The Relationship between Active Transportation and BMI from Kindergarten through Grade 2 among Children Participating in the Quebec Longitudinal Study of Child Development

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Pour l'amour des enfants
Université de Montréal

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EXCELLENCE ■ INNOVATION ■ VALORISATION

Rationale

- Increased prevalence of overweight (OW) and obesity among children
- Secular declines in physical activity (PA)
- Benefits of PA may include reduced OW/obesity
- Need opportunities for PA
  - e.g. active transportation (AT) to/from school
- Prevalence of AT to/from school declined in past 30 years

Background

- Small number of studies
- Typically cross-sectional
- AT & OW/obesity relationship unclear
  - OW/obese children less likely to use AT to school (Evenson et al, 2003)
  - No relationship (Fulton et al, 2005)
  - Positive relationship (Heelan et al, 2005)
- No studies involving young children (< 8 y)

Background (2)

- Single longitudinal study (Rosenberg et al, 2006)
  - No relationship between AT and BMI/skinfolds from grades 4 to 5
  - Cross-sectionally at grade 4, lower adiposity in boys using AT to school
- Need for more longitudinal studies
  - Large, population based
  - Children in earliest grades

Purpose

Determine the extent to which AT to/from school is associated with changes in body mass index (BMI) from kindergarten to grade 2

Data Source

- Quebec Longitudinal Study of Child Development (QLSCD-ELDEQ).
- ELDEQ = birth cohort (1998); annual follow-up since age 5 months.
- Initial sample (n=2120) = representative of singleton births in Quebec in 1997-1998
  - excluding those *born < 24 weeks gestation*
  - women living in northern regions and Aboriginal reservations
- ELDEQ designed to identify factors affecting social adjustment and academic performance.

Study Sample

- Data collected
  - Spring of 2003, 2004, and 2005
  - Children in kindergarten, grade 1, and grade 2
  - Aged 6, 7, and 8 years old, respectively
- 1 492 (70.5%) provided data in K
- 74 attending private school excluded
- 1170 (55.5%) provide data in K, G1, G2

Children Lost to Follow-up

- More likely to be:
  - Immigrants
  - Have insufficient family income at K
  - From urban regions
  - Boys
- No differences on:
  - Maternal perception of child's health
  - Low birth weight

Children in Private Schools

- Mothers more likely to:
  - Have high school or greater education
  - Belong to sufficient income households at baseline
  - Report their child is in excellent/very good health

Outcome - BMI

- Height and weight of participants measured in K, G1, G2
- Body Mass Index computed in kg/m^2
- Age and sex standardized BMI z-score values (CDC growth curves 2000)

Outcome-BMI (2)

- Continuous:
  - BMI Z-scores
- Dichotomous:
  - ≥ 95th percentile
  - ≥ 85th percentile
  - ≥ 75th percentile

Main Exposure: "Active Transportation (AT) to School"

- At each measurement time: "How does your child usually get to school?"
  - School bus
  - Public Transit
  - Is driven
  - Walking/bicycling

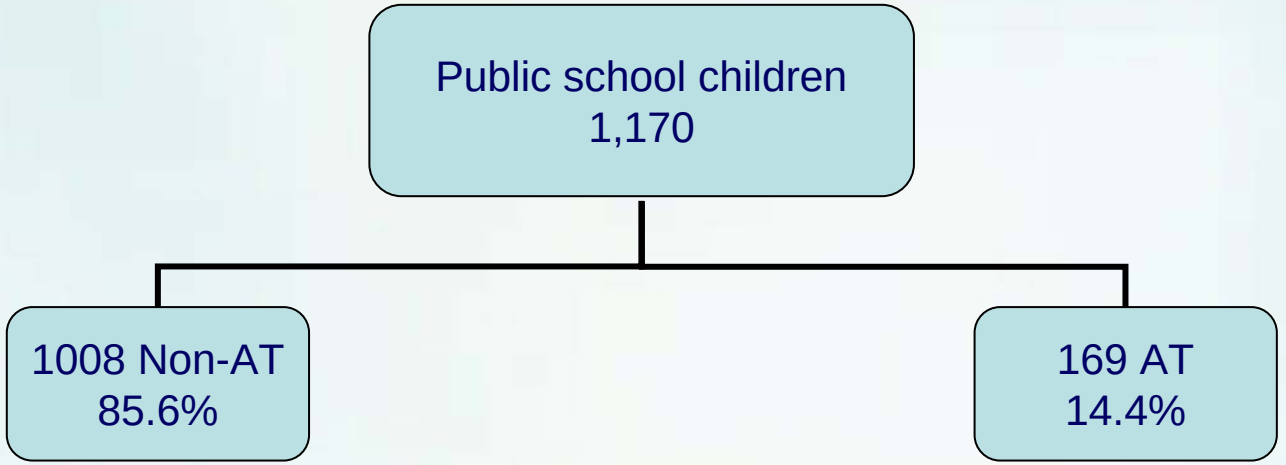
Non-active

Active

Changes in Proportions of Children who use AT in K, G1, G2

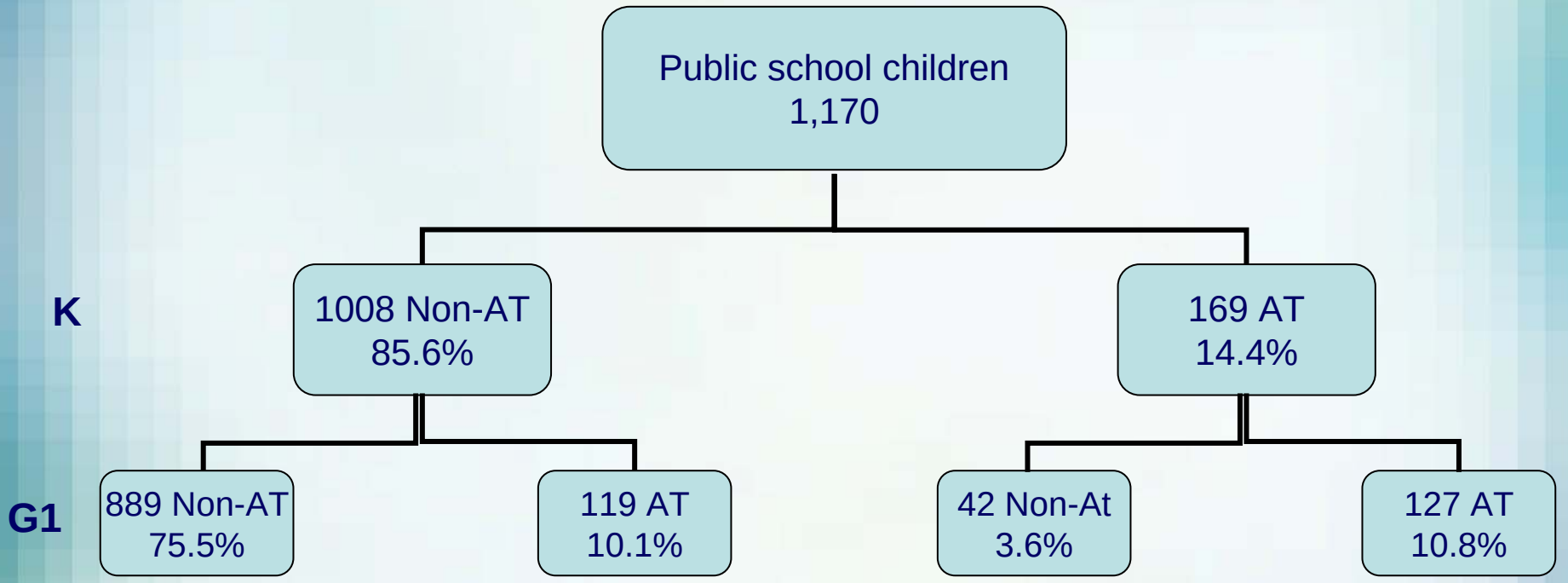
Public school children
1,170

Changes in Proportions of Children who use AT in K, G1, G2



K

Changes in Proportions of Children who use AT in K, G1, G2



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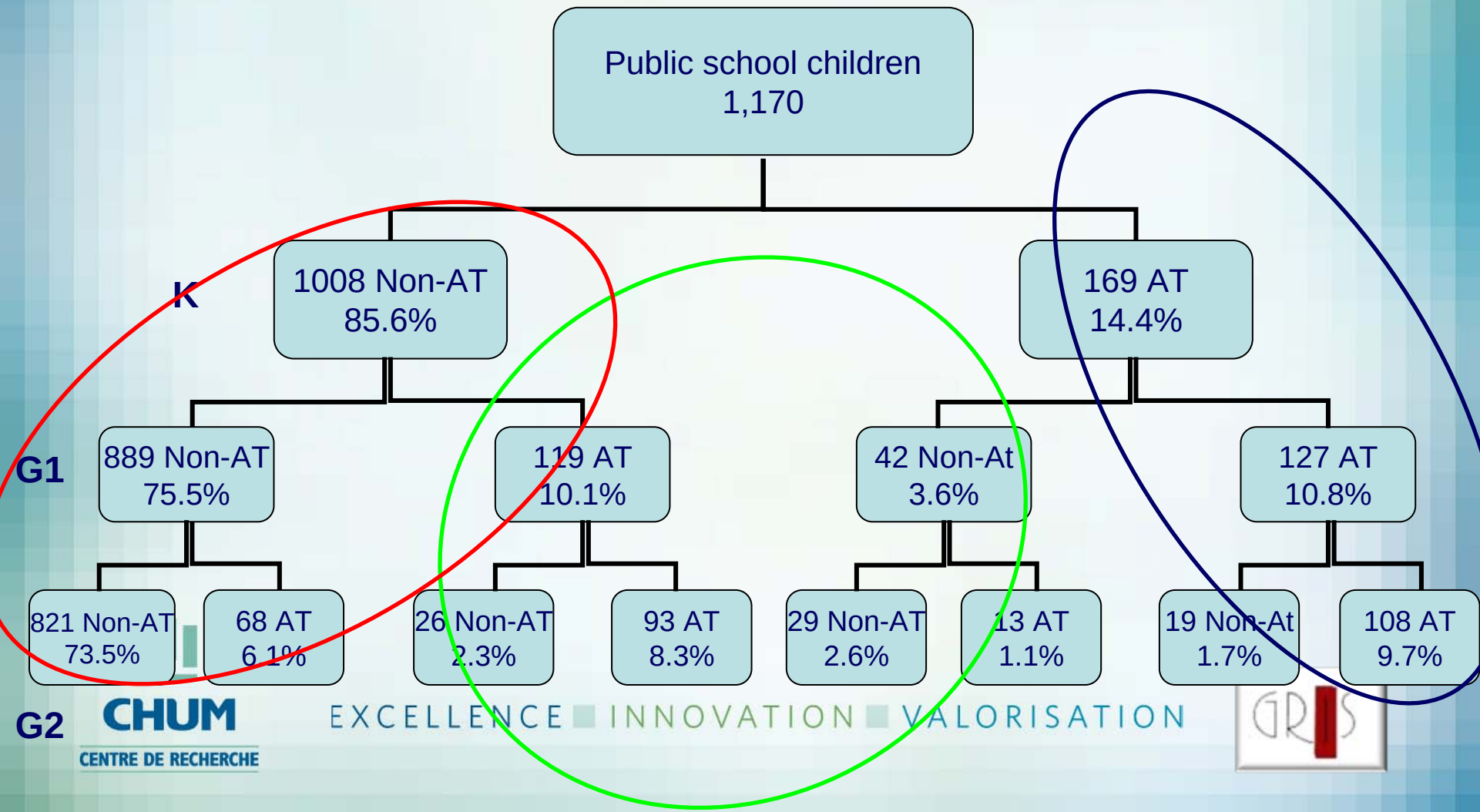

Covariates

- Sex, Age
- Rural vs. Urban
- Household income when child in K
  - Sufficient vs. Insufficient (Low Income Cut Off - LICO)
- Mother's Weight Status when child in K
  - Normal weight vs. OW/Obese
- Quality of neighbourhood for raising family
  - Excellent/good vs. average/bad/very bad
- Mother's perception of child's health
  - Excellent vs. other than excellent

Main Analyses

- Growth curve modelling:
  - allows for modeling change in outcome variable
    - across time
    - as a function of time varying and invariant covariates
  - overall change function is fitted and parameters can be allowed to vary

Main Analyses (2)

- Estimated growth curves for BMI z-score values as a function of sustained AT.
  - Controlling for
    - Sex
    - Rural vs. urban
    - insufficient household income,
    - mother's weight status,
    - neighbourhood quality,
    - mother's perception of child's health

Results

Children from Public Schools in both urban and rural areas

Participant Characteristics in K (n=1,170)

Female	51.8%
Rural	22.4%
Insufficient income	15.7%
Child OW/obese	18.1%
Mother OW/obese	29.6%
Perception of child's health Other than excellent	37.0%
Neighbourhood quality Average/bad/very bad	19.5%

RESULTS: BMI Z-Score

Average across K, G1, G2 as a function of Sustained AT (n=1170)

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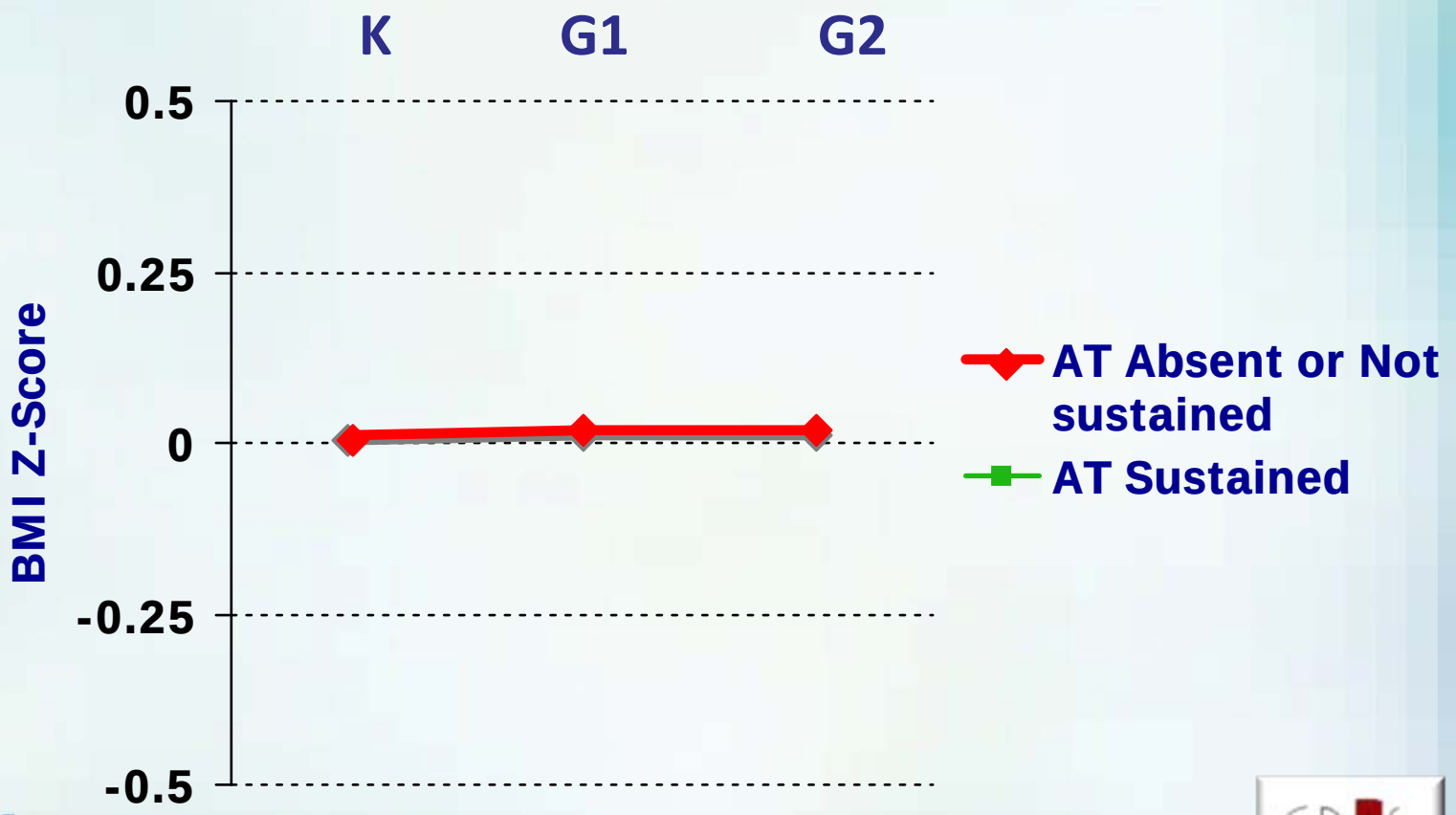

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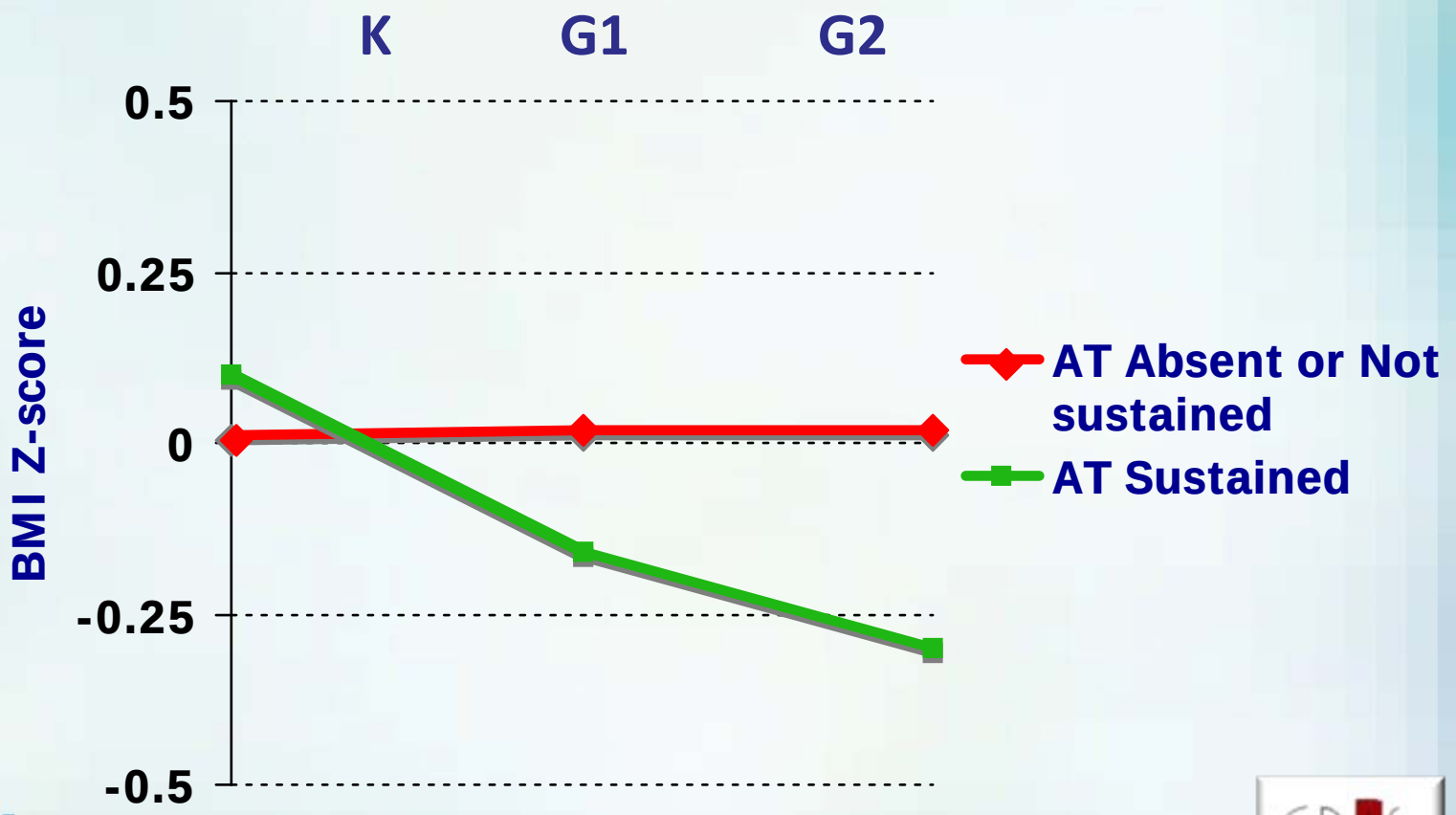

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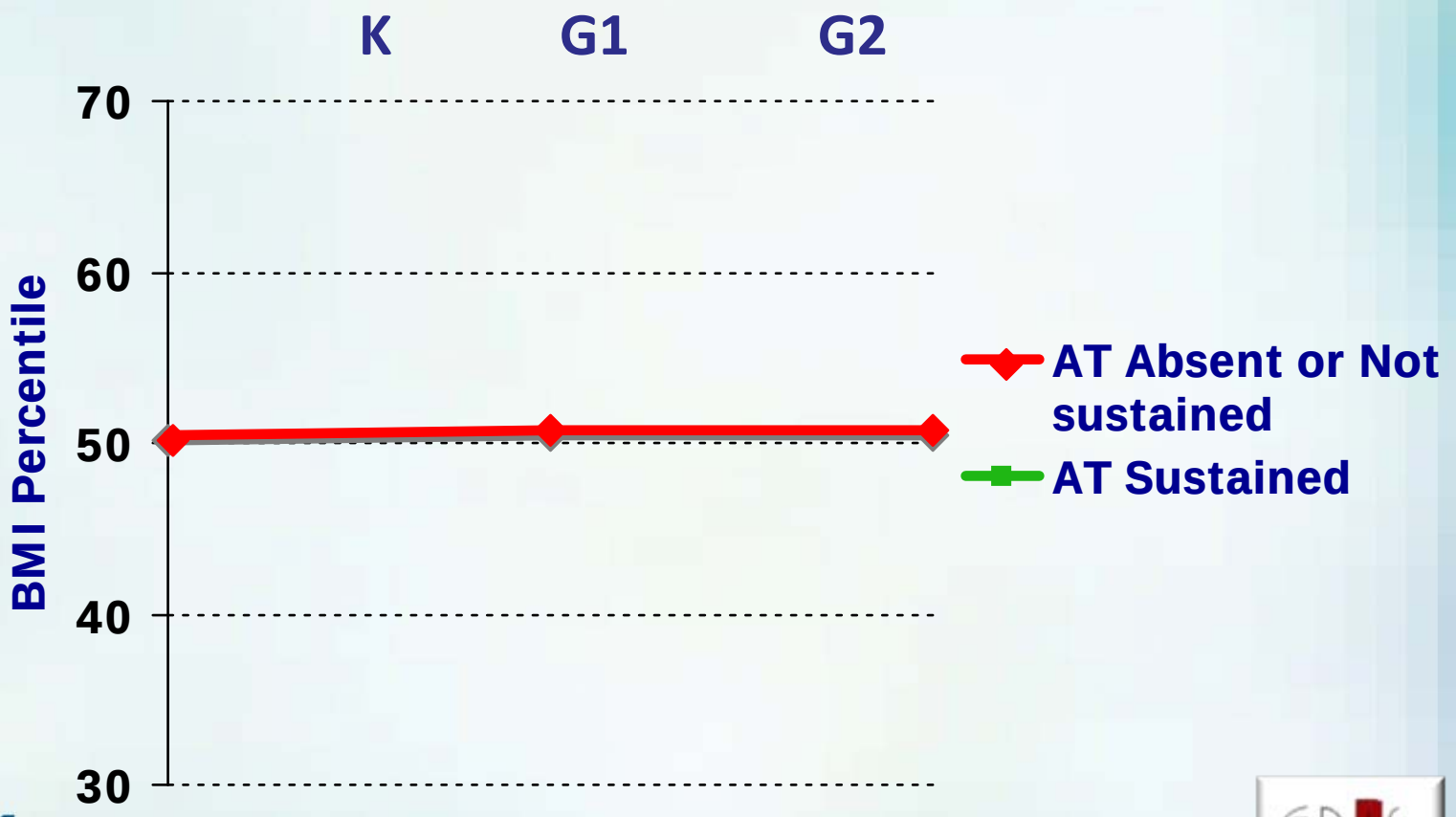
RESULTS: BMI Percentile

Average across K, G1, G2 as a function of Sustained AT (n=1170)



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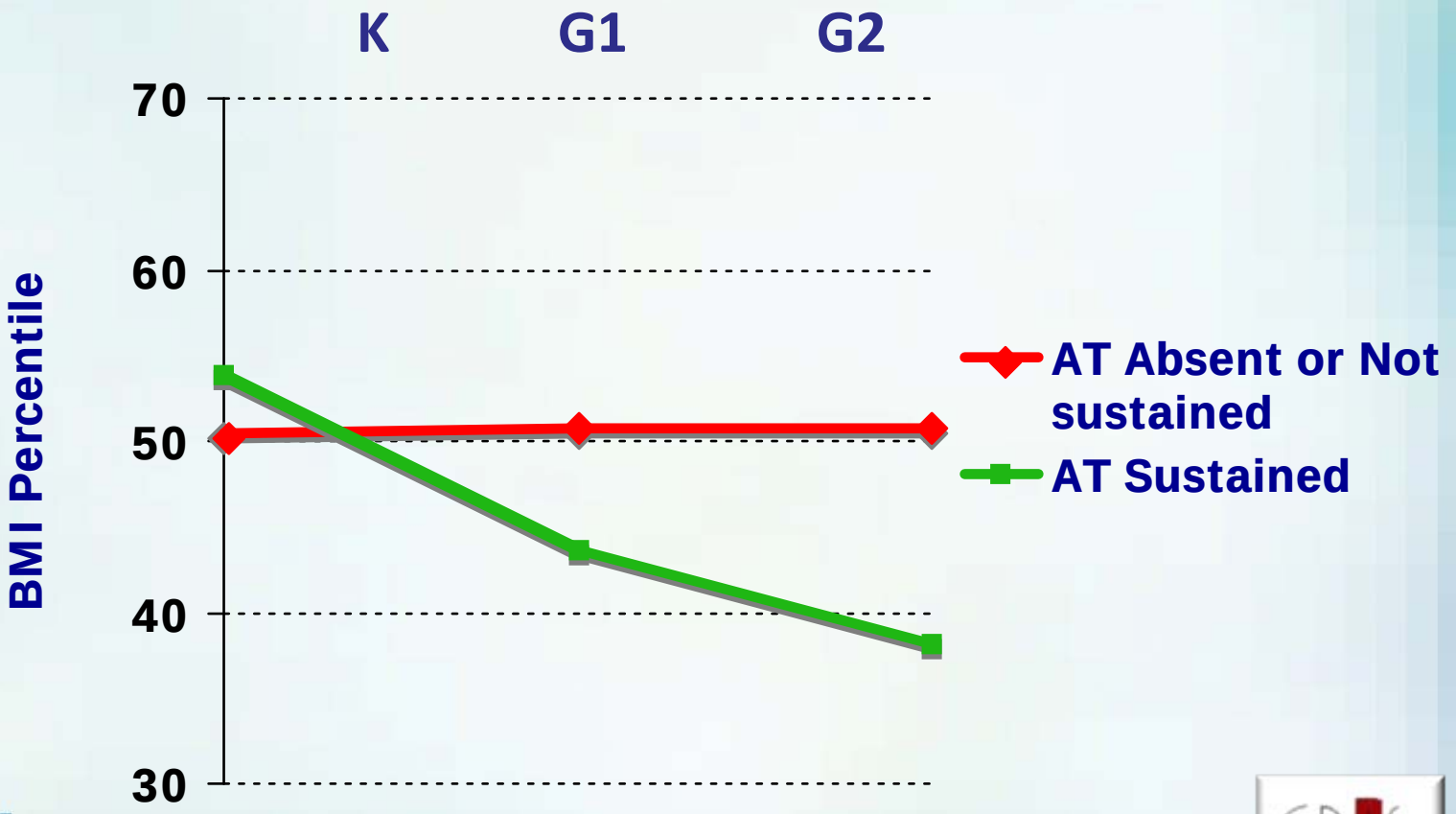
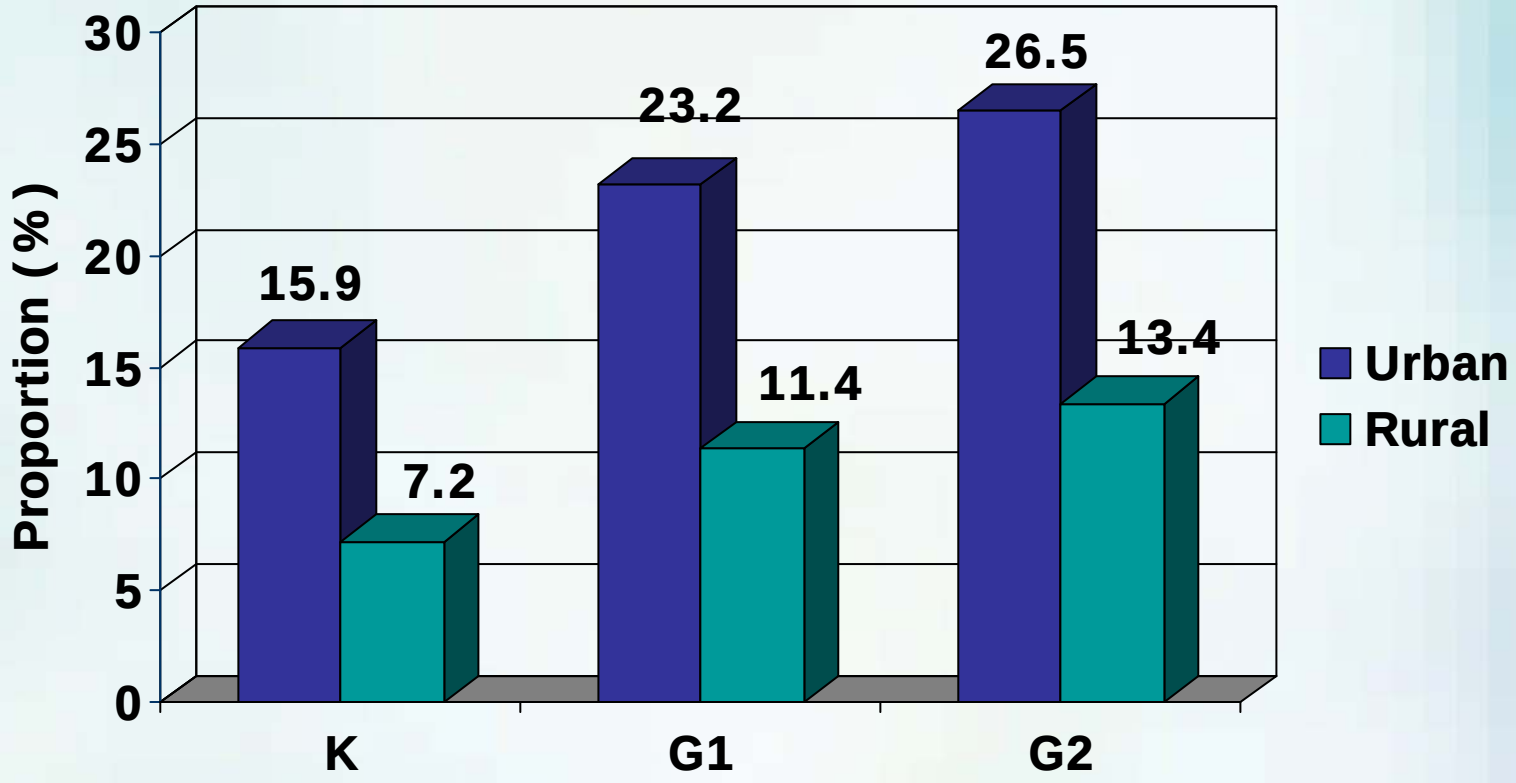


The Urban Area Influence ?

Proportion using AT at K, G1, G2, in Urban vs. Rural Areas



Results

Children from Public Schools in Urban Areas

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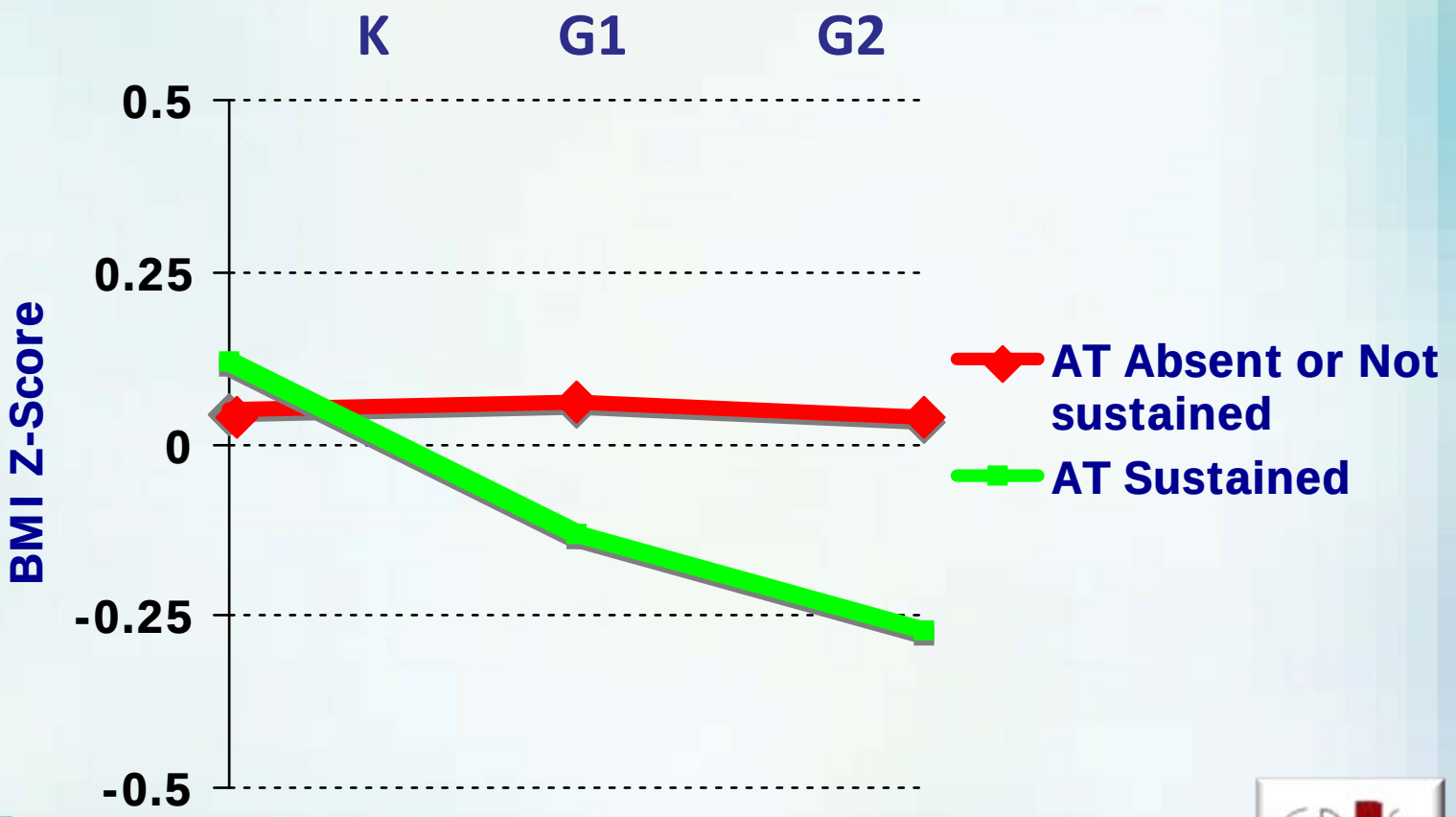
RESULTS: BMI Z-Score

Average across K, G1, G2 as a function of Sustained AT (n=907 Urban Dwelling Children)



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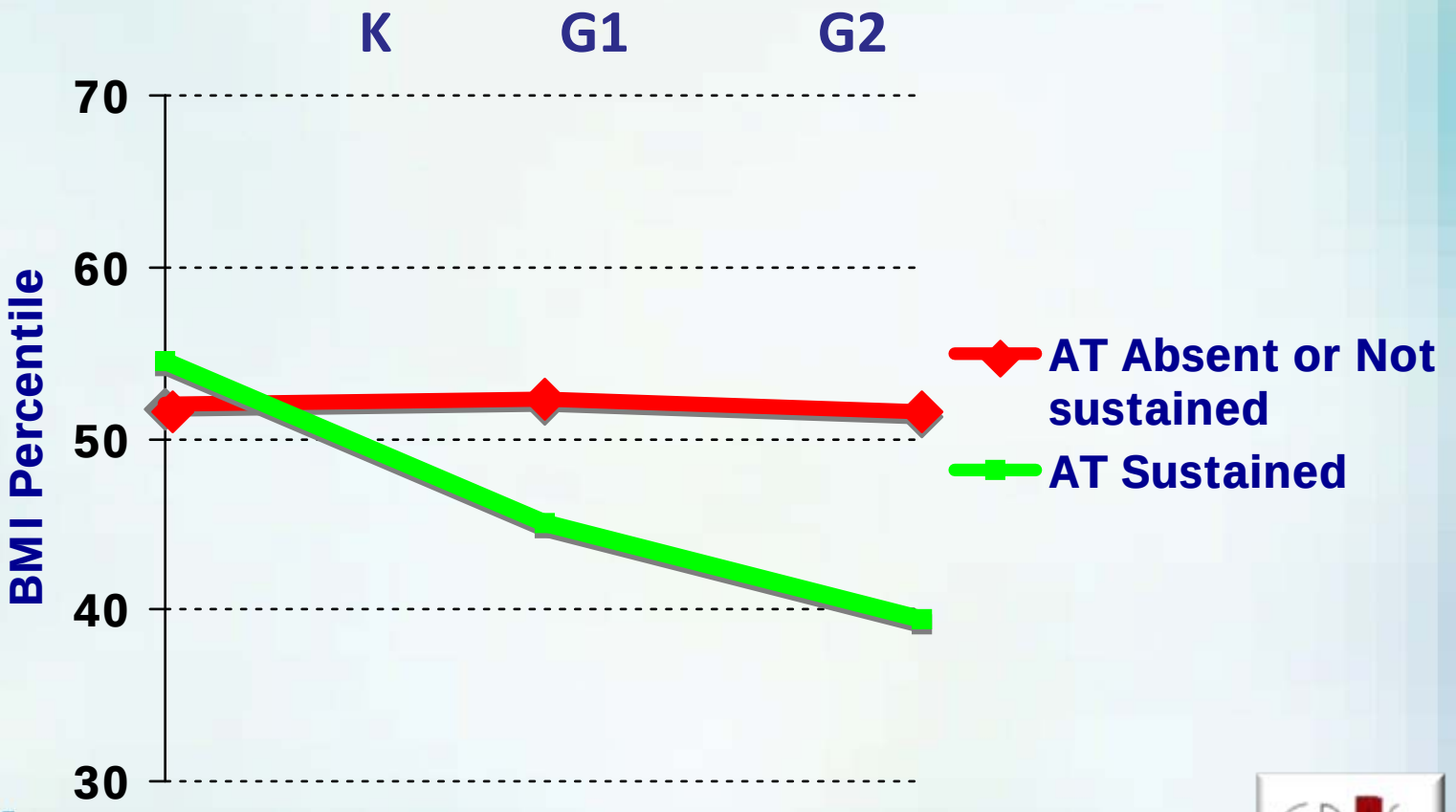


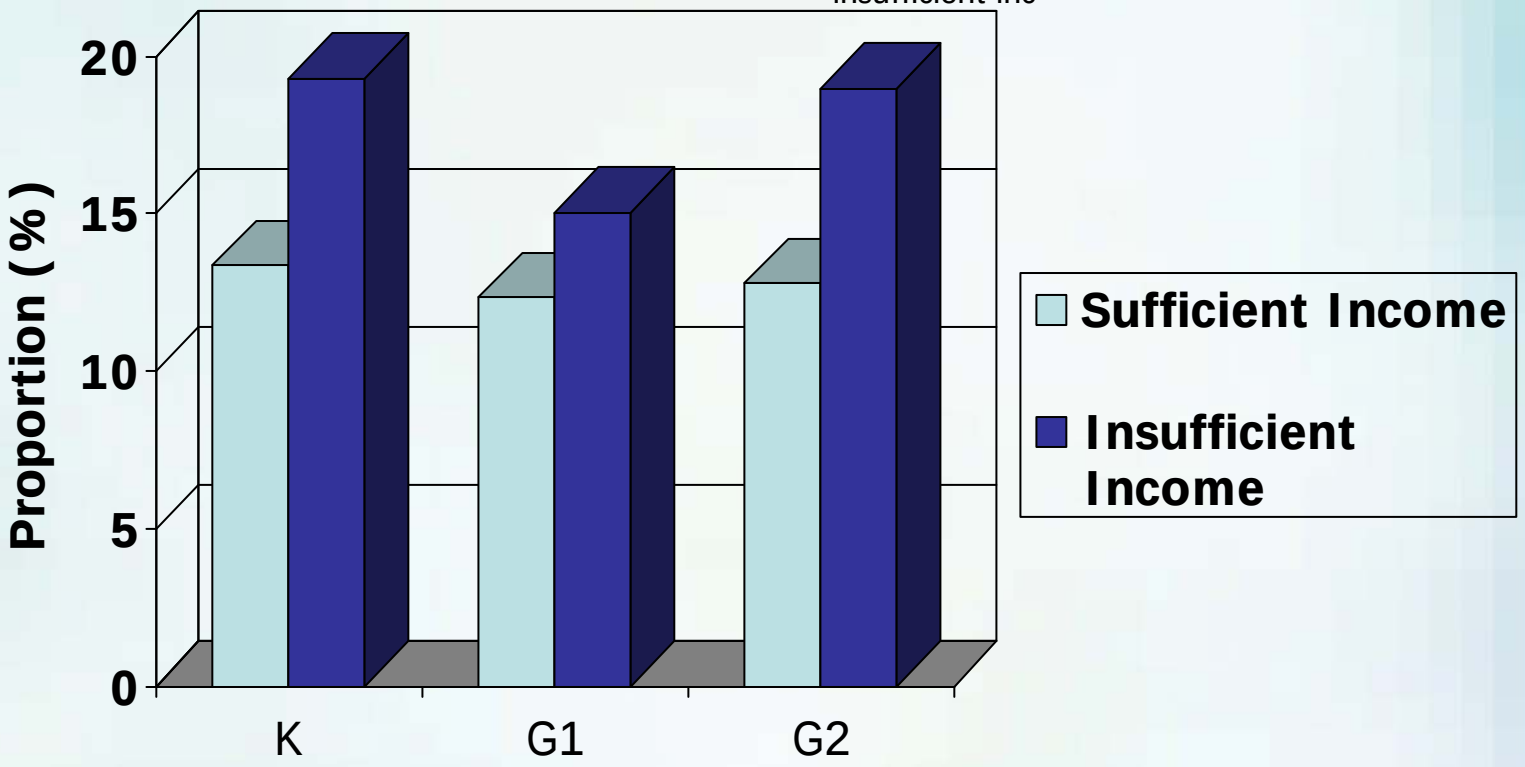
Results: Dichotomous Outcomes

- Cut-offs at 75th, 85th, 95th percentiles
- No effect of sustained AT when modelling any dichotomous outcomes
- Strong associations with insufficient income and maternal OW/obesity

The ELDEQ: Sample from a Unique Population ?

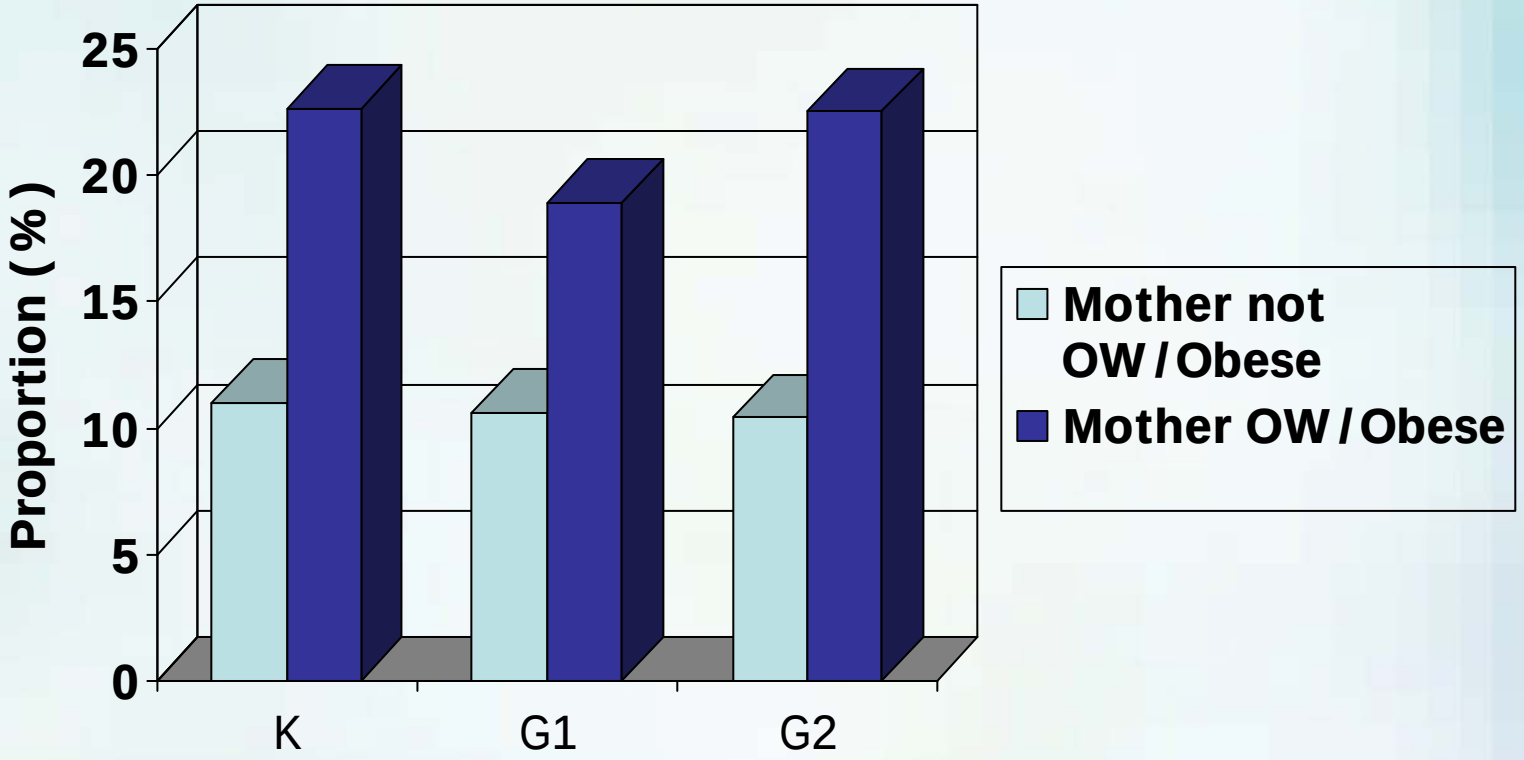
Influence of Income Insufficiency on Child OW/Obesity

$OR_{insufficient\ inc}$=1.6; 95% CI: 1.0, 2.4



Influence of *Maternal* OW/obesity on *Child* OW/Obesity

$OR_{Mother\ OW/obese}$=2.4; 95% CI: 1.5, 3.7



Summary of Results

- All children at the same BMI at K
- Sustained AT is associated with a lower BMI from grades 1 to 2 even though children engaging in Active and Inactive forms of transportation have on average the same levels of BMI in kindergarten
- This relationship is maintained when controlling for covariates

Limitations

- Parent-report of mode of transportation
- Not measured
  - Distance to school
  - Risk of pedestrian-vehicle collisions
- Selection bias
- External validity
  - Quebec is unique in comparison to rest of Canada and US
  - Fewer children OW/Obese
  - However expected associations were observed, i.e.
    - Income
    - Mother's weight status

Conclusion

- Sustained AT to school during early childhood associated with a lower BMI
- Relationship maintained when controlling for confounders
- Sustained AT may set children on a more healthful BMI trajectory
- Policies that encourage sustained AT to school may contribute to lower likelihood of increases in BMI among school-aged children
- Support for implementing policies as early as Kindergarten

Acknowledgements

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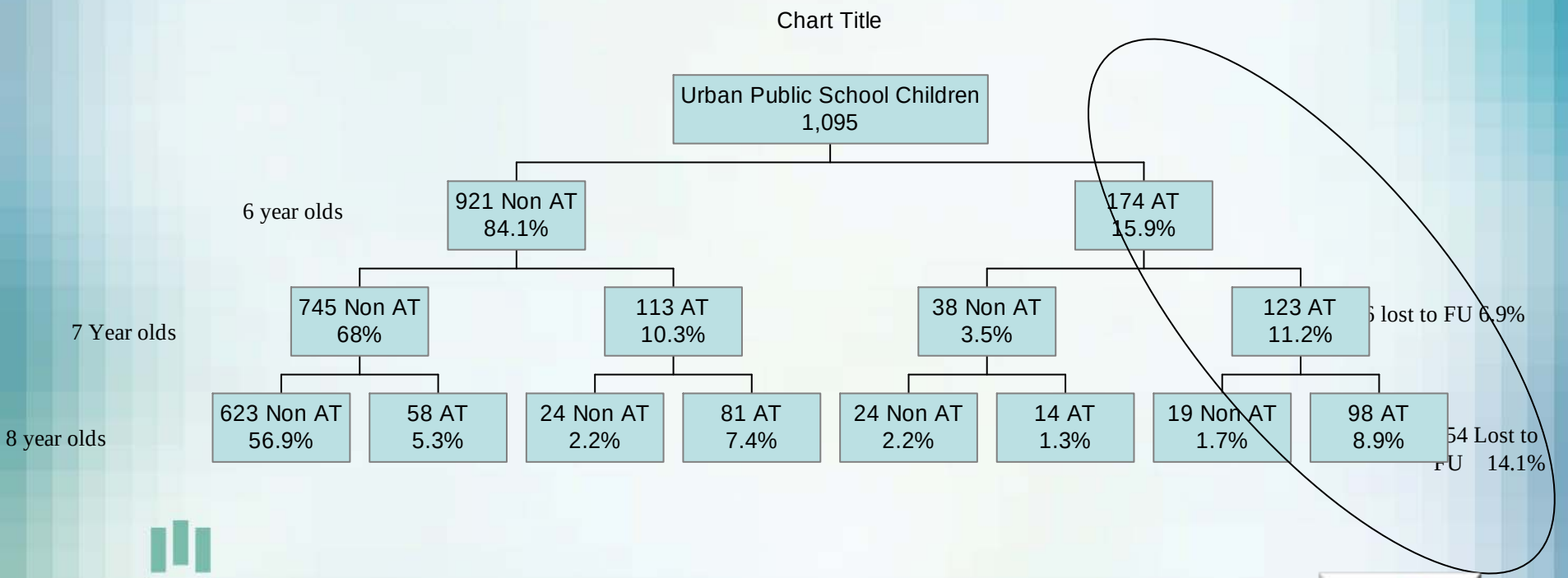
Changes in proportions of children living in urban areas who use AT at ages kindergarten, grade 1, and grade 2

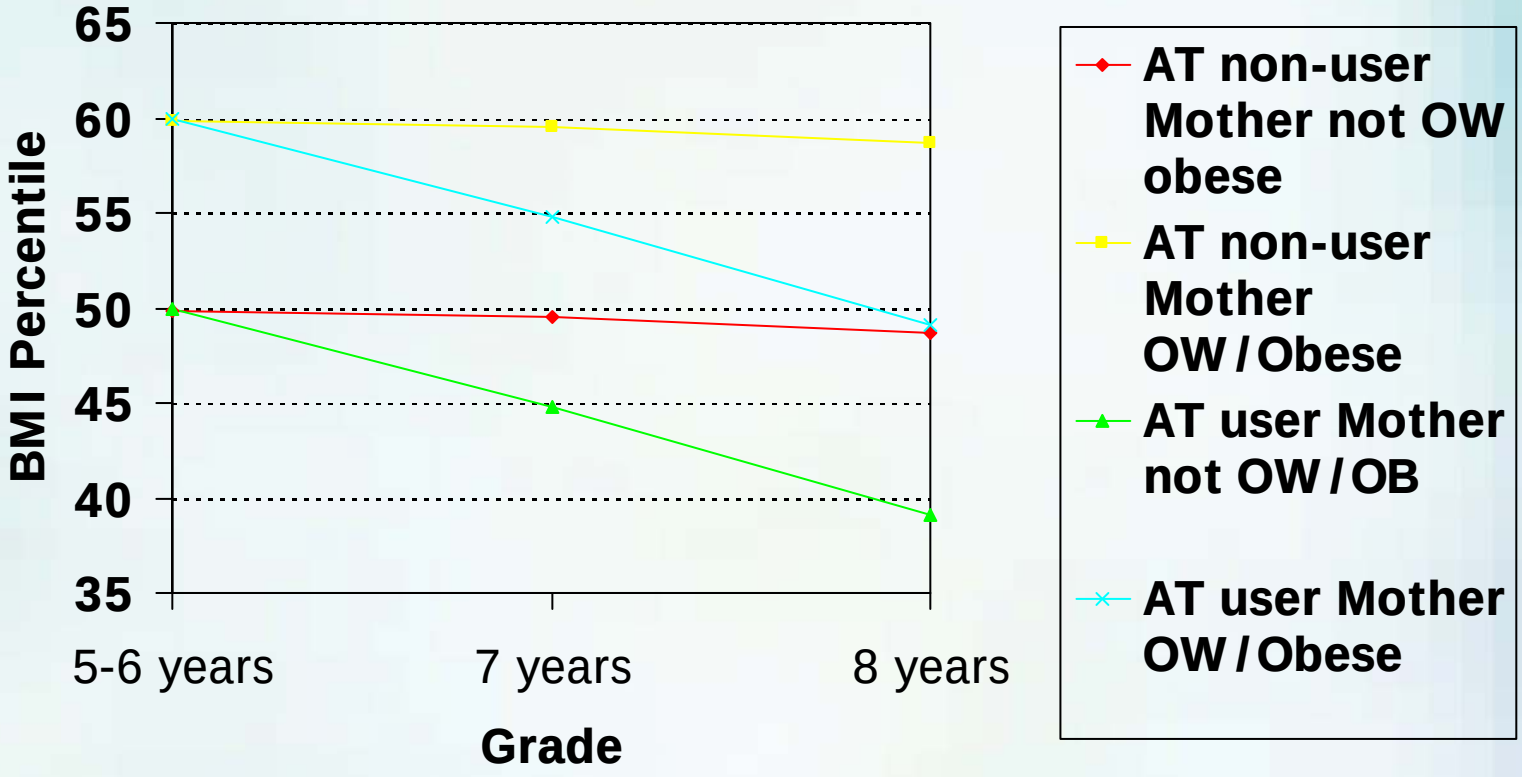


Association between SES and Neighborhood Quality

	Excellent	Good	Average/ bad	
Sufficient	416 88%	293 83%	165 75%	876 83%
Insufficient	59 12%	62 17%	55 25%	176 16.7%
Count	475	357	220	1052

P<0.01

Growth Curve Analysis of Sustained AT and BMI percentile



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