

# Epidemiologic Applications: Group-Based Developmental Trajectories

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# Applications of group-based trajectory method

- A. Topography of social development
- B. ID predictors of trajectories
- C. ID outcomes of trajectories
- D. Model co-morbidity (co-occurrence)

# Definition: Trajectory

- A developmental trajectory describes the course of a behaviour or characteristic as a function of age or time.



# Definition: Heterogeneity

Object or system consisting of multiple items having a large number of structural variations.



# When to use group-based trajectories?

Hypotheses about developmental trajectories that are inherently categorical:

Do certain types of people tend to have distinctive developmental trajectories?

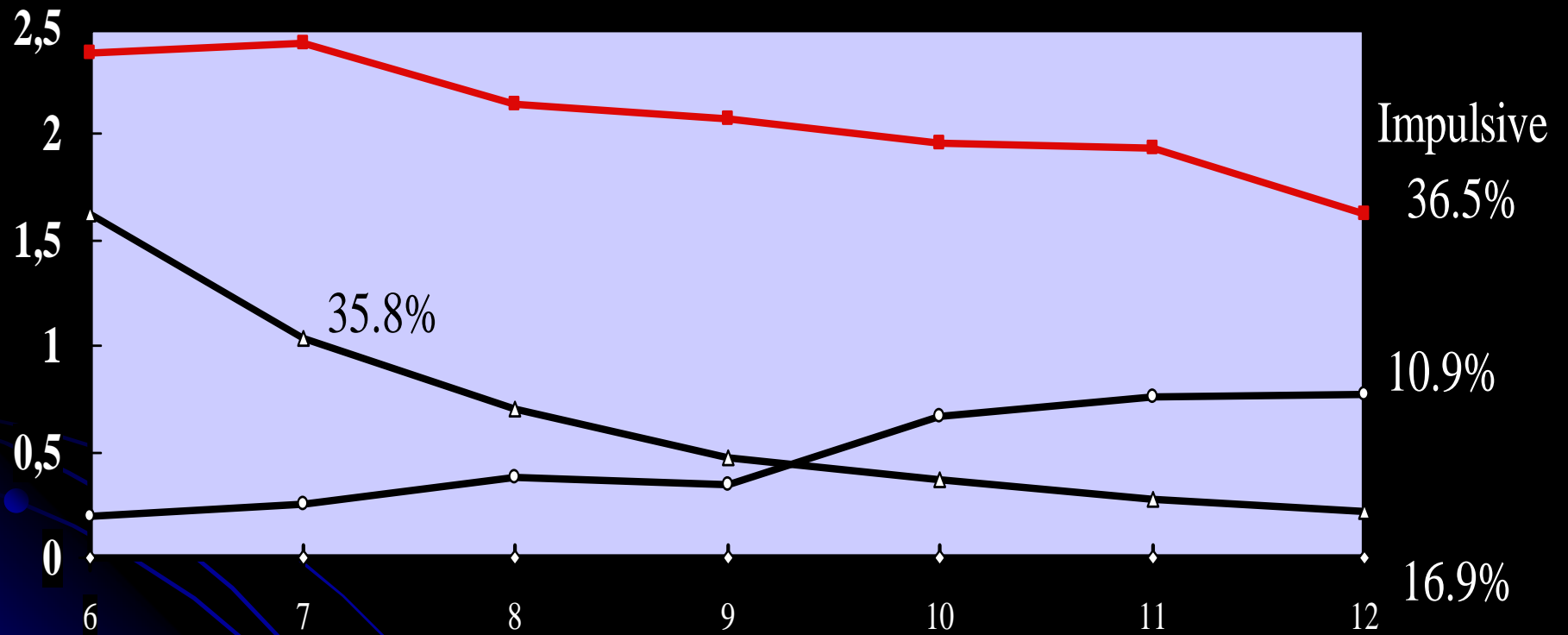
# Methods

## Participants:

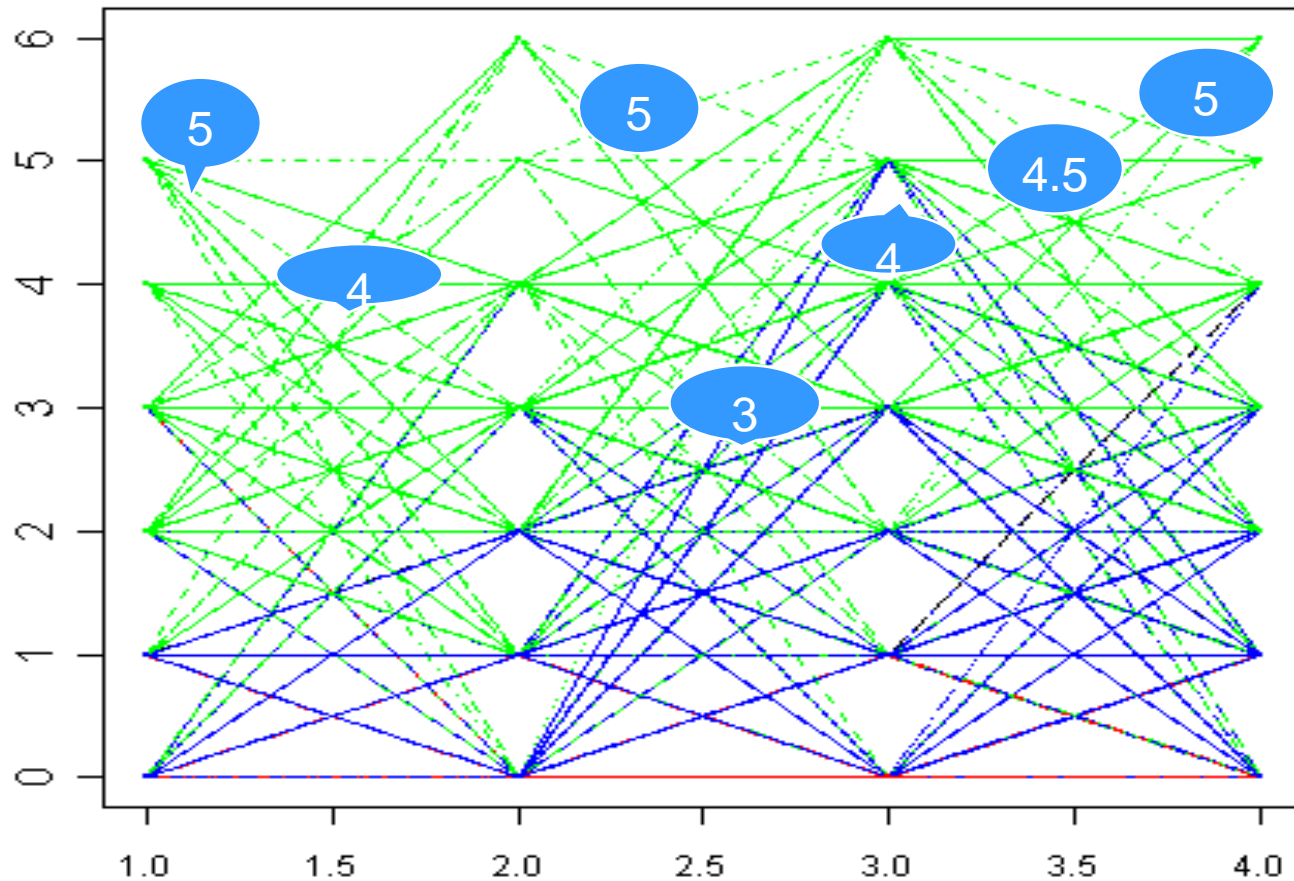
- 3000 kindergarten children.
- Representatives of Quebec children in 1986
- Repeated assessments of a behavior

# Hyperactivity Trajectories

## Boys



# Data before proc traj: 7 assessments per individual over 7 years



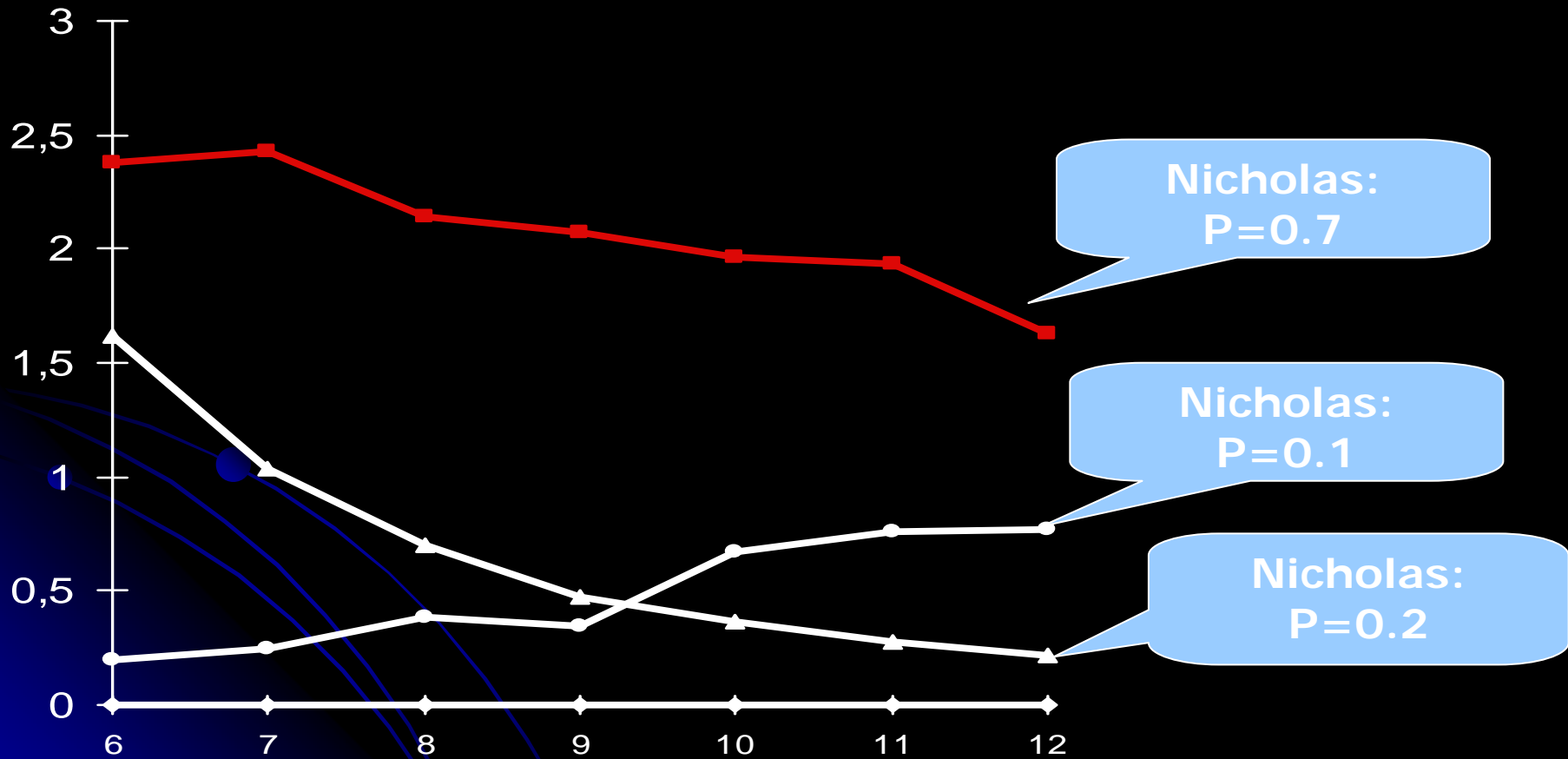


# Outputs of the analysis

- Probability of belonging to a trajectory group
  - Varies from 0 to 1
- Trajectory group assignement based on maximum posterior probability

# Trajectoires d'hyperactivité

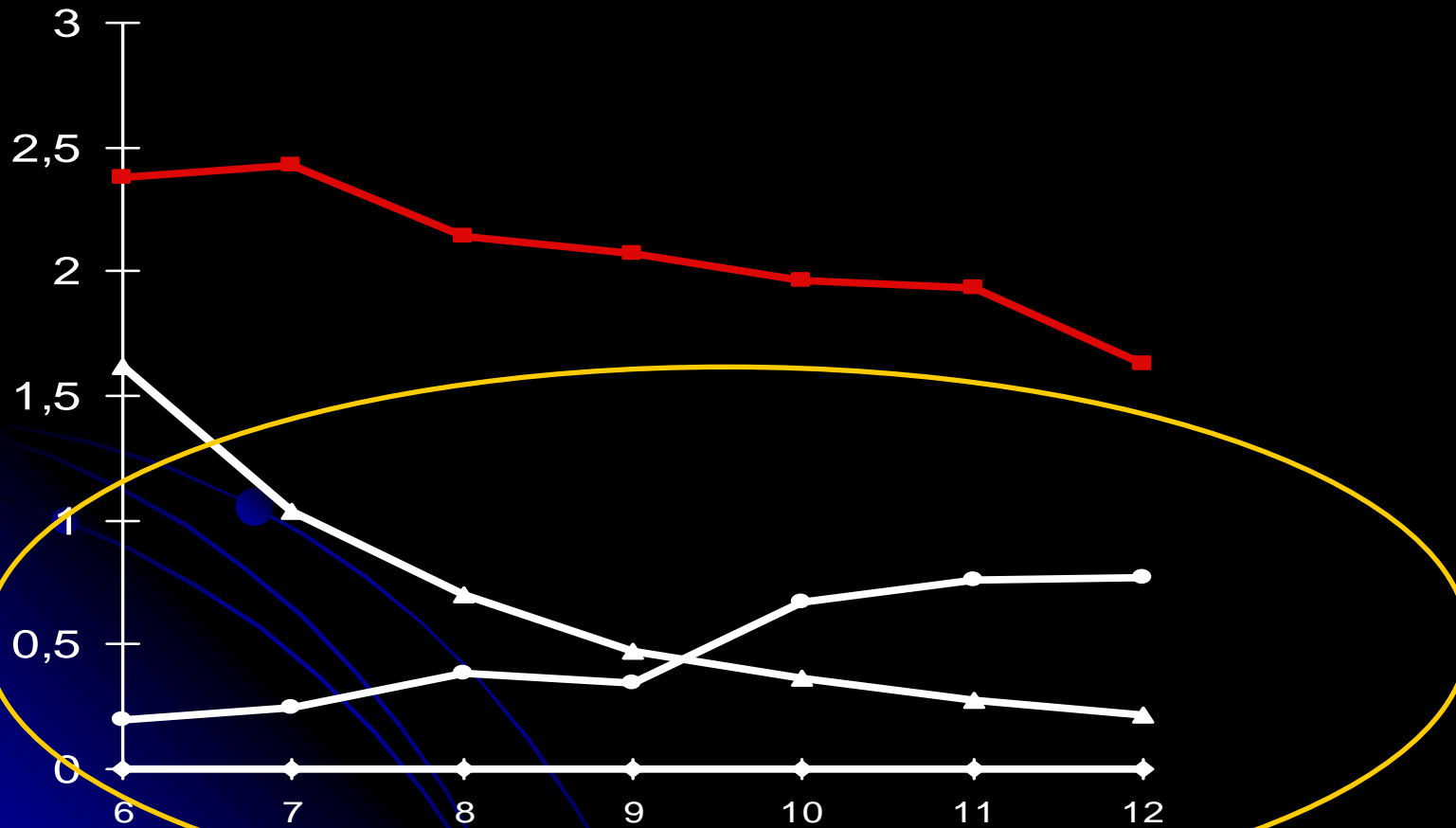
## Garçons



Côté et al. (2002). Journal of Child Psychology and Psychiatry

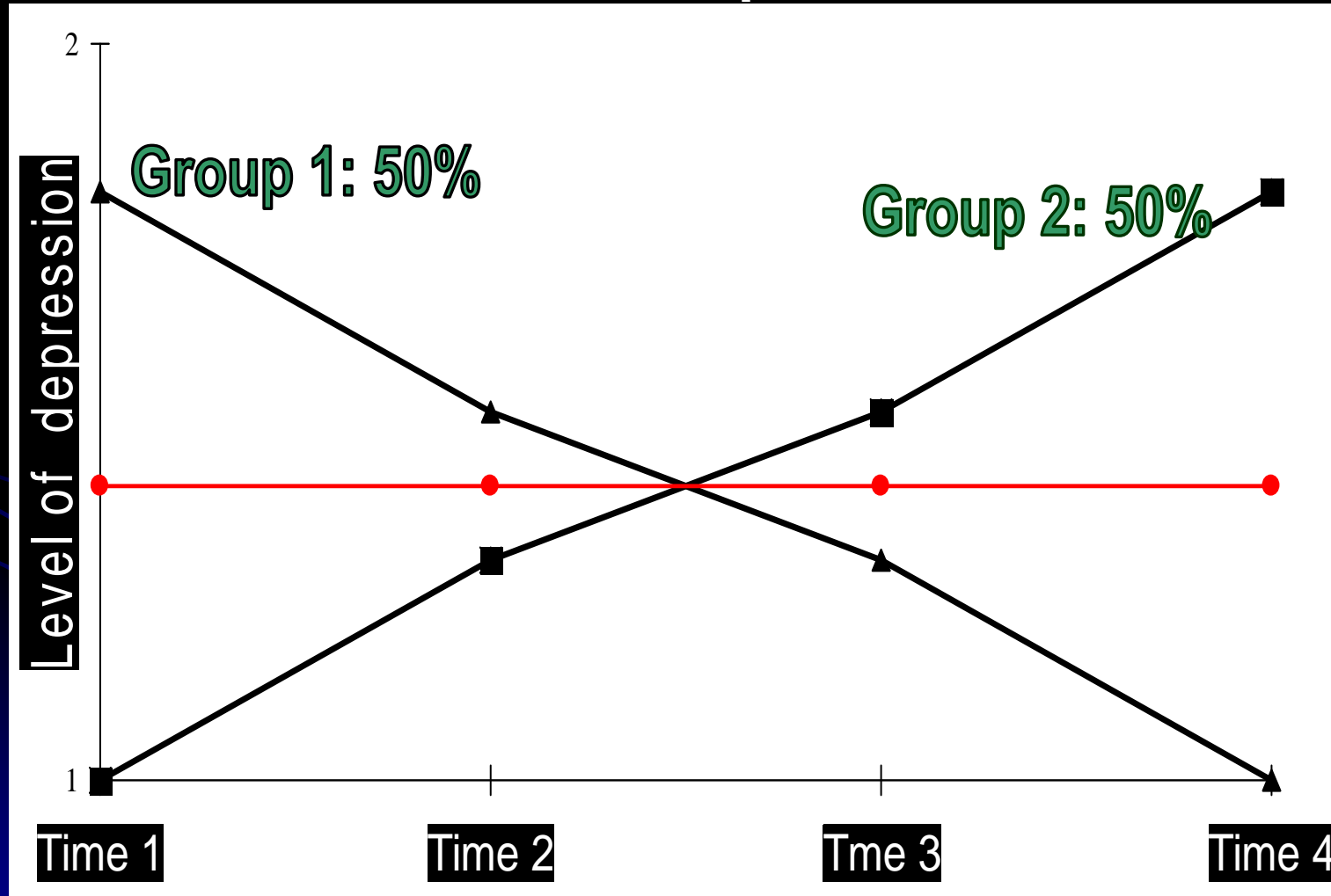
# Trajectoires d'hyperactivité

## Garçons

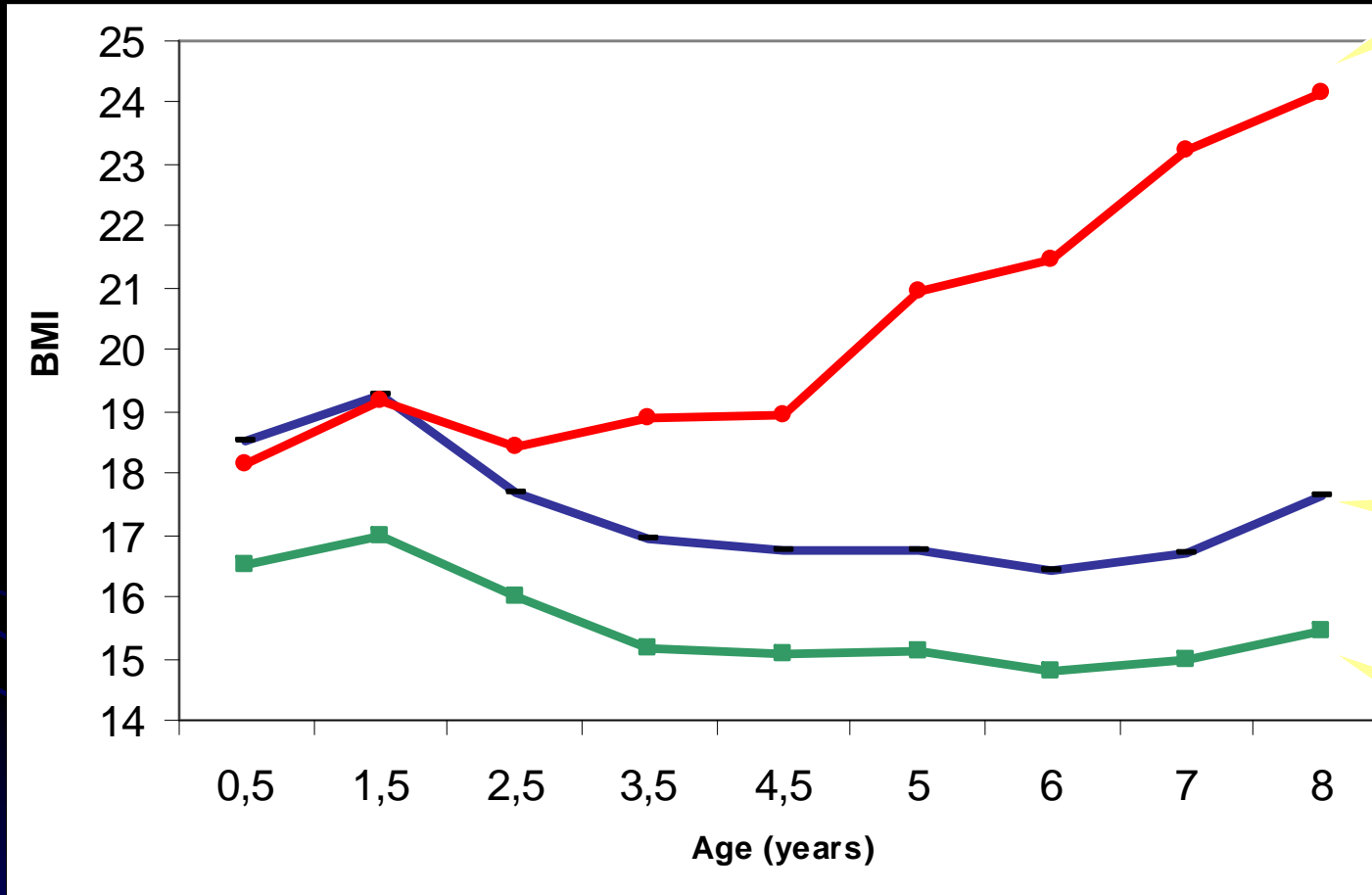


Côté et al. (2002). *Journal of Child Psychology and Psychiatry*

# Groups with distinct and opposite development



# Body Mass Index Trajectories



5.4%

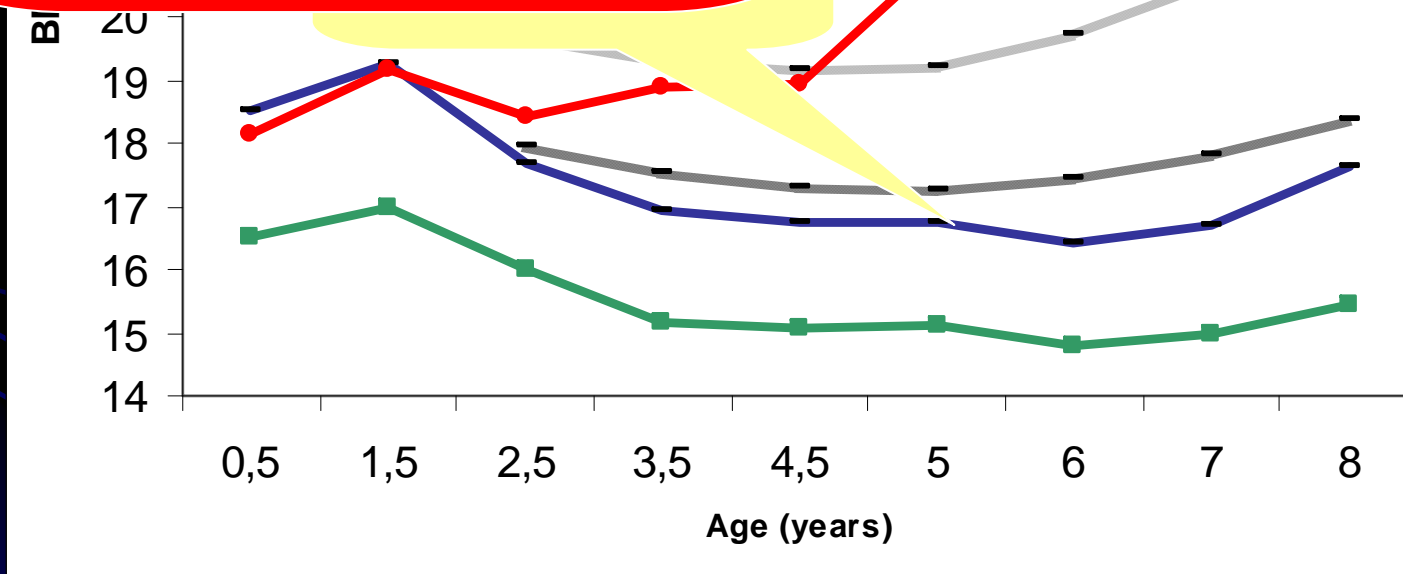
41%

54.5%

# Body Mass Index Trajectories

Maternal Risk:  
Smoking pregnancy  
Obesity

Obese



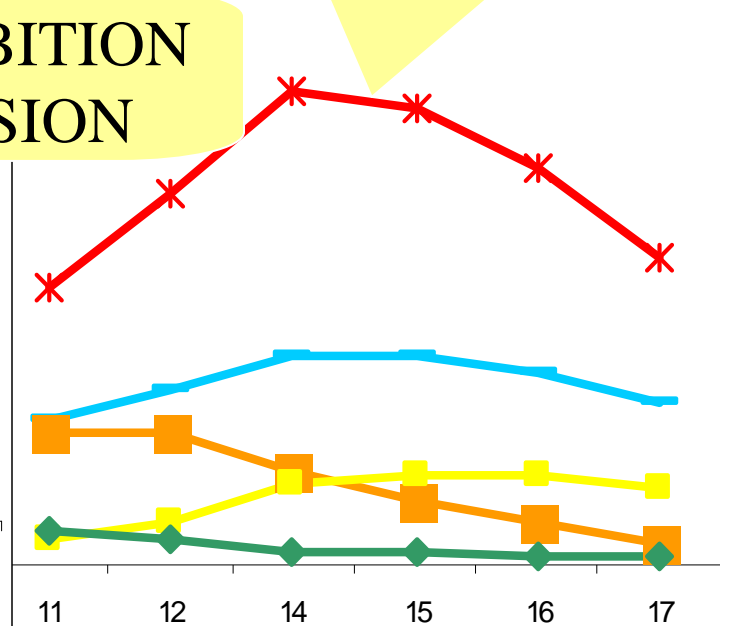
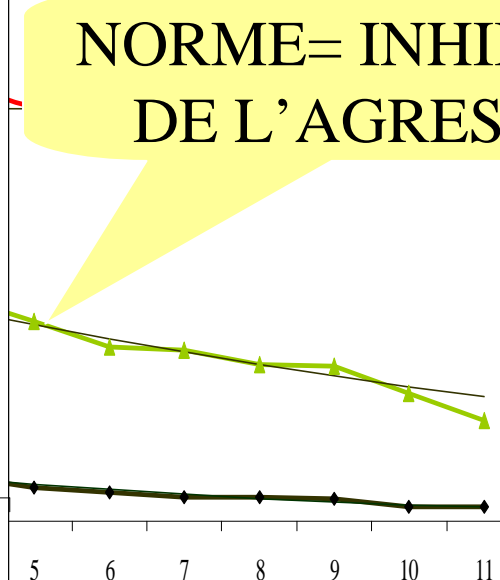
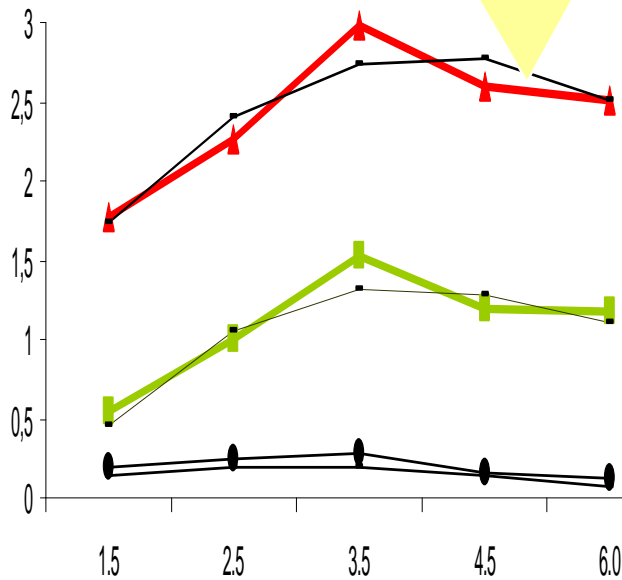
# DEVELOPPEMENT DE L'AGGRESSION PHYSIQUE: 1.5 TO 17 YEARS

N=22  
ELDEQ

NIVEAU ATYPIQUE  
OBSERVABLE TÔT

D'AGRESSION  
PHYSIQUE ÉLEVÉE =  
RARE  
DE NOVO =RARE

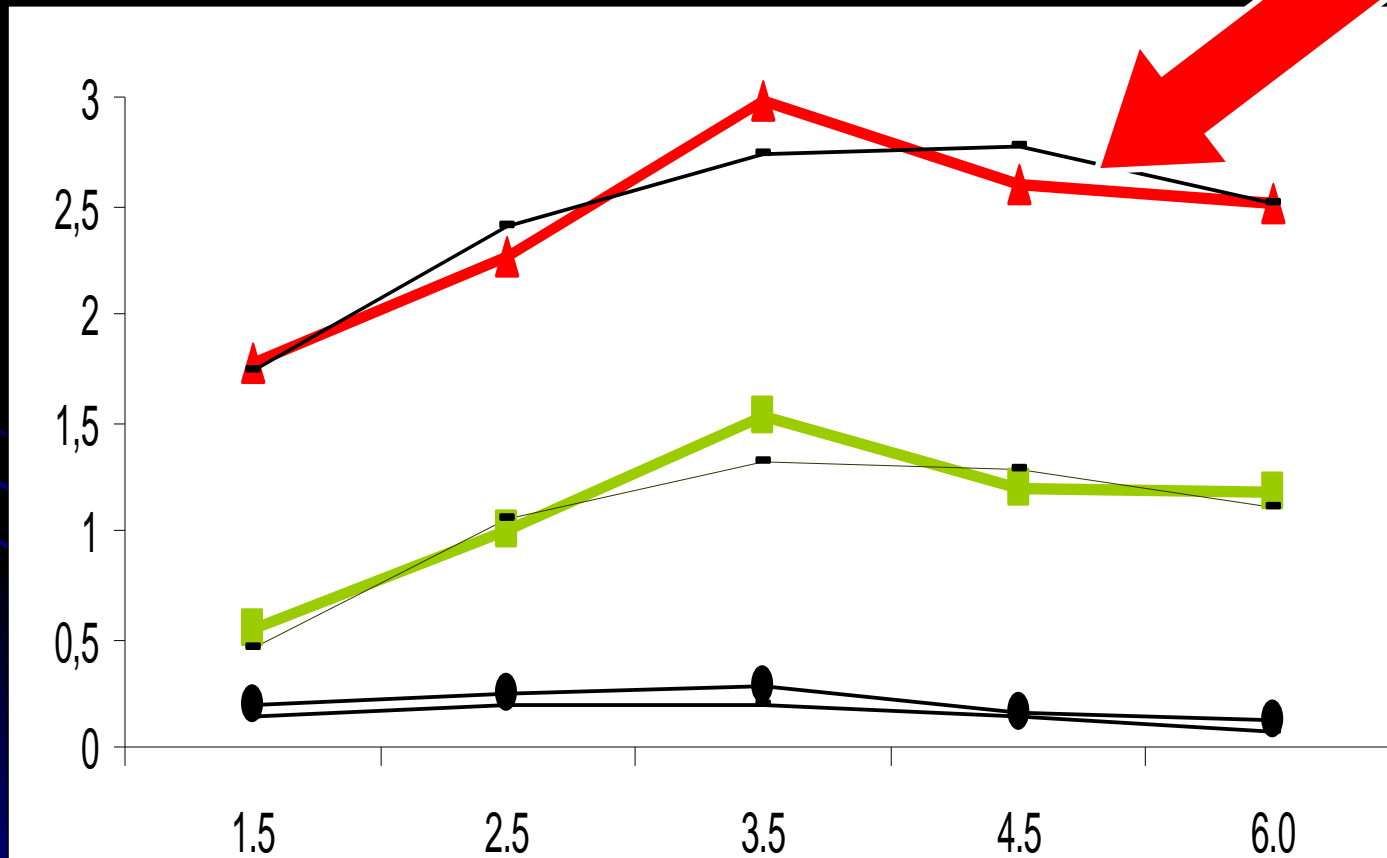
NORME= INHIBITION  
DE L'AGRESSION



# A. TOPOGRAPHY

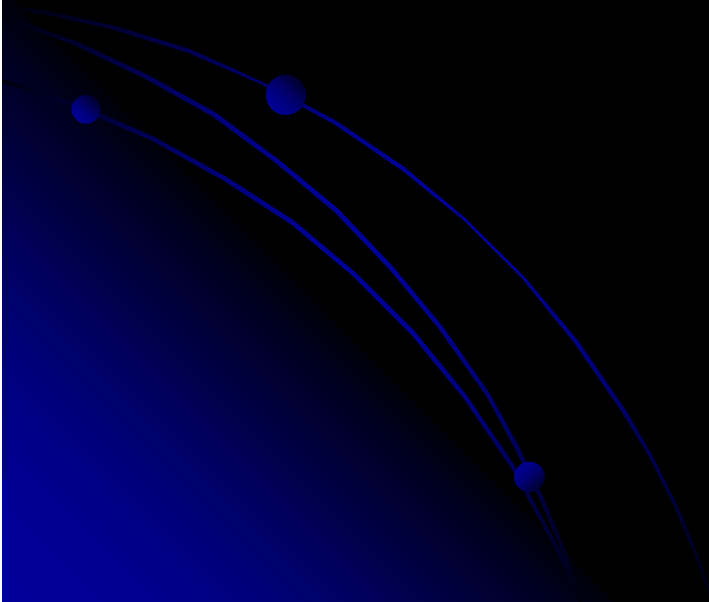
## Physical aggression between: 1.5 and 6 years


N=2000





# B. ID predictors of trajectories





Sous quelles conditions  
les enfants peuvent-ils  
bénéficier de la  
fréquentation de la  
crèche?

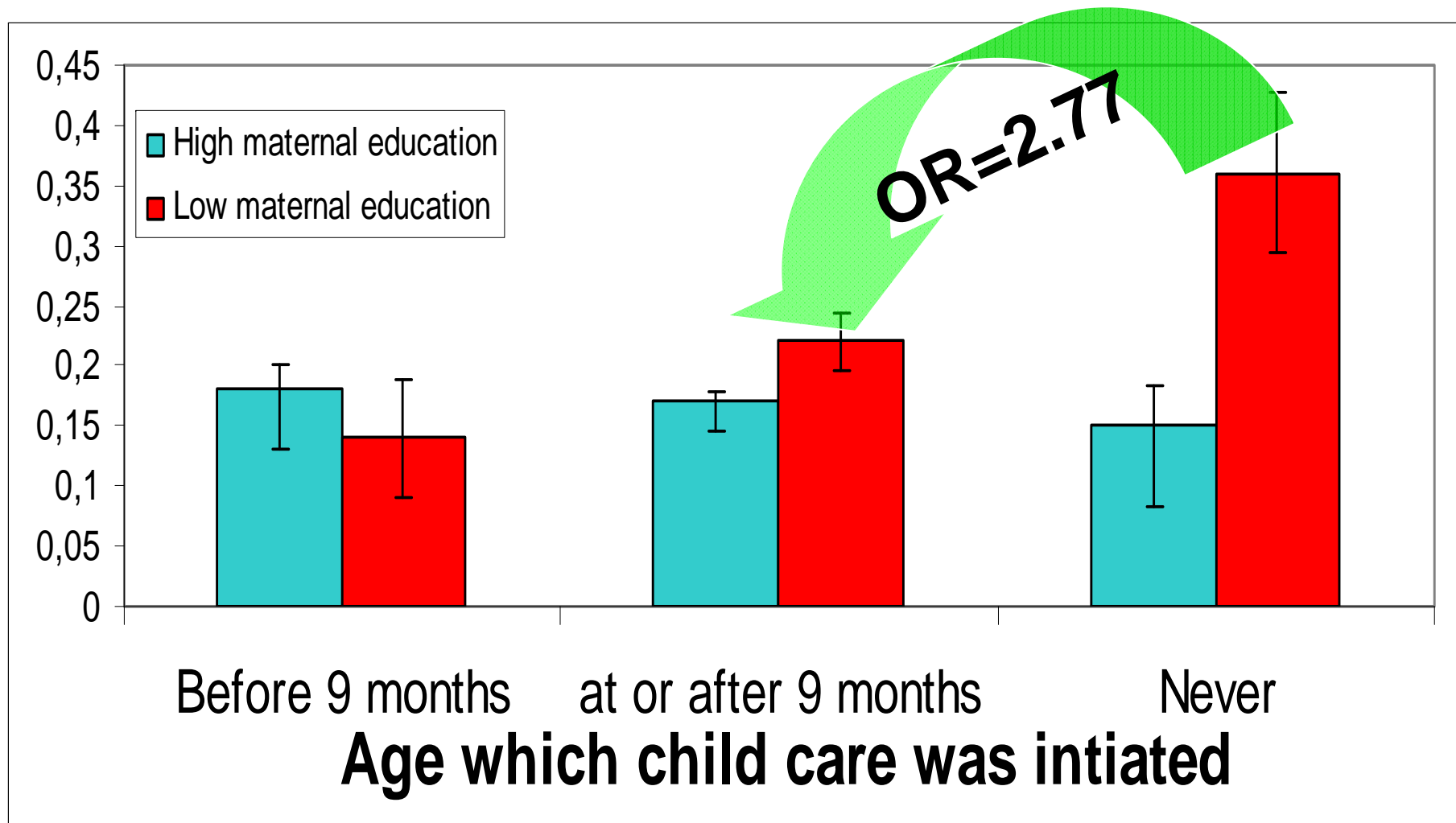
Milieu  
familiale?

Qualité de la  
garderie?

Conditions de la  
fréquentation?



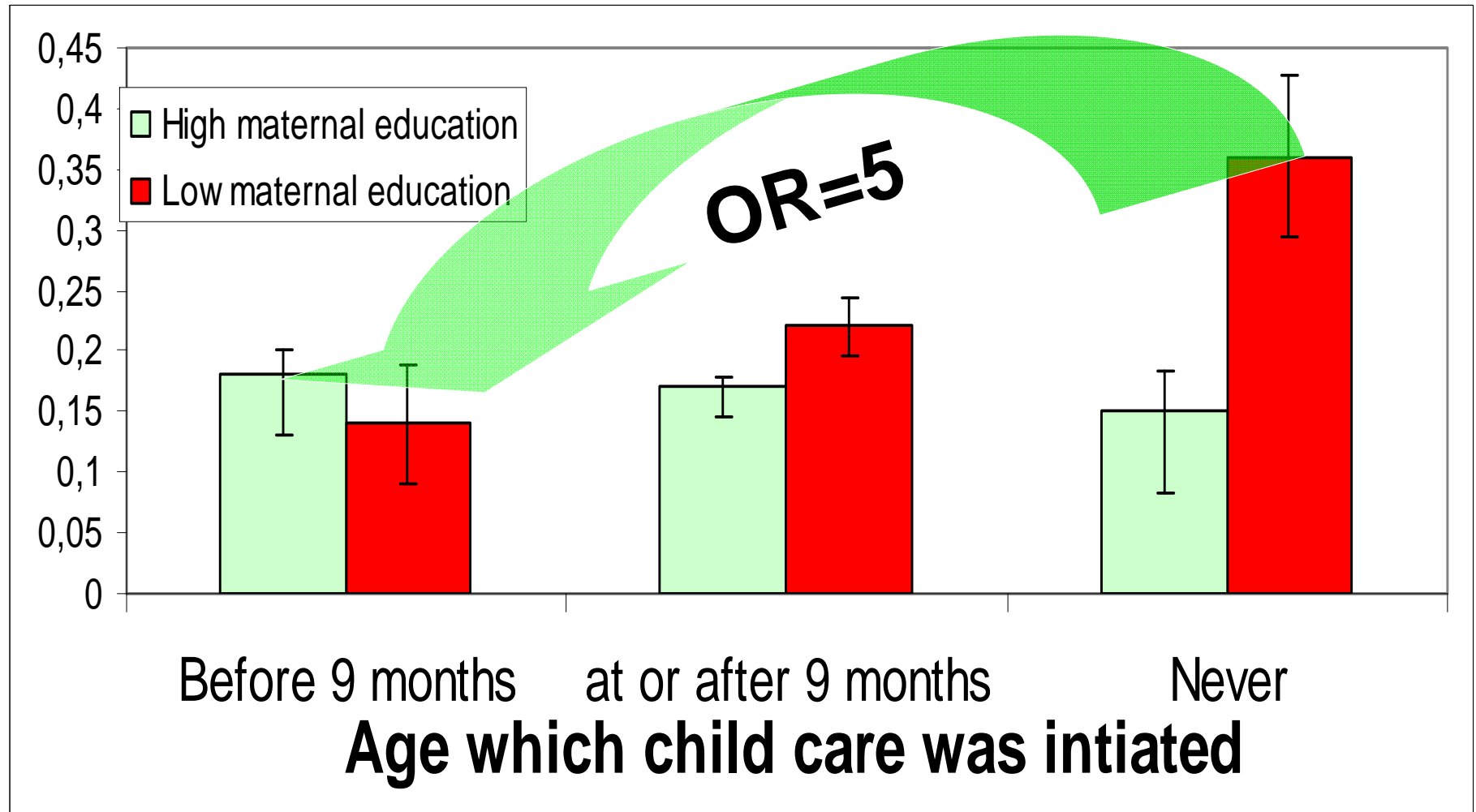
# Protection by Child Care for High-Risk Children: Physical Aggression (N=1691)



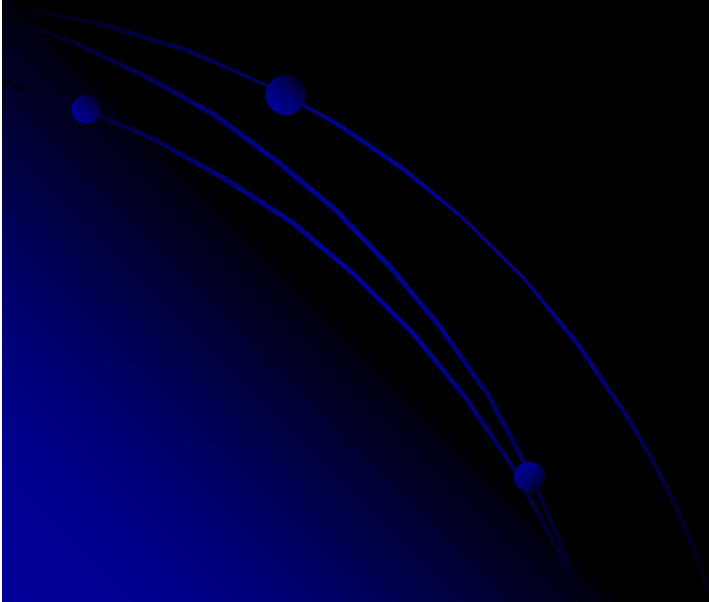
Coté S.M. et al (2007). *Archives of General Psychiatry*.



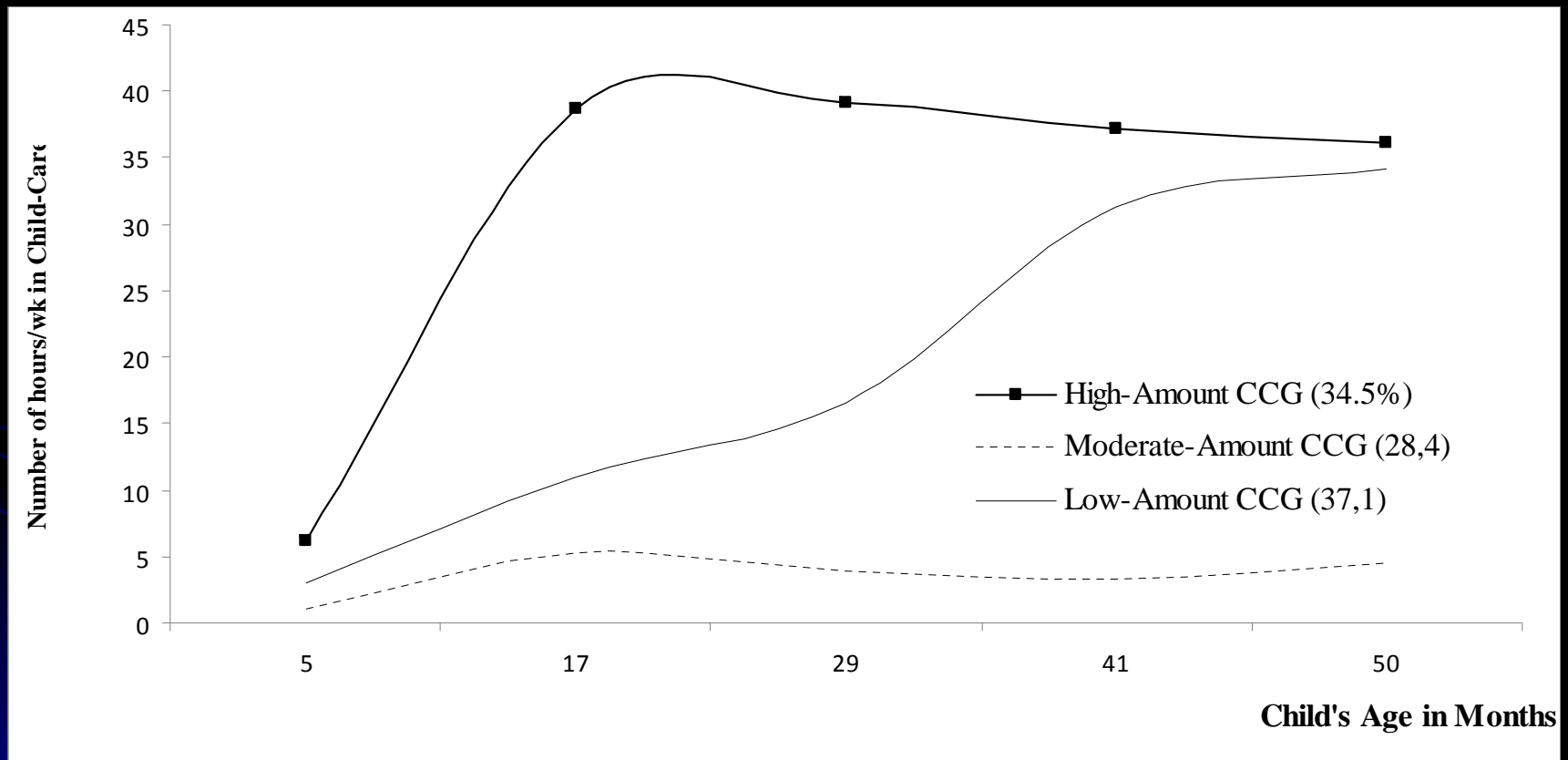
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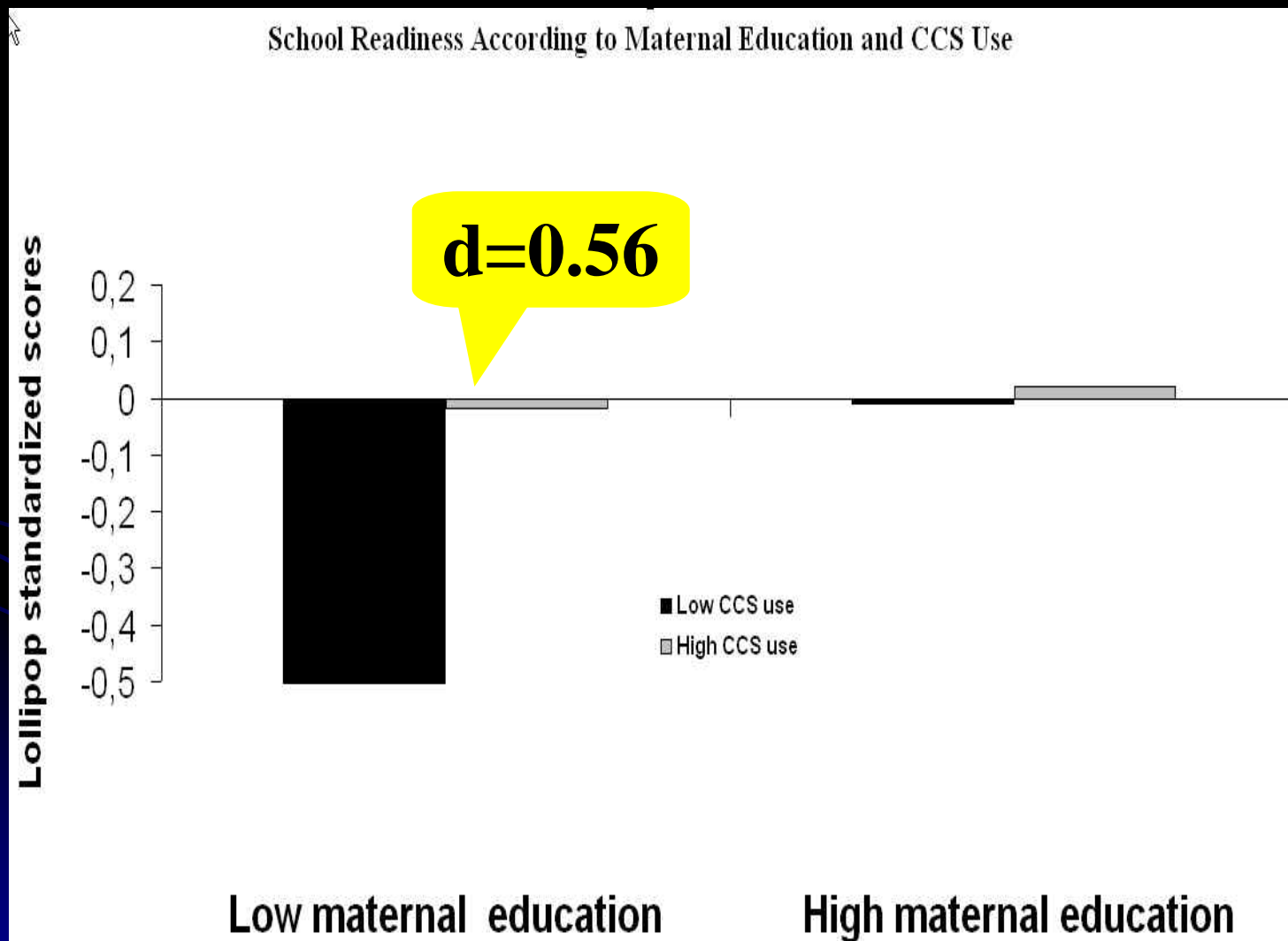
# C. Applications: Linking trajectories to outcomes



# Child Care services between 5 months and 4 ½ years

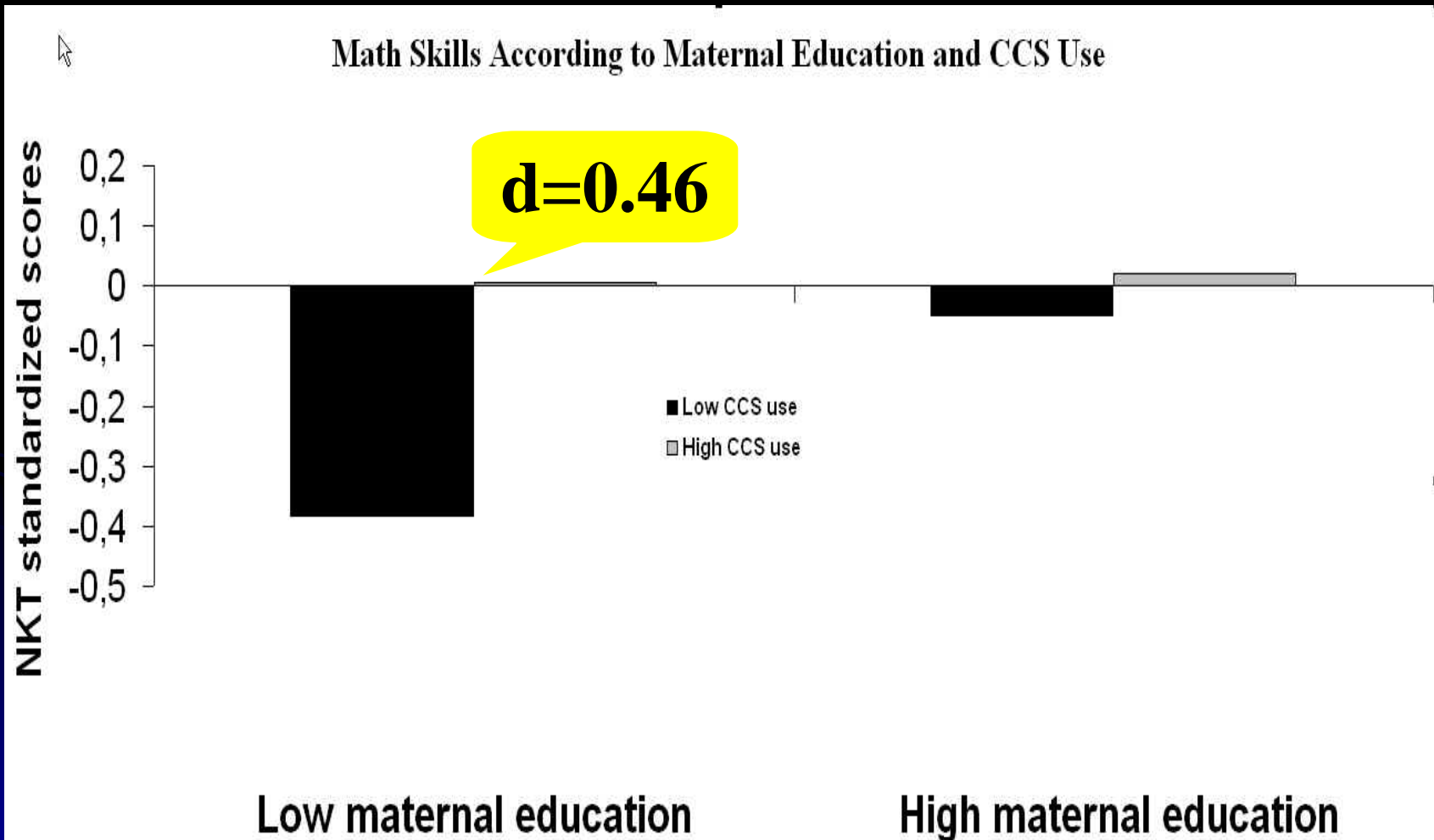


# Child-care services reduce socioeconomic inequalities in school readiness



Data courtesy of the Institut de la Statistique du Québec

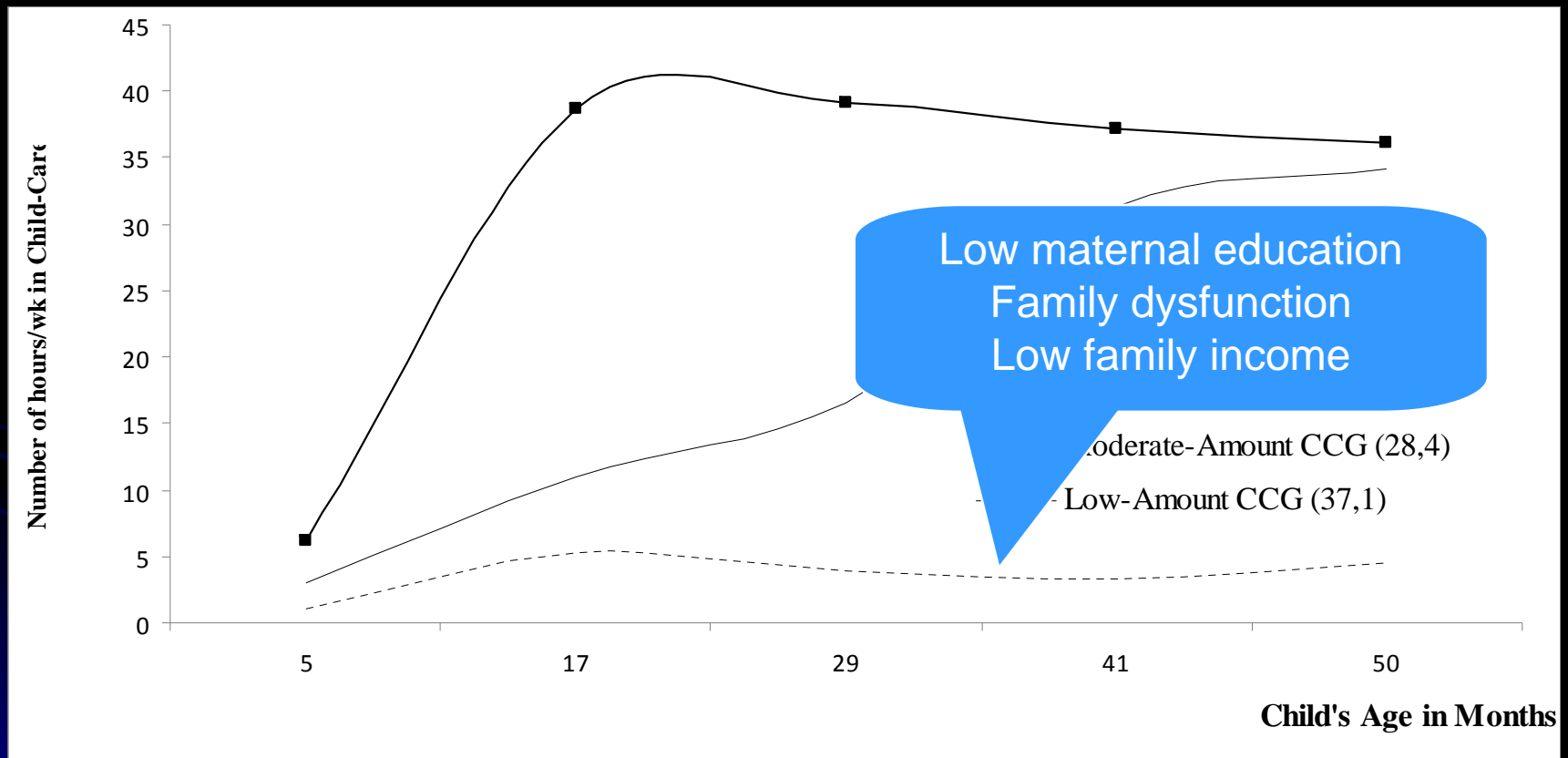
# Child-care services reduce socioeconomic inequalities in academic achievement



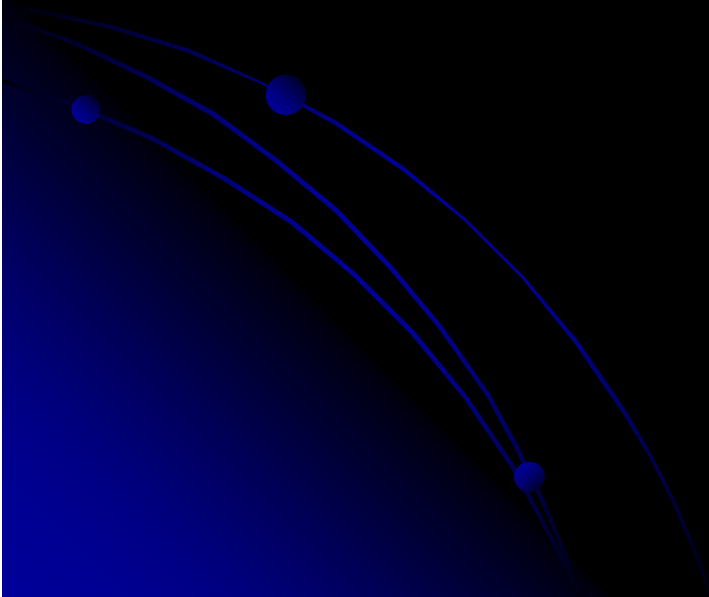
Data courtesy of the Institut de la Statistique du Québec



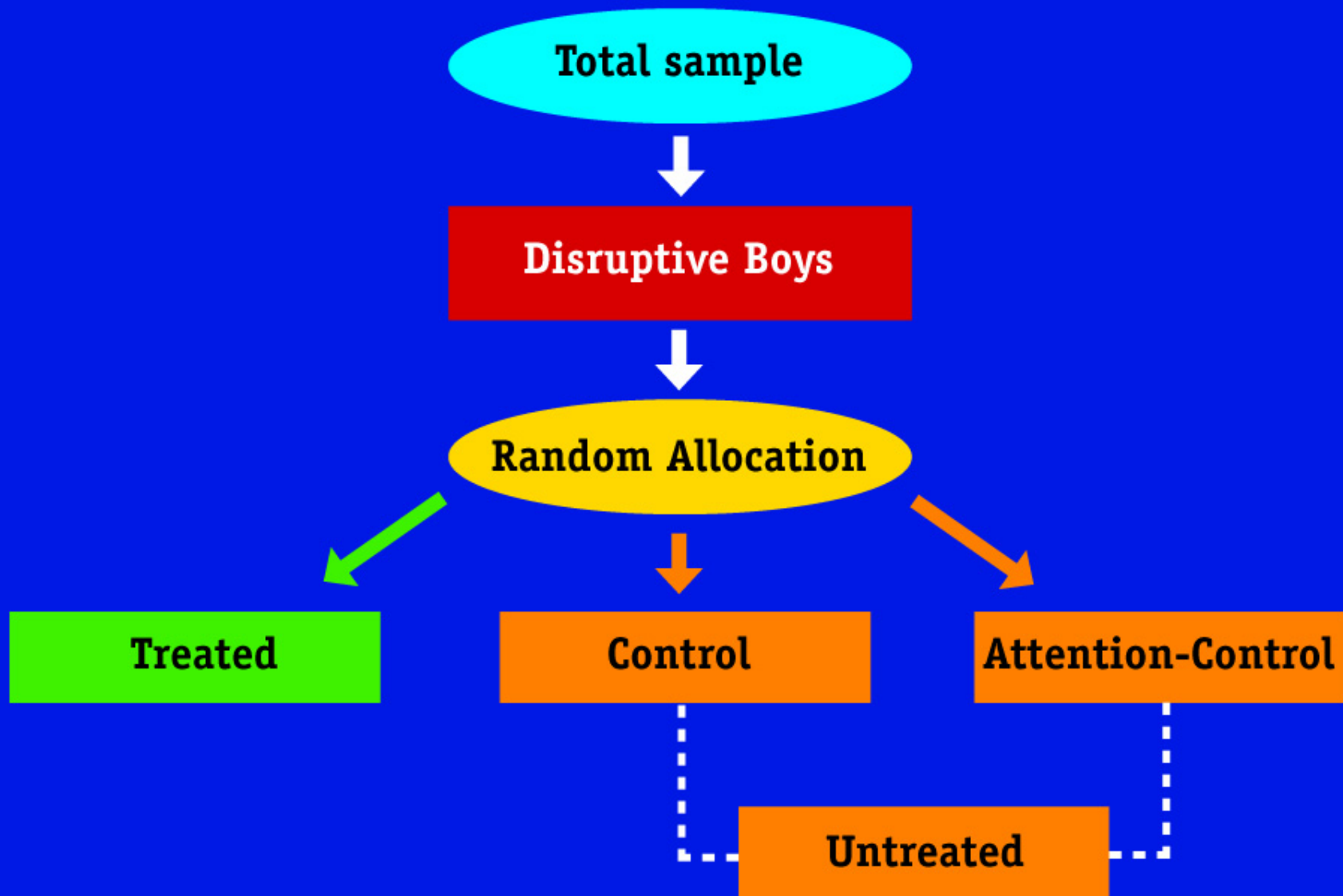
# Children who benefit the most are less likely to receive child care



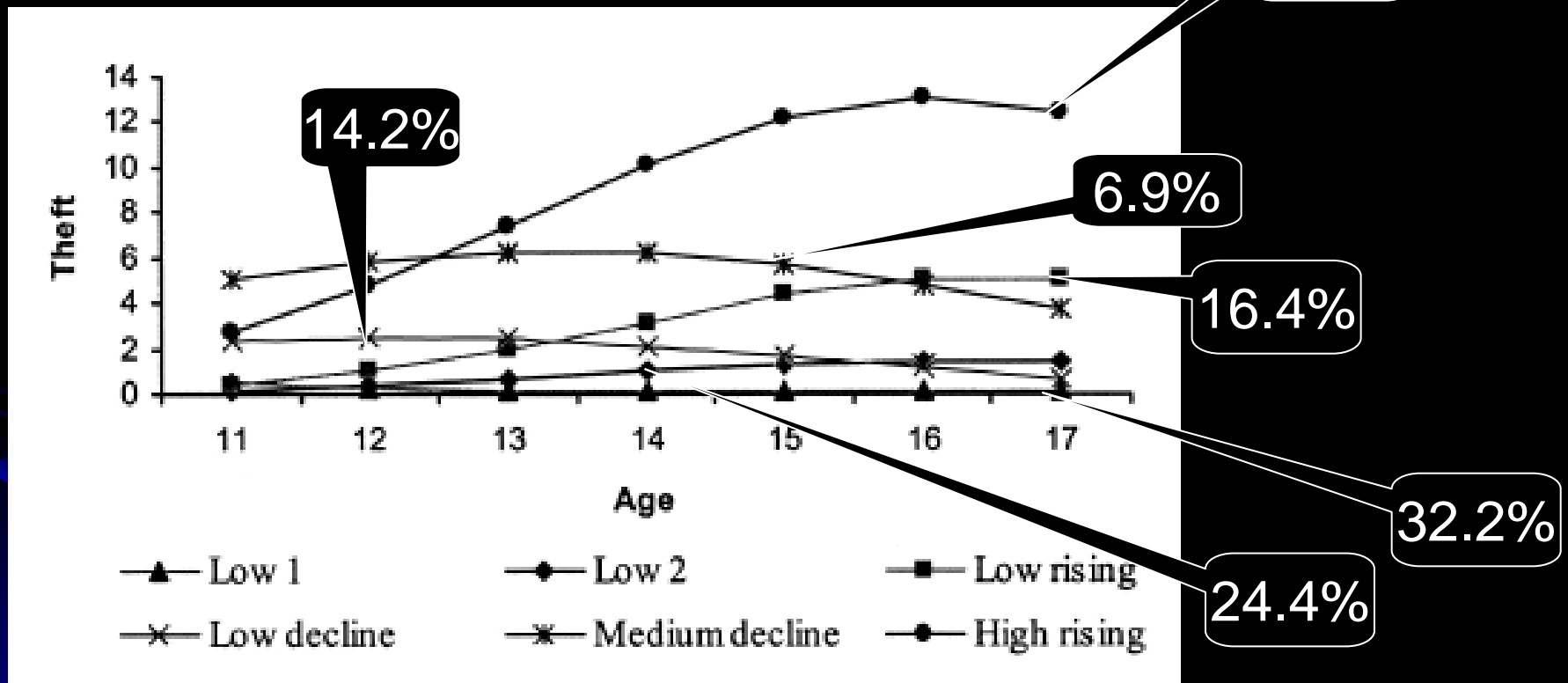
# Testing the impact of an experimental intervention



# MLLES EXPERIMENTAL DESIGN

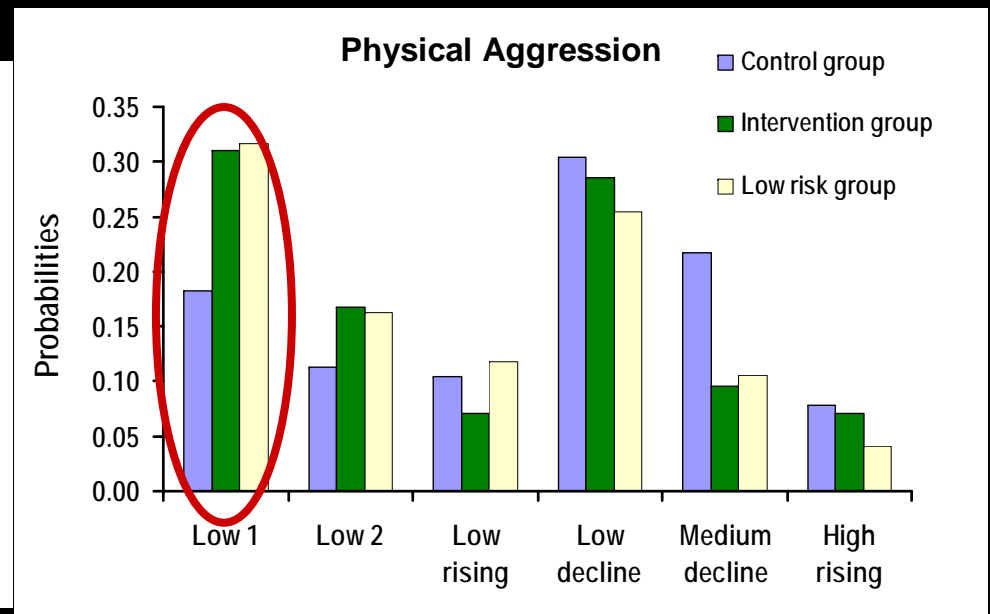
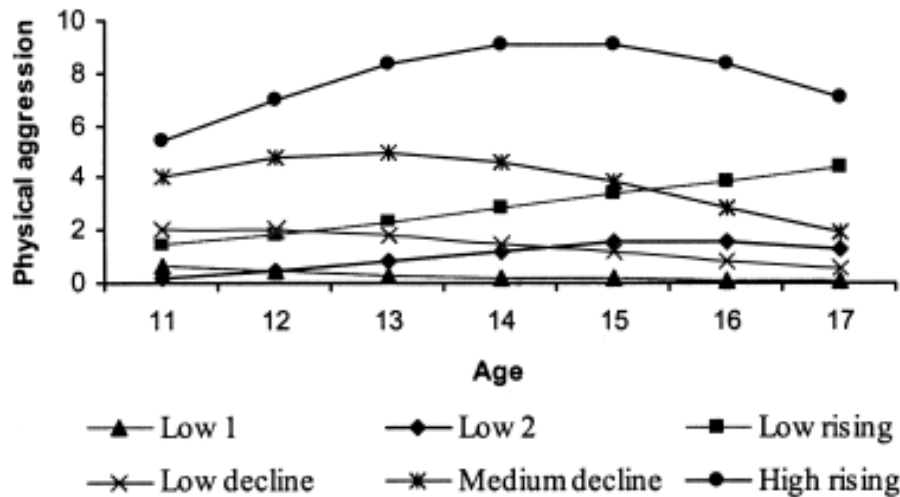


# Trajectories of physical violence



Lacourse, E., Côté, S., Nagin, D. S., Vitaro, F., Brengden M., & Tremblay, R. E. (2002). A longitudinal-experimental design to test developmental theories of antisocial behavior. *Development and Psychopathology*, 14, 911-926.

# KINDERGARTEN INTERVENTION MODIFIED TRAJECTORIES OF VIOLENCE

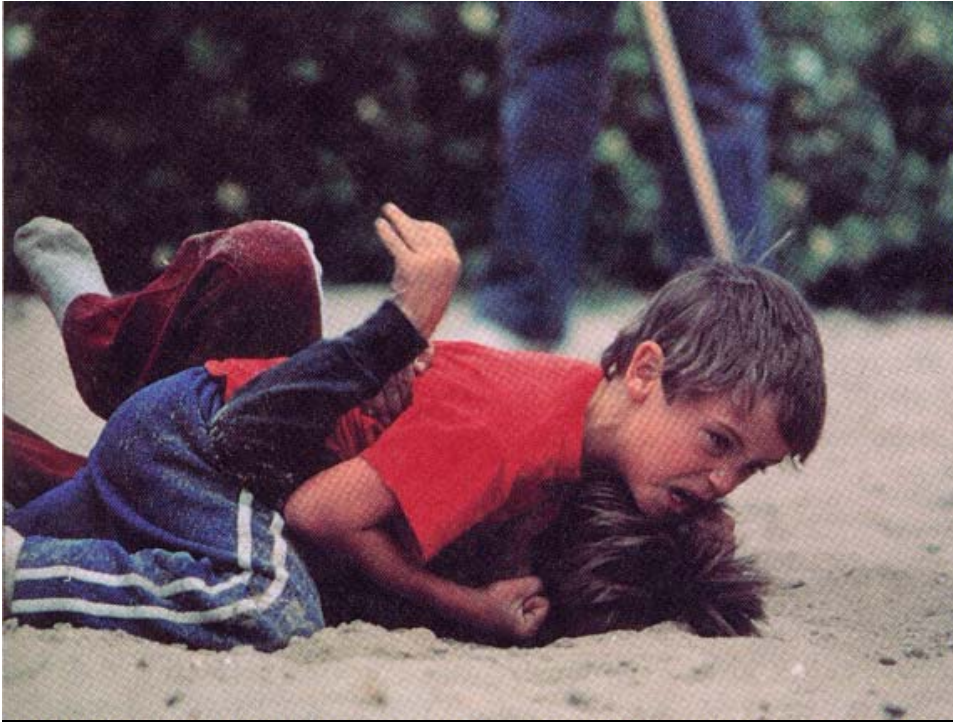


Lacourse, E., Côté, S et al. (2002). *Development and Psychopathology*.

**D. Applications:  
Modéliser la 'co-morbidité', la  
continuité hétérotypique versus  
homotypique**

# Continuité hétérotypique (vs homotypique)

- Continuité d'un trait ou attribue qui sous-tend divers comportements.
- Présume continuité mais avec des manifestations différentes selon l'âge et les contextes de vie. (autobus vs vélo)



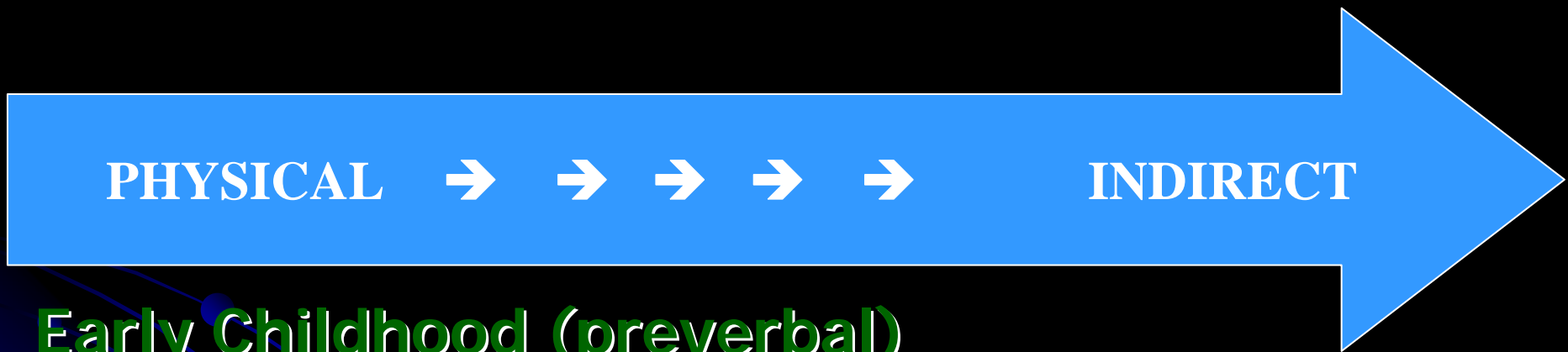
**L'agressivité physique:  
Frapper; donner des  
coups; se battre;**

**L'agressivité indirecte:  
répandre de fausses  
rumeurs; exclure  
d'autres enfants; dire du  
mal dans le dos des  
autres.**



# Age Differences Developmental Hypothesis

(Bjorkqvist et al., 1992)

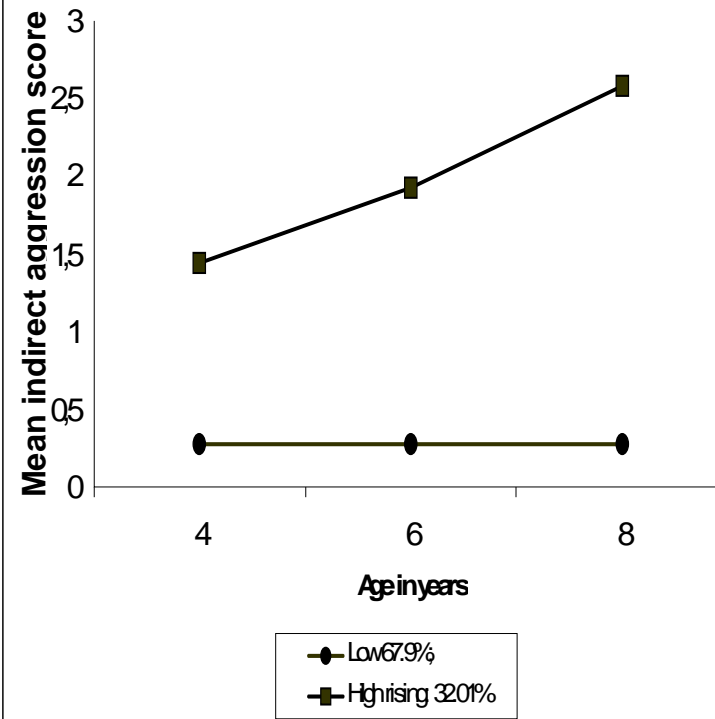
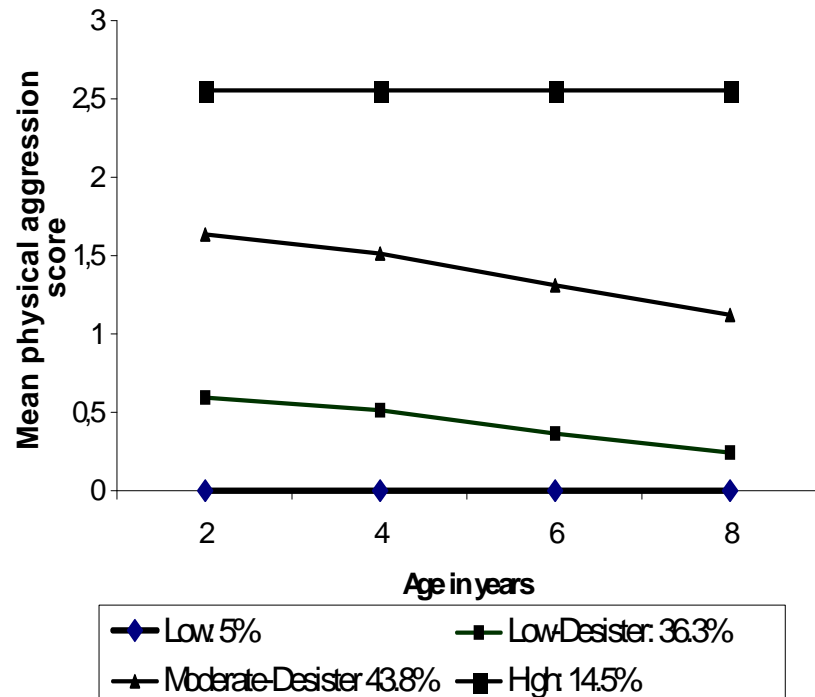


Early Childhood (preverbal)

Middle Childhood

Later Adolescence &  
Adulthood

# PREDICTORS OF JOINT TRAJECTORIES

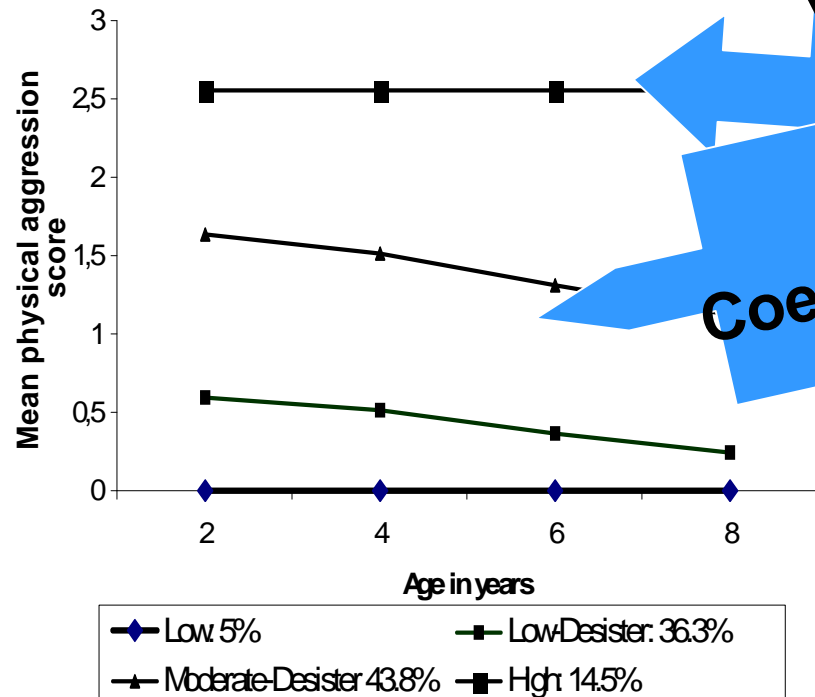


# Joint and conditional probabilities

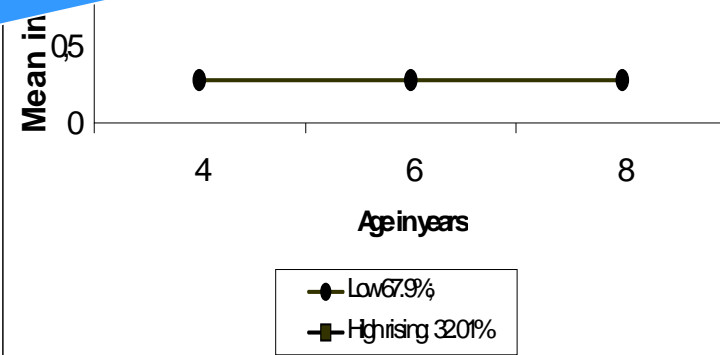
Type of Aggression	<i>Physical Aggression</i>			
	Low	Low desisting	Moderate Desisting	High
<i>Indirect Aggression</i>	Probabilities of Joint Trajectory Group Membership <sup>†</sup>			
Low	(1) 0.048	(3) 0.324	(5) 0.297	(7) 0.011
High rising	(2) 0.004	(4) 0.039	(6) 0.142	(8) 0.135
	Probability of PA Conditional on IA			
Low	0.071	0.477	0.436	0.016
High rising	0.011	0.124	0.444	0.420
	Probability of IA Conditional on PA			
Low	0.932	0.891	0.676	0.075
High rising	0.068	0.109	0.324	0.925

<sup>†</sup> The num

# PREDICTORS OF JOINT TRAJECTORIES



Young mom  
 Poverty  
 Girl  
 Coercive par



# E. Limits and notes of caution

- Toujours corrélationnel
- Id du meilleur modèle
- Voir de l'hétérogénéité là ou il n'y en a pas?
- Les groupes distincts sont des sont estimations