Built Environment and Active Living: People with High Health Risk and Low Income

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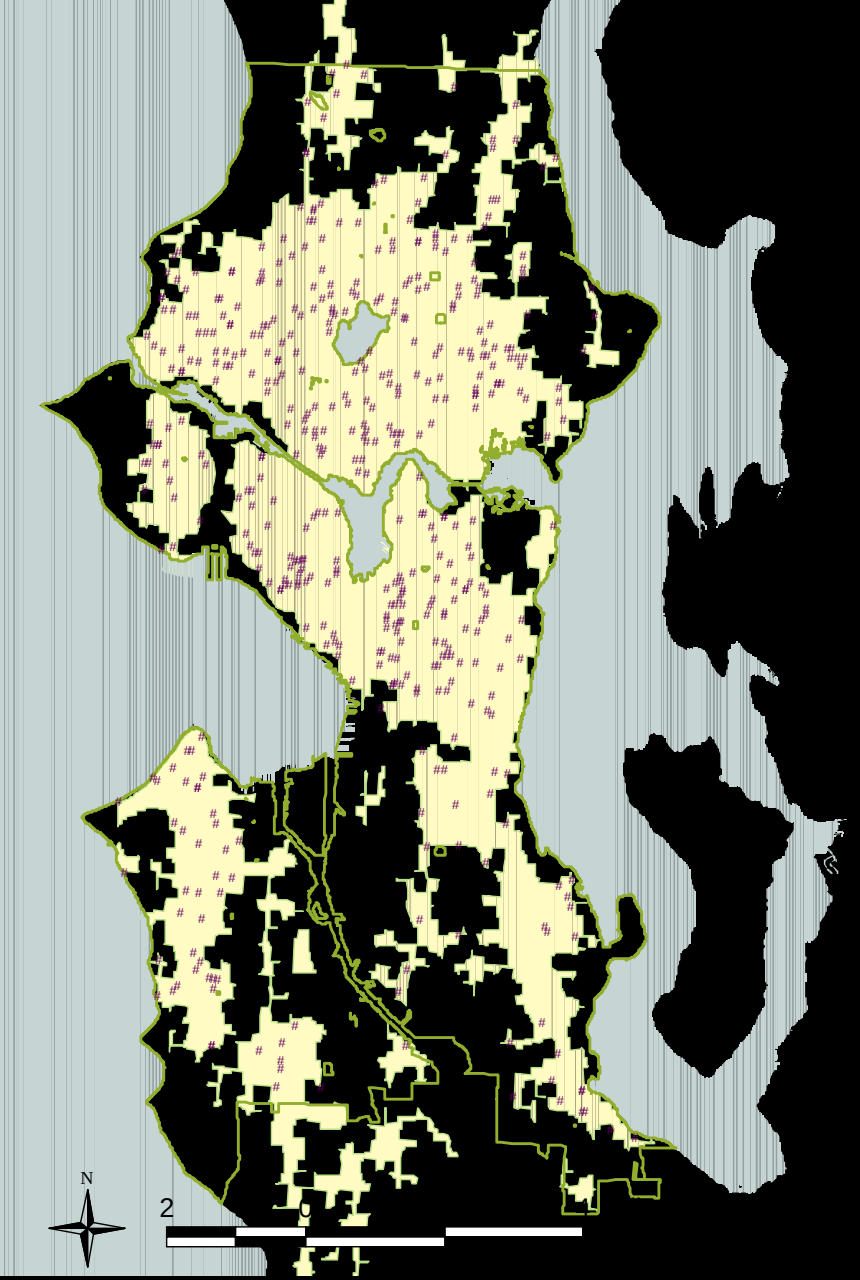
Background

- Disparities in physical activity and health
- Disparities in the environmental supports for active living
- Social and physical environment in the neighborhood
- Physical activity for transportation and recreation purposes

Objectives

- To examine the associations that the built and social environments of the neighborhood have with physical activity for two sub-populations:
  - People with high health risk
  - People with low income

  considering, physical activity for recreation purposes and transportation purposes



Methods

- **Sample Frame/Study Area and Regional Context**
  - medium to high residential densities
  - some retail-commercial activities
- **Study Population and Sampling**
  - English-speaking, able-bodied adults living in households with telephone
  - Spatial Sampling and simple random sampling *(Lee, et al. 2005)*

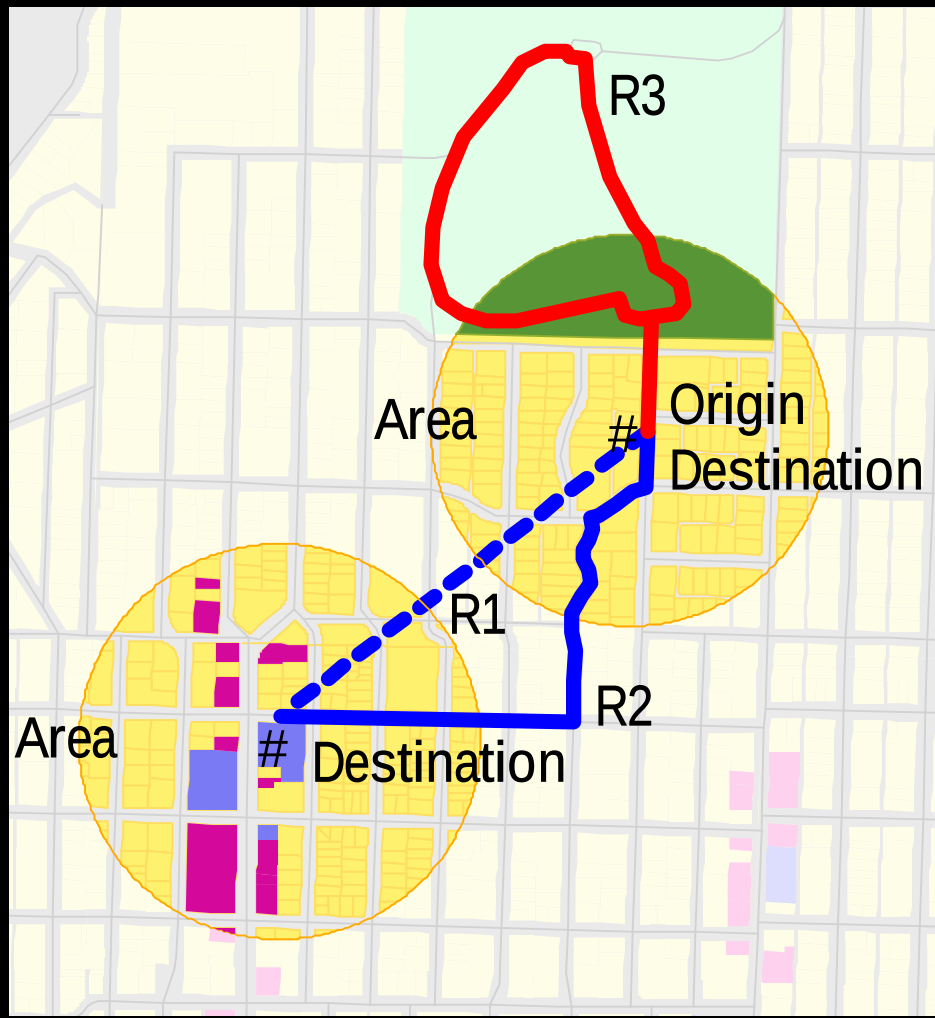
Conceptual Frameworks

Social Ecological Framework

- Personal
- Social
- Physical Environmental
  - Subjective (Perceived)
  - Objective (Actual)

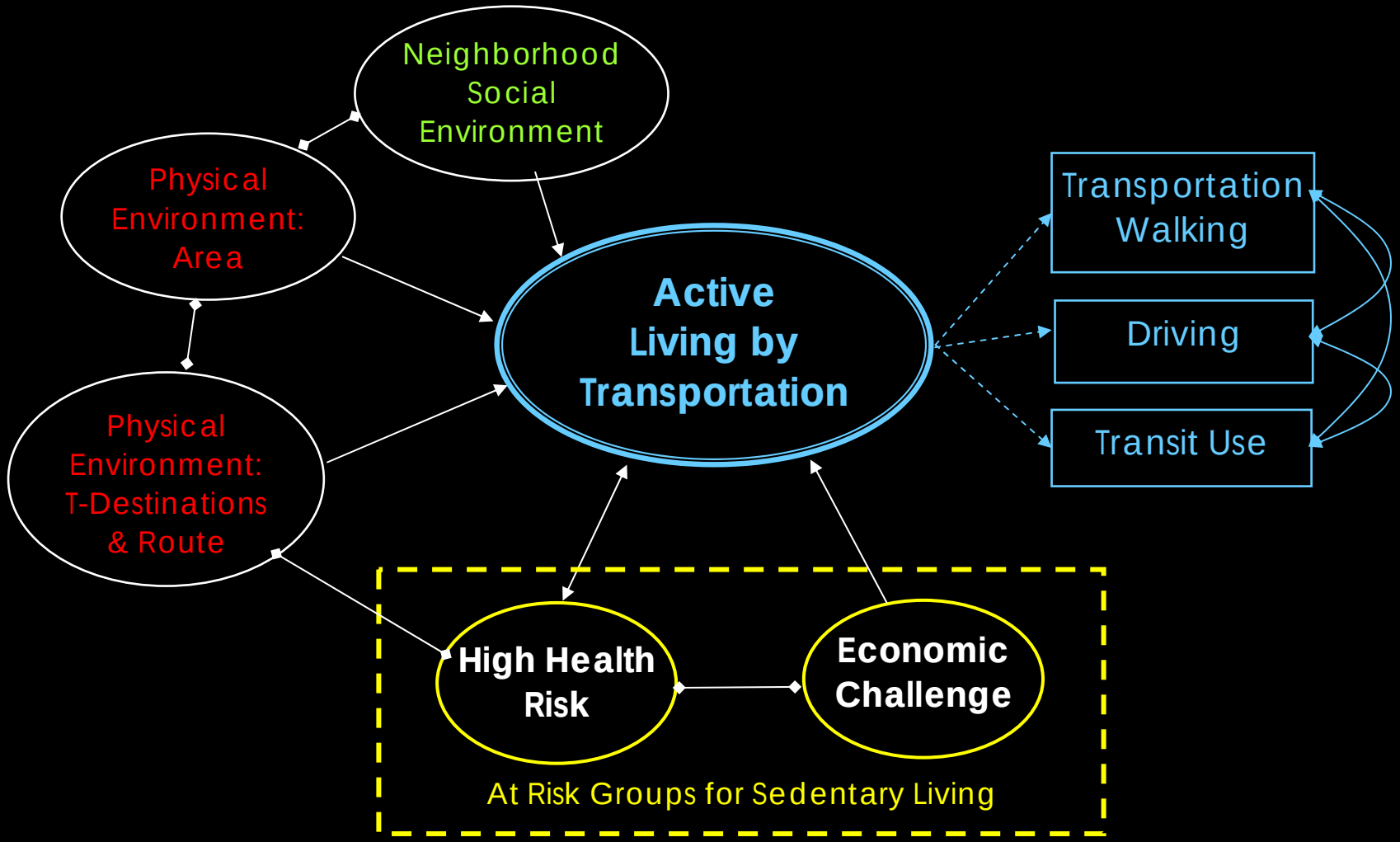
Behavioral Model of Environment

- Origin-Destination
  - Recreational Destination
  - Transportation Destination
- Route
- Area



Moudon and Lee 2003, Lee and Moudon 2004

Conceptual Framework:
Active Living by Transportation



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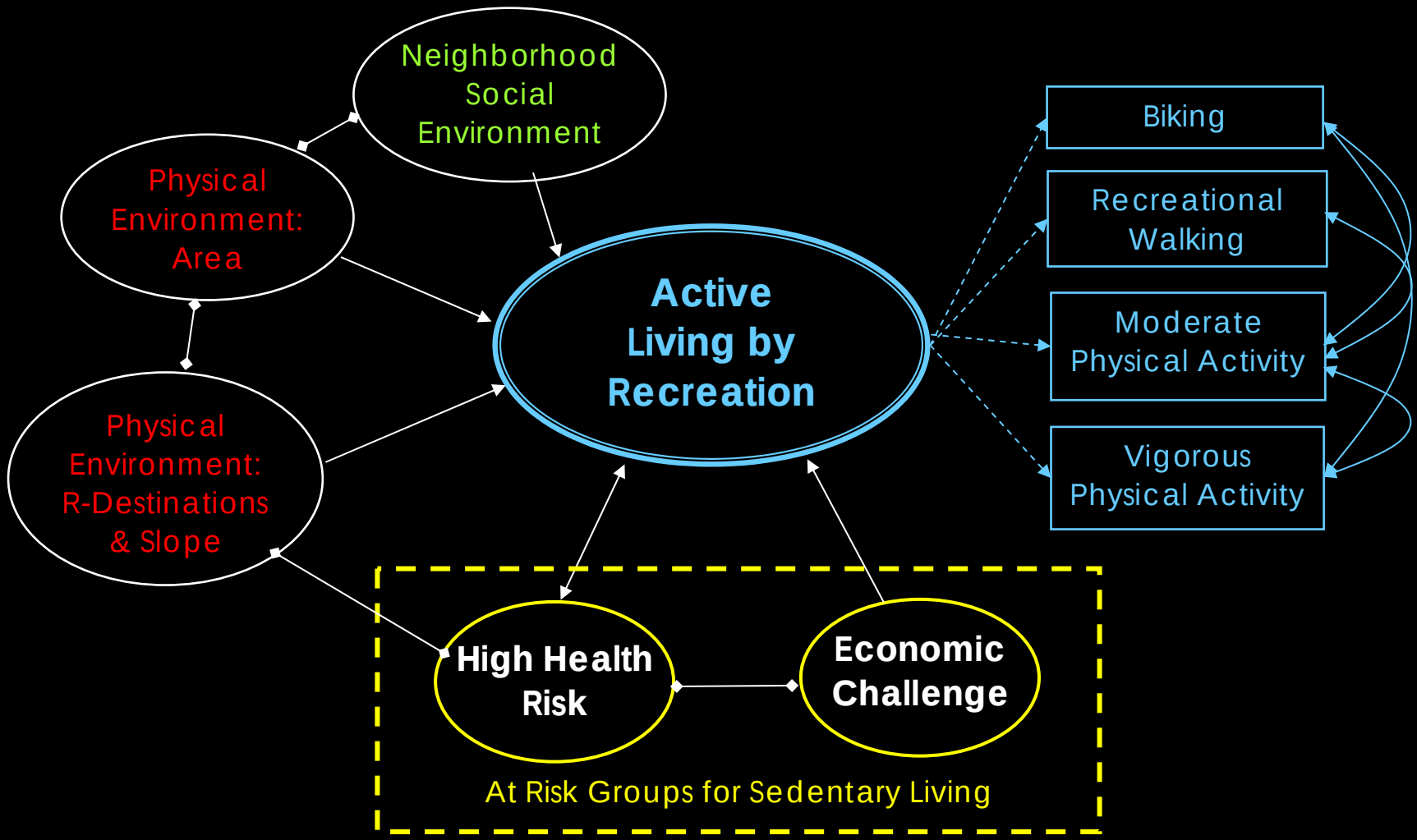


Socio-demographic Variables

WBC Survey (Telephone Interview)

- Walking
- Biking
- Transit Use
- Neighborhood Perception
- Attitude
- Physical Activity
- Household Characteristics
- Demographic Characteristics
- Short Section for the Initially Refusing Respondents

Environmental Variables:
Custom-made ArcView Extension - WBC Analyst

Home-based Proximity Measures

e.g. Distance to 31 individual and 11 agglomerations of destinations (Neighborhood Centers or NCs)

Home-based Buffer Measures

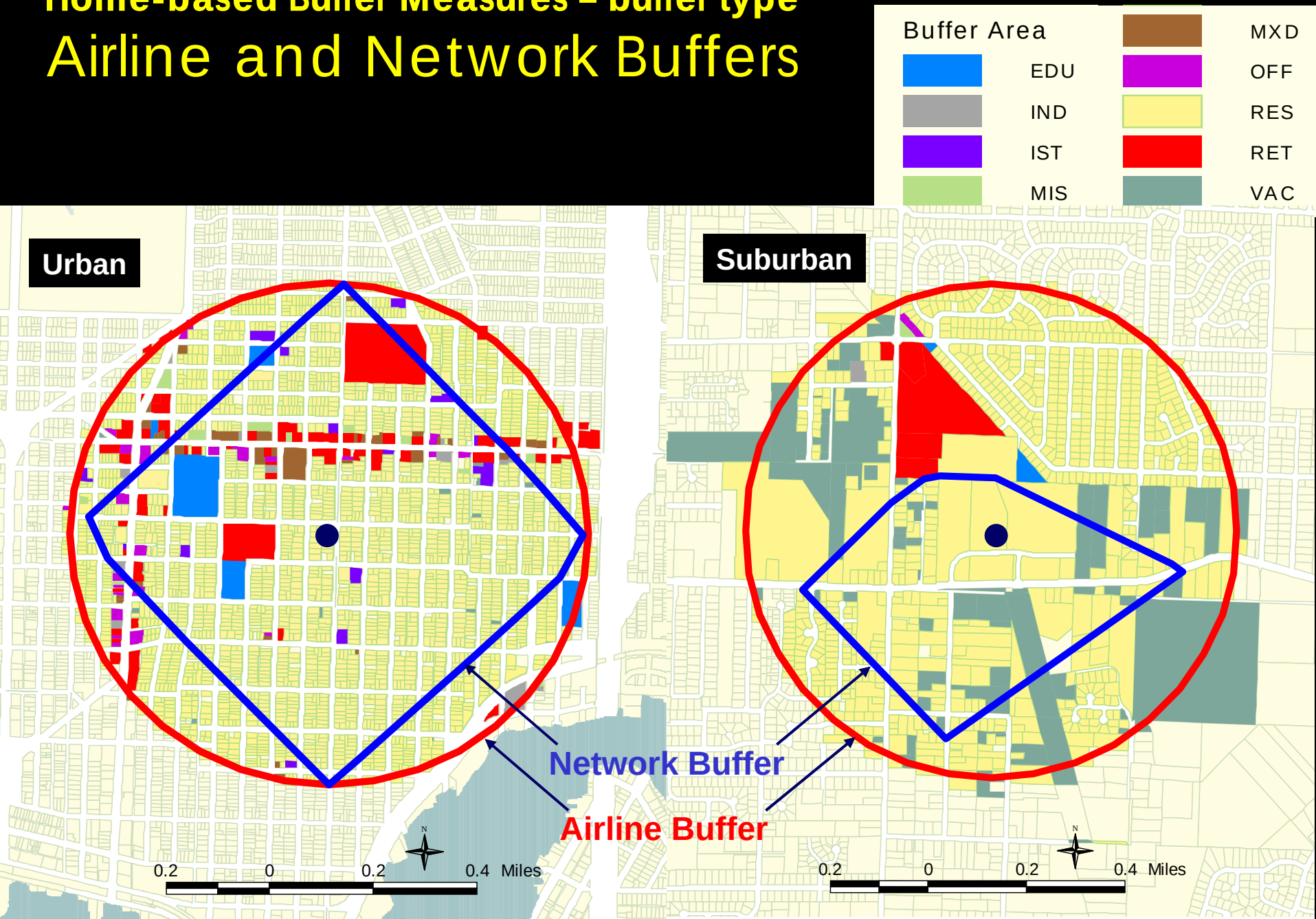
e.g. Density, land use mix, extent and completeness of sidewalks, bike lanes, and trails, traffic conditions, block size, bus stops and riderships, and slope

Neighborhood Center-based Measures

e.g. compactness, diversity, and size of NCs

Home-based Buffer Measures – buffer type

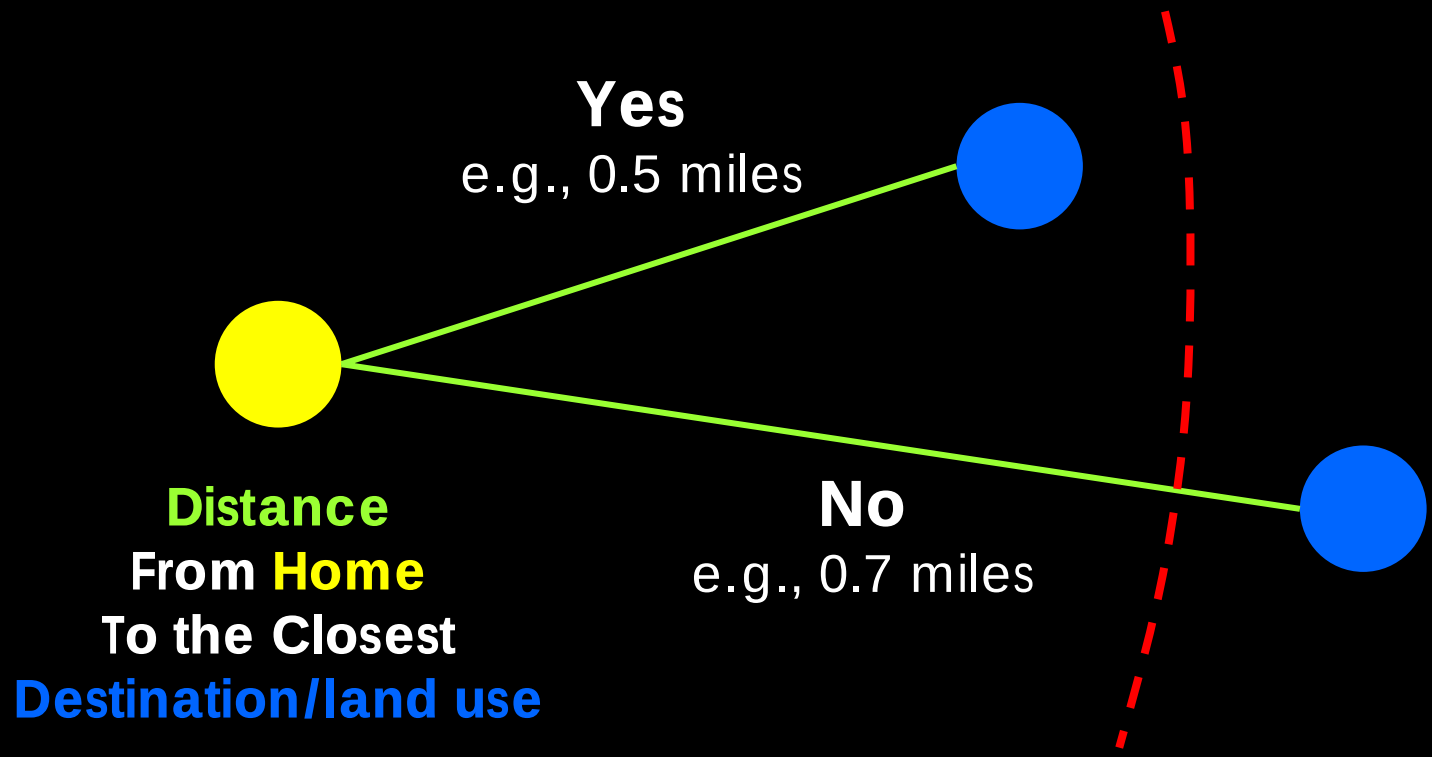
Airline and Network Buffers



Home-based Buffer Measures – buffer size

Neighborhood Boundary: Perception vs. Reality

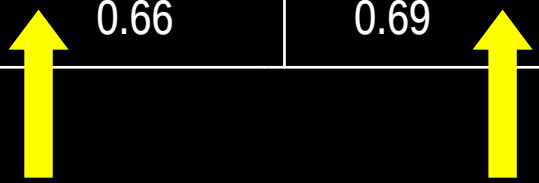
Do you have [Destination/land use] in your neighborhood?



Home-based Buffer Measures – buffer size

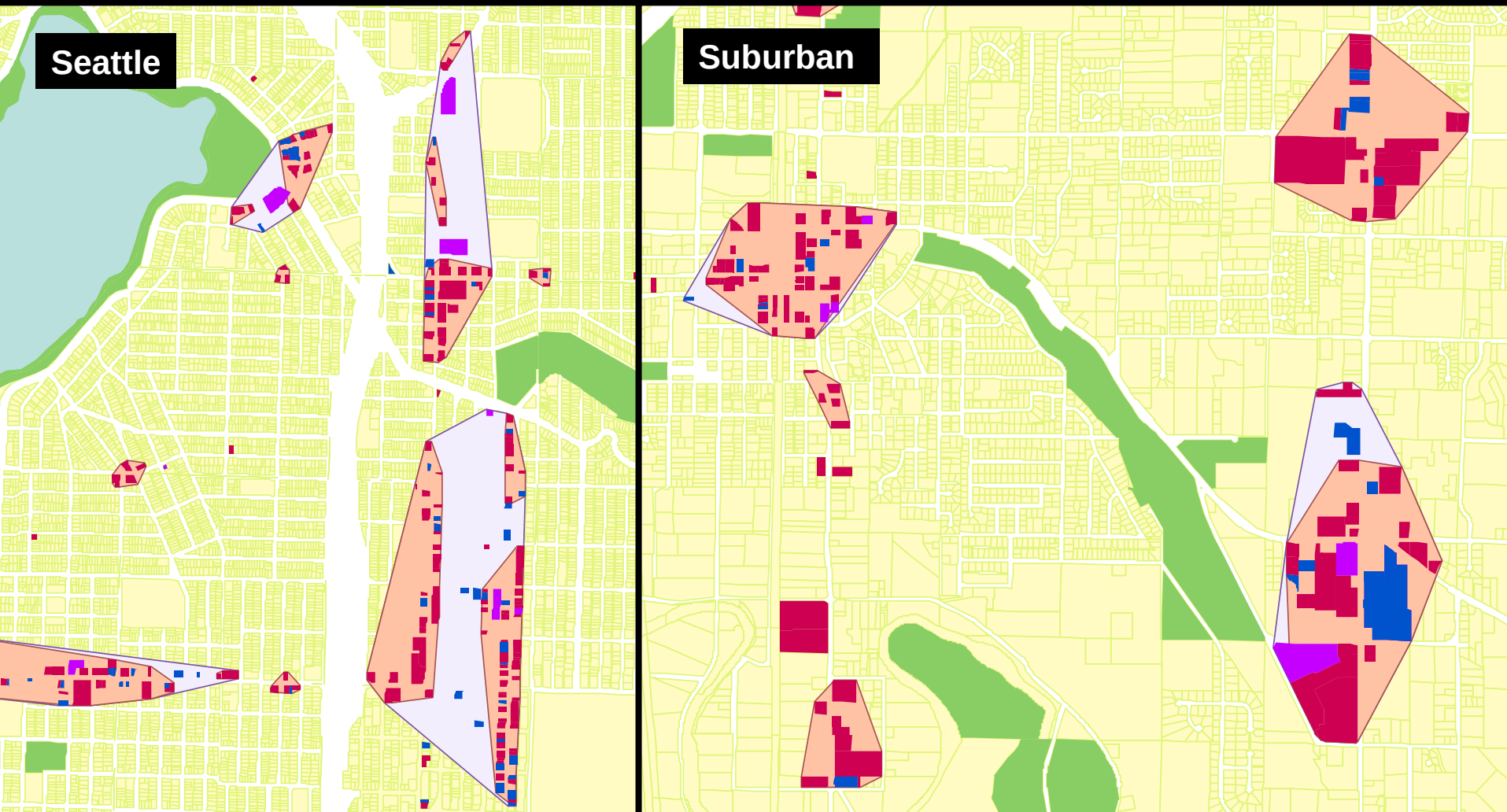
Neighborhood Delineation

	Airline Distance		Network Distance	
Do you have [Destination] in your neighborhood? (mile)	Yes	No	Yes	No
Retail-service facilities	0.11	0.15	0.20	0.24
Schools	0.23	0.35	0.36	0.53
Grocery stores	0.24	0.32	0.41	0.59
Parks	0.34	0.43	0.43	0.53
Sports facilities	0.64	0.71	0.87	0.94
Trails	0.75	0.93	0.92	1.13
Community/neigh shopping centers	0.83	1.23	1.04	1.42
Fitness centers/gyms	0.99	1.20	1.26	1.48
MEAN	0.52	0.66	0.69	0.86

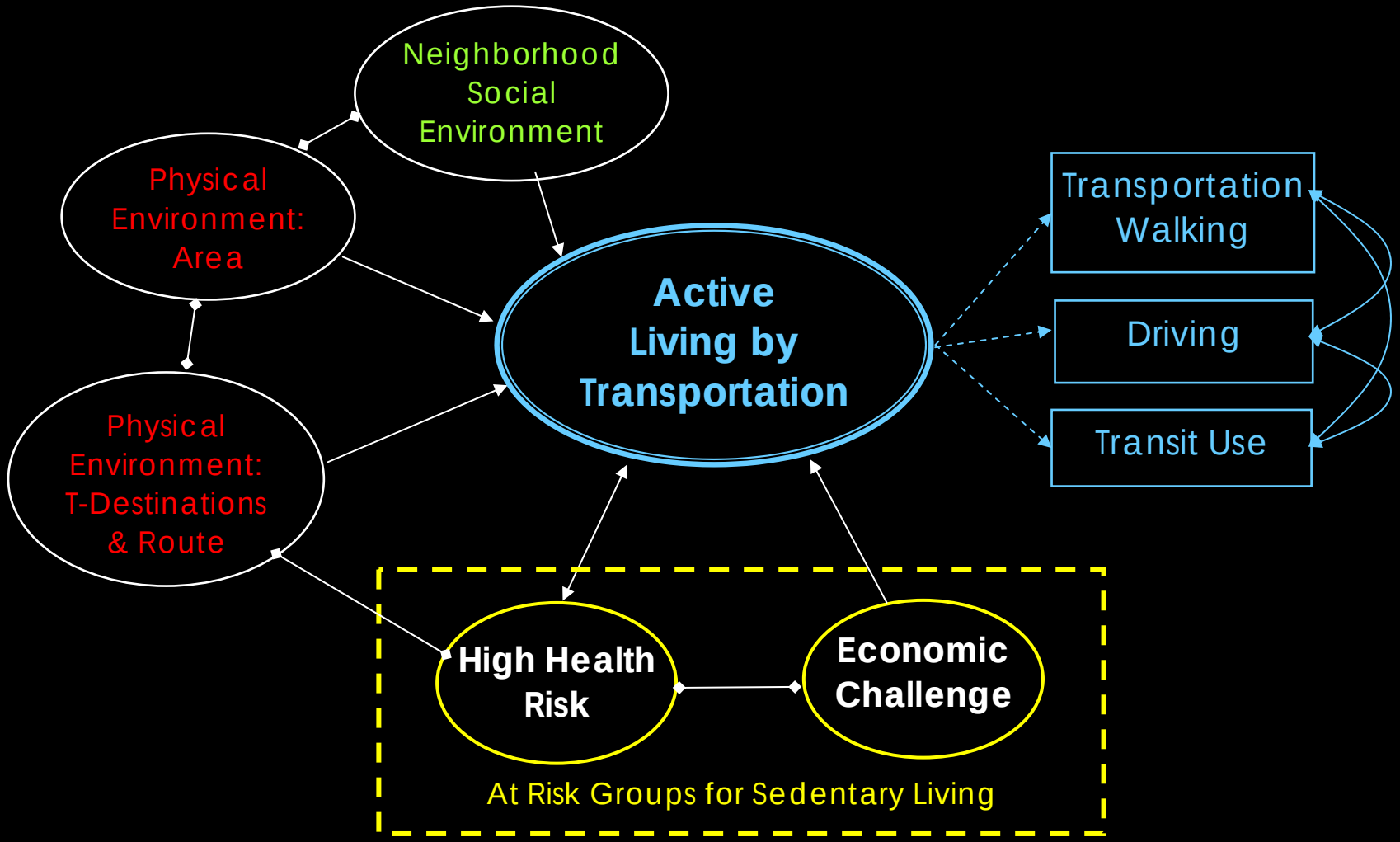


Neighborhood Center-based Measures

- Retail only (3 minimum)
- Retail, Grocery, and Restaurant (1 of each, 3 minimum)



Conceptual Framework:
Active Living by Transportation



Active Living Variables

Dependent Variables

Latent Variables	Observed Variables
Active Living by Transportation	Frequency of walking for transportation (trips/wk)
	Transit use (1+/wk vs. no use)
	Vehicle miles traveled (monthly VMT)
Active Living by Recreation	Amount of walking for recreation (min/wk)
	Amount of moderate physical activity (min/wk)
	Amount of vigorous physical activity (min/wk)
	Biking (1+/wk vs. no biking)

Sub-group Variables

Independent Variables

Latent Variables	Observed Variables
Health Risk	Body Mass Index
	Perceived health status
	Activity limitation
	Age
	Yearly household income
Economic Challenge	Cars in the household
	Own or rent home
	Gender
	Age
	Yearly household income
	Parcel-level residential density

Environment Variables

Independent Variables

Latent Variables	Observed Variables
Neighborhood Social Environment	People biking in the neighborhood People walking in the neighborhood
Physical Environment: Area Characteristics	Perceived neighborhood type Area-level mean net residential density Parcel-level net residential density Total traffic volume
Physical Environment: Transportation	Total length of sidewalks Total number of street trees Distance to the closest grocery store restaurant bank
Physical Environment: Recreation	Mean slope Distance to the closest park trail

Analytical Methods and Process

Cluster and Factor Analyses

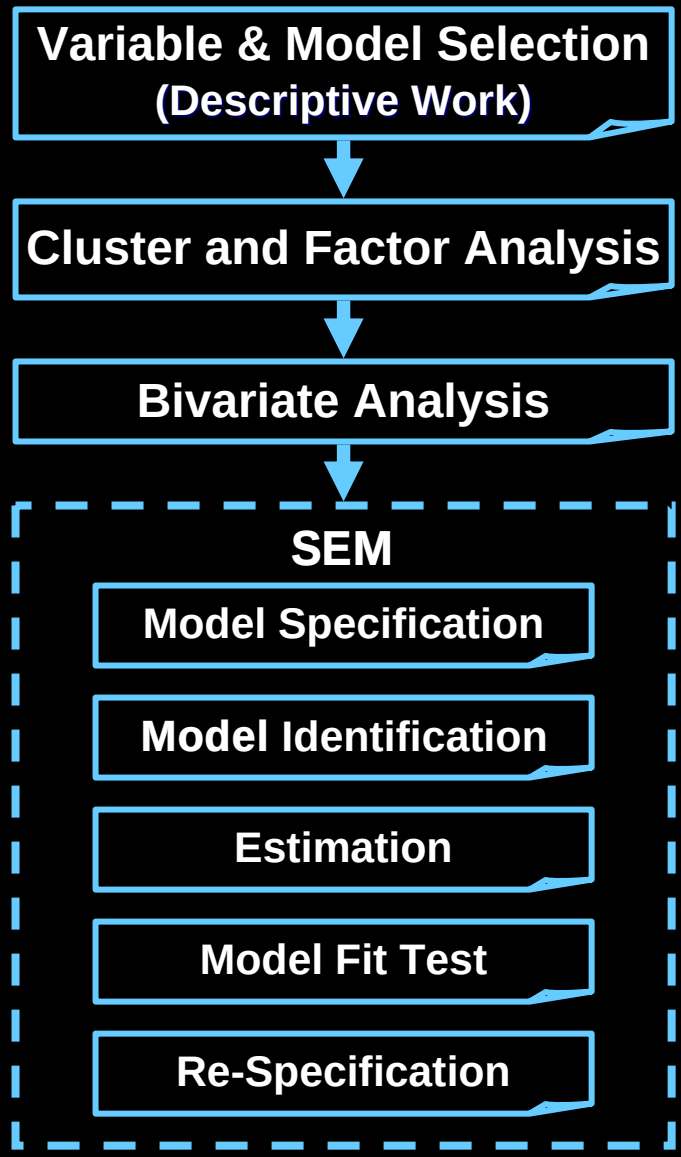
Selection of observed variables to adequately capture the latent variables

Bivariate Analyses

Association between observed variables

Structural Equation Modeling (SEM)

Examination of overall conceptual frameworks by testing a series of hypothesized associations among observed and latent variables



Findings: Bivariate Analyses

		Physical Environment - Area				Physical Environment - Transportation					Physical Environment - Recreation		
		p_neityp	den_area	den_prcl	trfv1000	swlkmi	tree1000	pcnres_l	pcnbanmi	pcngromi	slp_mean	pcnpakmi	pcntrl_c
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Findings:
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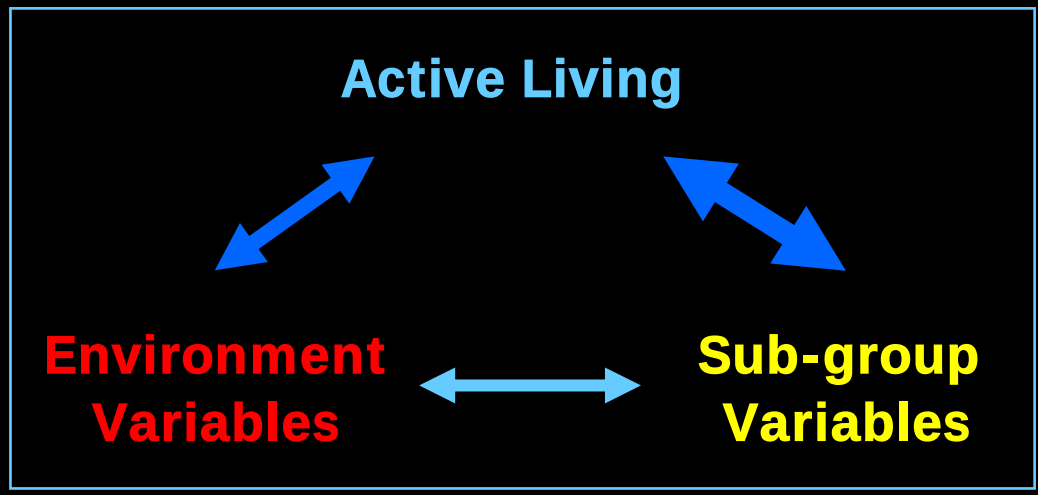

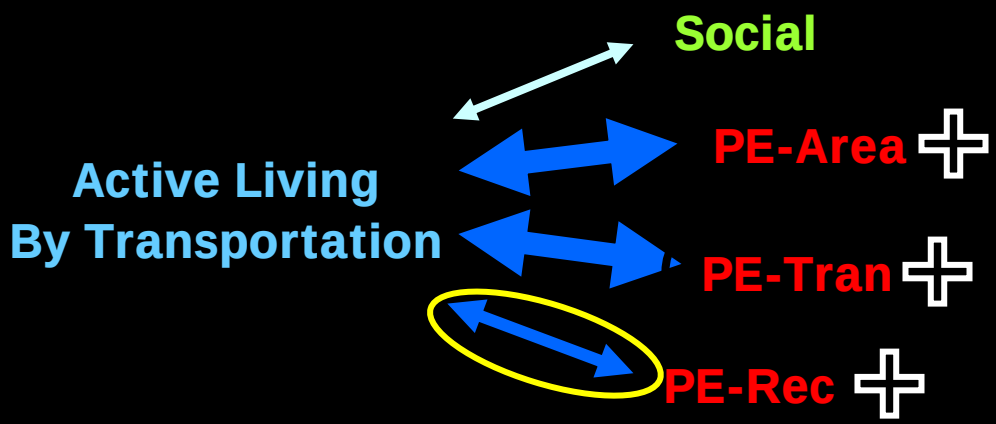

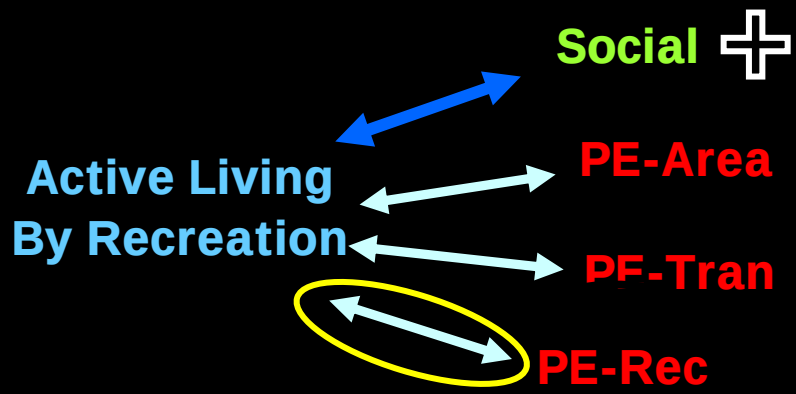

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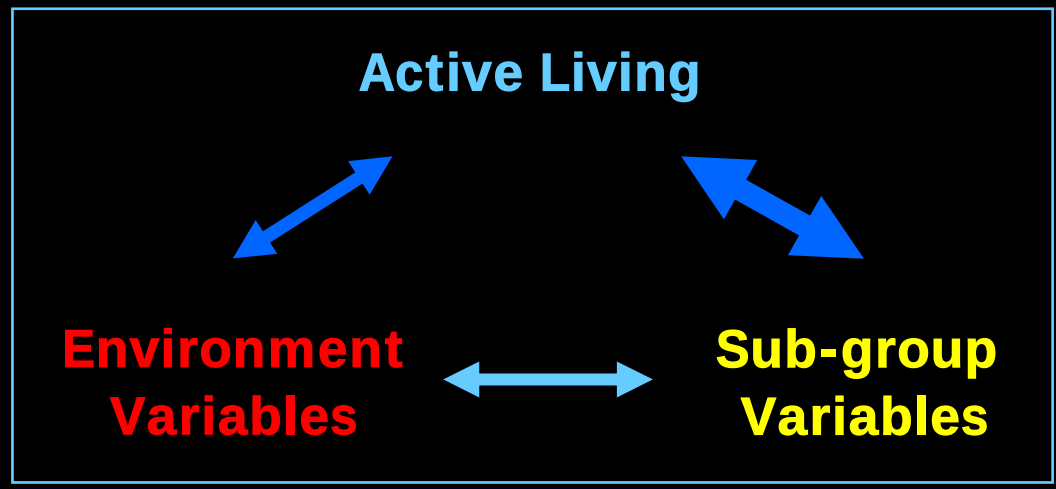

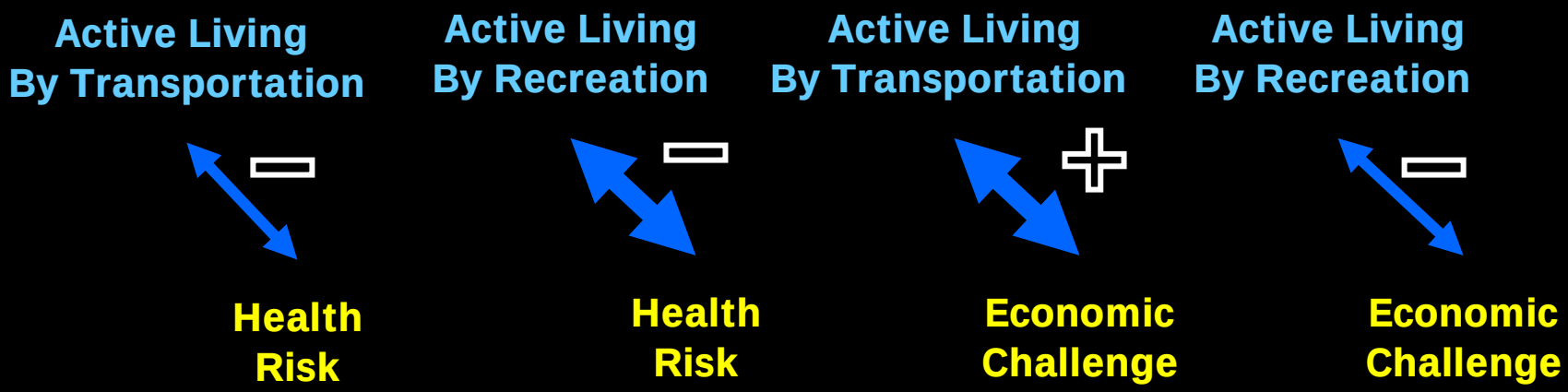

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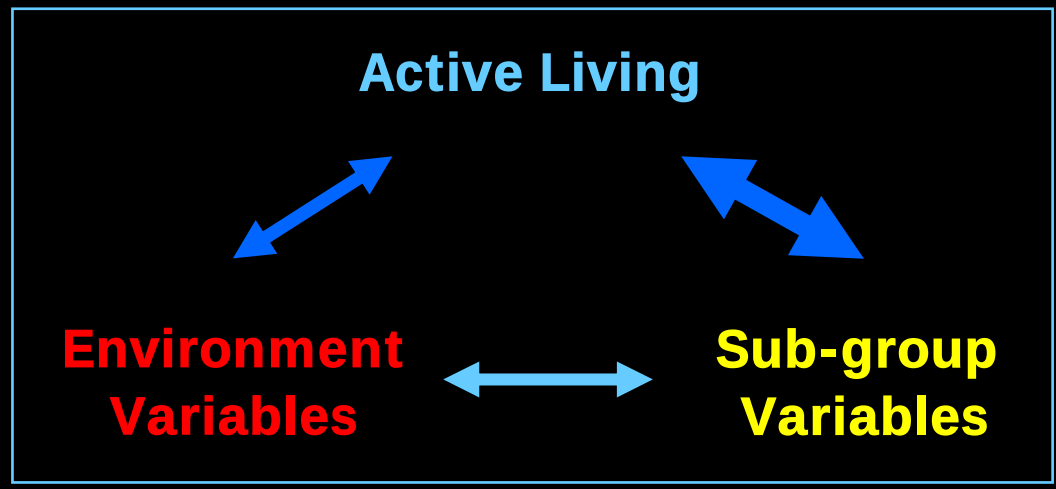
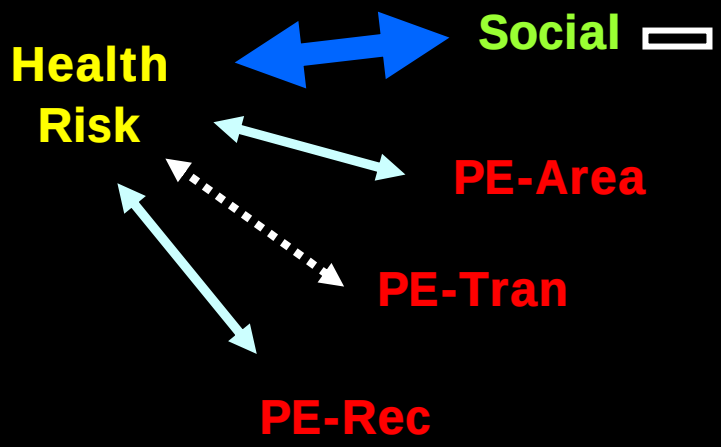
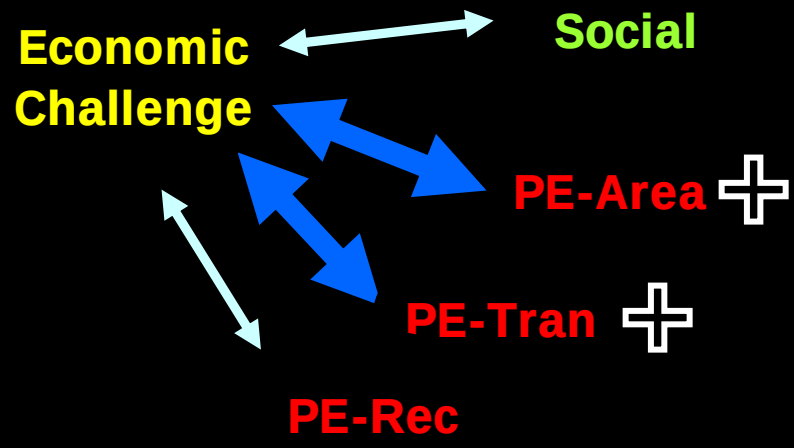






Bivariate Analysis Findings

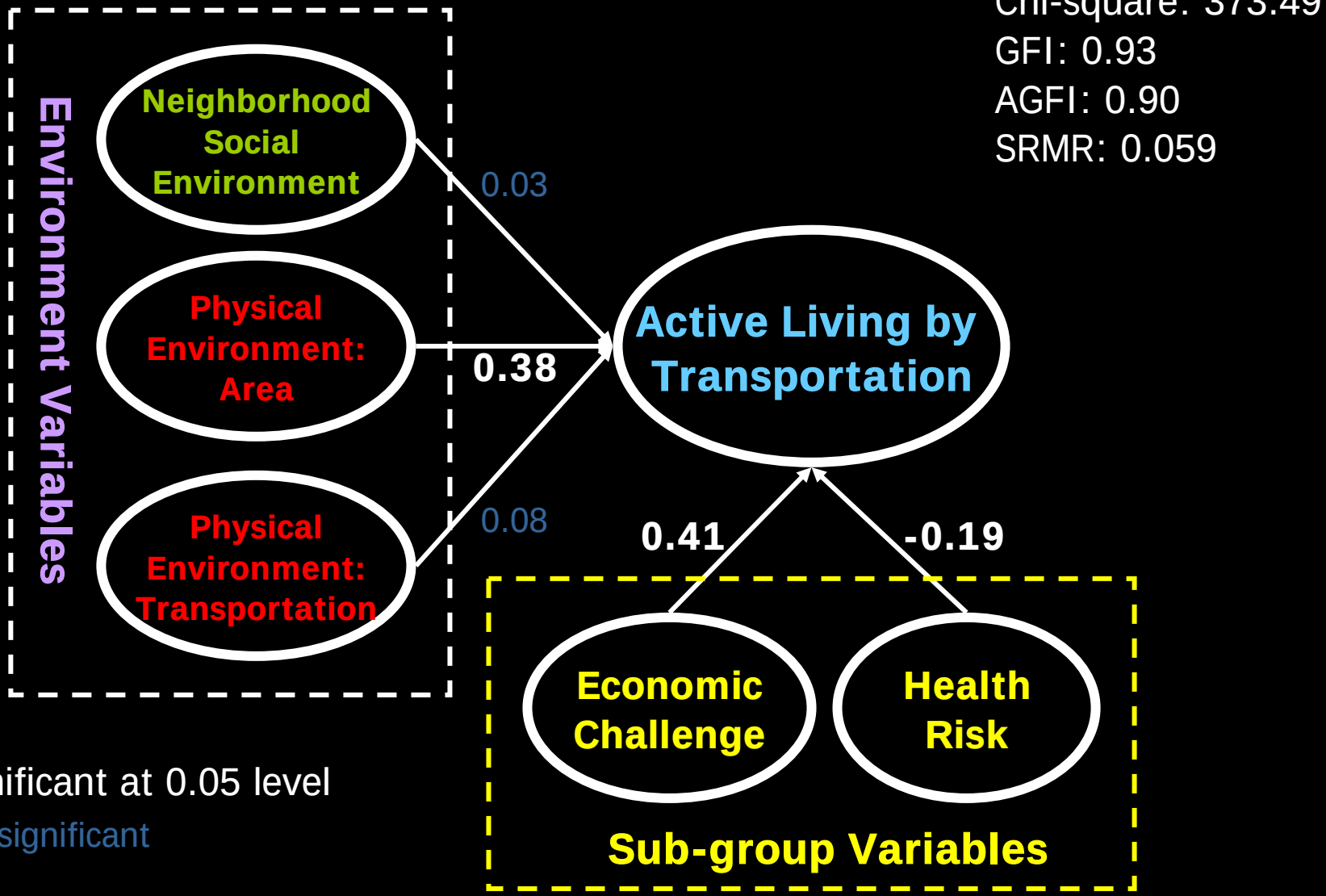
- The physical environment had a strong association with transportation physical activity.
- Moderate and vigorous physical activity was associated with reduced health risks.
- Engaging in moderate physical activity was strongly related to a higher health status and a lower BMI.
- Moderate physical activity was associated positively with both social environmental variables.
- Vigorous physical activity showed no significant association with social environmental variables.

Bivariate Analysis Findings

- Higher health risk was associated with less recreational activity, and less supportive social environment.
- Proximity to trails was associated with lower BMI.
- Hilly areas had a positive association with high economic status.
- Lower income populations lived in areas with more routine destinations such as restaurants and grocery stores, and higher densities.

Findings:

Structural Equation Model



Findings:

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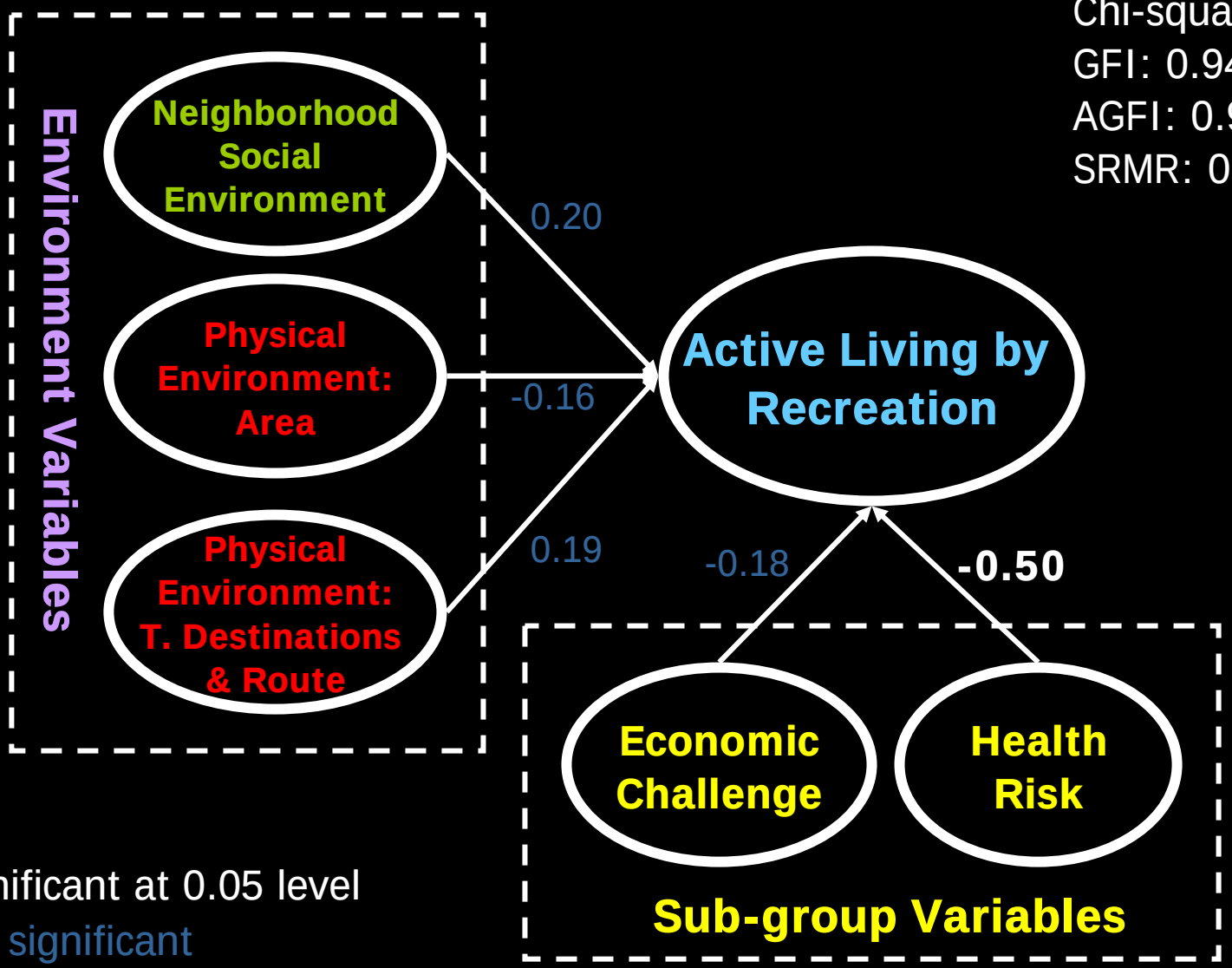

Summary: Bivariate and SEM

		Hypo.	Found
High Health Risk (Low Health Status)	Neighborhood Social Environment	-	-
	PE: Area	-	ns
	PE: Transportation	-	ns
	PE: Recreational	-	ns
	Active Living by Transportation	-	-
	Active Living by Recreation	-	-
High Econ. Challenge (Low Econ. Status)	Neighborhood Social Environment	-	ns
	PE: Area	+	+
	PE: Transportation	+	+
	PE: Recreational	-	ns
	Active Living by Transportation	+	+
	Active Living by Recreation	-	ns

Limitation

- Cross-sectional
- Self-reported data on physical activity
- Urban setting
- Other variables
- Many more…

Conclusions/Lessons

- Different Physical Activity Levels among Different Sub-Populations
- Different Levels of Environmental Supports for Active Living for Different Sub-Populations
- Different Environmental Correlates of Physical Activity by Different Purposes
- Overall Support for the Two Conceptual Models to Guide Future Research

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PI: Dr. Anne Vernez Moudon

Project Officer: Dr. Thomas L. Schmid