The comprehensive effect of PE and competitive food laws

Why researchers and policymakers must consider both sides of the energy balance equation

Daniel R. Taber, Jamie F. Chriqui, Frank M. Perna, Lisa M. Powell, Sandy J. Slater, Frank J. Chaloupka
Presenter disclosure

Daniel Taber

The following personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months:

No relationships to disclose
School nutrition policies

Many policy initiatives have been designed to reduce childhood obesity by improving school nutrition standards:

- Eliminating sodas from schools
- Improving USDA school meal standards
- Setting fat, sugar, and caloric limits for competitive foods (i.e., foods sold outside of school meal programs)

Evidence suggests that policies have improved nutrition quality of school foods and may reduce student weight gain.
Competitive food laws

September 2012 issue of Pediatrics:

- Longitudinal study of state competitive food laws and student weight change
- BMI change was lowest in states with laws that were **specific, required, and consistent**
“In order to receive, then we need to give
We gotta feed the kids, they gotta eat to live...
My rhymes got nutritional value
I get it how I live, it’s critical when the conditions allow you.”

*Talib Kweli Greene, “Eat to Live”*
States have been less aggressive in setting standards for physical education (PE)
Pro-nutrition bias

- Between 2003 and 2006\(^1\):
  - 16 states enacted laws governing competitive foods
  - 3 states enacted laws governing PE requirements

- National Association for Sport and Physical Education (NASPE) recommends 225 minutes of PE per week for middle school students

- # of states that required NASPE standards for middle schools in 2006\(^1\):
  
  ZERO

\(^1\)Classification of Laws Associated with School Students

class.cancer.gov
Why is PE ignored?

- Pressure to meet academic standards
- Emphasis on varsity sports
- Lack of evidence that PE attendance laws work

* Cawley et al. *(Health Econ, 2007)*: Modest associations between PE laws and physical activity among girls, no association with obesity

* Kim *(J School Health, 2012)*: PE requirement score not associated with PE or obesity

Kim did find significant bivariate association between % of schools requiring PE and obesity in 2007, but not in 2003

Kim speculated that difference may have been due to growing focus on school nutrition from 2003 to 2007
Study aims

**Aim 1:** To determine if strength of state PE laws is associated with PE attendance and physical activity

**Aim 2:** To determine if the association between state PE laws and BMI change is modified by competitive food laws
State laws

Classification of Laws Associated with School Students (CLASS)

- NCI database of state PE and nutrition laws
- Laws obtained from Westlaw database
- Collected annually, 2003-2008
- We utilized data on PE time requirement laws and competitive food laws
- Rated on 0-5 scale (PE) and 0-6 scale (competitive foods)
- Ratings reflect strength of language, specificity, and stringency
State law categories

- State laws categorized as “strong,” “weak,” or “none”
- PE categories adapted from Perna et al. (AJPH 2012)
  - 0-1 = “none”
  - 2 = “weak”
  - >2 = “strong”
- Competitive food categories based on mean rating for food and beverage laws in different settings (vending machines, school stores, cafeteria):
  - 0 = “none”
  - >0-2 = “weak”
  - >2 = “strong”
Student data

Early Childhood Longitudinal Study – Kindergarten Class (ECLS-K)

- Cohort followed from Kindergarten through 8th grade
- Our study utilized data from Round 6 (5th grade, Spring 2004) and Round 7 (8th grade, Spring 2007)
- Study sample included 5510 public school students in 40 states
Dependent variables

**PE attendance – 8th grade**
- Regular attendance: 3+ days per week (binary)
- Daily attendance: 5 days per week (binary)

**Days of physical activity – 8th grade**
- “On how many of the past 7 days did you exercise or participate in physical activity for at least 20 minutes that made you sweat and breathe hard?” (0-7)

**BMI change – 5th-8th grade**
- Calculated from objective height and weight measures
Analysis – Aim 1

- Mixed-effect models used to estimate association between 2006 state PE requirement laws and students’ 8th grade PE attendance and physical activity
  - Regular, daily PE attendance: Logistic model
  - Days of physical activity: Poisson model
- Stratified by gender
- Adjusted for race/ethnicity, SES, locale, sports participation, TV viewing
- State-level random intercept
State clustering

- Within-state correlation of PE attendance was exceptionally high in ECLS-K sample
- Intraclass correlation coefficients (ICC) for days of PE:
  - States with no PE laws: 0.07
  - States with weak PE laws: 0.13
  - States with strong PE laws: 0.30
- In comparison, ICC estimates for physical activity and BMI change were approximately 0.01
Results – Regular PE attendance

- Regular PE attendance was more common in states with strong PE laws, particularly among girls.

![Bar chart showing 3+ days PE per week (%) for Boys and Girls by None, Weak, and Strong PE laws.]

- Difference = 22.0
- 95% CI: 2.1, 42.0
Association between strong laws and daily PE attendance was positive among girls, but weaker and very imprecise.
## Results – Physical activity

Among girls, mean days of physical activity was higher in states with strong PE laws.

<table>
<thead>
<tr>
<th>Gender</th>
<th>State PE law</th>
<th>Mean</th>
<th>Adjusted difference</th>
<th>95% CI</th>
<th>Est.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls</td>
<td>None</td>
<td>4.09</td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Weak</td>
<td>4.32</td>
<td>0.23</td>
<td>-0.04,0.51</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strong</td>
<td>4.40</td>
<td>0.31</td>
<td>0.02,0.61</td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>None</td>
<td>4.80</td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Weak</td>
<td>4.89</td>
<td>0.10</td>
<td>-0.22,0.41</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strong</td>
<td>5.00</td>
<td>0.20</td>
<td>-0.14,0.54</td>
<td></td>
</tr>
</tbody>
</table>
Among girls, mean days of physical activity was higher in states with strong PE laws.
Analysis – Aim 2

- Individual-level fixed effect used to model association between PE/competitive food laws and BMI change
- States cross-classified based on 2006 PE and competitive food laws
- 4 comparison groups:
  1) PE – none, Competitive Foods – none (REF)
  2) PE – weak, Competitive Foods – none
  3) PE – weak, Competitive Foods – weak
  4) PE – weak, Competitive Foods – strong
- Stratified by gender
- Adjusted for SES, locale, sugar-sweetened beverage consumption, fast food consumption
Results – BMI change

- Weak PE laws not associated with BMI change, particularly in the absence of competitive food laws

<table>
<thead>
<tr>
<th>PE laws</th>
<th>Comp. food laws</th>
<th>Girls</th>
<th></th>
<th>95% CI</th>
<th></th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>None</td>
<td>-</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Weak</td>
<td>None</td>
<td>-0.17</td>
<td>-0.66</td>
<td>0.32</td>
<td>0.33</td>
<td>-0.14</td>
</tr>
<tr>
<td>Weak</td>
<td>Weak</td>
<td>-0.33</td>
<td>-0.90</td>
<td>0.25</td>
<td>0.08</td>
<td>-0.45</td>
</tr>
<tr>
<td>Weak</td>
<td>Strong</td>
<td>-0.34</td>
<td>-0.92</td>
<td>0.25</td>
<td>-0.23</td>
<td>-0.78</td>
</tr>
</tbody>
</table>
Results – BMI change

- Weak PE laws not associated with BMI change, particularly in the absence of competitive food laws

<table>
<thead>
<tr>
<th>PE laws</th>
<th>Comp. food laws</th>
<th>Girls</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Est.</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>None</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Weak</td>
<td>None</td>
<td>-0.17</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>-0.66, 0.32</td>
<td></td>
<td>-0.14, 0.80</td>
</tr>
<tr>
<td>Weak</td>
<td>Weak</td>
<td>-0.33</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>-0.90, 0.25</td>
<td></td>
<td>-0.45, 0.62</td>
</tr>
<tr>
<td>Weak</td>
<td>Strong</td>
<td>-0.34</td>
<td>-0.23</td>
</tr>
<tr>
<td></td>
<td>-0.92, 0.25</td>
<td></td>
<td>-0.78, 0.32</td>
</tr>
</tbody>
</table>

Weak PE laws not associated with BMI change, particularly in the absence of competitive food laws.
Results – BMI change

- Weak PE laws not associated with BMI change, particularly in the absence of competitive food laws

<table>
<thead>
<tr>
<th>PE laws</th>
<th>Comp. food laws</th>
<th>Girls</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Est.</td>
<td>95% CI</td>
</tr>
<tr>
<td>None</td>
<td>None</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Weak</td>
<td>None</td>
<td>-0.17</td>
<td>-0.66, 0.32</td>
</tr>
<tr>
<td>Weak</td>
<td>Weak</td>
<td>-0.33</td>
<td>-0.90, 0.25</td>
</tr>
<tr>
<td>Weak</td>
<td>Strong</td>
<td>-0.34</td>
<td>-0.92, 0.25</td>
</tr>
</tbody>
</table>

Association between strong, consistent competitive food laws and BMI change in Taber et al. (*Pediatrics*) = -0.44
Summary

- Weak PE laws are not getting it done
- Only strong laws are associated with PE attendance, particularly among girls
  - Effect of strong PE laws is likely modified by other state factors
- Strong laws were also associated with physical activity among girls
- No evidence that weak PE laws are associated with BMI change in the absence of competitive food laws
  - No additive benefit of weak PE laws
Limitations

- Self-reported measures of PE attendance and physical activity
- PA and PE only reported by students in 8th grade
- No data on activity within PE class
- No data on district PE policies
- Limited # of states with strong PE laws
Acknowledgments

- National Cancer Institute
- Institute for Education Sciences
- National Heart, Lung, and Blood Institute (R01HL096664)
- Robert Wood Johnson Foundation
- Tamkeen Khan