A propensity matched analysis of population movement implicating area contributions to increased cardiometabolic risk over time

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Presenter Disclosures

Natasha J. Howard

(1) The following personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months:

"No relationships to disclose"

Presentation Outline

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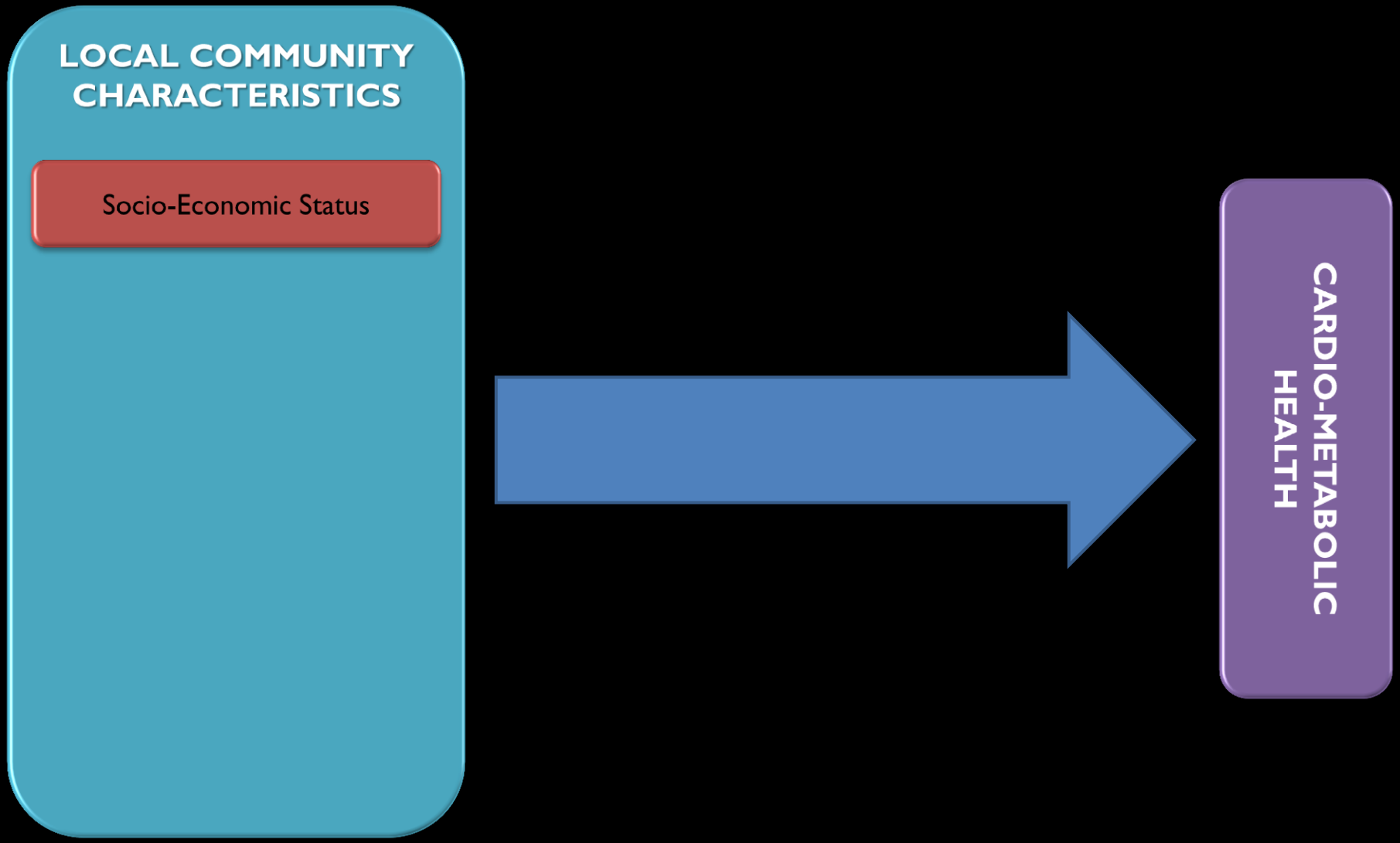
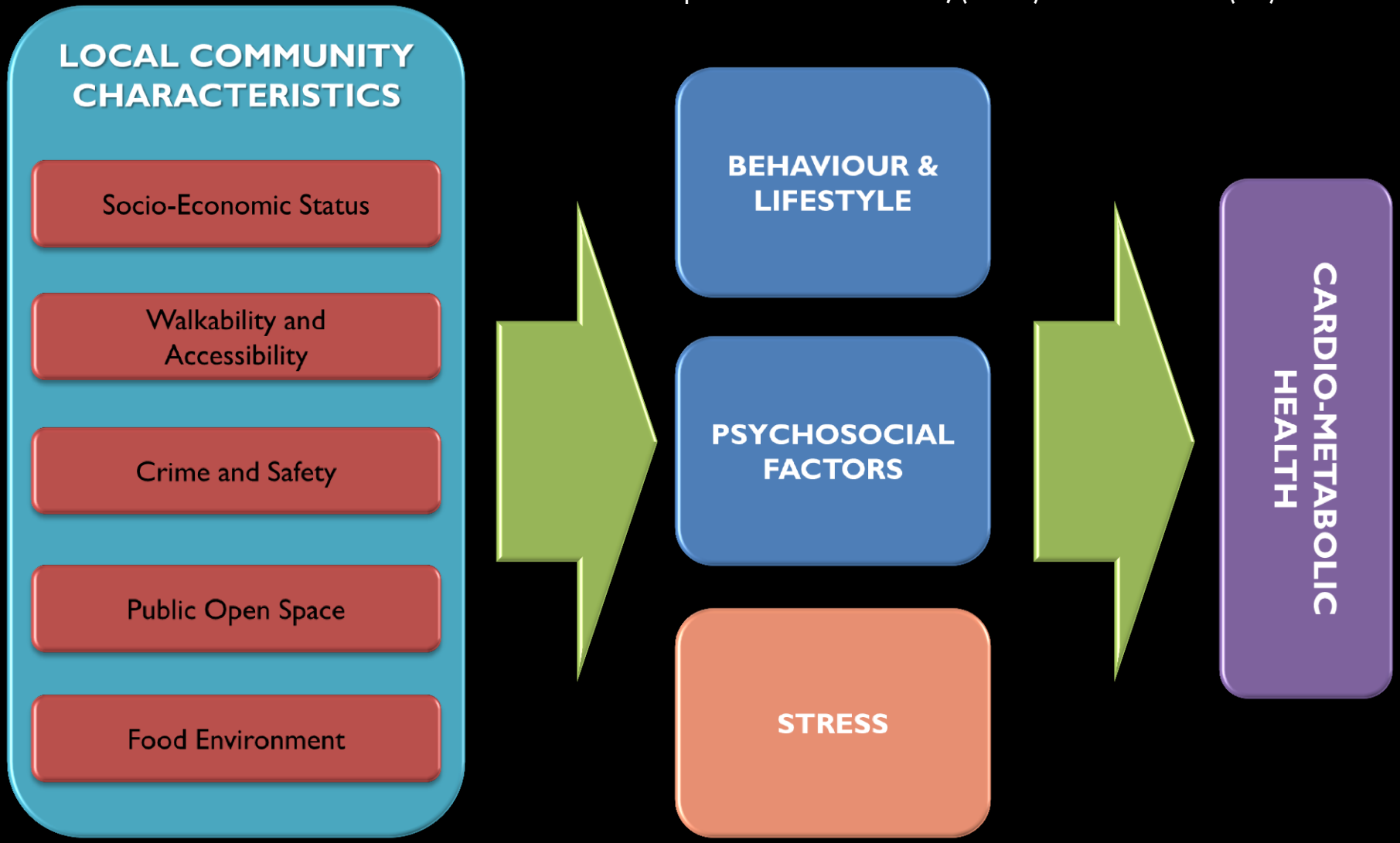
- Background on population movement and place-health studies
- Residential mobility theory and individual-level drivers of population movement
- Demonstration of propensity matching
- Implications for area-level (place) associations
- Future applications and considerations


LOCAL COMMUNITY CHARACTERISTICS
Socio-Economic Status
CARDIO-METABOLIC HEALTH

Adapted from Daniel et al., (2008) *Health & Place*: (14) 117-132.



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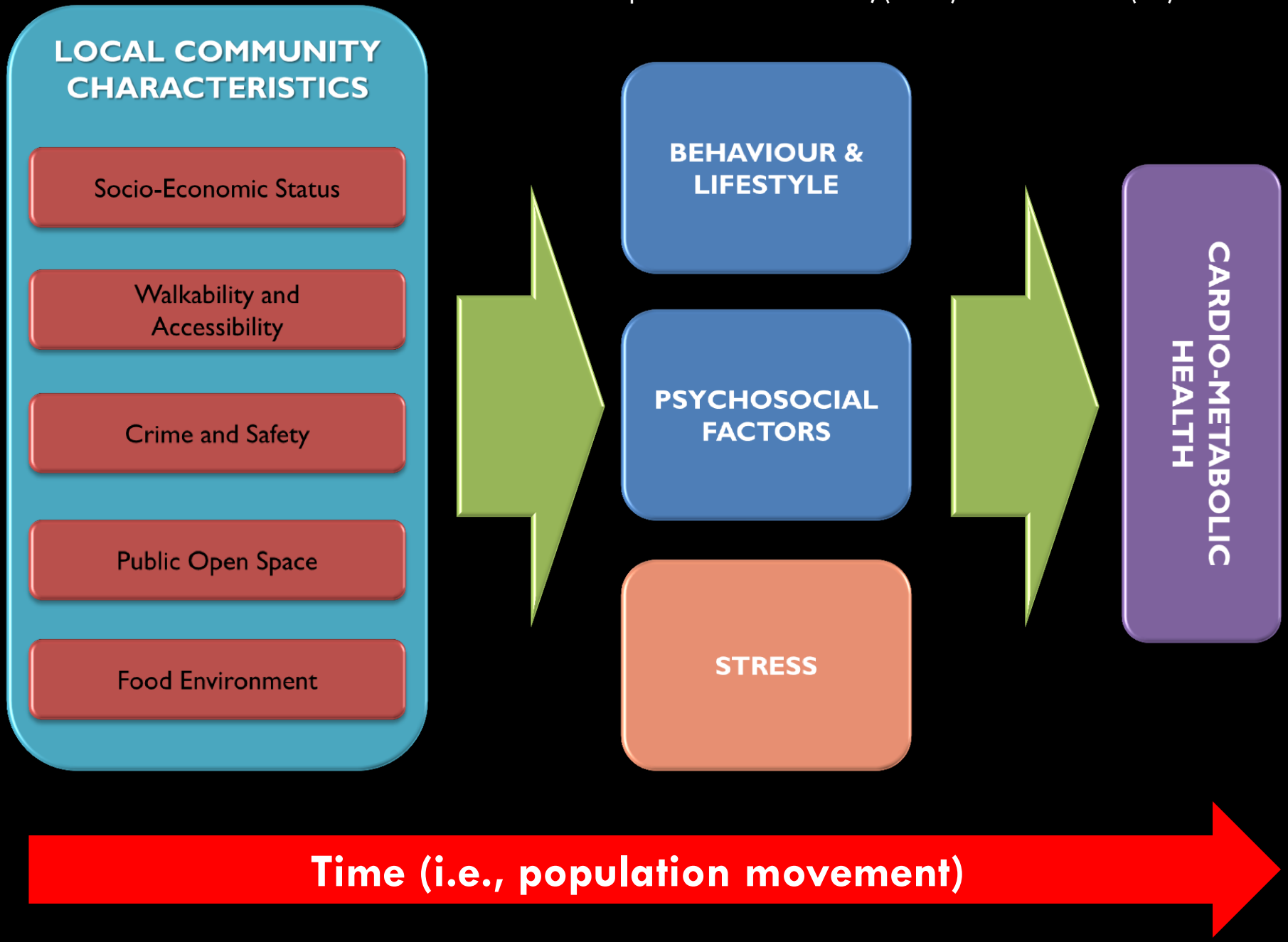
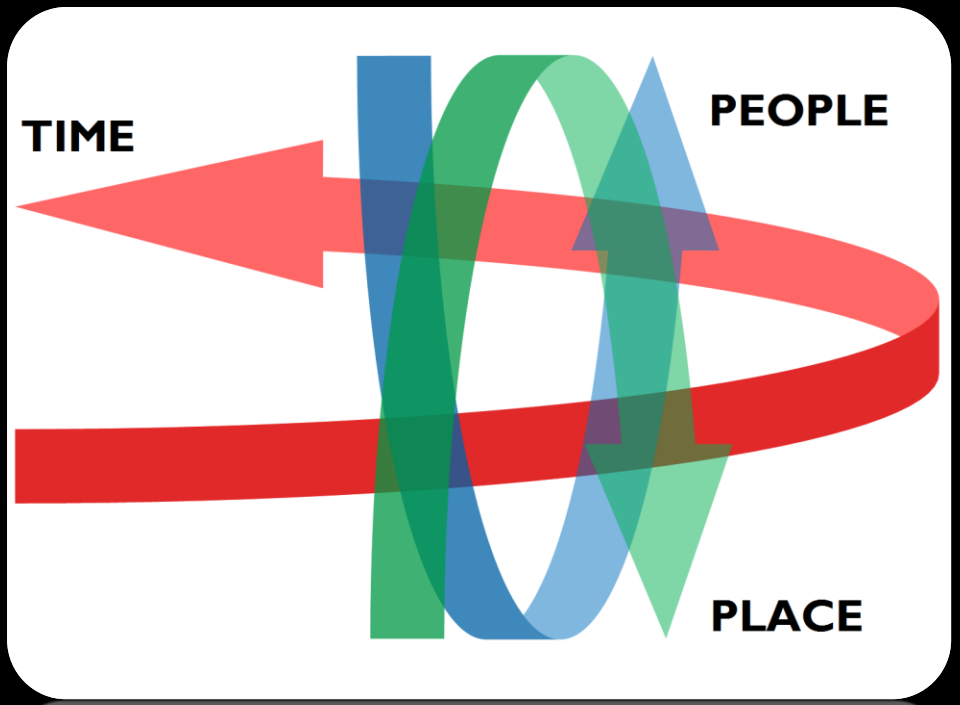




Neither people nor places are static
People move, too.

Health is a function of cumulative person-place interactions that occur across the life course

Residential Mobility

- Vary temporal and spatial scales.
- Involves changes in a residential location, whether within a city or across continents.

The Dictionary of Human Geography. (2009) Eds. Gregory, D, Johnston R, Pratt G, Watts M, Whatmore S). 5th Edition, Wiley-Blackwell.

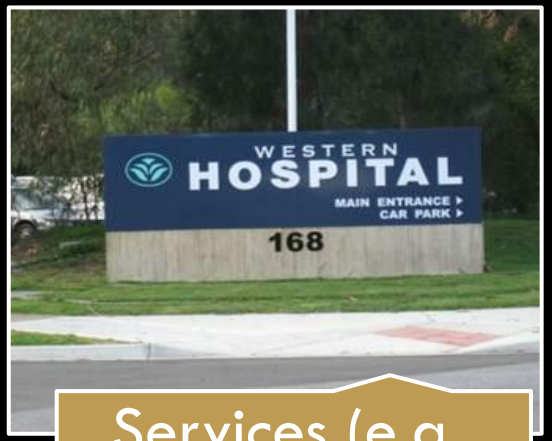
Residential Mobility

- Individuals will change their residential location over the lifecourse (e.g., marriage, education, employment)
- Capital accumulation
- Unstable housing tenure

Residential choice.....

Shops and Facilities

Transport



Services (e.g., hospital)

Locations (e.g., beach)

Resources (e.g., Library)

Place-health considerations

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- Limited longitudinal place-health cohort studies
  - ✓ Sample size large enough to study population movement
  - ✓ Limited information on space

Residential self-selection

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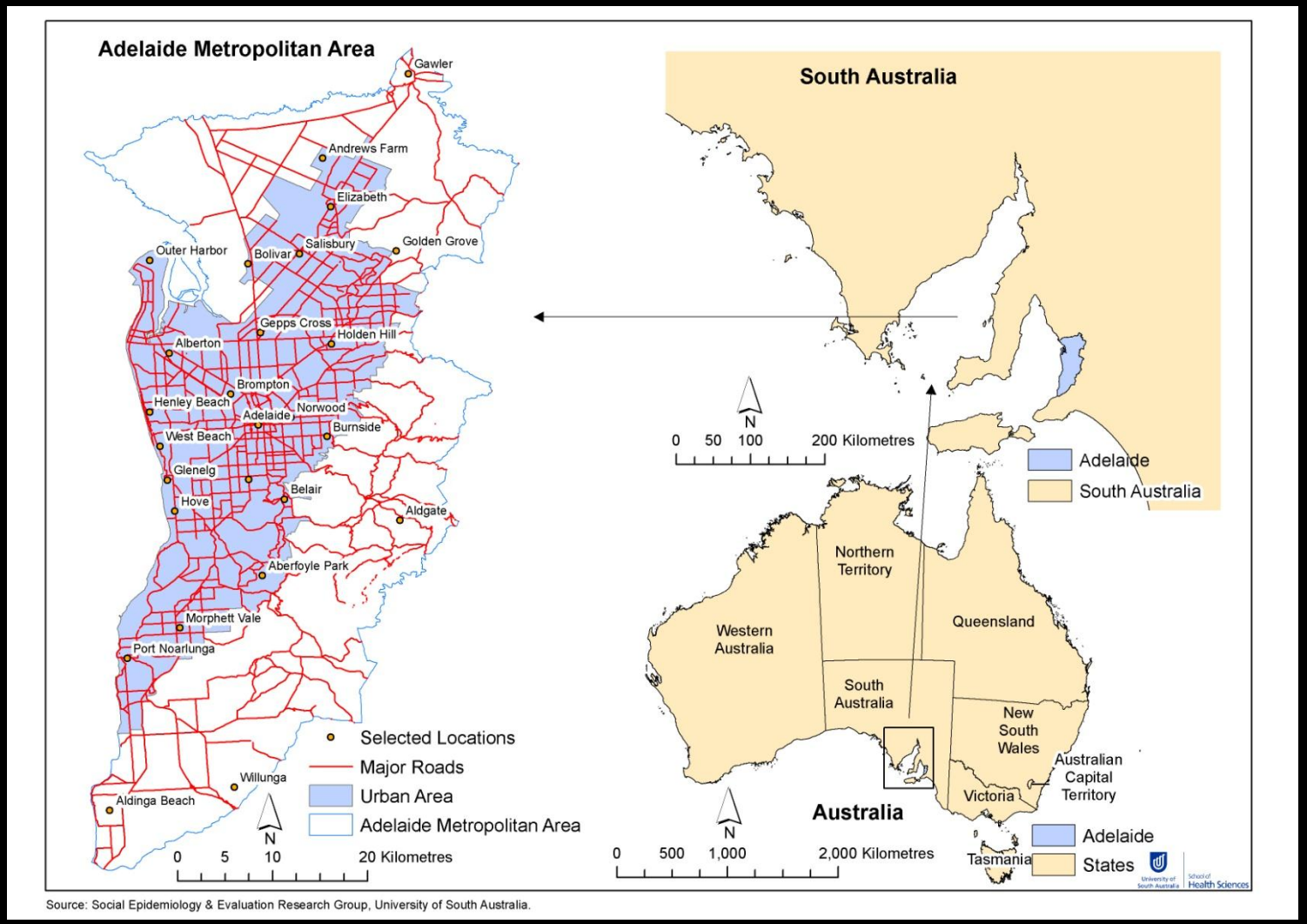
- Need to account for residential self-selection in studies that focus on place-health relations.
- Potential biases for geospatial epidemiological analyses.

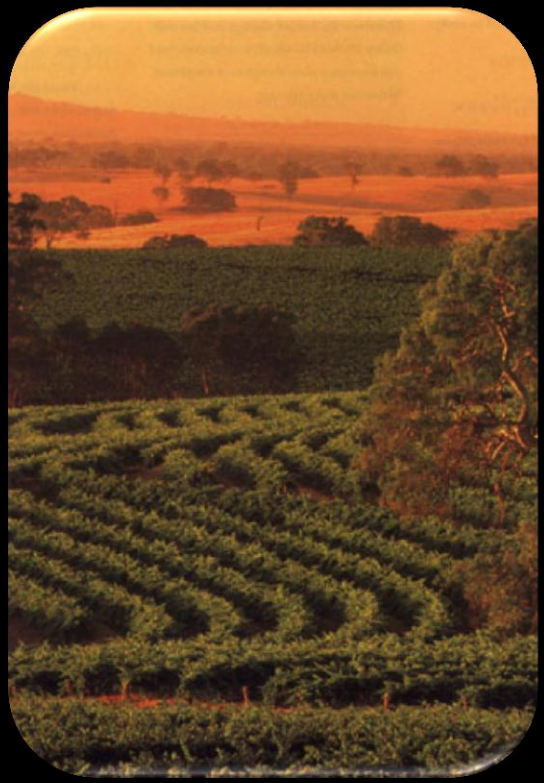
Case Study: Adelaide, South Australia

Adelaide, South Australia



Source: Social Epidemiology & Evaluation Research Group, University of South Australia.

Adelaide, South Australia



Research Funding

- Australia: National Health and Medical Research Council (NHMRC)
- Place and Metabolic Syndrome (PAMS) Project

PAMS Project Funding

Partnership Grant 2010-2013

Linking place to metabolic syndrome: Levers for public health intervention

Evaluate local community characteristics in relation to the development of metabolic syndrome over time.

Knowledge Translation Aims:

- Differentiate the importance of area attributes;
- Differentiate the changeability of area attributes;
- Inform policy interventions on environments.

Project Grant 2010-2014

Testing behavioural and psychosocial mechanisms underlying spatial variation in metabolic syndrome

Evaluate the mechanisms by which local community characteristics explain the development of metabolic syndrome.

Hypotheses:

Local community characteristics will predict:

- development of metabolic syndrome;
- trajectory of metabolic syndrome; and
- worsening of components of metabolic syndrome.

Health data

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North West Adelaide Health Study

- Longitudinal biomedical study with three waves collected over 10 years (nt1= 4056, nt2=3206, nt3= 2487)
- Adults (mean age (SD): 50.4 (16.3) yrs) randomly selected via Electronic White Pages directory from the north-western suburbs of Adelaide.

Health data

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- **Measures:**
  - ✓ Clinical markers (anthropometrics, Blood Pressure, fasting blood sample)
  - ✓ Psychosocial measures (e.g., SF-36, GHQ-12)
  - ✓ Behaviours (e.g., food and physical activity, smoking)
  - ✓ Socio-demographics

Cardiometabolic Health

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CARDIOMETABOLIC RISK FACTORS

- Abdominal obesity
- Hypertension
- Reduced HDL
- Raised Triglycerides
- Fasting Plasma Glucose
- Increased LDL

→ Individual Risk Factors

→ Sum of Risk Factors

→ Metabolic Syndrome

South **A**ustralian **E**pidemiological **G**eographic **I**nformation **S**ystem **(SAEGIS)**

Built Environment

Land use / zoning, Road network, Satellite images
Private sector businesses (e.g., Food stores)

Social Environment

Census, Property Valuation, Crime

Health Data

North West Adelaide Health Study

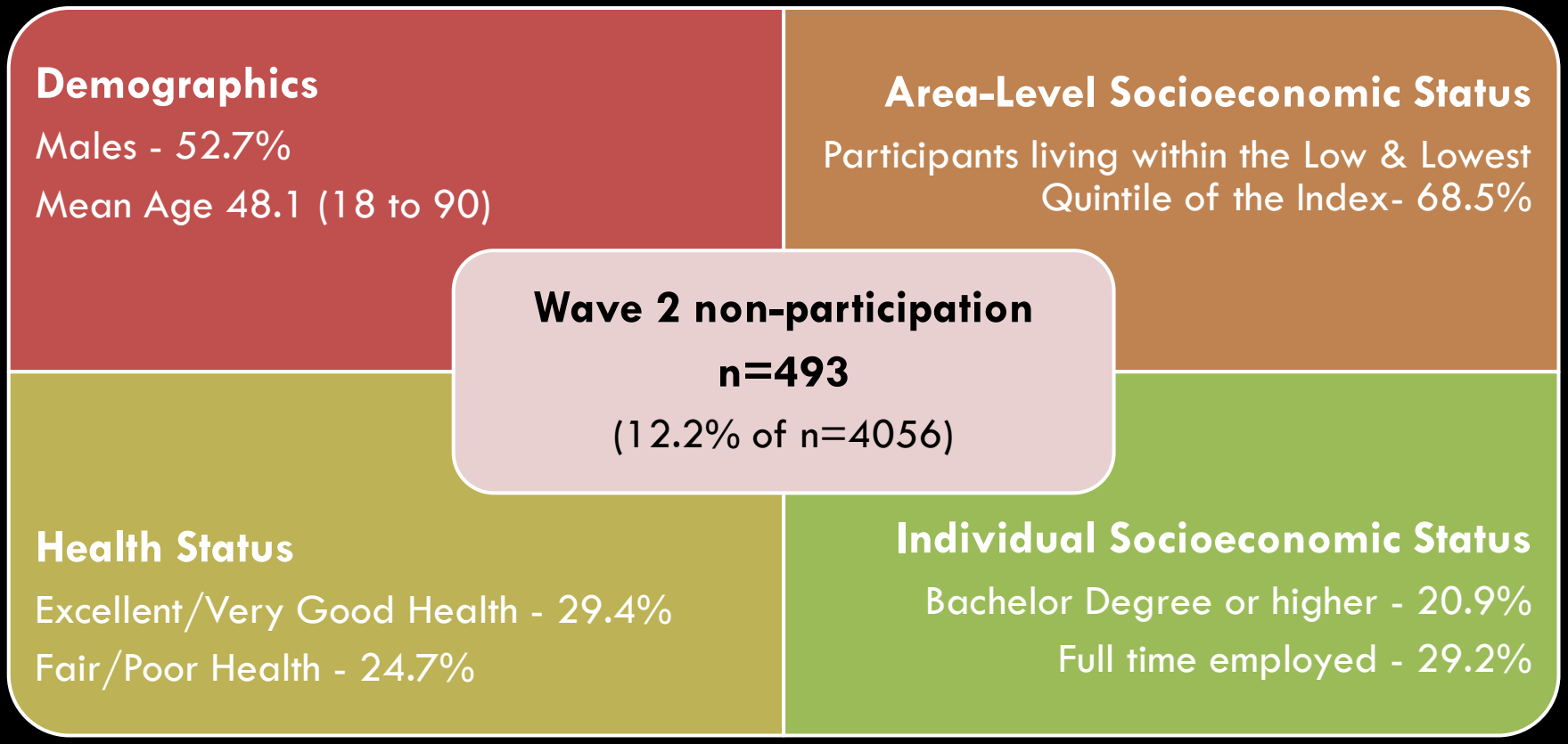
Wave 2
n=3508
(98.5% of n=3563)

Movers
n=611
(17.4%)

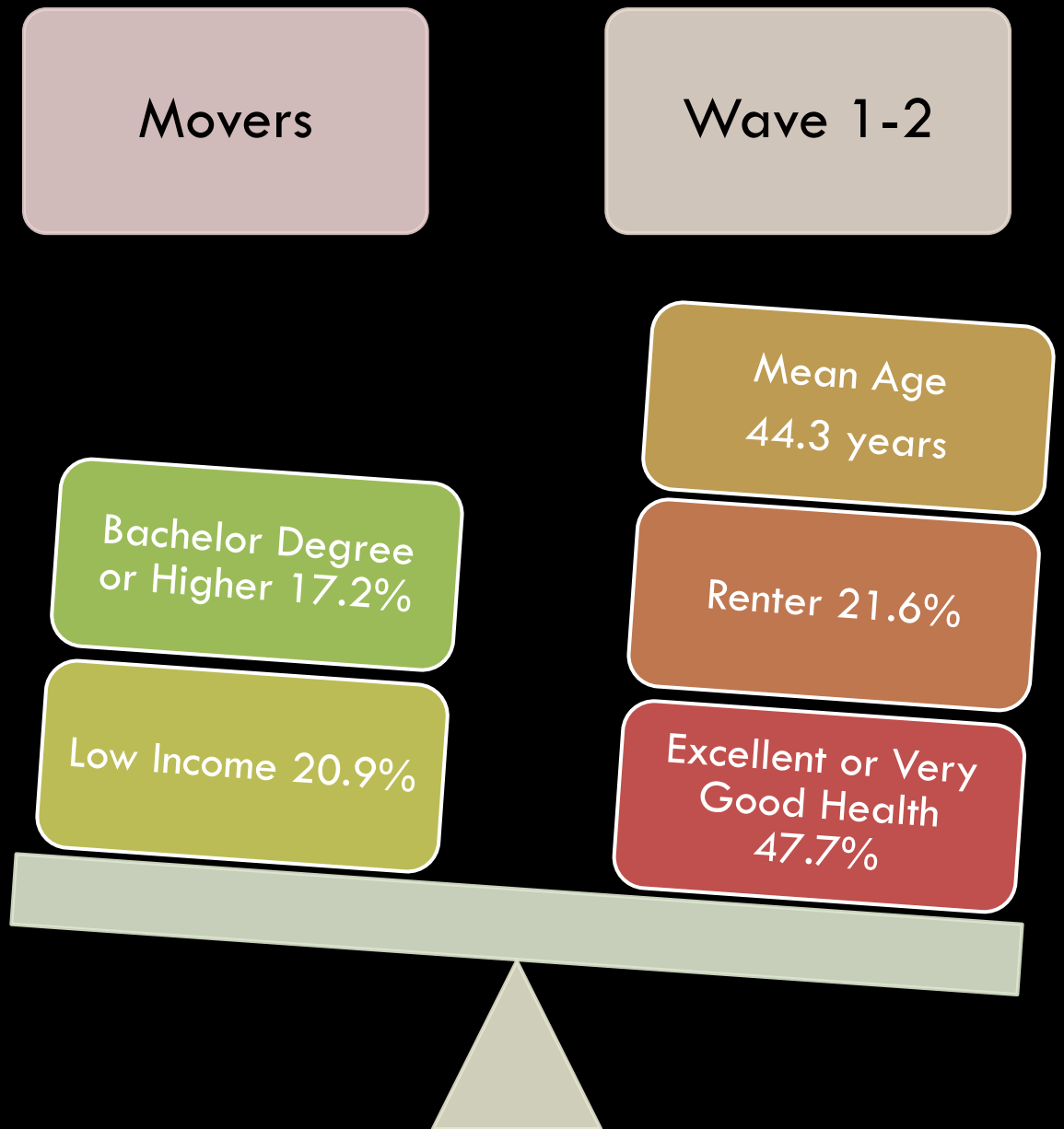
Non-Movers
n=2897
(82.6%)

Mover information at Wave 1 and 2
n=604

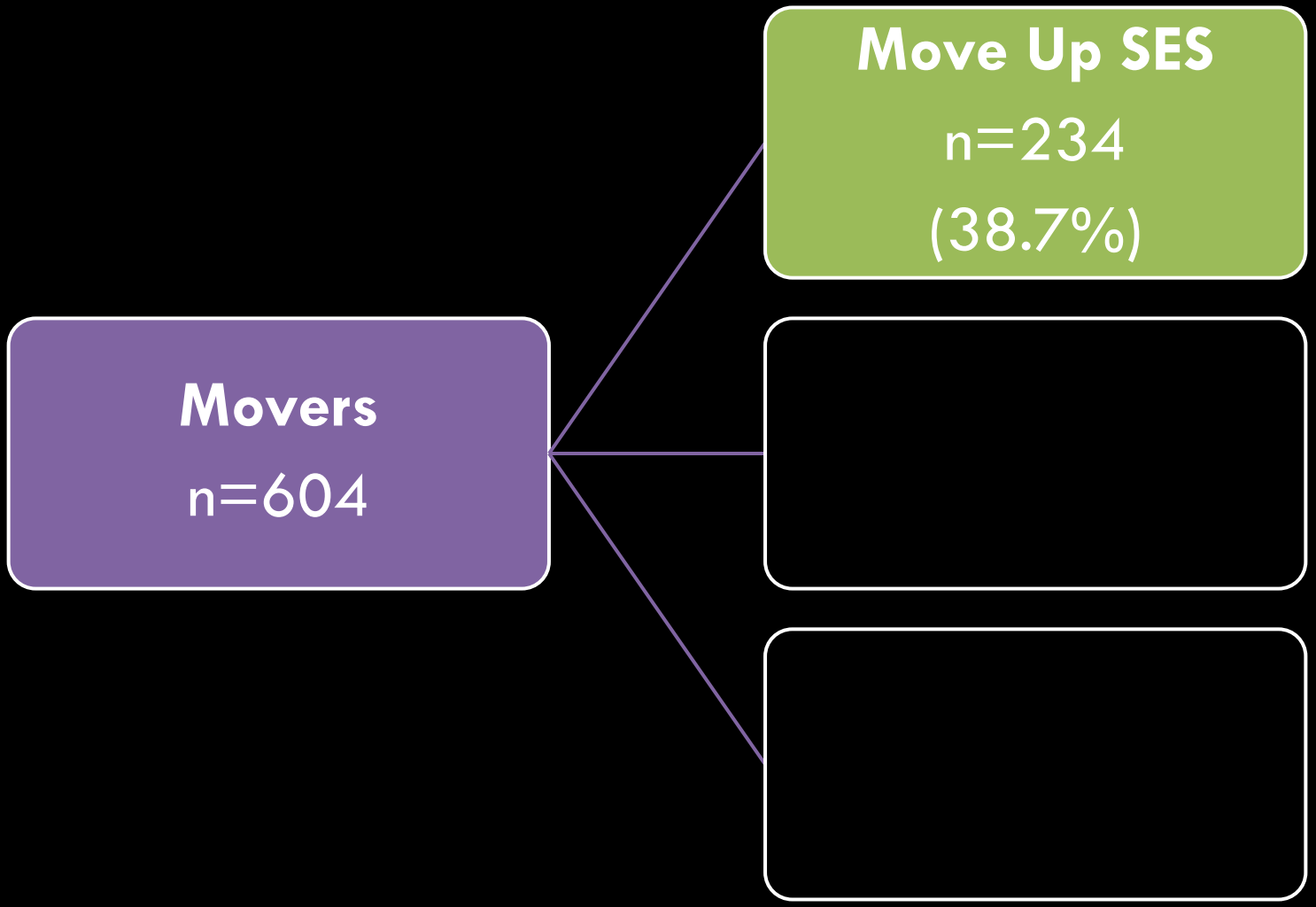
Wave 2 non-participation

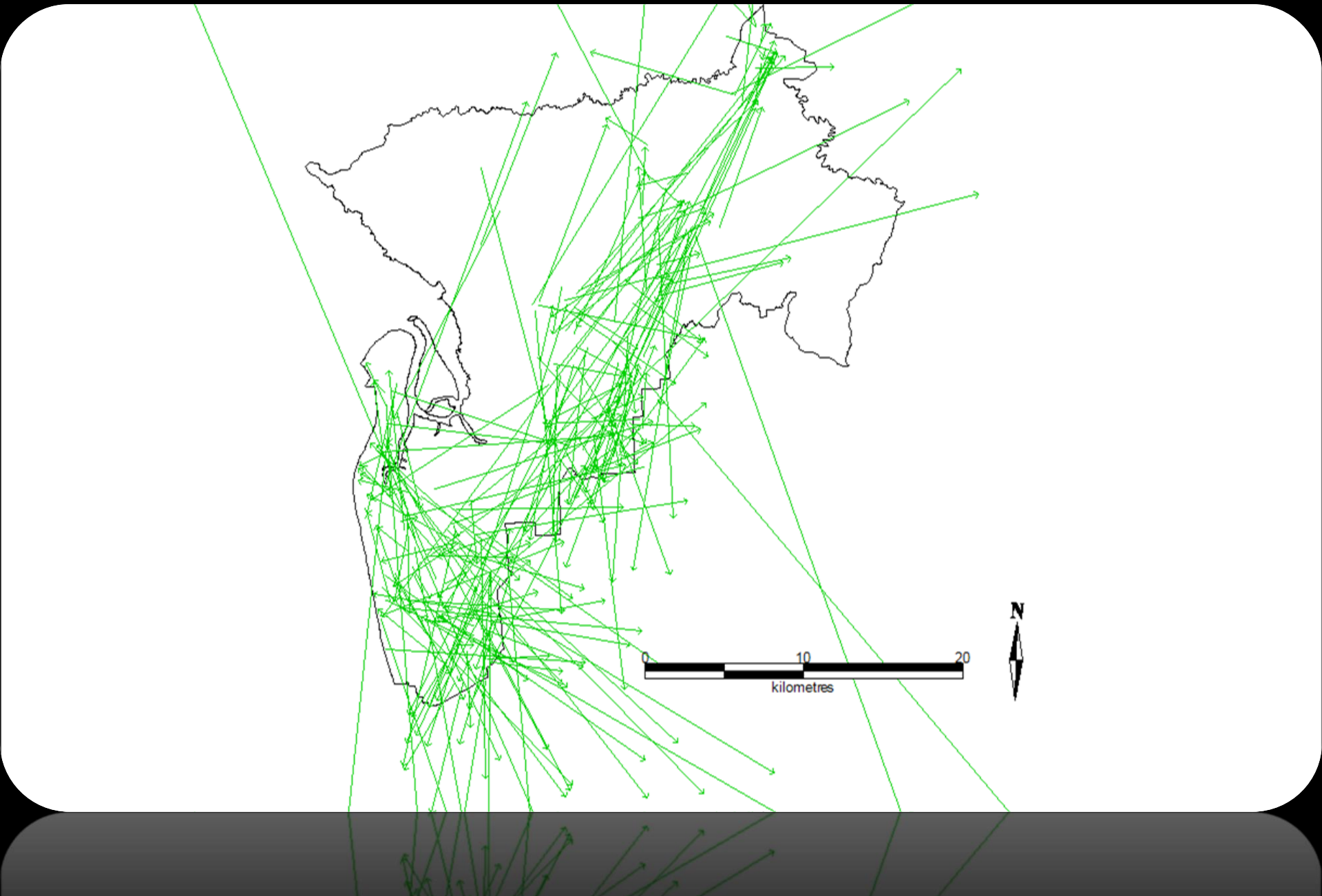


Socio-demographics



Who moves area-level socio-economic status ?

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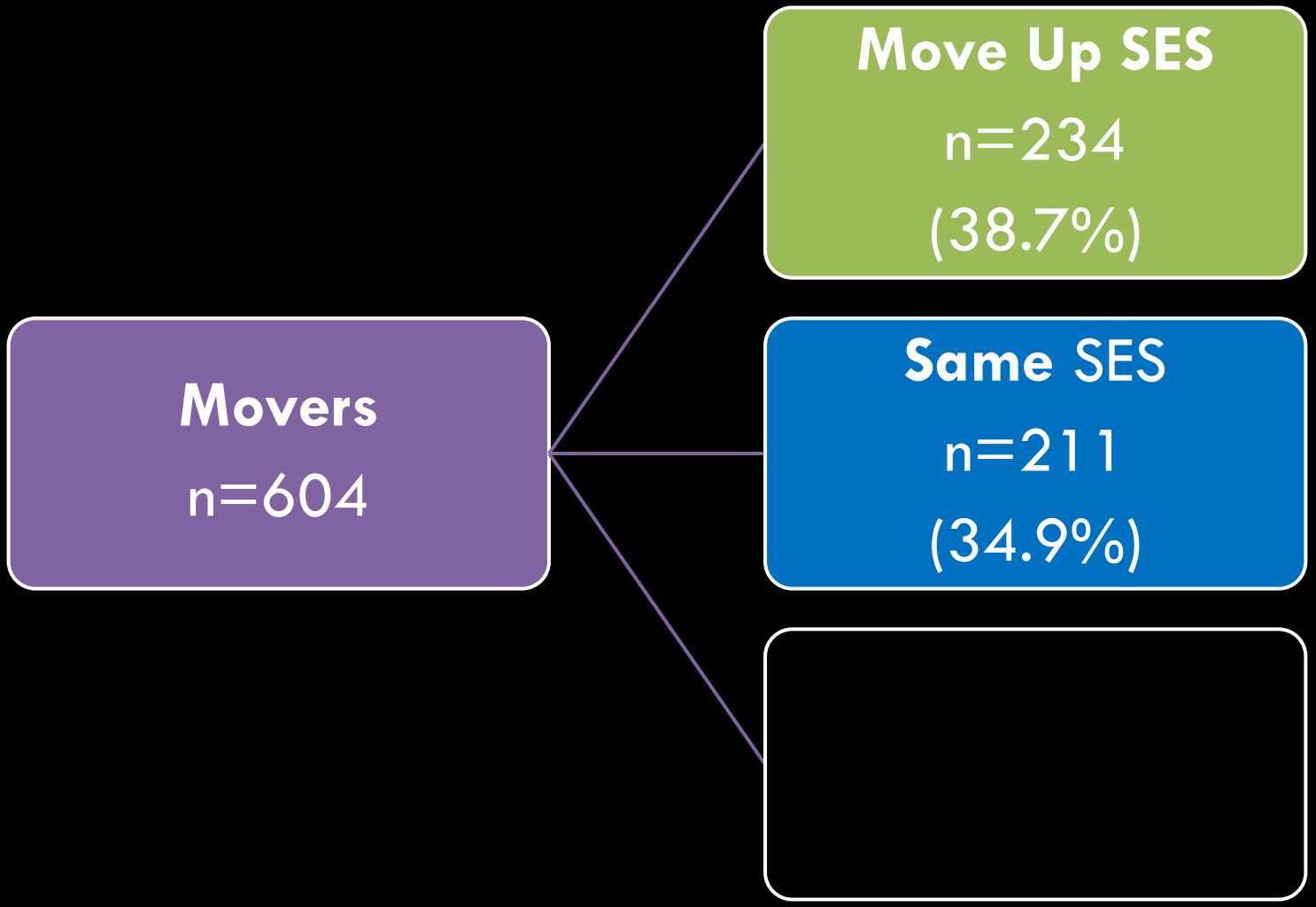

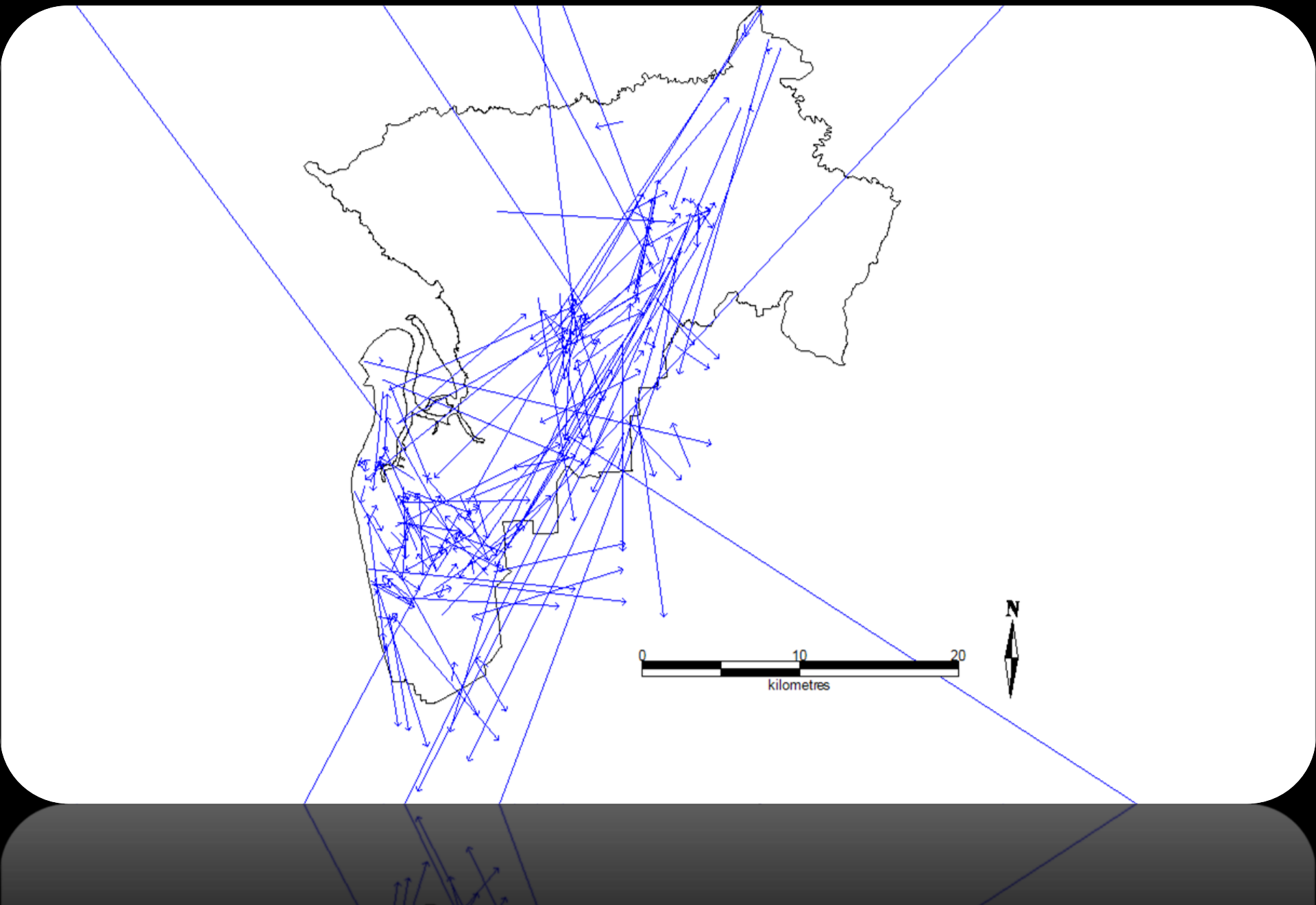
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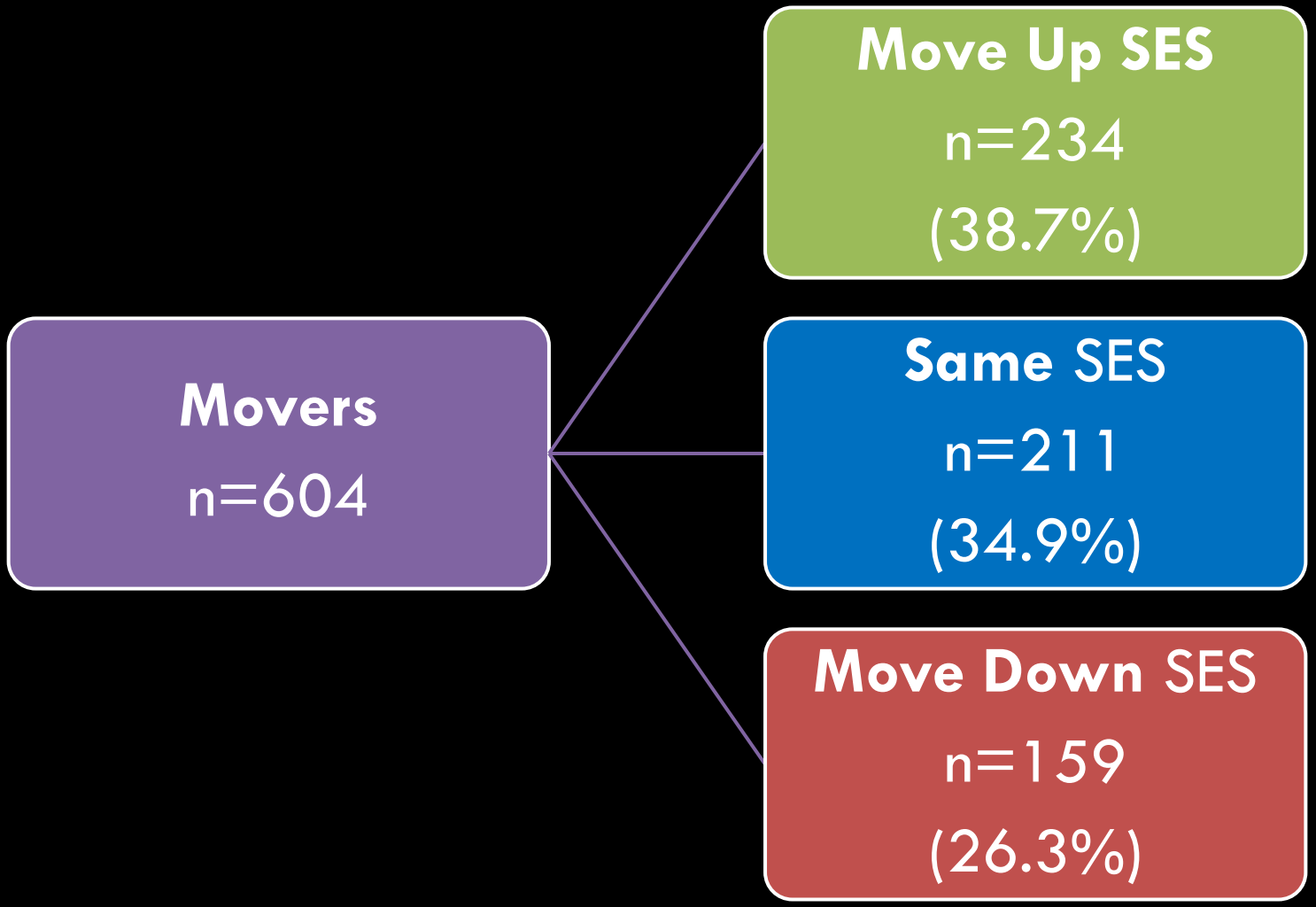


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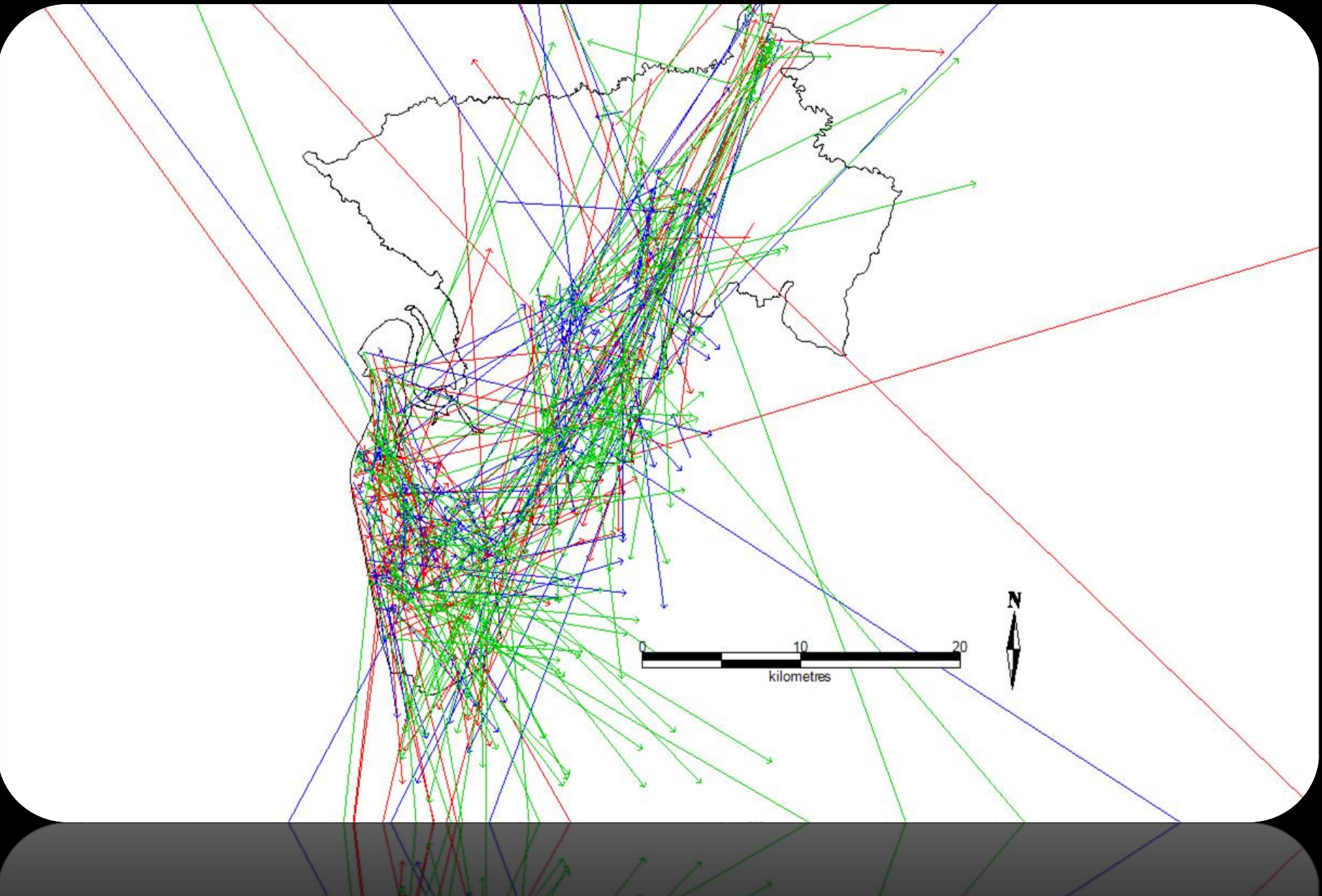
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Application: Research objectives

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- To implicate area-level influences by accounting for individual factors using propensity matched pairs of ‘movers’ and ‘non-movers’.

- To assess the difference between the two groups according to a number of biomedical cardiometabolic risk markers.

Propensity score estimation

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- Matching of members of a treatment group to members of a no treatment group.
- Applied within observational studies to reduce and bias and approximate a randomized trial (Parsons, 2004).
- Rosenbaum and Rubin (1983) have demonstrated as a 'balancing score' that ensure that the resulting matched samples have similar distributions.

Propensity score estimation

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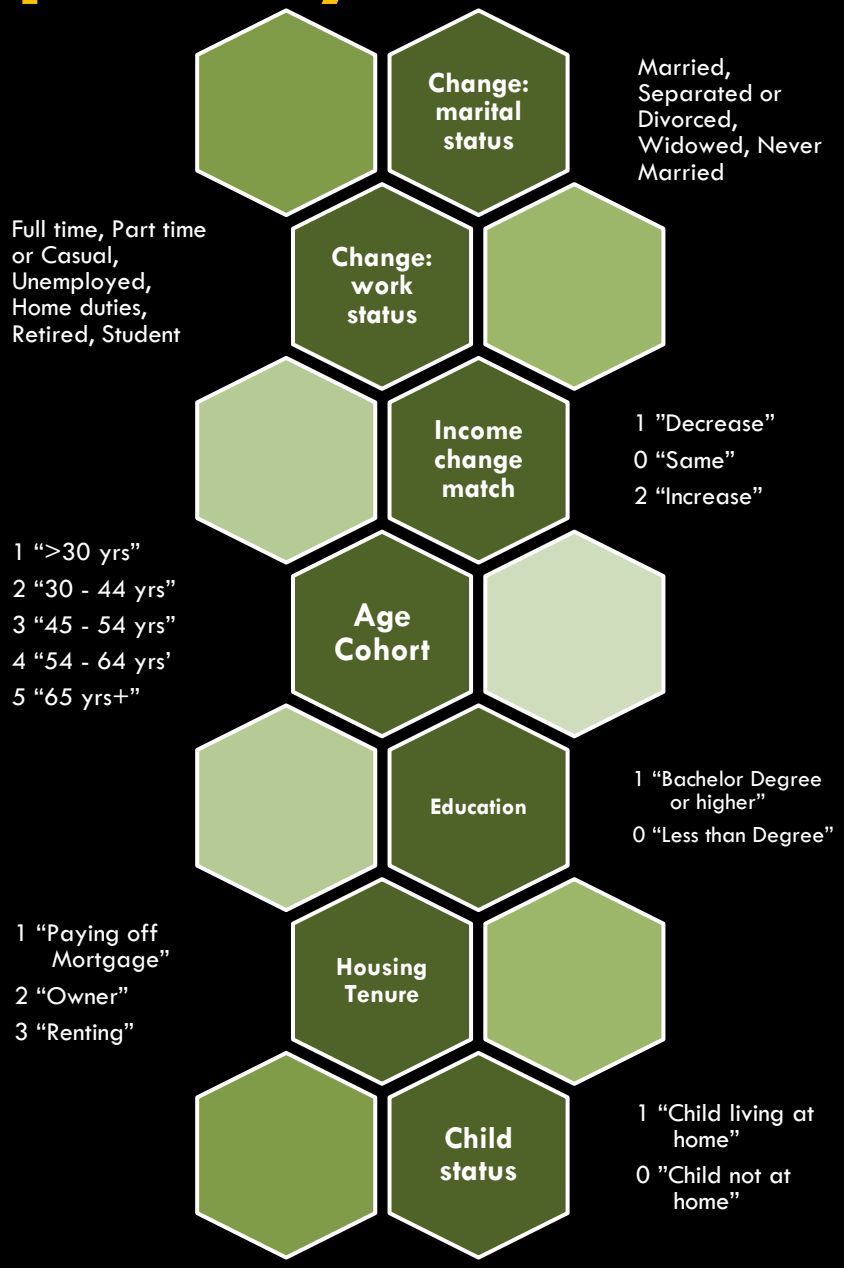
- Following steps in specifying the propensity score model (Austin, 2007):
  1) Derive a list of measured baseline variables that are likely related to exposure/outcome.
  2) Derive an initial propensity model by including all variables in the list as main effects.
- **Four steps:** Specifying propensity score model, matching, statistical assessment of balance, estimation of effect.

Step 1: Propensity Score Model



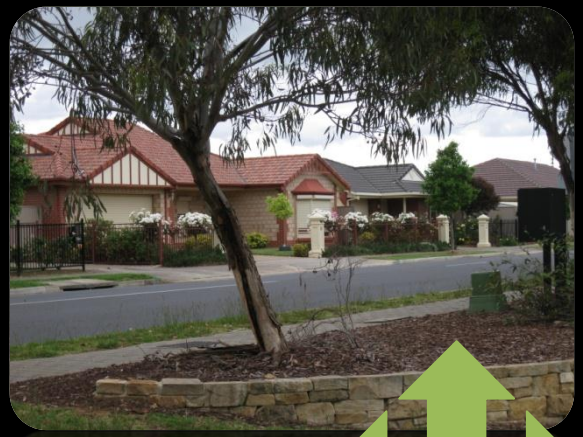
Propensity Score Estimation

Greedy Match Macro

(SAS 9.2. System for Windows)

- Propensity Score was estimated by a logistic regression model
- Wave 1 to 2 'Mover' regressed on the individual-level predictors of mobility.

Step 2: Propensity Score Matching



Mover n=413	Non-mover n=413
Change in marital status match (0,1)	Change in marital status match (0,1)
Change in work status match (0,1)	Change in work status match (0,1)
Income change match (0,1,2)	Income change match (0,1,2)
Age	Age
Bachelor Degree or higher (0,1)	Bachelor Degree or higher (0,1)
Housing Tenure	Housing Tenure

Step 3: Assessment

413 'Movers'

413 'Non-movers'

(SAS 9.2. System for Windows)

- Difference between matched pairs 'Movers vs Non-movers' were assessed by T-test.
- Non-movers had an increase in the count of elevated risk factors (mean 0.04) than 'Mover' counterparts (mean -0.11).

Discussion

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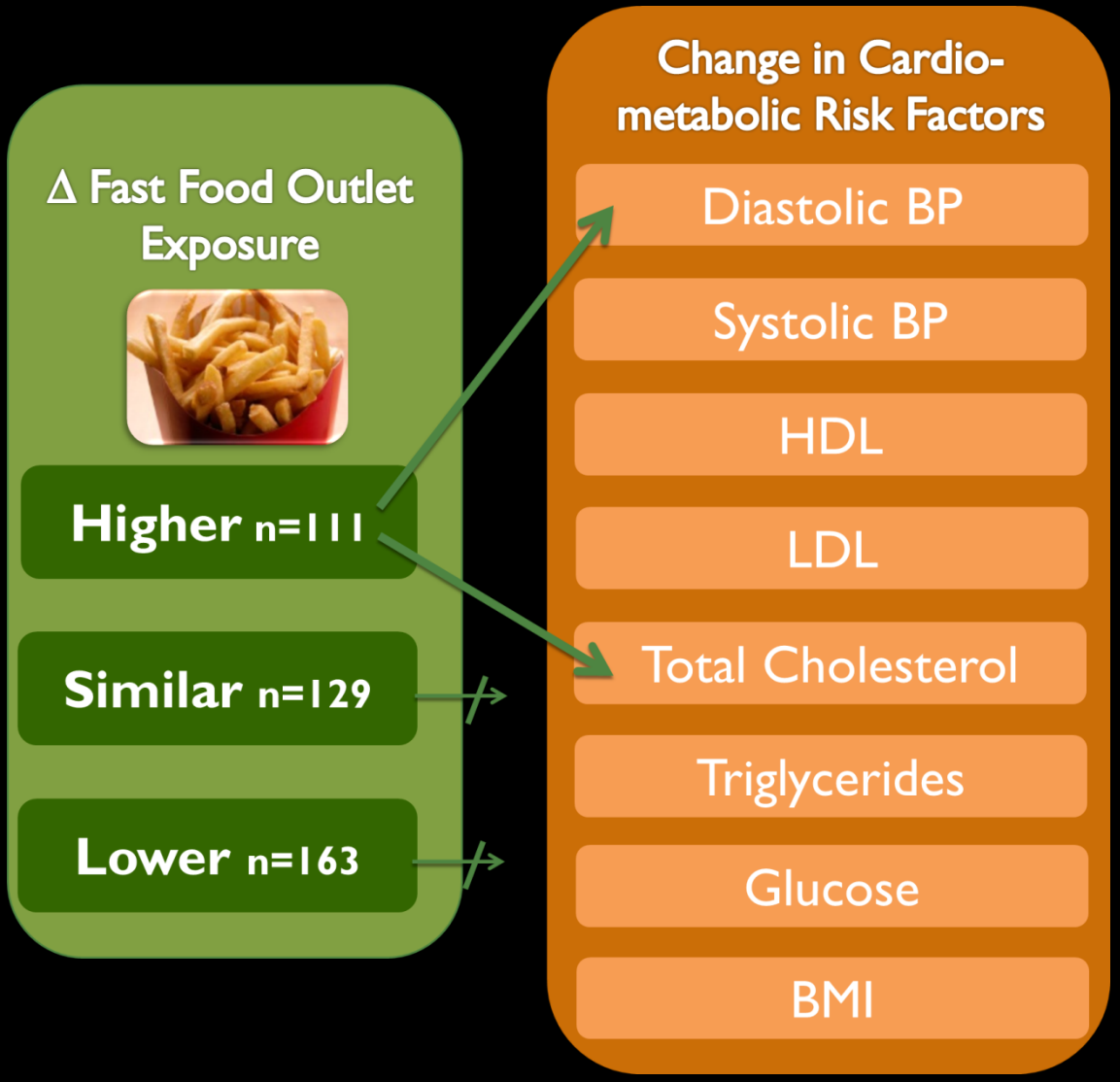
- 'Non-movers' had a greater increase in risk of cardiometabolic disease.
- Understanding mobility patterns will inform:
  - ✓ knowledge on residential self-selection;
  - ✓ interpretations on relationships between environmental contexts and health behaviours;
  - ✓ how individual-level drivers implicate area-level relationships.

Preliminary analyses – fast food

1. Matching 'movers' to 'non-movers' with respect to their propensity to re-locate into areas of varying fast-food outlet exposures through drivers of individual mobility.

2. Comparing mover/non-mover matches on their change in cardiometabolic risk.



NJ Howard, C Paquet , NT Coffee, GJ Hugo, P Lekkas, AW Taylor, RJ Adams, M Daniel (2014). Change in fast-food outlet exposure and cardiometabolic health status of propensity matched 'movers' and 'non-movers' in a biomedical population-based cohort. *International Society for Behavioral Nutrition and Physical Activity*, 21-24 May 2014, San Diego, California, USA.

Practical implications

- Include residential movement within population based cohorts
  - ✓ Spatial sampling
  - ✓ Consider movement in loss of sample
  - ✓ Collect information on other mobility drivers

Future directions

- Further understandings on the characteristics of residential mobility.
- Investigate other built environmental influences and assess how residential mobility implicates area-level factors.

People move places

Location 1

Location 2

Movement changes places

People move places

- Explore the dynamics of how neighbourhoods/local areas are formed and how they change.

- Consider how population movement influences residential segregation, influence the socio-spatial reproduction of local areas.

Contact Information

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