



# Where you live matters: The local environment and physical activity among children

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# Introduction

- **Childhood overweight and obesity socially structured.**
- **Lower levels of physical activity associated with higher BMI.**
- **Physical activity also socially structured.**



# Hypothesis

**Children who live in less advantaged areas are less physically active than their more advantaged peers.**

**Low levels of physical activity are considered a key proximal cause of obesity among children which is itself influenced by more distal factors such as the physical conditions of the child's neighbourhood.**



# What does the literature say?

***“Physical activity is determined by many factors”***

## 5 Domains

- Demographic and biological factors;
- Psychological, cognitive, and emotional factors;
- Behavioural attributes and skills;
- Social and cultural factors; and physical environment;
- Physical environment.

## 9 factors

- Gender;
- Parental overweight status;
- Physical activity preference;
- Intention to be active;
- Perceived barriers;
- Previous physical activity;
- Healthy diet;
- Access to suitable facilities;
- Amount of time spent outdoors.

Sallis, J., et al. (2000)



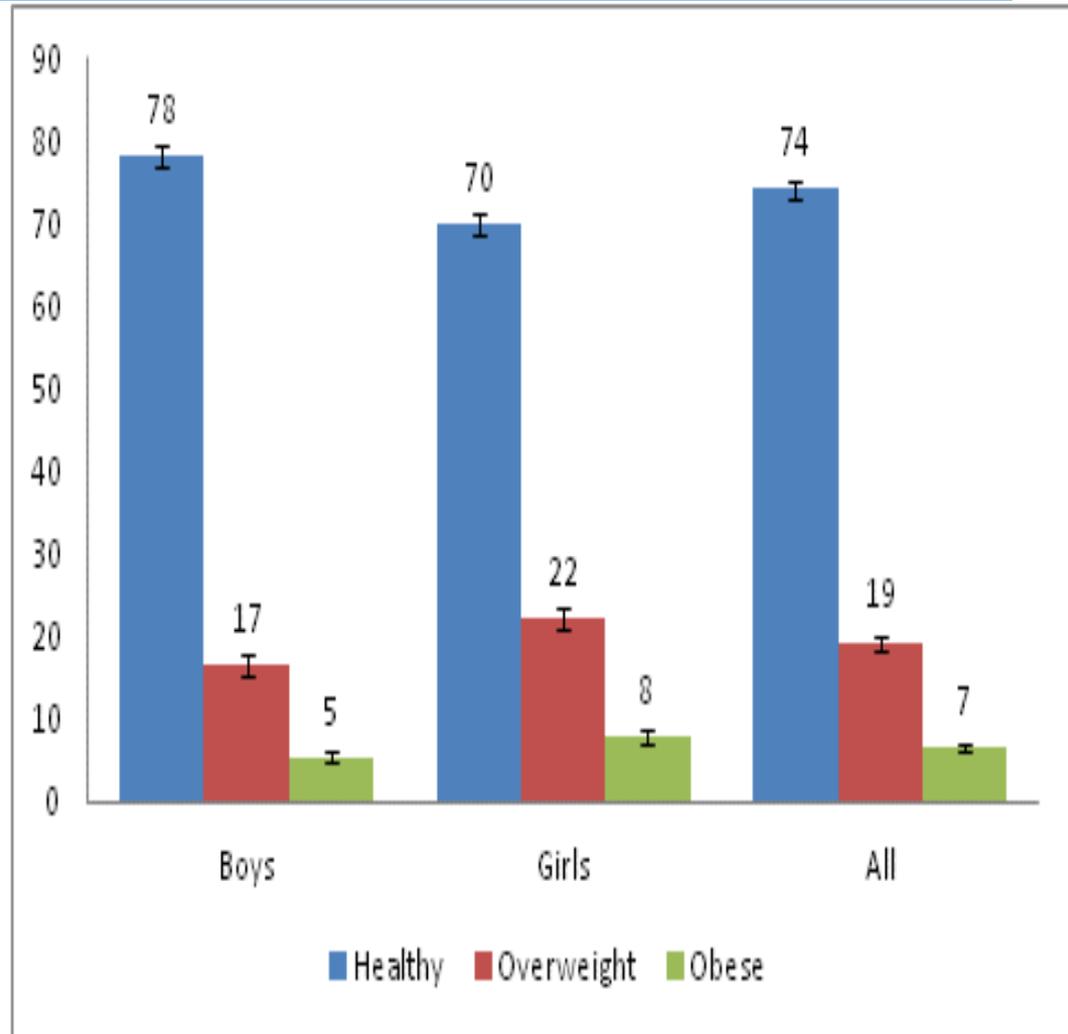
# Does neighbourhood matter?

- **Inverse association between adiposity and neighbourhood socio-economic status with lower socio-economic status associated with higher BMI** (e.g. Jansen and Hazebroek-Kampschreur, 1997; Kinra et al., 2000).
- **Neighbourhood socio-economic factors also associated with physical activity levels** (Brownson, 2001).
- **Higher levels of physical activity associated with access to recreational facilities** (Frank et al., 2012).
- **Multilevel analysis results more consistent** (Oliver and Hayes, 2005; Janssen et al., 2006; Nelson et al., 2006; Grow et al., 2010).



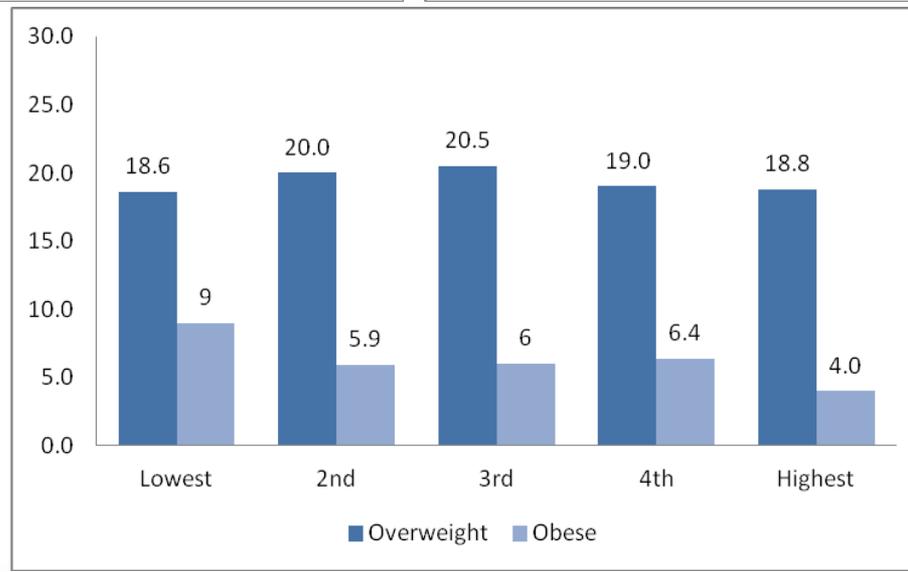
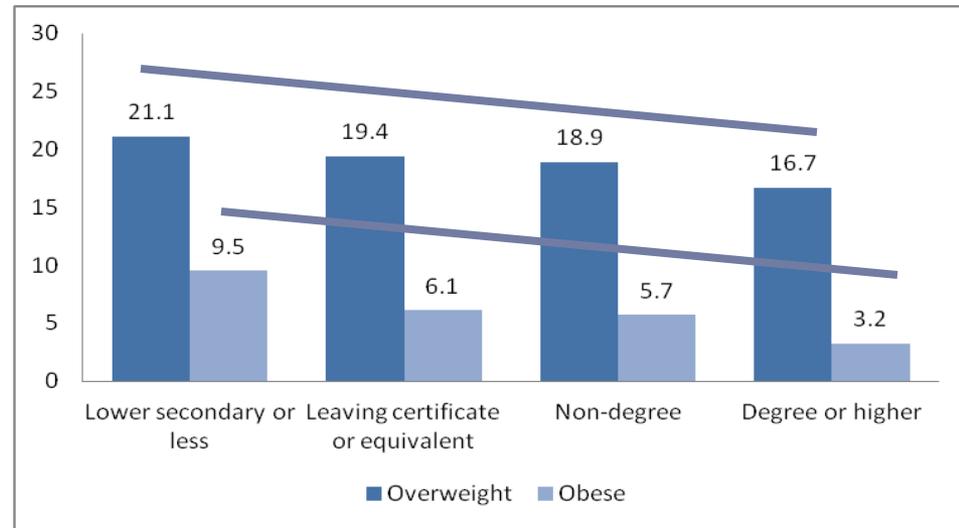
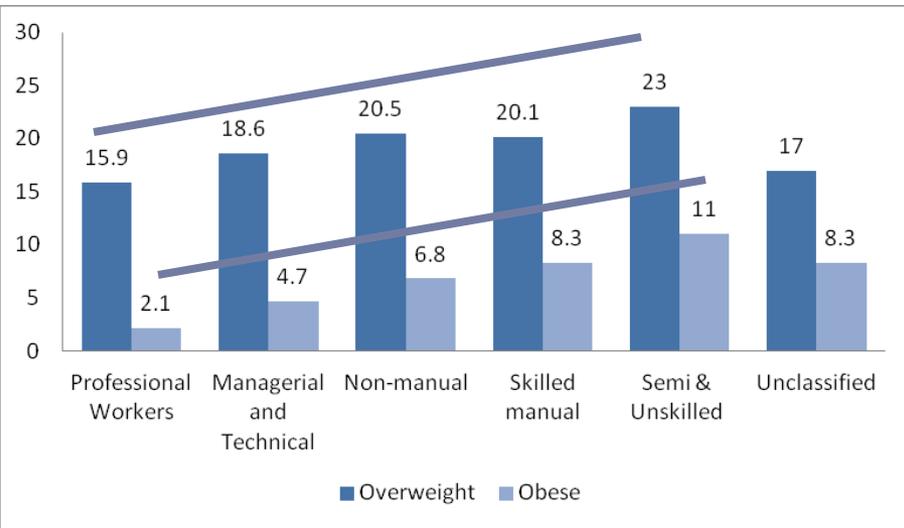
# Sample

- **Nine-year-old cohort (N=8,568)**
- **4,381 (51%) boys, 4,187 (49%) girls**
- **Measured height and weight for 8,089 (94%) of sample**
- **32% overweight, 20% obese, 46% healthy, 1% underweight**





# Social gradient of BMI





# Physical activity indicators

(x 5)

1. Number of days from last 14 - light exercise
  2. Number of days from last 14 - hard exercise
  3. How often Study Child takes exercise
  4. Number of days physically active 60+ minutes
  5. How often Study Child plays sport
- Leisure Time Exercise Questionnaire
- Meets advised guidelines



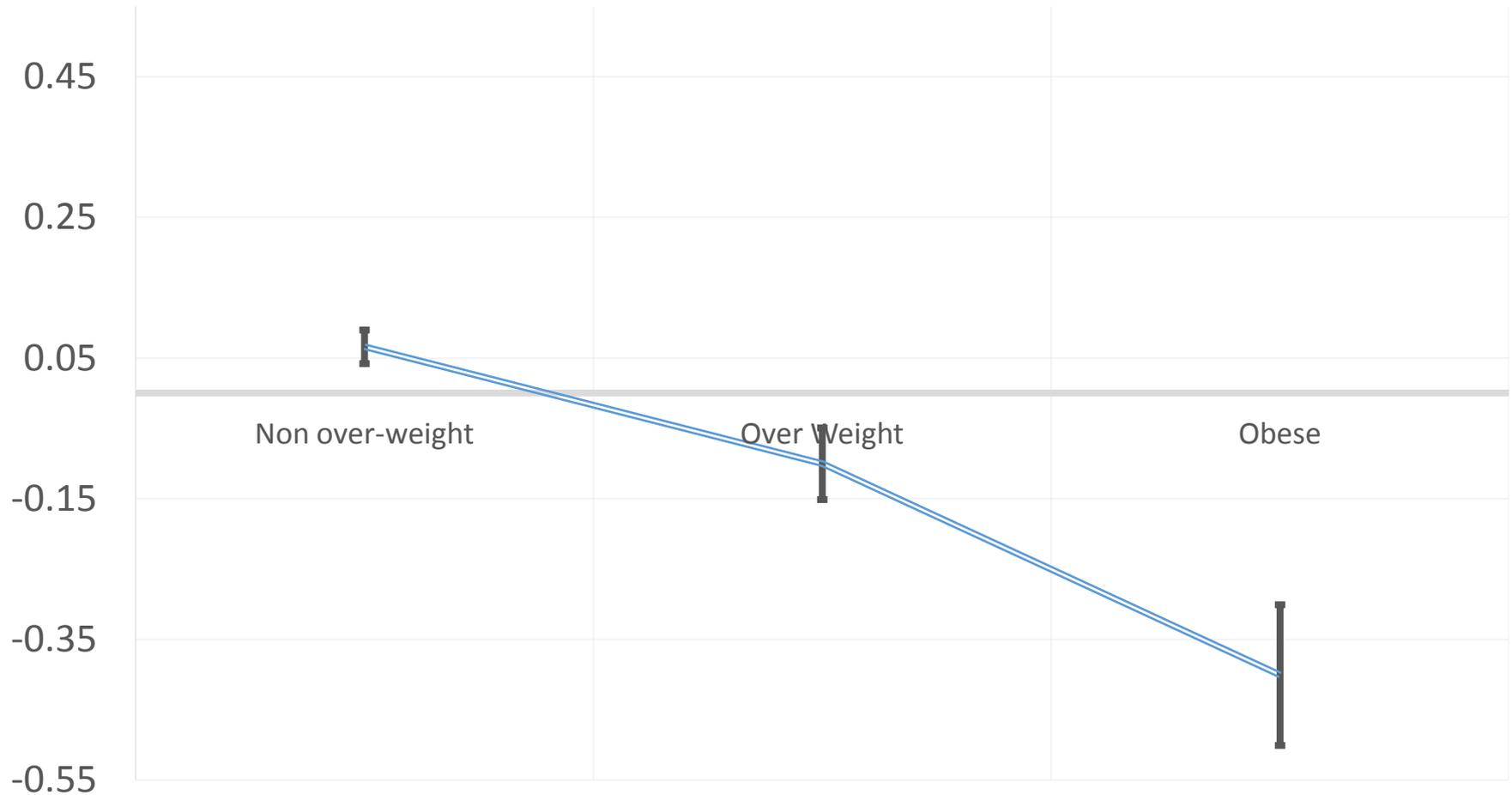
# A novel multi-domain measure of physical activity

## The 5 items reduced using PCA

- $KMO=0.704$
- Bartlett's test of sphericity [ $\chi^2 (10)= 6643, p<.001$ ]
- New factor explains 44.1% of total variance
  
- Standardised factor scores calculated
  - Mean=0
  - Std. Dev.=1
  - Range= -4.25 to 1.32

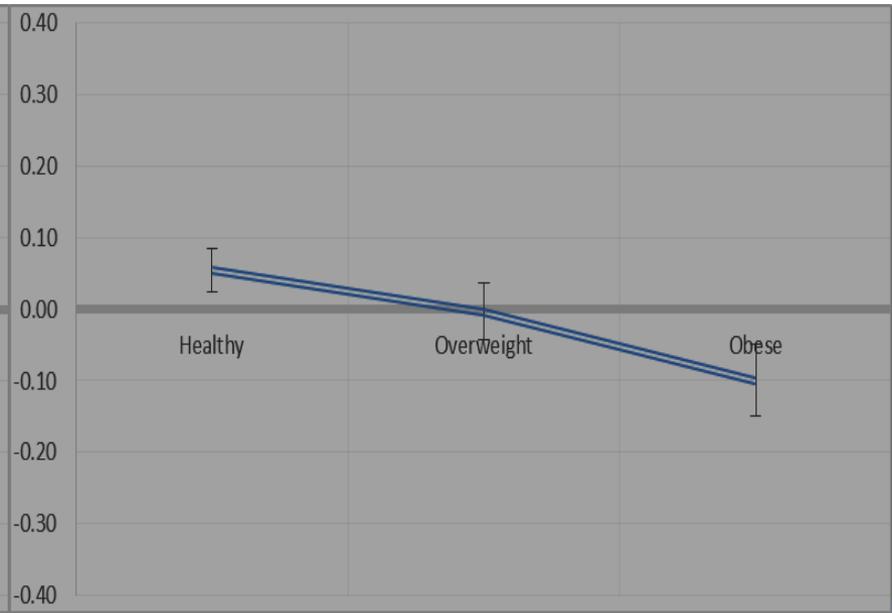
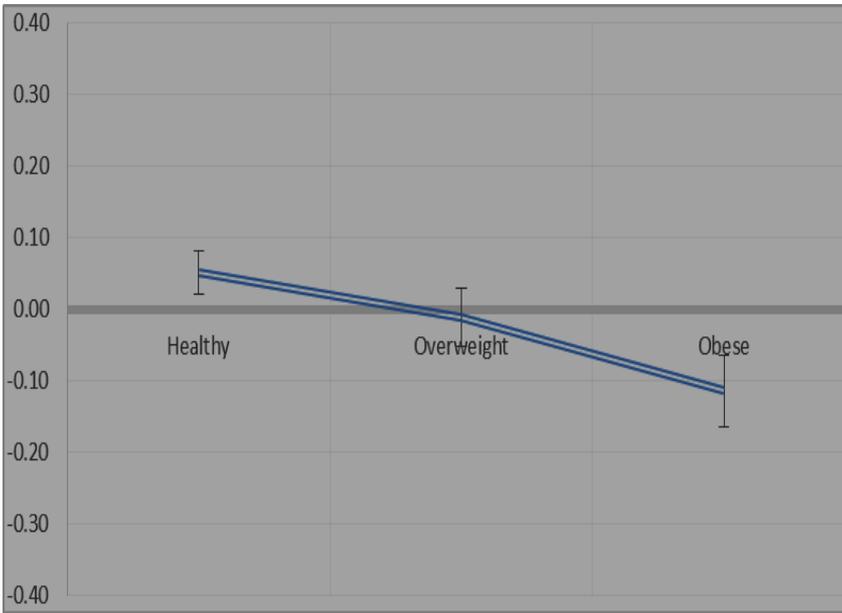
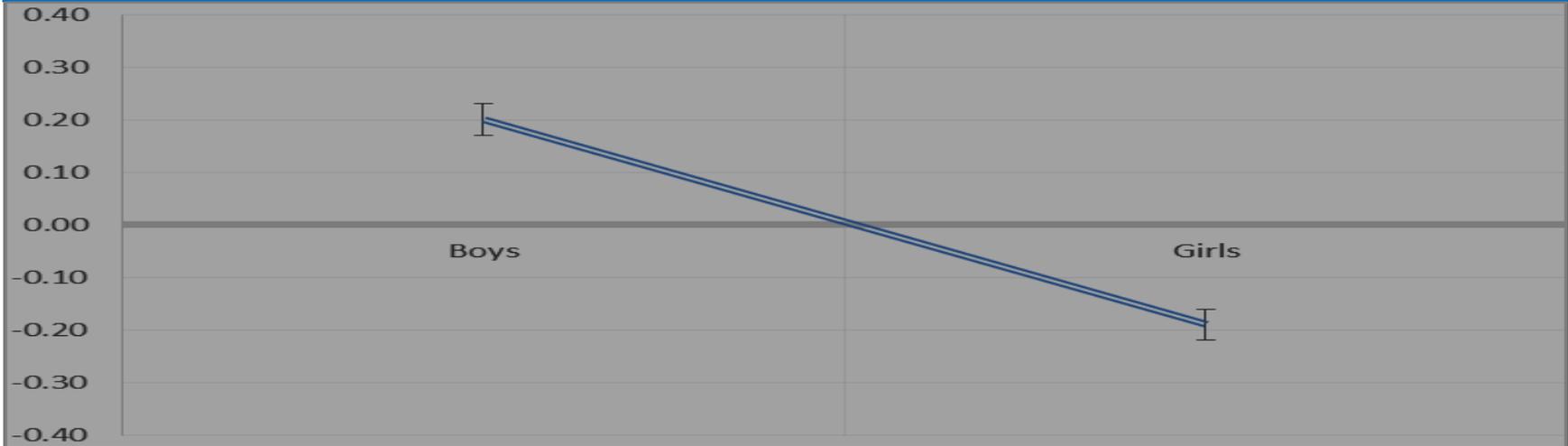


# Physical activity score by weight status



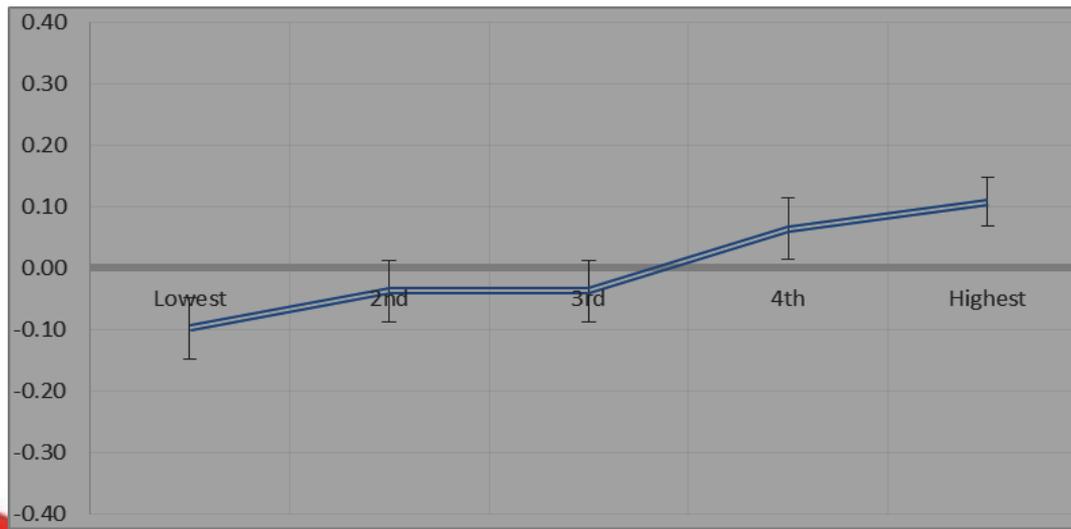
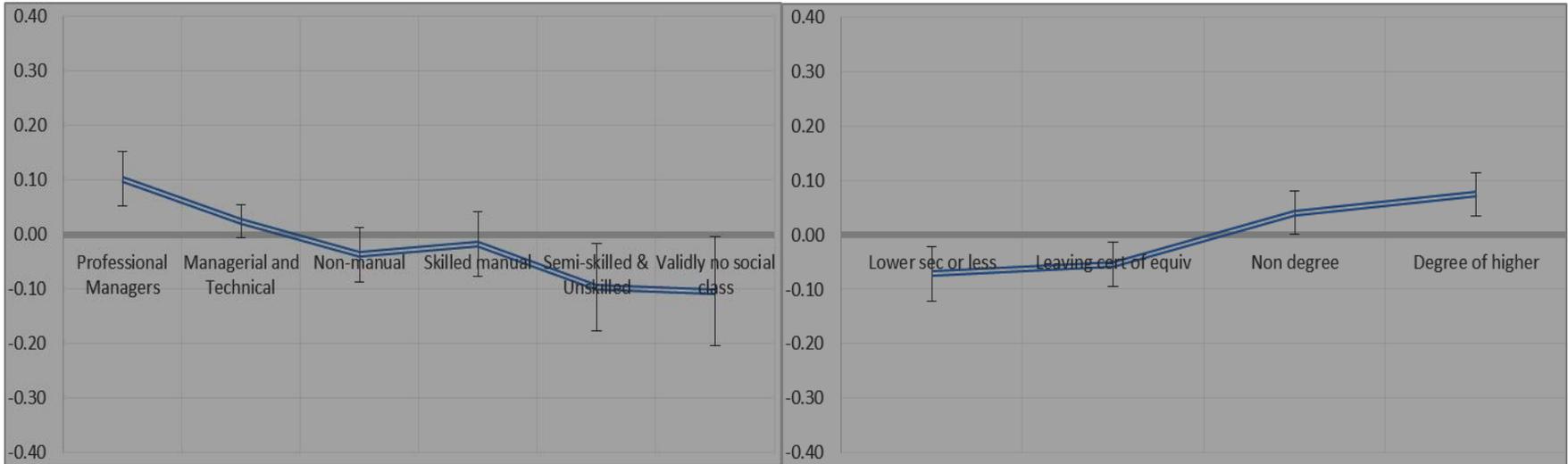


# Physical activity BY child and household indicators





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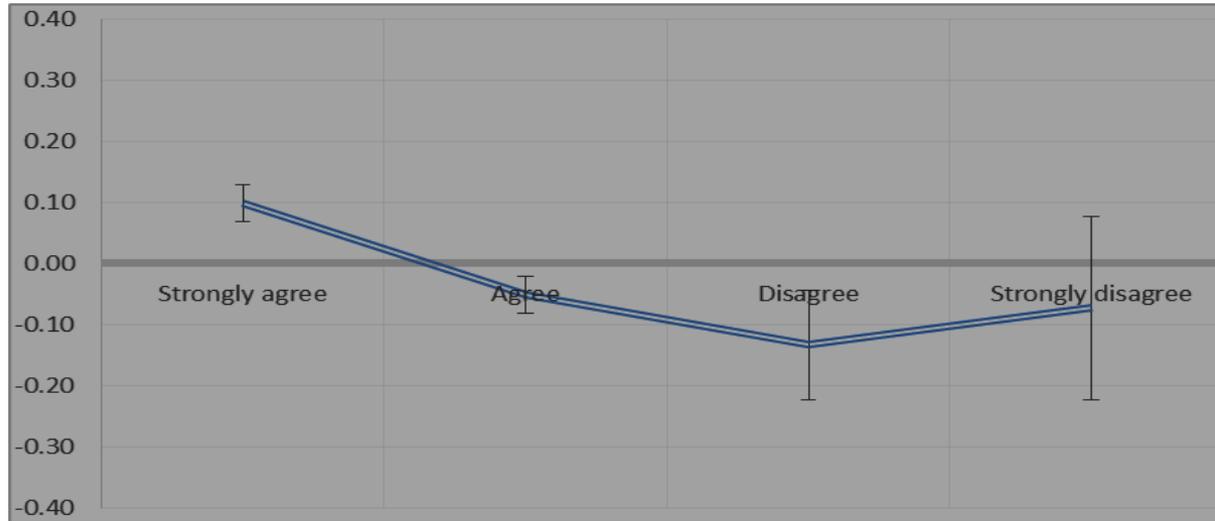


# Neighbourhood indicators

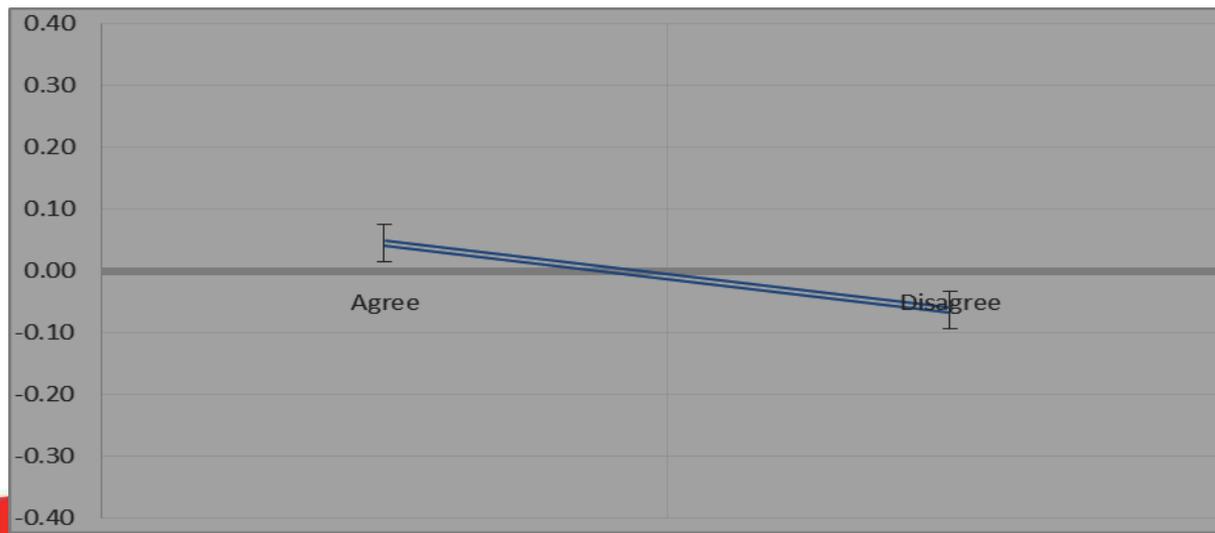
1. Safe for children to play during the day (parental report)
2. There are safe parks, playgrounds and play spaces (parental report)
3. Recreational facilities appropriate to a 9-year old (parental report)
4. Good places to play near house (child report)
5. Too much traffic (child report)
6. Green area to play (child report)
7. Playground nearby (child report)
8. Safe places to play (child report)



# Physical activity BY neighbourhood indicators



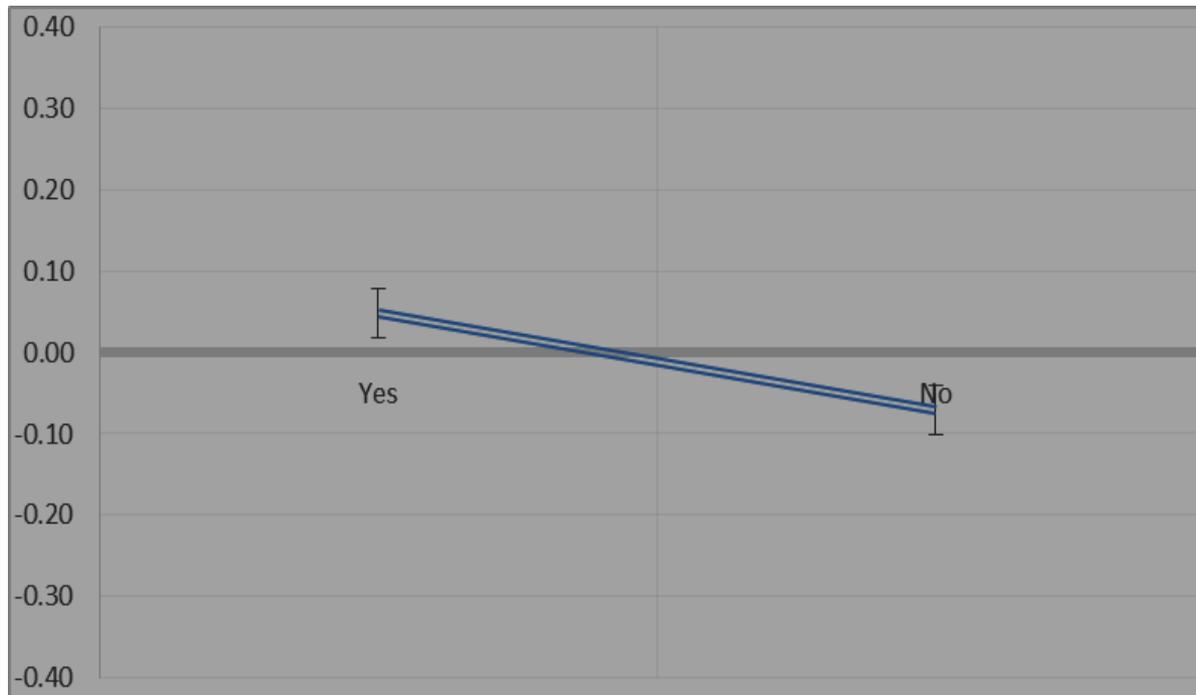
Safe for children to play during the day



Safe parks, playgrounds and play spaces



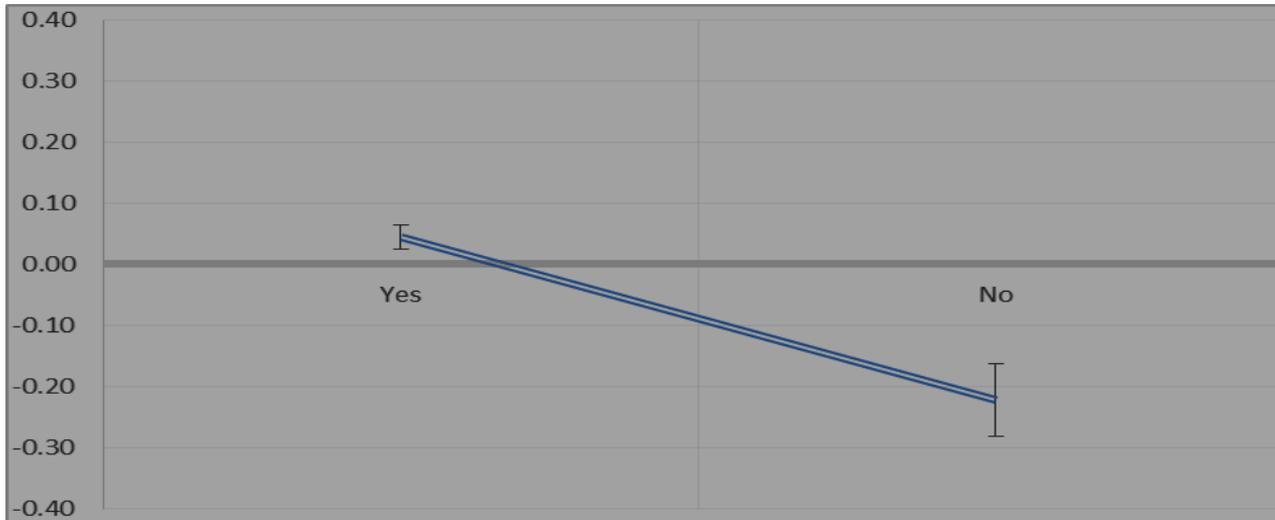
# Physical activity BY neighbourhood indicators



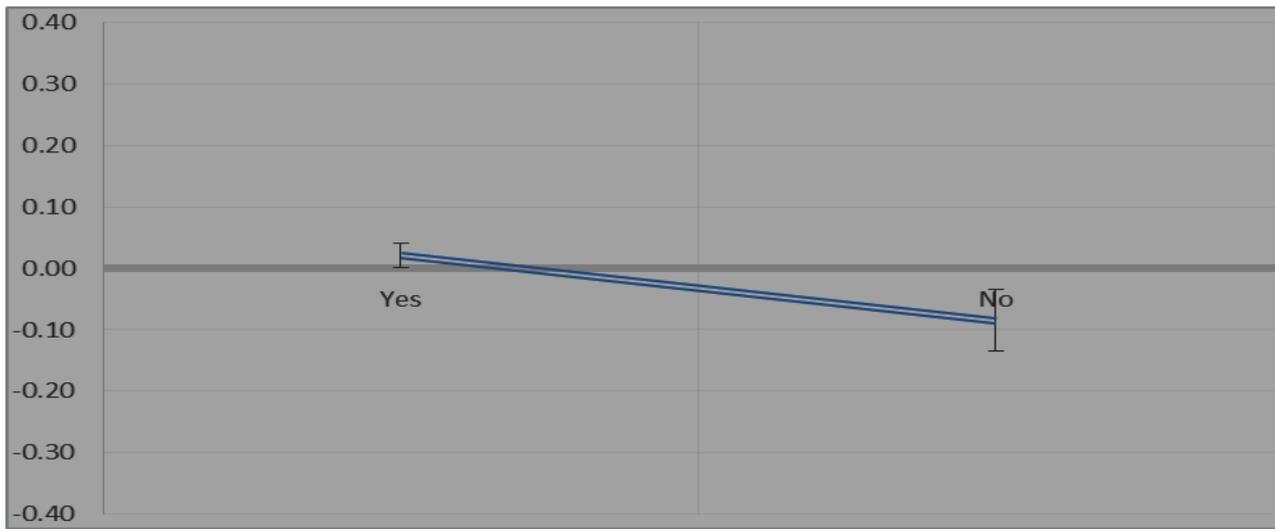
Recreational facilities appropriate to a 9-year-old



# Physical activity BY neighbourhood indicators



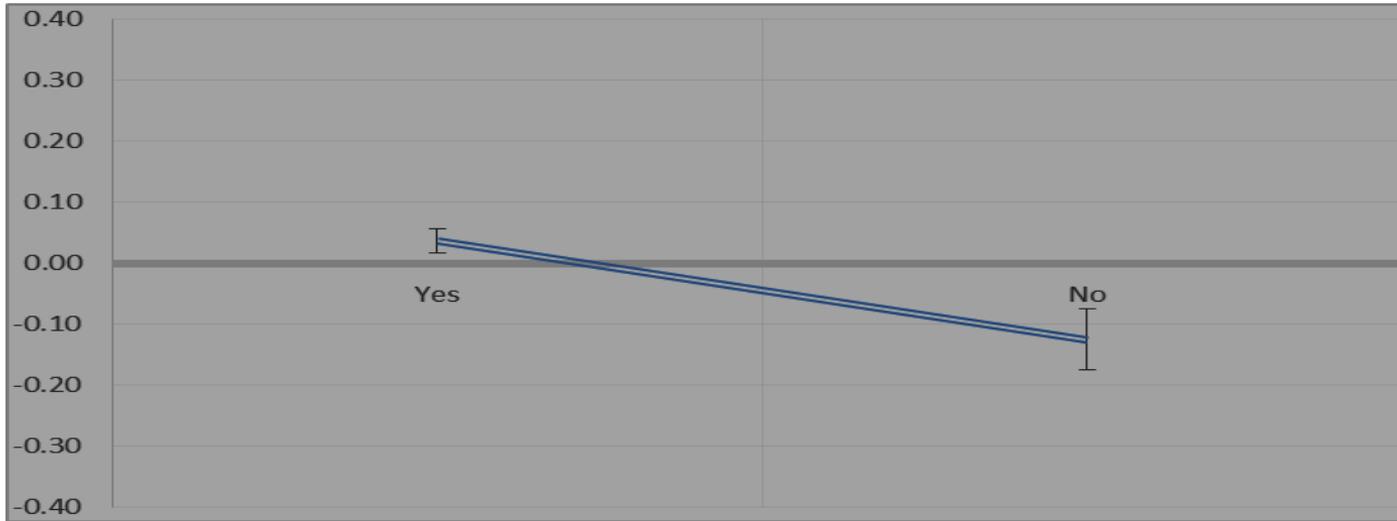
Good places to play near house



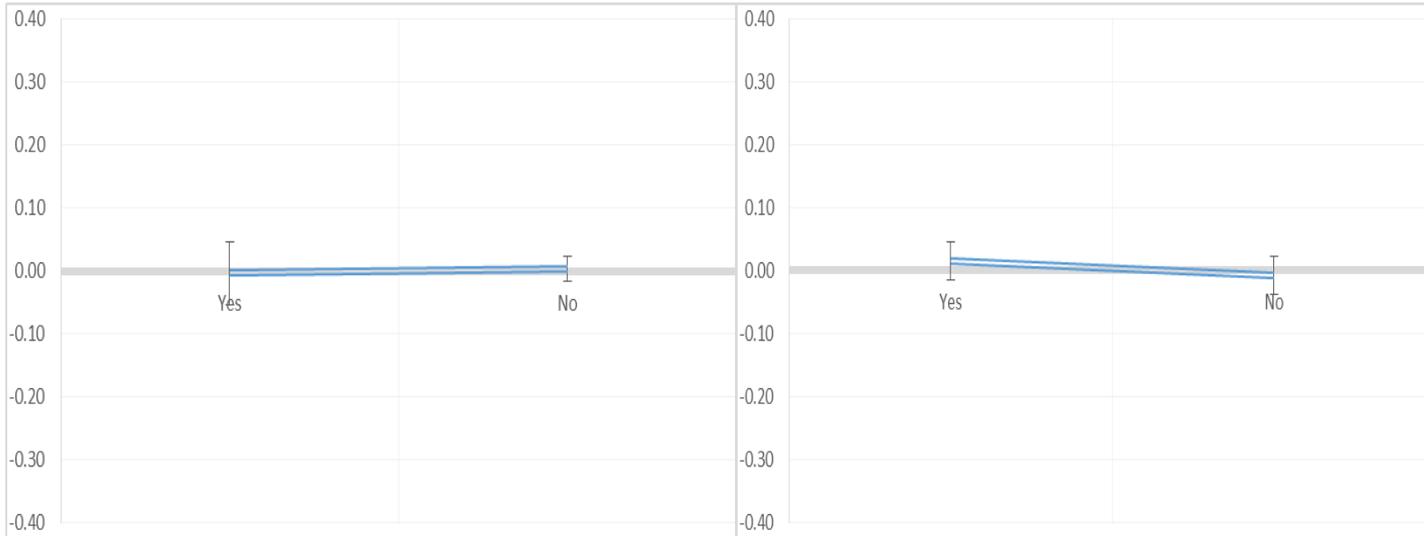
Green areas to play



# Physical activity BY neighbourhood indicators



Safe places to play



Too much traffic;  
Playground nearby



# Analytic approach

- Multilevel model with random effects to take account of geographic clustering of the children.
- xtreg GLS random-effects (re) procedure in Stata/IC 12.1
- Less likely to under-estimate standard errors, so reduces risk of Type I error
- Enables us to estimate the proportion of variance explained by neighbourhood and child level effects.



# Model specification

Child's gender

+

Household characteristics

+

Neighbourhood perceptions

+

Sedentary behaviours

(Time spent TV, video games, computers, homework, and reading for pleasure)

+

Child's temperament



# Results

Child & Household	Coef. (Std Error)	Neighbourhood	Coef. (Std Error)
Girls	-0.340 (0.021) <sup>***</sup>	Disagree - <b>Safe</b> to play outside	-0.103 (0.023) <sup>***</sup>
Temperament	0.387 (0.015) <sup>***</sup>	Strongly disagree - <b>Safe</b> to play outside	-0.129 (0.044) <sup>**</sup>
PCG 2 <sup>nd</sup> level education (vs. 3 <sup>rd</sup> level)	-0.076 (0.028) <sup>**</sup>	No good places to play	-0.136 (0.031) <sup>***</sup>
Income log	0.000 (0.000) <sup>**</sup>	No <b>safe</b> places	-0.058 (0.028) <sup>*</sup>
Watching TV	-0.359 (0.044) <sup>***</sup>	Video games	-0.092 (0.029) <sup>**</sup>
Computer	-0.111 (0.032) <sup>***</sup>	Homework	-0.065 (0.023) <sup>**</sup>

\*p<0.05, \*\*p<0.01, \*\*\*p<0.001



# Conclusions

- **Safety** an important issued for both children and their parents.
- Somewhere to play in local vicinity.
- Provides evidence for a potential distal pathway to social structure of childhood overweight / obesity.
- Importance of looking beyond simple associations.



# Limitations

- Based on self-reported perception of local environment rather than objective measures.



# References

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