Relating Childhood Health Behaviors and Adolescent Academics in Hawai‘i

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Why health and academics?

Education  Health
Why health and academics?

Education

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

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Mostly A's</th>
<th>Mostly B's</th>
<th>Mostly C's</th>
<th>Mostly D's/F's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carried a weapon*</td>
<td>12</td>
<td>16</td>
<td>21</td>
<td>37</td>
</tr>
<tr>
<td>Current cigarette use</td>
<td>10</td>
<td>19</td>
<td>27</td>
<td>32</td>
</tr>
<tr>
<td>Current alcohol use</td>
<td>32</td>
<td>43</td>
<td>51</td>
<td>62</td>
</tr>
<tr>
<td>Currently sexually active</td>
<td>24</td>
<td>34</td>
<td>43</td>
<td>54</td>
</tr>
<tr>
<td>Watched television 3 or more hours per day</td>
<td>24</td>
<td>32</td>
<td>39</td>
<td>49</td>
</tr>
<tr>
<td>Physically active at least 60 minutes per day</td>
<td>56</td>
<td>63</td>
<td>68</td>
<td>76</td>
</tr>
</tbody>
</table>

* 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

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

FV (fruits and vegetables)
MVPA (moderate-to vigorous physical activity)

# Grades in Hawaii

<table>
<thead>
<tr>
<th>Grades</th>
<th>6th grade</th>
<th>12th grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get mostly A/Bs</td>
<td>64.8%</td>
<td>66.4%</td>
</tr>
</tbody>
</table>

## Grades in School Mostly A's or B's

<table>
<thead>
<tr>
<th>DOH Race-Ethnicity</th>
<th>#</th>
<th>%</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>4,400</td>
<td>72.8%</td>
<td>65.2 - 80.5</td>
</tr>
<tr>
<td>Native Hawaiian</td>
<td>5,200</td>
<td>51.6%</td>
<td>43.3 - 59.9</td>
</tr>
<tr>
<td>Filipino</td>
<td>7,200</td>
<td>64.9%</td>
<td>58.1 - 71.7</td>
</tr>
<tr>
<td>Japanese</td>
<td>1,500</td>
<td>80.3%</td>
<td>71.4 - 89.3</td>
</tr>
<tr>
<td>Black</td>
<td>n/r</td>
<td>n/r</td>
<td>n/r</td>
</tr>
<tr>
<td>Native Alaskan/ American Indian</td>
<td>n/r</td>
<td>n/r</td>
<td>n/r</td>
</tr>
<tr>
<td>Other Asian</td>
<td>1,700</td>
<td>74.4%</td>
<td>68.9 - 79.9</td>
</tr>
<tr>
<td>Other Pacific Islander</td>
<td>500</td>
<td>35.8%</td>
<td>26.6 - 44.9</td>
</tr>
<tr>
<td>Other</td>
<td>5,800</td>
<td>63.1%</td>
<td>57.5 - 68.7</td>
</tr>
</tbody>
</table>

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

Adolescent Grades and Absenteeism

Childhood Sedentary Behavior
Methods

5-year longitudinal 3 cohort study

<table>
<thead>
<tr>
<th>Baseline</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>n = 894</td>
<td>n = 334</td>
</tr>
</tbody>
</table>

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+ 70

**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+ 70
Childhood Fruit and Vegetable Consumption (FVC servings/day)

This section is about fruits and vegetables. Examples of one serving are:
- ½ cup of cooked vegetables = size of 2 golf balls
- 1 piece of fruit = size of 1 baseball
- 1 cup of salad = size of 1 baseball
- 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.
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

Grade Level At Baseline

- 42.20% 4th
- 36.20% 5th
- 21.60% 6th
Follow-up Adolescent Demographics

n = 334 (37.6% response rate)
Age = 14.76 (SD = 0.87)
55.1% Female

Ethnicity at Follow-up

- Asian: 53%
- NHOPPI: 20%
- White: 15%
- Other: 12%
## Descriptive Statistics

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline Childhood Health Behaviors</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MVPA (mins/day)</td>
<td>45.42</td>
<td>31.20</td>
</tr>
<tr>
<td>FVC (servings/day)</td>
<td>6.96</td>
<td>4.54</td>
</tr>
<tr>
<td>SB (hours/day)</td>
<td>3.85</td>
<td>2.85</td>
</tr>
<tr>
<td><strong>Follow-up Adolescent Academic Indicators</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average School Grades</td>
<td>Median 4=B</td>
<td>0.84</td>
</tr>
<tr>
<td>Sick Days/year</td>
<td>0.94</td>
<td>1.92</td>
</tr>
</tbody>
</table>
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, \( \eta^2 = 0.04 \)
2-Step Multivariate Linear Regression

**Childhood**

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

**Ethnicity**

**Gender**

- Adolescence

**Grades**

- $F(7, 246.20) = 9.93$, $p<.01$
- $F(3, 243.20) = 3.00$, $p<.05$
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

**Adolescence**

- Self-efficacy
- Social Support
- PA Enjoyment

- \( \beta = -0.19, p<.05 \)
- \( \beta = -0.19, p<.05 \)
- \( \beta = -0.01, p>.05 \)

**Grades**
Multivariate Linear Regression

Childhood

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

- Physical Activity: $\beta = -0.02, p > .05$
- Fruit and Vegetable: $\beta = 0.01, p > .05$
- Sedentary Behavior: $\beta = 0.10, p = .079$

Adolescence

$F(7, 246.20) = 9.93, p < .01$

- Self-efficacy
- Social Support
- PA Enjoyment

$F(3, 243.20) = 3.00, p < .05$

Sick Days
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 overall 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:
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Questions?

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www.manoa.hawaii.edu/hbcr/
References

- Hawaii Health Data Warehouse. Healthy Lifestyles. Available at http://www.hhdw.org/