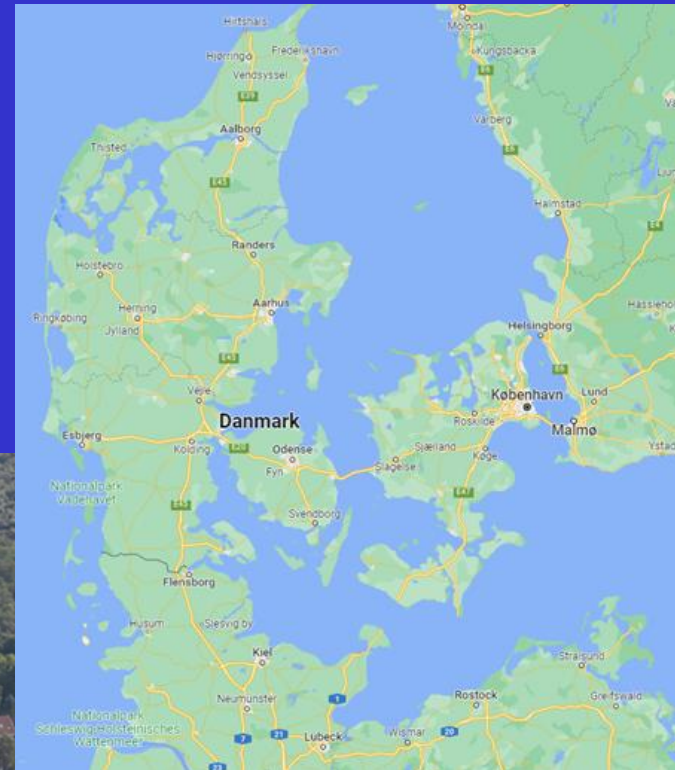


# Preterm infants and follow-up

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## Preterm infants: follow up

Can we use a 2 year follow-up to predict long-term outcomes ?

*(the next 10 – 15 minutes)*

Outcome measures from two year follow-up studies and the predictive value of these.

Stability of measures of cognitive development: the group vs. the individual

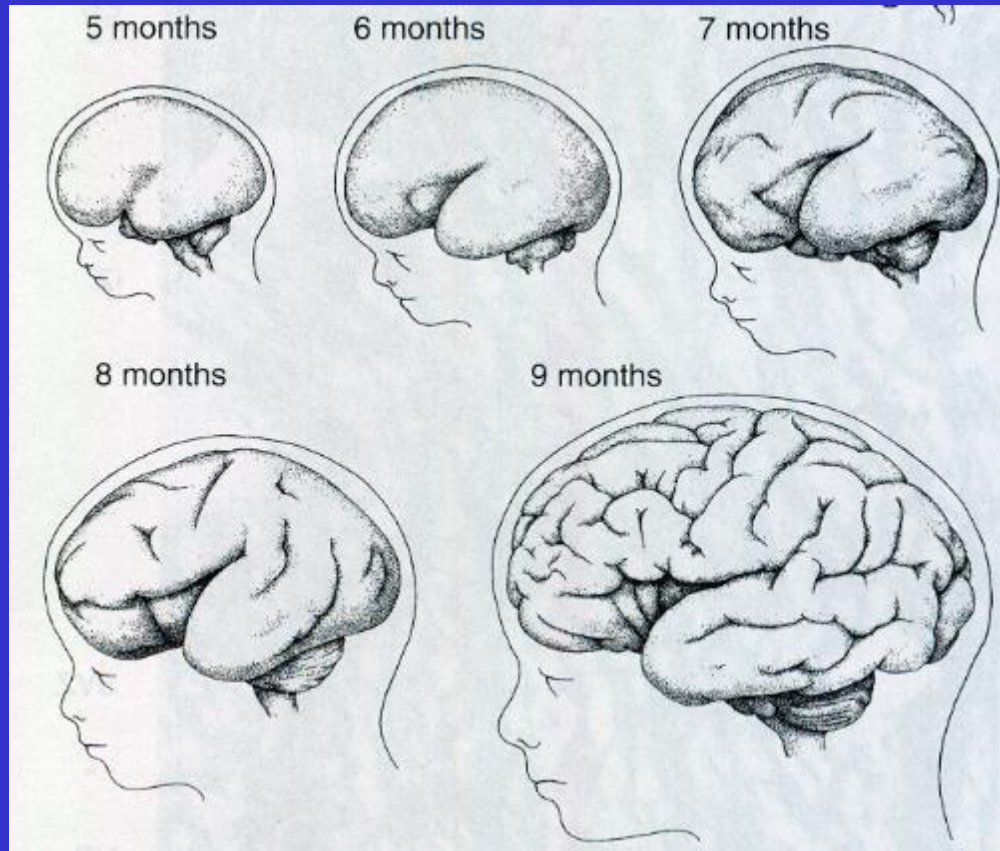
Gestational age and association to cognitive development.

Gestational age and association to School difficulties



# VPT and EPT infants at the NICU:

## Brain development: 28 to 40 weeks of gestation



- Total volume increases > 2 times
- Cortex, grey matter, volume increase > 4 times
- Cortex surface increases > 5 times
- Myelination increases > 5 times

*Hüppi, Clin Perinatol 2002.*

# Causation of brain injury in the preterm infant is likely to be (very) complex.

## Prenatal

Genetic  
Teratogenic/toxic  
Nutritonal  
Hormonal

## Antenatal

Hypoxic  
infection/inflammation



## Perinatal

Asphyxic  
Traumatic

## Postnatal

Intracranial  
haemorrhage  
Severe events  
of hypoxia-  
ishaemia or  
hyperoxia  
etc.

## Preterm infants: follow-up When ? How ?

### Too early:

we might overlook important outcomes.....

relevant to measure neurodevelopment and not only rely on measures of Major Neonatal Morbidity.

### Too late:

The gap between the intervention and the measure of outcome become too large – we need an answer as fast as possible.

The influence of genes, family and the community might blur the effect of a neonatal intervention.

# VPT infants

Different problems appear dependent on the age of the children

**At discharge:** Major Neonatal Morbidities: predictors of outcome.

## 0-2 years

- ❑ Cerebral Palsy:
- ❑ Visual impairment (incl. blind)
- ❑ Hearing loss
- ❑ Major developmental delays

## 4-6 years

- ❑ Cognitive deficits
- ❑ Minor motor deficits
- ❑ Major behavioural problems

## School age / teenage years

- ❑ School difficulties
- ❑ Social and emotional problems
- ❑ Psychiatric problems (anxiety, depression)

# VPT infants, follow-up

## Development and outcome measures

**At discharge:** Major Neonatal Morbidities: predictors of outcome.

### 0-2 years

- ❑ Cerebral Palsy:
- ❑ Visual impairment (incl. blind)
- ❑ Hearing loss
- ❑ Major developmental delays

Neuro-developmental disabilities

### 4-6 years

- ❑ Cognitive deficits
- ❑ Minor motor deficits
- ❑ Major behavioural problems

A quantitative measure of development  
(To classify present developmental and to predict future development problems)

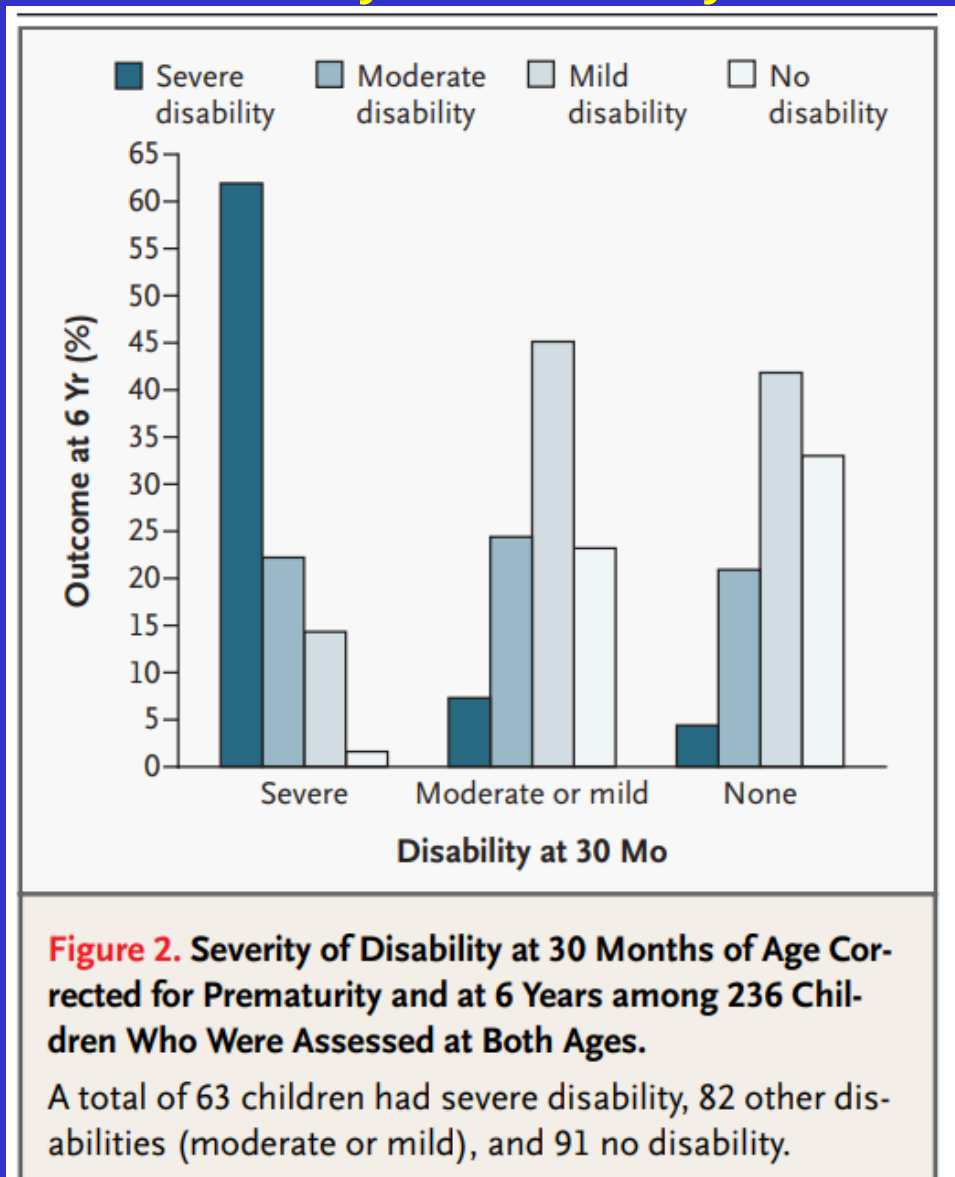
### School age / teenage years

- ❑ School difficulties
- ❑ Social and emotional problems
- ❑ Psychiatric problems (anxiety, depression)



# Neurodevelopmental disability (GA < 26 weeks)

## Severity of Disability at 30 months and at 6 years



Moderate / severe disability:

1: Motor impairment

2: Vision

3: Hearing

4: Cognitive impairment

Category "severe disability" at 30 months and "moderate / severe disability" at 6 years

Sensitivity: 50%

Specificity: 93 %

# Measures of cognitive development

## Correlation between adult IQ and measures of cognitive development during development

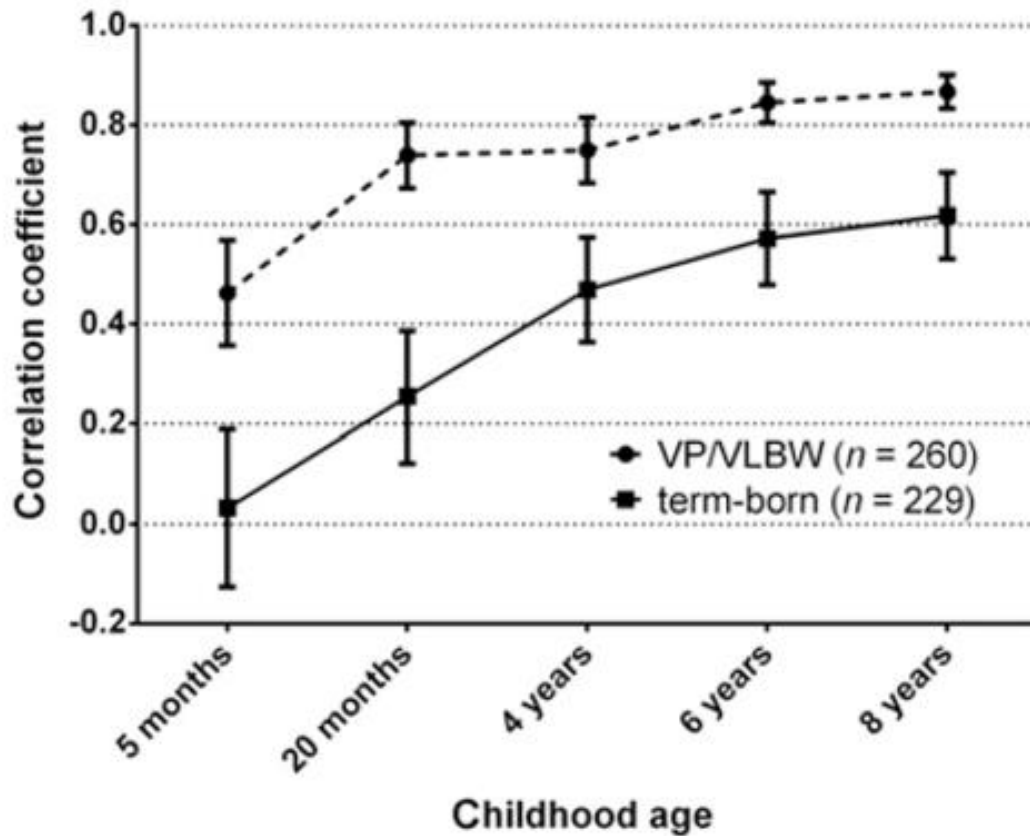
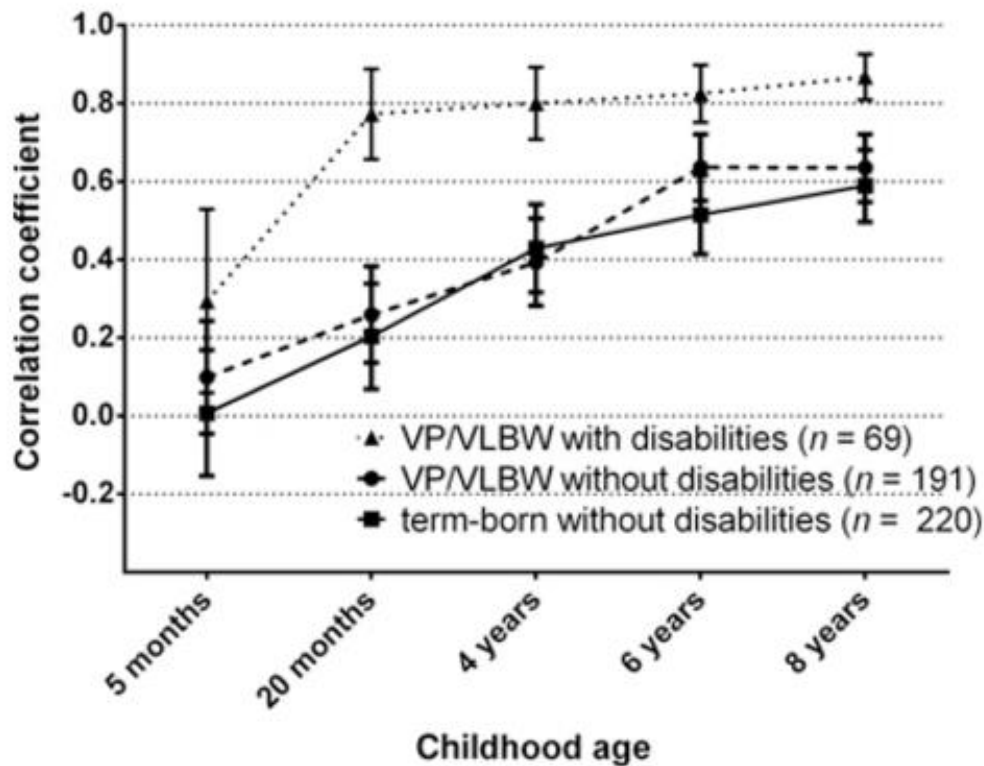


FIGURE 2

# Correlation between adult IQ and measures of cognitive development during development



**FIGURE 3**

*“Cognitive development can be predicted from age 2 years.....*

*Yet it is important to realize that these stability values based on the whole VP/VLBW group may not be as predictive of cognitive development of a single individual”*

## IQ deficit constant over time

|          | VP/VLBW Whole Sample,<br><i>n</i> = 260 |      |           | Term-Born Whole Sample,<br><i>n</i> = 229 |       |             |
|----------|-----------------------------------------|------|-----------|-------------------------------------------|-------|-------------|
|          | <i>n</i>                                | Mean | 95% CI    | <i>n</i>                                  | Mean  | 95% CI      |
| DQ 5 mo  | 248                                     | 96.3 | 93.7–98.8 | 229                                       | 107.1 | 105.7–108.5 |
| DQ 20 mo | 244                                     | 93.7 | 91.4–96.0 | 229                                       | 106.9 | 106.0–107.7 |
| IQ 4 y   | 230                                     | 87.2 | 84.8–89.6 | 228                                       | 101.8 | 100.5–103.2 |
| IQ 6 y   | 218                                     | 87.2 | 85.1–89.3 | 229                                       | 102.0 | 100.5–103.4 |
| IQ 8 y   | 233                                     | 90.3 | 88.2–92.5 | 227                                       | 102.0 | 100.7–103.3 |
| IQ 26 y  | 216                                     | 86.2 | 83.6–88.9 | 197                                       | 102.6 | 100.9–104.4 |

# Preterm birth: a biological risk factor

## Follow-up of the infants with high risk of neurodevelopmental problems

Neuro-developmental disabilities at age 2 years predicts future disabilities (cognitive impairment is a major cause of disability in follow up of VPT infants).

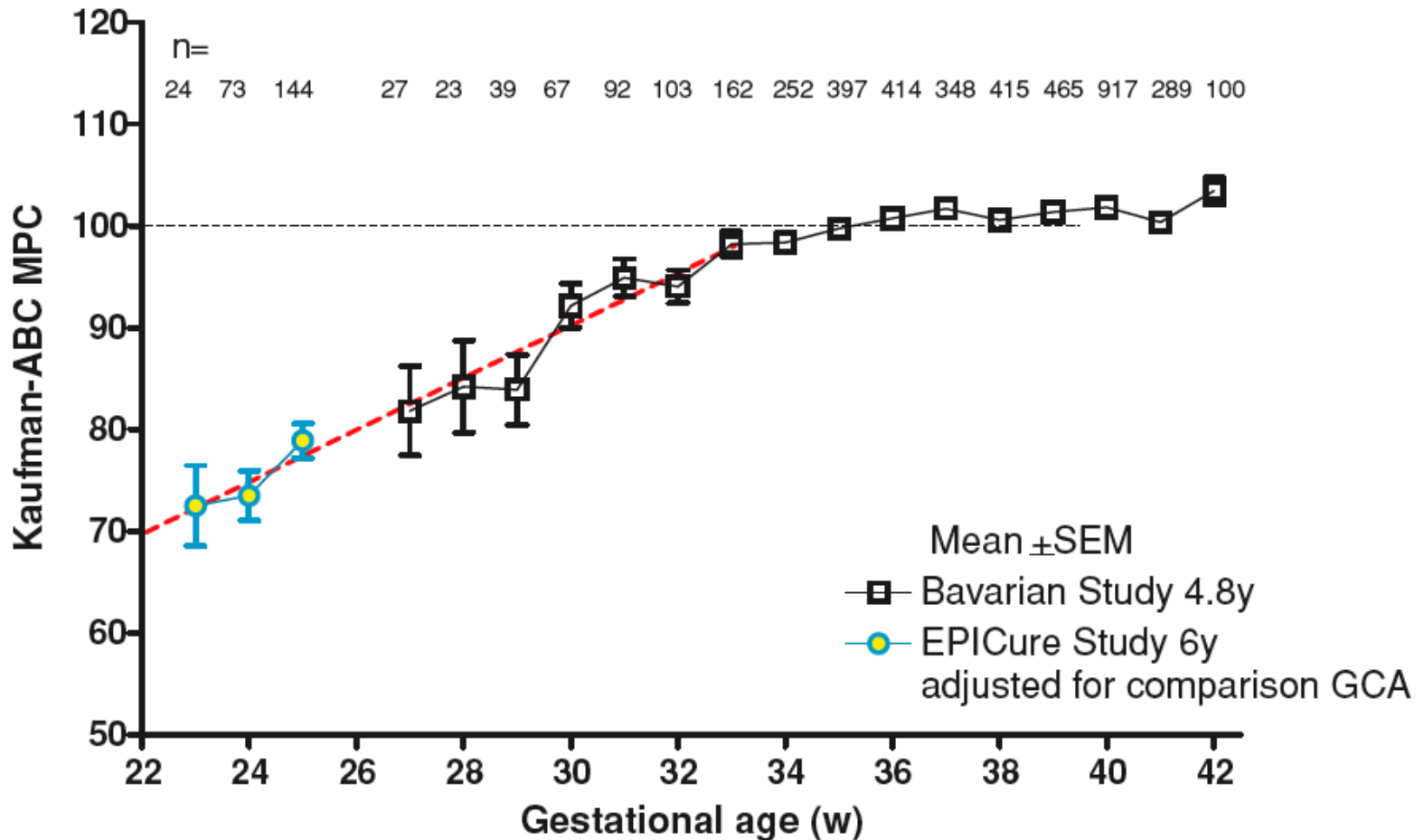
There is no narrowing of the cognitive deficits in groups of VPT / VLBW born individuals compared to controls over time.

Development unfolds within individual, family, and community contexts, all of which influence its course.

Developmental pathways are probabilistic, not deterministic.



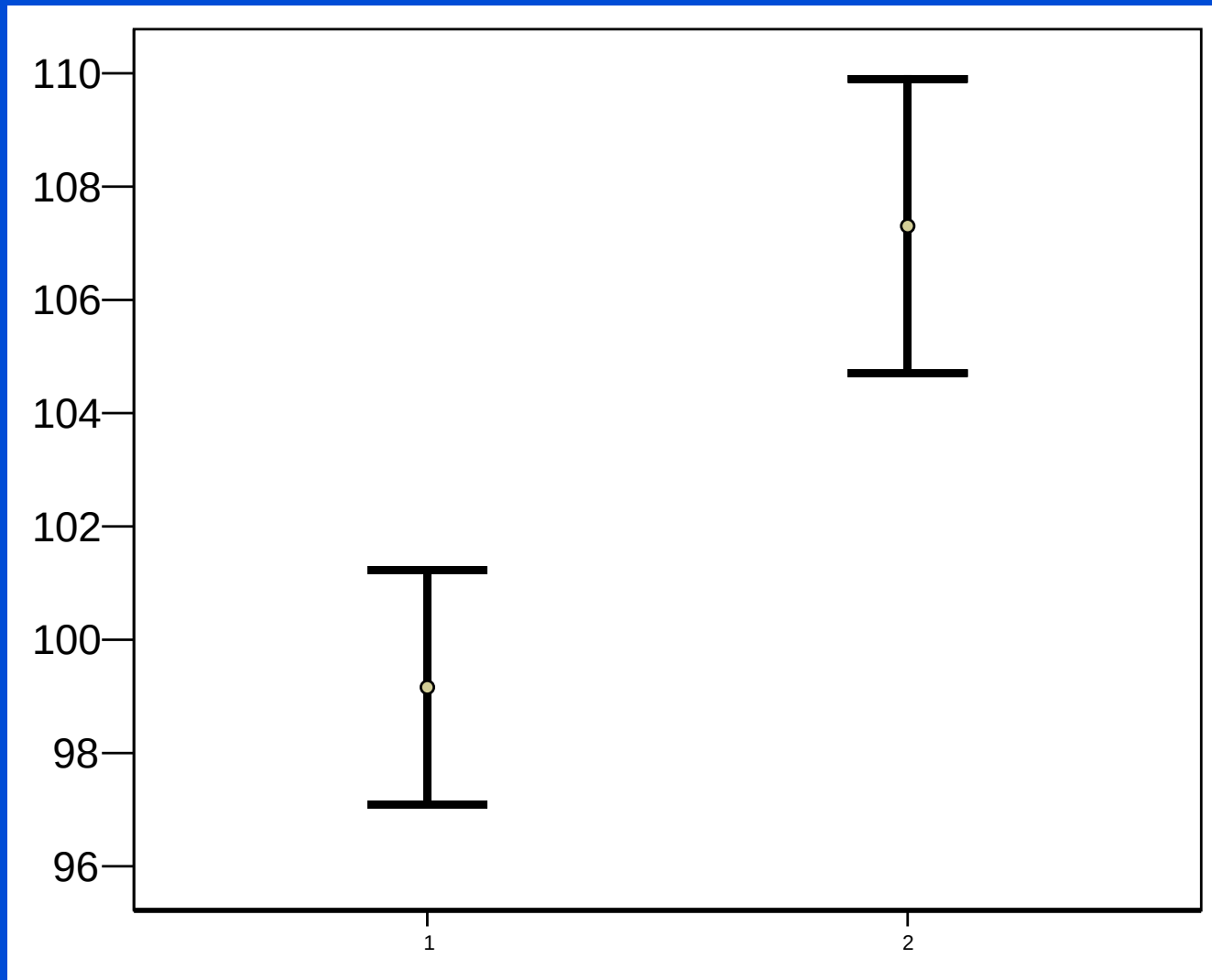
# Gestational age vs IQ



(Lagercrantz. Acta Pædiatr 2008)

# IQ deficit in the group. A cohort of VPT / EPT children at age 5 years

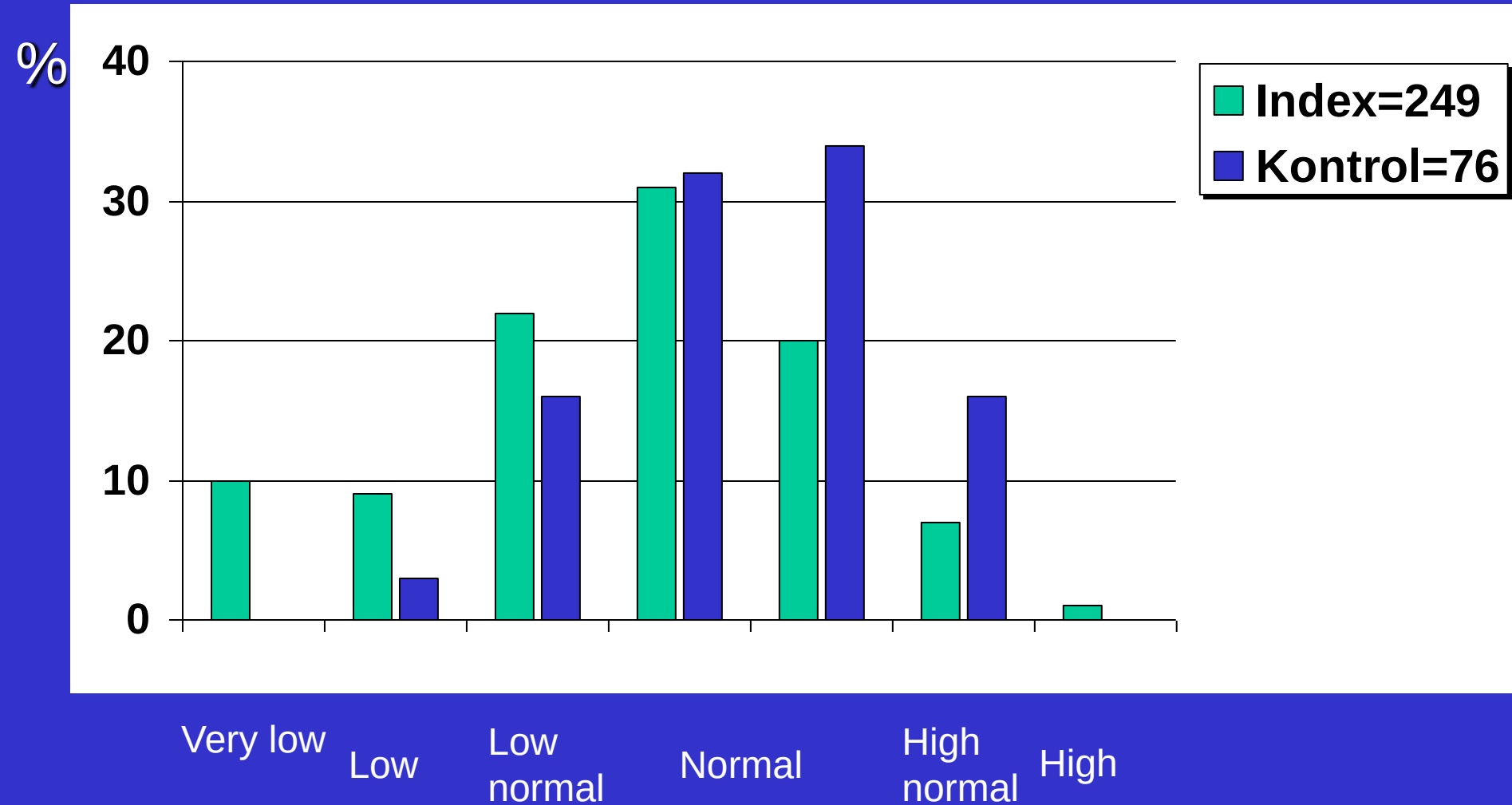
Mean IQ  
CI 95%



GA<28 u./ FV<1000g.  
n=226

Matched controls born at term  
n=76

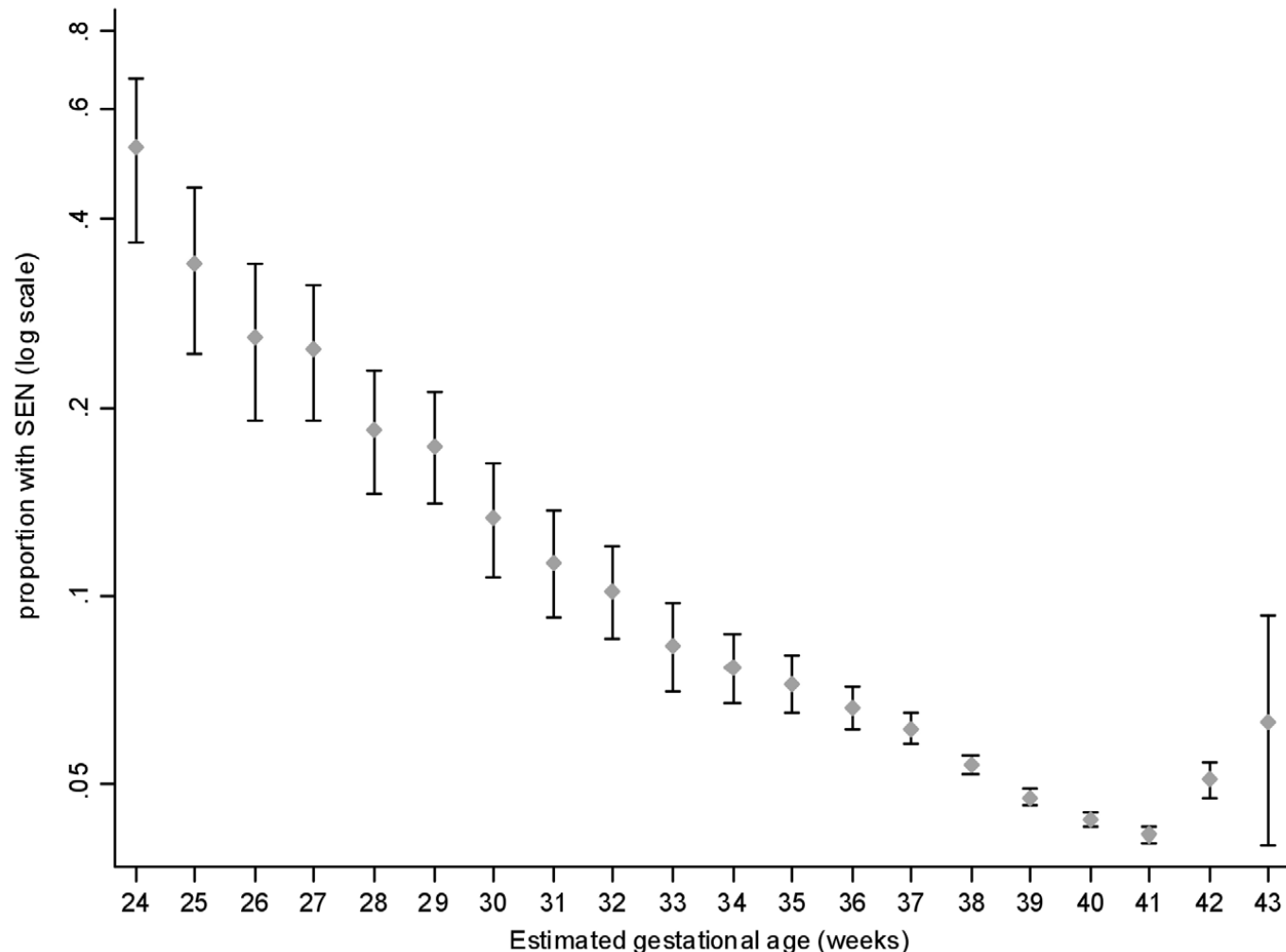
## IQ at age 5 years, WPSSI-R



# School

Prevalence of Special Educational Need  
by gestation at birth in Scotland in 2005.

N=407,503



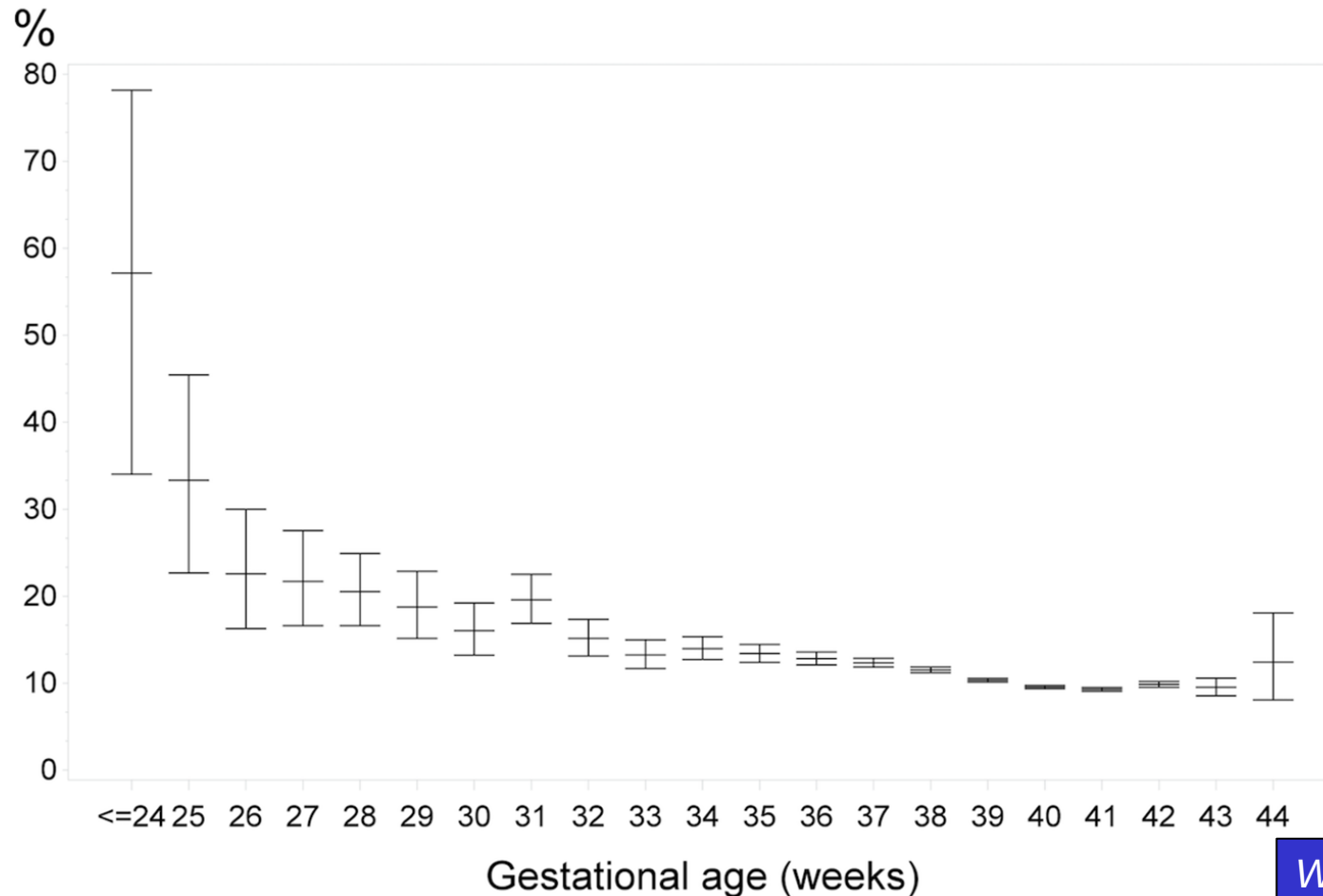
*MacKay et al. PLoS Med, 2010.*

# Basic school achievement

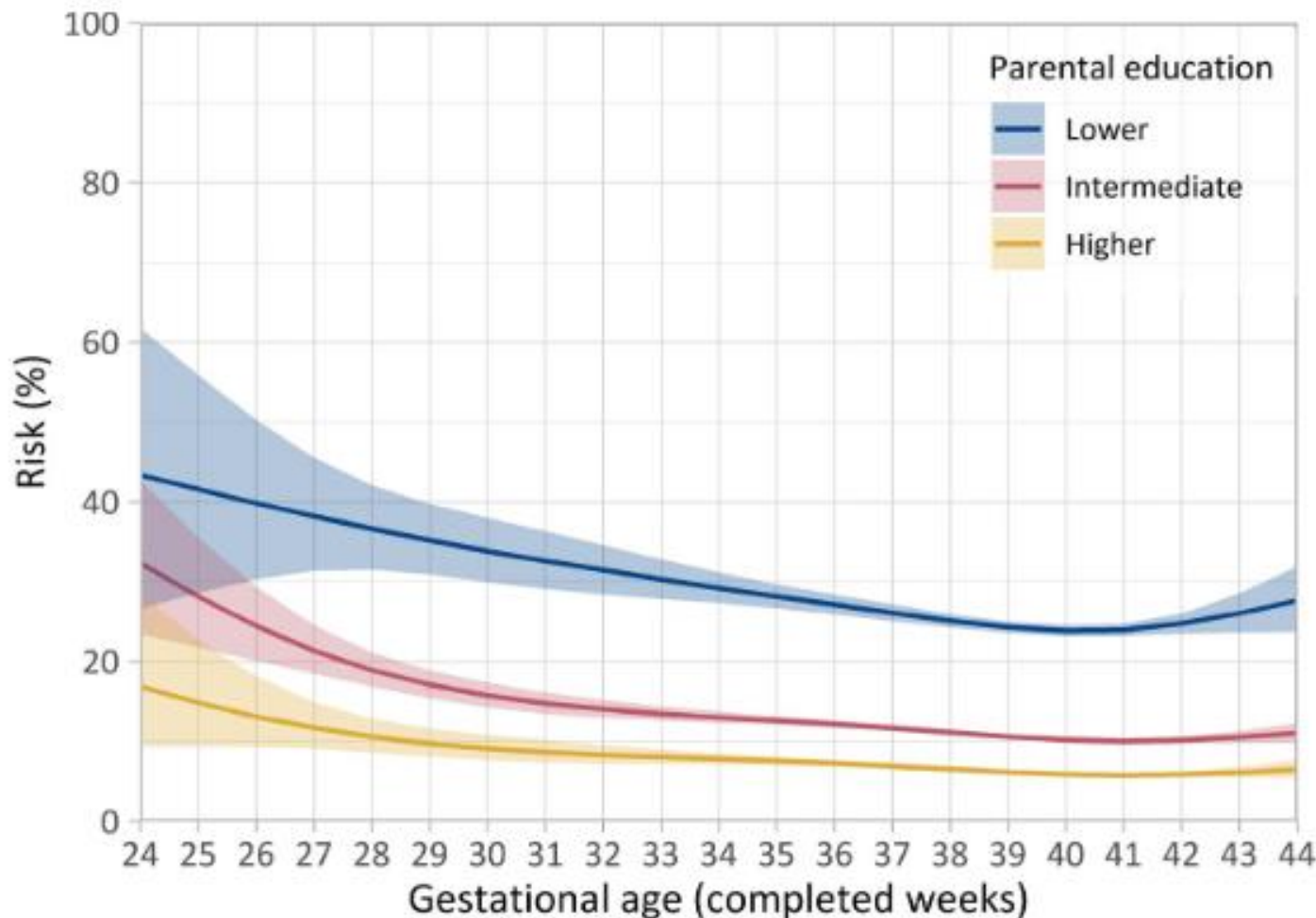
Born in Denmark 1992-97, n=374.798

**B**

## Failed to complete compulsory school (%)



# School difficulties and GA, stratified by parental education Denmark 1995-2001, n = 435.981



*Blistein J et al.  
Paediatr Perinat  
Epidemiol.  
2021*



## Preterm infants and follow-up

- Neurodevelopmental outcome at 2 years of age predicts persisting disabilities.
- In groups of VPT children the cognitive deficit is stable over time when compared to groups of term children.
- IQ seems to decrease with decreasing gestational age.
- School difficulties seems to increase with decreasing gestational age.
- Other factors than gestational age (such as parents / family) are important.

# Preterm infants: follow up

## Can we use a 2 year follow-up to predict long-term outcomes ?

I think: yes

but keep in mind the difference between a group and the individual child

developmental pathways are probabilistic, not deterministic.

Thank you  
for  
your attention

