mediation analysis effect estimates of cervical length mediators.

Predictor	Mediator	ACME	ADE	Total Effect	Proportion Mediated
Maternal Age	I	-0.005 ⁺ [-0.010, 0.001]	-0.031 [*] [-0.055, -0.008]	-0.036 ^{**} [-0.061, -0.012]	0.131 ⁺ [-0.028, 0.408]
	S	-0.002 [-0.008, 0.004]	-0.034 ^{**} [-0.058, -0.011]	-0.036 ^{**} [-0.061, -0.012]	0.045 [-0.17, 0.253]
	Q	-0.006 ^{**} [-0.011, -0.002]	-0.030 ^{**} [-0.054, -0.005]	-0.036 ^{**} [-0.060, -0.012]	0.174 ^{**} [0.059, 0.534]
Maternal Depression	I	-0.051 [-0.170, 0.063]	-0.226 [-0.734, 0.282]	-0.277 [-0.793, 0.240]	0.132 [-1.554, 2.081]
	S	-0.038 [-0.171, 0.089]	-0.243 [-0.741, 0.248]	-0.281 [-0.795, 0.226]	0.108 [-1.522, 1.909]
	Q	-0.04 [-0.127, 0.045]	-0.238 [-0.742, 0.265]	-0.278 [-0.792, 0.233]	0.103 [-1.414, 1.716]
Pre-pregnancy BMI	I	0.012 ^{***} [0.009, 0.015]	-0.012 [*] [-0.023, -0.001]	0 [-0.012, 0.011]	-0.899 [-31.035, 31.747]
	S	0.014 ^{***} [0.011, 0.017]	-0.014 [*] [-0.025, -0.003]	0 [-0.011, 0.011]	-1.025 [-41.642, 39.164]
	Q	0.006 ^{***} [0.003, 0.008]	-0.006 [-0.017, 0.005]	0 [-0.011, 0.011]	-0.375 [-16.400, 17.059]
Parity	I	0.125 ^{***} [0.099, 0.155]	0.014 [-0.066, 0.097]	0.139 ^{***} [0.058, 0.224]	0.902 ^{***} [0.552, 2.088]
	S	0.108 ^{***} [0.084, 0.134]	0.03 [-0.049, 0.111]	0.14 ^{***} [0.057, 0.223]	0.775 ^{***} [0.482, 1.826]
	Q	0.067 ^{***} [0.048, 0.087]	0.073 [-0.007, 0.155]	0.139 ^{***} [0.058, 0.224]	0.480 ^{***} [0.282, 1.113]
Previous PTB	I	-0.253 ^{***} [-0.321, -0.192]	-0.885 ^{***} [-1.100, -0.659]	-1.140 ^{***} [-1.36, -0.910]	0.221 ^{***} [0.163, 0.299]
	S	-0.280 ^{***} [-0.347, -0.218]	-0.857 ^{***} [-1.08, -0.631]	-1.140 ^{***} [-1.360, -0.908]	0.245 ^{***} [0.185, 0.325]
	Q	-0.135 ^{***} [-0.185, -0.090]	-1.00 ^{***} [-1.22, -0.785]	-1.140 ^{***} [-1.360, -0.923]	0.118 ^{***} [0.078, 0.169]
Previous Abortion	I	-0.025 ^{**} [-0.045, -0.006]	-0.038 [-0.113, 0.038]	-0.063 [-0.141, 0.014]	0.366 [-1.740, 3.111]
	S	-0.042 ^{***} [-0.063, -0.022]	-0.021 [-0.094, 0.056]	-0.063 [-0.140, 0.015]	0.611 [-3.893, 4.982]
	Q	-0.020 ^{**} [-0.035, -0.006]	-0.044 [-0.119, 0.032]	-0.063 [-0.141, 0.014]	0.285 [-1.345, 2.361]
Alcohol Use	I	0.008 [-0.114, 0.132]	0.237 [-0.379, 0.857]	0.246 [-0.384, 0.872]	0.033 [-1.947, 1.795]
	S	-0.08 [-0.197, 0.039]	0.326 [-0.305, 0.953]	0.247 [-0.396, 0.891]	-0.138 [-3.465, 3.136]
	Q	0.041 [-0.053, 0.137]	0.207 [-0.428, 0.852]	0.249 [-0.399, 0.892]	0.085 [-1.666, 1.799]
Smoking Status	I	0.057 ⁺ [-0.001, 0.119]	0.321 [*] [0.063, 0.573]	0.378 ^{**} [0.116, 0.640]	0.150 ⁺ [-0.004, 0.486]
	S	0.060 [*] [0.002, 0.120]	0.316 [*] [0.058, 0.573]	0.376 ^{**} [0.111, 0.639]	0.159 [*] [0.002, 0.504]
	Q	0.024 [-0.018, 0.068]	0.351 ^{**} [0.089, 0.612]	0.375 ^{**} [0.107, 0.641]	0.063 [-0.060, 0.270]
Substance Use	I	0.043 ⁺ [-0.002, 0.091]	-0.089 [-0.291, 0.116]	-0.045 [-0.252, 0.162]	-0.204 [-5.957, 6.203]
	S	-0.007 [-0.054, 0.038]	-0.039 [-0.240, 0.162]	-0.046 [-0.256, 0.164]	0.064 [-2.802, 2.640]
	Q	0.019 [-0.015, 0.054]	-0.066 [-0.271, 0.141]	-0.046 [-0.252, 0.160]	-0.067 [-2.850, 3.106]

ACME is the average causal mediation effect. ADE is the average direct effect. 95% confidence interval in brackets, all tests are two-sided, and p-values are unadjusted.

***p < 0.001. **p < 0.01. *p < 0.05. +p < 0.10.