Urban and Rural Differences in Time Spent in Physical Activity and Sedentary Behaviors

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Master of Public Health Defense

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Committee Members

- Dr. Mary McElroy
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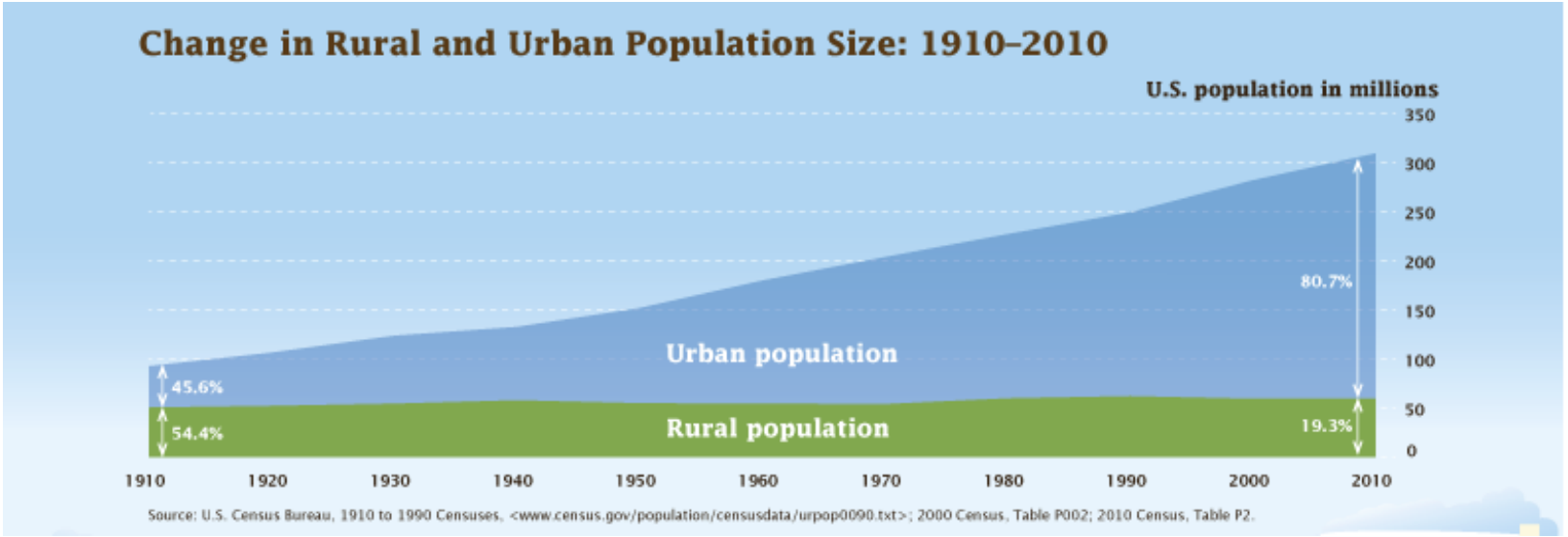
Presentation Outline

- Thesis
  - Background Information
  - Statement of the Problem
  - Methods
  - Results
  - Discussion
- Applied Practical Experience
  - Duties
  - Public Health Core Competencies

Rural America

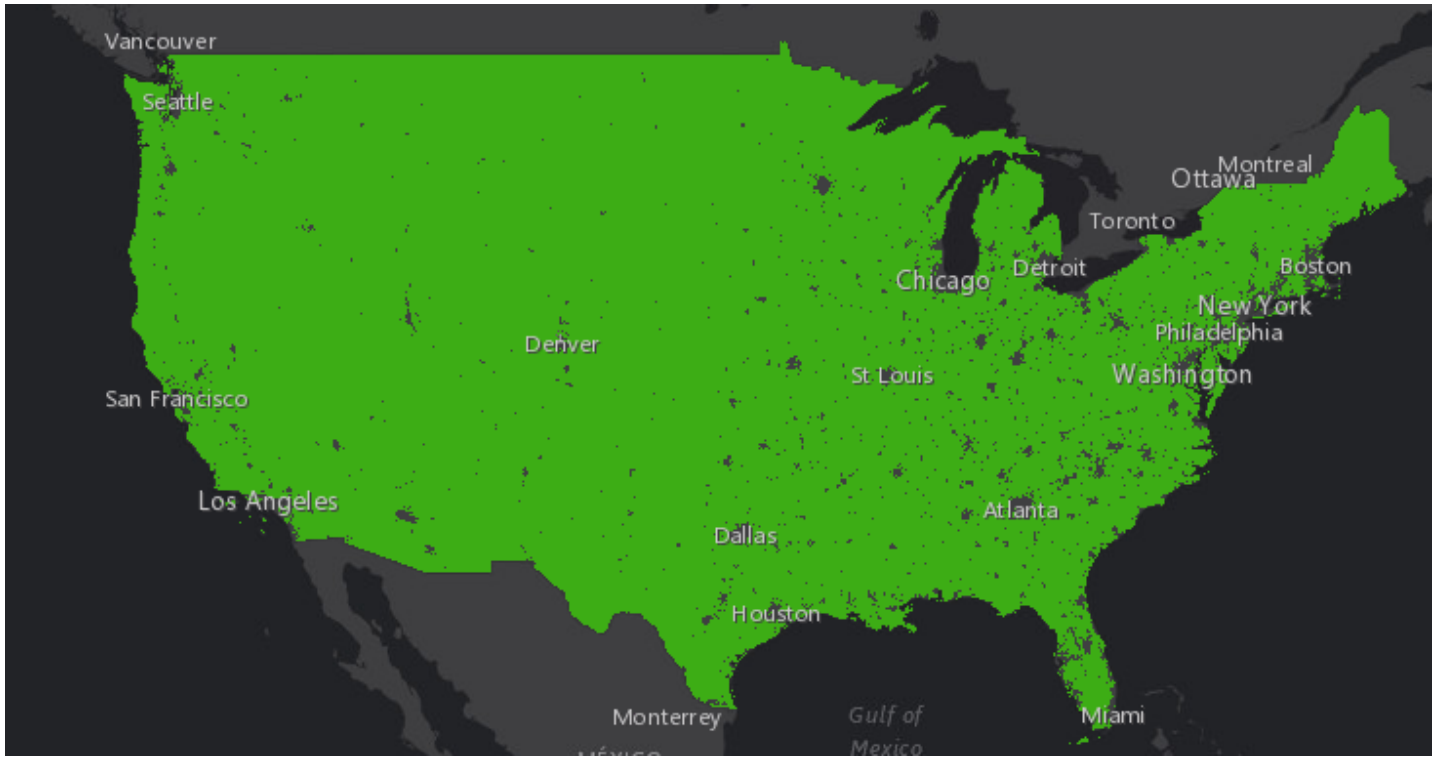
- Rural America is represented not only by a geographic location, but also, “a repository of traditional American values where a long history of life experiences are shared amongst close-knit communities of people.”



(W.K. Kellogg Foundation, 2002)
(United States Census Bureau, 2016)

Map of Rural America

- 19% of population, but 97% of landmass.



(United States Census Bureau, 2018)

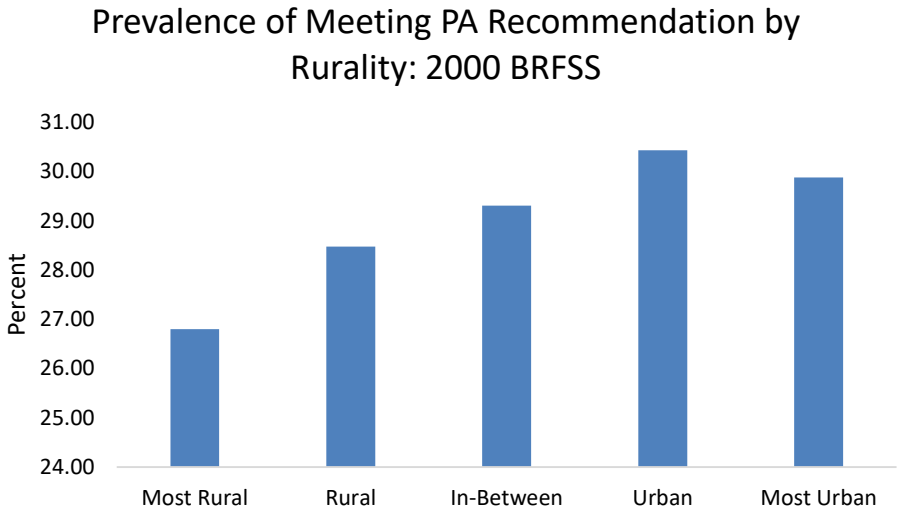
Why Rural America?

- Changing dynamics of rural life such as less physically demanding jobs
- Changes have led to:
  - Increases in obesity rates
  - Decreases in physical activity

(Joens-matre et al., 2008)
(American Journal of Public Health, 2017)

Adult Physical Activity in Rural America

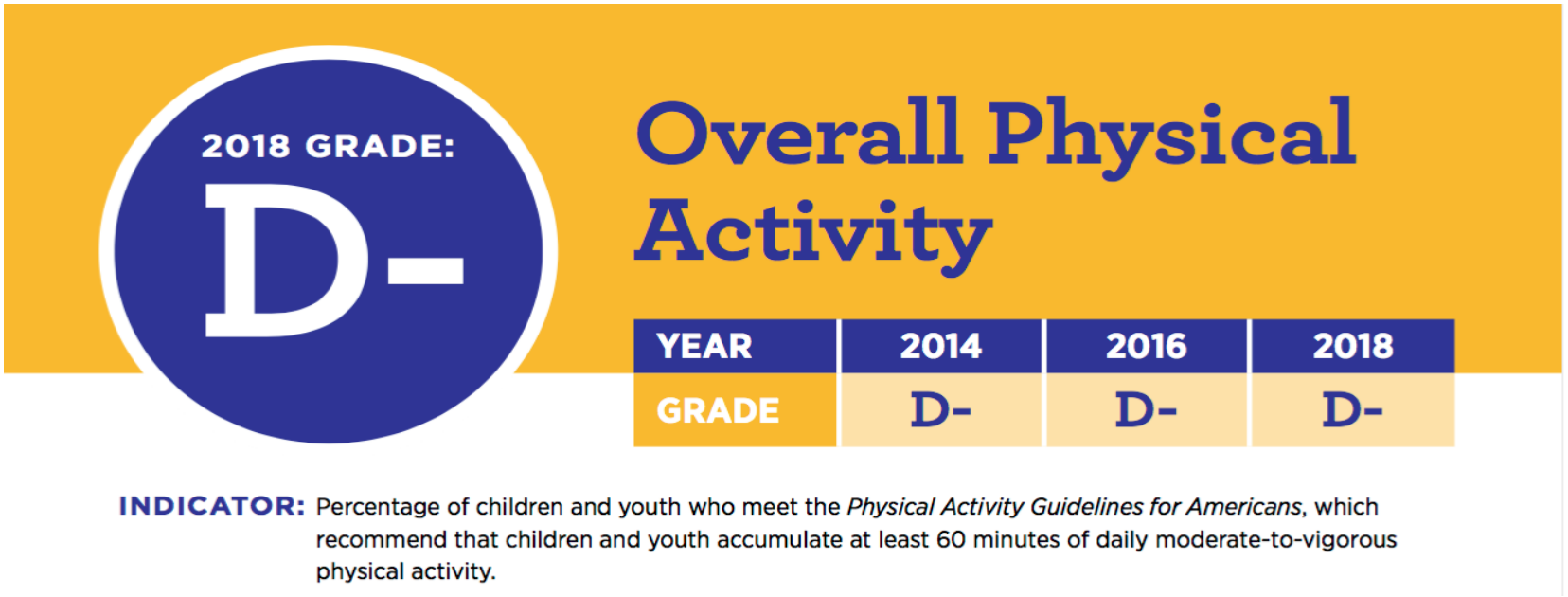
- Rural adults are more physically inactive than urban adults
- Rural adults are least likely to meet Physical Activity Guidelines



(Martin et al., 2005)
(Reis et al., 2004)

Children Physical Activity

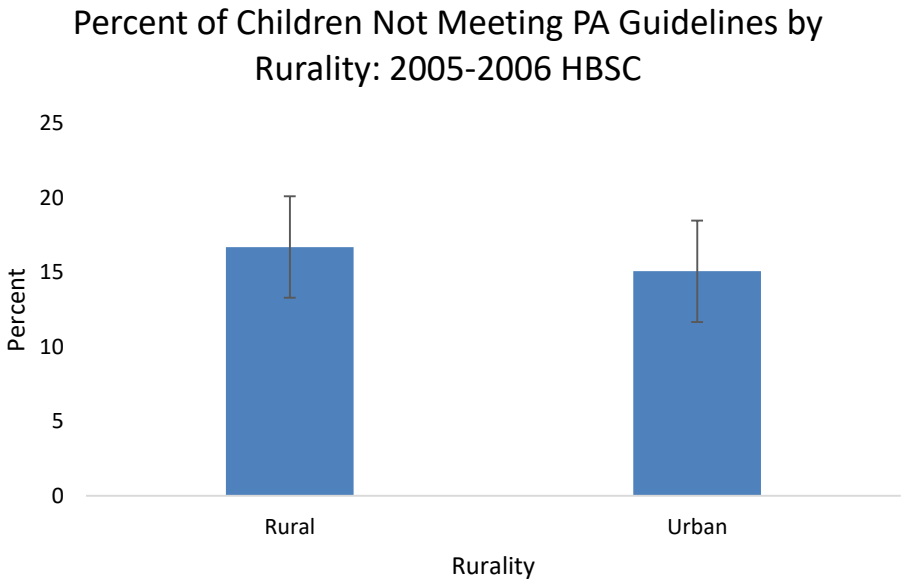
- National Recommendation: 60 minutes of aerobic physical activity per day
  - **Approximately 24% of children aged 6 to 17 meet this**
  - **28% of boys and 20% of girls meet these recommendations**



(United States Department of Health and Human Services, 2008)
(National Physical Activity Plan Alliance, 2018)

Urban More Active

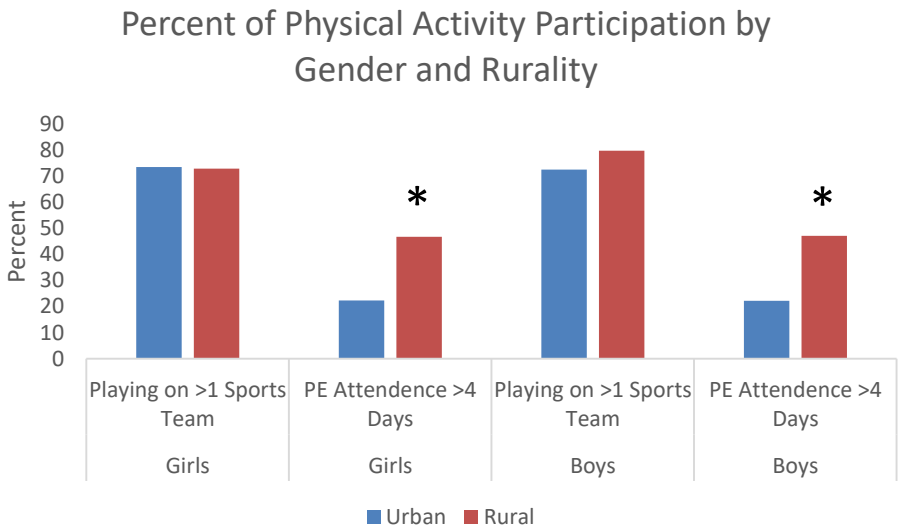
- Rural children less likely to engage in physical activity time or meet physical activity guidelines
  - Rural females lower than urban females
  - Lack of exercise facilities, parks, and PE class availability



(Lutfiyya, Lipsky, Wisdom-Behounek, & Inpanbutr-Martinkus, 2007)
(Kenney, Wang, & Iannotti, 2014)
(Felton et al., 2002)

Rural More Active

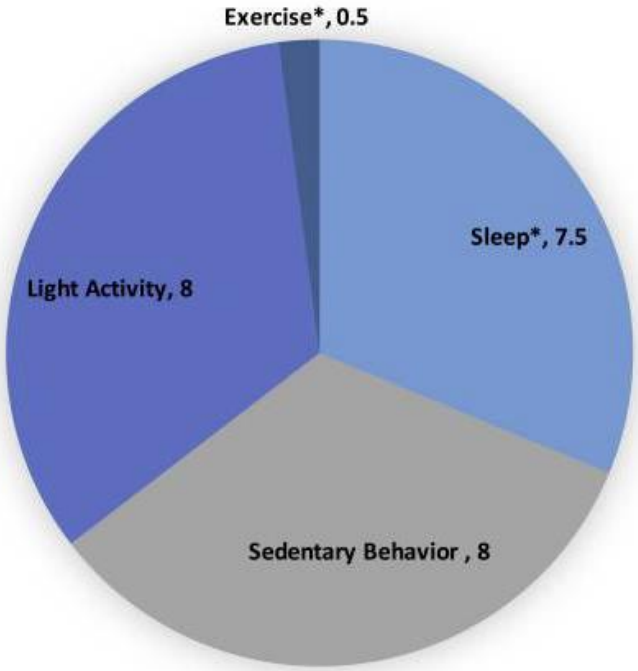
- Rural children age 10 – 17 are more likely to meet PA guidelines
  - Studies limited to individual states



(Liu, Bennett, Harun, & Probst, 2008)
(Springer, Hoelscher, Castrucci, Perez, & Kelder, 2009)

24 Hour Activity Cycle

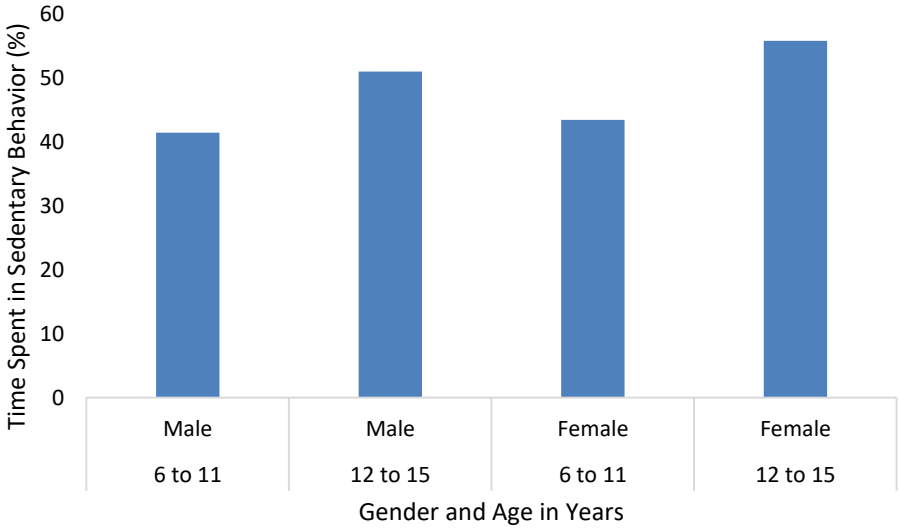
- Physical Activity, Light Activity, and Sedentary Behaviors encompass the waking hours for a typical American



(Rosenberger, Buman, Haskell, McConnell, & Carstensen, 2016)

Sedentary Behaviors

- American children spend over 6 hours/day in sedentary behaviors
- Lack of urban and rural studies
  - Rural areas less likely to experience problem gaming
  - Rural areas more likely to watch television and less likely to be high computer users



(Matthews et al., 2008)
(Shi, Boak, Mann, & Turner, 2018)
(Carson, Kuhle, Spence, & Veugelers, 2010)

Environments Influencing Physical Activity

- School Environment
- Out of School Environment

(Centers for Disease Control, 2018)

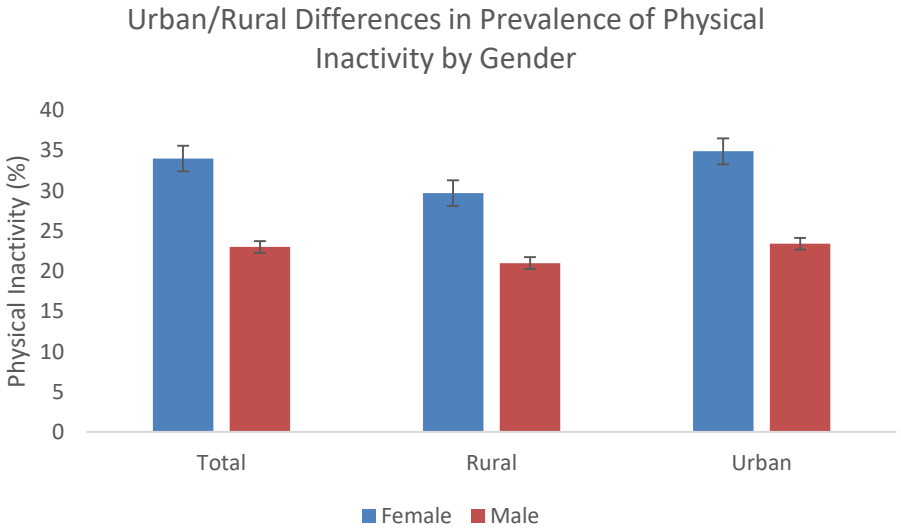
School and Out of School Environment

- School: considered an ideal setting for physical activity
  - Most ideal setting for families and communities lacking PA resources
- Outside of School: home and neighborhood provide areas for PA
  - Increases in park, recreation area, and home play equipment contributes to heightened PA time

(Spurrier, Magarey, Golley, Curnow, & Sawyer, 2008)
(McElroy, 2002)
(Epstein et al., 2006; Roemmich et al., 2006)

Gender Differences

- Females participate in significantly less PA than males
- Lack of studies involving urban/rural differences
  - Liu et al. (2008) reported differences existed regardless of urban/rural residence



(Liu et al., 2008)
(Hallal et al., 2012)

Goals of This Study

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1. To examine school physical activity, outside of school physical activity, and sedentary behavior among urban and rural fourth and fifth-grade students
2. To examine whether children's PA levels are related to the SES of the school
3. Examine if gender differences exist in school physical activity, outside of school physical activity, and sedentary behaviors between urban and rural students

Hypotheses

1) Rural students compared to urban students:
    1) Lower school physical activity
    2) Lower outside of school physical activity
    3) Higher sedentary behaviors

Hypotheses

2) Students attending low SES schools compared to students attending high SES schools:

1) Lower school physical activity

2) Lower outside of school physical activity

3) Higher sedentary behaviors

Hypotheses

3) Female students compared to male students:
    1) Lower school physical activity
    2) Lower outside of school physical activity
    3) Higher sedentary behaviors

NFL PLAY60 FITNESSGRAM Partnership

- The NFL PLAY60 FITNESSGRAM Partnership is a collaboration between the National Football League (NFL) and the Cooper Institute

(Welk, Bai, Saint-Maurice, Allums-Featherston, & Candelaria, 2016)

Participating Schools

- To participate, schools must be in the market of one of the thirty-two NFL franchises
- Partnership utilizes a participatory model in which schools voluntarily opt into the project

(Welk, Bai, Saint-Maurice, Allums-Featherston, & Candelaria, 2016)

Participating Schools

Dataset

- The 2017 NFL PLAY60 FITNESSGRAM Partnership Youth Activity Profile (YAP) dataset was used
- Dataset contained:
  - 4538 students
  - Grades 3-12
  - 64 schools, 39 Urban and 25 Rural
  - 20 states

Inclusion Criteria

- Inclusion Criteria
  - Schools must be public
  - Only 4th and 5th Grade
  - Dropped students with missing values

Sample

	Fourth-Grade (n=548)	Fifth-Grade (n=729)
School Characteristics	% (n)	% (n)
Rurality	% (n)	% (n)
Urban	68.4 (375)	62.0 (452)
Rural	31.6 (173)	38.0 (277)
High SES Schools	61.7 (338)	59.1 (431)
Urban	% (n)	% (n)
Boy	50.7 (190)	51.1 (231)
Girl	49.3 (185)	48.9 (221)
Rural	% (n)	% (n)
Boy	43.9 (76)	48.0 (133)
Girl	56.1 (97)	52.0 (144)
Student Characteristics		
Gender	% (n)	% (n)
Boy	48.5 (266)	49.9 (364)
Girl	51.5 (282)	50.1 (365)

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Low SES School	38.3 (210)	40.9 (298)
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Youth Activity Profile (YAP)

- YAP: Developed by Dr. Greg Welk and Dr. Pedro Saint-Maurice, online self-report questionnaire used to assess PA and sedentary behaviors in children
  - 15 Questions
    - Categorical Scale: 1 – 5 (1 = least activity, 5 = most activity)

(Saint-Maurice & Welk, 2014)

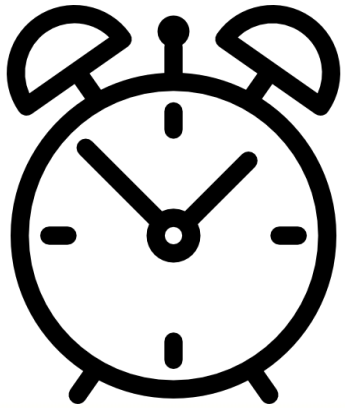
Survey Questions

- School Physical Activity (5 Questions)
- Outside of School Physical Activity (5 Questions)
- Sedentary Behavior (5 Questions)

(Saint-Maurice & Welk, 2014)

Estimated Minutes of Time

- YAP allows researchers to use self-report survey questions to estimate minutes of activity (Saint-Maurice & Welk, 2015)
  - Utilizes regression models to generate a composite score that has been cross-validated with accelerometer data



(Saint-Maurice & Welk, 2015)

Rurality

- Dichotomized as Urban or Rural for school in which the child attends
  - Uses National Center for Education Statistics classification system categorizes the area
  - Urban and Rural definitions are taken from the Census Bureau and EDGE Program

(National Center for Education Statistics, 2016)
(Geverdt, 2017)

Rurality

Our Classification	NCES Classification	Description
Urban	Urban	Any core area **containing >50,000 people** and **inside a principal city**
	Suburban	Any core area **outside of a principal city** but **inside an area of >50,000 people**
Rural	Town	Town was any core area inside an urbanized cluster containing **2500-50,000**
	Rural	Classified according to census-defined rural territory

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School Socio-Economic Status (SES)

- High SES Schools: <40% of school qualify for free and reduced price lunch
- Low SES Schools: ≧40% of of school qualify for free and reduced price lunch
  - Has been found to be adequate proxy for adolescent SES

NATIONAL SCHOOL LUNCH PROGRAM

(Department of Agriculture, 2018)
(Office of State Support, 2015)
(Nicholson, Slater, Chriqui, & Chaloupka, 2014)

Statistical Analysis

- Two-Level Mixed Model (School and Child)
  - Random Effects: School*Rurality*SES Group

(Effect sizes were calculated using Cohen's *d*)

Rurality

			Mean (95% CI)	Mean Difference (95% CI)	p-value	d
Fourth Grade (n=548)	**School Physical Activity**	Urban	43.89 (32.39, 55.40)	4.85 (-13.35, 23.05)	0.4757	0.23
		Rural	48.74 (33.23, 64.26)			
	Outside of School Physical Activity	Urban	84.22 (82.42, 86.02)	1.28(-1.83, 4.39)	0.2659	0.35
		Rural	85.50 (82.73, 88.27)			
	Sedentary Behavior	Urban	185.69 (180.31, 191.07)	4.6 (-4.7, 13.91)	0.1875	0.42
		Rural	181.09 (172.80, 189.38)			
Fifth Grade (n=729)	**School Physical Activity**	Urban	38.72 (31.27, 46.16)	8.68 (-2.13, 19.49)	0.0502	0.68
		Rural	47.40 (38.68, 56.13)			
	Outside of School Physical Activity	Urban	81.47 (78.85, 84.09)	1.60 (-2.54, 5.74)	0.2617	0.32
		Rural	83.07 (79.54, 86.61)			
	Sedentary Behavior	Urban	213.69 (202.42, 224.95)	9.46 (-8.31, 27.23)	0.1574	0.45
		Rural	204.23 (189.10, 219.36)			

Rurality

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Gender

			Mean (95% CI)	Mean Difference (95% CI)	p-value	d
Fourth Grade (n=548)	**School Physical Activity**	Boy	51.87 (41.44, 62.29)	11.1 (-3.58, 25.78)	< .0001	0.09
		Girl	40.77 (30.41, 51.13)			
	Outside of School Physical Activity	Boy	94.04 (92.94, 95.13)	19.93 (16.85, 22.45)	< .0001	0.82
		Girl	75.09 (73.08, 77.09)			
	Sedentary Behavior	Boy	174.98 (168.71, 181.25)	16.82 (8.15, 25.49)	< .0001	0.23
		Girl	191.80 (185.80, 197.80)			
Fifth Grade (n=729	**School Physical Activity**	Boy	47.26 (41.13, 53.39)	8.41 (-0.27, 17.09)	< .0001	0.1
		Girl	38.85 (32.70, 45.00)			
	Outside of School Physical Activity	Boy	91.77 (89.18, 94.36)	18.99 (15.35, 22.64)	< .0001	0.54
		Girl	72.78 (70.21, 75.35)			
	Sedentary Behavior	Boy	198.13 (187.58, 208.67)	21.66 (6.77, 36.55)	< .0001	0.15
		Girl	219.79 (209.26, 230.31)			

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School Socio-Economic Status

			Mean (95% CI)	Mean Difference (95% CI)	p-value	d
Fourth Grade (n=548)	**School Physical Activity**	High SES	45.96 (33.18, 58.75)	0.71 (-17.71, 19.13)	0.9189	0.03
		Low SES	46.67 (31.89, 61.46)			
	Outside of School Physical Activity	High SES	85.30 (83.22, 87.38	0.88 (-2.24, 4.00)	0.4420	0.24
		Low SES	84.42 (81.86, 86.99)			
	Sedentary Behavior	High SES	179.80 (173.56, 186.03)	7.18 (-2.14, 16.50)	0.0511	0.65
		Low SES	186.98 (179.30, 194.67)			
Fifth Grade (n=729	**School Physical Activity**	High SES	41.40 (33.13, 49.68)	3.31 (-7.50, 14.12)	0.4196	0.26
		Low SES	44.71 (36.77, 52.65)			
	Outside of School Physical Activity	High SES	82.42 (79.53, 85.30	0.29 (-3.86, 4.44)	0.8368	0.06
		Low SES	82.13 (78.82, 85.44)			
	Sedentary Behavior	High SES	206.37 (193.85, 218.90)	5.17 (-12.60, 22.94)	0.4247	0.25
		Low SES	211.54 (197.44, 225.65)			

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Summary of Findings

- Hypotheses partially supported:
  - Rurality Differences: Only fifth-grade attending rural schools reported higher school physical activity
  - SES Differences : Only fourth-grade students attending low SES schools reported higher sedentary behaviors
  - Gender Differences: Females reported lower school and outside of school physical activity and higher sedentary behaviors
- No significant interactions: Gender*Rurality, Gender*Rurality*SES

Rural School Physical Activity

- Agrees with some past research, rural children have more PE during the week
- Potential reasons why:
  - Play space positively correlated with physical activity
  - School may provide children with facilities not found elsewhere in the community

(Joens-matre et al., 2008; Springer et al., 2009)
(Ridgers, Fairclough, & Stratton, 2010)
(Whaley & Haley, 2008)

Low SES, High Sedentary Behavior

- Agreement with systematic review by Gebremariam et al. 2015
- Potential reasons why:
  - Neighborhood safety
  - Absence of physical activity resources and facilities
  - Low SES children more likely to watch TV, and have TV in bedroom

(Gebremariam et al., 2015)
(Morgenstern, Sargent, & Hanewinkel, 2009)
(Sallis et al., 2018)

Gender Differences

- Less physical activity opportunities for girls at school (Agrees with past research, systematic review by Vanderhorst, et al. 2007)
- More sedentary behavior in girls
  - Perhaps due to how screen time is measured
    - Past research focused on TV and video game use. This study examined phone and computer use, and sitting time.

(Van Der Horst, Paw, Twisk, & Van Mechelen, 2007)
(Saunders et al., 2018)
(Hager, 2006)

Strengths of the Study

- Strengths
  - Utilized a large, multi-state sample size
  - Used two physical activity environments (school and outside of school)
  - Considered multiple technological devices of screen time
  - Builds on past rurality research

Weaknesses of the Study

- Weaknesses
  - Only considered Urban/Rural dichotomy
  - Socio-economic status limited to school level

Conclusion

- Only partial support for rural differences in school and out of school activity, and sedentary behaviors
- Gender differences were observed regardless of rurality

MPH Thesis Competencies

MPH Emphasis Area		
Number	**Competency**	**Description**
1	Population Health	Rurality is a variable that is key to public health consequences in America. Evaluating rurality in the context of children's physical activity is something that has not been researched extensively.
2	Social, Behavioral and Environmental Influences	This study evaluated school and out of school physical activity, as well as sedentary activities and the influence of rurality
3	Theory Application	This study utilized the socio-ecological model to examine rural environments, and the its effect on the community and individual
4	Developing and Evaluating Interventions	This study used past research to evaluate rurality in the context of physical activity and sedentary activity. Rurality is a multi-faceted variable that was used to study the populations.
5	Support Evidence-Based Practice	This study supports public health officials and community partners by looking at key public health variables that have not been extensively researched

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MPH APPLIED PRACTICAL EXPERIENCE REPORT

World Organisation for Animal Health (OIE)

Science and New Technologies Department

Paris, France

Summer 2018

Thank you!

- MPH Program: Dr. Ellyn Mulcahy and Barta Stevenson
- Dr. Elisabeth-Erlacher Vindel

World Organisation for Animal Health (OIE)

- One of the Tripartite of International Health Organizations
- 184 member countries (5 regions)
  - Each country has a delegate
  - Delegates pass animal health resolutions
  - OIE Employees Implement resolutions

Overview

- Preceptor:
  - Dr. Elisabeth Erlacher-Vindel – Head of Science and New Technologies Department
- Tasks
  - Creation of Antimicrobial Usage Reports for OIE Regions
  - Development of Database Software for OIE
- Fulfillment of MPH Core Competencies

Antimicrobial Use Reports

- Antimicrobial Resistance has been identified by the Tripartite as critical to public health
- Antimicrobial Use Reports:
  - Provide knowledge on what antimicrobial was being used
  - Provide critical country information to OIE regions
  - Provide private health organizations with information to where funding should go

Competencies

Competency		Project
#3	Analyze quantitative and qualitative data using biostatistics, informatics .	Generation of Tables and Figures for the OIE Annual Report on Antimicrobial Resistance
#4	Interpret results of data analysis for public health research, policy or practice	Generation of Tables and Figures for the OIE Annual Report on Antimicrobial Resistance
#7	Assess population needs, assets and capacities that affect communities' health	Generation of Tables and Figures for the OIE Annual Report on Antimicrobial Resistance

Antimicrobial Use Database Project

Project/Activity Description

- The goal of this project is to identify a software tool that is suitable for Member Countries of the OIE to submit data for the OIE Annual Data Collection.

Objectives of the Project

- Alleviate workload of Member Countries and OIE Staff
- Have a centralized software to handle and collect data
- Have a software that interfaces with OIE Tiger and WAHIS+ Systems
- Have a software that is artificially intelligent: Can detect errors during data entry and in calculations of antimicrobial use

Features of the Database

- Submission of survey data
- Generation of graphs and figures
- Ability to provide descriptive statistics for Member Countries and Regions
- Ability to separate based off World Bank Income Status
- All messaging and email takes place through the software
- Integration of other world health databases
- Exporting of data by OIE staff and OIE Member Countries

June
- Needs Analysis
- Drafting of Specifications
- Looking for Financing

July
- Needs Analysis Phase
- Drafting Specifications

August
- Needs Analysis Phase
- Drafting of Specifications

March
- Development Phase
- Provider Search

April
- Development Phase

Competencies

Competency		Project
#18	Select communication strategies for different audiences and sectors	Antimicrobial Use Database Project
#21	Perform effectively on interprofessional teams	Antimicrobial Use Database Project

Key Takeaways

- Experience provided me with knowledge of an international health organization
  - Worked with people from all over the world
  - Learned key communication skills
    - Statistics
    - Speaking with individuals who did not speak English as their first language
- This experience along with my public health coursework has provided me with knowledge that I can use in my future health career

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QUESTIONS?