Spatial Modeling of Sport Facilities Distribution for Health Improvement

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Overview of the presentation

- Introduction
  - Sport and Health
  - GIS, Sport and Accessibility
- Traditional Accessibility Measurements
- Factors Affecting Accessibility
- Methodology
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- Conclusions

Introduction: Sport and Health

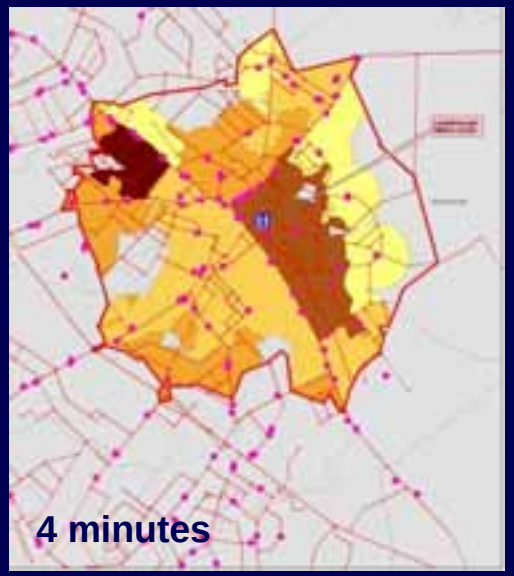
- Relationship between population health and sport.
- Chronic disease and diabetes illness related to physical inactivity .
- Today’s life style and using sport facilities.
- Ease access to sport facilities and sport complex availability.

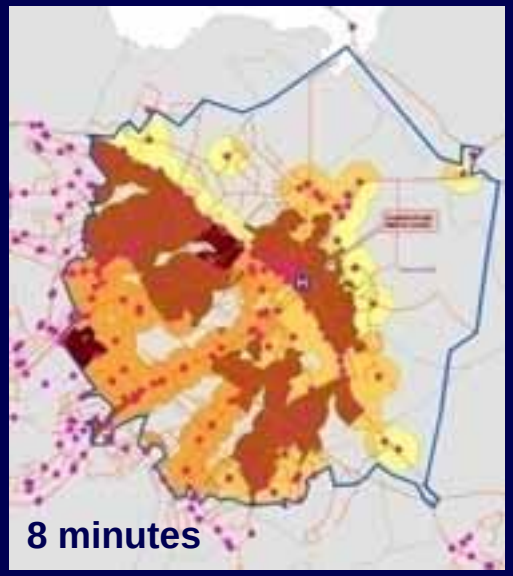
Introduction: GIS, Sport and Accessibility

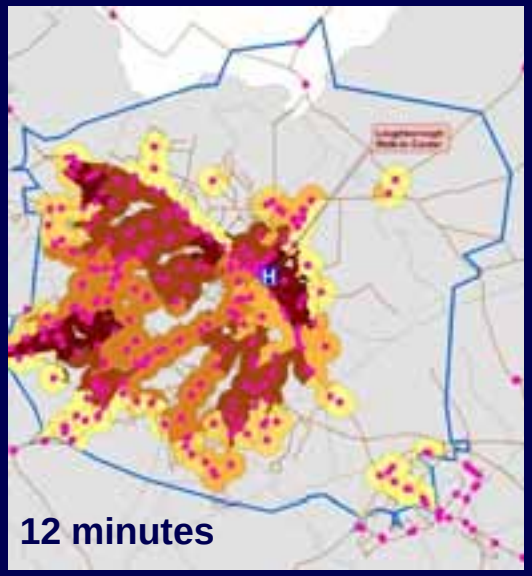
- **Spatial distribution** of population
- **Spatial distribution** of demand for sport facilities
- The population is geographically dispersed comprising differing **ages, gender and needs**
- Needs to measure of **accessibility to sport facilities**
- Current accessibility measurements primarily consider factors such as **distance** and **time** while measuring accessibility
- These methods are simple and easy to implement but **may not be fully transferable** for the case of accessibility to sport facility

Traditional Accessibility Measurements

- Primarily based on:
  - **distance** contour by car
  - **time** contour by car
  - drawn at the centre of the point of interest (i.e. a sport complex) using the gravity model.







Traditional Accessibility Measurements

- Do <u>not</u> consider:
  - user age, gender
  - user demands and interest
  - user perception and preference
  - user socio-economic situation
  - available travel modes
  - area-wide factors (e.g. crime/safety, level of public transport, deprivation)

Which are more important?

Factors Affecting Accessibility

Accessibility = f (individual, , area-wide, transport provision**)**

- **Socio-economic factors:**

  age, gender, income, …

- **Area-wide factors:**

  Transport network, public transport provision, safety/security and area deprivation

- **Individual transport usage:**

  travel modes, travel time and fuel usage

Methodology

- Spatial distribution of sport facilities and public health status within spatial units of an urban area has been modeled using GIS tools.

- Spatial analysis to the facilities has been assessed by considering other demographic factors such as population density, age groups, gender, and socioeconomic status.

- A statistical model has been developed to find which factors can significantly affect accessibility to sport facilities as well as health indices.

Linear Regression Modelling

$$
\begin{aligned}
A = \beta_0 &+ \beta_1 . \textbf{Travel Time by Car} \\
&+ \beta_2 . \textbf{Provided facilities} \\
&+ \beta_3 . \textbf{Quality of Sport facilities} \\
&+ \beta_4 . \textbf{Bus Frequency and Reliability} \\
&+ \beta_5 . \textbf{Income} \\
&+ \beta_6 . \textbf{Safety and Security} \\
&+ \beta_7 . \textbf{Walk Catchment Area} \\
&+ \beta_8 . \textbf{Bike Catchment Area} \\
&+ \varepsilon i
\end{aligned}
$$

A = A user perception of accessibility to a sport facility
β = Factors (weights) affecting accessibility parameters
εi = Error term (unobserved factor)

Questionnaire Survey

Why is a Questionnaire Survey needed?

Questions:

- Overall accessibility score (Perception)
- Destination and origin of respondents
- Respondents' address on map
- Access to a car
- Socio-demography (age, disability, ethnicity, gender, income)

Sample Size and Frame

Sample Population	Sample Frame
Users	All user over 16 years old (random)
Geography	Catchment area of three sport complex
Demographics	All people with different age, gender, disability
Census	Age, Gender, Health
Date and Time	During working hours