College of Sustainability, Dalhousie University, Halifax NS
Sustainability & Environmental Research Symposium 2012

SCHOOL GARDENS & CHILDREN'S HEALTH

Research challenges & strategies

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GARDENS & SUSTAINABILITY

GARDENS FIGURE PROMINENTLY IN SUSTAINABILITY AS

- food source
- direct connection to the earth
- science education activity
- way to enhance ecological literacy
- vehicle for intergenerational connection
- strategy to promote healthy habits

PRESENTATION OVERVIEW

- Gardens & Health
  - Childhood Obesity
  - Role of School Gardens
- Our Study: Healthy Gardens, Healthy Youth
- Good News

PRESENTATION OVERVIEW

Photo: http://inhabitat.com/nyc/nyc-public-schools-recieve-funding-for-student-gardens/

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      - Physical Activity
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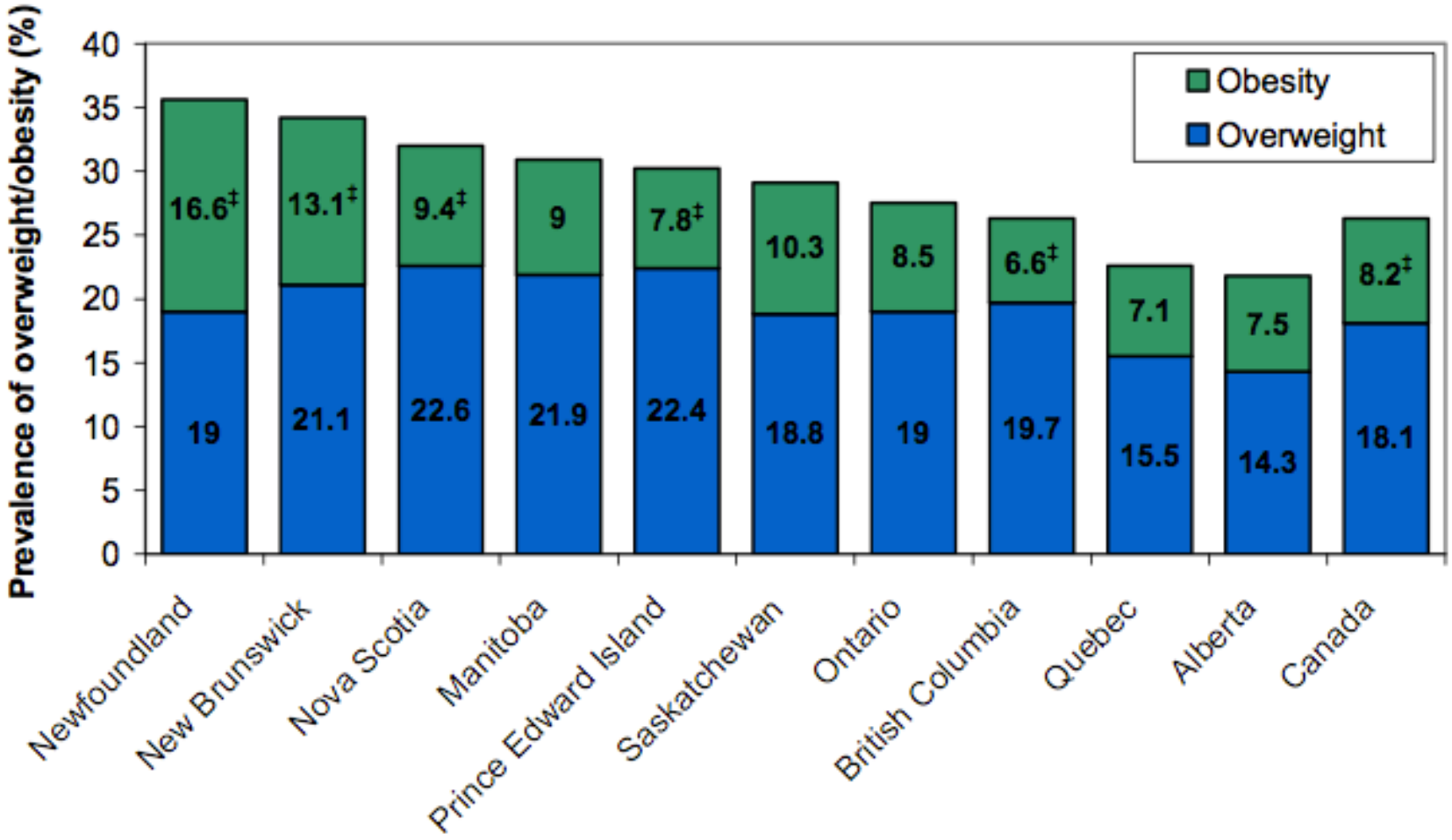
CHILDHOOD OBESITY

- Childhood obesity has tripled since 1980's

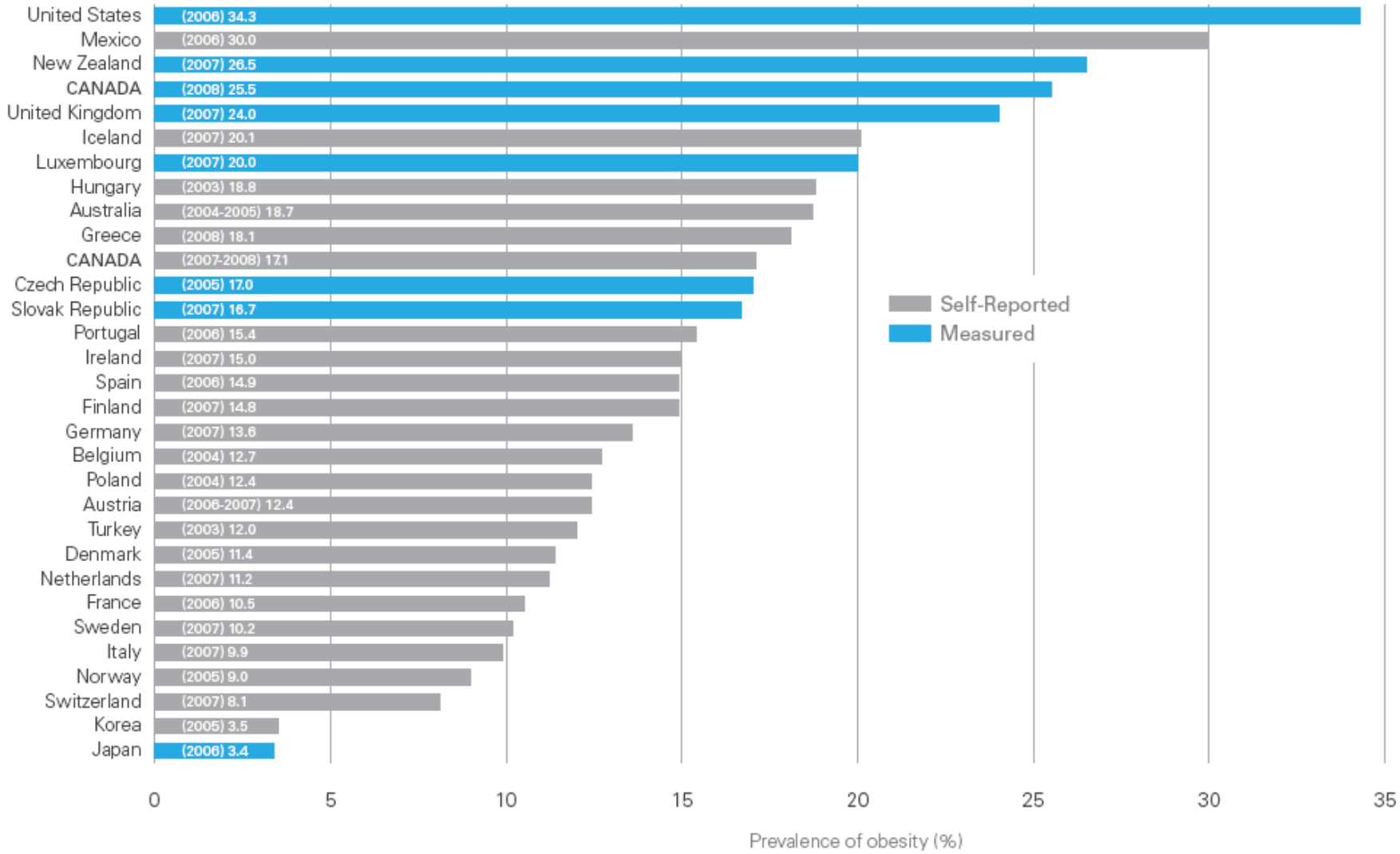
Image source: ***Healthy***WaterlooRegion.ca & Region of Waterloo Public Health

PREVALENCE OF CHILDHOOD OVERWEIGHT & OBESITY IN CANADA: AGES 2-17 YEARS (2004)



‡Estimates should be used with caution (coefficient of variation between 16.6% and 33.3%)

PREVALENCE OF OBESITY INTERNATIONALLY, 2004-2008



ENERGY BALANCE EQUATION

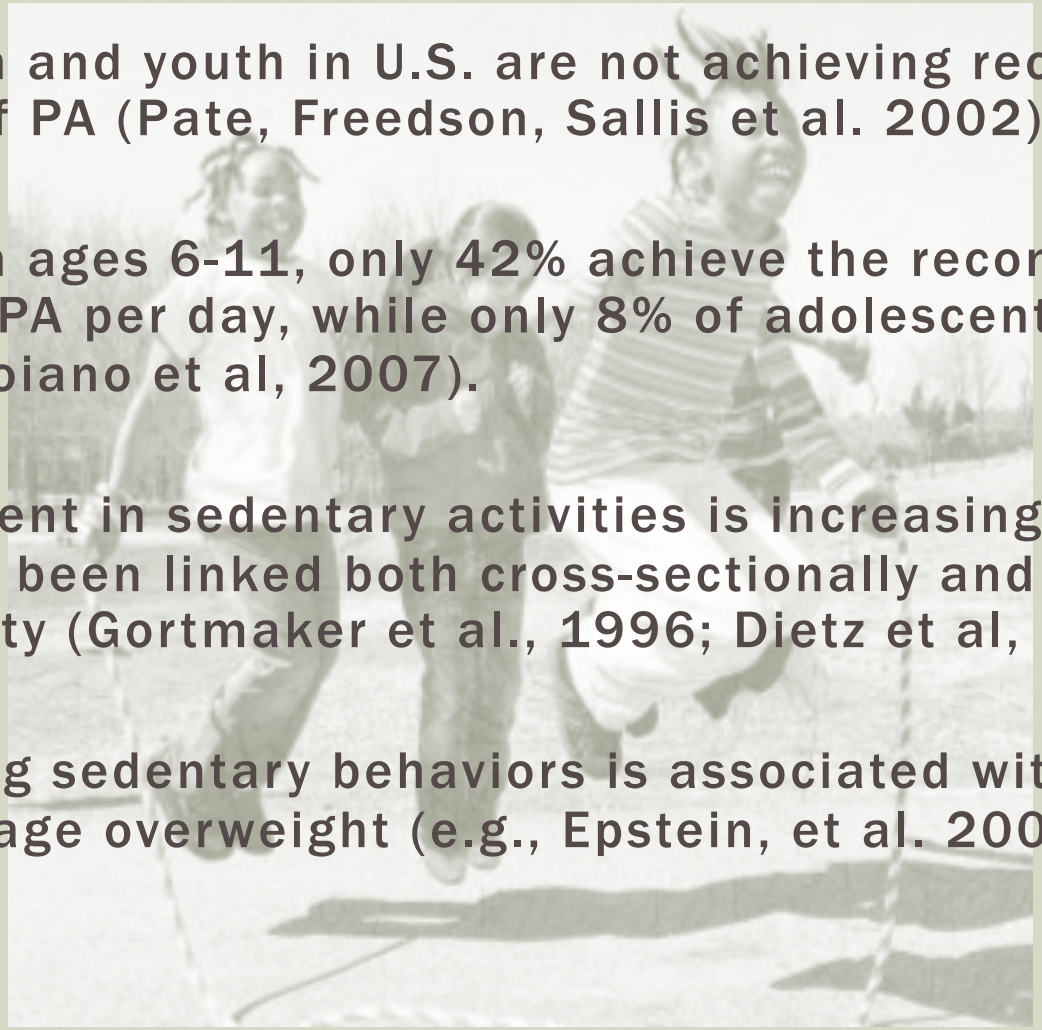
Energy Expenditure = Energy Intake

ENERGY IMBALANCE

↓

Overweight + Obesity

PHYSICAL ACTIVITY (ENERGY EXPENDITURE)



- Children and youth in U.S. are not achieving recommended levels of PA (Pate, Freedson, Sallis et al. 2002).
- Children ages 6-11, only 42% achieve the recommended 1 hour of PA per day, while only 8% of adolescents achieve this goal (Troiano et al, 2007).
- Time spent in sedentary activities is increasing among youth and has been linked both cross-sectionally and prospectively to obesity (Gortmaker et al., 1996; Dietz et al, 1995).
- Reducing sedentary behaviors is associated with decreases in percentage overweight (e.g., Epstein, et al. 2000).

DIETARY INTAKE (ENERGY INTAKE)

- It is recommended that children age 4-8 consume 3 – 3.5 cups FV daily; and that children age 9-13 consume 3.5 - 4.5 cups FV daily (Dietary Guideline for Americans, 2010).
- On average, children eat only 25% of the minimum number of FV servings per day (USDA, 2007).
- More than one third of the total daily amount of vegetables in the US food supply consisted of iceberg lettuce, frozen potatoes (mostly french fries), and potato chips (ADA, 2006).
- Greater intake of FV is associated with lower risk of all-cause, cancer, and cardiovascular disease death (Genkinger et al., 2004).

GARDENS HAVE POTENTIAL TO AFFECT PHYSICAL ACTIVITY & DIET

Gardens

Physical Activity

Healthy Diet

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WHAT'S THE EVIDENCE?
DO GARDENS AFFECT FV CONSUMPTION?

- **Fruit & Vegetable (FV) intake** may be affected by school gardens (compared to educational strategies alone) (McAleese & Rankin, 2007; Morris & Zidenberg-Cherr, 2002; Hermann et al., 2006)

- **vegetable preference** (e.g., Lineberger & Zajicek, 2000)

- **willingness to taste FV** (Morris et al., 2001).

- ***However***, some studies indicate no effects or **mixed results** (e.g., O'Brien & Shoemaker, 2006; Poston et al., 2005).

WHAT'S THE EVIDENCE?
DO GARDENS AFFECT PHYSICAL ACTIVITY (PA)?

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

RESEARCH NEEDED:

Gardens

Physical Activity

Healthy Diet

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- **Our Study: Healthy Gardens, Healthy Youth**
  - **Why. Who. Where. What. When**
  - **Research Challenges**
  - **Research Strategies**
- Good News

OUR STUDY: HEALTHY GARDENS, HEALTHY YOUTH

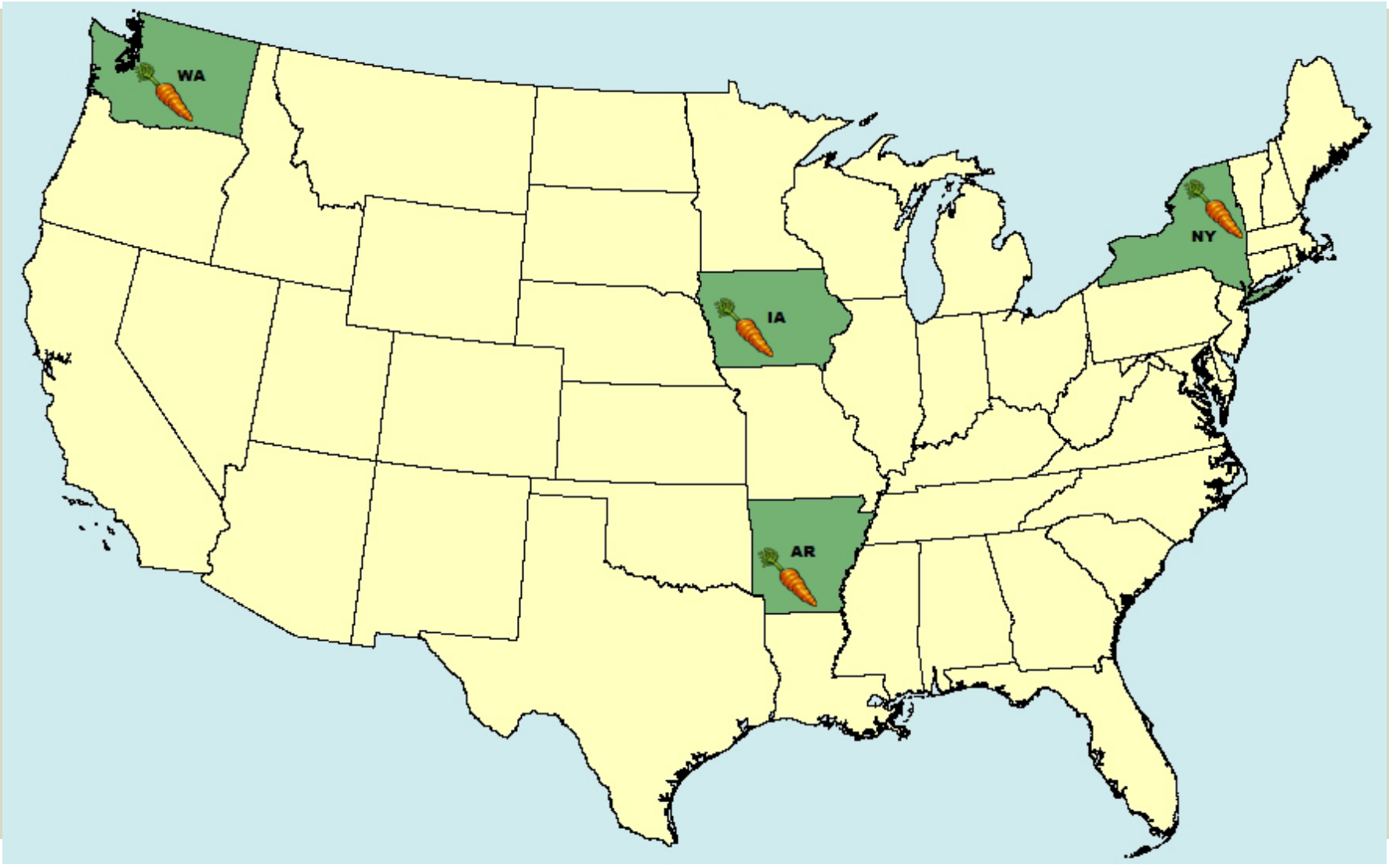
- **WHY**
  - To assess whether School Gardens affect children's diet and physical activity

WHO: 3000+ low income children

- ~3000 students
  - Two groups: grade 2; grade 4-5
- 53 schools
  - don't already have gardens
  - low income: at least 50% of children qualify for FRPM*
  - mostly in urban & suburban locations

* *Free or Reduced Price Meals*

WHERE: New York, Washington, Arkansas & Iowa



HOW: Staff & Network

- 30+ Cooperative Extension Educators
  - Outreach / Education
  - Nation-wide network in all states
  - On-the-ground data collection, garden implementation, school liaison
- Small Army of ~12 Research Assistants at Cornell
  - Develop measures
  - Create protocols
  - Code data

WHAT: RESEARCH QUESTIONS

RQ 1: Does Fruit & Vegetable (FV) consumption at school increase as a result of garden participation?

RQ 2: Does FV consumption at home increase as a result of garden participation?

RQ 3: Does preference for FV change as a result of garden participation?

RQ 4: As a result of their involvement with the garden program, were there changes from baseline to follow-up in children's: FV knowledge; Time spent outside, and physical activity?

RQ 5: What mediating variables explain linkages from program activities to medium-term outcomes? e.g, Increased availability of FV at home, increased availability of FV at school.

WHAT: RESEARCH QUESTIONS

RQ 1: Does Fruit & Vegetable (FV) consumption at school increase as a result of garden participation?

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RQ 4: As a result of their involvement with the garden program, were there changes from baseline to follow-up in children's… physical activity?

RQ 5: What mediating variables explain linkages from program activities to medium-term outcomes? e.g, Increased availability of FV at home, increased availability of FV at school.

WHEN: PROJECT TIMELINE

- Fall 2011
  - Baseline data collection
- Spring 2012
  - gardens & curricula begin
  - Post 1 – data collection
- Fall 2012
  - gardens & curricula continue
  - Post 2 – data collection
- Spring 2013
  - Post 3 – final data collection

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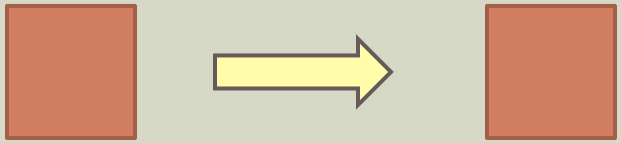
Photo: EcoTrust http://www.upstreampublichealth.org/sites/default/files/F2SHIA_FINAL.pdf

RESEARCH CHALLENGES

1. ASSESSING CAUSALITY



RESEARCH CHALLENGES

1. ASSESSING CAUSALITY

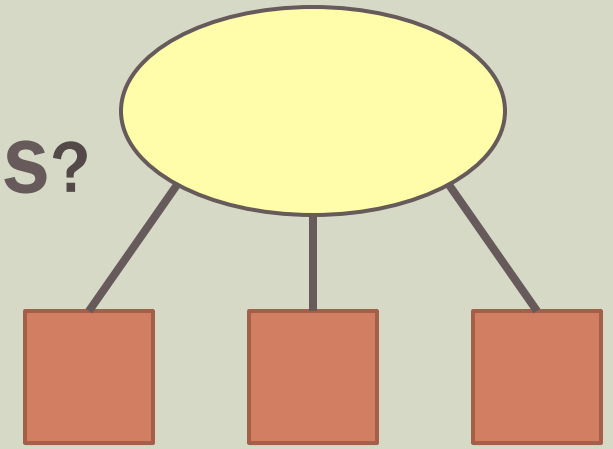
2. IDENTIFYING PATHWAYS

RESEARCH CHALLENGES

1. ASSESSING CAUSALITY

2. IDENTIFYING PATHWAYS

3. WHAT ARE GOOD MEASURES?



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1. CAUSALITY

how do we assess:

Gardens

Physical Activity

Healthy Diet

RESEARCH STRATEGIES

1. CAUSALITY

- Research Design

True Experiment or "Randomized Controlled Trial":
Schools are randomly assigned to:

a) intervention group that receives gardens in 2012 or

b) wait-list control group that receives gardens in 2013

Strong Internal Validity – i.e. make causal conclusions

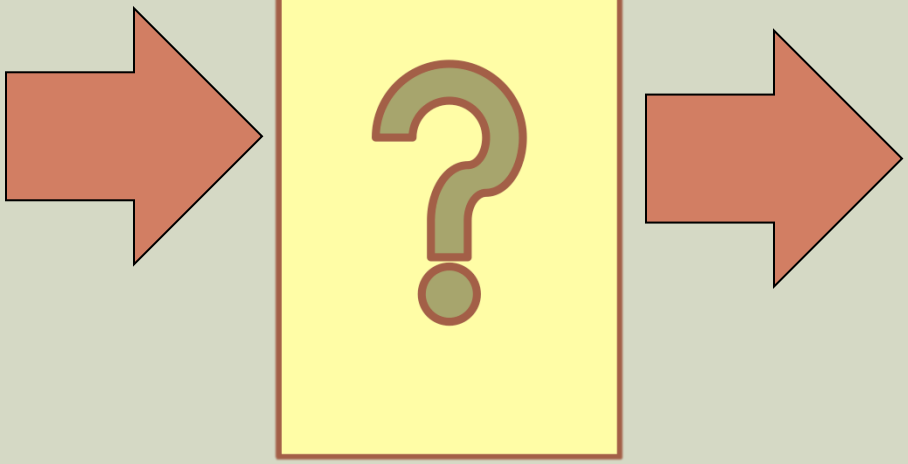
School /community context:

Preserves External Validity – e.g., "real world" relevance

2. ASSESSING PATHWAYS

how or why might gardens affect diet?

Gardens



Healthy Diet

RESEARCH STRATEGIES

2. ASSESSING PATHWAYS

how or why might gardens affect diet?

Gardens

How?
Why?

Mediator

Healthy Diet

RESEARCH STRATEGIES

2. ASSESSING PATHWAYS

MEDIATORS – elucidate how or why IV affects DV.

- what is the mechanism or pathway?
- Theoretically valuable
- Practical for intervention strategies

RESEARCH STRATEGIES

2. ASSESSING PATHWAYS

MEDIATORS – for example:

Gardens

FV availability

FV preference

Mediator

Healthy Diet

3. MEASURING OUTCOME VARIABLES

Identifying reliable and valid measures.

Physical Activity

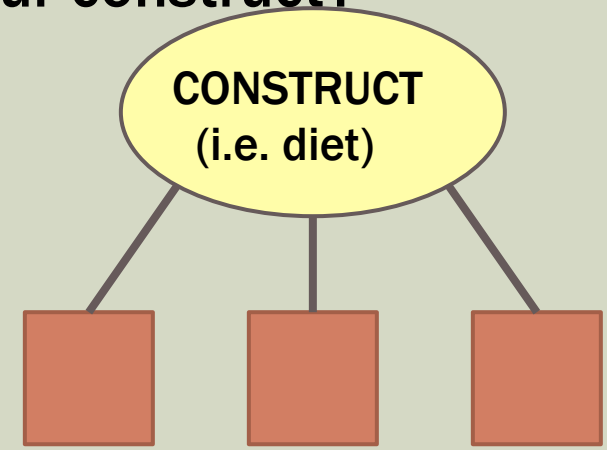
Healthy Diet

3. MEASURING OUTCOME VARIABLES

Identifying reliable and valid measures.

Reliability - Is the measure consistent?

Validity – Is it really a measure of your construct?



RESEARCH STRATEGIES

3. MEASUREMENT

How should we measure what children eat??

- Diet is notoriously difficulty to measure, even adults
- Especially among children!

Photo: EcoTrust http://www.upstreampublichealth.org/sites/default/files/F2SHIA_FINAL.pdf

SOME WAYS TO MEASURE DIET

- **Food record** – record at time of consumption.
- **Diet history** – report usual food intake
- **24 hour recall** – remember last day (e.g., "Day in the Life Questionnaire")
- **Food frequency questionnaire (FFQ)** – given a list of foods, indicate intake
- **Direct observation** – watch + record what others eat

- **Challenges**
  - **Memory**
  - **Bias** – wanting to "look good"
  - **Good reliability? Validity?**

OBJECTIVE MEASUREMENT: LUNCH TRAY PHOTOGRAPHY

VIDEO TAPE OF “PRE LUNCH” TRAY

ANALYZE PAIRS OF TRAYS BEFORE & AFTER LUNCH


3-16-21-0964


3-16-21-0964


FAT FREE
CHOCOLATE
MILK
Your full name should be on the back of this ruler.
Please place this ruler next to your lunch.
We need a photo before and after you eat!
1-36-22-4233


1-36-22-4233


Your full name should be on the back of this ruler
Please place this ruler next to your lunch.
We need a photo before and after you eat!
2-52-91-6928


2-52-91-6928


PREMIUM
PREMIUM
PREMIUM
Your full name should be on the back of this ruler.
Please place this ruler next to your lunch.
We need a photo before and after you eat!
2-52-91-6934


2-52-91-6934
PREMIUM
PREMIUM
PREMIUM


Your full name should be on the back of this ruler.
Please place this ruler next to your lunch.
We need a photo before and after you eat!
2-52-22-6892


Your full name should be on the back of this ruler.
Please place this ruler next to your lunch.
We need a photo before and after you eat!
2-52-22-6892

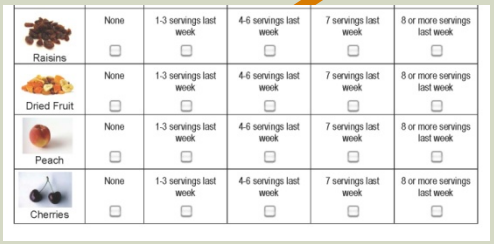

Welch
Fruit Snacks
4-62-21-8856
Your full name should be on the back of this ruler.
Please place this ruler next to your lunch.
We need a photo before and after you eat.
MILK
Simply Products
Farms
CHOCOLATE FAT FREE MILK


4-62-21-8856
Hunts


4-62-91-8973


Italian
4-62-91-8973

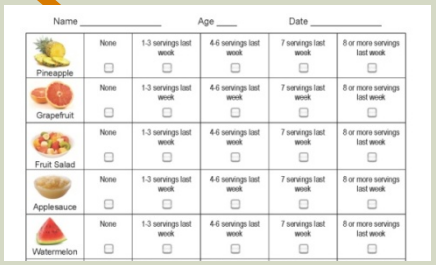
ASSESSING DIET: MULTIPLE MEASURES



Raisins	None ☐	1-3 servings last week ☐	4-6 servings last week ☐	7 servings last week ☐	8 or more servings last week ☐
Dried Fruit	None ☐	1-3 servings last week ☐	4-6 servings last week ☐	7 servings last week ☐	8 or more servings last week ☐
Peach	None ☐	1-3 servings last week ☐	4-6 servings last week ☐	7 servings last week ☐	8 or more servings last week ☐
Cherries	None ☐	1-3 servings last week ☐	4-6 servings last week ☐	7 servings last week ☐	8 or more servings last week ☐

SURVEYS, at SCHOOL

LUNCH TRAY PHOTOS
(objective measure)

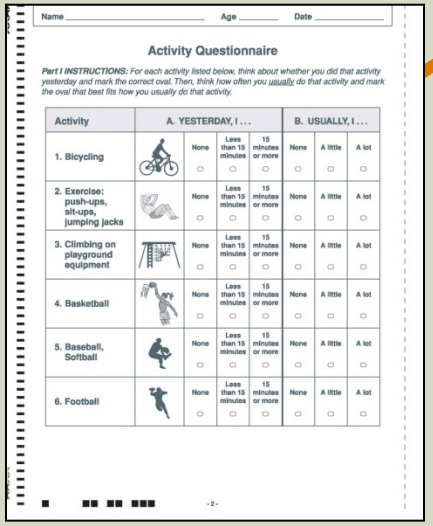


Name _____ Age ____ Date _____

Pineapple	None ☐	1-3 servings last week ☐	4-6 servings last week ☐	7 servings last week ☐	8 or more servings last week ☐
Grapefruit	None ☐	1-3 servings last week ☐	4-6 servings last week ☐	7 servings last week ☐	8 or more servings last week ☐
Fruit Salad	None ☐	1-3 servings last week ☐	4-6 servings last week ☐	7 servings last week ☐	8 or more servings last week ☐
Applesauce	None ☐	1-3 servings last week ☐	4-6 servings last week ☐	7 servings last week ☐	8 or more servings last week ☐
Watermelon	None ☐	1-3 servings last week ☐	4-6 servings last week ☐	7 servings last week ☐	8 or more servings last week ☐

SURVEYS, at HOME

ASSESSING PHYSICAL ACTIVITY: MULTIPLE MEASURES



Name _____ Age _____ Date _____

Activity Questionnaire

Part I INSTRUCTIONS: For each activity listed below, think about whether you did that activity yesterday and mark the correct oval. Then, think how often you usually do that activity and mark the oval that best fits how you usually do that activity.

Activity	A. YESTERDAY, I . . .				B. USUALLY, I . . .		
		None	Less than 15 minutes	15 minutes or more	None	A little	A lot
1. Bicycling		○	○	○	○	○	○
2. Exercise: push-ups, sit-ups, jumping jacks		○	○	○	○	○	○
3. Climbing on playground equipment		○	○	○	○	○	○
4. Basketball		○	○	○	○	○	○
5. Baseball, Softball		○	○	○	○	○	○
6. Football		○	○	○	○	○	○

SURVEY

ACCELEROMETERS
(objective measure)

OBSERVATION

RESEARCH CHALLENGES & STRATEGIES

- **Causality**
  - Experimental Design (RCT) in a real world context
  - Achieve internal validity without sacrificing external validity
- **Pathways: Understanding mechanisms**
  - Include Mediators in Research Design
  - To provide both theoretical & practical insight
- **Measurement: Reliability & Validity**
  - Objective measures
  - Multiple measures

Stay tuned. By 2013, we hope to answer:

Gardens

Physical Activity

Healthy Diet

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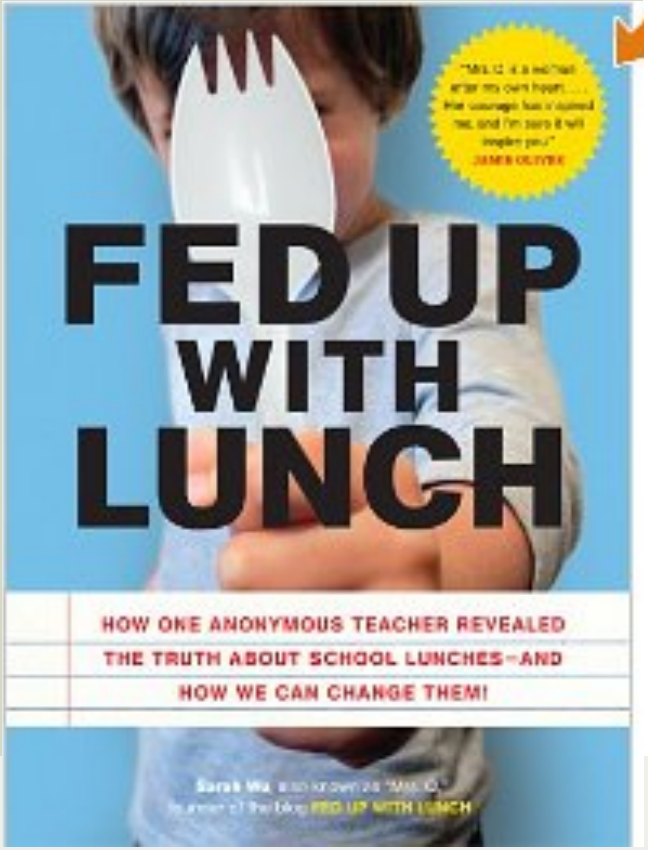
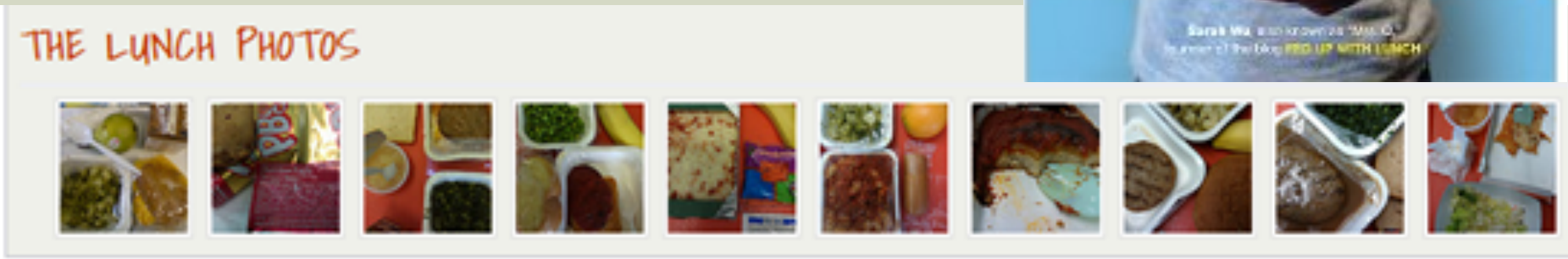
Photo: EcoTrust http://www.upstreampublichealth.org/sites/default/files/F2SHIA_FINAL.pdf

TEACHER TAKES ACTION

- Sarah Wu, Chicago teacher
- Undercover lunch spy “Mrs. Q”
- blog http://fedupwithlunch.com
- Book “Fed Up with Lunch”





SCHOOL GETS IT RIGHT

ST. PHILLIP'S ACADEMY: SUSTAINABLE SCHOOL MODEL

- LEED Silver
- Renovated chocolate factory
- "EcoSpaces" program
- Roof-top garden

SCHOOL GETS IT RIGHT

ST. PHILLIP'S ACADEMY: SUSTAINABLE SCHOOL MODEL

- A teaching kitchen
- Seed-to-table program
- Salad bar
- Programs linking plants with arts

CITY ADVOCATES FOR CHANGE

NEW YORK CITY SCHOOL GARDENS INITIATIVE:

- Aims to help kids eat better
- Supports development of gardens or connection to existing gardens for every NYC school
- Funding from GrowNYC and the Mayor's Fund to Advance NYC.

Photo: http://growtolearn.org/view/registergarden

STATE CHANGES POLICY

OREGON PASSES HB 2800:

FARM TO SCHOOL AND SCHOOL GARDEN POLICY

- Enables school districts to purchase Oregon foods
- Ensures students learn how to choose healthy, local food options in their cafeteria
- Provides grants to support school gardens, agriculture and nutrition education.

Photo: EcoTrust http://www.upstreampublichealth.org/sites/default/files/F2SHIA_FINAL.pdf

STATE CHANGES POLICY

OREGON PASSES HB 2800:

FARM TO SCHOOL AND SCHOOL GARDEN POLICY

- Create and maintain jobs
- Increase student participation in school meal programs
- Improve household food security
- Increase childhood food preferences for fruits and vegetables

Photo: EcoTrust http://www.upstreampublichealth.org/sites/default/files/F2SHIA_FINAL.pdf

CONCLUSION

- Urgent public health issues require action
  - Individuals, schools, cities, states, provinces… make a difference
- Research needed to inform:
  - Policy, design, programming…
- Together, these efforts can begin to reverse childhood obesity, to ensure a healthy future for today's youth

THANK YOU, COLLABORATORS

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THANK YOU!