Methods for Evaluating Natural Experiments in Parks: Impact on Physical Activity

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ALR Webinar
November 13, 2015
Common Scenarios

• A park is renovated, adding new equipment or sprucing up facilities
• A new pocket park is developed in a previously vacant lot
• A new exercise program is being offered in the community
How Effective are Park Interventions?

• Are there more park users?
• Are the park users more active?
• Do already active people just shift to a new location, or is there a net increase in physical activity?
• What is the return on investment?
Decisions when designing and conducting evaluations

• Goals
  – General change in # of park users vs. specific target groups? (Age, gender, race/ethnicity)
  – Importance of MVPA vs. Sedentary behavior

• Budget limits on data collection
  – How much observation is necessary?
  – What about self-reports/surveys?
  – Park Users? Local residents?
Observational Methods

• SOPARC
  – Ability to disaggregate by age group and activity level
  – Assessment over long/short time periods
  – Number of observers
  – Seasonality
The SOPARC is a protocol to conduct direct observation of physical activity in built environment. Key steps of the SOPARC include

– Mapping a park and dividing into numbered target areas
– A full-park observation consists of scans of all target areas in order.
– Scan each target area (usually by two observers) to record the use by gender, age, physical activity level, and race/ethnicity.
– Park-level observation: environment and atmosphere
– Static pictures

* Details of the SOPARC protocol and observation protocol were reported in
Example of mapped park
Tablet-based Counter for Recording Park Use and Physical Activity by Gender

![Counter Screen]

<table>
<thead>
<tr>
<th>Sedentary</th>
<th>Moderate</th>
<th>Vigorous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child</td>
<td>Teen</td>
<td>Adult</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

Counter display showing counts by age group and activity level.
We used the Open Data Kit (ODK) to store and transfer data collected in the field.

- **Front end:** standard apps on tablet computers
- **Back end:** Google cloud computing services
Environmental Scans

- Park conditions can influence/explain use:
  - Litter
  - Graffiti
  - Noise
  - Weather
  - Food vendors
  - Stray dogs
  - Homeless
  - Gangs, threatening behaviors
  - Major events
  - Construction
Pre-Post Design

• Controlled design (difference-in-differences)
• Consider duration between pre and post
  – Seasonal factor (usually 1 year minimum)
  – Time after intervention in place (more response right away due to novelty, and may drop off)
• Consider small number of parks vs. large number of repeated measures per park
Analytic Issues

- Small number of parks
- Many observations (usually 12-16)
  - Provides statistical power to detect differences
  - Captures intra-day and inter-day variation in park use
Verification

• Tools have time-stamps, so it is possible to verify accurate data collection
• Tablets have cameras, so can check reliability of observations
• We usually take 1 picture per park assessment.
# Full-park Observation Schedule

<table>
<thead>
<tr>
<th>Tuesday</th>
<th>Thursday</th>
<th>Saturday</th>
<th>Sunday</th>
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<tbody>
<tr>
<td>8am</td>
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<tr>
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</tr>
<tr>
<td>2pm</td>
<td>6pm</td>
<td>3pm</td>
<td>5pm</td>
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</table>
Training

• 2 days
• Practice in the field
• Meet reliability standard (80% agreement)
  – Do full park rotation,
  – Observe at least 3 complex target areas (>5 people in MVPA)
Decision to Survey

• Park Users vs. Local Residents
  – Park users easier to do
  – Depends on how busy park is
  – Convenience (80%) vs. quota (42%) or systematic sampling (higher refusal rates among sedentary than active)
实施挑战

- 安全问题
- 社区访问问题
- 家庭调查需要更多时间，多次访问（83%的响应率，最多4次访问）
Survey Items

• Assess:
  – Self-reported park use and PA, distance/mode travel
  – Exposure to the intervention
  – Facilitators and barriers to park use

• Other research questions/outcomes
  – Mental health, social capital, isolation

• Usually serial cross-sectional, rather than longitudinal cohort
Concerns

• Sample size:
  – For small exposure, need larger sample sizes
  – Very difficult to capture change from surveys

• Identify exposure to intervention or outreach

• Substitution or change—need to include non-park users
Return on Investment

• Calculate the cost of the investment/net gain in METS
  – Sedentary= 1.5 METS
  – Moderate PA= 3 METS
  – Vigorous PA= 6 METS

• Consider only MVPA (or also include sedentary, assuming people engaged in moderate PA to get to the park)
Fitness Zone Evaluation
(pre-post design, post-hoc controls)

- How well is the TPL fitness equipment used after installation?
  - Which age, gender, race/ethnic groups use it?
  - How often do they use it?
  - Do they use it correctly?

- Do more people use the park (Fitness Zones plus other activity areas)?
  - Are they more physically active than when the equipment was not available?
Total METs (12 Parks)

1 MET = Energy at rest for 1 hour
1.5 = Sedentary, 3.0 = Walking, 6.0 = Vigorous

![Bar chart showing total METs across different time points: Baseline, 1st FU, 2nd FU. The chart indicates a significant increase in METs from Baseline to 1st FU, with a slight decrease from 1st FU to 2nd FU.](chart.png)
Distance Fitness Zone Users Live from Park (1st and 2nd Follow-up Combined)

- **Fitness Zone Users**
  - Average: 0.85 miles
  - Range: 0.002 – 15.6 miles

- **Rest of Park Users**
  - Average: 1.07 miles
  - Range: 0.002 – 20.6 miles

Bar chart showing the percent of users living at different distances from the park.
Percentage Coming to the Park Solely to Use Fitness Zone Equipment

*Propensity score analysis confirms increase in new users at first follow-up (+2.3%=53% increase)

*controls for age, race, gender, ethnicity, distance from the park, participation in park activities, physical activity at work
Cost-Effectiveness is Favorable

Assumptions:

• $45,000 per zone for 15 years or $3000/year
• If maintenance is $2000 per year, annual cost is $5000
• Assume that average METs expended between time 1 and 2 holds for 12 hours/day, 7 days/week, 48 weeks/ year
• Cost per MET is $0.09/MET per FZ
• For adults, less than $0.50/MET is considered cost-effective; thus FZ more cost-effective than many other evaluated physical activity interventions
Lessons Learned

• Be prepared for delays
  – Renovations are often not on schedule
  – Park staff don’t even know when things will happen

• Factors outside of park control/domain can affect success of projects
  – Budget changes, sports league changes
  – Violence/gangs
  – Uncooperative staff
  – Weather
  – Controls are contaminated (become interventions)
Recommendations

• Allow extra time to complete project
• Be persistent
• Watch out for observer drift/shortcuts/missing data
• Review data to assess fidelity to protocols and allow for makeups when data are missing

Stay on top of it!