# Prenatal exposure to insecticides and child weight trajectories in the VHEMBE birth cohort (Limpopo province, South Africa)

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## INTRODUCTION

100 million exposed to insecticides from indoor residual spraying (IRS)

**DDT** and **pyrethroid insecticides** used for IRS disrupt sex hormones and may therefore interfere with **child growth**

Growth is an important indicator of current and future health

Few studies on prenatal exposure to endocrine-disrupting chemicals and child growth trajectories


**Research Question:** Does prenatal exposure to DDT/E and pyrethroids influence child weight trajectories?

## METHODOLOGY

**STUDY POPULATION:** Venda Health Examination of Mothers, Babies and their Environment (VHEMBE) birth cohort (n=751)

**Exposures:** Maternal peripartum **DDT/E** (serum, ng/g lipid) and **pyrethroid** metabolite (urine, adj. specific gravity) concentrations

**Outcomes:** Child growth trajectory parameters based on weight measurements taken from birth to 5 years, estimated using **SuperImposition, Translation and Rotation (SITAR),** a mixed effects model with population mean curve modelled as a natural cubic spline and up to three child-specific random effects:

- **Size,** vertical translation of the mean growth curve
- **Tempo,** or age at peak weight velocity, horizontal translation
- **Velocity,** or growth rate, compared to the average

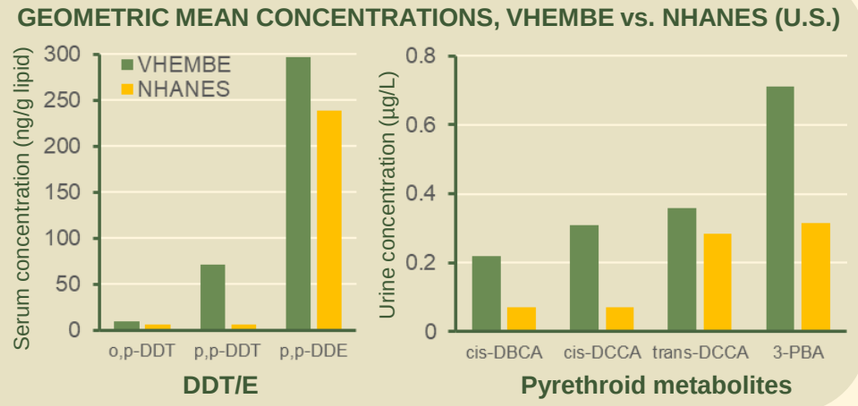
**STATISTICAL ANALYSIS: Marginal structural models** using stabilized inverse probability of treatment weights (IPTW) based on the generalized propensity score (GPS) for each exposure.

## RESULTS

### PARTICIPANT CHARACTERISTICS

- Mothers' mean age: 26 years, SD: 6
- Half are married (47%)
- Many without highschool diploma (57%)
- Most live below food poverty line (61%)
- Many suffer food insecurity (40%)
- Almost all exposed to DDT (91-98%), DDE (100%) and pyrethroids (100%)

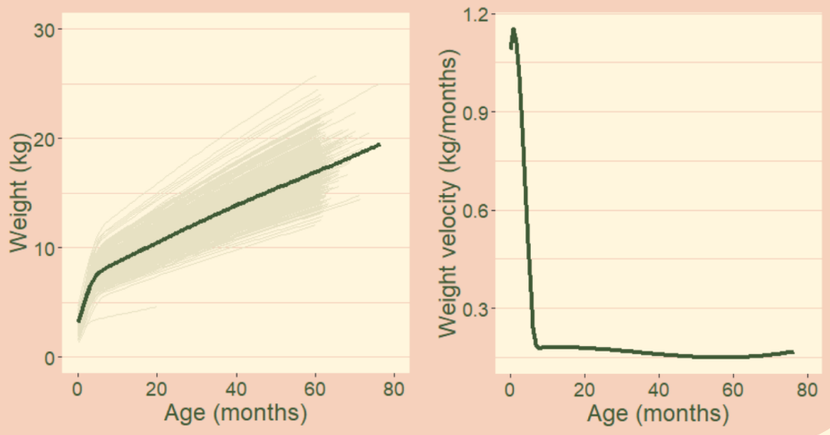
**GEOMETRIC MEAN CONCENTRATIONS, VHEMBE vs. NHANES (U.S.)**



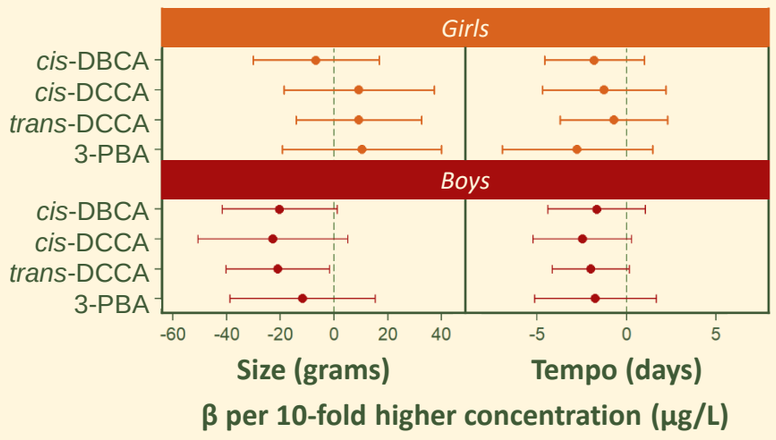

### CHILD WEIGHT TRAJECTORIES ESTIMATED USING SITAR

- Based on 13,489 weight measurements
  - 3,433 from VHEMBE study visits
  - 10,056 from medical records
- Best-fitting SITAR model:
  - Log-transformed weight
  - Mean spline curve with 2 knots
  - Size and tempo parameters
  - 75% variance explained
- Average age at peak weight velocity:
  - 26.6 days (SD: 12.2 days)

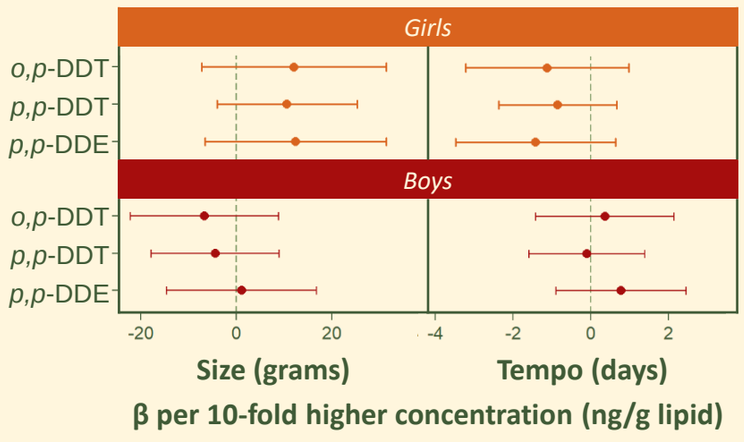
**MEAN GROWTH CURVES: WEIGHT and WEIGHT VELOCITY vs. AGE**




**Result #1: Pyrethroid metabolite *trans*-DCCA associated with smaller size in boys**




**Result #2: DDT/E not associated with child weight trajectory parameters**

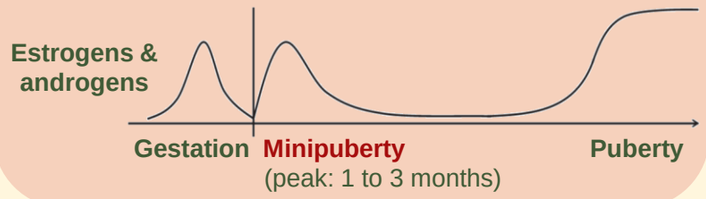



## DISCUSSION

**High exposures** in VHEMBE

- DDT detected in 98% of VHEMBE mothers vs. <10% in NHANES (U.S.)
- Pyrethroid metabolites detected in 100% of VHEMBE mothers vs. 0.5 - 75% in NHANES (U.S.)

Timing of average peak weight velocity consistent with **minipuberty,** a period of *hypothalamic-pituitary-gonadal (HPG) axis activation*




After weighting by the IPTW, all potential confounders were balanced

**#1a:** Pyrethroids may be associated with smaller size in boys

- Evidence of effect modification by sex for *trans*-DCCA only (p<0.10)
- Consistent with androgen disruption
- Previous findings in VHEMBE: lower BMI & weight-for-height (but not weight) at birth, 1, 2 and 3.5 years

**#1b:** Pyrethroids may be associated with earlier tempo (and therefore, timing of minipuberty)

- Confidence intervals crossed the null

**#2:** DDT not associated with child weight trajectories

## CONCLUSIONS

Pyrethroids may be linked to smaller size in boys and possibly earlier tempo (age at peak weight velocity)

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FRQ-S Doctoral Award