Harvard
Prevention Research Center
on Nutrition and Physical Activity

*Developing and Evaluating Objective Measures of Outdoor Walking Facilities: Project Overview & Update**

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Southwest Corridor:
Boston, MA

Our Interdisciplinary Team

- **Public health, geography, landscape architecture**
- Philip Troped, PI, Harvard School of Public Health
- Ellen Cromley, Co-PI, – University of Connecticut, Dept. of Geography
- Co-Investigators: Hope Hasbrouck, Harvard School of Design, and Steve Gortmaker, HSPH
- Other team members: Maren Fragala & Steve Melly
- Local & national consultants

GPS Data Collection at Franklin Park, Boston, MA

Project Aims

1. Develop objective GIS measures of the physical characteristics of six outdoor walking facilities in urban, suburban & rural communities in MA
2. Develop & assess the reliability of a path/trail data collection tool - *Path Environment Audit Tool (PEAT)*
3. Assess strengths & limitations of multiple methods used to measure physical characteristics of trails
4. Document GIS & other study methods
5. Disseminate findings through multiple venues

Research Approach: Components

1. Formative work to identify/prioritize key physical characteristics & identify study sites
2. Development of data collection tools & protocols
3. Data collection – GPS, paper & pencil observations (PEAT), identifying & downloading existing GIS data layers
4. Processing & analysis of data - testing reliability of observation tool, constructing GIS measures
5. Summarizing findings, including a critique of study methods, measures & estimated costs

Characteristics of Study Sites

	Southwest Corridor	Franklin Park	Daneny Park	Cutler Reservation	Minuteman Bikeway	Nashua River Rail-Trail
Setting & type of facility	Urban linear park	Large city park	Urban-suburban park	Suburban conservation land	Suburban rail-trail	Rural rail-trail
Trail length	13.6 km 8.4 mi	10.3 km 6.4 mi	4.8 km 3.0 mi	5.4 km 3.4 mi	18.6 km 11.6 mi	18.4 km 11.4 mi
Surface	Asphalt Concrete Brick	Asphalt Concrete	Asphalt Brick	Dirt Dirt/Gravel	Asphalt	Asphalt
Trail width (range)	2.7 m (1.3-8.2)	3.3 m (1.0-9.6)	2.4 m (1.4-3.2)	2.0 m (0.5-4.2)	2.9 m (0.4-3.8)	3.1 m (1.0-3.6)
Trail intersects road?	Yes	On access segments	No	No	Yes	Yes

Approach to Selecting Measures

- Apply social cognitive theory, ecological models & *behavior settings* construct
- Develop measures based on research & practice guidelines from physical activity, landscape architecture, urban planning & parks and recreation
- Gather & incorporate information from local users (i.e., intercept surveys at 2 sites)
- Develop measures of both trail (*site)* and neighborhood contextual (*situation)* characteristics

Developing Measures: 3 Primary Methods

1. Collect detailed trails data with high-level GPS unit
2. Develop *Path Environment Audit Tool (PEAT*) & collect supplemental trail data
3. Obtain & integrate existing GIS data layers (e.g., 2000 U.S. Census data)

Physical Characteristics

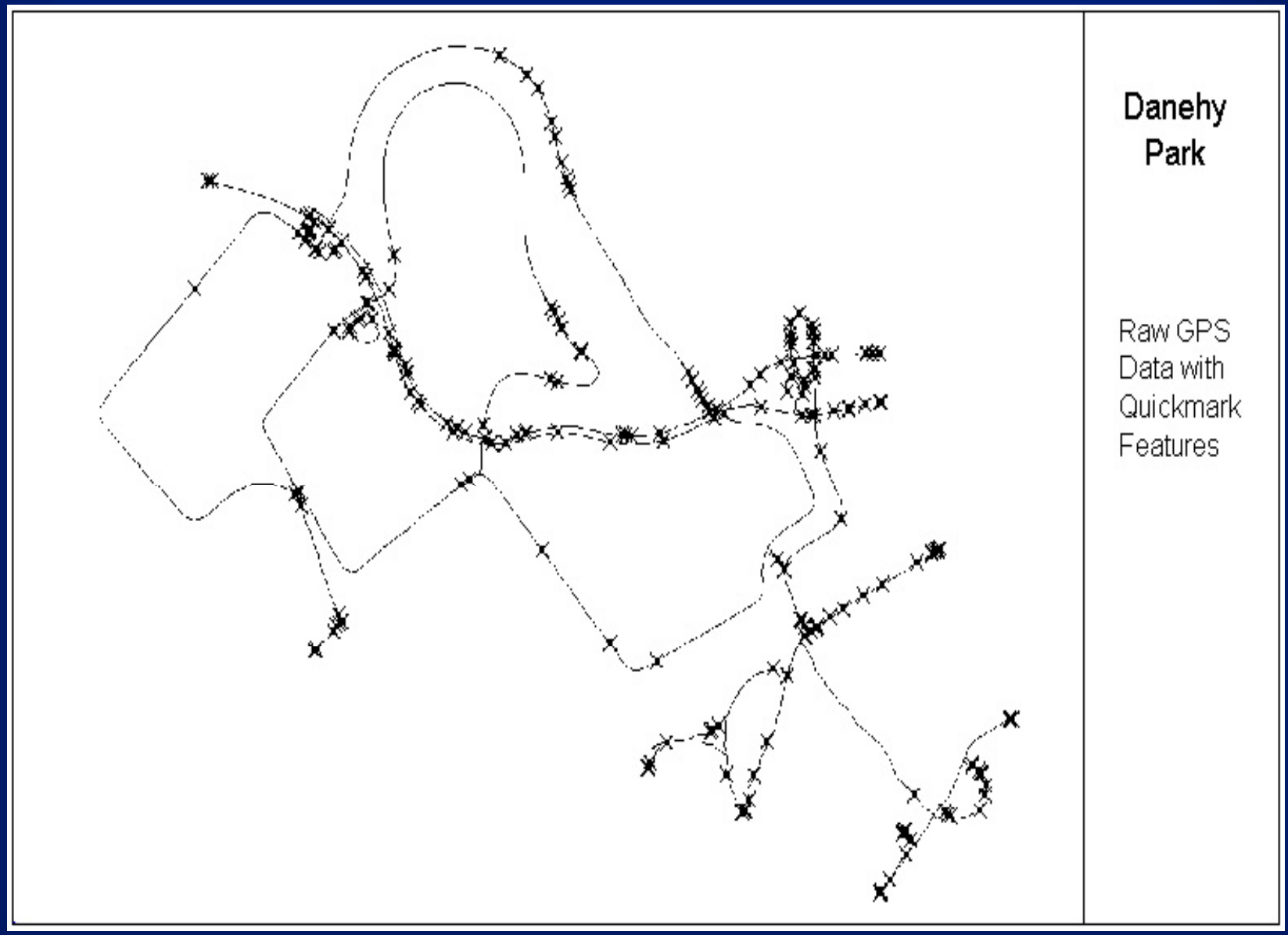
Physical Characteristics	*Data Source(s)*	*Examples - Derived Variables*
Design features (e.g., surface type & condition, trail width, grade)	GPS PEAT (paper & pencil tool)	• % paved • Mean width
Amenities (e.g., presence & condition of pay phones, lighting, restrooms)	GPS PEAT	• Mean # lights/mile or trail segment • % restrooms in good condition
Aesthetics (e.g., water body adjacent to trail, litter, graffiti)	GPS PEAT GIS data layer	• density litter/trail segment
Situation or contextual variables (e.g., residential density within buffer of trail)	GPS GIS data layers	• % of buffer that is residential, mixed use or commercial.

Overview of GPS Data Collection

- **Aim:** obtain accurate spatial data on trail attributes (e.g., surface type) and site amenities (e.g., lighting)
- **Rationale:** adequate spatial data on trails and paths not available
- **Methods:** used Trimble GPS Pathfinder Pro XR receiver, a TSCI Asset surveyor (hand-held) & Trimble Pathfinder software
  - 3-4 person teams from UConn & Harvard
  - Collected GPS data on > 40 miles of paths

Raw GPS Data

Danehy Park



Danehy Park Trail Network: From GPS

GPS Results: Counts of Amenities

Amenity	Southwest Corridor	Franklin Park	Danehy Park	Cutler Reservation	Minuteman Bikeway	Nashua River Rail-Trail
Lighting	467	59	21	0	12	0
Garbage cans	158	123	31	3	21	2
Signs	186	29	32	25	150	113
Benches	101	71	42	5	21	7
Picnic tables	1	36	32	0	3	0
Telephones	0	0	3	0	1	0
Emergency call boxes	0	0	3	0	0	0
Restrooms	0	7	5	0	3	2
Drinking fountains	0	3	4	0	2	0

PEAT Methods

- **Aim:** conduct observations on amenity attributes (e.g., cleanliness of benches) & integrate with GPS data
- Create an Access-based tool for PEAT – use in field with tablet PC (***currently pretesting***)
- Use GPS trails data to create functional unit of observation (approx. 400 m) – PEAT segments
- Collect data on all PEAT segments using Tablet PC, maps created from GPS & hand-held GPS to identify location
- Two observers will conduct observations at 6 sites

Link to PEAT

Integration of GIS Data Layers

- Led by Dr. Ellen Cromley & Steve Melly, team identified “useful” datalayers available from MassGIS
- Examples of datalayers downloaded:
  - Town and county boundary data
  - Massachusetts roads
  - Elevation contours
  - 2000 U.S. Census
  - Orthophoto images

Data Analysis Plan

- **Statistical analyses:**
  - **Interobserver reliability**: Pearson correlation coefficients; Cohen's kappa coefficient and/or Spearman's rank correlation
  - **Intrasite variability**: statistical techniques described by Raudenbush & Sampson*
- **GIS analyses:**
  - Path structure (connectivity, path density)
  - Analysis of recreational area accessibility

*Raudenbush SW, Sampson RJ. Ecometrics: Toward a science of assessing ecological settings, with application to the Systematic Social Observation of Neighborhoods. Sociological Methodology. 1999;29:1-41.

Remaining Workplan Priorities

- Finish pretesting PEAT & prepare tool for actual observations
- Complete processing of GPS data & downloading of GIS data layers
- Conduct PEAT observations at 6 sites & assess reliability
- Integrate PEAT data into GIS database
- Create derived variables – both for trail characteristics & neighborhood contextual measures
- Develop manuscripts for publication

So What?..... What are the Potential Contributions?

- Created a reliable trail/path audit tool (*PEAT*)
- Produced a comprehensive set of objective (GIS) measures of trail and neighborhood characteristics that can be used in PA/trail use determinants studies
- Developed a valid and reproducible approach to GIS database design for outdoor trails/paths

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and……

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Thank You!