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The PTB-AI Accelerator Framework

From rapid evidence synthesis to an actionable, immune-informed risk index and a trial-stage digital therapeutic

Presented by:

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HOPE

NYU RORY MEYERS COLLEGE OF NURSING

NYU Langone Health

UCSF University of California San Francisco

Northwestern

Providence

UAB

Prediction Alone Is Not Enough

1 in 10

U.S. births are preterm
(<37 weeks gestation)

<50%

Of those who could benefit
receive a proven intervention

+9.4%

Increase in singleton PTB
rate, 2016 to 2023

2–3x

Substantially Higher PTB rates among
Black and Native American/ Indigenous people

The PTB-AI Accelerator Framework

Three phases moving preterm birth work from prediction to action, anchored by the PTB-ARIx. **Every AI output expert-verified.**

Phase 1 Creation

1.9 million California births
Hundreds of siloed studies
19 actionable risk factors

AI-assisted synthesis compressed a months-long review to weeks; PTB-ARIx from Poisson regression

Phase 2 Validation

Alabama cohort, n = 776
25 first-trimester cytokines
Composite PTB-ARIx-CD

Independent validation, expanded with an AI-informed cytokine dysregulation metric

Phase 3 Translation

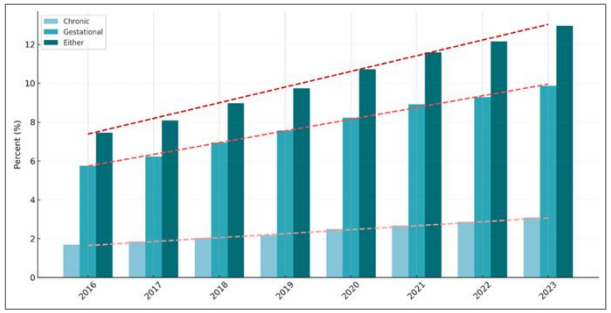
Natally digital therapeutic
Industry + community
Conversational AI agent

AI-aided development of a tool to increase uptake of proven care; RCT launching Fall 2026

Critically, the framework reframes preterm birth work from prediction toward action on modifiable pathways, with explicit attention to the most affected groups.

The Know-Do Gap: Actionable Risks, Underused Care

Hypertension in US pregnancies, 2016–2023 (CDC Wonder)



p < .001 for all trends (Armitage-Cochrane)

Nineteen preterm birth risk factors have an established, risk-reducing treatment. Many are common and rising. Most people who could benefit never receive the treatment.

Clinical & Medical Risk Factors

Risk Factor	Indicated Treatment	Risk Reduction	% Receiving Treatment
Chronic hypertension	Low-dose aspirin; antihypertensives	**OR 0.63 [<37w]**	78.8% prescribed
Asthma	Inhaled corticosteroids	**RR 0.76 [<37w]**	59.0% private · 44.0% Medicaid
Mental health condition	Psychotherapy; medication	**HR 0.82 [<37w]**	40.7% NH White · 19.1% NH Black

Phase 1 — Creation: Building the PTB-ARIx

AI-assisted synthesis of several hundred siloed studies, expert-verified

Pre-print at MedRxiv (currently in revisions: BMC)

What it is

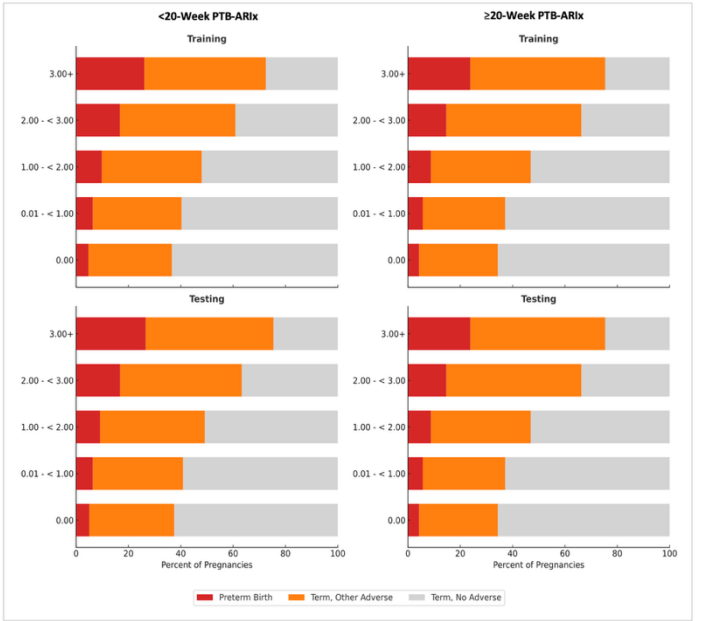
- **Questionnaire covering 19 modifiable risk factors**
- **Regression-derived coefficients summed into a continuous index**
- **Computable at ≤12 weeks using first-trimester data and afterwards**
- **Trained and tested in more than 1.9 million California births**
  Each 1-unit increase: 67% higher PTB risk at <20 wks (RR 1.67); AUC up to 0.965

What makes it different

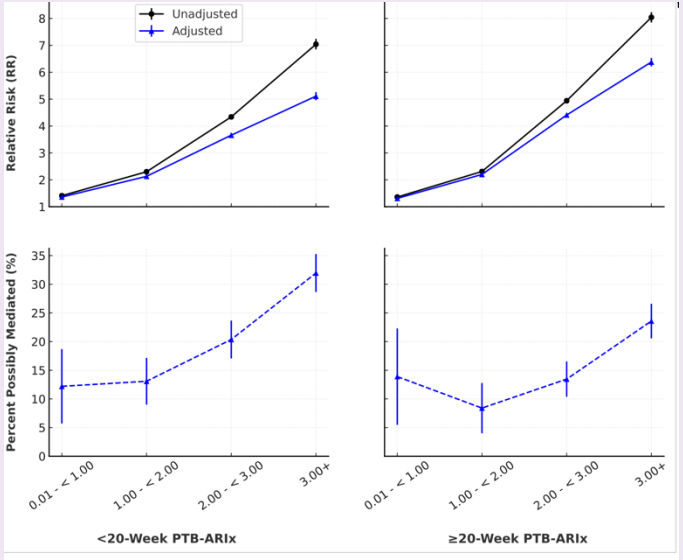
- **Treatment-responsive factors only**
- **Actionable by design**
- **Precision therapeutics reframe**
- **Know-do gap quantification**
- **Mediation: 20–30% of the effect may act through prenatal care**

Performance: PTB-ARIx

Each one-unit increase in the PTB-ARIx corresponded to a 67% rise in risk at <20 weeks (RR 1.67, 95% CI 1.67, 1.68). Mediation analyses suggested 20–30% of the effect may operate through prenatal care.



PTB, preterm birth; PTB-ARIx, actionable risk index for preterm birth

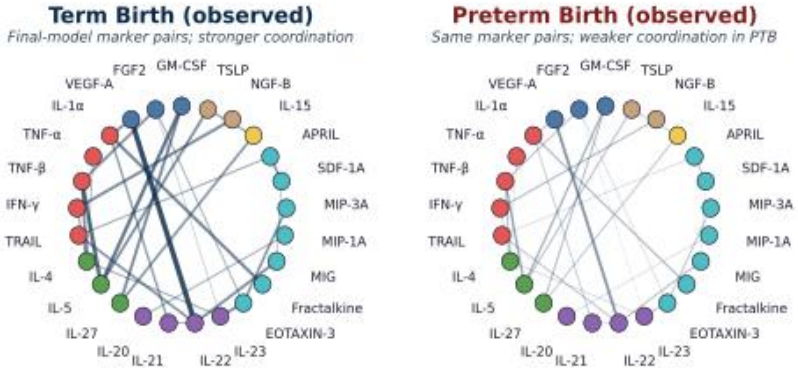


Jelliffe-Pawlowski and colleagues (BMC) 2026: https://link.springer.com/article/10.1186/s12884-026-09517-z

Phase 2 — Validation and Mechanism: Alabama, n = 776

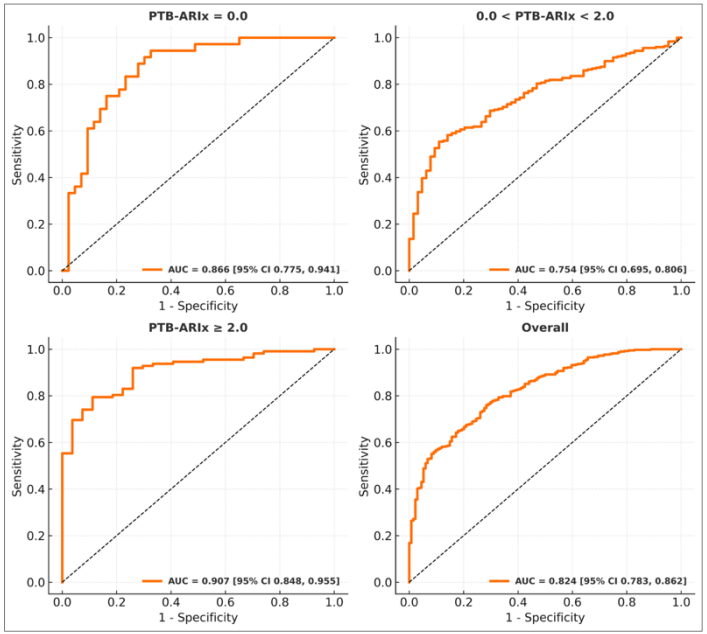
The PTB-ARIx performed similarly in an independent Alabama cohort. **We then asked whether first-trimester immune signal could sharpen prediction** and **surface mechanism, without requiring an actionable clinical risk factor to be present.**

The challenge: how do you measure “cytokine dysregulation”?



2016 unique pairs; 30 differed significantly; 27 weaker

Adding CD to the <20-week model enabled robust prediction even with no actionable clinical risk

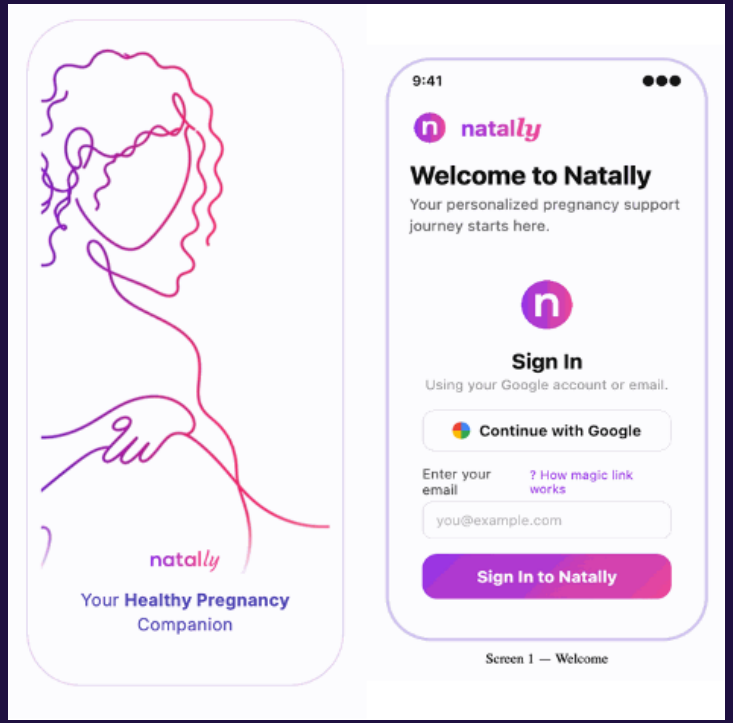


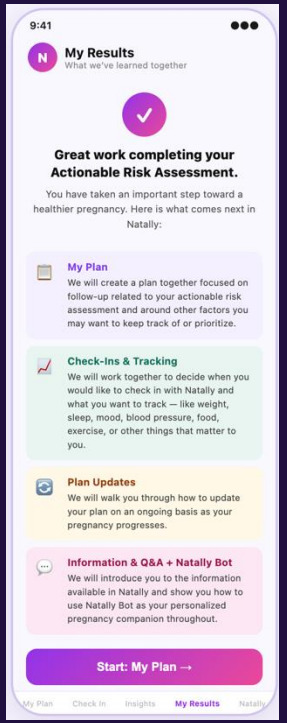
PTB-Arix + Cytokine Dysregulation Score

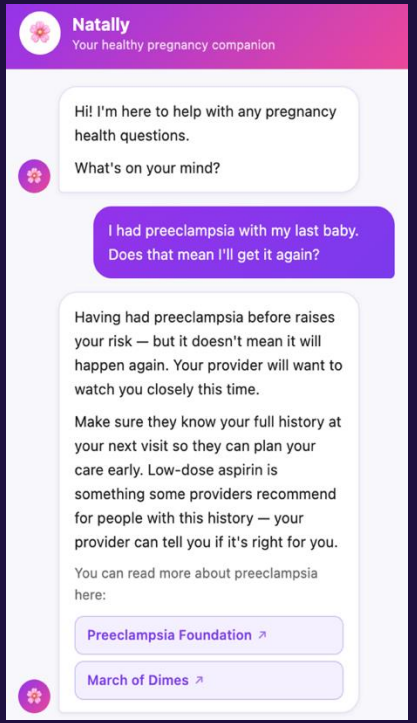
$$\beta_0 + \sum_{j=1}^{K} \beta_j \left| \log(C_{i,a_j}) - \log(C_{i,b_j}) \right|$$

Phase 3 — Translation: Natally

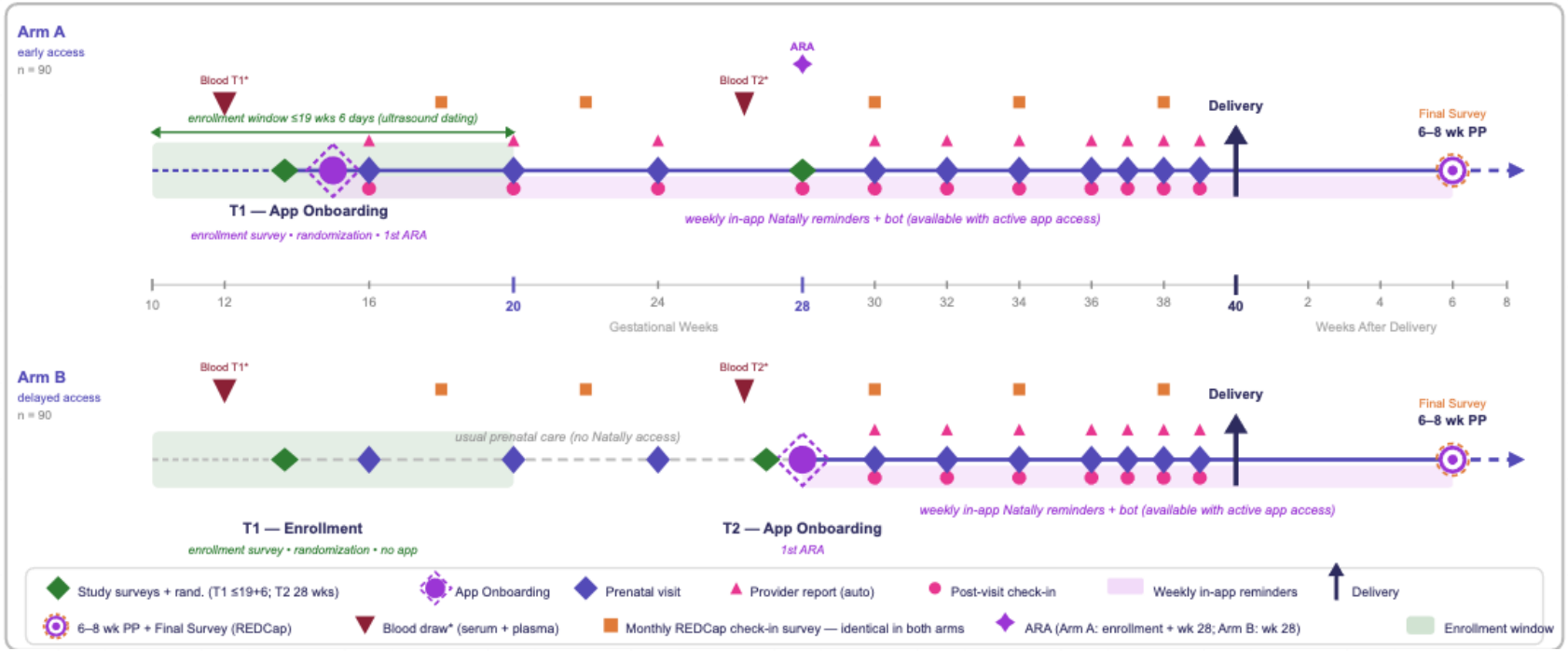
An industry-partnered digital therapeutic, vetted with clinical and community partners, with an embedded conversational agent (web address: Natal.ly)







Phase 3 in Practice: Waitlist RCT, Fall 2026



Blood T1 with the NIPT screen (wk 10–14) or another indicated draw in the enrollment window; Blood T2 with the gestational diabetes screen (wk 24–28). Serum is the primary validated matrix.

Conclusion and Next Steps

Across three phases the framework moved from siloed evidence to an externally validated, mechanistically informed model and a deployable tool for closing the know-do gap.

Prediction to Action

- A risk index built only from factors with an established risk-reducing intervention
- AI-assisted synthesis made a months-long evidence review tractable in weeks
- Mediation suggests 20–30% of the effect may operate through prenatal care

Mechanism

- External validation in Alabama, with an AI-informed cytokine dysregulation metric added
- The PTB-ARIx-CD predicted robustly even without actionable clinical risk (AUC 0.866)
- Immune signal points toward pathways that may themselves be modifiable

Next Steps

- Waitlist randomized controlled trial of Natally launching Fall 2026 at NYU Langone Health
- Prospective, multi-site validation of the PTB-ARIx and PTB-ARIx-CD is critically needed
- Sustained attention to the groups carrying the heaviest burden, not equity as an afterthought