Spatial Model of Medical facilities: a modification based on P-median model

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Outline of this presentation

- **Introduction**
  - Background
  - Target and problem statement

- **Methodology**
  - Literature review on 5 models
  - P-median model

- **Investigation and Analysis**
  - General situation, status-quo of medical faculties in study area
  - Field survey and modification of the P-median model
  - Meaning of this modification: how to apply it?

- **Conclusion and discussion**
I. Background

☐ The distribution of major public service is required according to the newest “Urban Planning approach”

☐ Currently, the research of spatial distribution of medical faculties is still at early stage

☐ In accordance with the city’s, further study of the system of medical facilities to improve the resources optimization allocation and promote the health service is inevitable.
II. Target & Problem statement

- The central aim of this research is to examine the spatial distribution of health care facilities, and to develop a model that may be used to explain it.
Investigation and description of the distribution and status of the existing medical facilities in the urban fringe area.

Analysis and evaluation of the distribution of medical facilities and service regions of them.

Propose the strategy on how we modify the P-median model to make out fairly plausible explanations for the results of Investigation.

Study on the time-space evolution mechanism of medical facilities.

Study on the impacts of different urban functions on the distribution of medical facilities.

Propose the modifications to the P-model.

Provide proposals on the distribution of medical facilities in urban fringe areas.
III. Methodology: Summary of methods

5 classic models on distribution of medical faculties:

- P-median model
- Location set covering model
- Maximal covering model
- Hierarchical location-allocation mode
- Spatial interaction models
III. Methodology: Introduction to P-median model

- Firstly proposed by Kakimi (1964), which claims that facilities should be arranged to meet the requirement that the sum of all the distance from the demand point to point P would be minimum under the given amount of point P.

\[
\text{Max} \sum_{i=1}^{n} a_i d_{ij} x_{ij} \\
\sum_j x_{ij} = 1 \quad (1) \\
s.t. \left\{ \begin{array}{l} 
 x_{ij} \leq x_{ij} \quad \forall i, j \quad (2) \\
 \sum_j x_{ij} = p \quad (3) 
\end{array} \right.
\]
IV. Investigation and analysis: research area

Xianlin, Nanjing
IV. Investigation and analysis: categorization
IV. Investigation and analysis: status-quo of medical facilities
IV. Investigations and analysis: study of service scope

Service Areas of facilities determined by P-median model

Service Areas of facilities by field survey
IV. Investigations and analysis: the modification of P-median model

Max $\sum_{i=1}^{n} K_{ij} a_i d_{ij} x_{ij}$

\begin{align*}
\sum_j x_{ij} &= 1 \quad (1) \\
\text{s.t.} \quad x_{ij} &\leq x_{ij} \quad \forall i, j \quad (2) \\
\sum_j x_{ij} &= p \quad (3)
\end{align*}

$K_{ij} = T_j^\alpha \times F_j^\beta \times S_i^\gamma \times P_j^\delta$;
IV. Investigation and analysis: the meaning of this modification

- Explain the change of medical facility’s service scope
- The advantage of vein-shaped distribution based on the modification
- Explain the impacts of policies
IV. Investigation and analysis: the meaning of this modification

- Strategy on the building of medical facilities
5. Conclusion and discussion

- How we apply this modification
- The prospect of following researches
- Suggestion of a social-share mechanism
Thank you