



# DETERMINANTS OF PRE-ADOLESCENT PHYSICAL ACTIVITY –A CASE FOR ACTION ON SOCIAL DETERMINANTS OF HEALTH

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## INTRODUCTION

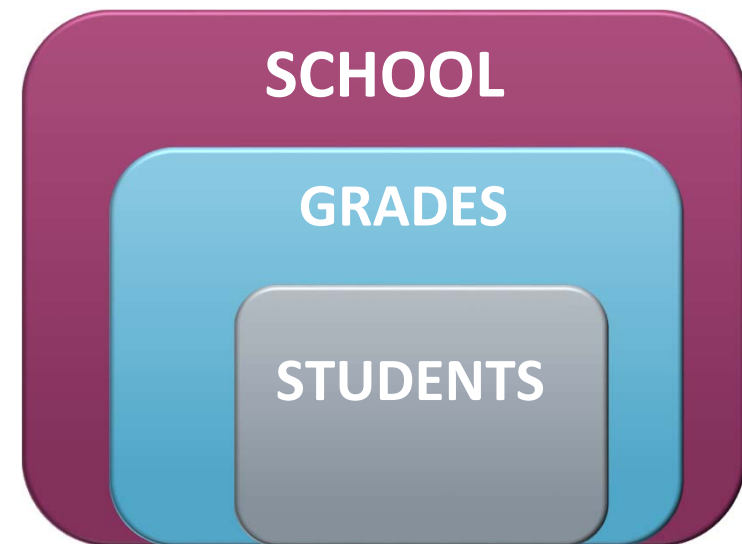
- The Public Health Agency of Canada recommends that 5 to 17-year-olds should participate in at least one hour of moderate to vigorous physical activity per day.
- According to the 2007-2009 Canadian Health Measures Survey, only 7% of Canadian children and youth achieve the amount of physical activity recommended by the Canadian Physical Activity guidelines.

## RESEARCH OBJECTIVES

- To examine the association of physical activity levels among school children with
  - Age, self-rated health
  - Socio-economic status (measured by deprivation quintiles), parent education, parent employment status
  - Aboriginal ethnicity
  - Relationship with friends (Social networks)
- To test for rural/urban differences in physical activity levels

## STUDY DESIGN

- Students from 120 schools in 4 school divisions in Saskatoon Health Region were surveyed to assess the physical activity levels, health status, and high risk behaviors of grades 5 to 8 students.
- Student Health Survey (SHS)(2011) was adapted from a number of validated sources, including
  - National Longitudinal Survey of Children and Youth.
  - Health behaviour in school-aged children (HBSC) survey (WHO & EUROPE)



## PHYSICAL ACTIVITY MEASURE

In the last week how many minutes per day did you participate in:

**Hard Activity**, defined as jogging, team sports, fast dancing, jump rope and any other physical activity that increased the heart rate and made the respondent breathe hard and sweat

**Moderate Activity**, defined as physical activities that are lower in intensity, such as walking, biking to school, and swimming for fun

Response scale used 15 minutes increments ranging from zero to more than 60 minutes  
Kilocal per Kg per day (KKD) value was calculated for each student and categorised as:

Physically inactive (KKD < 3)

Moderately active (KKD  $\geq 3$  – < 8)

Optimally active (KKD  $\geq 8$ )

## INDEPENDENT VARIABLES

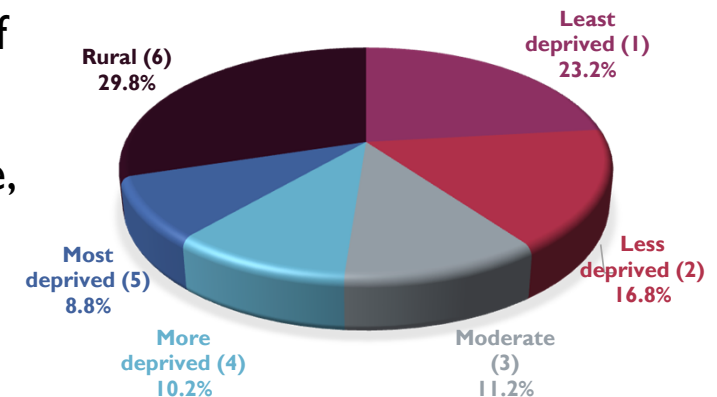
SOURCE: NATIONAL LONGITUDINAL SURVEY OF CHILDREN & YOUTH CANADA

- **Age**
  - $\leq 10$  years (17.3%), 11 (24.8%), 12 (25.9%),  $> 13$  years (32%)
- **Aboriginal ethnicity**
  - Yes (9.8%)
  - No (90.2%)
- **Self-rated health**
  - Poor/Fair (7.9%)
  - Good (32.7%)
  - Very good/excellent (59.4%)
- **Parent employment**
  - Neither parents employed (0.8%)
  - One parent employed (16%)
  - Both parents employed (83.3%)
- **Gender**
  - Female (51.4%), Male (48.6%)
- **Parent education**
  - Both parents high school graduate or less (21.8%)
  - One parent has some university or university graduate (19.0%)
  - Both parents some university or university graduates (59.2%)
- **Body Mass Index (BMI)**
  - Based on CDC growth charts
    - Underweight (5.3%)
    - Normal (73.5%)
    - Overweight/Obese (21.2%)
- **I have many friends**
  - False
  - Mostly false
  - Sometimes true
  - Sometimes false
  - Mostly true (22.2%)
  - True (64.3%)
- **School location**
  - Urban (73.0%)
  - Rural (27.0%)
- **School Division**
  - Urban (1 & 2) (77.6%)
  - Rural (1 & 2) (22.4%)

## INDEPENDENT VARIABLES

### ■ Deprivation Index

- Social deprivation: proportion of lone parents, proportion of residents living alone, and marital status
- Material deprivation: educational attainment, average income, and employment status.
- Divides population into 5 quintiles
  - Quintile 1 – least deprived
  - Quintile 5 – most deprived



**Limitation:** Due to small size of the communities, census data on the indicators was not available for rural communities. For comparison, students in rural schools were coded as category 6 (rural)

## STATISTICAL ANALYSIS

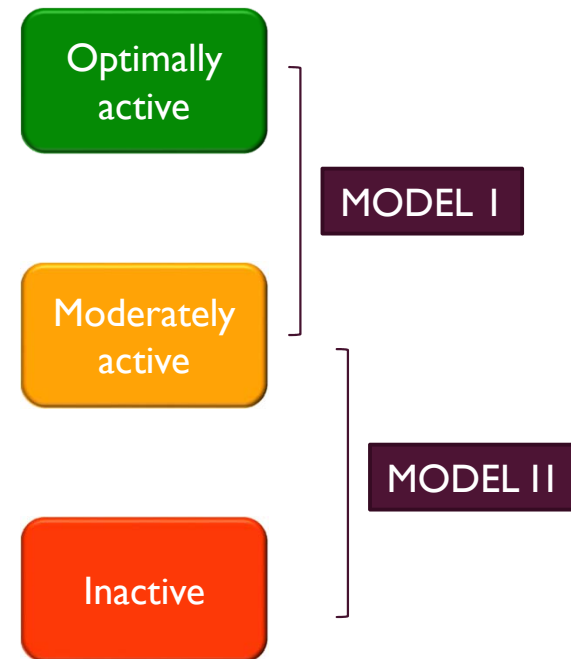
- Logistic mixed-effects multivariable regression models
  - **Model I:** Optimally & Moderately activity vs Physically Inactive
  - **Model II:** Optimally vs Moderately activity & Physically Inactive
  
- To account for the increased probability of a Type I error due to multiple comparisons, an independent variable was considered statistically significant and retained in the model if the computed p-value was  $\leq 0.025$  (i.e., Bonferroni correction)





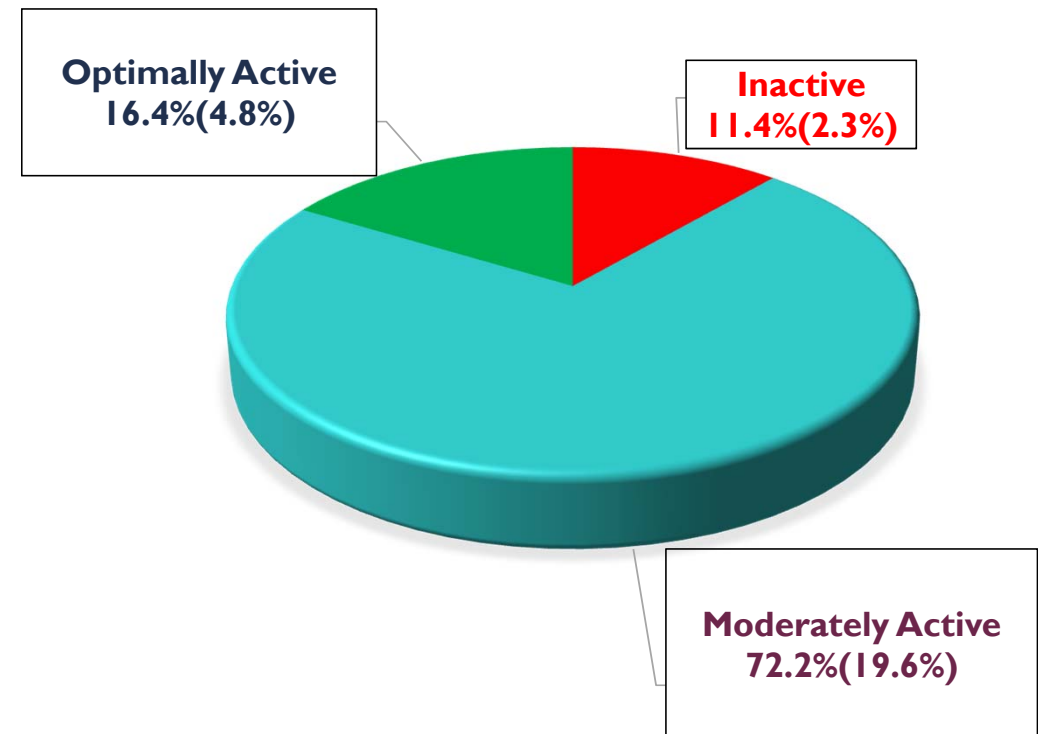
## STATISTICAL ANALYSIS

- **Model building strategy**
  - Unconditional analysis at  $p < 0.2$  based on Type III Wald test
  - Manual stepwise backward selection at  $p < 0.025$
  - Potential confounders assessed based on  $> 10\%$  change in other significant regression coefficients of interest
- Population averaged odds (OR) ratio with 97.5% confidence intervals and variance partition coefficient (VPC) were calculated



## RESULTS

- 5783 students from grades 5 to 8
  - Grade 5 - 1074 (23.9%)
  - Grade 6 - 1193 (26.5%)
  - Grade 7 – 1156 (25.7%)
  - Grade 8 – 1076 (23.9%)
- Ages: 9 – 13 years
- Response rate of 78.3% (4528)
  - 51.4% female
  - 9.8% Aboriginal
  - 26.9% rural



## MODEL I: OPTIMAL & MODERATE VS INACTIVE

OR (PA) = POPULATION AVERAGED ODDS RATIO

97.5% CI = CONFIDENCE LIMITS

Variable	OR (PA)	97.5% CI		P value	Type III Wald
Aboriginal vs non-Aboriginal	0.54	0.33	0.87	0.004	
Neither vs one parent employed	0.61	0.14	2.62	0.45	0.0017
Both vs one parent employed	1.73	1.19	2.52	0.001	
One parent university vs high school graduates or less	2.42	1.45	4.03	<0.001	0.0004
Both parents university graduates vs high school graduates or less	1.43	1.10	2.04	0.023	
I have many friends: Mostly false vs false	1.60	0.56	4.51	0.314	0.017
I have many friends: Sometimes true & false vs False	2.84	1.13	7.13	0.011	
I have many friends: Mostly true vs False	2.07	0.91	4.70	0.047	
I have many friends: True vs False	2.80	1.25	6.25	0.004	
Good vs Poor/Fair general health	2.22	1.40	3.53	<0.001	<0.001
Very good/Excellent vs Poor /Fair general health	4.54	2.82	7.30	<0.001	

**MODEL I: OPTIMAL & MODERATE**  
**OR (PA) = POPULATION AVERAGED ODDS RATIO**
**VS**  
**INACTIVE**  
**97.5% CI = CONFIDENCE LIMITS**

Variable	OR (PA)	97.5% CI	P value	Type III Wald
Aboriginal vs others	0.44	0.24 0.80	0.002	
Neither vs one parent employed	1.29	0.09 17.79	0.83	0.03
Both vs one parent employed	1.78	1.09 2.92	0.009	
One parent university vs high school graduates or less	2.28	1.13 4.60	0.008	0.022
Both parents university graduates vs high school graduates or less	1.10	0.68 1.78	0.65	
I have many friends: Mostly false vs false	1.84	0.37 9.16	0.39	0.78
I have many friends: Sometimes true & false vs False	2.08	0.53 8.09	0.23	
I have many friends: Mostly true vs False	1.77	0.50 6.28	0.31	
I have many friends: True vs False	1.96	0.57 6.80	0.22	
Good vs Poor/Fair general health	2.36	1.30 4.30	<0.001	<0.001
Very good/excellent vs Poor /Fair general health	6.14	3.27 11.53	<0.001	
Normal weight vs underweight	0.86	0.32 2.32	0.73	0.84
Overweight/Obese vs underweight	0.78	0.27 2.23	0.59	
Female vs Male	0.85	0.56 1.28	0.37	

## MODEL II: OPTIMAL VS MODERATE & INACTIVE

OR (PA) = POPULATION AVERAGED ODDS RATIO

97.5% CI = CONFIDENCE LIMITS

Variable	OR (PA)	97.5% CI		P value	Type III Wald
Female vs Male	0.50	0.40	0.59	<0.001	<0.001
Good vs Poor/Fair general health	1.21	0.68	1.99	0.45	<0.001
Very good/excellent vs Poor /Fair	3.20	1.86	5.13	<0.001	
I have many friends: Mostly false vs false	0.89	0.23	2.87	0.85	<0.001
I have many friends: Sometimes true & false vs False	1.08	0.35	2.93	0.88	
I have many friends: mostly true vs False	1.25	0.42	3.21	0.65	
I have many friends: True vs False	2.17	0.75	5.49	0.10	
<b>Least deprived vs Rural</b>	<b>0.42</b>	<b>0.27</b>	<b>0.63</b>	<b>&lt;0.001</b>	<b>0.0016</b>
Less deprived vs Rural	0.72	0.51	1.01	0.06	
Moderately deprived vs Rural	0.77	0.56	1.05	0.09	
More deprived vs Rural	0.80	0.61	1.06	0.12	
Most deprived vs Rural	0.92	0.72	1.18	0.512	

## MODEL II: OPTIMAL VS MODERATE & INACTIVE

OR (PA) = POPULATION AVERAGED ODDS RATIO

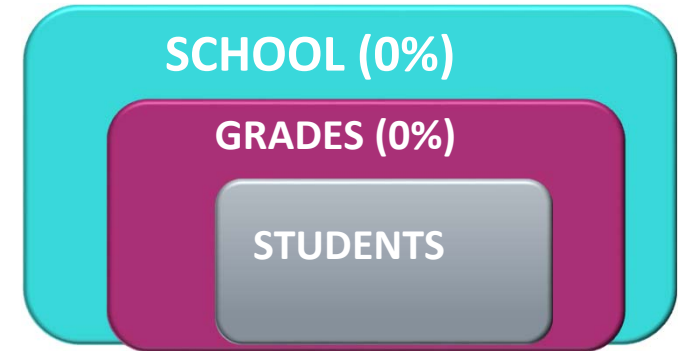
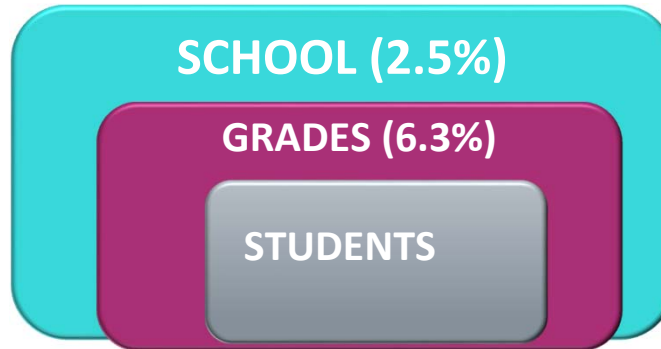
97.5% CI = CONFIDENCE LIMITS

Variable	OR (PA)	97.5% CI	P value	Type III Wald
Female vs Male	0.48	0.38 0.60	<0.001	<0.001
Good vs Poor/Fair general health	0.91	0.47 1.61	0.741	<0.001
Very good/excellent vs Poor /Fair	2.20	1.19 3.77	0.004	
I have many friends: Mostly false vs false	0.95	0.18 4.06	0.95	<0.001
I have many friends: Sometimes true & false vs False	0.67	0.15 2.49	0.55	
I have many friends: mostly true vs False	1.25	0.31 4.21	0.73	
I have many friends: True vs False	2.02	0.51 6.68	0.25	
Less deprived vs Least deprived	1.29	0.62 2.43	0.44	<b>0.18</b>
Moderately deprived vs Least deprived	1.49	0.75 2.72	0.19	
More deprived vs least deprived	1.80	0.94 3.19	0.04	
Most deprived vs least deprived	2.12	1.13 3.68	0.008	
Rural vs Least deprived	2.08	1.11 3.60	0.009	
Normal weight vs Underweight	1.12	0.65 1.80	0.64	0.037
Overweight/Obese vs Underweight	0.78	0.43 1.32	0.35	

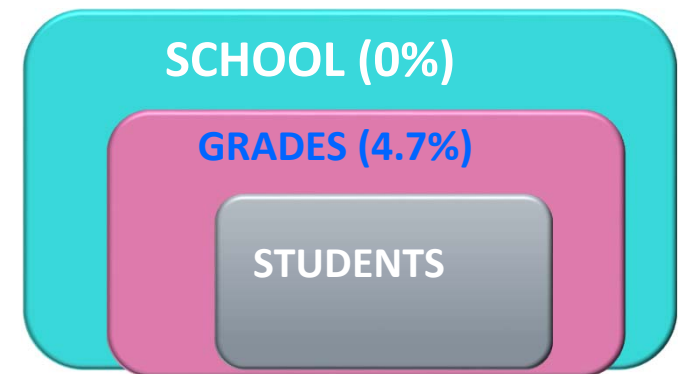
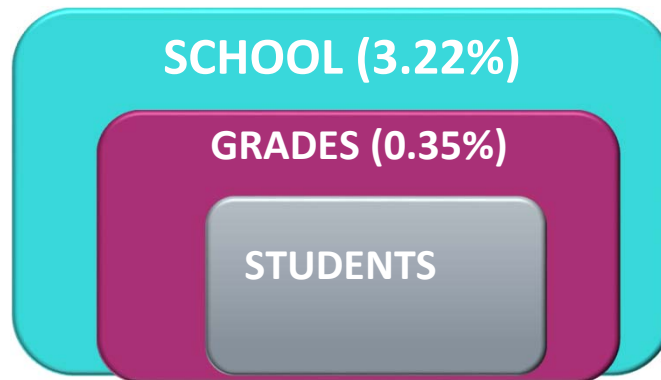
# VARIANCE PARTITION COEFFICIENT NULL MODEL

# FINAL MODEL

MODEL I



MODEL II



## CONCLUSIONS

- Physical activity levels were not optimal among most students.
- Activity levels were lower among females, Aboriginal, low income, and *rural* students.
- *Perceived number of friends* and *perceived general health* were associated with optimal physical activity.
- *Parents education* and *employment* were positive predictors of physical activity.



## RECOMMENDATION

Our study shows that **population-level interventions** designed to affect social determinants of health and **positive peer engagement** in schools are critical in improving childhood physical activity levels and overall health.

# THANKS

