LA Sprouts: A school based gardening, nutrition, and cooking program reduces obesity and related metabolic disorders in Latino youth

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http://www.lasprouts.org
Rational for Gardening

• Provides access to low-cost, fresh and tasty F&V
• Appropriate for all ethnicities/races, SES, and ages
  – “Big or small, rich or poor, fat or skinny, everyone likes to play in the dirt”
• Gardens can be put anywhere (inside containers on concrete, in window sills, on patios, in ground)
Previous Literature: Gardeners Benefit From:

- Improved physical fitness:
  - Lee, 2002;
  - Armstrong, 2001;
  - Blair et al., 1991
- Improved food security/socioeconomic situation:
  - Brown and Jameton, 2000;
  - Tucker, 2001
- Improved social activity
  - Relf, 1973
- Education/vocational skill development:
  - Spence, 2001;
  - Relf, 1973
- Stress relief, relaxation, improved mental health:
  - Armstrong, 2001, 2001;
  - Brown and Jameton, 2000
- Improved self confidence and personal fulfillment
  - Armstrong, 2000, 2001;
  - Brown and Jameton, 2000
Gardening Programs Benefits on Health

- Increases a child’s willingness to taste vegetables\(^1,^3\)
- Increases preferences\(^2,^3\)
- Increase identification of fruits and vegetables (FV)\(^3,^4\)
- Improved attitudes toward FV\(^3\)
- Increased self-efficacy to eat FV\(^5\)
- Improved dietary knowledge\(^6\)
- Increased physical fitness and physical activity\(^6\)
- Increased consumption of FV\(^5-^9\)

2001  ➔  2014

\(^1\) Morris California Agriculture 2001; \(^2\) Morris and Zidenberg-Cherr JADA 2002; \(^3\) Ratcliff 2011; \(^4\) Somerset 2009; \(^5\) Gatto and Davis 2012; \(^6\) Parmer 2009; \(^7\) Wells 2014; \(^8\) McAleese JADA 2007; \(^9\) Hermann 2006
PROXIMAL EFFECTS

Student Level
- Garden site and gardening activities
- Sense of ownership and attachment to school site
- Aesthetic improvement
- New settings for children to play/interact

School Level
- Nutrition knowledge
- Environmental awareness/knowledge
- Engagement/learning in academic topics

Meso Level
- Presence of family at school site
- Communication between school personnel and families
- Presence of community members at school site

Family Level
- Parental knowledge of nutrition, food systems and resource conservation

DISTAL EFFECTS

Student Level
- Exposure to fresh produce
- Positive attitudes towards fresh produce
- Intake of fresh produce
- Risk behaviour
- Vandalism
- Academic achievement
- Pride in school setting
- Ecological conservation practices
- Academic performance
- Potential in aggregate academic performance
- Parental involvement in schooling
- Student achievement, graduation
- Improved family dietary patterns
- Improved children’s nutritional intake
- Improved family resource conservation practices
- Strengthened school community, collective efficacy, social networks
- Ties between school and community

Ozer et al. Health Education Behavior 2007; Davis et al Public Health Nutr 2015
Edible Schoolyard (ESY)

Founder: Alice Waters
Edible Schoolyard (ESY) Berkeley

• 17 years ago: Martin Luther King Jr. MS
• Small grant from the Center for Ecoliteracy:
  – 1\textsuperscript{st} year:
    • First full-time garden director
    • > 1 acre asphalt was cleared, and garden boxes were built
  – 3\textsuperscript{rd} year:
    • Kitchen Director
    • Teacher liaisons to develop and teach lessons
  – 5\textsuperscript{th} year:
    • Program coordinator and 8 staff hired
    • Weekly garden and kitchen lessons
Chez Panisse Foundation

• 1996 – Alice Waters created the Chez Panisse Foundation
• Creation of a public school curriculum that includes hands-on experiences in school kitchens, gardens, and lunchrooms and provides healthy, freshly prepared meals
• Partnership with Berkeley Unified School District and Center for Eco-literacy
  – Curriculum and food now served at all 16 schools in district and provides >10,000 meals per day.
School Gardening Programs – Edible Schoolyards (founder Alice Waters)
Conducting RCT with:

- 4 elementary schools randomized by region
  - 2 intervention schools (n=200)
  - 2 control schools with delayed intervention (n=200)
- 12-week afterschool nutrition, gardening, & cooking curriculum
- Bimonthly parental workshops
- Gardens built at school
- Added blood measure to assess glucose, insulin, and lipids
Pre/Post Measures:

• Anthropometrics: Height, Weight, BMI parameters, Waist circumferences
• Body fat via Tanita BIA
• Blood pressure
• Optional fasting blood sample (glucose, insulin, lipids)
• Dietary intake via Block Kid Screener
• Determinants of dietary behavior via questionnaire packet:
  – Nutrition/gardening knowledge;
  – Motivation to eat/cook/garden FV;
  – Intention to eat FV;
  – Preference for FV;
  – Self efficacy to eat/cook FV;
  – School engagement;
  – Gardening habits at home
Assessed for eligibility (n = 409)

Enrollment

Excluded (declined to participate, n = 34)

Randomized (n = 375)

Assigned to intervention (n = 204)
- Received intervention & baseline data collected (n = 198)
  - Fasting blood sample obtained (n = 97)
  - Did not receive intervention (n = 6 withdrew from after-school program)

Assigned to control (delayed intervention) (n = 171)
- Participated as control & baseline data collected (n = 166)
  - Fasting blood sample obtained (n = 72)
- Did not participate as control (n = 5 withdrew from after-school program)

Follow-Up

Lost to follow-up (n = 31; n = 30 withdrew from after-school program, n = 1 absent on all data collection days)

Analysis

Both baseline & follow-up data available for main outcomes analysis (n = 173)
  - Both pre & post blood sample collected (n = 67)

Lost to follow-up (n = 24 withdrew from after-school program)

Both baseline & follow-up data available for main outcomes analysis (n = 147)
  - Both pre & post blood sample collected (n = 46)
### Table 2. Validation of Determinants of Dietary Behavior Questions Used in Questionnaire Packet

<table>
<thead>
<tr>
<th>Item</th>
<th>Items, n</th>
<th>Internal Consistency</th>
<th>Intra-Rater Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation to eat FV</td>
<td>7</td>
<td>0.809</td>
<td>0.665</td>
</tr>
<tr>
<td>Motivation to garden</td>
<td>9</td>
<td>0.858</td>
<td>0.739</td>
</tr>
<tr>
<td>Motivation to cook FV</td>
<td>7</td>
<td>0.850</td>
<td>0.635</td>
</tr>
<tr>
<td>Self-efficacy for FV consumption and related behaviors</td>
<td>14</td>
<td>0.883</td>
<td>0.478</td>
</tr>
<tr>
<td>Fruit neophobia</td>
<td>6</td>
<td>0.800</td>
<td>0.521</td>
</tr>
<tr>
<td>Vegetable neophobia</td>
<td>6</td>
<td>0.901</td>
<td>0.542</td>
</tr>
<tr>
<td>Preferences for fruit</td>
<td>10</td>
<td>0.809</td>
<td>0.722</td>
</tr>
<tr>
<td>Preferences for vegetables</td>
<td>15</td>
<td>0.866</td>
<td>0.575</td>
</tr>
<tr>
<td>Cooking and gardening attitudes</td>
<td>8</td>
<td>0.842</td>
<td>0.912</td>
</tr>
<tr>
<td>Nutrition and gardening knowledge</td>
<td>8</td>
<td>0.472</td>
<td>0.400</td>
</tr>
</tbody>
</table>

FV indicates fruit and vegetables.

*a*The researchers used Cronbach alpha to determine interval consistency (*n* = 350) and correlations to evaluate intra-rater reliability (*n* = 19). All questionnaire items had 4 response options, with the exception of demographic questions and current home gardening practices, which ranged from 2 to 7 response options (not included in psychometric tests).
# Table 1: Demographic characteristics of LA Sprouts and control participants at baseline

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>LA Sprouts (n=173)</th>
<th>Controls (n=147)</th>
<th>p-value†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Pre</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>82 (47.7)</td>
<td>71 (48.3)</td>
<td>0.91</td>
</tr>
<tr>
<td>Hispanic/Latino*</td>
<td>153 (89.0)</td>
<td>127 (88.8)</td>
<td>0.97</td>
</tr>
<tr>
<td>Age, years</td>
<td>9.3 ±0.9</td>
<td>9.3 ±0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Height, cm</td>
<td>135.0 ±8.5</td>
<td>135.0 ±8.5</td>
<td>0.96</td>
</tr>
<tr>
<td>Weight, kg</td>
<td>36.9 ±10.6</td>
<td>38.1 ±12.6</td>
<td>0.3</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>19.8 ±4.1</td>
<td>20.6 ±4.6</td>
<td>0.13</td>
</tr>
<tr>
<td>Overweight (≥85th percentile)</td>
<td>82 (51.3)</td>
<td>73 (53.3)</td>
<td>0.73</td>
</tr>
<tr>
<td>Obese (≥95th percentile)</td>
<td>54 (33.8)</td>
<td>54 (39.4)</td>
<td>0.31</td>
</tr>
<tr>
<td><strong>Socioeconomic factors</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No English spoken at home*</td>
<td>48 (28.7)</td>
<td>27 (19.6)</td>
<td>0.06</td>
</tr>
<tr>
<td>No computer at home</td>
<td>42 (26.1)</td>
<td>32 (23.2)</td>
<td>0.56</td>
</tr>
<tr>
<td>No internet at home</td>
<td>39 (23.2)</td>
<td>32 (23.2)</td>
<td>0.99</td>
</tr>
<tr>
<td>Mother does not have own car</td>
<td>57 (34.3)</td>
<td>38 (27.1)</td>
<td>0.17</td>
</tr>
<tr>
<td>Eligible for free lunch at school</td>
<td>152 (90.5)</td>
<td>125 (89.3)</td>
<td>0.73</td>
</tr>
</tbody>
</table>
Significant Changes in Health Outcomes

- BMI z-scores
- Waist circumferences
- Metabolic Syndrome

Gatto NM et al. Pediatric Obesity 2016 (in press)
Significant Changes in Dietary Intake

- Dietary fiber (g/d)
- Whole grains (oz/d)
- Vegetables (cup/d)
- Green beans (cup/d)
Significant Changes in Determinant of Dietary Behavior

Identification of FV
Nutrition and Gardening Knowledge
Garden at Home

Percent Change

Control
LA Sprouts
Conclusions from LA Sprouts

• First RCT garden based trial to result in:
  – Reductions in obesity, waist circumference and Met Syndrome
  – Increased dietary fiber, vegetables and whole grain intake
  – Improved determinants of dietary behavior

• Longer RCTs (>12 months) are warranted to understand the long-term health effects and the sustainability concerns.
Next Analyses for LA Sprouts

• Analyzing changes in parent data and the influence of those changes on child outcomes;
• Food insecurity and acculturation analyses;
• Examining the link between baseline and changes in cooking self efficacy and attitudes on baseline and changes in health outcomes
Key Strategies:

- Involve stakeholders in planning, development, and implementation
- Heavy emphasis on cooking activities/lessons
- Provide educators or gardeners to teach the lessons
- Include parental components/lessons
- Provide “Train the trainers” workshops and toolkits to the schools
- Media promotion around garden

Davis and Somerset; Public Health Nutrition; 2015
A school-based gardening obesity intervention for low-income minority children

PI: Jaimie Davis
NIH: NHLBI (1R01HL123865)
Collaborators

UT Health
The University of Texas
Health Science Center at Houston

Seton Medical Center
Member of Daughters of Charity Health System

TEXAS A&M AgriLIFE
Teaching • Research • Extension • Service

Texas A&M System

AgriLIFE EXTENSION
Texas A&M System
Travis County

Sustainable Food Center
Overall Goal

To develop and test the effects of a 1-year in-school gardening, nutrition, and cooking intervention on improving dietary intake and reducing obesity parameters in Hispanic 3rd-5th graders and their families.
AIMS

• To test the effect of the TX Sprouts intervention on the following changes in health outcomes for the child:
  a. Fruit and vegetable intake;
  b. Determinants of dietary behavior;
  c. Anthropometric parameters (e.g., BMI, WC, percent body fat);
  d. Metabolic risk factors (e.g., blood pressure, fasting glucose);
  e. Home environment (e.g., availability and accessibility of FV);
  f. Academic performance (grades and time on task);
  g. Physical Activity
• To test the effects of the TX Sprouts intervention on changes in dietary intake and related dietary determinants of the parents.

• **Exploratory Aim:** Identify success of strategies to sustain long-term garden programs in schools.
Program Design

• 16 schools will be randomized to either:
  – TX Sprouts (n=8 schools)
  – Delayed intervention (n=8 schools)

• Each school will get a edible garden (~$5K per site):
  – Designed with feedback from stakeholders at each school
  – Design features included:
    • 5-6 teaching garden beds
    • Outdoor teaching area with benches/tables
    • Storage units, with gardening/cooking supplies

• Curriculum used: Expansion of LA sprouts:
  – 18 lessons taught during school hours across the school year
  – 9 monthly classes for parents/families
Garden Leadership Committees

– Formed year before intervention starts
– Made up of admin, teachers and parents (PTA reps, CATCH champions, Wellness Committees)
– Will lead planning/build of the school garden
– Will receive trainings from Sustainable Food Center on school garden management in 1st year
– Master Gardeners from Travis County Extension will assist and work with the GLCs in garden maintenance
Sustainability of Garden Programs

• Sustainable Food Center will lead at least 2 more training on garden skills and garden/classroom integration.

• Travis County Master Gardeners will continue to assist GLCs with maintenance of garden for 1 year after intervention – 10 hrs a week

• TX Sprouts staff will provide a tool kit and training to all teachers

• Evaluation will include:
  – Structured interviews with teachers and GLC members
  – School observations of strategies implemented to sustain program
Garden Builds! Oak Meadows Elementary
Acknowledgements

• LA Sprout’s Team:
  – Nicole Gatto, MPH, PhD
  – Donna Spruijt-Metz, PhD
  – Lauren Martinez
  – Monica Chazez-Solares

• TX Sprout’s Team
  – Sandra Evans, PhD
  – Deanna Hoelsher, PhD
  – Adriana Perez, PhD
  – Stephen Pont, MD
  – Daphne Richards
  – Andrew Smiley
  – Katie Nikah, MPH
  – Bonnie Martin
  – Shirene Garcia
  – Tatiana Antonio

• Collaborators:
  – Shawn Somerset, PhD
  – Nancy Wells, PhD

• Graduate Students
  – Annie Markowitz
  – Matt Landry

• Undergraduate Students

Funding:
  NIH 5R21DK094066
  NIH 1R01HL123865-01A1
  Kaiser Permanente
  Home Depot
  Gardenville
Questions?

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