



Data and Analytics for Activity Modeling
or
Place Perception, Attractiveness, Meaning & Relationship to Activity & Travel

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Executive Course
Activity-Based Modeling of Spatial and Temporal Patterns of Human Travel Behaviour
Tongji University, Shanghai July 9-10, 2016

Examples of policy analysis needs

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Congestion Pricing

- Toll strategies/pricing
 - Impose a toll and predict elasticity of demand (-0.1 to -0.4)
- Conventional models
 - Predict shifts in departure & arrival time
 - Observed elasticity lower than predicted
 - Why?
 - Time offset (freeing capacity taken by others)
 - Value of time very different among segments
 - Entire activity-travel schedule modified by pricing
- Activity-based models could address these issues

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HOV/HOT

- Conventional models
 - HOV as a mode (time and cost)
 - Overestimate the number of users
 - The problem is lack of accounting for intra-household interactions and carpool formation
- Activity-based models
 - Include hh-member interactions
 - Include a car assignment to person model/routine

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Parking

- Conventional models
 - Parking duration not modeled
 - Parking lot = destination of trip
 - Summary demand by period of day
- Activity based models
 - Explicit estimation of parking duration
 - Operate at fine temporal resolutions
 - Can keep track of cars in households

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Transit fare

- Conventional models
 - Zone to zone base fares
 - Examine changes in ridership and correlate with fare changes
- Activity based models
 - Transit paths can be developed
 - The impact of waiting times and costs examined in terms of overall change in scheduling
 - Too much work?

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Shorter days and weeks

- Conventional models
 - Not sensitive to work duration
 - Impose change in trip generation and see what happens
- Activity-based models
 - Activities, travel, and duration of activities are tied together
 - Changes in work duration and days of the week are explicitly modeled (increases in after work periods, available extra day to do other things and so forth)

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Demographic shifts

- Conventional models
 - Very few segments
 - Operate at OD level
- Activity based models
 - Include full-time vs. part time workers
 - Include children by age groups
 - Can include many additional segmentations because of synthetic population generation (see PUMS like data)

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Car ownership and type

- Conventional models
 - Absent
 - Number of cars per household
- Activity-based models
 - Explicit car ownership and assignment to persons
 - Type easily incorporated (including fuel type)

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Emissions inventory

- Conventional models
 - Vehicle activity is handled by post-processing
 - Does not account for within household vehicle assignment and does not produce a vehicle trace -> loss of vehicle use profiles
- Activity-based models
 - Details about who uses each vehicle and when/where
 - Some produce traces of vehicles (soak times)
 - New generation emissions models may be more compatible (!) with this approach

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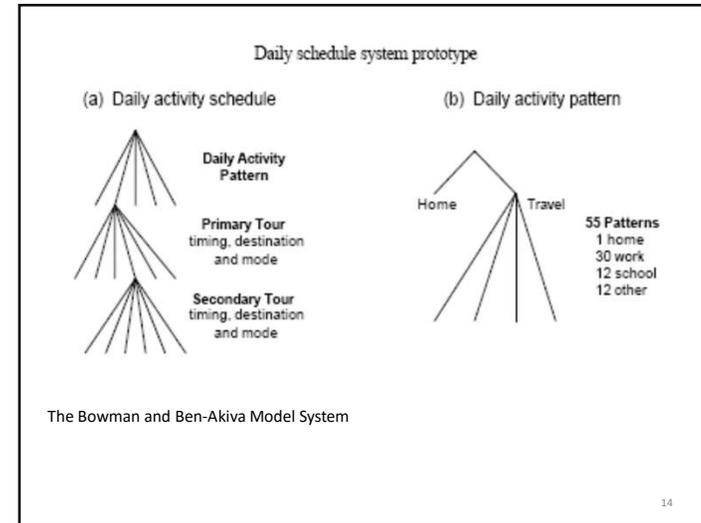
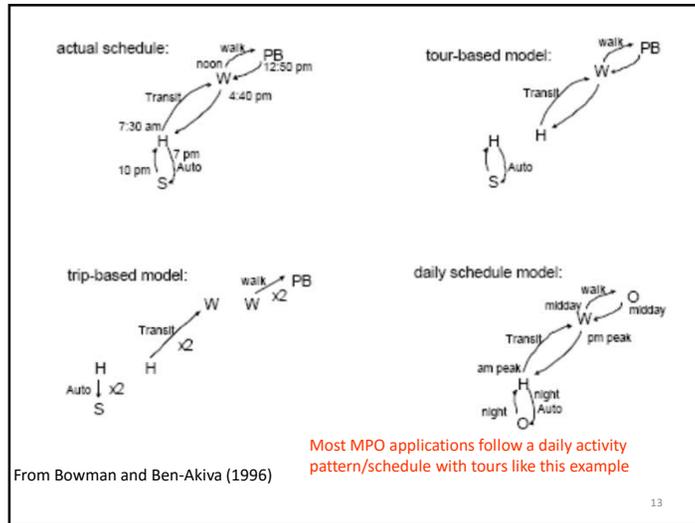
Land use & development

- Conventional models
 - Build scenarios and data fed into 4-step
 - Zone to zone travel time and costs (accessibility indicators) used in land use
 - Can be done in feedback fashion for lagged time
- Activity based models
 - Offer opportunity for true integration
 - Land use driven by location desires (and developer desires)
 - Travel models use more detailed land use data

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Common components among applications

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Common Modeling Trends

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- ## Models
- Anchor points (Home location – work location – school location) are in the first choice level
 - Out-of-home activity purposes include work, school, shopping, meals, personal business, recreation, and escort
 - In-home activities sometimes (work, maintenance and discretionary)
 - Stop frequencies and activities at stops are modeled at the day pattern and tour
 - Mode and destination are modeled together (mutual influence – sequence or simultaneous)
 - Departure time modeled explicitly and feed into multiple time periods for traffic assignment
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Human Interactions

- Day patterns of one person relate to day patterns of another person within a household
- Joint activities are explicitly modeled (joint recreation, escort trips)
- Allocation of activity-roles explicitly modeled

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Time

- Departure time for trips
- Tour time of day choice
- Time periods between 30 minutes and minute-by-minute
- Time windows to account for scheduling
- Output of time periods depends on traffic assignment needs

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Spatial and Land Use

- Spatially distributed synthetic population using external control totals provide the basic data
- Accessibility measures start to be used (spatial interaction types) – usually logsums
- Network zones from 1,250 to 6,000
- Other units include:
 - Sacramento moves to 700,000 parcels
 - MTC possibly subzones for transit
 - Denver attempts use of buildings

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Other Key Aspects

- Car ownership and car type
- Car allocation within household
- System LOS within accessibility but congestion?
- Homes and schools emphasized - Business locations and major center locations not prominent

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Requirements for a typical activity based model?

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Possible Parallel Tracks/tasks

TRANSITION MODEL

- Day Schedule Tour based
- Car to person assignment
- Destination choice
- Account for multi-center agglomeration
- Compatible with enhanced four step
- Interfaced with truck model
- Use existing survey data
- Interfaced with existing land use scenarios
- Loosely integrated land use travel model

FINAL MODEL

- Synthetic schedules in space and time
- Human interaction
- Rhythms of life (week and seasons at least)
- Synthetic pop. Generator
- Synthetic residence locations
- Synthetic industrial locations
- Truly integrated land use travel model

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WHAT TYPE OF DATA COLLECTION METHODS DO WE NEED?

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Total Design Data Needs for the New Generation Large Scale Activity Microsimulation Models

Goulias-Bhat-Pendyala



9th International Conference
on Transport Survey Methods:
Scoping the Future While Staying on Track

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Data Needs

- Core Behavior and Household Characteristics
 - Other aspects – policy dependent (cars and costs, long term choices and lifestyle, attitudes)
- Other agents (firms, institutions, plans, and so forth)
- Landscape/Environment/Context
 - Activity locations
 - Homes/Jobs/Schools
 - Availability over time

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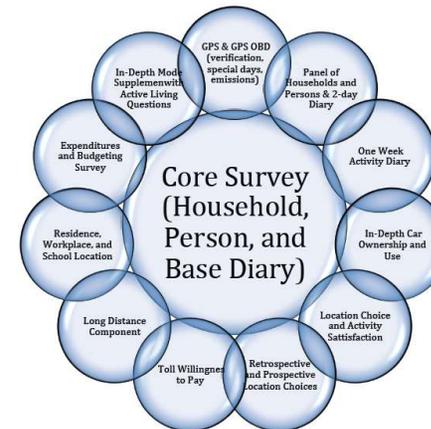


Figure 4 The Data Collection Overall Scheme

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One Week Activity and Travel Diary

- Account for day-to-day variation in activity scheduling and travel and attempt to identify shifting of tasks and activities from one day of the week to the next.
- Design to capture the behavioral processes of scheduling activities, and planning and subsequent re-scheduling modifications (see the Toronto tradition).

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Toll Willingness to Pay

- Attitudes and willingness to pay for tolls on highways
 - Develop behavioral equations of the willingness to pay
 - Large scale regional simulation models to develop pricing strategies
- (Bhat and Castellar, 2002; Bhat and Sardesai, 2006).

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GPS and GPS OBD

- Develop a database to correlate destinations to routes and identify a typology of different types of routes and stop making patterns;
- Develop a route choice model;
- Estimate the level and nature of misreported trips by different modes of the main two-day activity diary;
- Verify day-to-day behavioral change in other survey components and day of the week effects; and
- Provide detailed operating characteristics of the household vehicles.
- NOTE: This component for persons carrying GPS devices (wearable GPS) can also be supplemented with an online diary and vehicle-mounted GPS (week long to capture day to day variation) and
- On-Board Diagnostics devices (to identify driving patterns and correlate/link them with emissions models).

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Mode Supplement

- **Reasons** for not using specific modes, including non-motorized modes for active living studies.
- The survey objective is to identify situational constraints, attitudes, and predispositions in favor or against modes such as walk, bike and public transportation.
- Create models to study policy actions that go beyond the time-cost-comfort analysis.
- Add a stated choice, intentions, and preference component to this module.
- Emphasis on collecting data about walking and biking either as a main mode for each trip or as an access mode to another main mode (e.g., walking from a parking lot to an office, biking to a bus stop and then taking the bus).

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Residence, Workplace, and School Location Choice:

- Critical survey component for behaviorally integrated land use travel demand models!
- In-depth survey to identify the determinants for each of the residential, workplace, and school choices (see Kortum et al., 2012).
- Both primary locations and secondary locations should be examined in more detail than typical household surveys and data collected to estimate choice models for each facet.
- Examine behavior retrospectively and prospectively.
- Possibly add questions about personal biography of each household member using techniques that are not used by typical household surveys (e.g., ethnography).

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In Depth Car Ownership Change and Car Assignment

- **Identify** the determinants for each of the car ownership, car type (e.g., new/used, model, make, and fuel type), and car assignment decisions.
- In the car assignment data collection, both the primary and secondary drivers should be identified.
- Identify determinants of changes in car ownership, type, and assignment of cars to household members.
- Particular emphasis should be given to policy controlled determinants (e.g., taxation, incentives). One approach to study this latter part is using combinations of revealed and stated preference surveys.

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Activity Satisfaction Survey

- Provide a benchmark for the diary instrument; and
- Create an assessment of activities (including trips) and subjective experiences that is able to capture preferences, satisfaction, and perceived quality of life.
- This second set of objectives will enable estimation of choice models with latent variables and classes that are by far richer and more informative than their counterpart observed variable discrete choice models (see the “happiness literature”).

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Destinations & Perceptions

- We know that places have symbolic and other meanings that travel behavior models neglect.
- This component identifies how destinations are perceived and what role these perceptions play in their selection.
- Major aspects = mental maps and sense of place

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Panel of Households and Persons and Multi-Day Activity

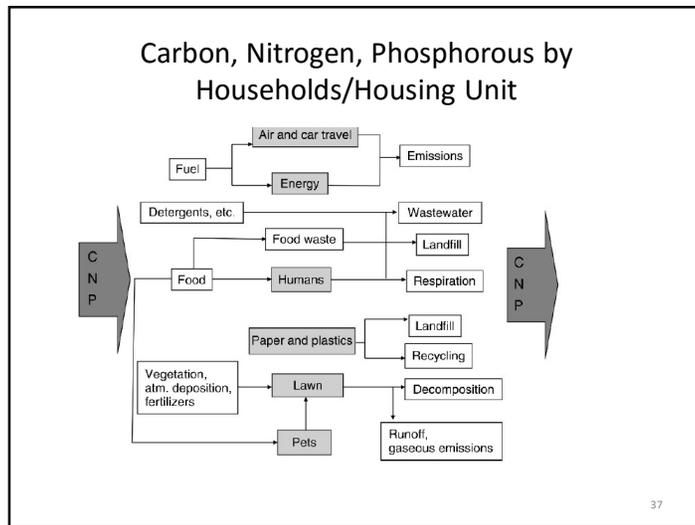
- Undecided: would like a Mobidrive (6 weeks)
- Would also like year to year evolutionary measurement
- Most likely a rotating panel of longer than one week duration

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Energy Use and Expenditures

- Link housing to transportation demand.
- Develop more complete household Greenhouse footprints
- Develop models of comprehensive accounting of energy demand.
 - Annual, monthly, or even weekly expenditures for activity participation, travel, and vehicles and housing units maintenance ownership and energy consumption are not collected in typical travel surveys.
 - This component will provide the data needed to enable a direct association between travel and at home energy consumption to eventually create models of the type in Fissore et al. (2011).

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Long Distance Travel

- Travel models in Mega regions and statewide applications also need models that are able to capture what is called interregional travel and long-distance travel.
- Many of the trips in this class are business related, leisure related, or simply long commutes.
- Maybe also study trade-offs people make when they engage in travel that, for example, requires an overnight stay outside the home base.

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In Closing

- This is still not enough!
- Business Establishments – spatial distribution of opportunities, time of day availability, commodity flows and trucks/commercial vehicles
 - Firmographics to parallel Demographics
- Deliveries to households (UPS/FEDEX, DHL, Postal, Gardeners, Maintenance)
- See recent SANDAG RfP and the FAME supply chain simulation models

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PERCEPTION & REALITY

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Quality of Urban Life

- Jan Gehl – architect and urban designer (Copenhagen mostly)
- Elements of good design
- Uses human **physiology** characteristics to guide design (human dimensions!)
- Uses **social interaction** to also guide design but not sophisticated social networks analysis
- Developed a detailed taxonomy of micro-design principles
- Normative principles – we need assessment based on behavior, cognition, and satisfaction

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Protection	PROTECTION AGAINST TRAFFIC AND ACCIDENTS — FEELING SAFE <ul style="list-style-type: none"> • Protection for pedestrians • Eliminating fear of traffic 	PROTECTION AGAINST CRIME AND VIOLENCE — FEELING SECURE <ul style="list-style-type: none"> • Lively public realm • Eyes on the street • Overlapping functions day and night • Good lighting 	PROTECTION AGAINST UNPLEASANT SENSORY EXPERIENCES <ul style="list-style-type: none"> • Wind • Rain/snow • Cold/heat • Pollution • Dust, noise, glare
Comfort	OPPORTUNITIES TO WALK <ul style="list-style-type: none"> • Room for walking • No obstacles • Good surfaces • Accessibility for everyone • Interesting façades 	OPPORTUNITIES TO STAND/STAY <ul style="list-style-type: none"> • Edge effect/ attractive zones for standing/staying • Supports for standing 	OPPORTUNITIES TO SIT <ul style="list-style-type: none"> • Zones for sitting • Utilizing advantages: view, sun, people • Good places to sit • Benches for resting
	OPPORTUNITIES TO SEE <ul style="list-style-type: none"> • Reasonable viewing distances • Unhindered sightlines • Interesting views • Lighting (when dark) 	OPPORTUNITIES TO TALK AND LISTEN <ul style="list-style-type: none"> • Low noise levels • Street furniture that provides “talkscapes” 	OPPORTUNITIES FOR PLAY AND EXERCISE <ul style="list-style-type: none"> • Invitations for creativity, physical activity, exercise and play • By day and night • In summer and winter
Delight	SCALE <ul style="list-style-type: none"> • Buildings and spaces designed to human scale 	OPPORTUNITIES TO ENJOY THE POSITIVE ASPECTS OF CLIMATE <ul style="list-style-type: none"> • Sun/shade • Heat/coolness • Breeze 	POSITIVE SENSORY EXPERIENCES <ul style="list-style-type: none"> • Good design and detailing • Good materials • Fine views • Trees, plants, water

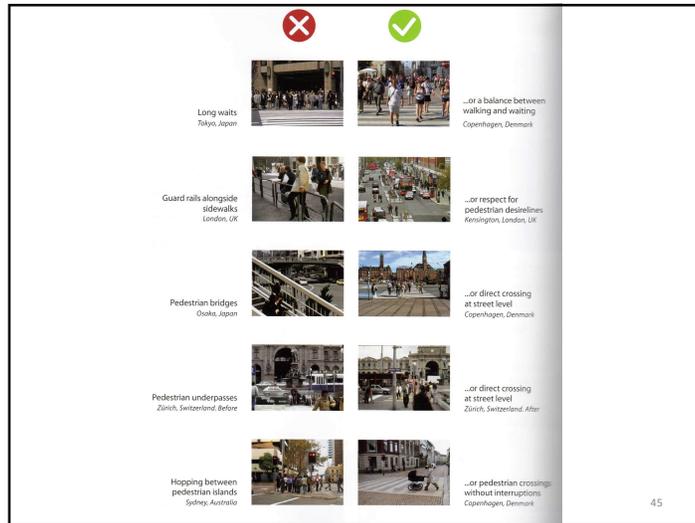
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Obstacles on the sidewalks <i>Cordoba, Argentina</i>			...or a dignified pedestrian experience <i>Riga, Latvia</i>
Narrow sidewalks <i>London, UK</i>			...or a more equal distribution of space <i>Copenhagen, Denmark</i>
Applying to cross the street <i>Sydney, Australia</i>			...or being politely informed <i>Copenhagen, Denmark</i>
Flashing red light urging people to speed up while crossing <i>New York, USA</i>			...or being politely informed <i>Copenhagen, Denmark</i>

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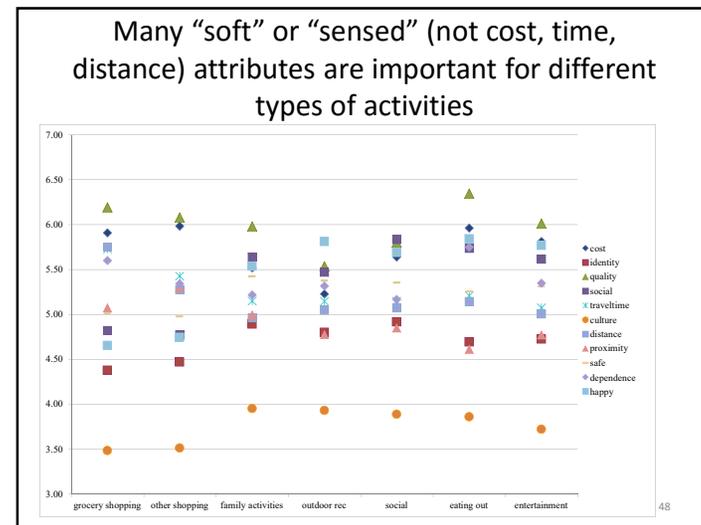


Locations and Activities are Closely Related and Activity Location Choice Depends on Different Attributes with Different Decision Weights

In one of the Geotrans surveys we asked a series of questions about attributes for 7 types of activities: *grocery shopping, other shopping, activities with family, outdoor recreation, social activities, eating out, and entertainment* (Likert 7 categories of strongly disagree to strongly agree)

1. Cost of goods or services at the place- "cost"
2. Whether the place is a good reflection of the type of person I am- "identity"
3. The quality of the products or services offered- "quality"
4. Whether the place has a positive social atmosphere- "social"
5. How much time it will take me to travel to the place- "traveltime"
6. How well the place reflects the Santa Barbara lifestyle- "culture"
7. How close the place is to my home- "distance"
8. The safety of the surrounding area- "safe"
9. If there are other places close by where I can do other activities- "proximity"
10. Whether the place meets all my [fill in the activity type] needs- "dependence"
11. Whether the place makes me feel happy- "happy"

Intangible amenities? Imaginary? Sensed attributes?



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The usual multivariate analysis tells us dig deeper!

	Grocery shopping		Other shopping		Family activities		Outdoor recreation		Social activities		Eating out	
	Coef	Wald	Coef	Wald	Coef	Wald	Coef	Wald	Coef	Wald	Coef	Wald
Intercept	-1.233	5.924 (.015)	.001	.000 (.999)	.384	.666 (.414)	1.480	11.227 (.001)	.347	.599 (.439)	-2.607	25.970 (.000)
Cost	-.137	4.726 (.030)	.064	.979 (.323)	-.233	16.460 (.000)	-.325	34.567 (.000)	-.080	1.950 (.163)	.008	.020 (.889)
identity	.076	2.056 (.152)	.115	4.845 (.029)	.086	2.762 (.097)	.088	3.029 (.082)	.078	2.563 (.109)	-.080	2.916 (.088)
quality	.488	34.638 (.000)	.363	20.623 (.000)	.075	.941 (.332)	-.383	30.155 (.000)	-.317	19.510 (.000)	.418	26.633 (.000)
social	-.373	31.396 (.000)	-.449	45.701 (.000)	.097	1.706 (.191)	-.077	1.295 (.255)	.437	33.799 (.000)	-.009	.019 (.890)
traveltime	.318	14.477 (.000)	.274	11.884 (.001)	.145	3.662 (.056)	.147	3.946 (.047)	.020	.076 (.783)	.056	.601 (.438)
culture	.070	2.130 (.144)	.067	1.993 (.158)	.043	.913 (.339)	.011	.061 (.804)	-.001	.000 (.984)	.117	7.175 (.007)
distance	.312	14.200 (.000)	-.139	3.192 (.074)	-.168	4.992 (.025)	.006	.007 (.932)	.048	.438 (.508)	.049	.463 (.496)
proximity	.189	10.068 (.002)	.554	74.863 (.000)	.217	3.251 (.074)	-.001	.000 (.989)	.089	2.538 (.111)	-.214	16.880 (.000)
safe	-.260	26.626 (.000)	-.253	25.465 (.000)	.076	2.166 (.141)	.096	3.640 (.056)	.019	.152 (.696)	-.110	5.487 (.019)
dependence	.273	20.463 (.000)	.091	2.413 (.120)	-.096	2.967 (.085)	.041	.564 (.453)	-.138	6.742 (.009)	.291	27.527 (.000)
happy	-.769	136.749 (.000)	-.698	113.071 (.000)	-.293	18.261 (.000)	.170	6.070 (.014)	-.182	7.247 (.007)	-.104	2.403 (.121)

McFadden R² 0.11, -2 Log likelihood (full model) is 13718.54, -2 log likelihood (intercept model) is 12050.63, n= 3847

We Need to Find Ways to Measure Previously Unmeasured Aspects (also called emotions by part of the literature)

- @Clearly Definable Locations for Multiple Activities – 2 Shopping Malls
- In a Region Where Respondents Live
- @Institution/Place of Significant Value to the Personal Growth of Respondents

Outline

- **Location-Space-Place and Human-Built Environment Relations**
 - Two Malls
 - The Region
 - UCSB Campus
- Next Steps

With Kate Deutsch (main), Seo Youn Yoon, and Srinath Ravulaparthi

SENSE OF PLACE AND PLACE HAPPINESS (AN EXAMPLE OF ATTITUDES IN ACTIVITY & TRAVEL BEHAVIOR)

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Sense of Place (SOP)

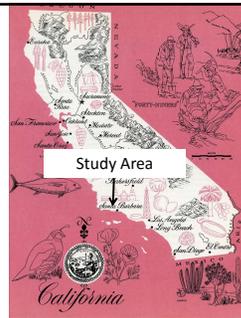
- Initialized by Tuan(1974) as phenomenological entity. He provided the foundation and theoretical framework to describe **the emotional connection between place and people**
- Geographers debated on **quantifiability** and measurement issues (Canter, 1983; Golledge and Stimson,1997)
- Today we have a variety of options in terms of **attitudinal questions-based** measures of Sense of Place mainly from environmental psychology (Jorgensen and Stedman, 2001, 2006; Deutsch and Goulias, 2009, 2010, 2013)
- **Multiple dimensions** of Sense of Place (Altman and Low, 1992; Stokols and Shumaker, 1981; Guest and Lee, 1983; Jorgensen and Stedman, 2001, 2006 ; Brown and Werner, 2009; Deutsch and Goulias, 2009, 2010, 2013)
- We started exploring the connection between **Sense of Place and Travel Behavior** (Deutsch and Goulias, 2009, 2010, 2013)

Measuring Place Affect and Cognition

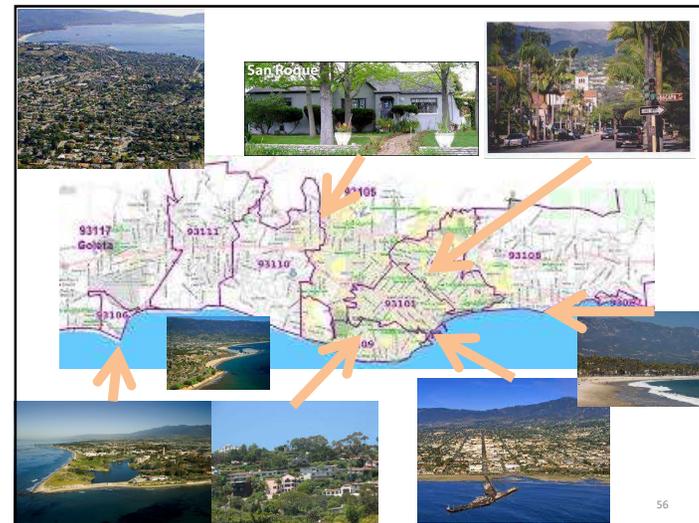
- Theory of Sense of Place
 - Belonging (I am Californian, Shanghainese, Parisian)
 - Attachment (makes me relaxed, proud, happy, sad)
 - Dependence (meets my needs)
 - Identity (reflection of me)
- Theory of Affordances:
 - People perceive the environment in terms of functionally significant properties (e.g., social interaction)
- Place Perception/Satisfaction
 - For each location measure attributes and importance

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BACKGROUND ON STUDY AREA (SOUTH SANTA BARBARA COUNTY)

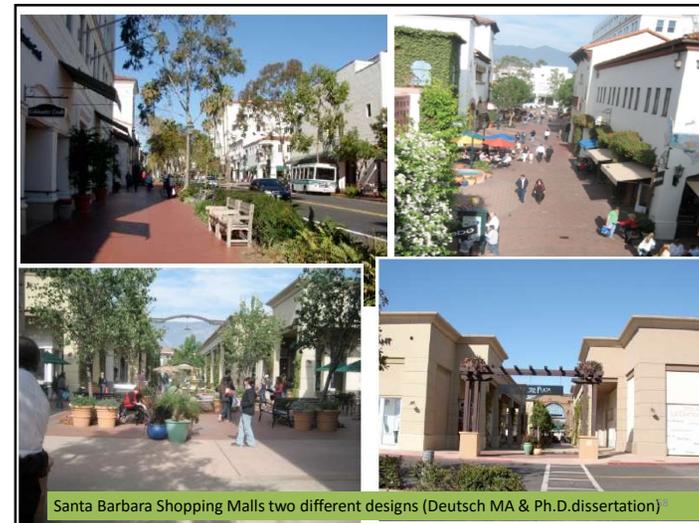
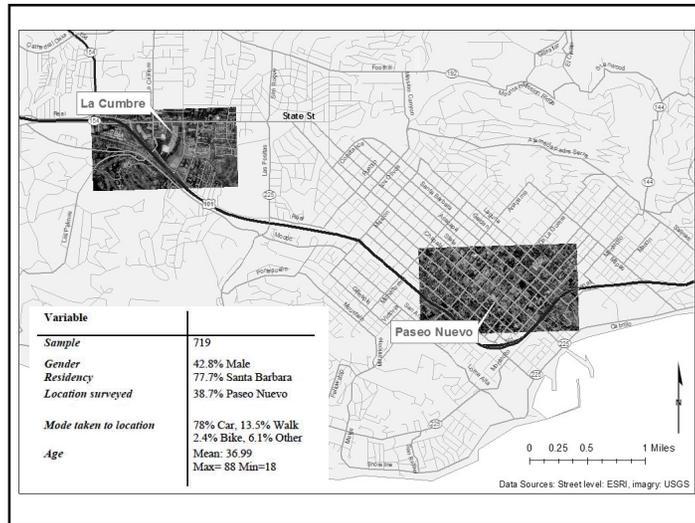


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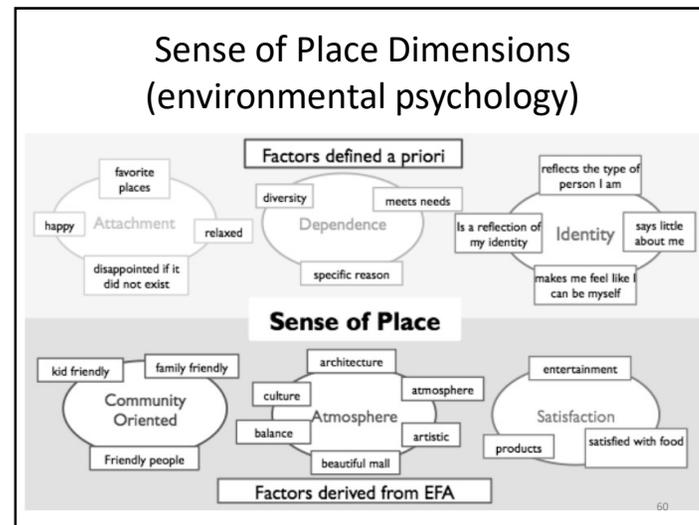
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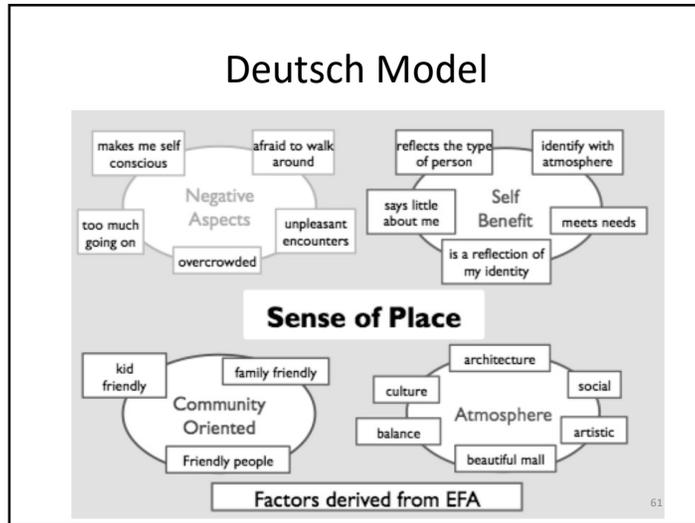


	J/S	SOP	M1	M2
Sat= satisfaction, dep= dependence, id= identity, atm= atmosphere, ph= physical, cul= cultural, soc= social				
Makes me feel relaxed.	X	Att	F1	
Makes me feel happy.	X	Att	F1	
I would be disappointed if it did not exist.	X	Att	F1	
Is one of my favorite places in SB.	X	Att	F1	
Meets my needs better than any other location in SB.	X	Dep	F2	F2
Has better diversity in activities than any other place in SB.	X	Dep	F2	
I only come when I have specific reasons in mind.*	X	Dep	F2	
Makes me feel like I can be myself.	X	Id	F3	
Is a good reflection of my identity.	X	Id	F3	F2
Reflects the type of person I am.	X	Id	F3	F2
Says very little about me.*	X	Id	F3	F2
I feel comfortable because I identify with the atmosphere.	Id	F2		
Makes me feel too self-conscious.*	Id	F1		
I am satisfied with the entertainment options	Sat	F6		
I am satisfied with the food options	Sat	F6		
I am satisfied with the products offered	Sat	F6		
Has stores that lack specific things.*	Sat			
I am satisfied with the parking	Sat			
I am satisfied with the level of services	Sat			
I am satisfied with the amount of people.	Soc	F4	F3	
[location]. is a family friendly place to be.	Soc	F4	F3	
[location]. is a kid friendly place to be.	Soc	F4	F3	
Has generally friendly people around.	Soc	F4		
Has a definite social atmosphere.	Soc	F4		
Involves a risk of unpleasant encounters*	Soc	F1		
Is always overcrowded.*	Soc	F1		
Has too much going on at it.*	Soc	F1		
Makes me afraid to walk around.*	Soc	F1		
Has visually appealing architecture.	Phy	F5	F4	
Is a beautiful mall.	Phy	F5	F4	
Has a good balance of decorative features and businesses.	Phy	F5	F4	
Has artistic value.	Phy	F5	F4	
Peaceful and relaxing atmosphere.	Phy	F5		
Reflects the culture of Santa Barbara (SB).	Cul	F5	F4	

*reverse coded, J/S= Jorgensen and Stedman, M1= Model 1 salience, M2= Model 2 salience



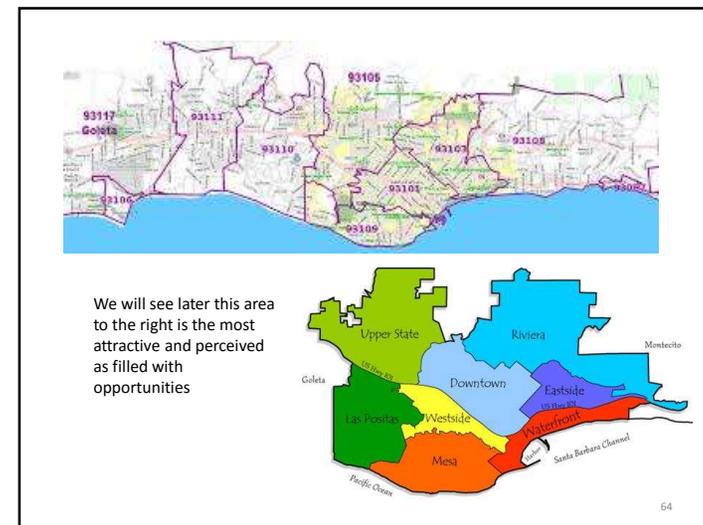
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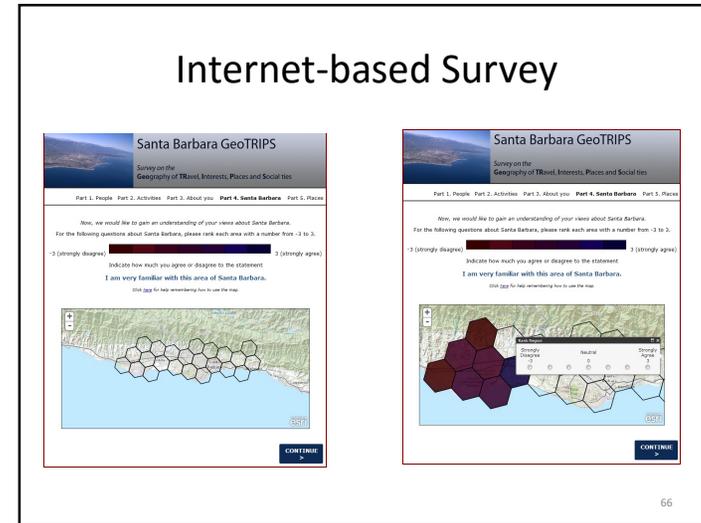
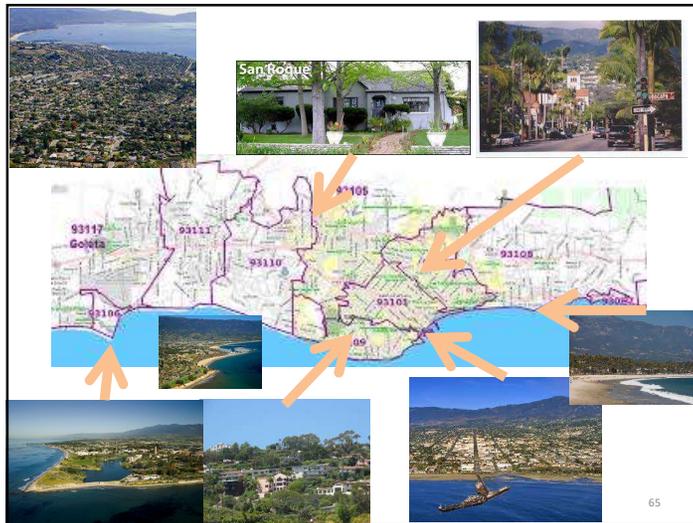
- ### Lessons Learned
- We can ask questions and derive factors but more than just the 3 main SOP factors (dependence, identity, attachment) are needed to capture variance in responses
 - Strong correlation with scheduling of activities and mode used to arrive at destinations – just shopping or a movie too?
 - Interactions with social networks important – with whom?
 - Different persons attracted by different features (again depending on activity) – strollers at La Cumbre
 - Need to look at different scales to identify the effect of multiple destinations – “downtown”

Measure attitudes and satisfaction for an entire city & region

Kate Deutsch Dissertation and Extensions by Lee and Davis (right now)



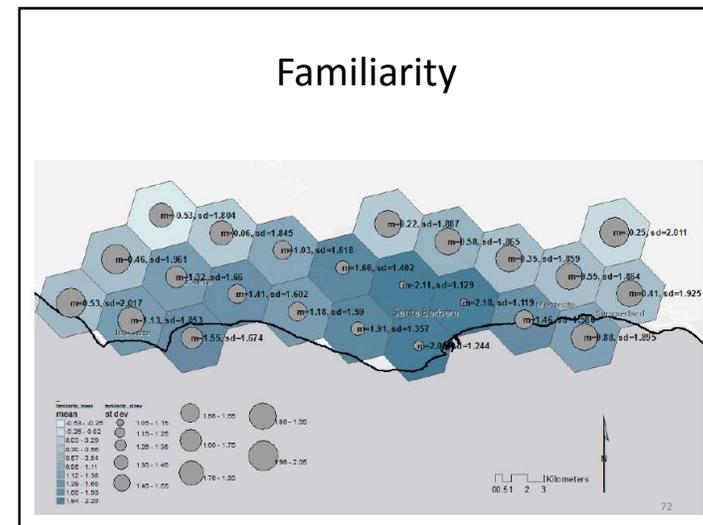
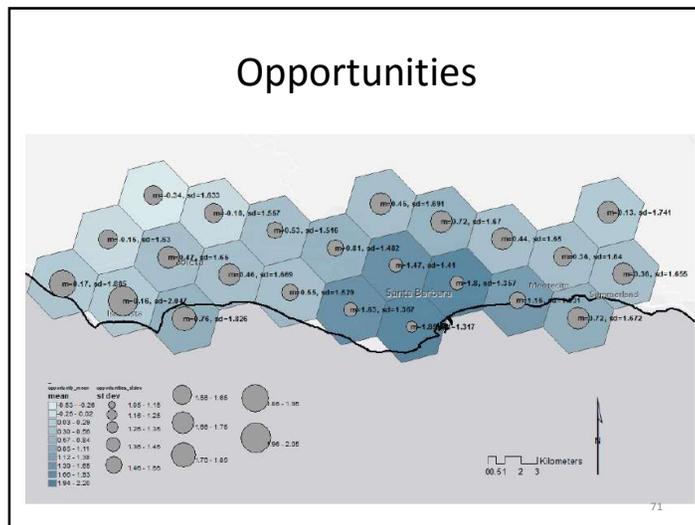
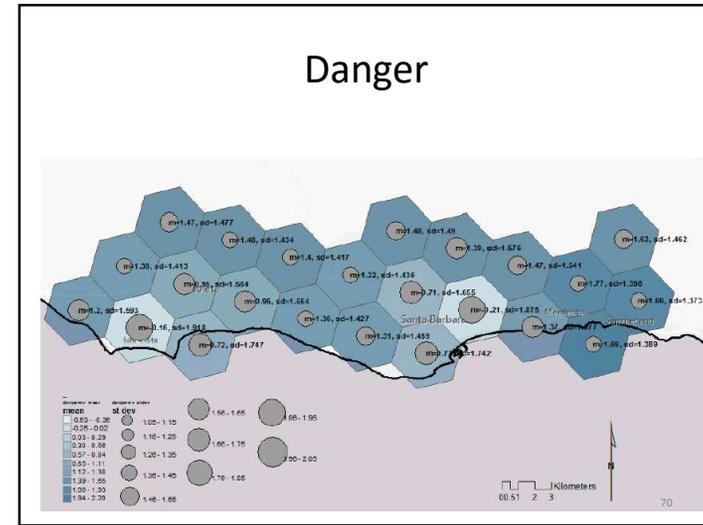
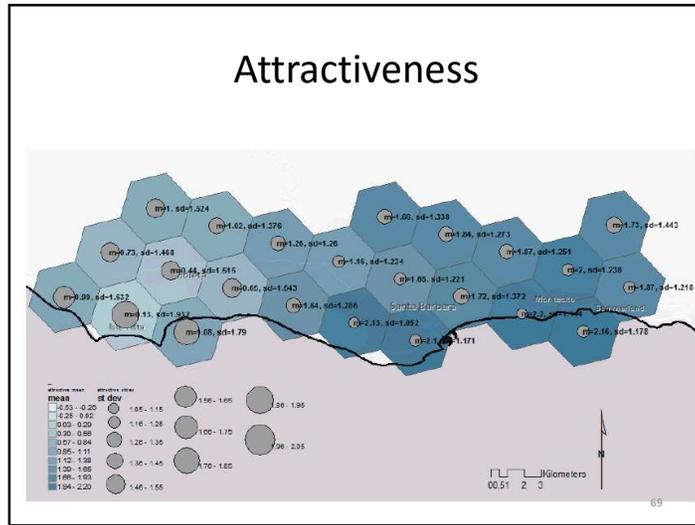
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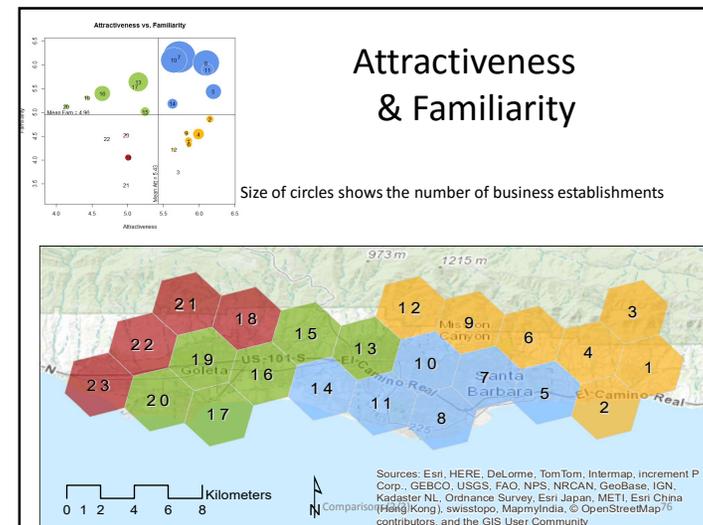
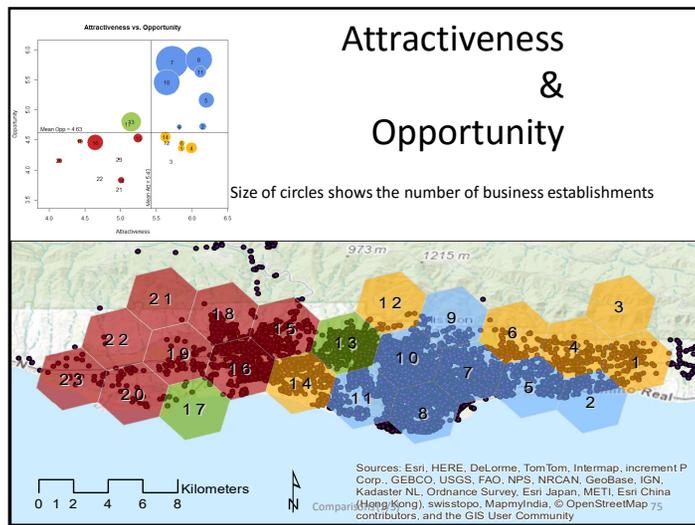
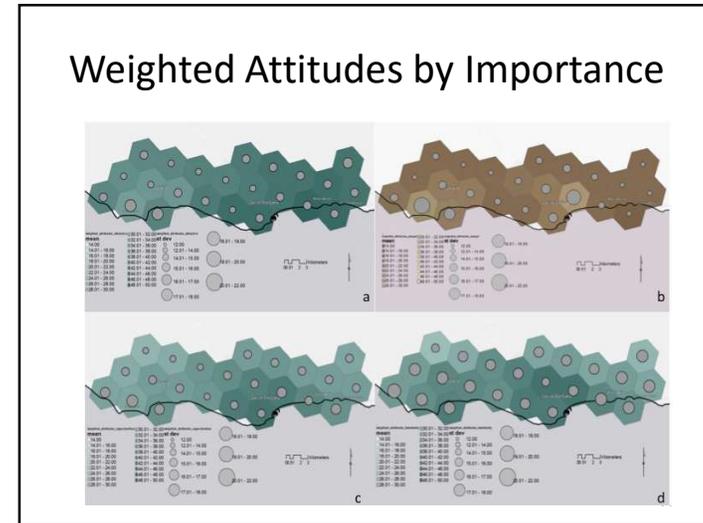
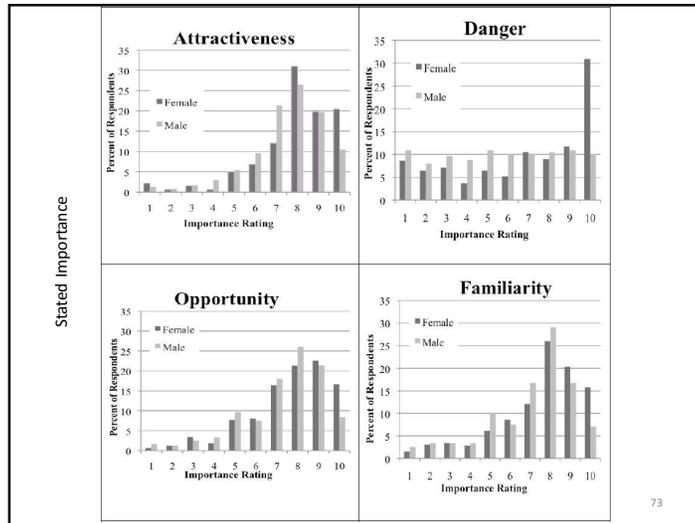
Variable	County Population	Study Area Population	Sample
Gender	Female: 49.8%	Female: 49.4%	Female: 57.6%
Years in house			Mean: 9.67 Standard Deviation: 7.84
Age	Median: 33.6	30-34 years	Median: 49 years
Household income	Median: \$61,896	Median: \$50,000-\$74,999	Median: \$50,000-\$9,999
	Less than \$10,000 5.00%	0 - \$9,999 6.10%	Less than \$10,000 5.88%
	\$10,000-\$14,999 4.50%	\$10,000-\$24,999 13.06%	\$10,000-\$19,999 4.63%
	\$15,000-\$24,999 9.20%	\$25,000-\$34,999 8.12%	\$20,000-\$29,999 4.99%
	\$25,000-\$34,999 9.10%	\$35,000-\$49,999 11.90%	\$30,000-\$39,999 8.20%
	\$35,000-\$49,999 12.80%	\$50,000-\$74,999 17.80%	\$40,000-\$49,999 8.73%
	\$50,000-\$74,999 18.60%	\$75,000-\$99,999 11.18%	\$50,000-\$59,999 9.27%
	\$75,000-\$99,999 12.10%	\$100,000-\$149,000 15.28%	\$60,000-\$69,999 8.91%
	\$100,000-\$149,999 15.40%	\$150,000-\$199,999 7.93%	\$70,000-\$79,999 13.37%
	\$150,000-\$199,999 6.70%	\$200,000 or more 8.63%	\$80,000-\$89,999 4.81%
	\$200,000 or more 6.70%		\$90,000-\$99,999 4.46%
			\$100,000-\$109,999 5.70%
			\$110,000-\$119,999 2.14%
			\$120,000-\$129,999 2.50%
			\$130,000-\$139,999 1.78%
			\$140,000-\$149,999 2.14%
			\$150,000 or more 12.48%
Households w/ children	33.9%	25.0%	25.1%
Household members	Mean: 2.86 persons	2.57	Mean: 2.69 persons
Size	423,895	84,475	561

- ### For each hexagon (isotropic tessellation)
- This is an attractive area of Santa Barbara
 - This is a dangerous area of Santa Barbara
 - This area provides me with a lot of opportunities to do things I like to do
 - I am very familiar with this area of Santa Barbara

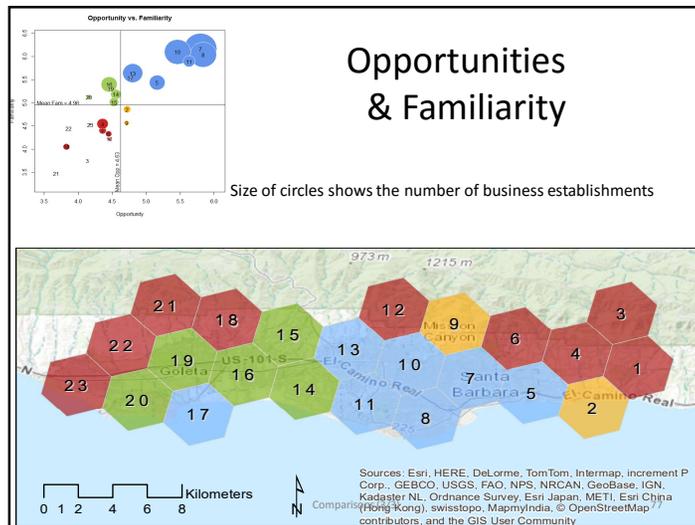
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We are building a variety of “regression” like models to understand relationships with objectively measured attributes

- Cross-correlation among attractiveness, opportunities available, familiarity, and perception of safety
- Personal and household characteristics (including residence location)
- Land uses
- Network characteristics
- Hexagons and spatial correlation
- *Individual factors important, land use diversity, place of residence also important, strong spatial correlation (Tobler’s law)*
- More @ the choice modeling conference and IATBR in July

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Summary/Feasibility Check

- We can collect data of place perceptions at fine spatial detail
- We can measure and quantify a variety of place-specific aspects
- They are correlated with destination choice, mode used, type/mix of activities
- We can associate micro-design to place perceptions
- But, still need to build the association with activity participation, social networks, and travel*

* All this in addition to the use of **accessibility** indicators!!!

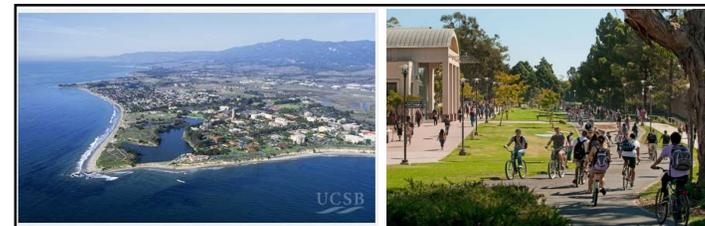
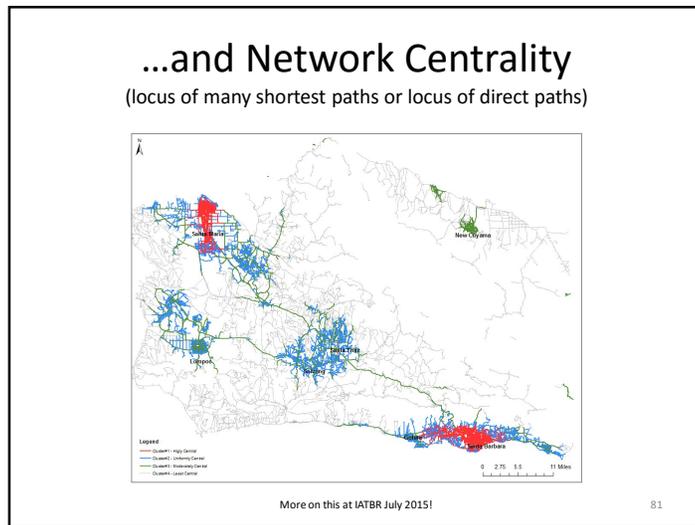
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Example of New Data (land use classes)

Final Classified Image Original Aerial Imagery

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With Jae Hyun Lee & Adam Davis

UCSB CAMPUS SENSE OF PLACE, SUBJECTIVE WELL-BEING, AND LONG- DISTANCE TRAVEL

Research Questions

- Sense of Place and Subjective Well-Being
 - Are people who experience “good” sense of place happier than others?
- Sense of Place and Long-distance travel
 - Do people that leave town often have lower sense of belonging?
- Subjective Well-Being and Long-distance travel
 - Does Long-distance travel make people happier?

From Jay Lee’s presentation at AAG 2015

Data Collection

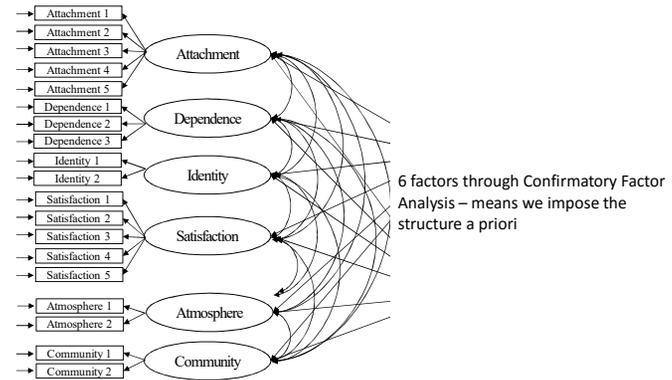
- Place for measuring SOP : University of California Santa Barbara
- Population : UCSB students (21,927, 2012-2013 academic year)
- Survey period : two weeks in February 2013
- Sample size : 789
- 7-Point Likert Scale was used for measuring SOP
- Diener’s Satisfaction With Life Scale(SWLS) questions were used for measuring SWB
- Demographic data, academic standing, activity-travel related questions, car ownership

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SOP+ Data

Indicators	Sense of Place Questions
Attachment1	UCSB is a place that I feel a strong connection with
Attachment2	UCSB makes me feel relaxed
Attachment3	UCSB is a place I care a lot about
Attachment4	I would be disappointed if UCSB never existed
Attachment5	UCSB makes me feel happy
Dependence1	I cannot picture myself being a student at another school
Dependence2	UCSB is the best place for doing the things that I enjoy most
Dependence3	UCSB is vital for the lifestyle I enjoy
Identity1	UCSB is a good reflection of my identity
Identity2	UCSB says a lot about me
Satisfaction1	The education I receive at UCSB is good value for the money
Satisfaction2	Food options at UCSB are many and offer variety
Satisfaction3	There are many housing options at UCSB
Satisfaction4	There is adequate time to get from one class to another
Satisfaction5	UCSB has good technology infrastructure (wi-fi, computer labs, etc.)
Atmosphere1	UCSB has visually appealing landscape
Atmosphere2	At UCSB I enjoy good balance between plants, art and buildings
Community1	There is a culture of tolerance at UCSB
Community2	UCSB has a good social atmosphere

Sense of Place (SOP)



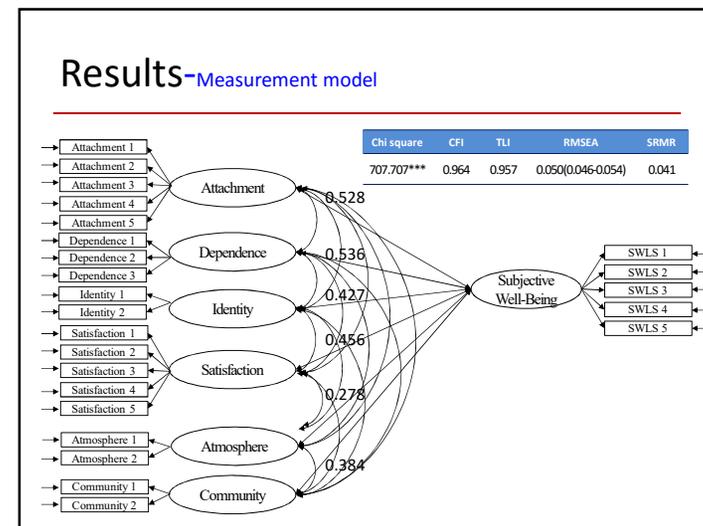
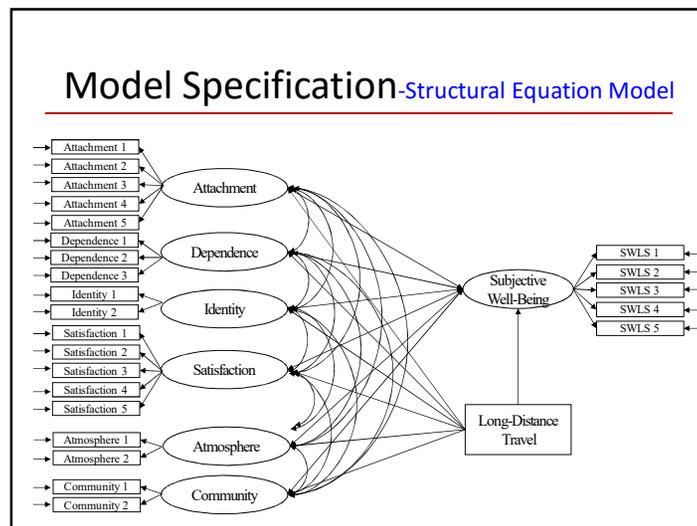
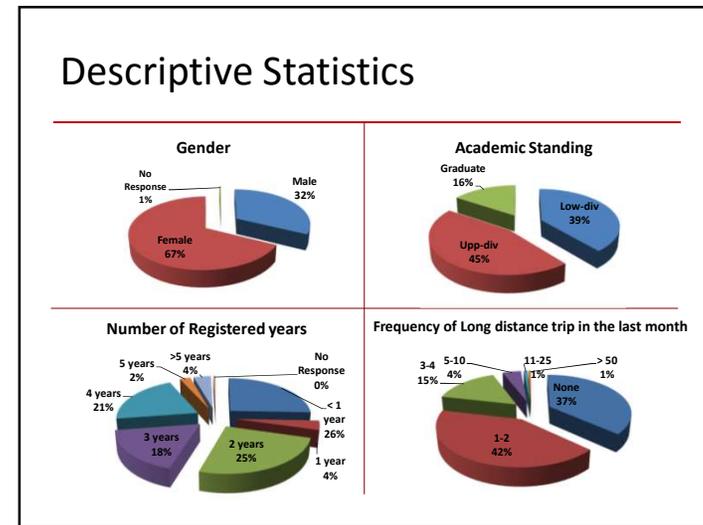
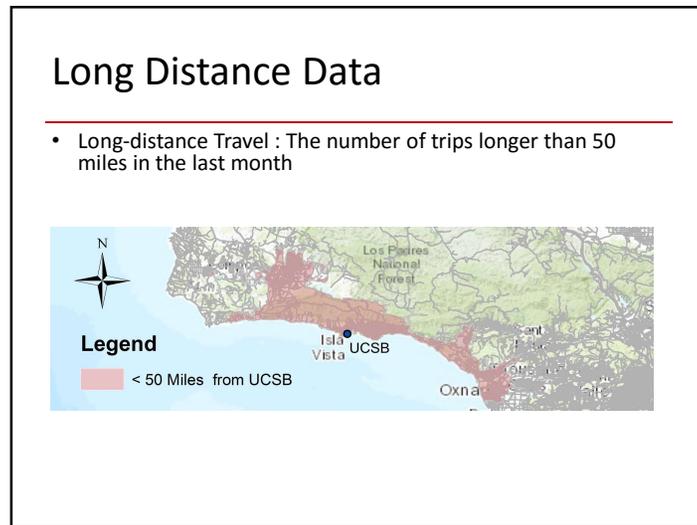
Subjective Well-Being

- “A person’s cognitive and affective evaluations of his or her life” Diener, Lucas, and Oishi(2002, p63)
- Three multi-item measures : **Satisfaction With Life Scale (SWLS)**, Scale of Positive and Negative Experience(SPANE), Flourishing Scale (FS) (Diener et al, 1985, 2009)
- The theoretical framework between SWB and activity travel behavior (Ettema, Garling, Olsson, Friman, 2010)
- Increasing number of papers about SWB and travel behavior (before travel, during travel, after travel, usual travel etc) – also many time use and SWB papers by travel behavior analysts!

Subjective Well-Being Data

	Satisfaction With Life Scale(SWLS) questions
Life Close to Ideal	In most ways my life is close to my ideal.
Life Conditions	The conditions of my life are excellent.
Life Satisfaction	I am satisfied with my life.
Life Achievement	So far I have gotten the important things I want in life.
Life Change	If I could live my life over, I would change almost nothing.

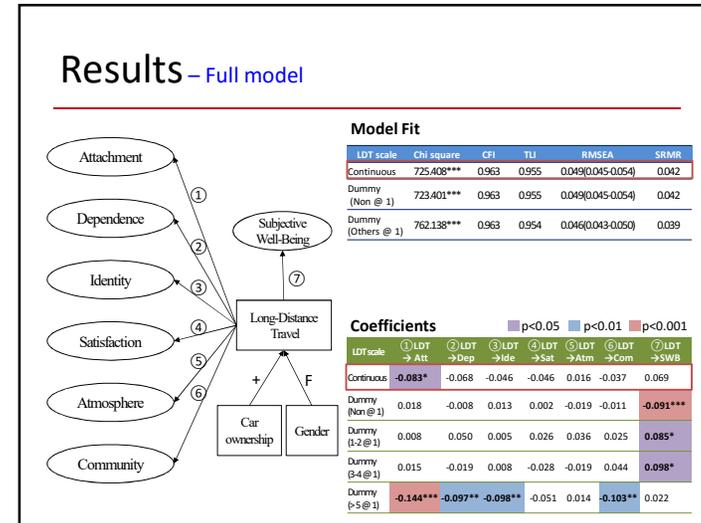
Jay Lee prefers these scores following Diener’s approach



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Results – Measurement model

	Attachment	Dependence	Identity	Satisfaction	Atmosphere	Community	SWLS
Attachment1	0.887						
Attachment2	0.801						
Attachment3	0.922						
Attachment4	0.764						
Attachment5	0.909						
Dependence1		0.668					
Dependence2		0.878					
Dependence3		0.892					
Identity1			0.956				
Identity2			0.930				
Satisfaction1				0.532			
Satisfaction2				0.623			
Satisfaction3				0.646			
Satisfaction4				0.583			
Satisfaction5				0.627			
Atmosphere1					0.704		
Atmosphere2					0.888		
Community1						0.664	
Community2						0.890	
SWLS1							0.862
SWLS2							0.807
SWLS3							0.902
SWLS4							0.737
SWLS5							0.673



- ### Findings
- A model that fits the data well shows **strong correlation among SWB, SOP, and long distance travel**
 - SOP and SWB are positively correlated**, indicating that students with higher levels of *place attachment, dependence, identity, satisfaction, atmosphere, and community* are also happier with their life
 - Similarly, students taking between **1 and 4 long distance trips per month** also report **higher happiness** with their life.
 - In contrast, students with **no long distance travel** and students with very frequent travel tend to display **less satisfaction with their lives**.
 - There were no other significant explanatory variables except **gender and car ownership!**
 - Relationship with **progression** through academic years still debatable in GeoTrans!

- ### Lessons learned
- Tailor SOP questions to research questions and the behavioral models we target.
 - Scale (mall, campus, region) different dimensions, data collection, analysis and ultimately modeling and simulation.
 - Social interaction indispensable component to understand SOP & of course SWB (we also know this from time use research).
 - Travel behavior and SOP? Not sure yet!
 - Destination choice – yes!
 - Activity type and location – yes!
 - Routes? Activity schedules? Social networks? Modes?
 - Pat’s Sense of Travel?
 - Collect SOP and SWB data with detailed activity-travel data and then develop appropriate models – many ideas on new methods of data collection.

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Types of Problems

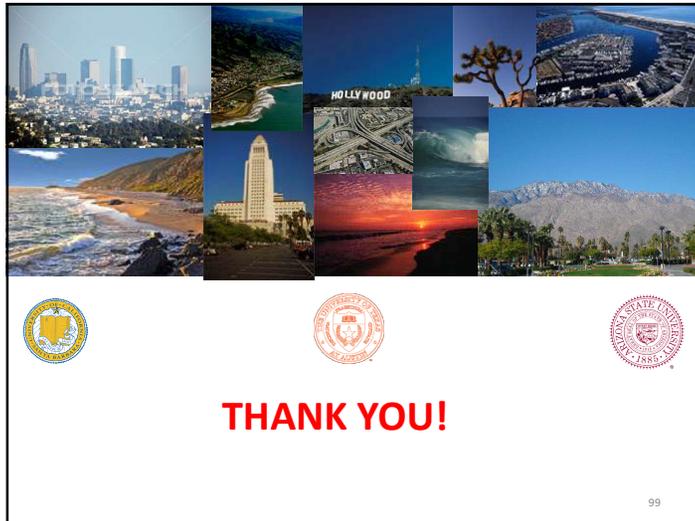
- **THE USUAL**
 - Sustainability Assessments (economy, environment, society)
 - Epidemics Spread and Disease Control and Prevention
 - Disaster Preparedness
 - Migration and demographic evolution is space-time
- **BETTER URBAN DESIGN** (neighborhood, city, region) -> see combination of urban footprint & architectural design & quality of life
- **RICHER LOCATION BASED SERVICES** (portfolios of services = theater reservation+car on-demand+restaurant reservation+notification to friends+...)

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Activity/Travel & Location Based Services

- Services are needed at specific places and times
- Services depend on the groups involved
- Synchronicity (same time) and location coordination (syntopic - same place) is needed for specific services
- Polytopic and polychronic (same activity at multiple places – shopping, dating, working)
- Timing and duration of activities are important but interaction in social groups is also important (you and I need to be both available for this presentation!)
- Perception and happiness/satisfaction can be measured and geolocated
- Crowdsourcing important but dependable? Volunteered Geographic Information (VGI) but we know
- Objective measures of space quality very detailed and good fidelity
- We know many things about values, beliefs, attitudes, behavior, social influence, use of information but:
 - We are not packaging services (yet!)
 - We are not designing services tailored to activity desires (yet!)

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