



# Physical Activity Levels and Obesity Status of Oregon Rural Elementary School Children

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The goal of the GROW Healthy Kids and Communities project is to prevent obesity in rural children



## ABSTRACT

Children living in low-income, rural areas are at a disproportionately higher risk of overweight and obesity compared to children living in less rural areas.

### PURPOSE

To evaluate the relationship between physical activity (PA, min/school-day) at school and body mass index (BMI, kg/m<sup>2</sup>) among rural elementary-aged children.

### METHODS

Height (cm), weight (kg), and PA were measured for 1767 children (5-12 years) enrolled in six rural Oregon elementary schools in fall, 2013. PA at school was measured over four days using Walk4Life pedometers. Children with ≥ 3 valid monitoring days (n=1482) were included in analyses. Means were calculated for wear time, total PA (TPA: combined light, moderate, vigorous PA), and moderate to vigorous PA (MVPA: step count > 120/min). BMI z-scores were calculated and regression models were run to examine the relationship between PA and BMI z-scores, adjusting for wear time, sex, and grade.

### RESULTS

Overweight (38.1%: BMI ≥ 85<sup>th</sup> percentile for age and sex) and obesity (19.4%: BMI ≥ 95<sup>th</sup> percentile) prevalence was similar for boys (n=782) and girls (n=700). More MVPA was associated with lower BMI (P < 0.001), independent of sex, wear time or grade. Mean MVPA was 18.9 +/- 8 min/d, versus 15.2 +/- 6.7 min/d for healthy-weight and obese children, respectively.

### CONCLUSION

Children are not meeting minimum MVPA recommendations (60 min/d) during school hours. Efforts to promote PA for obesity prevention in rural elementary schools should focus on increasing opportunities for MVPA.

## INTRODUCTION

In Oregon, and nationwide, there is a dearth of data assessing the amount of time spent in physical activity (PA) at school among rural children and no data relating PA at school to health indicators such as BMI. This makes it challenging to advocate school policies and resources to promote PA as critical among rural children.

### PURPOSE

The purpose of this study was to measure PA levels during the school day among children attending elementary schools in rural Oregon, and to determine the relationship of PA behaviors at school to BMI.

### Research Design

- This study is nested within a larger, multi-level, 5-year, USDA NIFA-funded project titled *Generating Rural Options for Weight-Healthy Kids & Communities (GROW HKC)*.
- GROW HKC is partnering with Oregon State University Health Extension (OSUHE) and rural communities to examine the effects of obesity preventing policy, systems, and environment targeted change strategies on child obesity risk.
- The study presented in this poster is a cross-sectional examination of PA behaviors of rural elementary school children and the relationship of these behaviors at school to BMI.
- All participating schools met the following inclusion criteria:
  - Located in a community designated as a rural place by the US Census
  - ≥ 50% of school families eligible for free and reduced meals
  - OSUHE county faculty were available to collaborate



## METHODS

### Measures

#### Consent and Assent

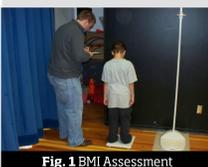
- All assessments took place at school, during school hours.
- Parents were notified about the BMI and PA assessments through school communication outlets and received opt-out forms two weeks prior to assessments.
- Children gave assent at the time of BMI or PA assessments.

#### Assessment of Body Mass Index (BMI; kg/m<sup>2</sup>)

- Height and weight were measured over 2-days at each school.
- BMI raw data were transformed to BMI z-scores based on CDC growth charts.
- Children were classified as "overweight" or "obese" using the age- and sex-specific 85<sup>th</sup> and 95<sup>th</sup> percentiles from CDC growth charts.

#### Assessment of Physical Activity (PA; min/day at school)

- PA was measured over 4 consecutive days at each school during school hours.
- PA data collection coincided with height and weight assessments.
- Classroom teachers were trained to distribute pedometers, log non-compliance, daily wear time (min/d), and school attendance, and to help children put on the devices at the start of each school day and remove them at the end of the school day (~6.5 hours).
- Walk4Life MVP pedometers (Walk4Life Inc.; Oswego, IL) were used to collect data. The Walk4Life MVP is a validated device that records all physical activity and can differentiate activity minutes at or above a pre-specified step rate (Fig. 2).
- Children wore the pedometers on their right hip attached by an elastic belt (Fig. 3).



### Data Management and Analyses

#### PA Data

- 4-day cumulative averages were calculated for wear time (min/d at school), total PA (TPA; combined light, moderate, vigorous PA), and MVPA (step rate > 120/min).
- There were no differences in TPA or MVPA between children with 2, 3, or 4 days of valid PA data; nonetheless only kids with ≥ 3 days of PA data were included in analyses.

#### BMI Data

- BMI z-scores were calculated for use in regression models.
- Z-scores > 4 SD above or below age and sex matched reference data were identified as outliers and excluded from analyses.

#### Analyses

- T-tests were used to compare TPA and MVPA means by sex and by grade (grade 1 vs. grade 2-6).
- Proportional tests were used to compare proportions of overweight and obese children by sex and by grade.
- Regression models were run to examine relationships between TPA and MVPA and BMI z-scores, adjusting for wear time, sex, and grade using Stata/IC 13.1.



## RESULTS

### Sample Descriptive Data

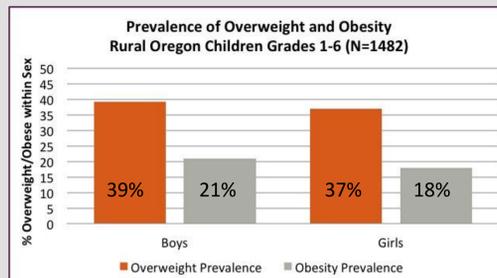
Table 1. Characteristics of Participating Rural Schools

	OREGON COUNTY 1		OREGON COUNTY 2		OREGON COUNTY 3	
Grade Levels	School 1 K-6	School 2 K-5	School 3 K-6	School 4 K-6	School 5 K-6	School 6 K-6
Student Enrollment	571	442	495	347	166	191
Participation in Federal School Meal Programs (Yes/No)	Yes	Yes	Yes	Yes	Yes	Yes
Students eligible for free/reduced school meals - n (%)	321 (56.2)	289 (65.4)	297 (60.0)	215 (62.0)	156 (94.0)	151 (79.1)
Race/Ethnicity - n (%)						
White	461 (80.7)	260 (58.8)	438 (88.5)	287 (82.7)	64 (38.6)	132 (69.1)
Hispanic	66 (11.6)	160 (36.2)	22 (4.4)	20 (5.8)	11 (6.6)	39 (20.4)
Other	44 (7.7)	22 (5.0)	35 (7.1)	40 (11.5)	91 (54.8)	20 (10.5)

Data source: Oregon Department of Education <http://www.ode.state.or.us/data/reports/toc.aspx#students>. Data reflect 2013-2014 enrollment information.

- Within the 6 participating schools, we measured 1767 of 1852 enrolled 1st-6th graders (95.4%). The final sample included 1482 children (83.8% of measured children; 782 boys; 700 girls).

### Overweight and Obesity Prevalence



- Overall, there were no differences between boys and girls for prevalence of overweight/obesity; however, a greater proportion of 4th grade boys vs. girls were classified as obese (P = 0.004; Table 2).

Table 2. Overweight and Obesity Prevalence by Grade and Sex

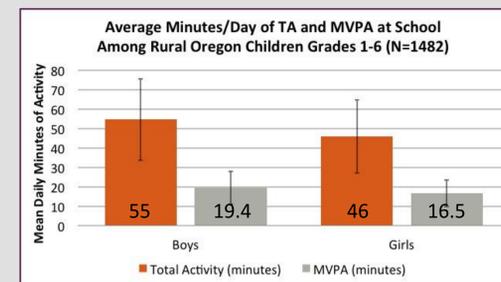
GRADE	GIRLS n=700		BOYS n=782		P-values	P-values
	OW/OB <sup>1</sup> % (SE)	Obese % (SE)	OW/OB % (SE)	Obese % (SE)		
All (1482)	36.8 (0.02)	17.8 (0.01)	39.3 (0.02)	20.8 (0.01)	0.342	0.147
1 (229)	38.2 (0.05)	15.7 (0.04)	26.7 (0.04)	11.8 (0.03)	0.064	0.394
2 (237)	36.4 (0.05)	18.2 (0.04)	38.5 (0.04)	19.7 (0.04)	0.725	0.769
3 (278)	37.9 (0.04)	15.3 (0.03)	42.2 (0.03)	19.5 (0.03)	0.467	0.366
4 (249)	29.8 (0.04)	11.4 (0.03)	40 (0.04)	25.9 (0.04)	0.094	0.004
5 (275)	41.4 (0.04)	25.2 (0.04)	42.1 (0.04)	22.6 (0.04)	0.907	0.626
6 (214)	35.9 (0.05)	19.4 (0.04)	45.9 (0.05)	26.1 (0.04)	0.136	0.243

<sup>1</sup> OW/OB = Combined prevalence of overweight and obese.



## RESULTS

### PA Levels of Rural Oregon Children at School



- On average, children wore pedometers for 357 (± 25 min/d); approximately 92% of a 6.5-hour school day.
- The average participation in TA during the school day was 46 (± 19) and 55 (+/-21 min/d), for girls and boys respectively.
- Girls averaged 16.5 (+/-6.8 min/d) of MVPA, while boys spent 19.4 (+/-8.5 min/d) in MVPA.
- Boys accrued more TA and MVPA than girls at every grade (p < 0.01).



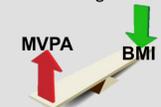
### Relationship of MVPA to BMI

Table 3. Regression Model with BMI z-score as Outcome

Variable	Coef.	SE	T	P> t	[95% Conf. Interval]
Mean MVPA <sup>1</sup>	-0.0205366	0.0035234	-5.83	0.000	-0.0274479 -0.0136252
Sex (f=0; m=1)	.1639585	0.0527306	3.11	0.002	.0605234 .2673936
Grade <sup>2</sup>					
2	0.1685549	0.0922358	1.83	0.068	-0.0123725 0.3494824
3	0.1327545	0.0889906	1.49	0.136	-0.0418074 0.3073163
4	0.0293762	0.091849	0.32	0.749	-0.1507926 0.2095449
5	0.1376162	0.0905722	1.129	0.259	-0.0400481 0.3152805
6	0.0277179	0.0975812	0.276	0.776	-0.1636951 0.2191309
Mean Wear Time <sup>3</sup>	-0.0013107	0.0010354	-1.27	0.206	-0.0033416 0.0007203
Constant	1.455601	0.3818981	3.81	0.000	0.7064784 2.204723

Number of observations included in the model = 1482; F (8, 1473) = 6.19; p=0.0000; R-Squared = 0.0325; Adjusted R-Squared = 0.0272; Root MSE = 0.99355. Data collected in Oregon, fall 2013.

- TA time was not associated with BMI z-scores; as such, TA was not included in the final model.
- More MVPA was associated with lower BMI z-scores (p < 0.001), independent of sex, wear time or grade.



- Multiple logistic regression models with BMI percentile categories (overweight vs. healthy; obese vs. healthy) showed healthy-weight children participated in more MVPA (19±8 min/d) vs. obese children (15±7 min/d; p < 0.001);
- This corresponds to obese children having 7.3% lower odds of participating in MVPA compared to healthy-weight children.

## DISCUSSION

- This is the first study to objectively assess the relationship between PA (min/d) at school and BMI in rural elementary children (6-12 y) in Oregon.
- Regardless of grade level, on average children accrued < 60 min/d of TA and < 20 min/d of MVPA, during a 6.5-h school day; higher MVPA associated with lower BMI z-scores for boys and girls.
- Notwithstanding the potential impact on BMI, the evidence is clear that more MVPA at school ultimately benefits child health and overall PA.

### Considerations...

- De-identified data were collected at the whole school population level (allowing for an opt-out consent process and greater study participation). This resulted in an inability to collect PA outside of school, eating behaviors, or demographics for inclusion in analyses.
- We did not control for day-to-day variations in school/class schedules (PE, recess) or local climate, but we did gather these data.
- School and class schedules indicated daily recess and weekly PE were offered at all schools during the periods of data collection.
- PE programming ranged from 30-150 min/wk; delivered by classroom teachers, PE specialists, or a combination of the two.
- Cumulative rainfall varied, but observations by our research assistants indicated all schools allowed kids out to play at recess regardless of weather.
- Unfortunately, those opportunities for PA do not appear sufficient to provide children with even half the daily MVPA dose recommended to minimally protect them from chronic hypokinetic conditions.
- This is alarming as over 85% of our sample is bussed to and from schools with one-way travel times ranging from 14-125 minutes, precluding participation in before and after-school programs and leaving the burden of provisioning PA to under-resourced families.

## CONCLUSION

- There are numerous other factors which likely contribute to the observed relationship of MVPA at school to BMI that we did not measure due to the whole-school assessment protocol (PA outside of school, child eating behaviors, demographics, etc.); nonetheless, this study provides initial insights into the dearth of PA provided in rural schools and the potential effects this may have on child BMI.
- Efforts to promote PA as a strategy for obesity prevention in rural schools should focus on adding opportunities for MVPA during school hours, as this is the component of TA with the greatest potential to reduce the risk of disease associated with low PA levels.



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