Maternal depression trajectories and child development at age 5

The French EDEN Mother-child Cohort

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Maternal depression

- Depression is one of the most common mental health problems among women Le Strat et al, 2011

- Prevalence in France:
  - 22,0% ≥ 1 depressive symptom
  - 10,4% suffered from a depressive episode Beck et al, 2007

- Depression in pregnancy or postpartum often of a temporary nature, but symptoms may persist or reappear later Connelly et al., 2010
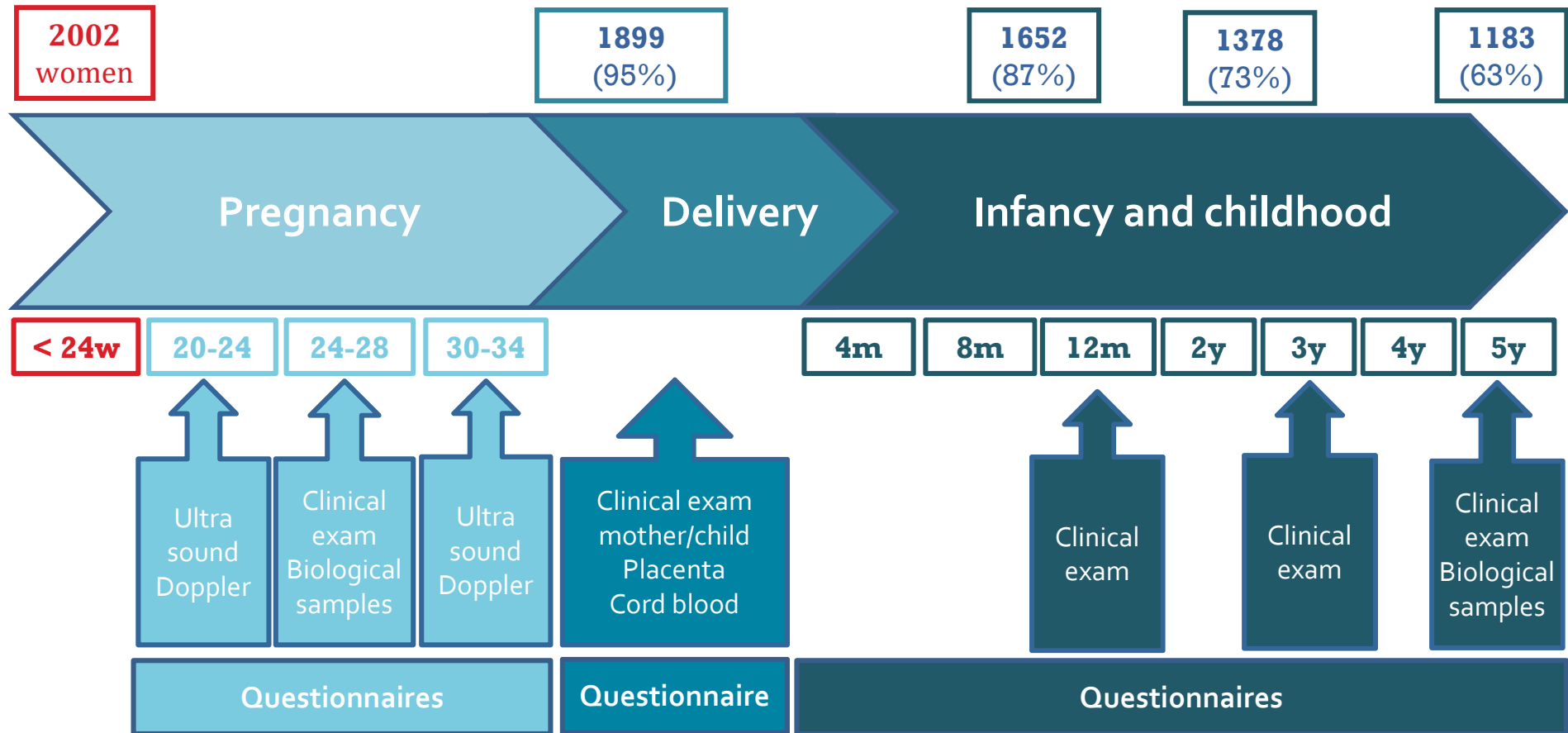
Maternal depression and child behavior

- Maternal depression is an important risk factor for behavioral, psychological, cognitive and psychomotor problems in children Goodman et al., 2011

- Association between the timing, chronicity and severity of depressive symptoms in women and development of their children
  - Exposure during crucial periods early in life (pregnancy, infancy) Essex et al, 2001; Glover, 2011
  - Persistence, rather than timing Campbell et al, 2009; Fihrer et al, 2009; Korhonen et al, 2012

- Limited number of studies using longitudinal data; failure to account for maternal depression prior to the child's birth or during pregnancy Campbell et al., 2007, 2009; Gross et al., 2009; Cents et al., 2013; Ashman et al., 2008

+ Aims

Information on the timing, chronicity and severity of depressive symptoms in women with young children is important if we are to understand through what mechanisms and moderating factors depression in mothers affects children

- This study aims to:
  - Identify longitudinal trajectories of maternal depression;
  - To assess the differential effects of maternal depression trajectories on the emotional, behavioral and cognitive development of the child;

+ EDEN birth-cohort

2002 women

1899 (95%)

1652 (87%)

1378 (73%)

1183 (63%)

Pregnancy   **Delivery**   **Infancy and childhood**

| < 24w | 20-24 | 24-28 | 30-34 | | 4m | 8m | 12m | 2y | 3y | 4y | 5y |

Ultra sound Doppler

Clinical exam Biological samples

Ultra sound Doppler

Clinical exam mother/child Placenta Cord blood

Clinical exam

Clinical exam

Clinical exam Biological samples

Questionnaires   Questionnaire   Questionnaires

Measures-Maternal depression

| 2002 women | | 1899 (95%) | 1652 (87%) | 1378 (73%) | 1183 (63%) |

Pregnancy → **Delivery** → **Infancy and childhood**

| < 24w | 20-24 | 24-28 | 30-34 | | 4m | 8m | 12m | 2y | 3y | 4y | 5y |

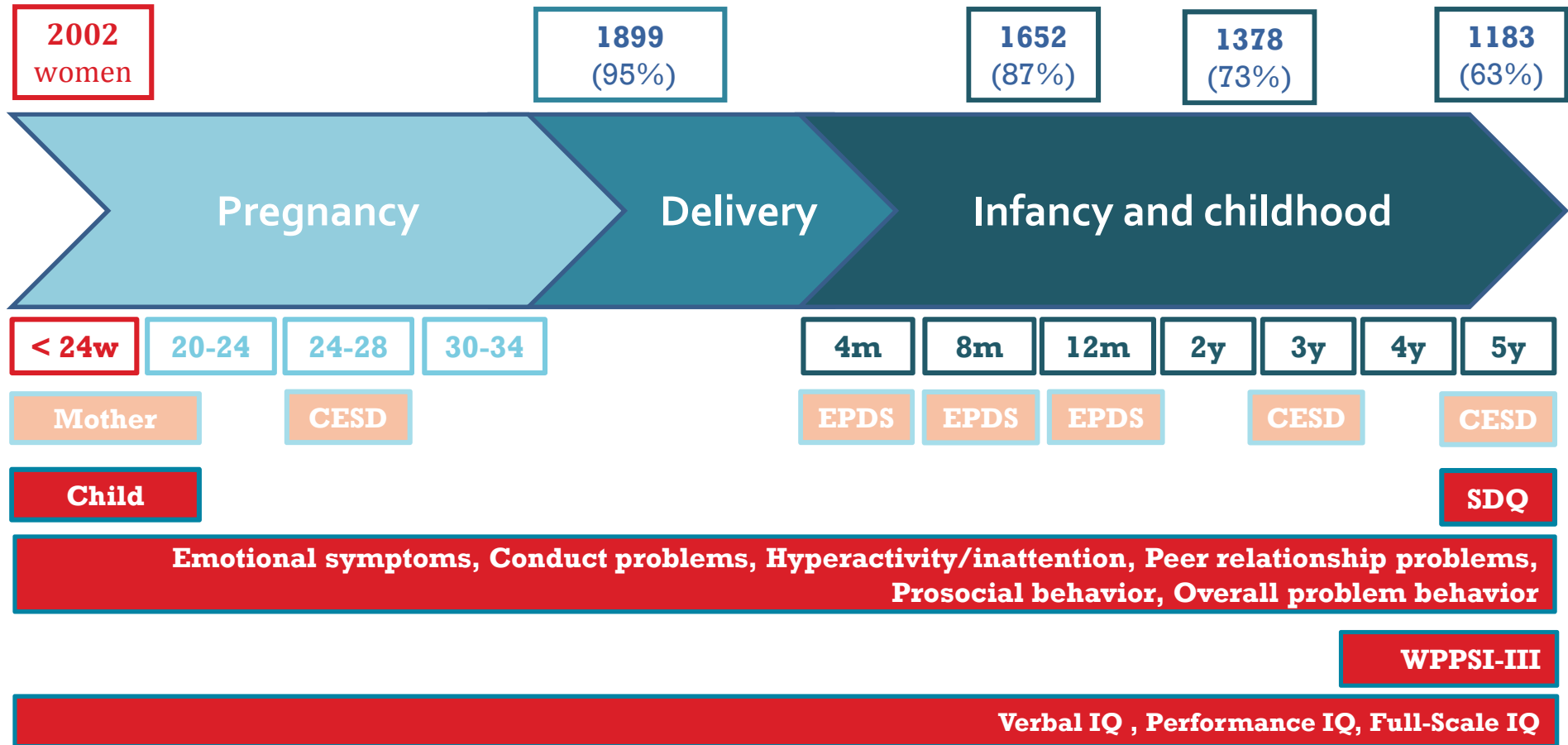| Mother | | CESD | | | EPDS | EPDS | EPDS | | CESD | | CESD |
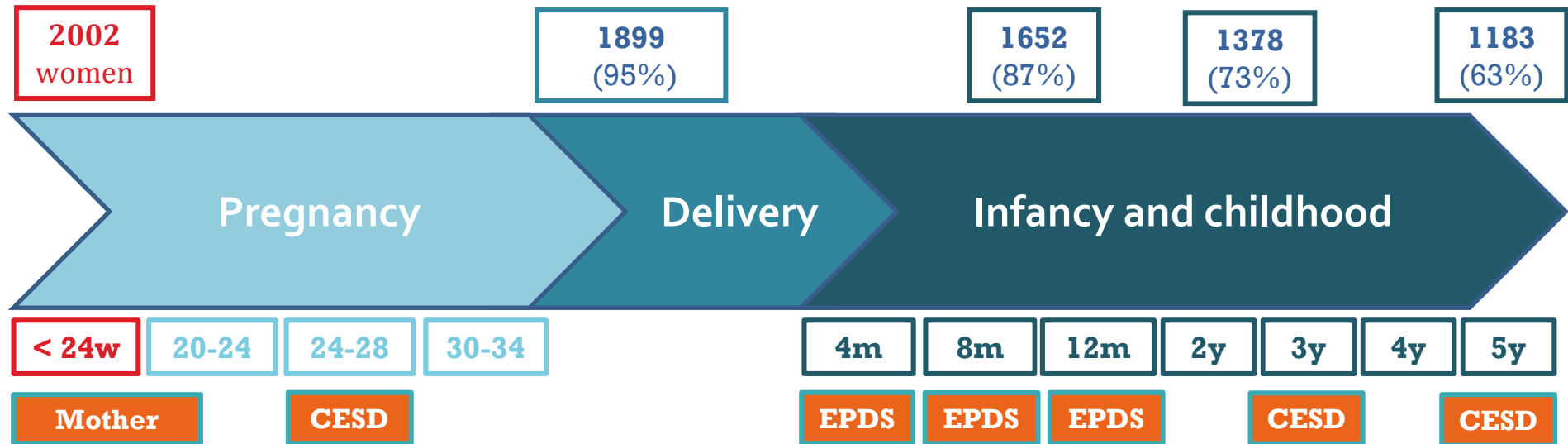
- CES-D (Center for Epidemiological Studies – Depression Scale)
  - *I felt that I could not shake off the blues even with the help of my family or friends*
- EPDS (Edinburgh Postnatal Depression Scale)
  - *I have been so unhappy that I have been crying*

Measures-Child development

| 2002 women | | 1899 (95%) | | 1652 (87%) | 1378 (73%) | 1183 (63%) |

Pregnancy ⟩ **Delivery** ⟩ **Infancy and childhood**

| < 24w | 20-24 | 24-28 | 30-34 | | 4m | 8m | 12m | 2y | 3y | 4y | 5y |

Mother | CESD | EPDS | EPDS | EPDS | CESD | CESD

Child | SDQ

Emotional symptoms, Conduct problems, Hyperactivity/inattention, Peer relationship problems, Prosocial behavior, Overall problem behavior

WPPSI-III

Verbal IQ , Performance IQ, Full-Scale IQ

+ Child behavior

- Strenghts & Difficulties Questionnaire –SDQ (parent report) at 5 years

  - Emotional symptoms (5 items)

    "Many worries or often seems worried"

  - Conduct problems (5 items)

    "Often fights with other children"

  - Hyperactivity/inattention (5 items)

    "Restless, overactive, cannot stay still for long"

  - Peer relationship problems (5 items)

    "Rather solitary, prefers to play alone"

  - Prosocial behavior (5 items)

    "Considerate of other people's feelings"

Overall problem behavior score

(0 – 40; based on 20 items)

Cognitive development

- WPSSI-III (Wechsler Preschool and Primary Scale of Intelligence, 3rd edition) (assessed by psychologist, mean age 5,7 year)

- Assesses general cognitive abilities across several domains:
  - Information, Vocabulary, Word Reasoning, Block Design, Matrix Reasoning, Picture Concepts, and Coding

- Three composite scores: Verbal IQ (VIQ), Performance IQ (PIQ), and Full-Scale IQ (FSIQ)
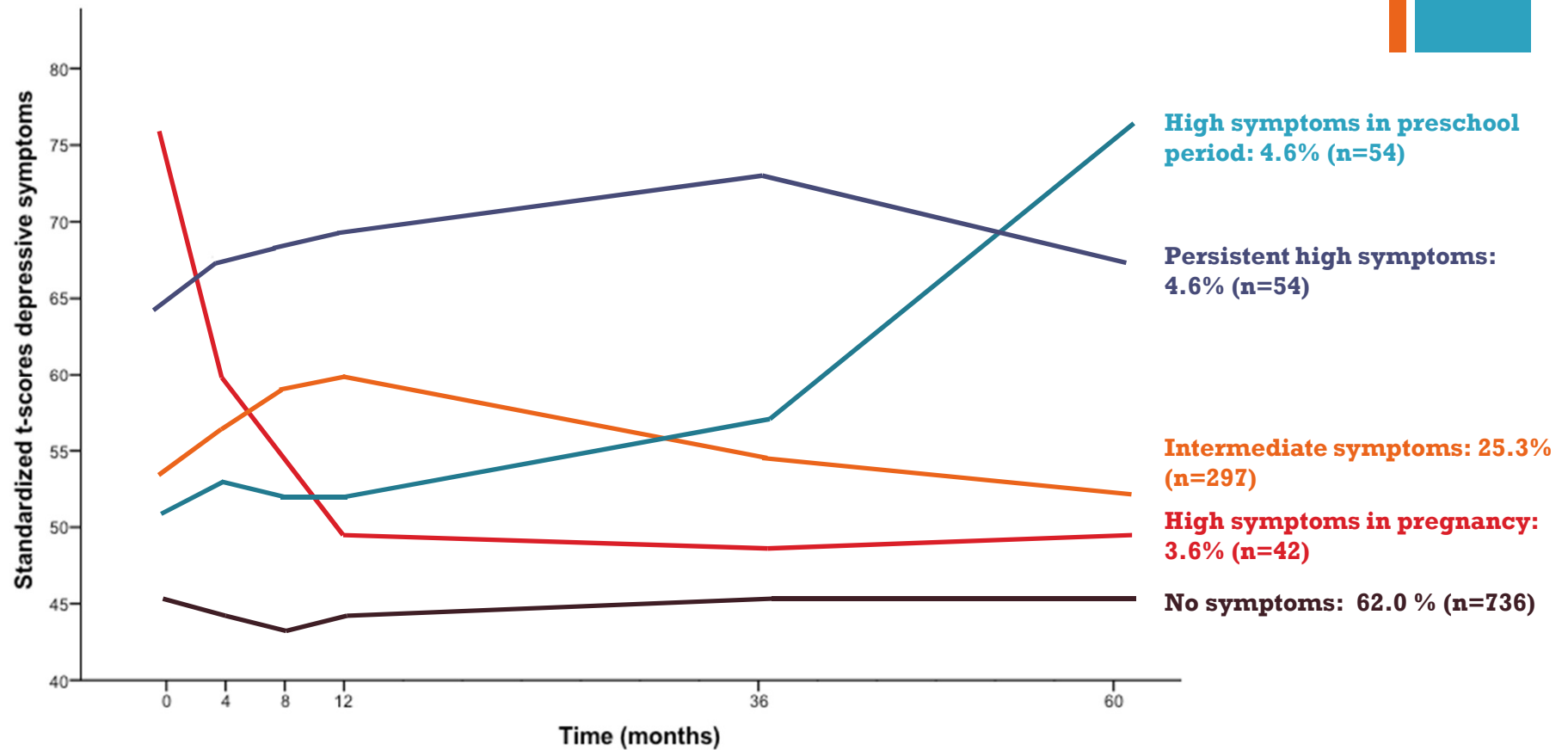
+ Covariates

- **Maternal:** maternal age at birth, educational level, maternal anxiety in pregnancy (STAI score <17 vs ≥18), history of psychiatric problems, maternal antidepressant use, maternal prenatal substance use (alcohol, smoking, illicit drugs), breastfeeding duration, frequency of stimulating activities with child

- **Family:** Study center (Poitiers vs. Nancy), family situation in the last 5 years, family income in the last 5 years, number of children living at home, domestic violence in the last 5 years, paternal substance abuse, social support, family history of language problems, childcare arrangements

- **Child:** child's sex, premature birth (≤ 37 weeks of gestation), low birth weight (< 2500g), birth order, age at school entry, bilingualism

+ Statistical analyses

- Identify distinct clusters of individual trajectories within the study population- growth trajectory models (PROC TRAJ in SAS)
  - Bayesian Information Criterion (BIC) used to identify best-fitting model

- Multiple linear regression between maternal depression trajectories and child development, controlling for significant (p <.10) covariates

- Sensitivity analyses for concurrent maternal depression

Maternal depression trajectories

High symptoms in preschool period: 4.6% (n=54)

Persistent high symptoms: 4.6% (n=54)

Intermediate symptoms: 25.3% (n=297)

High symptoms in pregnancy: 3.6% (n=42)

No symptoms: 62.0 % (n=736)

van der Waerden JEB, Galéra C, Larroque B, Saurel-Cubizolles MJ, Sutter-Dallay AL, Melchior M. (2015). Psychol Med 13:1-14

Maternal depression trajectories and child behavior

Trajectory of maternal symptoms of depression and children's behavioral scores at age 5 to 6 years												
	Children's behavioral scores											
	Emotional symptoms		Conduct problems		Peer relationship problems		Prosocial behavior		Symptoms of hyperactivity /inattention		Overall behavior score	
	B [95% CI]	p	B [95% CI]	p	B [95% CI]	p	B [95% CI]	p	B [95% CI]	p	B [95% CI]	p
Adjusted model [1]												
No symptoms	[ref]		[ref]		[ref]		[ref]		[ref]		[ref]	
High symptoms in pregnancy only	.13 [-.59- .85]	.72	.03 [-.75 - .79]	.94	.32 [-.19-.83]	.22	.02 [-.63-.67]	.95	.19 [-.68 - 1.06]	.67	.66 [-1.25-2.58]	.49
High symptoms in preschool period only	.84 [.25-1.42]	.005	.52 [-.11 - 1.14]	.11	.60 [.19-1.01]	.004	-.30 [-.82 - .23]	.26	.29 [-.42 - 1.00]	.42	2.25 [.69- 3.79]	.004
Persistent intermediate-level symptoms	.62 [.33-.91]	.000	.49 [.18-.80]	.002	.34 [.13 - .54]	.001	-.27 [-.53 - -.06]	.04	.66 [.30-1.01]	.000	2.10 [1.33-2.88]	.000
Persistent high-level symptoms	1.29 [.64-1.90]	.000	1.80 [1.13 - 2.48]	.000	.95 [.51-1.39]	.000	-.99 [-1.56 - -.43]	.001	1.58 [.81-2.34]	.000	5.60 [3.92-7.27]	.000
Adjusted model [2]												
No symptoms	[ref]		[ref]		[ref]		[ref]		[ref]		[ref]	
High symptoms in pregnancy only	.37 [-.59 -.13]	.45	.39 [-.64 - 1.42]	.45	.19 [-.48 - .86]	.57	.28 [-.58 – 1.14]	.53	.47 [-.69 - 1.64]	.43	1.42 [-1.13 - 3.97]	.27
High symptoms in preschool period only	.94 [.35- 1.53]	.002	.52 [-.12 - 1.15]	.11	.67 [.25 - 1.08]	.002	-.57 [-1.10 - .03]	.04	.78 [.05 - 1.49]	.03	2.89 [1.32-4.48]	.000
Persistent intermediate-level symptoms	.54 [.19-.89]	.003	.39 [.01 - .76]	.04	.22 [-.03 - .47]	.07	-.18 [-.49 - .13]	.25	.54 [.11 - .97]	.01	1.69 [.76 - 2.63]	.000
Persistent high-level symptoms	1.36 [.68- 2.04]	.000	1.61 [.88- 2.34]	.000	1.21 [.73- 1.68]	.000	-.91 [-1.52 - -.30]	.003	1.37 [.54 - 2.20]	.001	5.55 [3.73- 7.36]	.000

1 adjusted for study center, child's sex, preterm birth, small for gestational age, duration of breastfeeding, parental separation, age mother, low income, education level mother, number of siblings, childcare, domestic violence, paternal substance abuse, social support, maternal anxiety, history of mental health problems, maternal substance use before pregnancy, maternal antidepressant use

2 adjusted for all covariates and concurrent maternal depression at age 5

van der Waerden JEB, Galéra C, Larroque B, Saurel-Cubizolles MJ, Sutter-Dallay AL, Melchior M. [2015]. J Pediatrics: 166(6):1440-8

Maternal depression trajectories and child cognitive development

Trajectory of maternal symptoms of depression and children's IQ scores at age 5 to 6 years					
Children's WPPSI-III scores					
	WPPSI-III Verbal IQ		**WPPSI-III Performance IQ**		**WPPSI-III Full scale IQ**	
	B [95% CI]	*p*	*B [95% CI]*	*p*	*B [95% CI]*	*p*
Adjusted model[1]						
No symptoms	[ref]		[ref]		[ref]	
High symptoms in pregnancy only	1.45 [-4.44- 7.35]	.628	-.20 [-6.09- 5.37]	.946	.84 [-4.75- 6.43]	.768
High symptoms in preschool period only	2.40 [-2.26- 7.03]	.309	1.13 [-3.49- 5.75]	.631	1.83 [-2.62- 6.28]	.420
Persistent intermediate-level symptoms	-1.10 [-3.43- 1.22]	.350	-2.59 [-4.91- -.28]	.028	-1.78 [-3.99- .42]	.113
Persistent high-level symptoms	-6.81 [-11.93- -1.69]	.009	-5.05 [-10.17- -.07]	.048	-6.21 [-11.07- -1.36]	.012
Adjusted model[2]						
No symptoms	[ref]		[ref]		[ref]	
High symptoms in pregnancy only	-.96[-8.16- 6.23]	.793	-4.65 [-11.83- 2.53]	.204	-2.98 [-9.80- 3.83]	.391
High symptoms in preschool period only	.01 [-4.63- 4.66]	.996	-3.64 [-8.27- .99]	.123	-1.76 [-6.16- 2.64]	.434
Persistent intermediate-level symptoms	-.07 [-2.82- 2.68]	.959	-1.43 [-4.18- 1.32]	.307	-.40 [-3.02- 2.23]	.767
Persistent high-level symptoms	-7.16 [-12.74- -1.59]	.012	-6.13 [-11.69- -.57]	.031	-7.00 [-12.28- -1.72]	.009

[1] *Adjusted for: age at birth, history of mental health problems, anxiety in pregnancy, substance use during pregnancy, pre pregnancy BMI, total energy intake during pregnancy, breastfeeding duration, frequency of maternal stimulations, parental educational level, family income, family situation, domestic violence, social support, family history of language problems, study center, child sex, preterm birth, low birth weight, birth order, age at school entry, bilingualism*

[2] *Adjusted for all covariates in model 2 and concurrent maternal depression at age 5*

van der Waerden JEB, Bernard JY, De Agostini M, Saurel-Cubizolles MJ, Peyre H, Heude B, Melchior M. [submitted]

Maternal depression trajectories and child development at age 5

- Children whose mothers had persistent depressive symptoms were more likely to have developmental problems than their peers whose mothers were not depressed

- Maternal depression when the child is preschool age is strongly associated with emotional and behavioral problems

- Role of maternal depression during pregnancy remains uncertain
  - may have influence on fetal development, such as birth weight, neurological development

+ Strengths and limitations

- **Strenghts**
  - Large community sample
  - Longitudinal assessment of outcomes and covariates
  - Multiple, validated measures for mother and child mental health

- **Limitations**
  - Selective attrition
  - Maternal depression and child behavior both rated by mother
  - No clinical diagnosis of mother and child mental health
  - Paternal psychopathology not measured

+ Conclusions

- Depressive symptom trajectories in mothers of young children are heterogeneous and vary with a number of preexisting characteristics

- A chronic course of maternal depressive symptoms, even of subclinical severity, may have deleterious effects on several aspects of child development

- Identifying mothers in need of support and addressing their needs may help reduce the burden of early behavioral and cognitive problems in children