



时空行为与健康城市

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01

引言

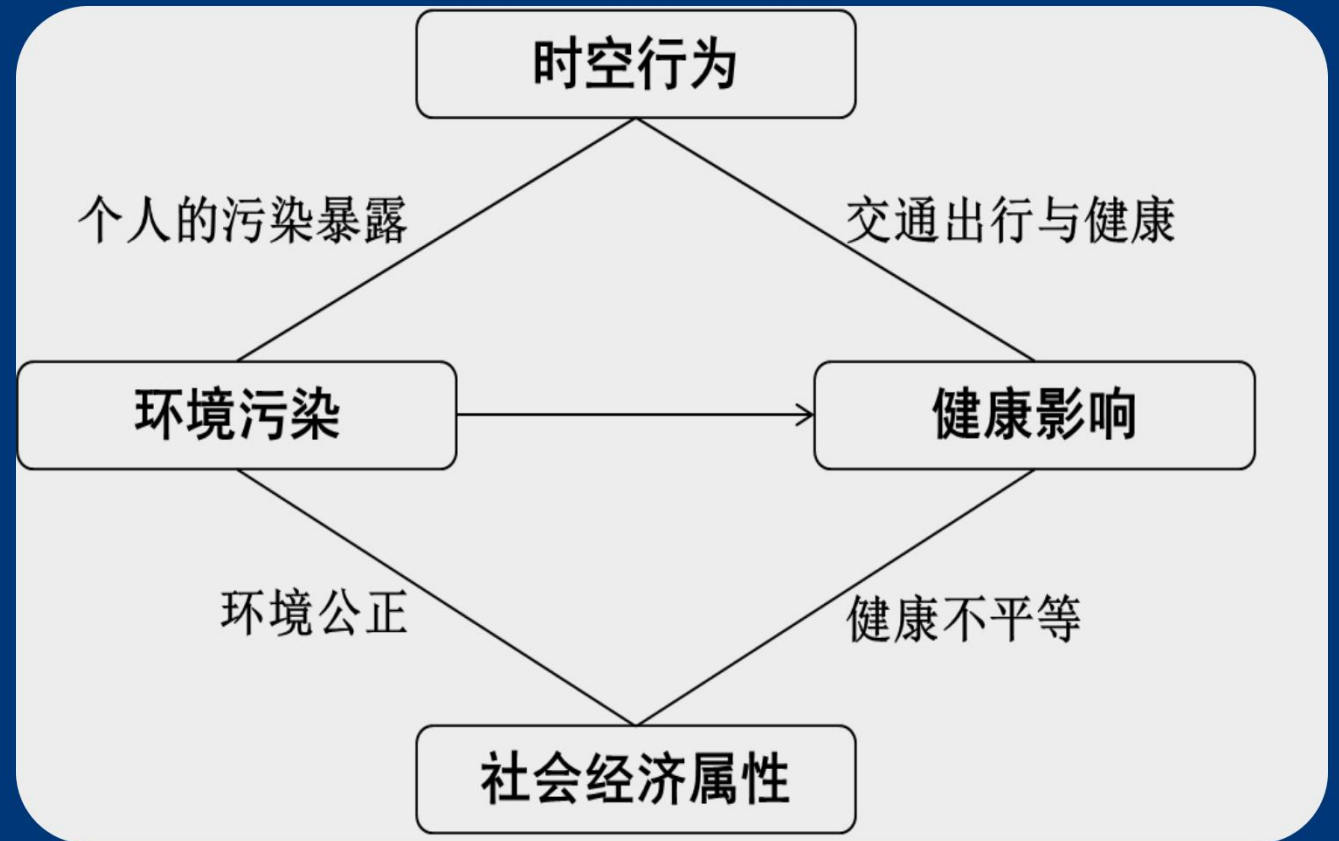
- ◆ 快速城市化与城市空间重构
- ◆ 环境污染问题
- ◆ 时空行为研究
- ◆ 健康城市



环境污染暴露：从基于居住地转变为基于个体时空行为

城市形态影响时空行为及健康效应

环境公正与健康不平等研究



社会经济属性



02

城市形态、交通出行与健康

- ◆ 城市规划减少非传染性疾病，发展紧凑城市
- ◆ 城市规划的健康效应主要通过影响交通出行
- ◆ 提出八项城市与交通规划措施，促进绿色出行行为



区域和地方层面的八项规划措施 (Giles-Corti et al., 2016)

	Urban and transport planning and design features	Examples
Regional planning		
Destination accessibility	Regional employment, facilities, and services conveniently accessible by public transport; destinations for daily living available locally	Jobs, facilities, and services within 30 min travel from home by public transport; daily living destinations within walking distance
Distribution of employment	An appropriate mix of employment available across a region	A job-housing balance from 0.8 to 1.2
Demand management	Parking supply and pricing policies increase the attractiveness of using alternative travel modes to driving	Building codes and other government policies that minimise car parking
Local urban design		
Design	Urban design creates walkable catchments around activity centres and incorporates accessible public open space; street networks minimise distances between homes and daily living destinations, reduce traffic exposure, and create safe pedestrian, cycling, and public transport networks; lot* layouts designed to increase residential densities and promote natural surveillance	High street connectivity including ped-sheds ≥ 0.6 within 0.8–1.2 km (ie, 1–15 min walk) of activity centres, transport hubs, and schools; separated pedestrian and cycle paths; local public open space provided; housing overlooks streets and public open spaces
Density	Residential densities sufficient to support the viability of local business and high-frequency public transport services	Multiunit housing built around activity centres with shops, services, and transport hubs
Distance to public transport	High-frequency public transport located within short walking distances from homes	Bus stops accessible ≤ 400 m; rail stops accessible ≤ 800 m from homes
Diversity	Residential areas built with different types of housing mixed with commercial, public, and recreational opportunities	Different types of housing available near, around, and on top of shops and services required for daily living
Desirability	Neighbourhoods designed to be safe, attractive, and accessible; public transport that is convenient, affordable, frequent, safe, and comfortable	Crime prevention design principles incorporated into residential and commercial developments; urban greening strategies implemented; traffic minimised, calmed, and separated from pedestrians and cyclists, particularly near schools

通过影响居民日常生活及交通出行模式及需求进而对健康产生直接或间接影响

1

影响包括交通量、空气与噪音污染、日常活动量、饮食等八大风险暴露

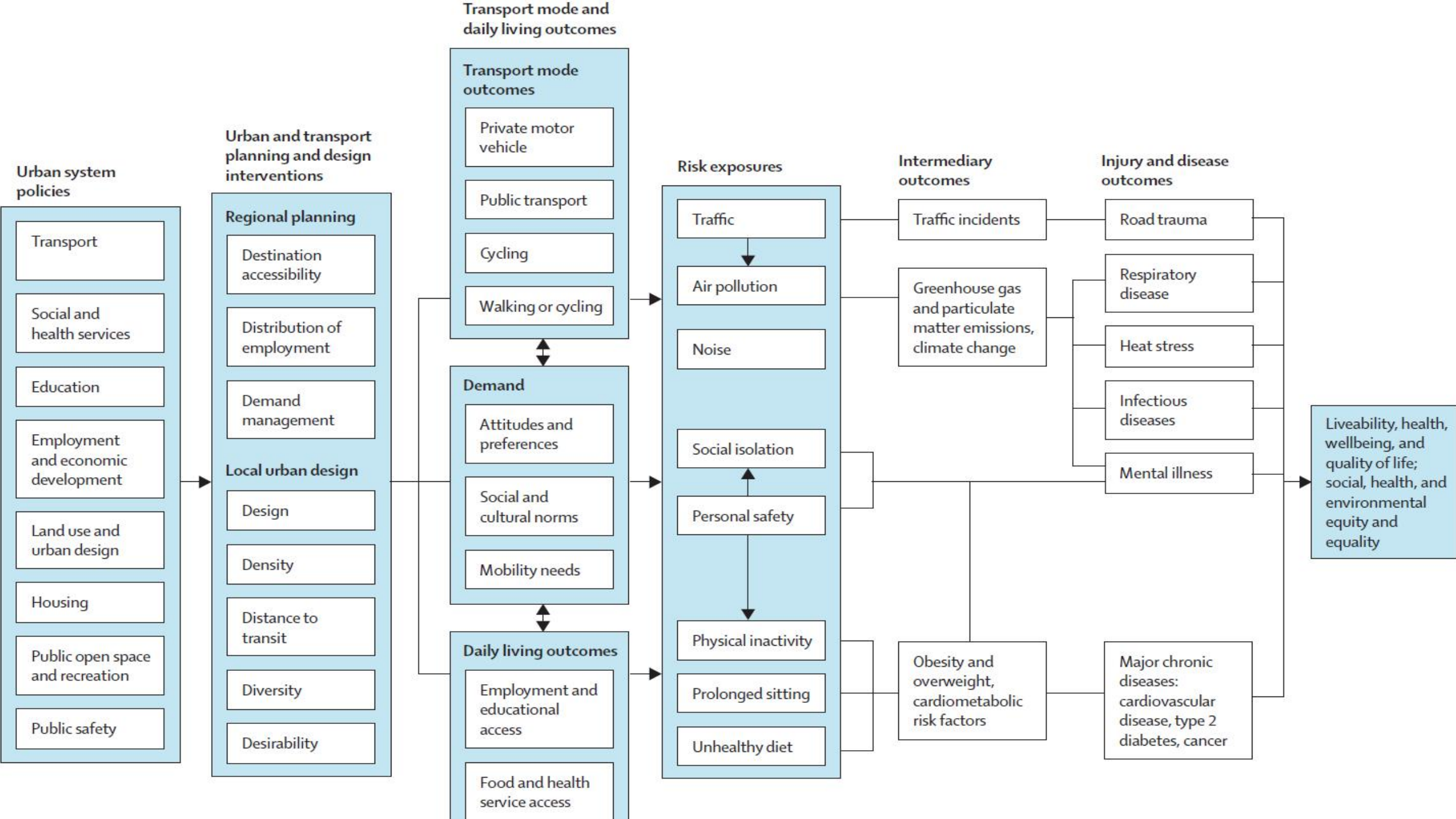
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风险暴露因素进而影响交通事故、温室气体排放、肥胖症及心血管疾病等

3

最终影响居民生活质量，身体与心理健康，幸福感，造成环境与健康不平等

4



通过影响与居民日常生活及交通出行相关的八大风险因素对健康产生影响



需要制定不同层面的规划措施，促进居民绿色出行，发展紧凑的健康城市



交通出行是影响居民健康效应及扩大健康不平等的重要因素之一



城市与交通规划在制定政策、建设基础设施等方面需要重点考虑弱势群体

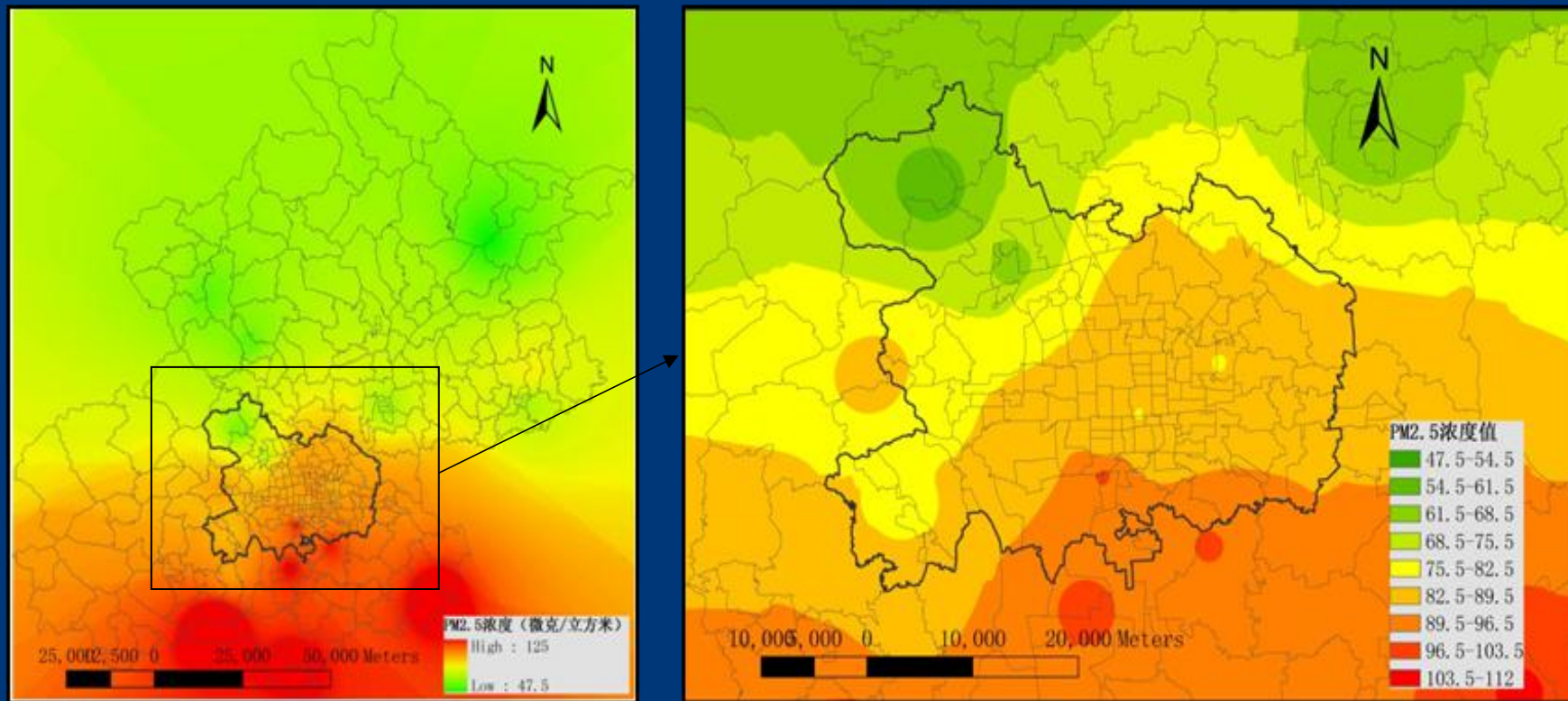




03

时空行为与个体污染暴露

- ◆ 空气污染暴露测算方法
- ◆ 基于时空行为的个体污染暴露及健康效应



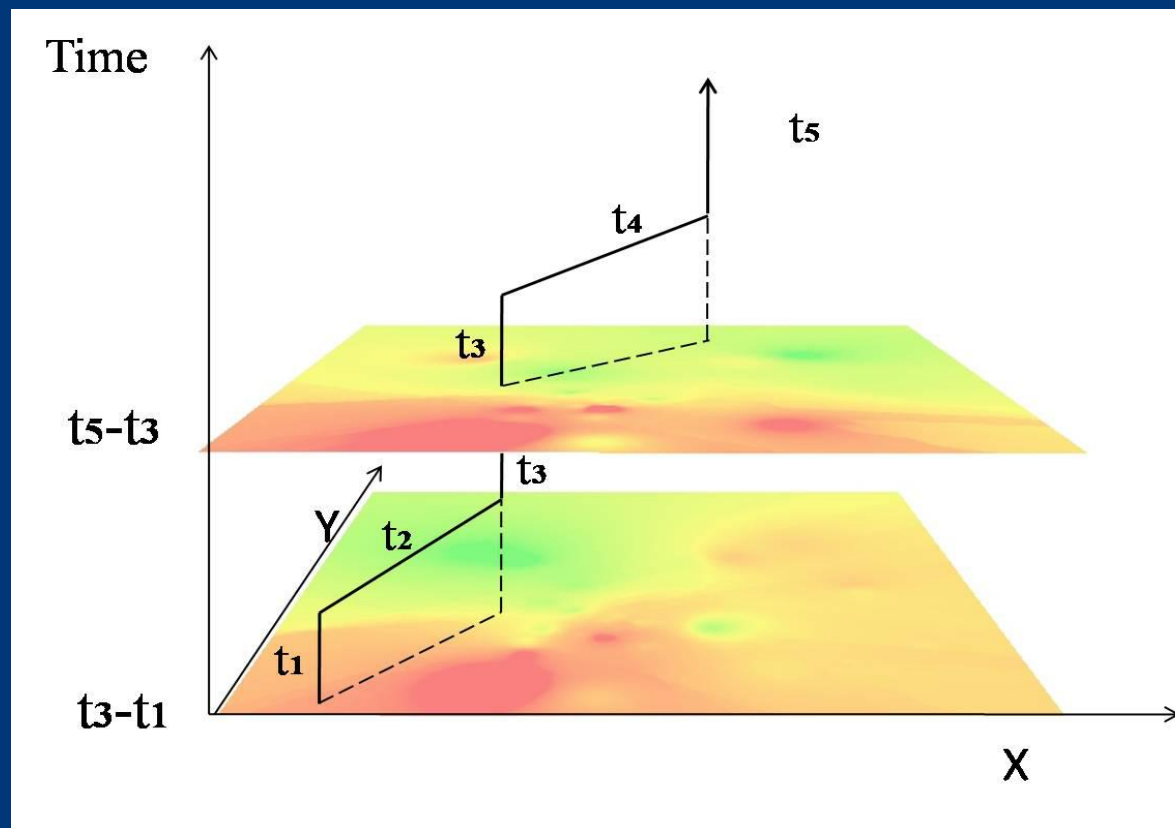
北京市10月9日至12月20日平均PM2.5空气污染分布

基于时空行为的个体污染暴露

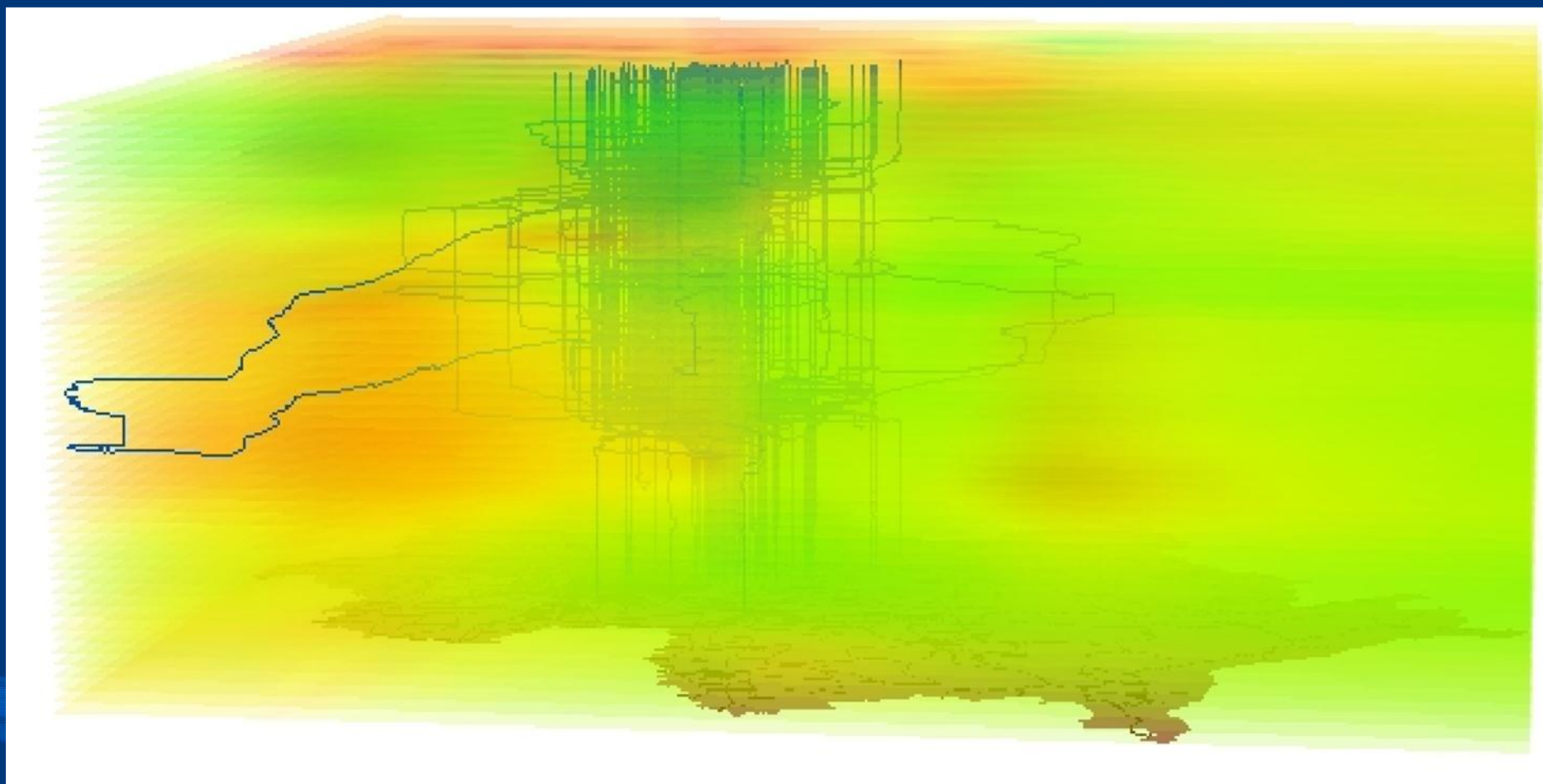
$$\mathcal{E}_i = \int_0^{ta} C_{Si}(t) dt \cdot I_i$$

$C_{Si}(t)$ 表示个体*i*在*t*时间内和*s*空间区域内的空气污染浓度

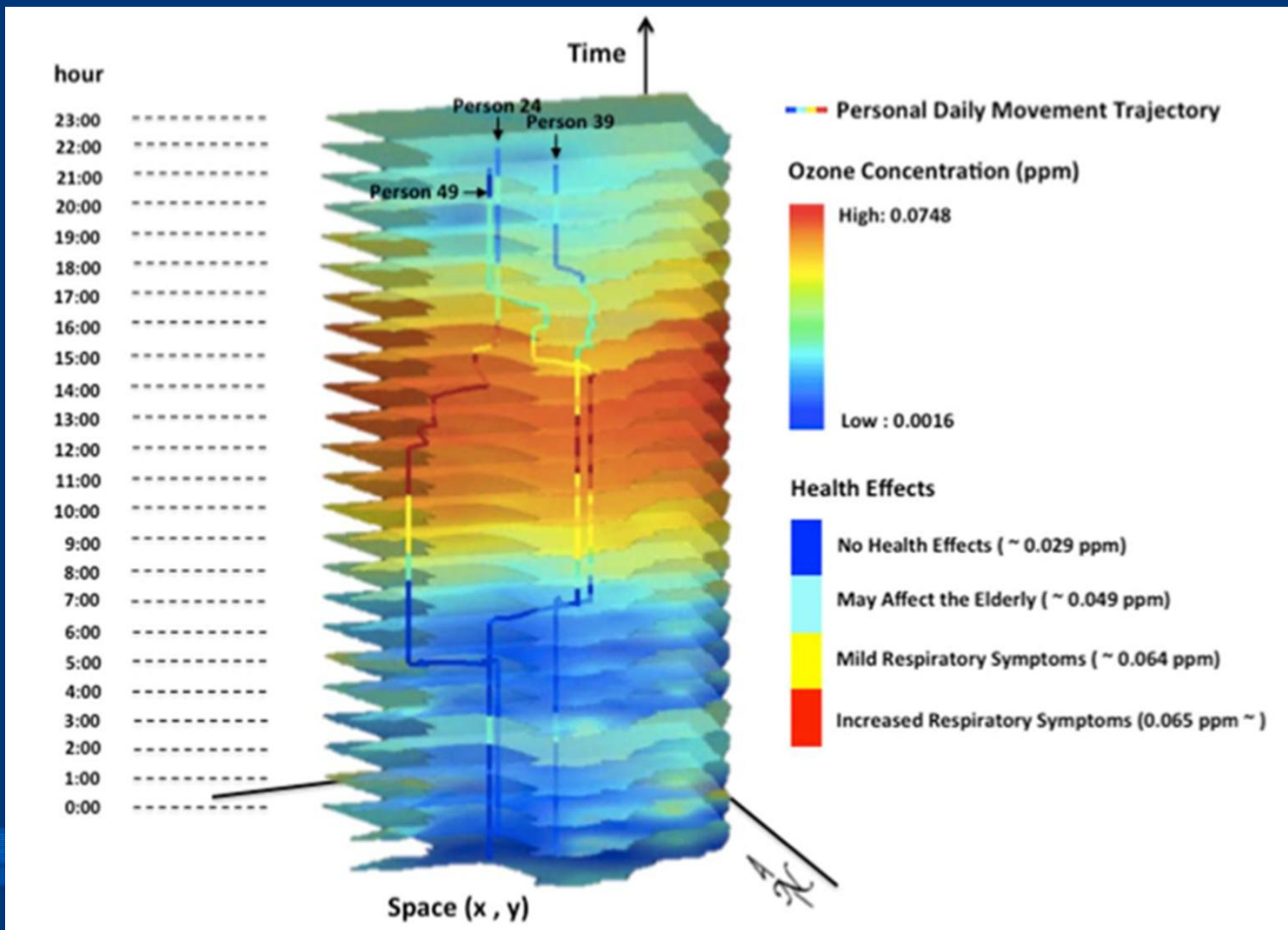
I_i 为个体*i*在某一时段的空气吸入率



2012年10月9日至12月20日，北京上地-清河地区GPS调查
一共791个样本（包括543个社区样本、248个企业样本）
包括一周GPS时空轨迹和活动日志
同一时段北京35个空气质量监测点数据，基于小时采集



基于时空行为的个体污染暴露及健康效应



Source: Park and Kwan, 2017



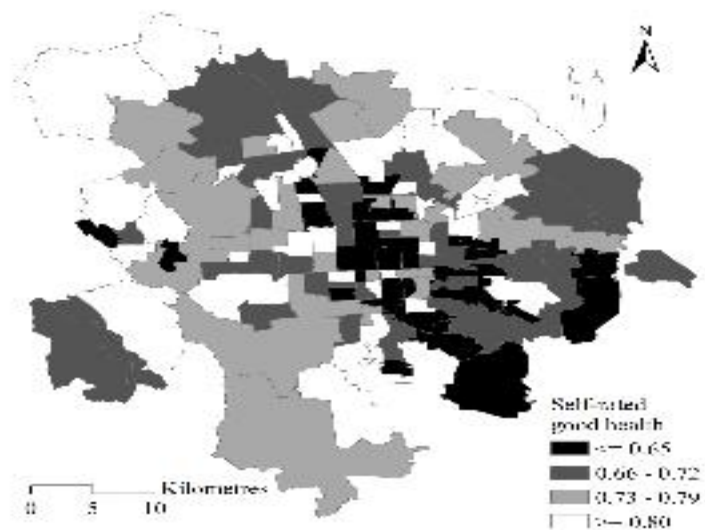
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环境公正与健康不平等

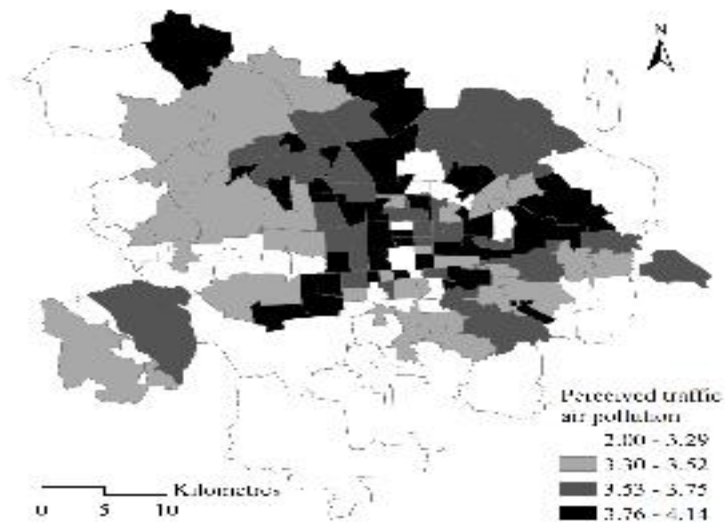
- ◆ 环境污染暴露的社会分布
- ◆ 环境不平等的动态分析

环境风险因素及健康的微观空间分布

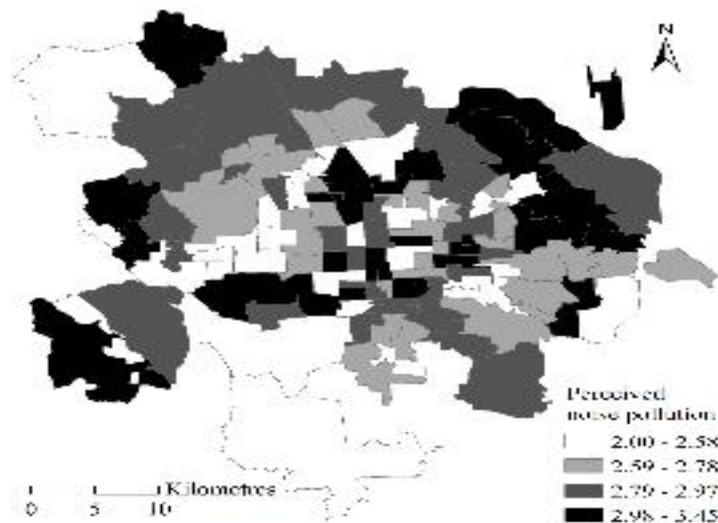
A. Self-rated good health



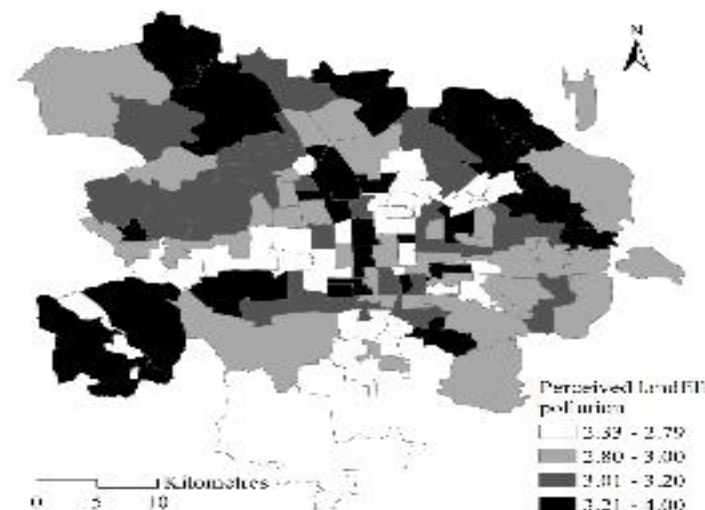
B. Perceived traffic-related air pollution



C. Perceived noise pollution



D. Perceived landfill pollution



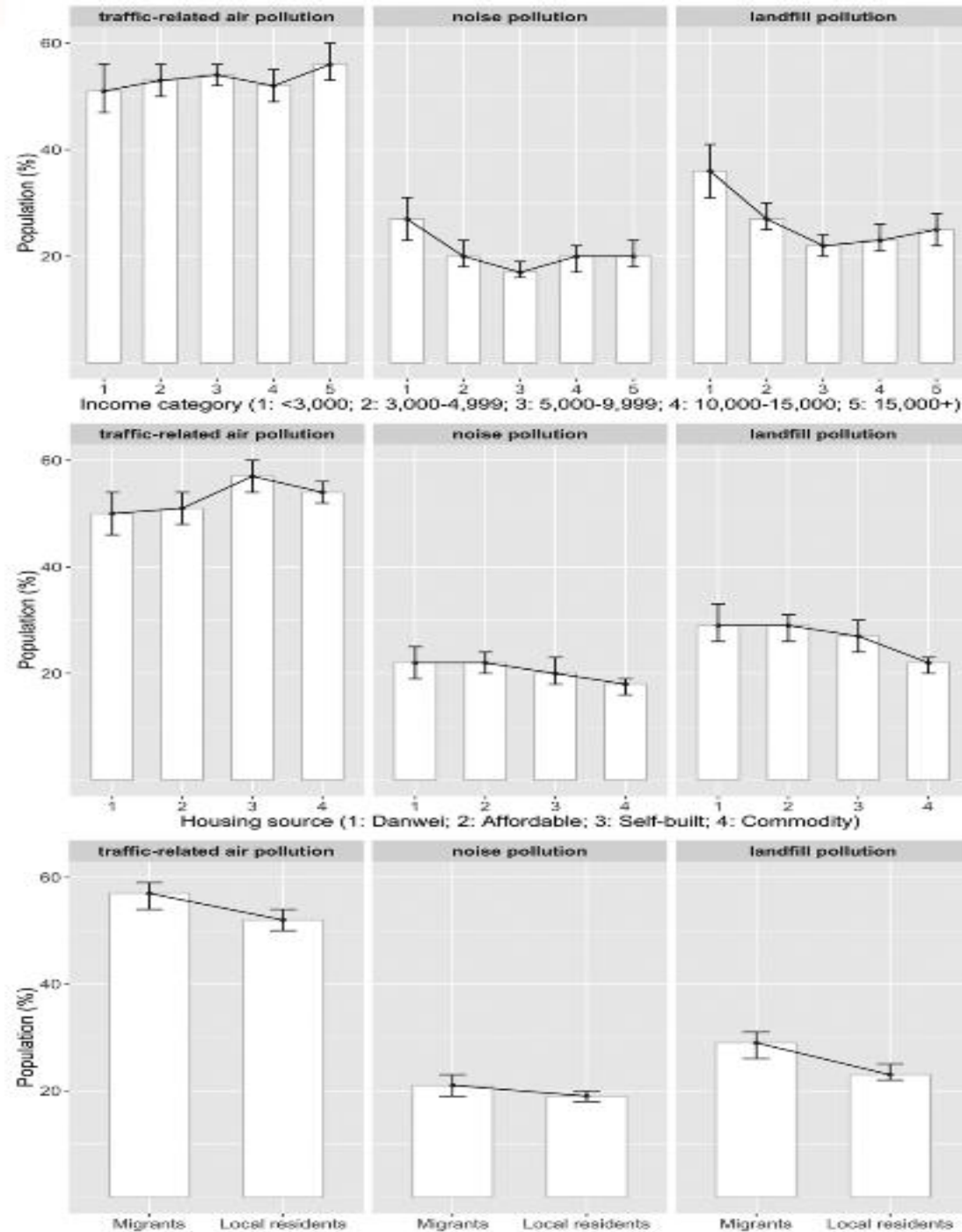
Source: Ma et al., 2017

◆ 环境污染暴露的社会分布

收入：高收入阶层的环境污染暴露小于中等收入和低收入阶层

住房来源：商品房社区居民环境污染暴露小于其他社区居民

户籍：流动人口污染暴露高于本地人口





环境不平等 (environmental inequality) 的动态分析

Source: Mitchell et al., 2015

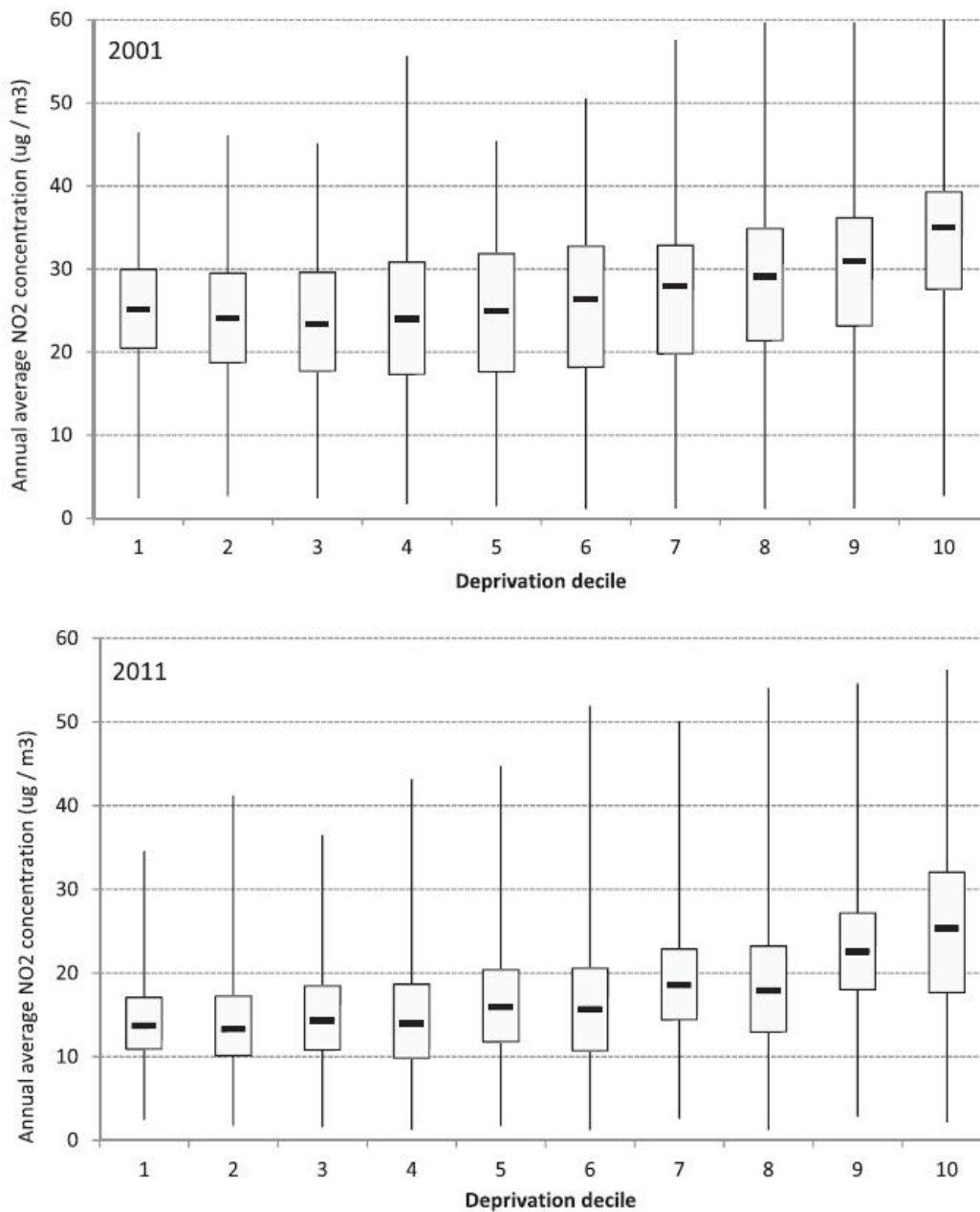


Figure 2. GB social distribution of annual average nitrogen dioxide ($\text{NO}_2 \mu\text{g m}^{-3}$), 2001 and 2011. Each decile has 10% of GB population in the relevant year. Decile 1 is least deprived. Concentrations shown are max and min whiskers, 25 and 75 percentiles (box) and median annual average.



05

小结

- ◆ 基于时空行为的环境污染动态测量及健康效应
- ◆ 环境不公正与健康不平等的内在关系及影响机理
- ◆ 城市形态，时空行为与健康，促进健康行为及健康城市的发展

谢谢

2017
中国·上海

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