

EP13.04. The time-series changes in cervical length are associated with the risk of spontaneous preterm birth in twin pregnancies

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[BACKGROUND] Twin pregnancies have a high risk of PTB. The clinical value of repeated cervical length (CL) measurements remains unclear.

[OBJECTIVE] To evaluate the predictive value of longitudinal CL changes for spontaneous PTB (sPTB).

[METHODS]

Study Design: Retrospective cohort study (2012–2023, Tohoku University Hospital).

Participants: Twin pregnancies (excluded if delivered within 1 week of first visit)

CL Measurement: Transvaginal CL every 2 weeks after 20 weeks.

Statistical Analysis

I) Time-Series Clustering of CL: Time-series clustering of CL using k-means.

II) Risk of sPTB in Each Cluster: Fine–Gray model (adjusted for age, BMI, parity) for sPTB risk.

III) Cutoff Values of CL for Predicting sPTB <28 Weeks: ROC analysis for CL cutoffs (<28 weeks), including likelihood ratios for 20 mm and 25 mm.

[RESULTS]

I)Time-Series Clustering of CL (Figure 1, Table 1)

Among 348 women, three distinct CL trajectories were identified:

Group A (47%): Stable CL ~30–40 mm until late gestation

Group B (45%): Gradual shortening to ~30 mm in the late 20s weeks

Group C (8%): Early, rapid shortening to ~20 mm by ~20 weeks

Maternal baseline characteristics were similar across groups.

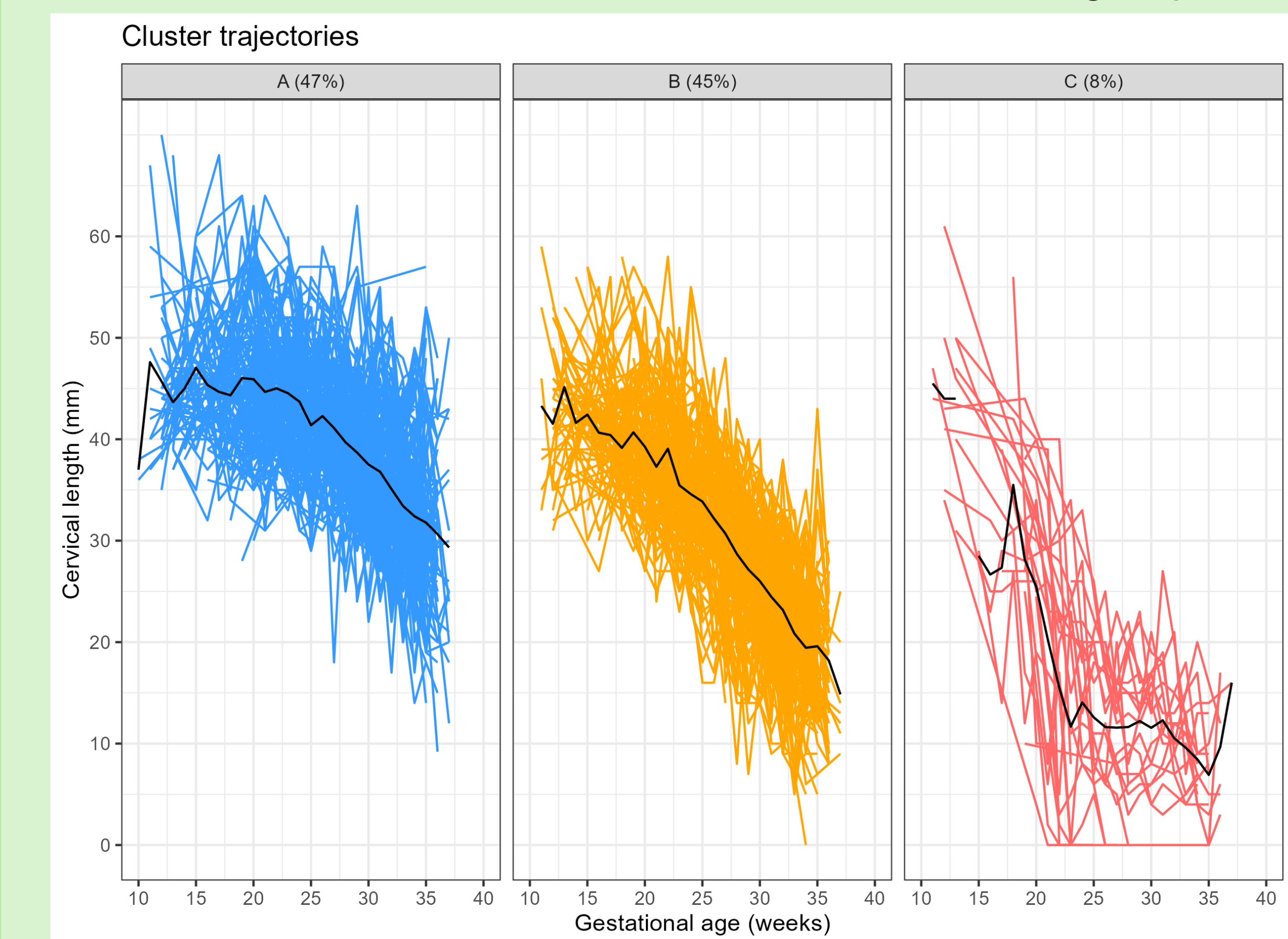


Figure 1

Variables	Overall [†]	A N = 165 [†]	B N = 155 [†]	C N = 28 [†]
Age (years)	32.8 ± 5.0	33.0 ± 4.7	32.5 ± 5.1	32.7 ± 6.5
Height (cm)	159.1 ± 5.0	159.5 ± 4.8	159.1 ± 5.0	157.3 ± 5.7
Pre-pregnancy body weight (kg)	55 ± 10	57 ± 12	53 ± 8	53 ± 11
BMI	21.7 ± 3.8	22.4 ± 4.2	21.1 ± 3.0	21.4 ± 4.5
Parity				
Nulliparous	174 (50%)	71 (43%)	90 (58%)	13 (46%)
Multiparous	174 (50%)	94 (57%)	65 (42%)	15 (54%)
History of preterm birth	7 (2.0%)	2 (1.2%)	5 (3.2%)	0 (0%)
Type of multiple pregnancy				
DD	197 (57%)	96 (58%)	83 (54%)	18 (64%)
MD	149 (43%)	69 (42%)	70 (45%)	10 (36%)
MM	2 (0.6%)	0 (0%)	2 (1.3%)	0 (0%)
Mode of conception				
non ART	258 (74%)	123 (75%)	114 (74%)	21 (75%)
ART	90 (26%)	42 (25%)	41 (26%)	7 (25%)
Chronic hypertension	10 (2.9%)	6 (3.6%)	3 (1.9%)	1 (3.6%)
Hypertensive disorders of pregnancy	32 (9.2%)	13 (7.9%)	17 (11%)	2 (7.1%)
DM or GDM	22 (6.3%)	11 (6.7%)	11 (7.1%)	0 (0%)

[†] Mean ± SD; n (%)

Table 1

II) Risk of Preterm Birth in Each Cluster (Figure 2, Table 2)

sHRs (vs. Group A) for sPTB: Group B 1.63 (95% CI, 0.93–2.82); Group C 7.84 (3.75–16.37).

Adjusted risk ratios (aRRs, vs. Group B):

Extremely sPTB (22–27 wks): Group A, not estimable; Group C, **41.6** (95% CI, 5.54–312.93).

Very/Moderate sPTB (28–33 wks): Group A, **0.19** (0.03–1.39); Group C, **4.38** (1.20–15.93).

Late sPTB (34–36 wks): Group A, **0.71** (0.40–1.27); Group C, **1.69** (0.72–3.97).

Summary: Groups A and B showed similar sPTB risks, while **Group C had a markedly higher risk**, especially for extremely preterm birth <28 weeks.

Delivery Outcomes by Group				
項目	Overall	A	B	C
N	348	165	155	28
Mean gestational age (weeks)	35.55 ± 2.95	36.11 ± 2.12	35.62 ± 2.62	31.86 ± 5.43
term (≥37w)	213 (61.2%)	116 (70.3%)	90 (58.1%)	7 (25.0%)
PTB (<37w)	135 (38.8%)	49 (29.7%)	65 (41.9%)	21 (75.0%)
non-sPTB	70 (20.1%)	29 (17.6%)	35 (22.6%)	6 (21.4%)
sPTB	65 (18.7%)	20 (12.1%)	30 (19.4%)	15 (53.6%)
late preterm birth (34–36w)	48 (13.8%)	19 (11.5%)	24 (15.5%)	5 (17.9%)
very and moderate preterm birth (28–33w)	9 (2.6%)	1 (0.6%)	5 (3.2%)	3 (10.7%)
extremely preterm birth (<28w)	8 (2.3%)	0 (0.0%)	1 (0.6%)	7 (25.0%)

Table 2

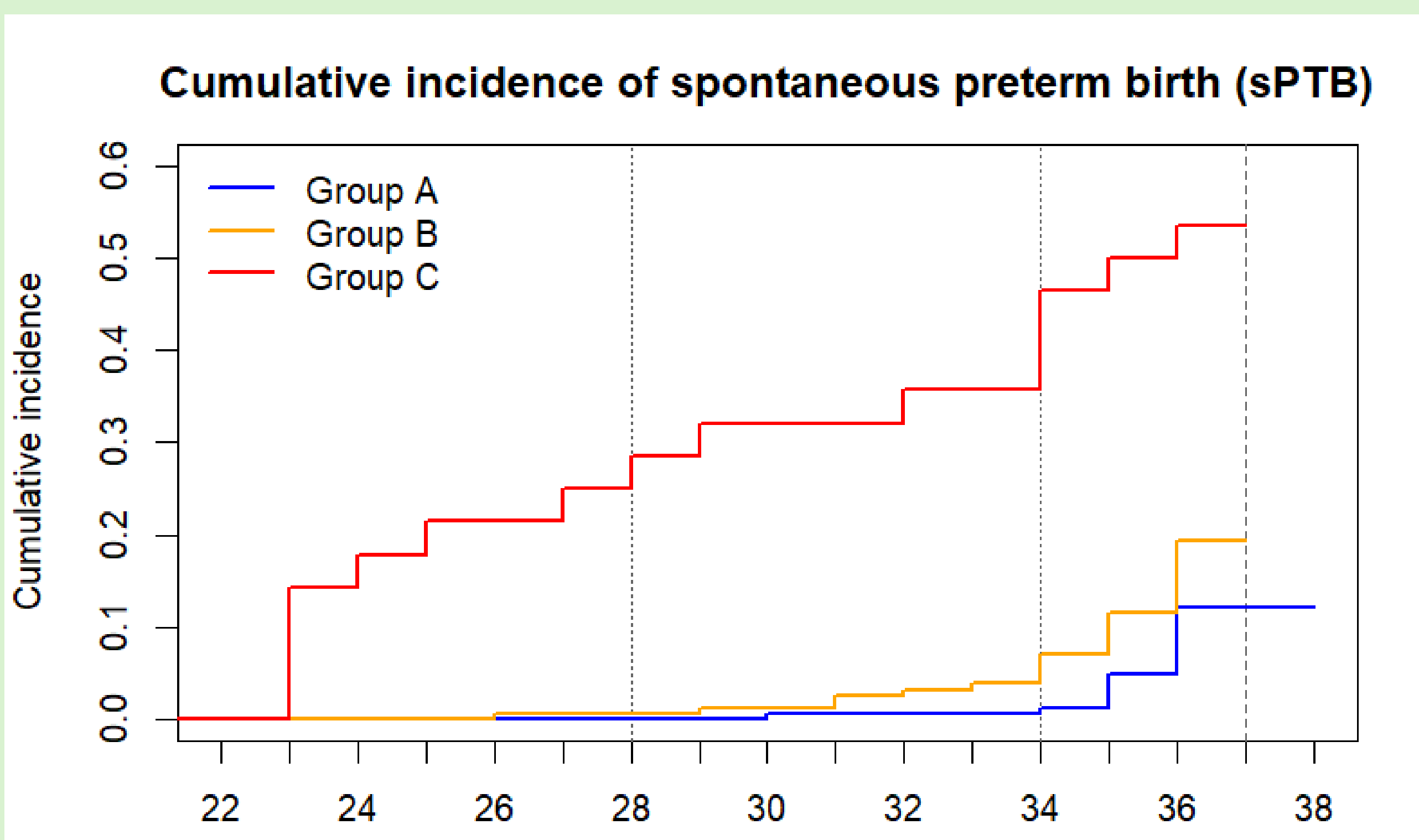


Figure 2

III) Cutoff Values for Predicting sPTB <28 Weeks

ROC-derived cutoffs shortened with gestation (**18 mm at <22 wks → 6 mm at 23 wks → 2 mm at 24 wks**) with increasing positive likelihood ratios.

CL ≤20 mm before 22 wks was the most effective screening threshold for identifying women at high risk of extremely preterm birth.

CxL Cutoff Performance for Predicting Extremely Preterm Birth				
Grouped by Gestational Age (GA)				
Cutoff	Sensitivity	Specificity	LR+	LR–
<22w				
18mm	0.500	0.990	52.250	0.505
20mm	0.500	0.991	52.750	0.505
25mm	0.500	0.972	17.583	0.515
22w				
6mm	0.714	0.991	77.143	0.288
20mm	0.857	0.977	37.029	0.146
25mm	0.857	0.954	18.514	0.150
23w				
2mm	0.857	0.995	188.571	0.144
20mm	1.000	0.973	36.667	0.000
25mm	1.000	0.945	18.333	0.000
24w				
19mm	0.750	0.964	21.000	0.259
20mm	0.750	0.960	18.667	0.260
25mm	0.750	0.942	12.923	0.265

Table 3

[COMMENT]

CL trajectories in twin pregnancies could be classified into three groups. Women with early cervical shortening (early 20s weeks) had a markedly increased risk of sPTB <34 weeks, especially extremely sPTB <28 weeks. In contrast, late shortening (Group B) showed no clear association with sPTB.

These results support CL screening at 20–24 weeks and suggest that reports of limited predictive value may reflect characteristics of Group B. In our study, using a cutoff of 20 mm before 22 weeks yielded a positive likelihood ratio of 52.75 for predicting sPTB <28 weeks, far exceeding previous reports (Honest 2003: 5.04; Conde-Agudelo 2021: 9.6), likely due to earlier measurement and identification of women with progressive early shortening.

Dynamic early CL shortening provides clinically meaningful predictive value, while late shortening has limited utility.

Early CL shortening **before 22 weeks** with a cutoff of **20 mm** strongly predicts extremely preterm birth in twin pregnancies. Dynamic shortening offers clinical predictive value, whereas late shortening has limited utility.