A stylized, colorful illustration of a landscape. The background features wavy blue lines representing a sky or water. In the foreground, there are rolling green hills with a brown path. On the left, there is a green tree, a purple flower, and an orange flower. A small red bird is flying in the sky. The title text is centered in the upper half of the image.

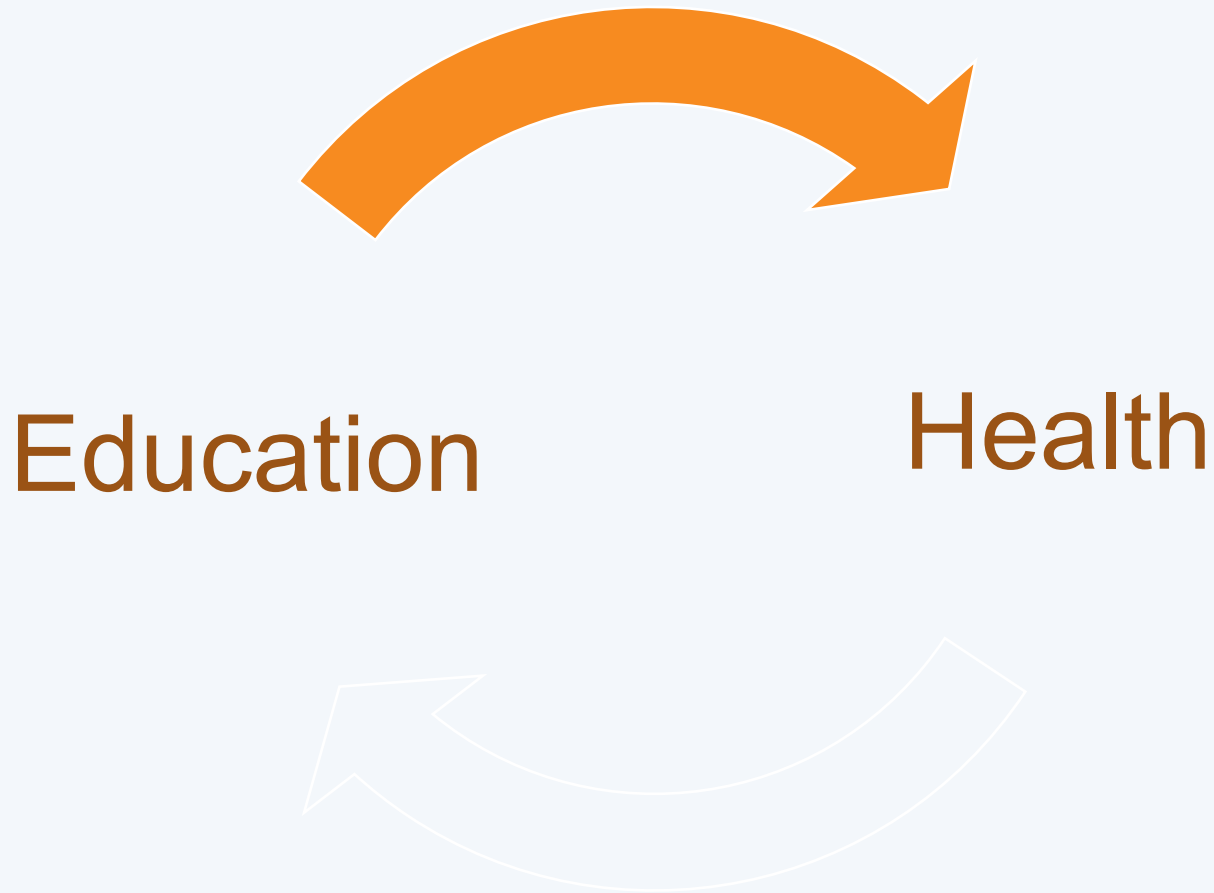
Relating Childhood Health Behaviors and Adolescent Academics in Hawai'i

Katie Amato and Claudio Nigg

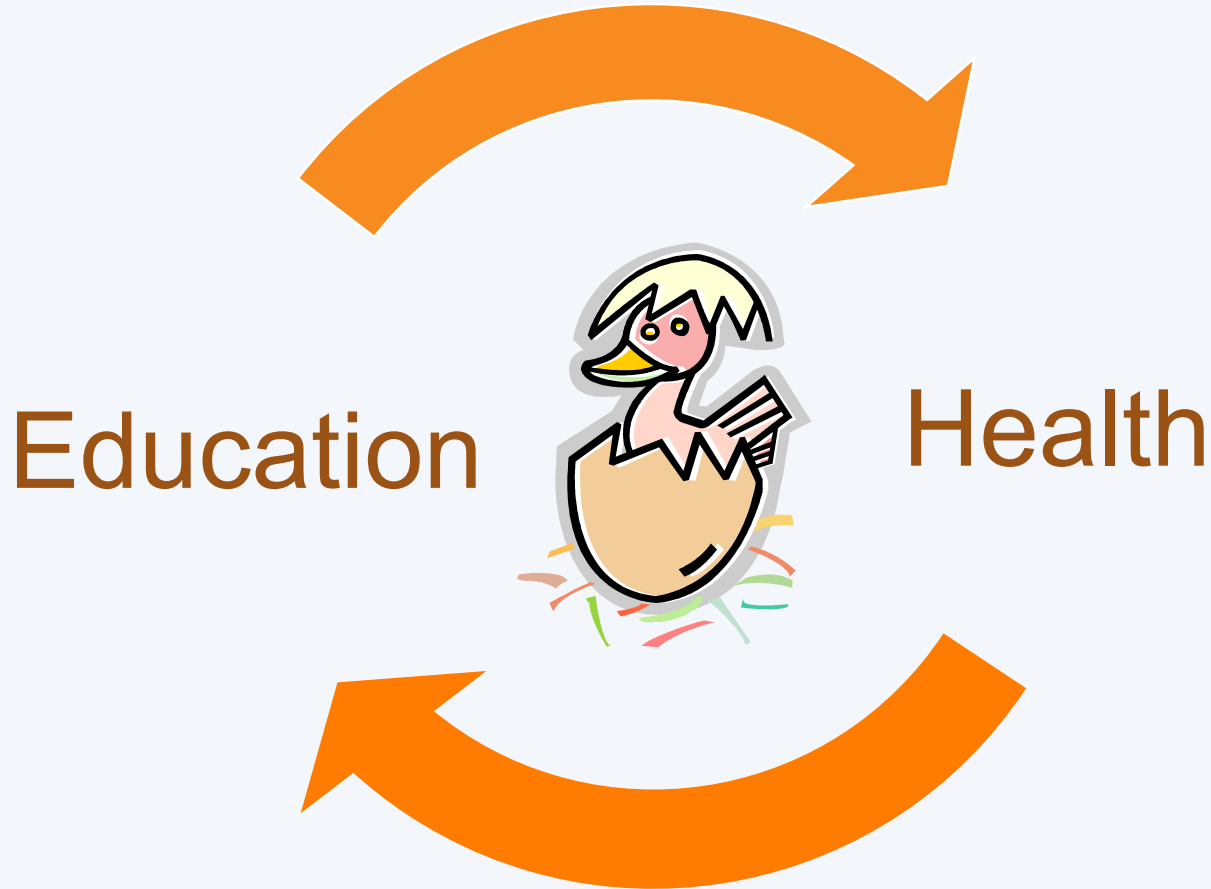
Office of Public Health Studies
University of Hawai'i at Mānoa

Funded by Hawai'i Medical Service Association, an Independent Licensee of the Blue Cross and Blue Shield Association & the Office of Public Health Studies University of Hawai'i at Mānoa

Why health and academics?



Why health and academics?



Physical Activity & Academic Outcomes

- Fedewa et al., 2011
 - 59 studies; 1947-2009, 5-16 years old
 - Aerobic exercise = achievement & cognitive
- Donnelley, et al. 2011
 - 3-year randomized control intervention
 - 24 elementary schools
 - *physically active* academic lessons
 - Intervention group ↑ reading, math & spelling

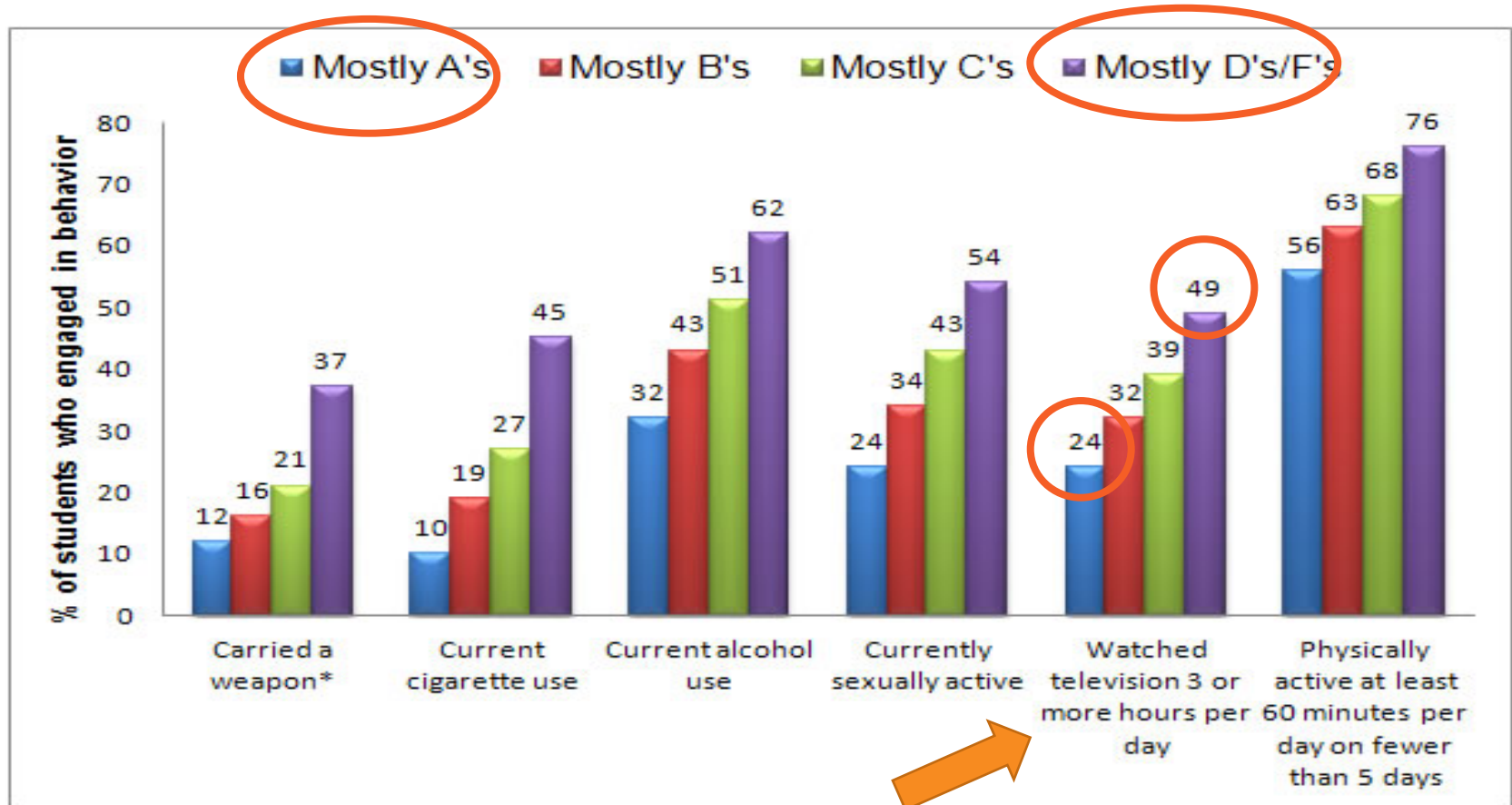
Diet & Academic Outcomes

- Florence et al., 2008
 - n = 5200; 5th grade students
 - ↑ diet quality = ↑ standardized literary assessments
 - ↑ fruit and vegetable consumption
 - ↓ calories from fat



Sedentary Behavior & Academics

Percentage of high school students who engaged in selected risk behaviors, by type of grades earned — United States, Youth Risk Behavior Survey, 2009



* This means that 12% of students with mostly A's carried a weapon and 37% of students with mostly D's or F's carried a weapon.

http://www.cdc.gov/healthyyouth/health_and_academics/data.htm

National Youth Risk Behavioral Survey 2011

Physical Activity (PA)

- 50.5% do MVPA 5 days/week
- 62.1% in Hawaii

Fruit and Vegetable Consumption (FVC)

- 87.5% eat 0-2 servings/day
- 86.1% in Hawaii

Sedentary Behavior (SB)

- 32.4% watch TV 3+ hours/day
- 31.7% in Hawaii

Health Behaviors in Hawai'i

Health Behavior	6 th grade	12 th grade	% difference
MVPA 60+ min, 5+ days/week	44.5%	31.7%	12.8%
5+ FV/day for 7 days	26.6%	14.1%	12.5%
No MVPA for 7 days	18.8%	22.5%	3.7%

FV (fruits and vegetables)

MVPA (moderate-to vigorous physical activity)

[http://www.hhdw.org/cms/uploads/Data%20Source %20YRBSS/YRBS_Healthy%20Lifestyles_IND_00000001.pdf](http://www.hhdw.org/cms/uploads/Data%20Source%20YRBSS/YRBS_Healthy%20Lifestyles_IND_00000001.pdf)

http://www.hhdw.org/cms/uploads/Data%20Source%20YRBSS/YRBS_Healthy%20Lifestyles_IND_2003-2005.pdf

Grades in Hawaii

Grades	6 th grade	12 th grade
Get mostly A/Bs	64.8%	66.4%

DOH Race-Ethnicity	Grades in school mostly A's or B's		
	#	%	CI
Caucasian	4,400	72.8%	65.2 - 80.5
Native Hawaiian	5,200	51.6%	43.3 - 59.9
Filipino	7,200	64.9%	58.1 - 71.7
Japanese	1,500	80.3%	71.4 - 89.3
Black	n/r	n/r	n/r
Native Alaskan/ American Indian	n/r	n/r	n/r
Other Asian	1,700	74.4%	68.9 - 79.9
Other Pacific Islander	500	35.8%	26.6 - 44.9
Other	5,800	63.1%	57.5 - 68.7

Rationale and Significance

Lack of info in Hawai'i

Intervention & policy implications

Encourage holistic and innovative approaches

Educate, expand & unite stakeholders

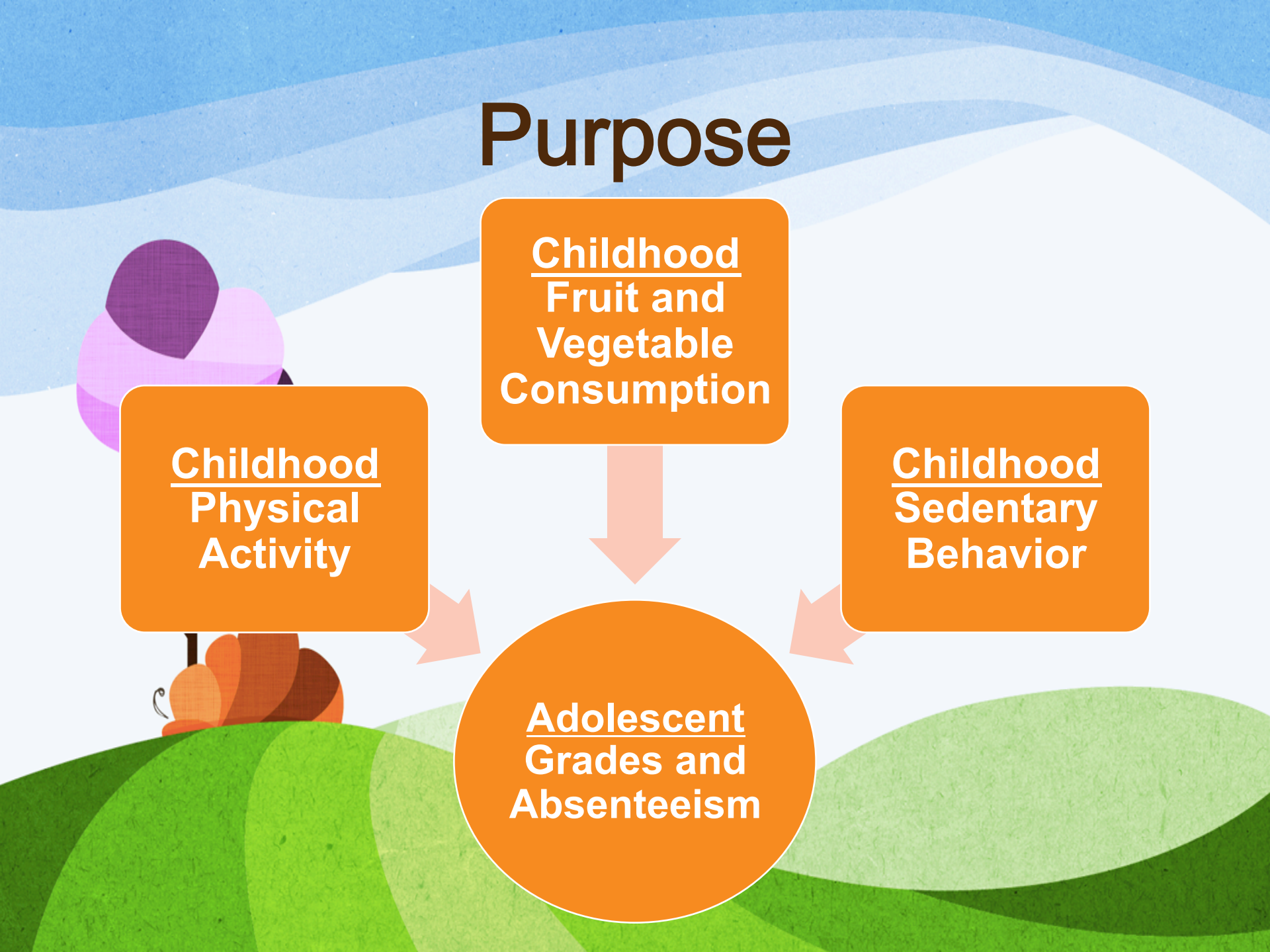
Purpose

Childhood
Fruit and
Vegetable
Consumption

Childhood
Physical
Activity

Childhood
Sedentary
Behavior

Adolescent
Grades and
Absenteeism



Methods

5-year longitudinal
3 cohort study

<u>Baseline</u> n = 894	<u>Follow-up</u> n = 334
2004	2009
2005	2010
2006	2011

Baseline Participants:



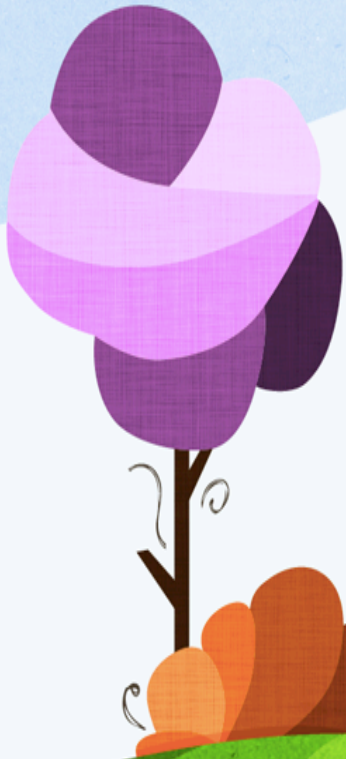
- 4th-6th grade
- A+ afterschool
 - Maui
 - Kauai
 - Big Island
 - Oahu

(see Nigg et al., 2012)

Procedure

- **Baseline surveys**
 - administered on site
- **Follow-up surveys**
 - addresses from consent forms & white pages
 - 2 reminders at 2-week increments
 - \$10 gift card

Measures



Childhood Moderate-Vigorous PA (MVPA min/day)

Godin Leisure-Time Exercise Questionnaire (Godin, 1986)

Strenuous activity (It makes my heart beat quickly, and makes me sweat.)

Examples are: running, jogging, fast bicycling, aerobic dance, rollerblading, paddling, fast swimming, soccer, basketball, football, martial arts.

1. How many days a week do you do this?

(0) (1) (2) (3) (4) (5) (6) (7)

2. How many minutes each day?

(0) (10) (20) (30) (40) (50) (60+)

Moderate activity (It doesn't make me tired, and makes me sweat just a little.)

Examples are: fast walking, slow bicycling, easy swimming, weight lifting, baseball, softball, tennis, volleyball, hula.

3. How many days a week do you do this?

(0) (1) (2) (3) (4) (5) (6) (7)

4. How many minutes each day?

(0) (10) (20) (30) (40) (50) (60+)

Childhood Fruit and Vegetable Consumption (FVC servings/day)

This section is about fruits and vegetables. Examples of one serving are:

- $\frac{1}{2}$ cup of cooked vegetables = size of 2 golf balls
- 1 cup of salad = size of 1 baseball
- 1 piece of fruit = size of 1 baseball
- $\frac{3}{4}$ cup of 100% fruit juice = 6 ounces

10. How many servings of fruits do you eat each day?

(0) (1) (2) (3) (4) (5) (6) (7) (8) (9) (10+)



11. How many servings of vegetables do you eat each day?

(0) (1) (2) (3) (4) (5) (6) (7) (8) (9) (10+)



Childhood Sedentary Behavior (SB hours/day)

7. How many hours a day do you spend watching television, playing video games and using internet
(not for homework)?

0

1

2

3

4

5

6

7

8

9

10+

Adolescent Academics: Average Letter Grade & Health-related School Absenteeism

The following questions are about academics. Please fill in ONE circle.

20. What is your average grade in your classes this school year? (Fill in ONE that applies)

☐

Mostly A's

☐

Mostly B's

☐

Mostly C's

☐

Mostly D's

☐

Mostly F's

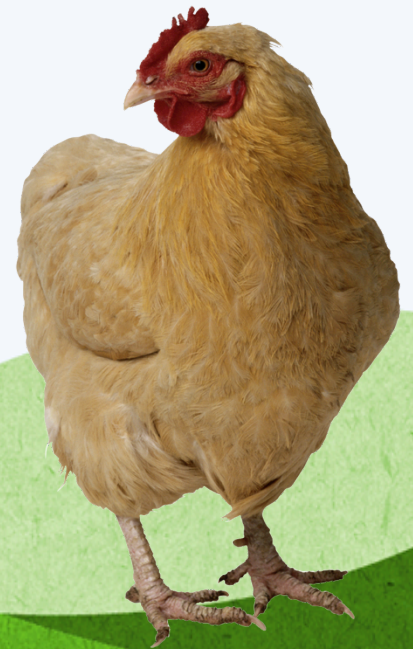
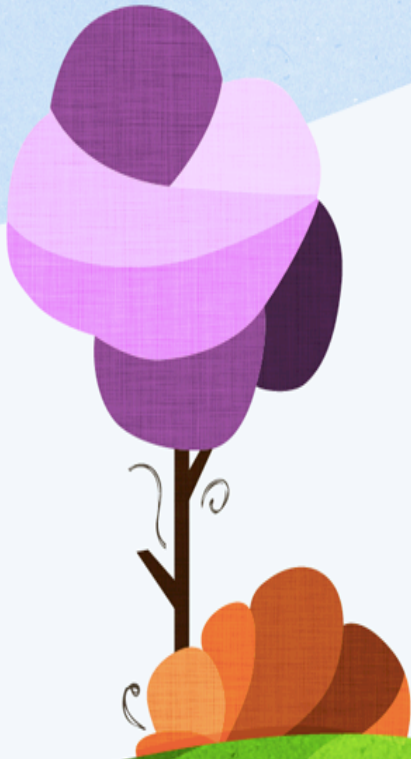
☐

N/A

21. How many school days did you miss this school year due to an illness?

_____ Days.

Results



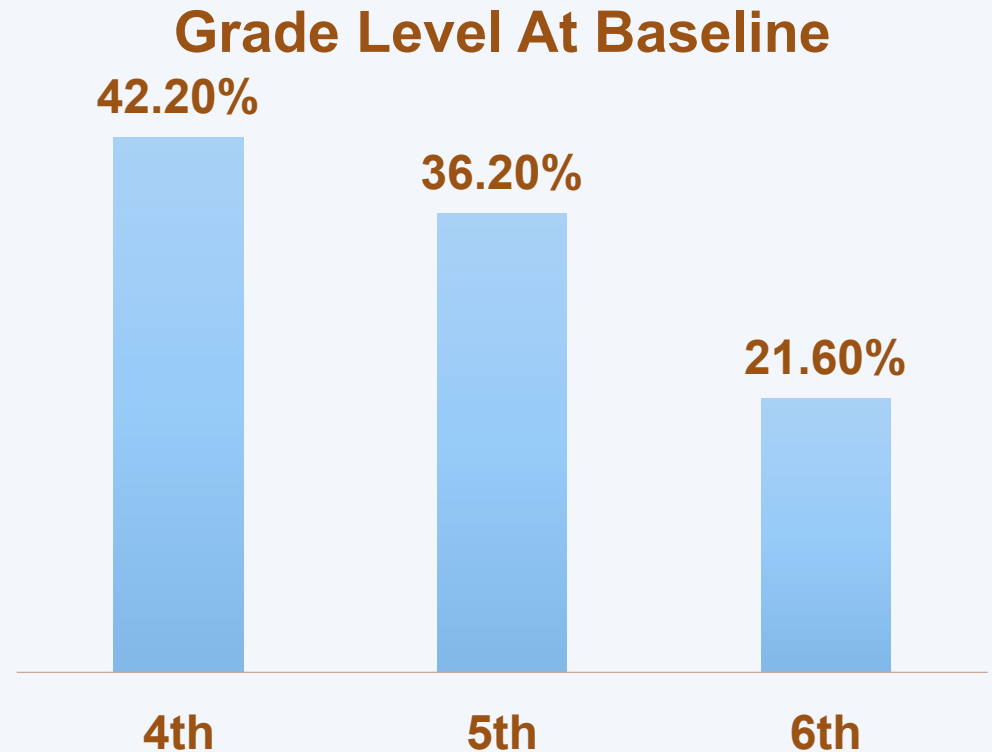
Preliminary Analysis

- No cohort differences
- Follow-up Completers v. Non completers
 - 37.6% response rate
 - = gender, grade, fruit and vegetable consumption, and sedentary behavior
 - Completers ↑ moderate to vigorous PA (MVPA)
 - $F(1, 853) = 7.44, p < 0.05$
- Missing data: 2.7% and appeared at random
=> it was deleted pairwise.

Baseline Childhood Demographics

n = 894

53% Female



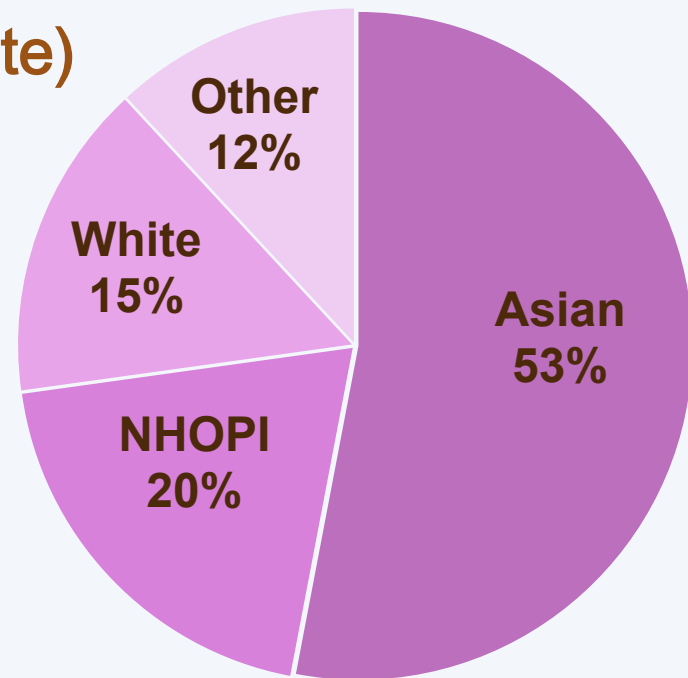
Follow-up Adolescent Demographics

Ethnicity at Follow-up

n = 334 (37.6% response rate)

Age = 14.76 (SD = 0.87)

55.1% Female



Descriptive Statistics

Variables	Mean	SD
Baseline Childhood Health Behaviors		
MVPA (mins/day)	45.42	31.20
FVC (servings/day)	6.96	4.54
SB (hours/day)	3.85	2.85
Follow-up Adolescent Academic Indicators		
Average School Grades	Median 4=B	0.84
Sick Days/year	0.94	1.92

ANOVAS revealed covariates

Ethnicity

$F(6,307) = 2.39,$
 $p < 0.05, \eta^2 = 0.05$

Gender

$F(1,324) = 12.73,$
 $p < 0.05, \eta^2 = 0.04$

Grades

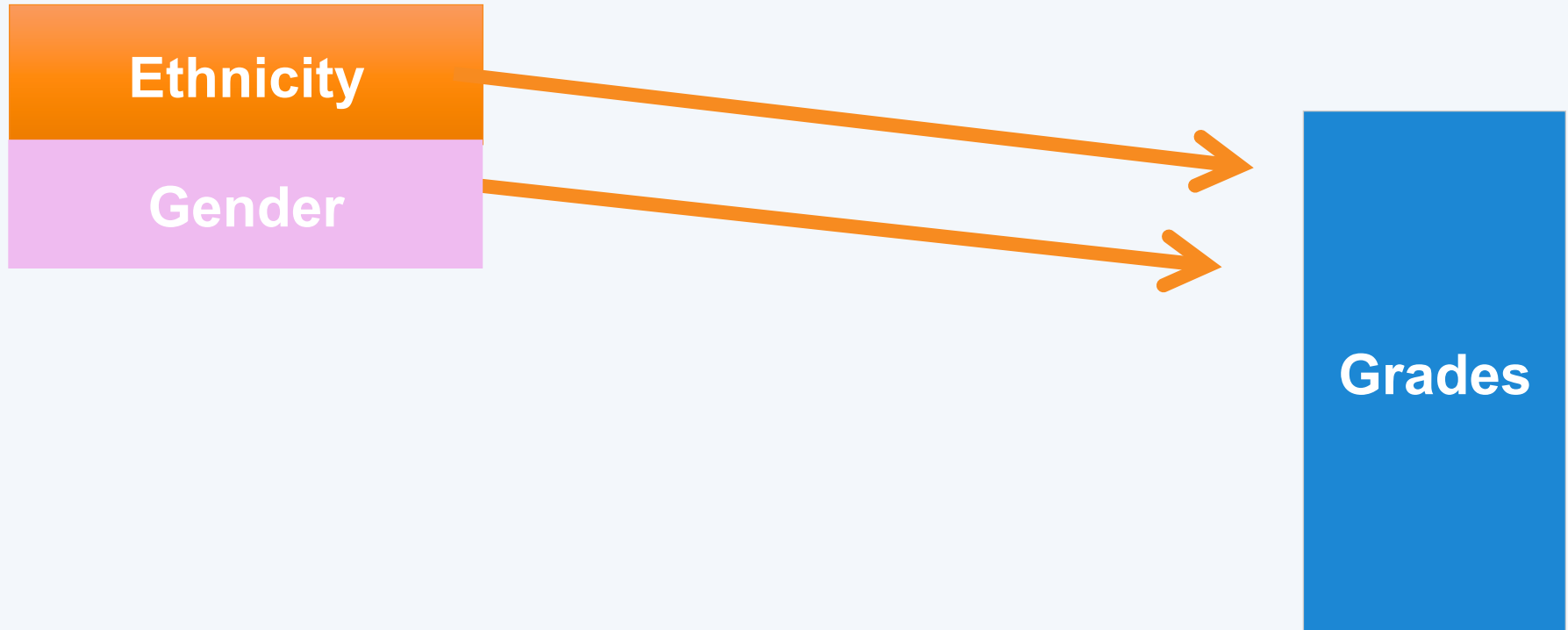


2-Step Multivariate Linear Regression

Childhood

Step 1: $r^2 = .16$, $F(7,289) = 7.68$, $p < .05$

Adolescence



2-Step Multivariate Linear Regression

Childhood

Step 1: $r^2 = .16$, $F(7,289) = 7.68$, $p < .05$

Ethnicity

Gender

Step 2: $\Delta r^2 = .07$, $F(3,289) = 7.89$, $p < .05$

Physical
Activity

Fruit and
Vegetable

Sedentary
Behavior

$\beta = -0.01$, $p > .05$

$\beta = -0.19$, $p < .05$

$\beta = -0.19$, $p < .05$

Adolescence

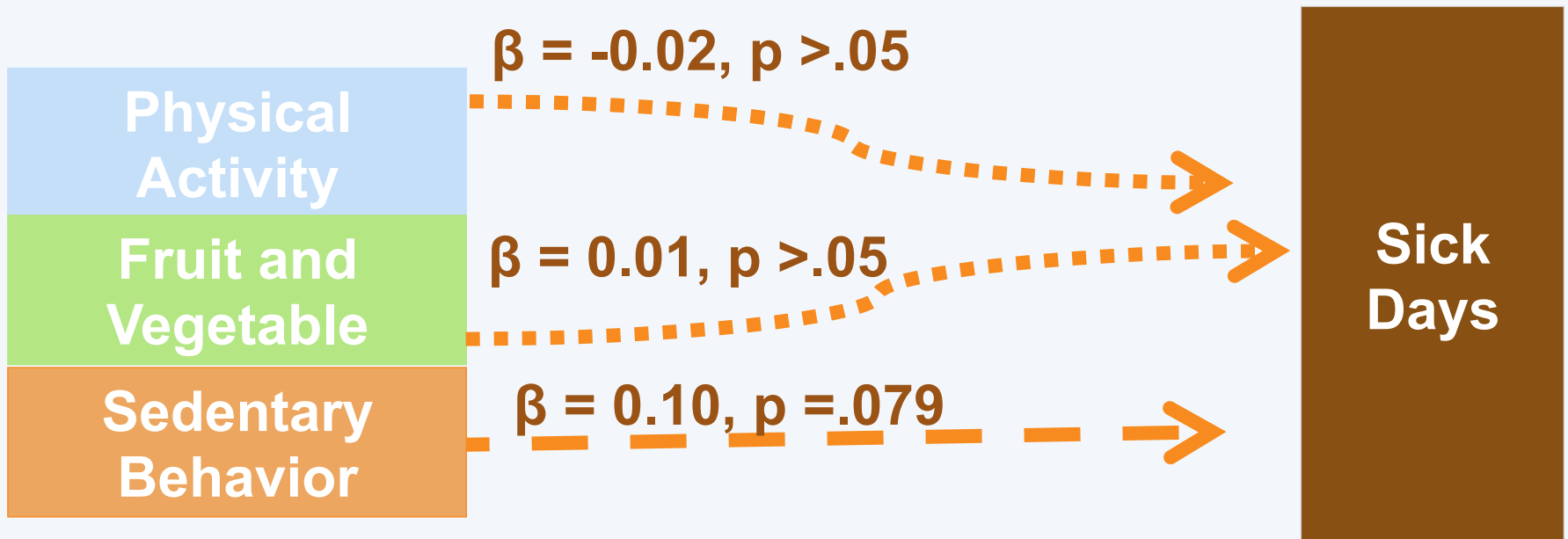
Grades

Multivariate Linear Regression

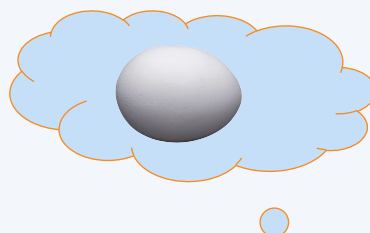
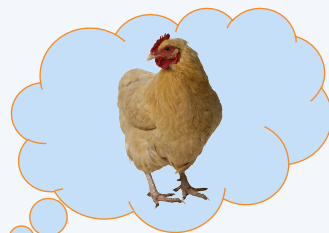
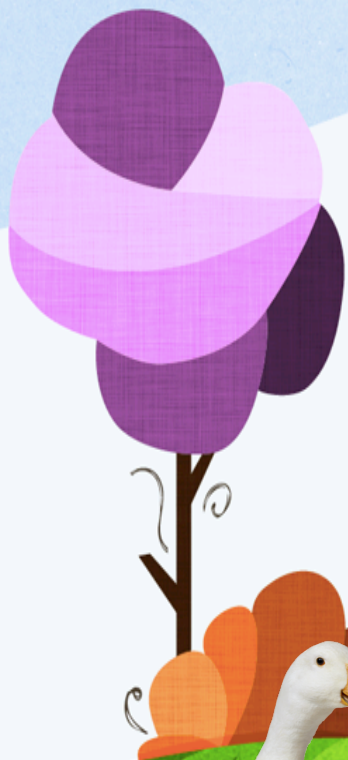
Childhood

Adolescence

$r^2 = .01$, $F(3,294)=1.04$, n.s.



Discussion



Physical Activity & Grades

- Childhood physical activity (PA) was not related to adolescent grades
 - Not related?
 - Due to 5 year interval?
 - Self-selection bias?
- Recommendations:
 - shorter follow-up
 - replicate with different sample

Fruits and Veggies & Grades

- Higher fruit and vegetable consumption was related to lower school grades
 - FVC is related overall larger intake of calories
➡ obesity ➡ lower grades
- Recommendation:
 - Pay attention to over all caloric intake and portion sizes



Sedentary Behavior & Grades

- Increased levels of childhood sedentary behavior (SB) were related to lower adolescent grades
 - ↓ homework time available
 - ↓ health & cognitive benefits associated with PA
- Recommendation:
 - Decrease sedentary behavior, *especially* leisure-oriented behaviors like TV watching and videogame playing

Health Behaviors & Sick Days

- Childhood health behaviors did not predict adolescent school absenteeism due to illness
 - Long follow-up period
- Recommendation:
 - Investigate other academic outcomes
 - test scores
 - civic engagement
 - class participation

Strengths & Limitations

Self-report

62.4% attrition rate

5-year follow-up

Generalizability

Implications

- **Future Research:**
 - Underlying mechanisms
 - Other health behaviors & confounding variables
- **Practice:**
 - Promote healthy behaviors early
 - Address leisure-time sedentary behaviors
- **Policy:**
 - Advocate health promotion as a way to empower healthy minds



Special thanks to:

The participants, Angela Atkins, Marina Johler, Kyaw Lin Tun, Clémence Belleudy, and Mahabub Anwar

Questions?

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HBCR

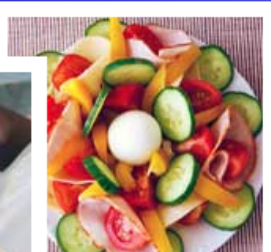
The Health Behavior Change Research Workgroup

Purpose

Structure

Current Research

Future Research



HEALTH BEHAVIOR CHANGE RESEARCH WORKGROUP

"Improving health and quality of life by conducting cutting edge research in multiple health behavior change science."



Dr. Claudio R. Nigg
HBCR Workgroup Director

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