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Modeling Longitudinal Change in Cervical Length Across Pregnancy

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Background

- A **short cervix** in the mid-trimester is a *powerful predictor* of maternal risk for **spontaneous preterm delivery (sPTD)**.
- The **rate of cervical length change** is associated with an increased risk for sPTD, *independent* of the baseline measurement.

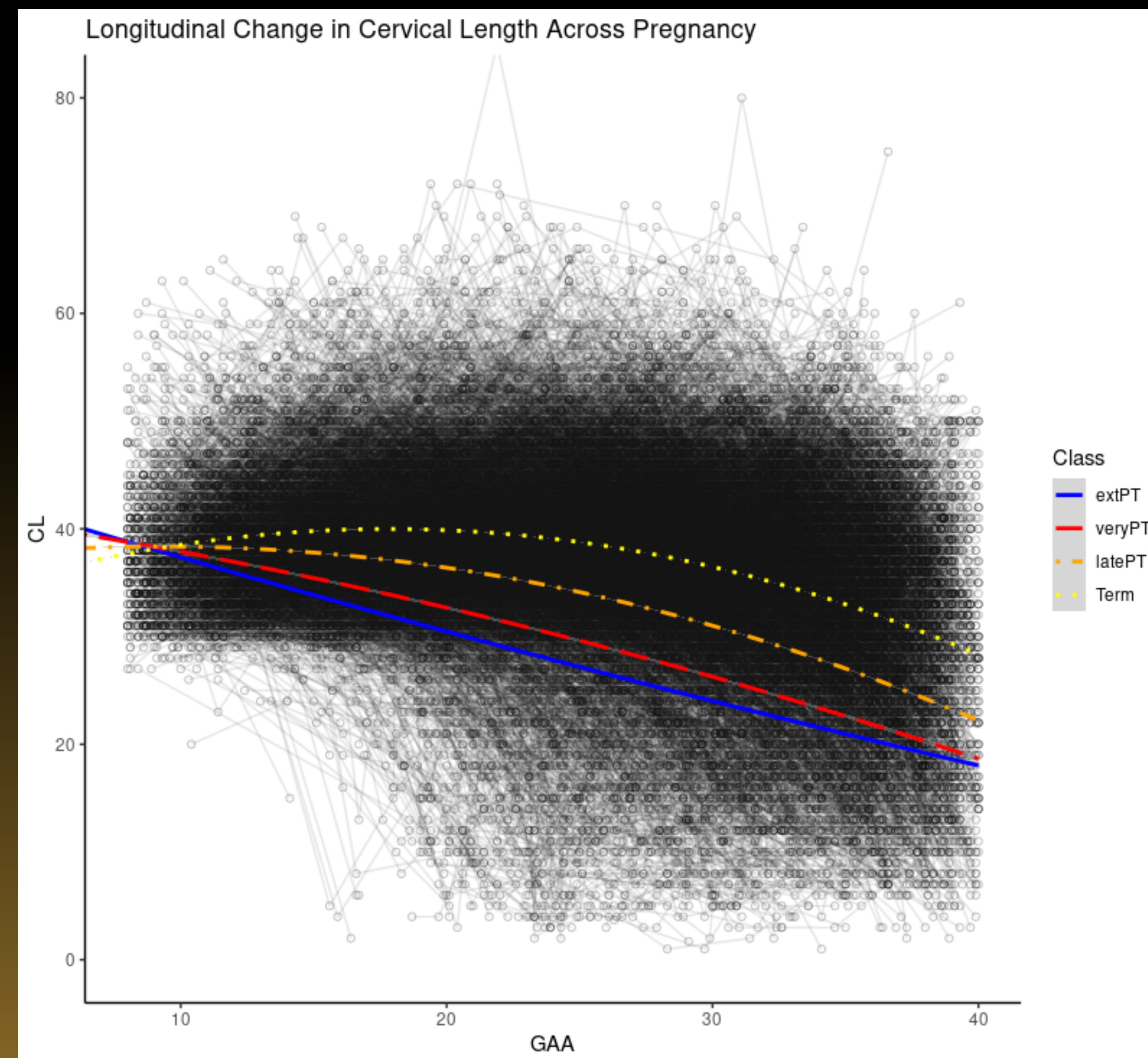
Methods

- Longitudinal data from **5,160** women carrying **5,971** singleton pregnancies.
- Cervical Length (CL)** measured in mm via transvaginal ultrasound 2-16 times (mean: 6 measurements per pregnancy).
- Gestational Age at Assessment (GAA)** measured in weeks from last menstrual period.
- Change in CL** during pregnancy modeled as a longitudinal, multilevel **growth curve**.
- A three-level variance structure accounts for **non-independence** of **repeated measurements** (clustered by unique pregnancies and participants).

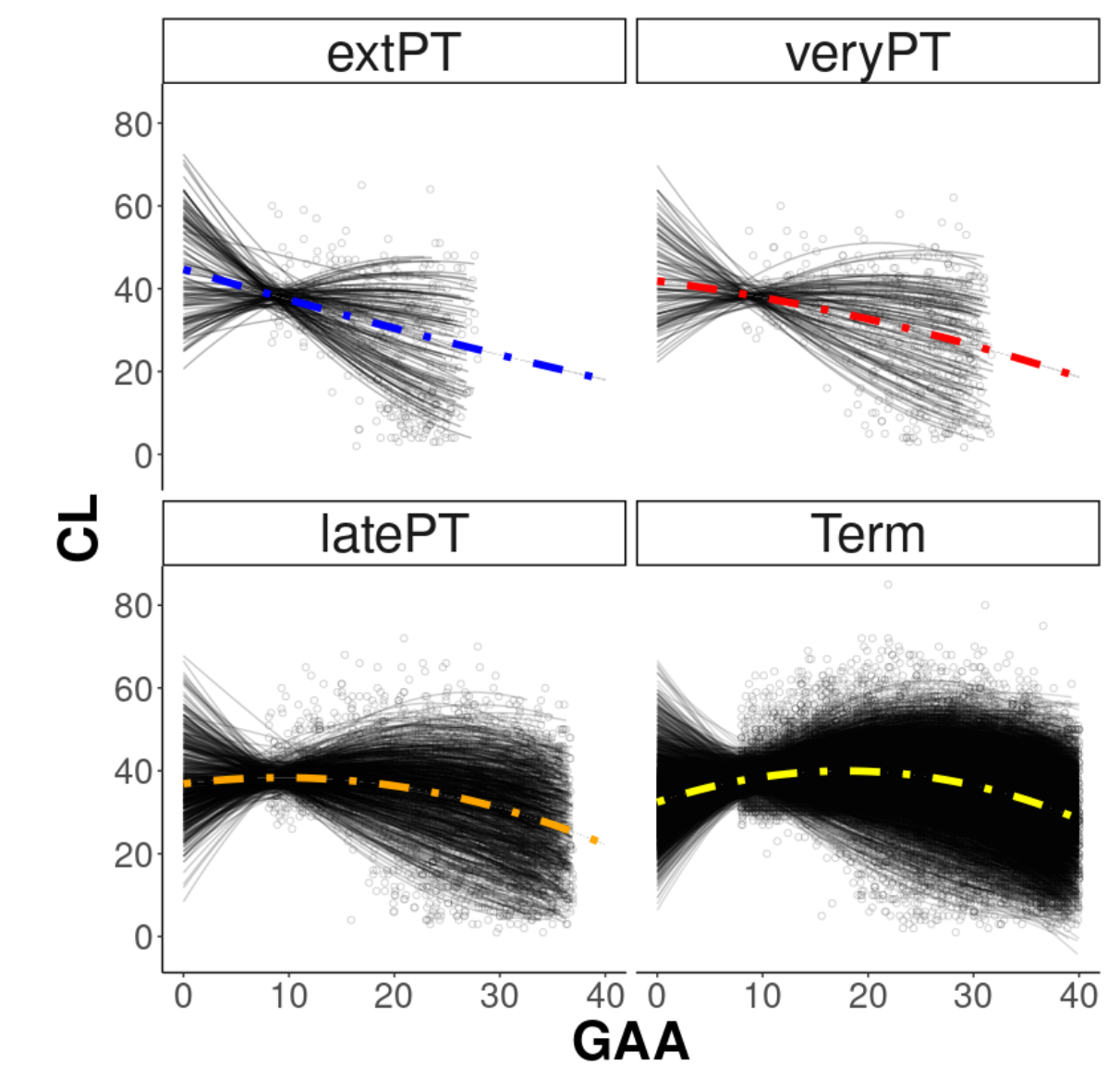
Results

- Shorter* mid-trimester cervical lengths and *accelerated rates* of cervical shortening are associated with *earlier gestational age at delivery (GAD)*.
- Maternal age** is associated with *longer CL* and *faster rates* of cervical shortening. Pre-pregnancy **BMI** is associated with *shorter CL* and *slower rates* of cervical shortening.
- Growth curve parameters** (I, L, Q) explain more variance in **gestational duration (GAD)** than a single mid-trimester CL measurement (current clinical standard), and could improve prediction of maternal risk for sPTD.

How does cervical length change over the course of a pregnancy?



Individual Predictions of CL Trajectories



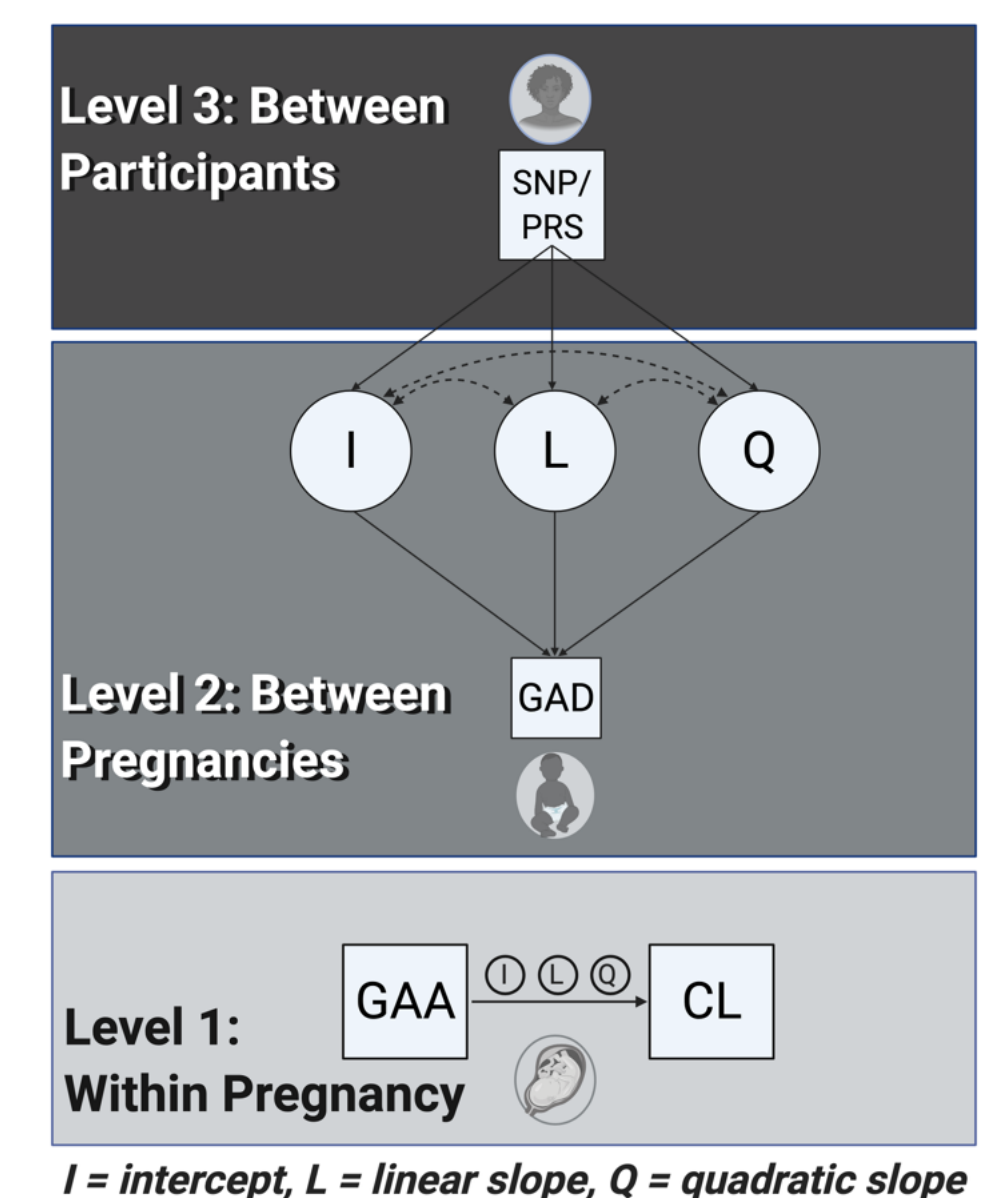
Mean Growth Curve Parameters by Class

Delivery Class	Intercept	Linear	Quadratic
Ext Preterm	28.07	-1.17	0.0086
Very Preterm	28.82	-0.52	-0.0039
Late Preterm	31.96	0.22	-0.0160
Full Term	36.27	0.81	-0.0232

Discussion

Future Directions:

- Estimate the **genetic contribution** (SNPs/PRS) to cervical change during pregnancy, and its role in **mediating** the timing of birth.



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