

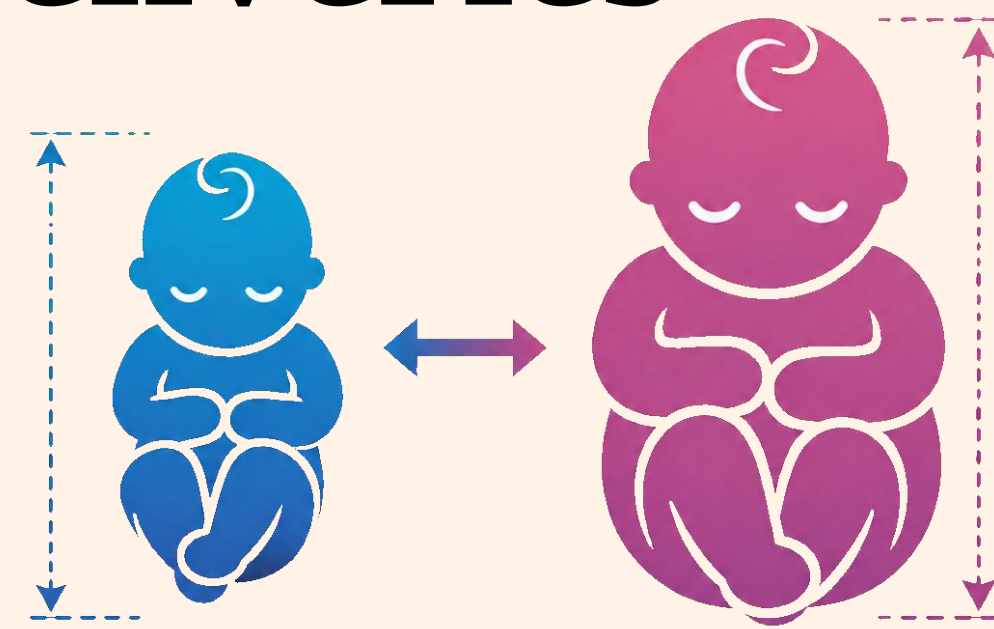
Association of Maternal Thyroid Dysfunction With Risks of Small- and Large-for-Gestational-Age Births: A National Cohort Study of 2.9 Million Deliveries

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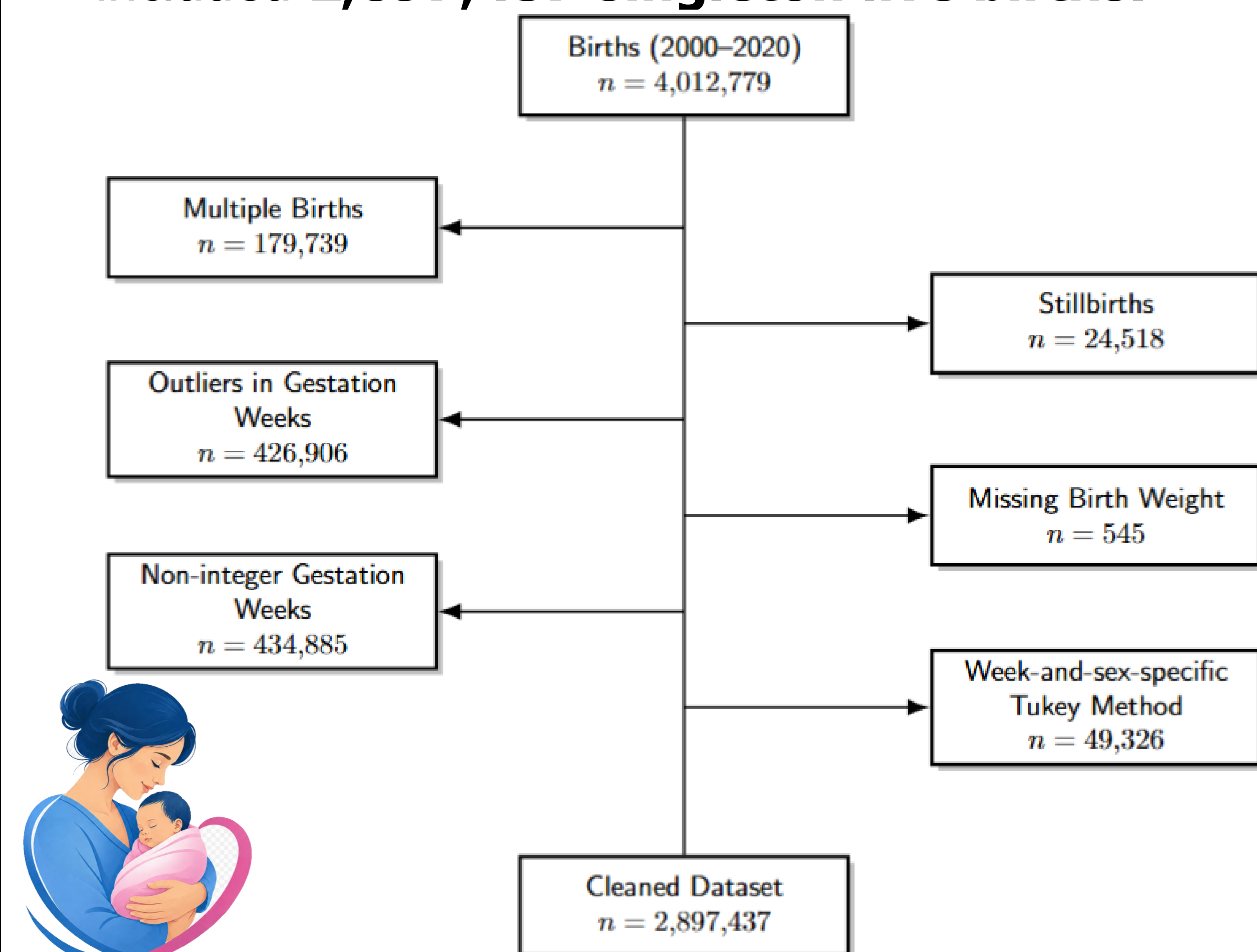
Background

- Maternal thyroid hormones play an important role in metabolism, placental function, and fetal development during pregnancy.** Thyroid dysfunction has been linked to adverse pregnancy outcomes, but its independent relationship with abnormal birth weight remains unclear because prior studies were often small and did not fully adjust for major confounders.
- Small-for-gestational-age (SGA) and large-for-gestational-age (LGA) births are clinically important outcomes associated with neonatal and long-term health risks.** Therefore, this study aimed to determine whether maternal thyroid dysfunction independently contributes to birth weight, SGA, and LGA risk in a large national cohort after accounting for metabolic and hypertensive factors.

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Data

- Data were obtained from the Israeli National Birth Registry (TIMNA) and included all recorded births in Israel between 2000 and 2020 (n = 4,012,779).** After excluding multiple gestations, stillbirths, missing birth weight, implausible or non-integer gestational ages, and birth-weight outliers, the final analytic cohort included **2,897,437 singleton live births.**



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Methods & Metrics

- Outcomes:** Birth weight was analyzed as a continuous outcome, while **SGA** and **LGA** were defined as birth weight below the 10th percentile and above the 90th percentile for gestational age and sex.
- Models:** Multivariable linear regression was used for birth weight prediction, and logistic regression was used to estimate SGA and LGA risk. XGBoost models were added to capture nonlinear relationships, with SHAP analysis used to interpret feature importance.
- Evaluation metrics:** Regression performance was evaluated using **R²** and **RMSE**, while classification models were evaluated using **ROC-AUC**.

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Results

Birth Weight Model

Hypothyroidism: -7.77 g, $P = .003$

Effect was statistically significant but clinically very small.

SGA Risk

Strongest risk factor: severe preeclampsia

OR = 2.96; 95% CI, 2.68–3.27

LGA Risk

Main drivers: GDM, T2DM, obesity

GDM OR = 1.80; 95% CI, 1.77–1.83



Conclusions

- Maternal thyroid dysfunction showed minimal independent association with fetal growth extremes** after adjustment for metabolic and hypertensive risk factors.
- Metabolic and vascular conditions were the dominant predictors:** GDM and obesity were strongly associated with LGA, while severe preeclampsia was the strongest predictor of SGA.
- Clinical focus should prioritize maternal **metabolic and vascular health** to prevent abnormal birth weight.

Regression Coefficients and Effect Sizes

