

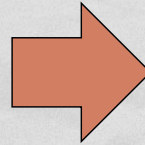
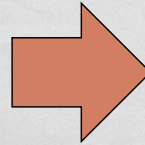
School Gardens & Physical Activity:

A randomized controlled trial of low-income elementary schools



Nancy M. Wells, Beth M. Myers, Charles R. Henderson, Jr.
Cornell University, Ithaca NY

GARDENS MAY AFFECT PHYSICAL ACTIVITY AND DIET



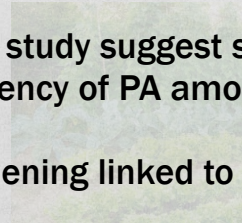
What's the Evidence?

Do gardens affect physical activity?

- **Time outdoors predicts PA among youth** (Ferreira, 2006; Sallis et al., 2000).
- **Pilot study suggest school gardens may lead to increased frequency of PA among children** (Hermann et al., 2006; Phelps et al., 2010)
- **Gardening linked to PA among adults** (Twiss et al., 2003; Sommerfeld et al., 2010).
- **However, there is a relative dearth of data.**



Physical Activity



School Gardens



Diet

OUR STUDY:

- Builds on larger 4-state USDA-funded study examining effects of gardens on dietary intake, nutritional knowledge etc.
- Collaboration with Cooperative Extension
- ~2500 children, 48 schools in four states: AR, IA, WA, NY
- All under-resourced schools (50% or higher FRPM)
- Schools randomly assigned to intervention or wait-list control
- 4 waves of data collection: Fall 2011 - Spring 2013



Photos by:

Stacey Lauren-Kennedy
Daily Gazette.com, Schenectady NY

OUR PHYSICAL ACTIVITY STUDY:

- Builds on larger 4-state USDA-funded study examining effects of gardens on dietary intake, nutritional knowledge etc.
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Gardens --> Physical Activity study

- New York State: 5 regions, 12 elementary schools
- 4th - 5th graders at baseline
- Funded by RWJF / ALR

Diet

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THE INTERVENTION

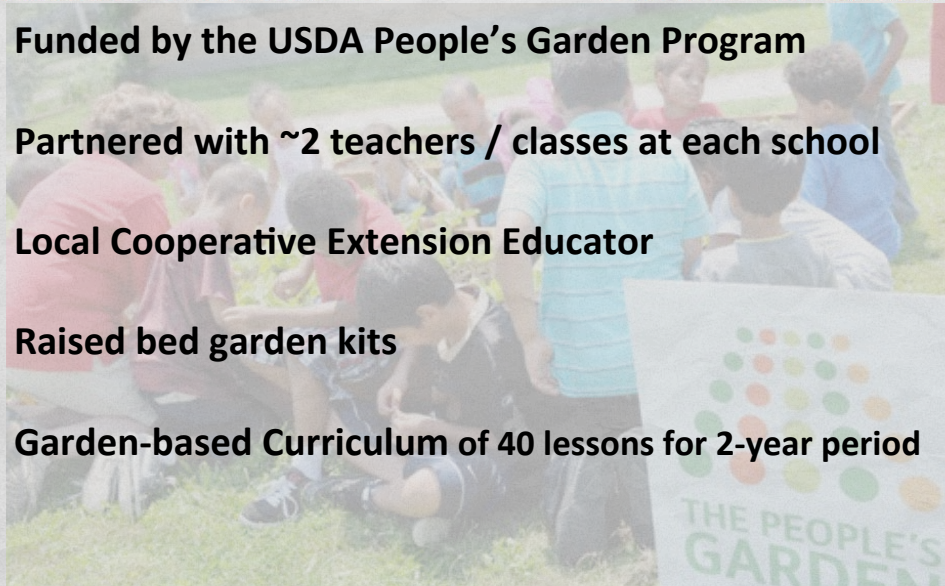
Funded by the USDA People's Garden Program

Partnered with ~2 teachers / classes at each school

Local Cooperative Extension Educator

Raised bed garden kits

Garden-based Curriculum of 40 lessons for 2-year period



http://www.dailygazette.com/news/2012/jun/14/0614_veg/

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Daily Gazette.com, Schenectady NY

ASSESSING PHYSICAL ACTIVITY: Multiple Measures



Activity Questionnaire

April 1997/2002/2008 For ages 6-17. Used under license. All rights reserved. You are not to reproduce, distribute, or otherwise use this questionnaire for any purpose other than the one for which it was developed. This questionnaire is for personal use only. It is not to be used for any other purpose.

Activity	A. YESTERDAY			B. USUALLY		
	Times	Length	Intensity	Times	Length	Intensity
1. Walking						
2. Exercising, playing sports, climbing stairs						
3. Household or yardwork						
4. Gardening						
5. Football						

GAQ Survey



Accelerometry



Direct Observation

ASSESSING PHYSICAL ACTIVITY: Multiple Measures

GAQ - General Activity Questionnaire -in and out of school (Trueuth et al.)

Physical Activity - usually (0-10)

Physical Activity - yesterday (0-10)

Sedentary Activity - usually (0-2.5)

Sedentary Activity - yesterday (0-2.5)

ACCELEROMETRY - during the school day (for 3 days)

% Sedentary

% Light PA

% Moderate PA

% Vigorous PA

% MVPA

DIRECT OBSERVATION (PARAGON) Classroom v. Garden (Myers + Wells, in press)

% lying, % sitting, % kneeling, % standing,

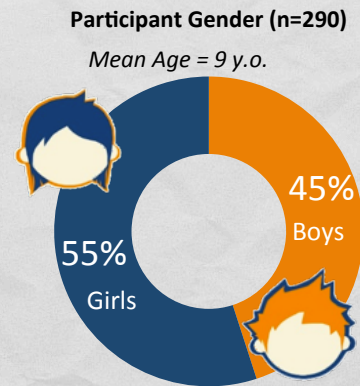
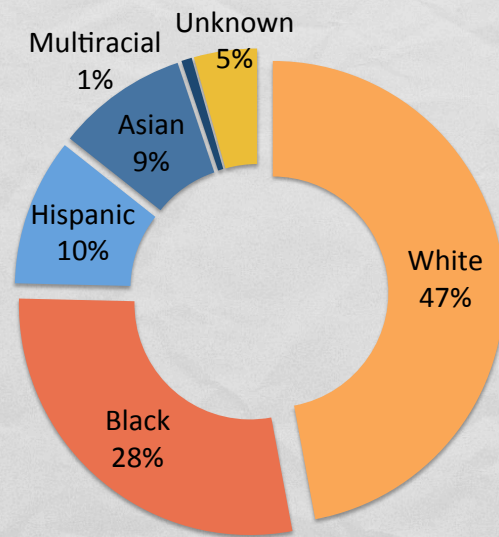
% squatting, % walking, % very active

Research Questions

1. Do school gardens affect children's overall PA and sedentary activity as measured by the GAQ?
2. Do school gardens affect PA levels during the school day, as measured with accelerometry?
3. Does PA, measured by direct observation, differ during indoor classroom lesson v. outdoor garden lesson?



Sample Ethnicity + Gender

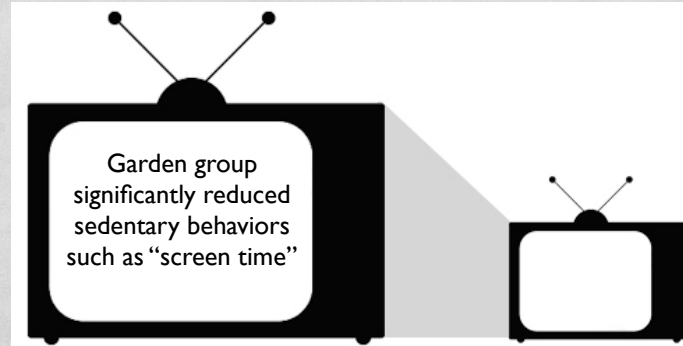


A red textured background with a gold horizontal line near the top. The word "RESULTS" is centered in white.

RESULTS

1. Is there an effect of school gardens on children's overall physical activity and sedentary activity as measured by the GAQ?

GAQ survey results indicate that children at the garden schools reduced their usual sedentary activities from baseline to follow-up more than children at control schools.



1. Is there an effect of school gardens on children's overall physical activity and sedentary activity as measured by the GAQ?

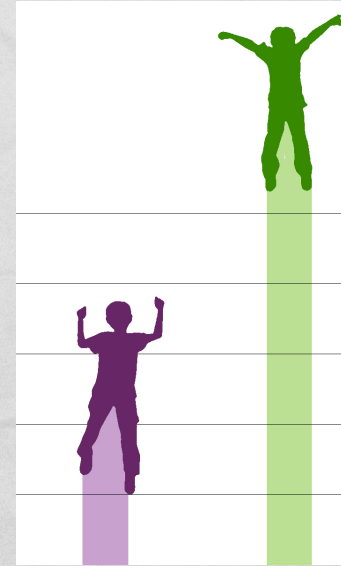
Physical Activity (PA) data + Sedentary Activity by Intervention/ control and pre-garden (Wave 1) to post-garden (Waves 2, 3,4) (N=290)

	Intervention		Control		p-value
	Pre (W1)	Post (W2-W4)	Pre (W1)	Post (W2-W4)	
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	
PA Yesterday	2.80 (0.16)	2.43 (0.17)	2.76 (0.16)	2.48 (0.18)	.619
PA Usually	3.69 (0.14)	3.35 (0.16)	3.56 (0.14)	3.58 (0.16)	.060
Sedentary Yesterday	.61 (0.03)	.52 (0.04)	.58 (0.03)	.54 (0.04)	.286
Sedentary Usually	.75 (.04)	.68 (.04)	.69 (.04)	.77 (.04)	.003**
** p < .01.					

2.

Do school gardens affect PA during the school day, measured with accelerometry?

Accelerometry data indicate that children at the garden schools increase the percentage of the school day that is spent in moderate physical activity more than children at the control schools.



2.

Do school gardens affect PA during the school day, measured with accelerometry?

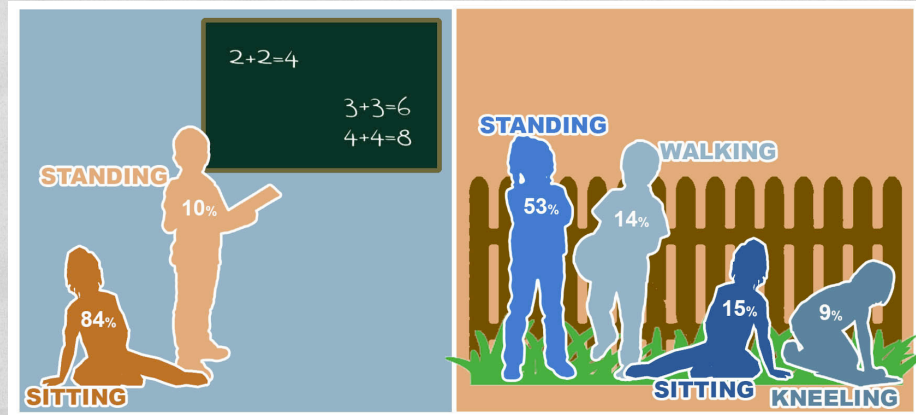
Physical Activity (accelerometry) data by intervention / control and pre-garden (Wave 1) to post-garden (Waves 2,3,4) (N=166)

	Intervention		Control		p-value
	Pre (W1)	Post (W2-W4)	Pre (W1)	Post (W2-W4)	
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	
% Sedentary	53.74 (1.57)	53.54 (1.60)	53.19 (1.55)	54.28 (1.55)	.220
% Light PA	35.96 (0.80)	34.49 (0.85)	36.15 (0.81)	34.24 (0.82)	.586
% Moderate PA	5.04 (0.47)	5.52 (0.47)	5.43 (0.45)	5.41(0.45)	.020*
% Vigorous PA	5.00 (0.52)	6.22 (0.52)	5.09 (0.50)	5.96 (0.50)	.282
% MVPA	10.02 (0.91)	11.73 (0.92)	10.48 (0.88)	11.32 (0.88)	.072

* p<.05.

3. Does physical activity, as measured by direct observation, differ during an indoor lesson versus outdoor lesson?

Children move more & engage in more varied postures during garden-based lesson compared to indoor classroom lesson.



3. Does physical activity, as measured by direct observation, differ during an indoor lesson versus outdoor lesson?

Percentage of time spent in each PA category, indoors v. outdoors, as measured by direct observation (PARAGON) (n=121 in/out paired observations)

PARAGON Activity Category	Outdoor		Indoor		p-value
	Mean	(SE)	Mean	(SE)	
Lying	.01	.00	.00	.00	.017*
Sitting	.16	.04	.84	.04	.000***
Kneeling	.09	.02	.01	.02	.000***
Standing	.53	.02	.10	.02	.000***
Squatting	.05	.01	.00	.01	.000***
Walking	.14	.02	.03	.02	.000***
Very Active	.02	.00	.00	.00	.000***

* p<.05; *** p<.0001

CONCLUSIONS

- **Children at schools with gardens report a reduction in usual sedentary behaviors.** *This suggests that gardening may contribute to a reduction in “screen time” and other sedentary behaviors.*
- **School gardens lead to increased moderate physical activity during the school day.** *Although typically children spent just 1-2 hours in the garden per week, there was an effect on PA.*
- **Children move more and sit less during outdoor garden lesson versus indoor, classroom lesson.** *Suggesting more integration of gardens with curriculum can yield even stronger effects.*

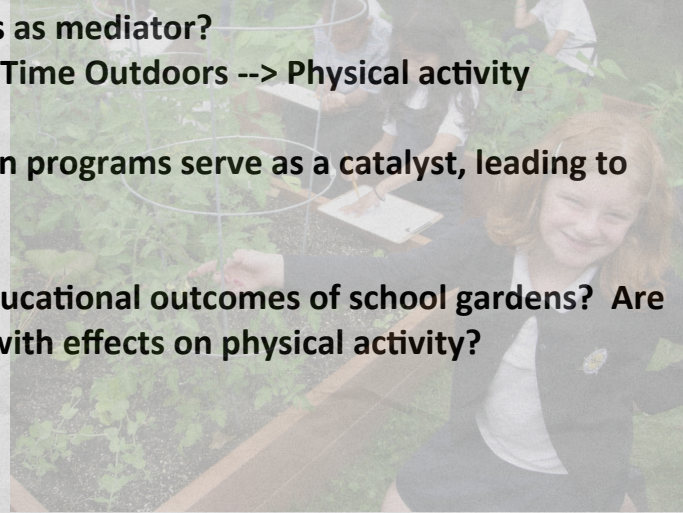
Next Steps / Future Research

A. Is time outdoors as mediator?

School Gardens --> Time Outdoors --> Physical activity

B. Do school garden programs serve as a catalyst, leading to home gardening?

C. What are the educational outcomes of school gardens? Are they synergistic with effects on physical activity?



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THANK YOU CORNELL RESEARCH ASSISTANTS & STAFF

Lauren Todd, Research Aide/ Project Co-Manager

Kimberly Rollings, Jennifer Mackall, Sudy Majd, Eunhwa Yang, Haley Conover,
Raechel Schneider, Kimberly Silver, Mindy Ha, Jessica Chen, Design &
Environmental Analysis

Margaret Demment, Ivy Mumo, Alvin Nugroho, Tingting Wu, Nutritional
Sciences

Helen Ong, Sarah Dinger, Dani Corona, Mallory Stellato, Biology & Society
Alexandra Gensemer, Human Development

Peter Wang, Nonye Acholonu, Edan Elias, Jia Gao, Nicole Katapodis, Emily
Murphy, Jaclyn Vingan, Iha Kaul, Human Biology Health & Society

Aaron Ong, Urban Studies

Buck McBroom, Architecture

Andrew Dunn, Development Sociology

Chris Dackow, Policy Analysis & Management

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Washington: Barb Schreibe, WSU King County Extension; Kerri Wilson, WSU Pierce County Extension

THANK YOU COLLABORATORS

Brad Gaolach, HGHY Project Director, Washington State University, Pierce & King Counties
Extension Director

Martha Aitken, National Project Co-Manager & WA State Co-Lead, WSU King County
Extension

Gretchen Ferez, National Project Co-Manager & NY State Co-Lead, Cornell University
Cooperative Extension-NYC

Caroline Tse, National Project Team & NY State Co-Lead, Cornell Univ. Coop. Extension-NYC

Karen Barale, WA State Co-Lead, Washington State University Extension & WSU Pierce
County Extension

Easter Tucker, AR State Co-Lead, University of Arkansas Extension

Laura Connerly, AR State Co-Lead, University of Arkansas Extension

Janet Carson, AR State Co-Lead, University of Arkansas Extension

Janet Toering, IA State Co-Lead, Iowa State University Extension

Linda Naeve, IA State Co-Lead, Iowa State University Extension



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