GIS: AN INDISPENSABLE TOOL IN HEALTH APPLICATIONS

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Outline

- **Introduction**
- **Objectives**
- **GIS and Health Studies**
- **GIS Tools**
- **Case Studies**
- **Discussion and Conclusion**

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Introduction

Objectives

 GIS and Health Studies

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Introduction

- Application of mapping tools in public health planning to address the social welfare and epidemiological issues is not new.

- Evident by the cholera outbreak map in Soho, England, in 1854 by John Snow

- GIS technology is increasingly used by public health professionals, policy makers and other public health actors to better understand how geographic relationships affect disease transmission patterns, access to health care and health outcome
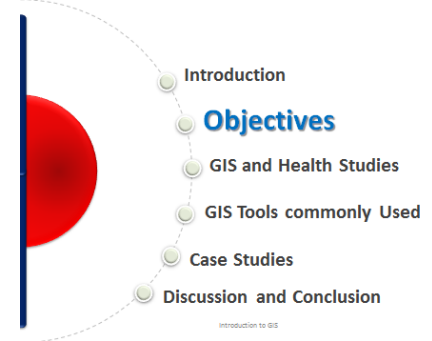
Introduction

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Objectives

The aim of this term paper is to briefly discuss

1. GIS tools used in Health planning and epidemiological studies.

2. Summarize the findings of Murad 2008, 2007, 2005, 2004

3. Explore the uses of GIS in health services in Saudi Arabia.

GIS and Health Studies
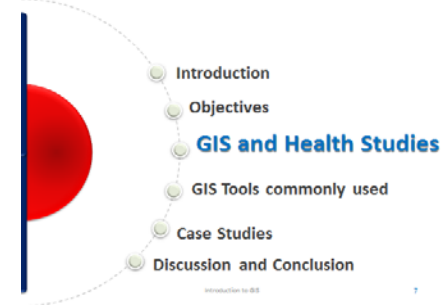
- Gatrell and Senior 2005 divided GIS health applications into two broad areas:
    - Geography of disease and ill-health; and the
    - Geography of health care planning

- This term paper focuses on both aspects .
- The data used for such studies can be in different formats e.g.
    - Supply and demand data
    - Planning standards
    - Population Census e.t.c

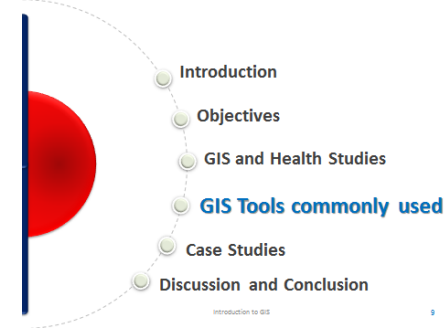# GIS Tools commonly used

- **Overlay Analysis** Overlay is accomplished by joining and viewing together separate data sets that share all or part of the same area.

- **NETWORK ANALYSIS:** Network analysis is used for identifying the most efficient routes or paths for allocation of services.

- **BUFFER ANALYSIS :** Buffer analysis is used for identifying areas surrounding geographic features.

Introduction
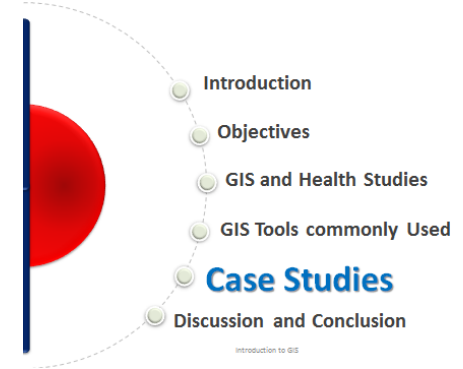
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Case Studies

➢ **Creating a GIS application for Health services at Jeddah city (Murad 2007).**

- Used patient demand data find:
  - spatial distribution of health demand
  - Classes and type of Health demand
  - Accessibility to the hospital

o Data where collected from MIS (management information system)

o Data obtain lack spatial information: geocoding and digitizer (create the area polygon)

OBJECT ID	PATIENT ID	NAME	AGE	SEX	DIAGNOSIS	TREATMENT	DOCTOR	DATE
FID 2	7094139	ABDULJAMIU	<Null>	M	<Null>	VITAMIN C	MUSA	16.01.2011

Attributes of 'MIS SHEETS'

Case Studies

Findings

Al Mohammadia

KAA Airport

Express Road

Red Sea

N
W E
S

City Center

Hospital Location
Road
Hospital Demand
- 0 - 6
- 7 - 19
- 20 - 45
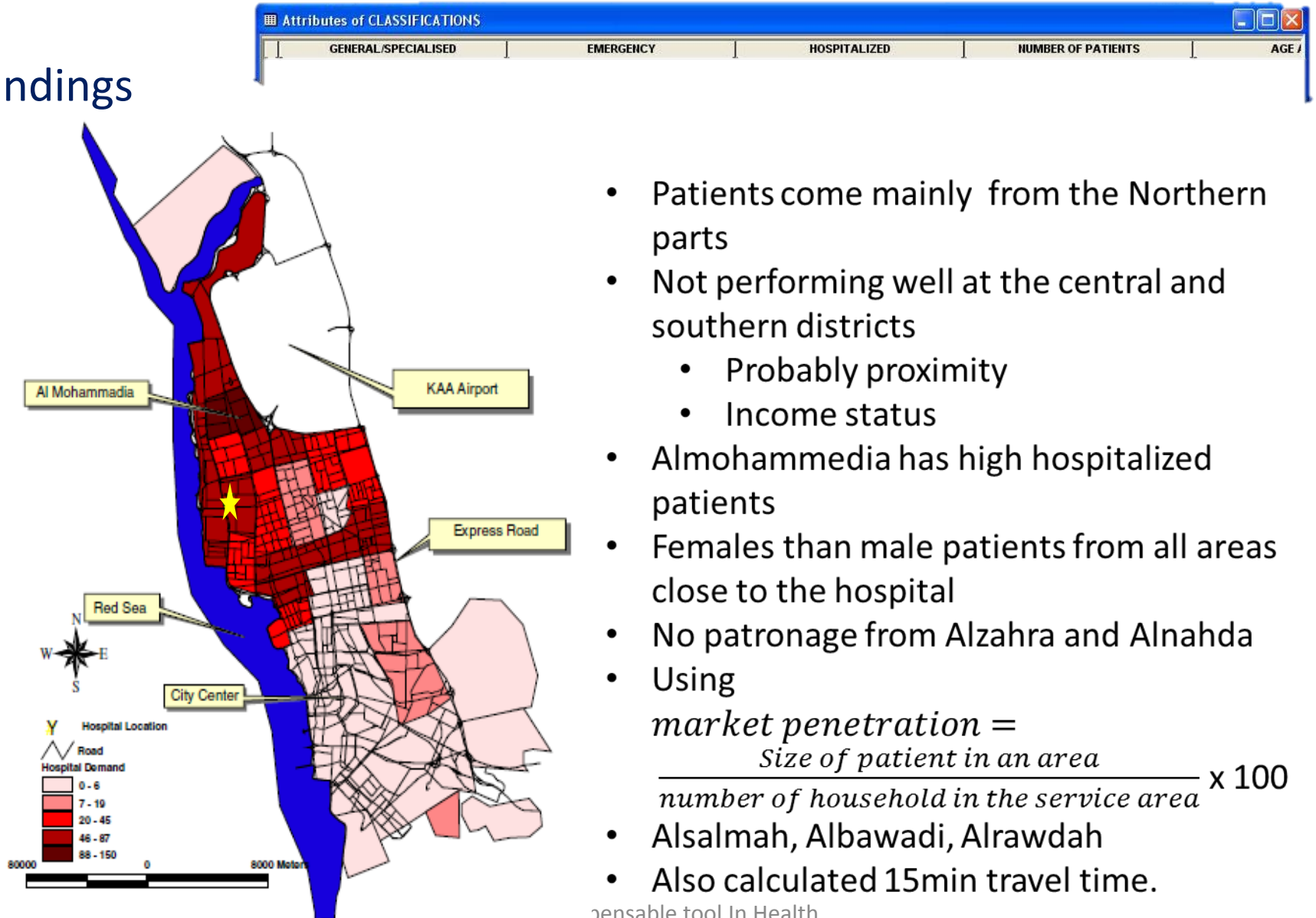- 46 - 87
- 88 - 150

80000   0   8000 Meter

Fig. 1. Distribution of hospital demand.

- Patients come mainly from the Northern parts
- Not performing well at the central and southern districts
  - Probably proximity
  - Income status
- Almohammedia has high hospitalized patients
- Females than male patients from all areas close to the hospital
- No patronage from Alzahra and Alnahda
- Using

$$market\ penetration = \frac{Size\ of\ patient\ in\ an\ area}{number\ of\ household\ in\ the\ service\ area} \times 100$$

- Alsalmah, Albawadi, Alrawdah
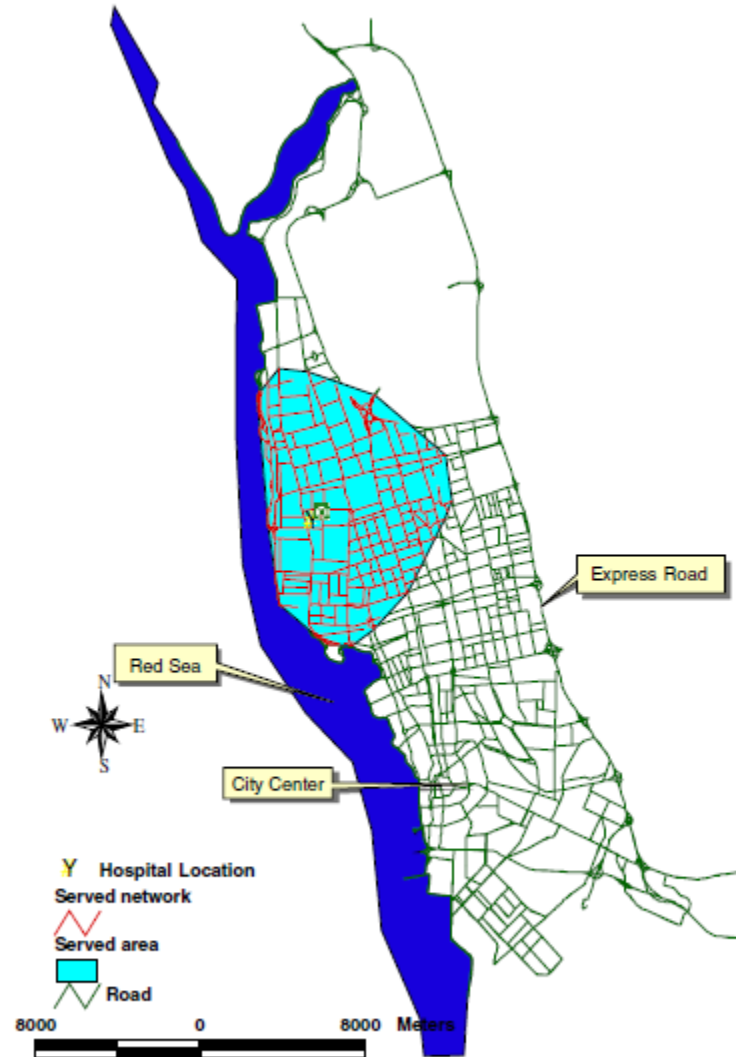- Also calculated 15min travel time.

Case Studies
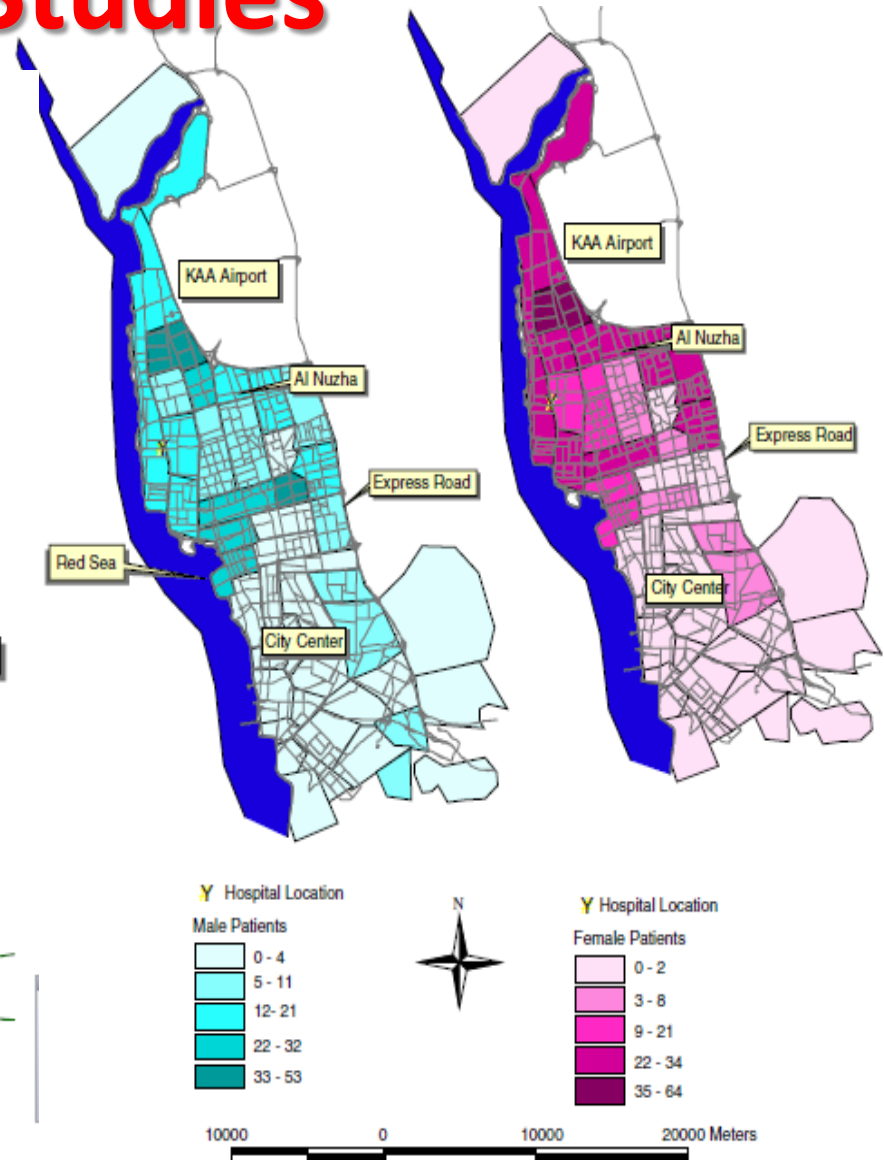

Fig. 5. 15-min drive-time service area.

Fig. 4. Classification of male and female patients.

Case Studies

- Murad A., (2004) Creating a GIS application for local health care planning in Saudi Arabia

- Carried out this study in a public health care center (Rusaifa center in Makkah)

- The main issues he considered where
  - Catchment area
  - Patient profile
  - Patient distribution and flow

- Network analysis preferred overlay technique in this study because it incorporates planning data and demand/supply data.

- There are 20975 people in the predefined area and the Saudi Arabian Health planning standards stipulates 1 doc=2000 people

- Demand is the number of people while supply is the available health workers.

Case Studies

FINDINGS
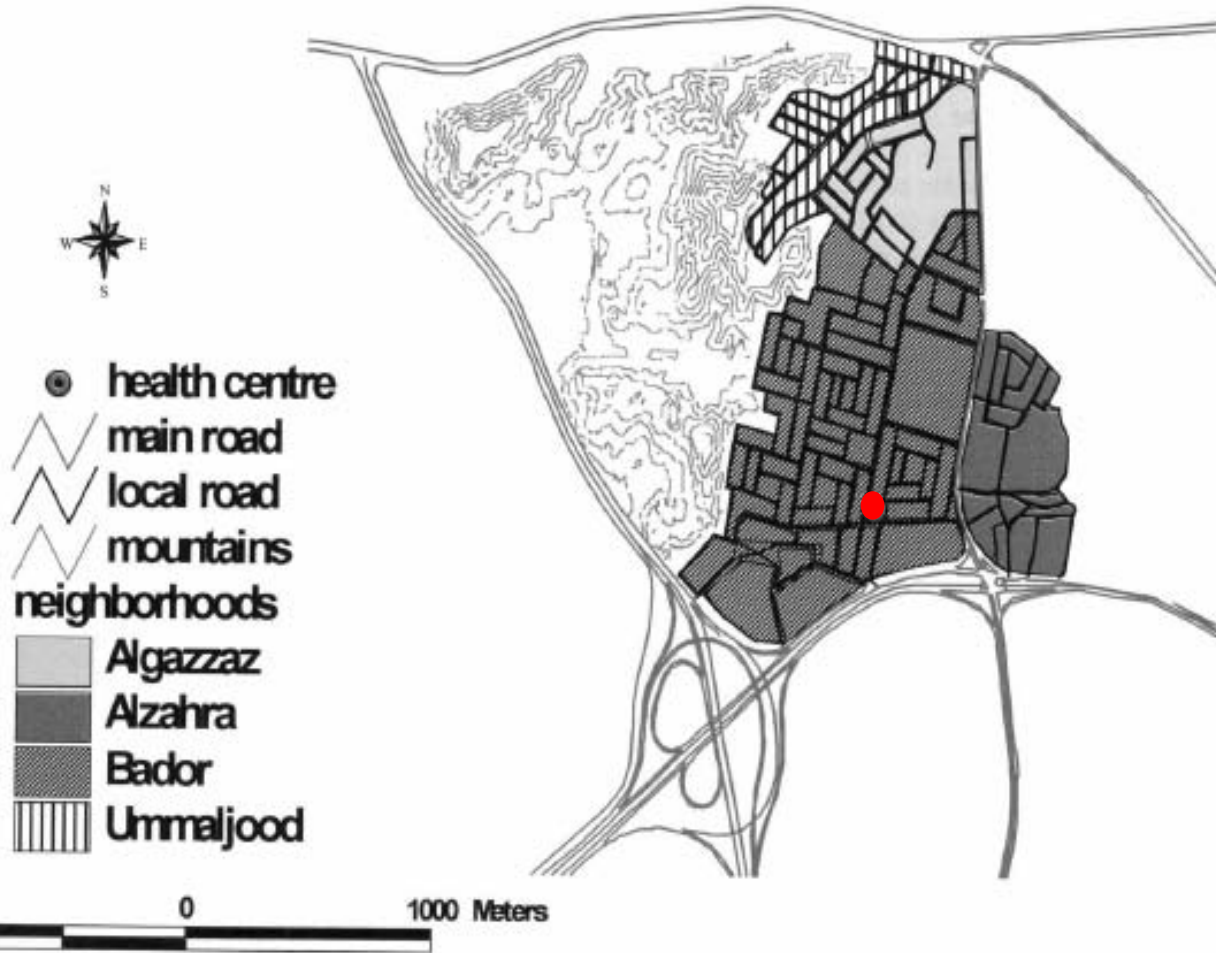
Fig. 1. Neighbourhood areas of Rusaifa health centre.

- Using the demand data, the study concluded that
- Population is highest in Bador   Al-Zahraa
- While the population in Ummal Jood and Al-gazzaz are less.
- Q.....Does pattern of diseases follow population density?
- To answer this question, the author selected and compared health diagnosis data which include: **diabetic patients, Blood pressure** and **asthma**.
- Al-Zahraa - Badoor- Ummal Jood - Gazzaz

Case Studies

- Similarly, A. Murad (2005) in the paper titled " Using GIS for planning public general hospitals at Jeddah City"

- Used planning standard in terms number of beds and predefined service area .

- He noticed that only 70% of Jeddah city are in the service area and that 25% are not.

- Also he used demand allocation model to regularize the data. Using "what if scenario's" on Al-Thagher, and assert that an increase in the number of beds at this center would further increase the coverage area

- Concluded that health services provisions in Jeddah city is insufficient and that the Government should establish more health centers atleast 2 with a bed capacity of 2000 to serve the northern parts of the city.

Case Studies

Hospital name	Supply (number of Beds	Catchment Area
King Fahd	932	8
King Abdulaziz	417	8
Al-Thagher	90	6
King Saud	50	4

Size	Beds	Catchment Area (km)
Small	50	4
Medium	100	6
Large	400+	8

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Case Studies

Fig. 2. Hospitals' catchments area based on planning standards.

Fig. 3. Hospitals' catchments area based on hospitals demand & supply.

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Case Studies

- The use of planning standards for catchment area analysis alone have some limitations due to the following assumptions

  – People within a region have equal access to physicians within that same region

  – And that people do not venture beyond their own region to seek care.

- In other solve this problems, Murad 2008 used a more analytical method (Straight line allocation method) to define health catchment areas

- The straight line allocation function assigns each cell the value of the source to which it is closest . The nearest source is determined by the straight line distance (measures the straight line distance from each cell to the closest source)
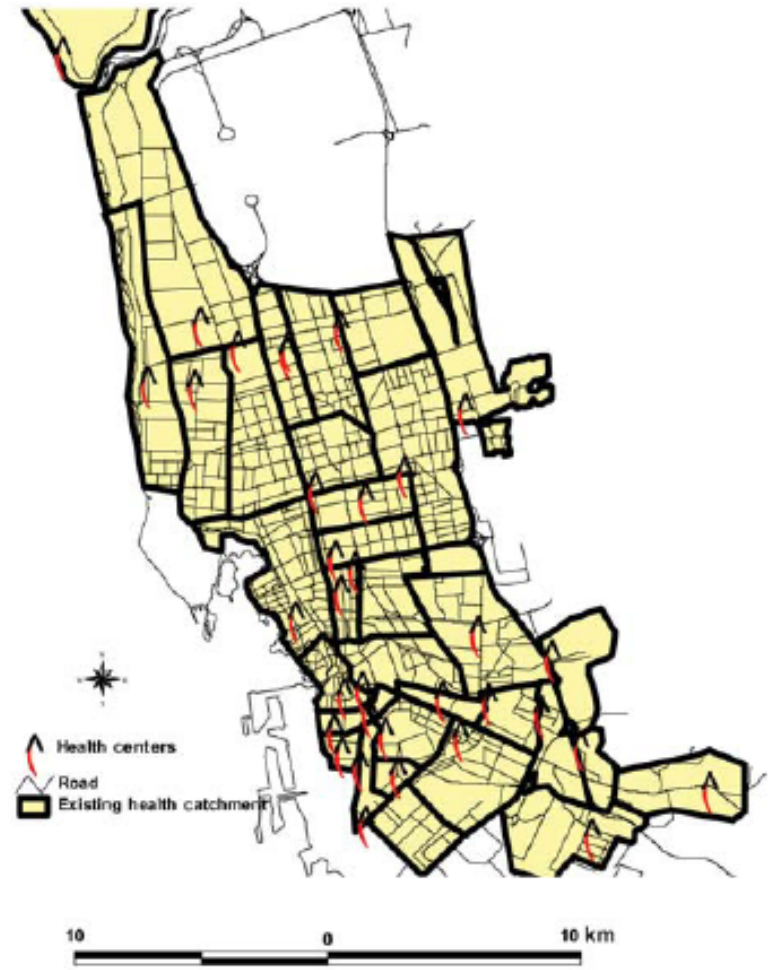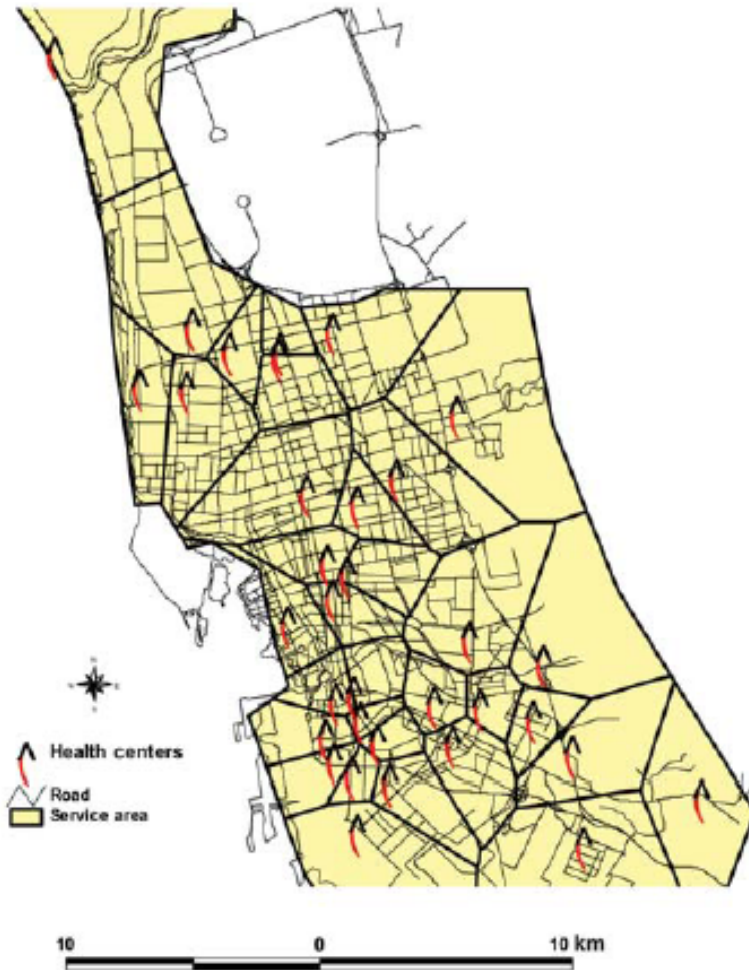
Case Studies

Fig. 6. Application of the SLA function for new catchment areas of health care centers.

Fig. 7. Existing health care centre catchment areas.
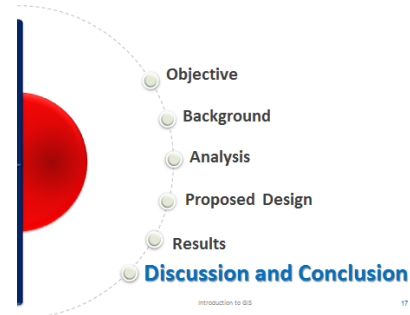
Objective

Background

Analysis

Proposed Design

Results

Discussion and Conclusion

Discussion and Conclusion

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Introduction to GIS   17

➢ At the end, the catchment area applications appears to be the most important in health planning as in appears in all the cases studies

➢ The analysis can be carried out using different techniques and data sources ranging from demand/supply data, health planning standards e

➢ I feel more information can be gotten across if only the author can concentrate on a topic at a time with less ambiguity.

➢ The studies explored in detail, all forms of available health data in the Kingdom and how the can be put to a visual and productive use

Discussion and Conclusion

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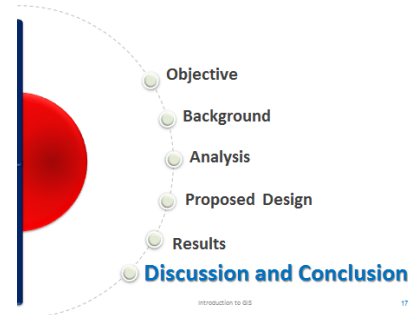
➢ Examples of places in which such studies would be useful is Nigeria, where the federal Government has allocation for each local government. This type of study would help to convince the government to expand its health investments in areas not properly covered.

➢ GIS can serve as warning tool for Health Planner not to invest in areas where facility is not needed

➢ In all the study, there was no mentioning of whether or not the findings are adopted by the concerned health centers/government

➢ And due to the small scale of the studies, there was also no mention of the cost. However, this would have assisted decision makers to know the gravity of what they are getting into.

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Thanks for Listening

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