

Social ecological mapping of physical activity behaviours in deprived inner-city communities

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Project Aims

Theoretical framework - social ecological perspective to better understand (and change) the relationship between the environment and health behaviours

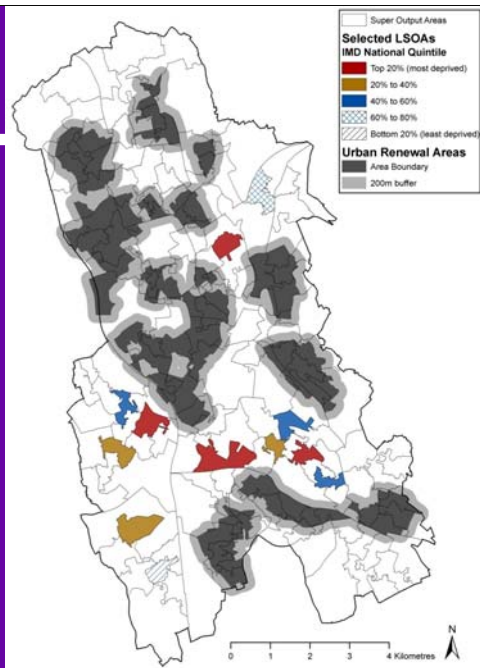
- Detailed mapping of environment for 10 lower super output areas (SOA) to evaluate relationship between environment, PA behaviour, health and health/social care utilisation
- 3 main components of the study:
 - i) Mapping of environment and health
 - ii) Community survey
 - iii) Schools survey



- Using 12 NH in SoT defined by SOA, will produce a detailed map of environment to explore and evaluate the relationships between the environment, health, health care utilisation, and PA, peoples environmental perceptions, and SR health.
- Areas were selected according to certain criteria (not areas for redevelopment, non-adjacent, reasonable churn rate) and ground truth to identify areas of new build, etc
- 3 main components:
 - i) Mapping using existing health data gathered from different sources
 - ii) Comm survey of random adult sample (n=900) residing within study areas(NatCen)
 - iii) Schools survey
- This is coming from a social ecological perspective
 - Shift away from individual as indiv-orientated approach to increasing PA NOT working
 - Therefore, need to change environment to support PA

Selection Criteria

- Due to HMR only 25 out of 160 LSOAs were suitable
- LSOAs – “small area” ~1,500 popn.
- Representative range of IMD scores



Emphasise renewal areas

SOAs

Intervention areas	IMD Score	IMD Decile	Control	IMD score	IMD Decile
Sandford - E	46.31	1	Sneyd Green	55.73	1
Heron Cross	38.71	2	Stoke	43.11	2
Sandford - W	32.22	3	Hanford	32.63	3
Adderley Gn.	20.14	5	Trent Vale	21.33	4
Meir Hay	15.95	6	Hartshill	16.66	6



GIS data collection components

- Residential population distribution and density (households)
- PA Facilities / Public open space (green space)
- Commercial Outlets - type of food outlets and density
- Roads and Pathways (Street Connectivity, “walkability”)
- Land use mix
- Mass transport provision (Bus and Rail Stations)
- Road Traffic levels
- Street Safety – Road Accidents (especially pedestrians)
- Crime and Anti-Social Behaviour
- **Weather** (sunshine/rainfall) – important in UK



These are just some of the examples of the environment and neighbourhood data that we will be including in our analysis.

Focus is on the effect on access to or levels of physical activity

NC examples – eg research shows that the connectivity of an estate can have an impact on peoples mobility

Population distribution to see if people are located in areas with a high landuse mix that facilitates easy access to areas for Physical Activity

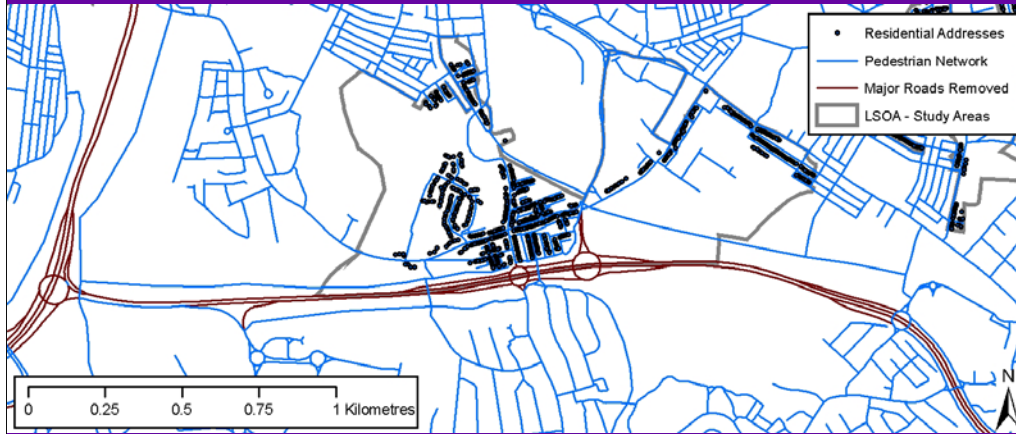
Aims of GIS Analysis

- **Locate residential addresses (population)**
- **Proximity / accessibility analysis**
 - e.g. Green space/leisure facility, food outlets
- **Distance along pathways from individual households**
 - i.e. Network Analysis (paths/sidewalks, cycle paths, road network)
- **Create / combine indices and other measures**
- **Link to other analyses and datasets:**
 - Community Survey
 - Health datasets (Stoke PCT)
 - Hierarchical Linear Modelling (HLM)



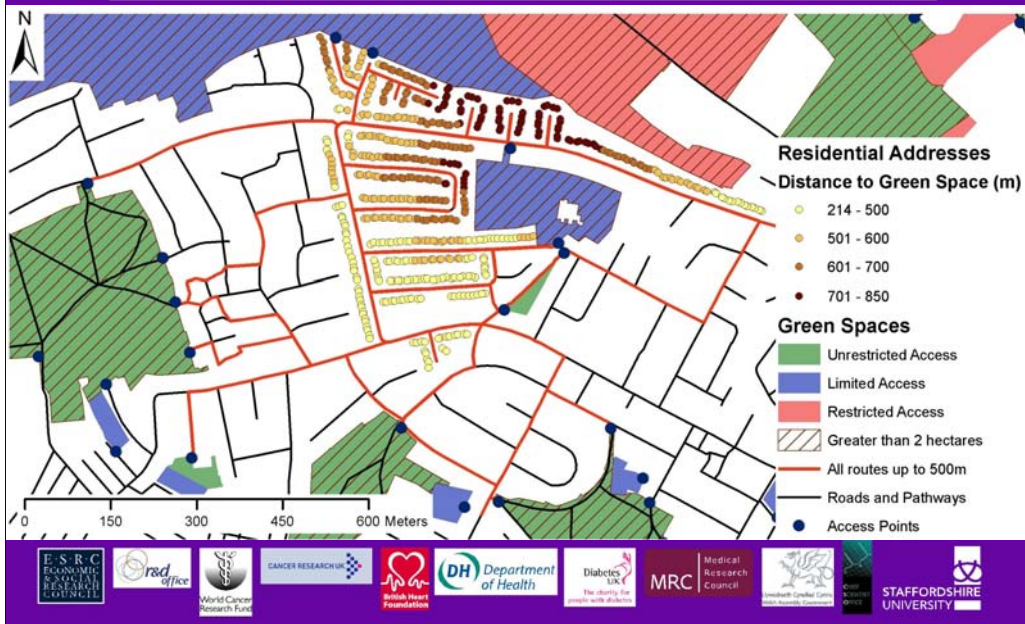
Creating a Pedestrian Network

Major roads with **no pedestrian access** removed



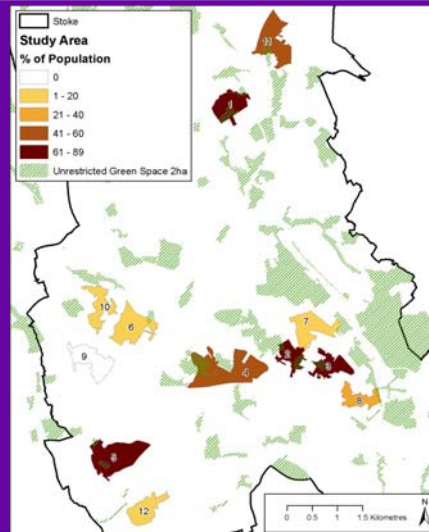
Access to Green Space

network distance from every household



% population within 300m of Green Space

Site	Size and Access of Green Space		
	All	2 hectares in size	Unrestricted Access 2ha
1	88.9	88.6	88.6
2	97.8	79.4	79.3
3	95.3	75.9	75.9
4	75.9	46.4	46.4
5	96.9	93.4	77.9
6	97.8	28.2	20.1
7	76.1	67.9	2.0
8	90.9	29.4	29.4
9	79.9	32.0	0
10	92.6	56.1	17.5
11	60.1	50.4	49.6
12	63.5	11.9	8.5

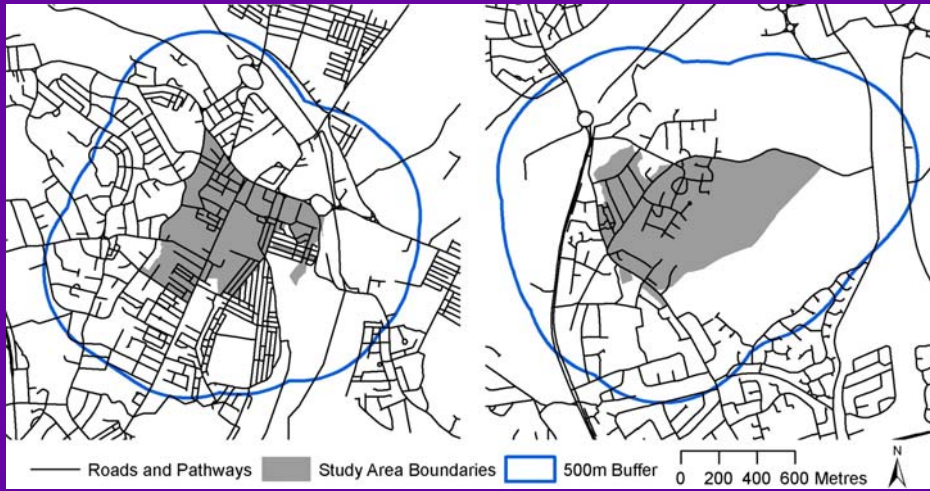


Street Connectivity

Street pattern effects

High Connectivity (Stoke)

Low Connectivity (Hanford)



Potential Barriers to PA

- **Road Accident data**
 - Point location of every accident (and casualty)
 - Severity, Type (pedestrians and cyclists as a subset)
- **Road Traffic levels**
 - Data from automatic and manual traffic counts attached to stretches of road
- **Crime**
 - Point location of every crime in the last 3 years
 - Type of crime (Criminal Damage, Violent, Burglary)
- **Anti-social Behaviour**
 - Point location of every reported incident

***Expected to have an effect on walking / cycle trips
Linked to individuals' perceptions of a neighbourhood***



Barriers to PA

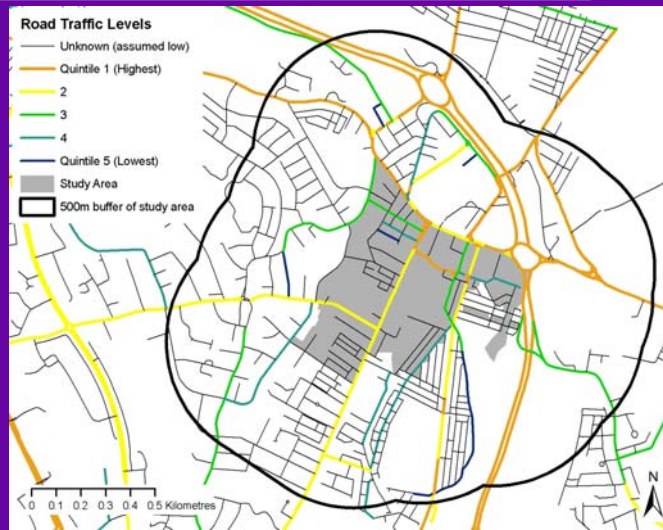
mapping road traffic levels

- Data from automatic and manual traffic counts

- Point location counts attached to stretches of road

- Road stretches ranked and split into quintiles

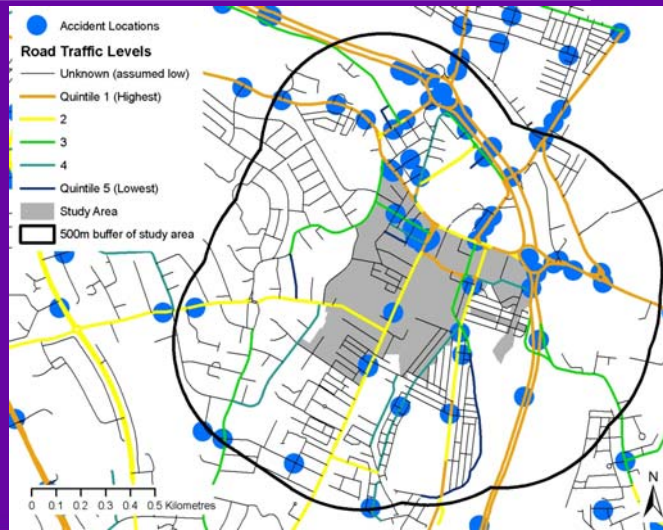
- Roads without data assumed low traffic (no through traffic)



Barriers to PA

mapping accident casualties

- Point location of every accident (and casualty)
- Severity (Fatal, serious, slight)
- Type (pedestrians and cyclists as a subset)



Community Survey - CAPI

Self-reported attributes & health datasets

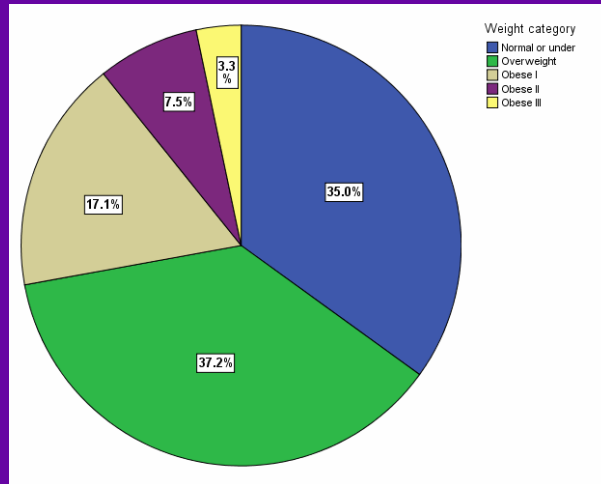
Dimension	Sample metrics
Neighbourhood environment (ANEWS)	Accessibility to local amenities & spaces, perception of safety/crime, perceived barriers to PA, social capital, socio-demographics.
Health indicators	BMI, perceived health status (SF12, EQ5D), mortality data, hospital admissions, CVD risk
Current PA levels and PA behaviour	“Objective” PA (accelerometry), PA domains (IPAQ (long)), behaviour change.



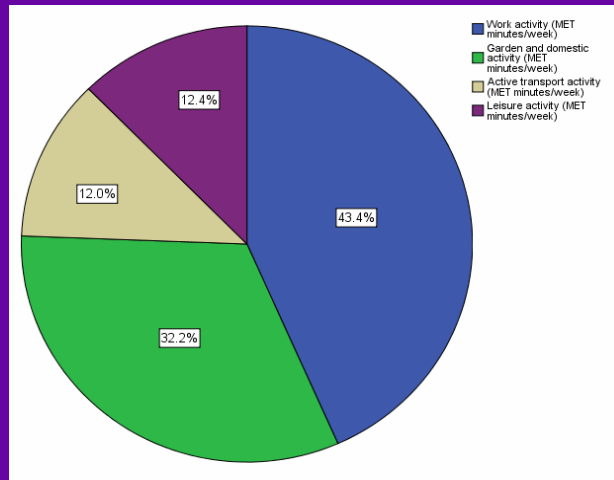
In addition to the GIS mapping of the environment and neighbourhood data there will be health data and survey results

This is just a few examples of the health attributes

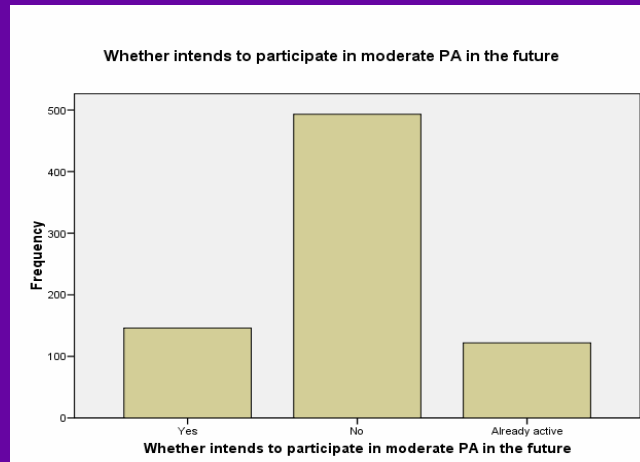
Weight categories



Activity domains



Future participation in PA?



Belief in ability to participate



“Walkability Index”

- Calculated for a defined area based on a set of indices including:
 - Residential Population Density
 - Street Connectivity
 - Land use mix
 - Net Retail area
- Frank LD, et al. 2005 (US), Leslie et al. 2005 (AUS)
- Other environmental determinants of PA also influence walkability. (e.g. accessibility)
- Need to develop the index for a British context



“Stoke Physical Activity Index”

Initial components:

- Household / Population Density
 - Street Connectivity (Density of 3-way junctions)
 - Access to Green space (2ha unrestricted)
 - Density of Retail destinations
 - Density of Local Services
 - Density of Eating and Drinking destinations
-
- Buffer / network distance of 500 metres around SOA
 - Scores are all based on a *relative scale* of 0 to 1
 - All factors given equal weighting (averaged)



“Stoke PA Index”

- Walkability on a scale of 0 to 1
- Range from 0.17 to 0.81
- Good range of data for the majority of individual indices

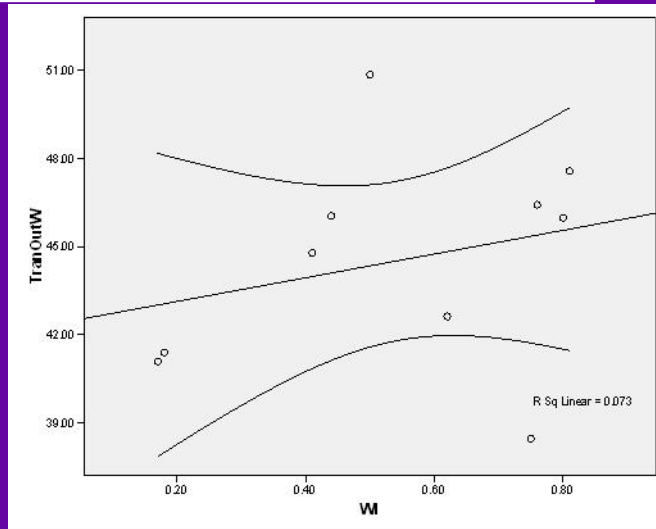
Site ID	Walkability Index
1	0.41
2	0.81
3	0.75
4	0.62
5	0.18
6	0.80
7	0.17
8	0.44
9	0.50
10	0.76
11	0.32
12	0.19



PA Index

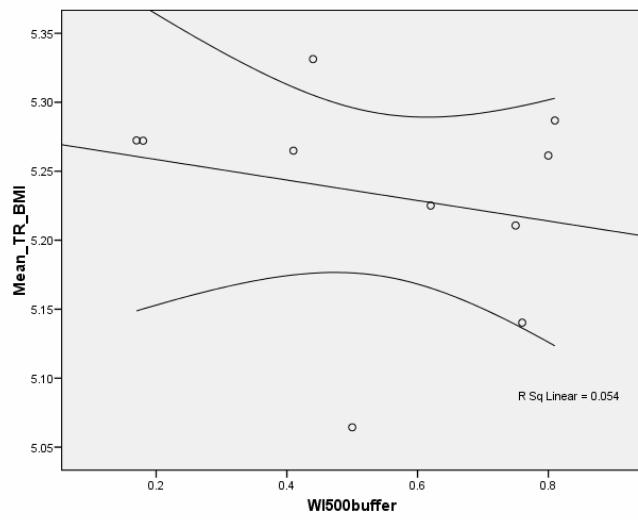
Walkability
vs
Total Activity
Outside of Work

Promising results
but.....
Two clear outliers



PA Index

Walkability
VS
BMI



Stoke PA Index

The next step:

- Alternative components (differentiation of current indices)
- Change in accessibility distance (or buffer size)
- Tie in with modelling of individual indices and PA
 - » **Adapt weightings for components**
- Do we look at barriers to PA?
 - Traffic, crime, anti-social behaviour....
- What is a good walkability score?
 - » **Setting standards for planners**



Correlates: PA outside work

- Positive
 - Accessibility of shops and service (ideally within ~5 minutes walking distance).
 - Functional greenspace.
 - “Walkability” of an area may impact on physical activity?
- Negative
 - Crime – burglary, violence, anti-social behaviour
 - Traffic accidents
 - Traffic volume
 - % within 800m unrestricted green space



Key Findings/Policy implications

Individual

- Prevalence of overweight and obesity high and widespread
- Levels of physical activity low
- Intentions to change PA behaviour low
- Impact of public health messages negligible
- Study confirms the importance of perceived neighbourhood on PA level
- Access to facilities, services and spaces important in promoting PA

Neighbourhood

- Traffic levels and road casualties involving public transport
- Criminal damage
- Access to greenspace (influenced by weather)

Further research



Acknowledgements

Medical care Research Council and NPRI
Funding Bodies: Grant G0501287

- NatGen and Interviewers
- Stoke-on-Trent City Council
- Staffordshire Police
- Stoke PCT
- RENEW North Staffordshire

