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
- Data processing
- Results
- 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.

4 minutes

8 minutes

12 minutes
Traditional Accessibility Measurements

- Do not 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

\[ A = \beta_0 + \beta_1 \cdot \text{Travel Time by Car} + \beta_2 \cdot \text{Provided facilities} + \beta_3 \cdot \text{Quality of Sport facilities} + \beta_4 \cdot \text{Bus Frequency and Reliability} + \beta_5 \cdot \text{Income} + \beta_6 \cdot \text{Safety and Security} + \beta_7 \cdot \text{Walk Catchment Area} + \beta_8 \cdot \text{Bike Catchment Area} + \epsilon_i \]

\( A \) = A user perception of accessibility to a sport facility
\( \beta \) = Factors (weights) affecting accessibility parameters
\( \epsilon_i \) = 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

<table>
<thead>
<tr>
<th>Sample Population</th>
<th>Sample Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Users</strong></td>
<td>All user over 16 years old (random)</td>
</tr>
<tr>
<td><strong>Geography</strong></td>
<td>Catchment area of three sport complex</td>
</tr>
<tr>
<td><strong>Demographics</strong></td>
<td>All people with different age, gender, disability</td>
</tr>
<tr>
<td><strong>Census</strong></td>
<td>Age, Gender, Health</td>
</tr>
<tr>
<td><strong>Date and Time</strong></td>
<td>During working hours</td>
</tr>
</tbody>
</table>