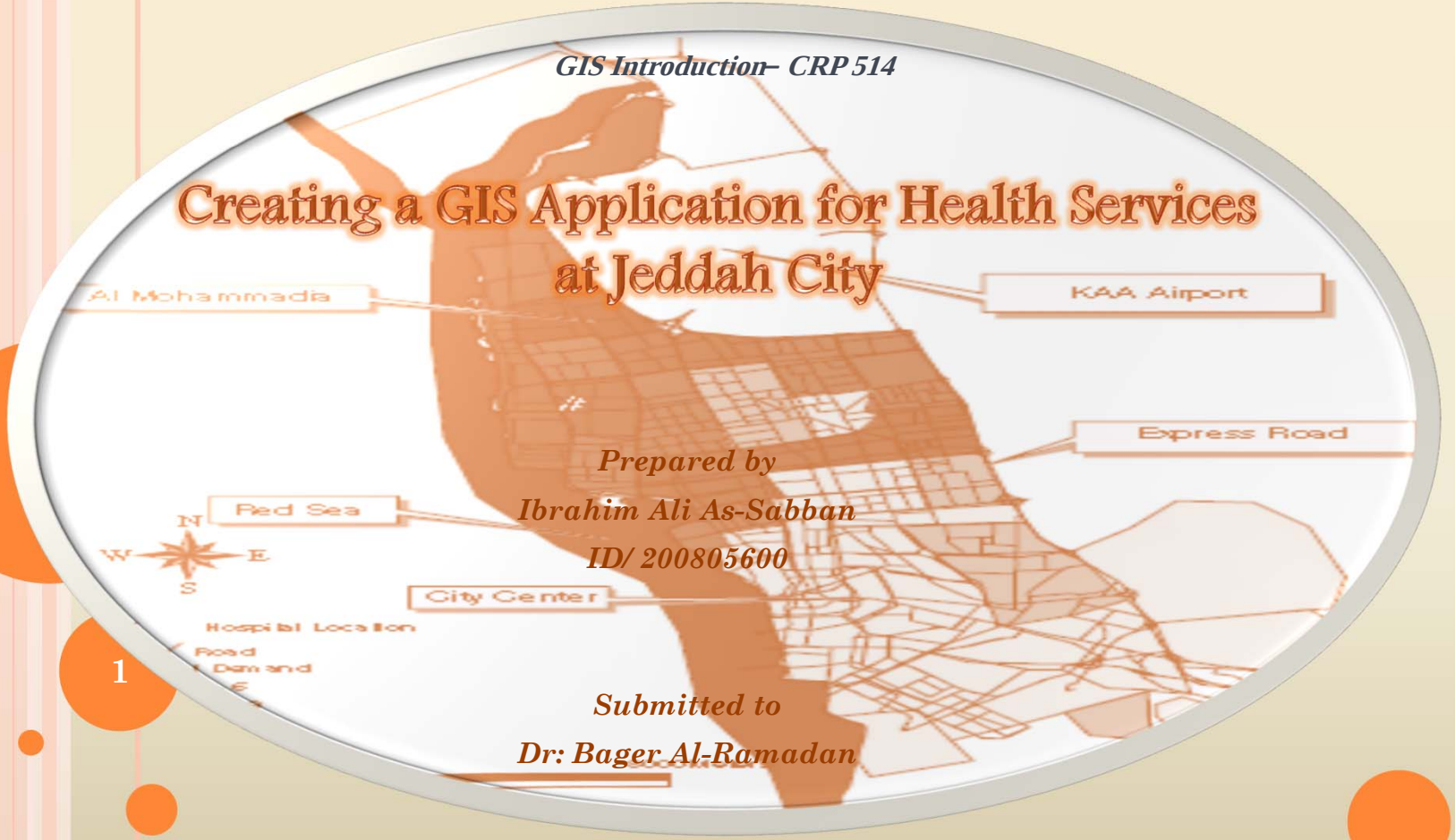
King Fahd University of Petroleum& Minerals
Department of Electrical Engineering

GIS Introduction– CRP 514

Creating a GIS Application for Health Services at Jeddah City



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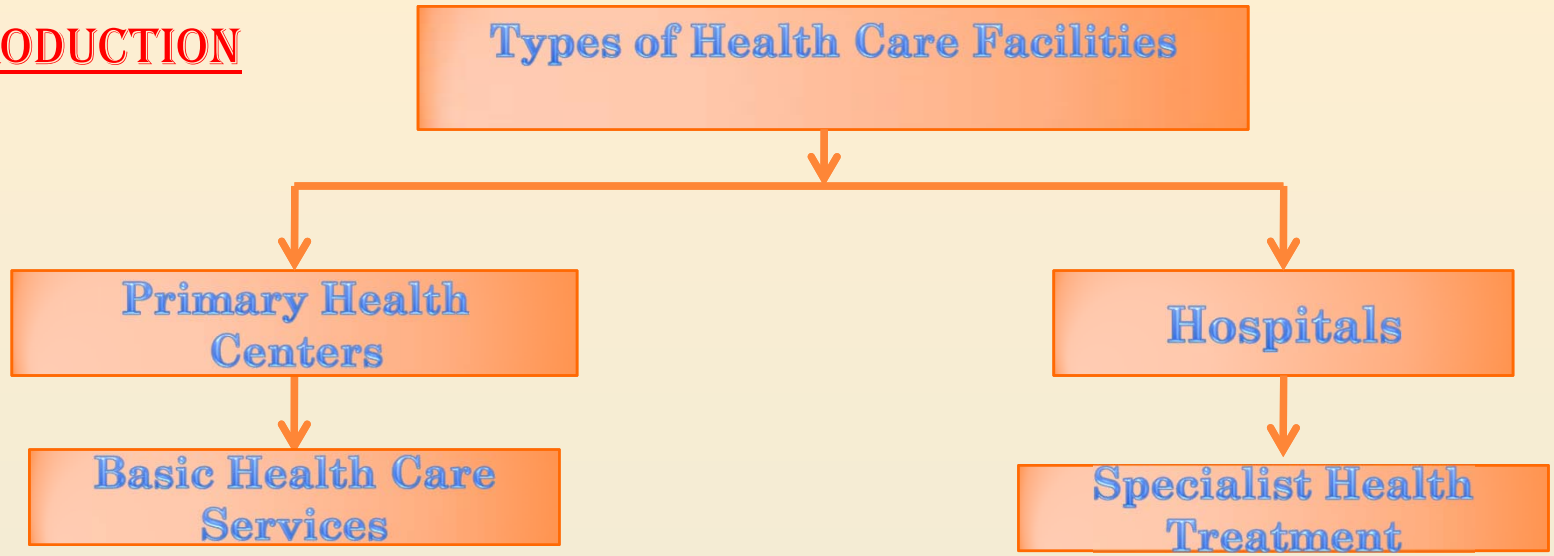
INTRODUCTION



❑*Issues (Challenges) of Health Policy:*

- The relationship between distance to health services and the need for health care
- Financial status
- Time constrains
- Social inconveniences
- Psychological stress of journey to health services

To explore these challenges, GIS are used by health planners for analyzing and manipulating health data.

INTRODUCTION

The Purpose

1. Creating a GIS application cover some of health issues related to hospital at Jeddah city, Saudi Arabia
2. This project also focuses on the advantages of using GIS in hospital planning and management.

METHODOLOGY

Study Area

- Jeddah city
  - Commercial capital of Saudi Arabia
  - Locate on the western coast of Saudi Arabia by the Red Sea
  - A population over 2.9 million people
  - 14% of the total population in Saudi Arabia
- Types of health facilities at Jeddah city
  - Public Health Facilities:
    - 72 health centers
    - 7 hospitals
  - Private health facilities:
    - 29 hospitals (2836 beds)
    - 151 clinics

METHODOLOGY

- ***Study Area***

- Major private hospital

- Factors for Selecting Private Hospital:

  – Accessibility to health demand data

  – Types of health services

  – All the planning issues that are dealt with at this hospital are relevant to the remaining hospitals of Jeddah city

- This hospital has:

  – Capacity of 300 beds

  – 120 doctors

  – Difference department (family medicine, gynecology, pediatric department)

METHODOLOGY

Research Issues

1. Define the spatial location of health demand
2. Identify health access
3. Identify service area

Analysis Techniques

- **Network Analysis:**
  - This function can be used for defining the shortest path between patient location and health centre.
  - This path can be presented to the ambulance driver together with the direction file that describes step by step the best routes for getting to such patient fast.
- **Overlay Analysis:**
  - To manipulate spatial data organized in different layers to create combined spatial features.
  - This data will be stored by GIS that can be retrieved and overlaid one on another.
  - to find out the amount of population that lives inside the resulted service area

RESULTS AND DISCUSSION

Distribution of hospital demand

- **Use management Information System (MIS) to finding needs information:**
  - Patient number or recording file
  - Reviewing the medicine history
- MIS is related to the lack of their spatial presentation of these data.
- **Using Spatial Information Systems (SIS)**
  - Defining health demand location in the city

RESULTS AND DISCUSSION

- ***Distribution of hospital demand***

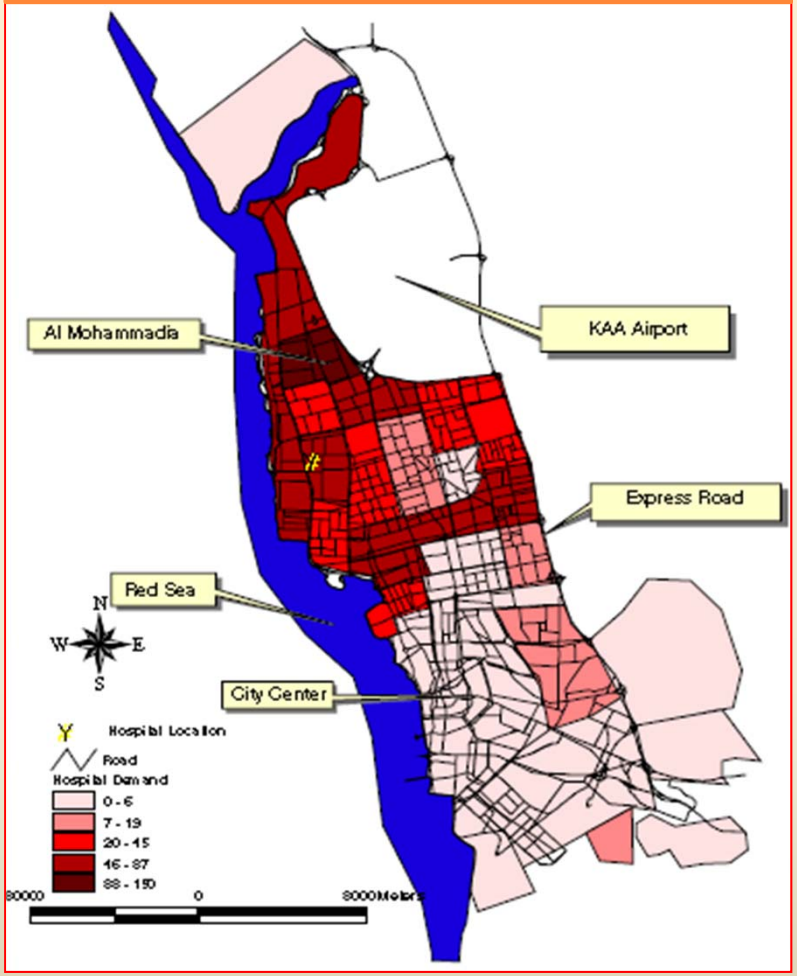
- **GIS functions for identifying location of any feature :**
  - **On-screen digitizing:** is used to draw different tool (point line and polygon) to capture and define health demand location in districts level.
  - **Geocoding:** to create point feature on map from a table having x, y coordinates
  - **Entered attributes data** as records in coverage table (Number of patients, Age, sex, hospital utilization)

- **Classifying Numerical Data**
  - Applying on health demand data to grouping and subdividing data purpose
  - Use natural breaks method to minimizes the variance within class and maximizes the variance between classes

RESULTS AND DISCUSSION

- ***Distribution of hospital demand***
  - Hospital demand comes mainly from the northern city district (close to hospital location)
  - Very little demand coming from southern city district
  - Possible reason are the proximity to the hospital location and income of low performance area

Distribution of hospital demand.



RESULTS AND DISCUSSION

- ***Types of hospital demand***

– This is useful for health planners for health supply.

  - For example, if the health demand is about diabetic clinics, then the needed supply of these clinics should match that demand.

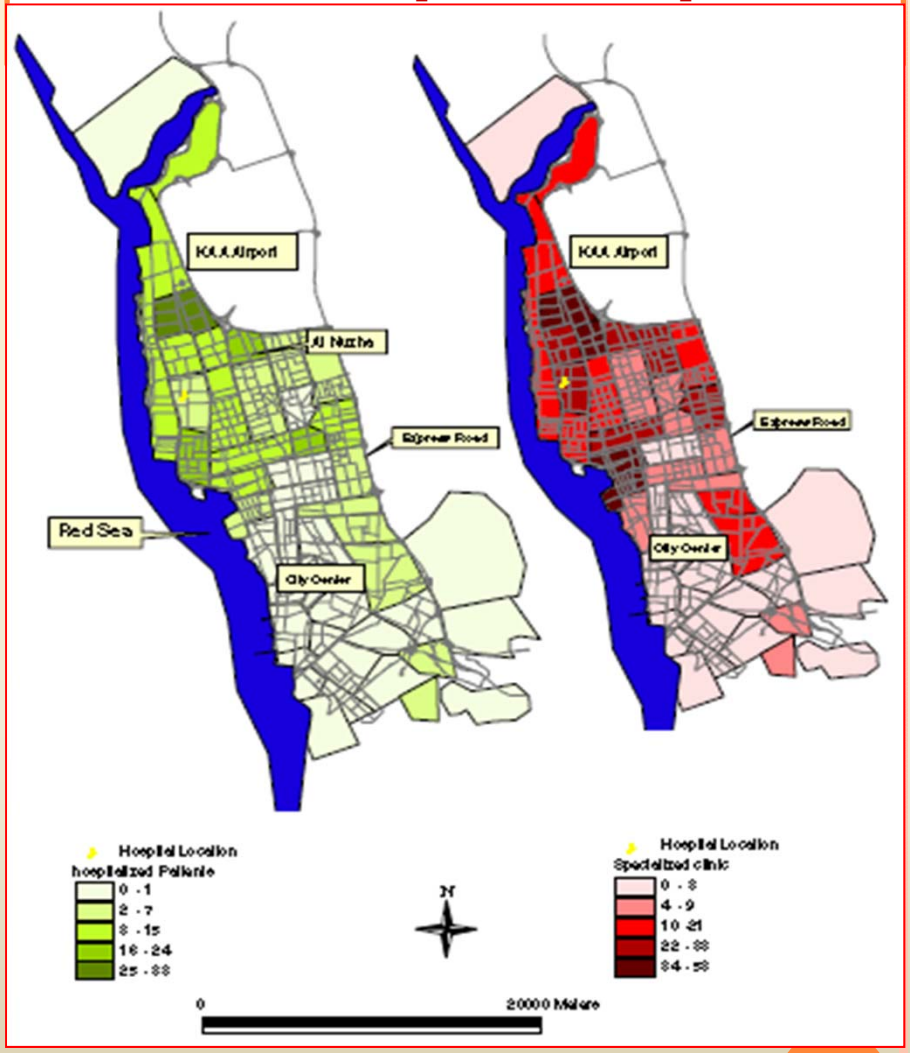
– ***Tow types of hospital demand:***

- **Health Service Utilization**
  - General/specialized clinics patients
  - Emergency clinic patients
  - Hospitalized patients
- **Demand Gender**
  - Male
  - female

RESULTS AND DISCUSSION

- ***Types of hospital demand***
  - To define the relationships between utilization types. For example, Alnuzha has high-hospitalized patients and also have the same high figures about general specialized and emergency clinics
  - Ability of showing more than one attribute data in one view

Classification of hospitalized and specialized

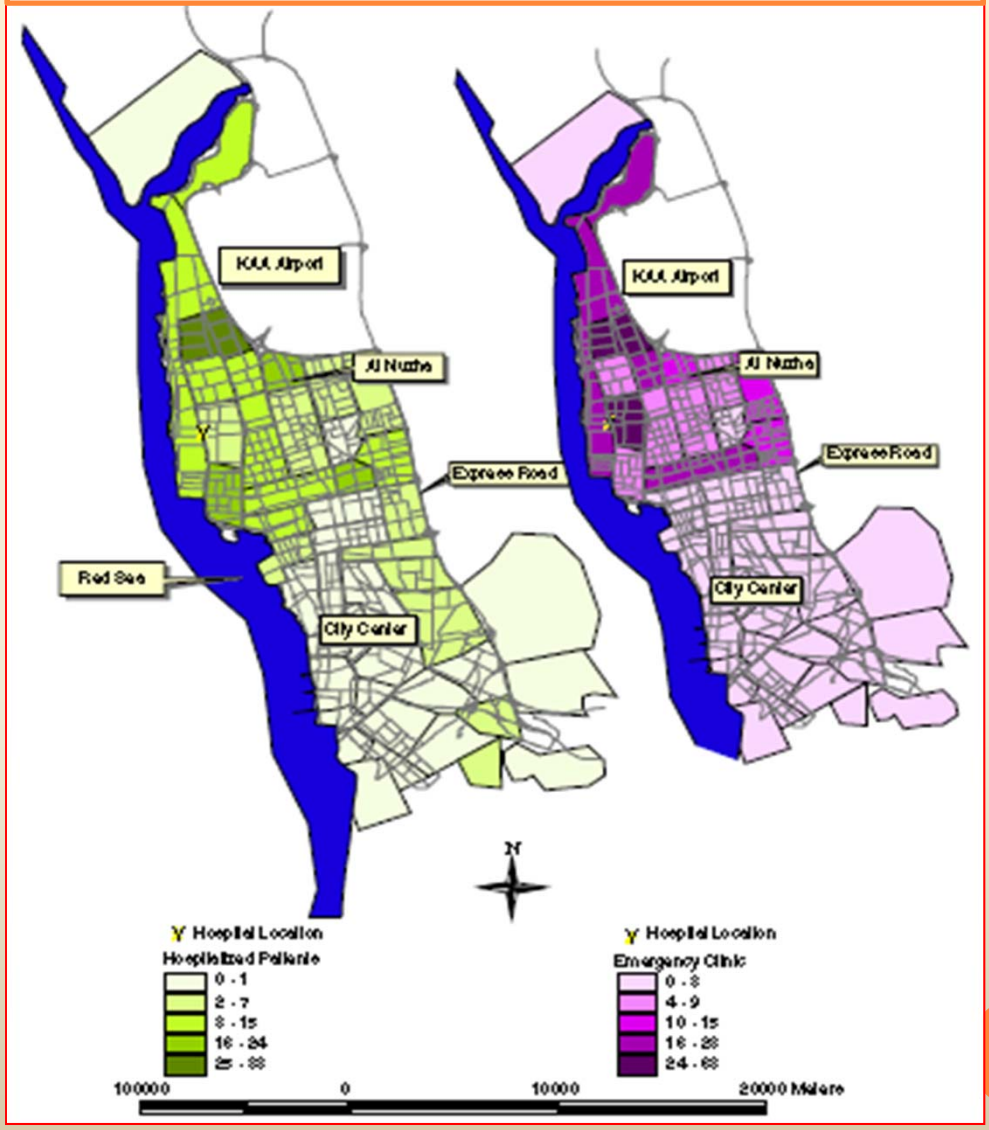


RESULTS AND DISCUSSION

- ***Types of hospital demand***

  - The area with high-hospitalized patients should be studies further by health planner to find out if the area are any factors that produce such high-hospitalized patients

Classification of hospitalized and emergency clinic patients

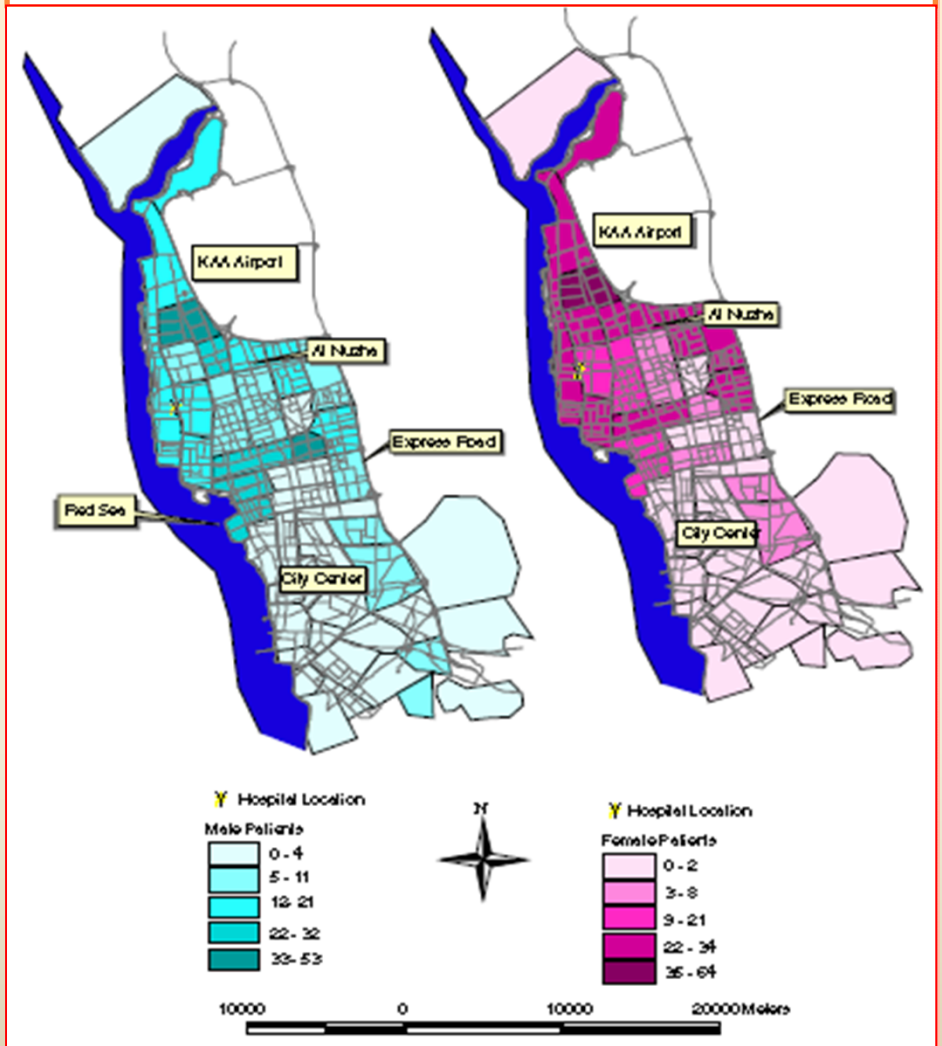


RESULTS AND DISCUSSION

Types of hospital demand

- To identify the required health services for male and for female patients.
- Female patients mainly from the western city districts
- Male patients are distributed at difference districts and amount
- Health service should be provided female patients staff and facilities than male patients

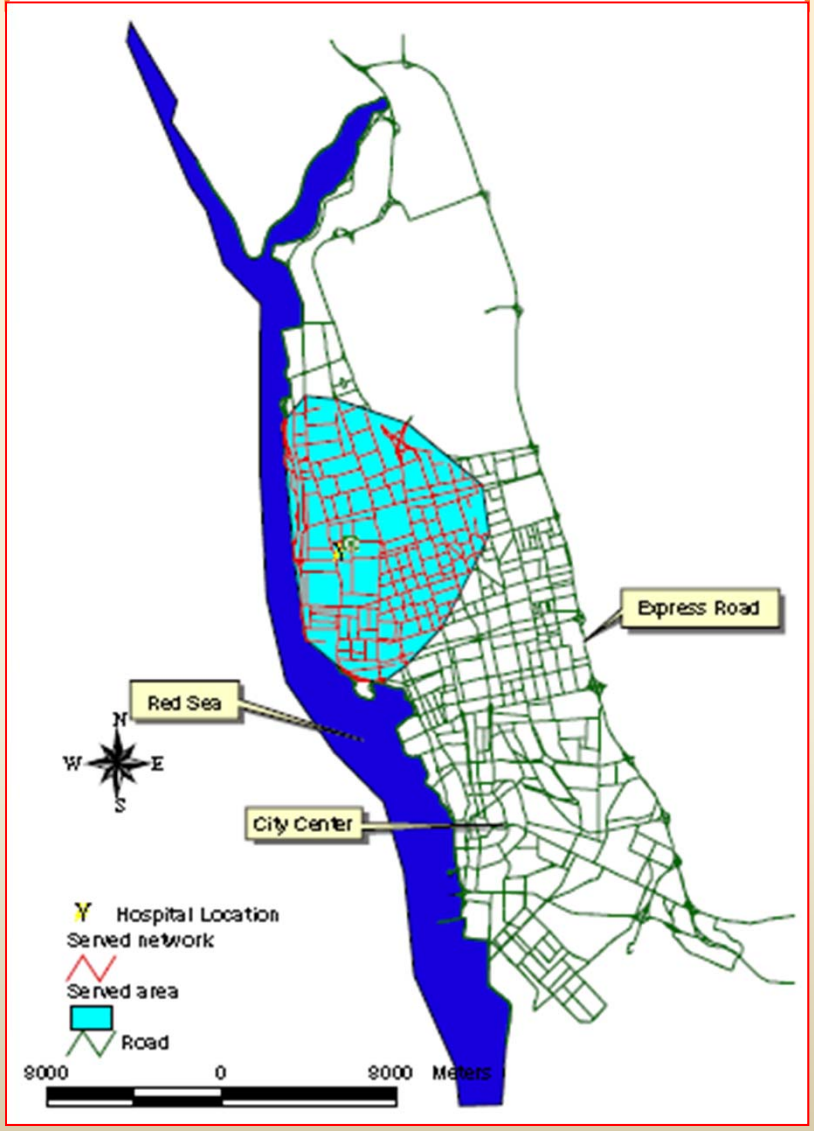
Classification of male and female patients



RESULTS AND DISCUSSION

- ***Hospital Service Area***
  - Create service area for selected hospital by producing 15-min drive-time area
  - Use network analysis to determine the efficient paths and travel sequences then calculating drive time to hospital
  - Use overlay analysis to find out the amount of population that lives inside the resulted service area

15-min drive-time service area



RESULTS AND DISCUSSION

❑*Hospital Service Area*

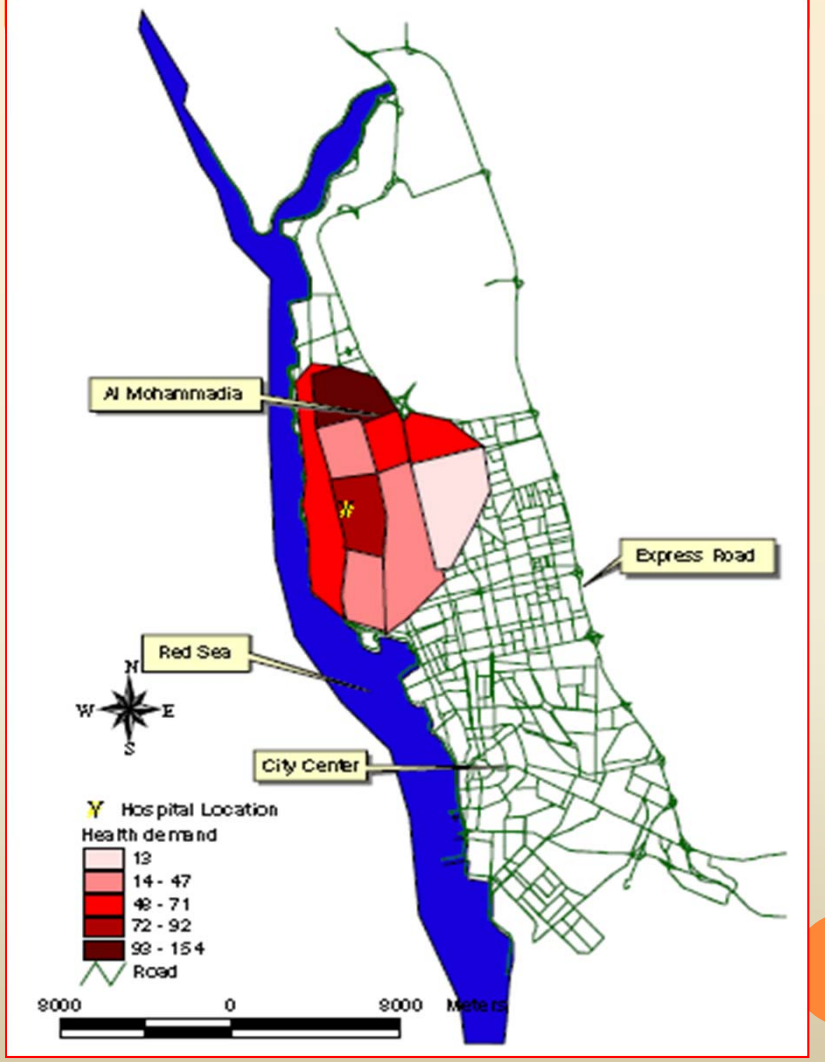
1. Hospital demand that shows all hospital patients within Jeddah city
2. 15-min drive-time service area.

– 580 patients who use the selected hospital and live 15 min away from the hospital

– These patients represent 60% of all hospital demand

– Most of health demand come from the nearest residential areas around the hospital location

Distribution of served health demand

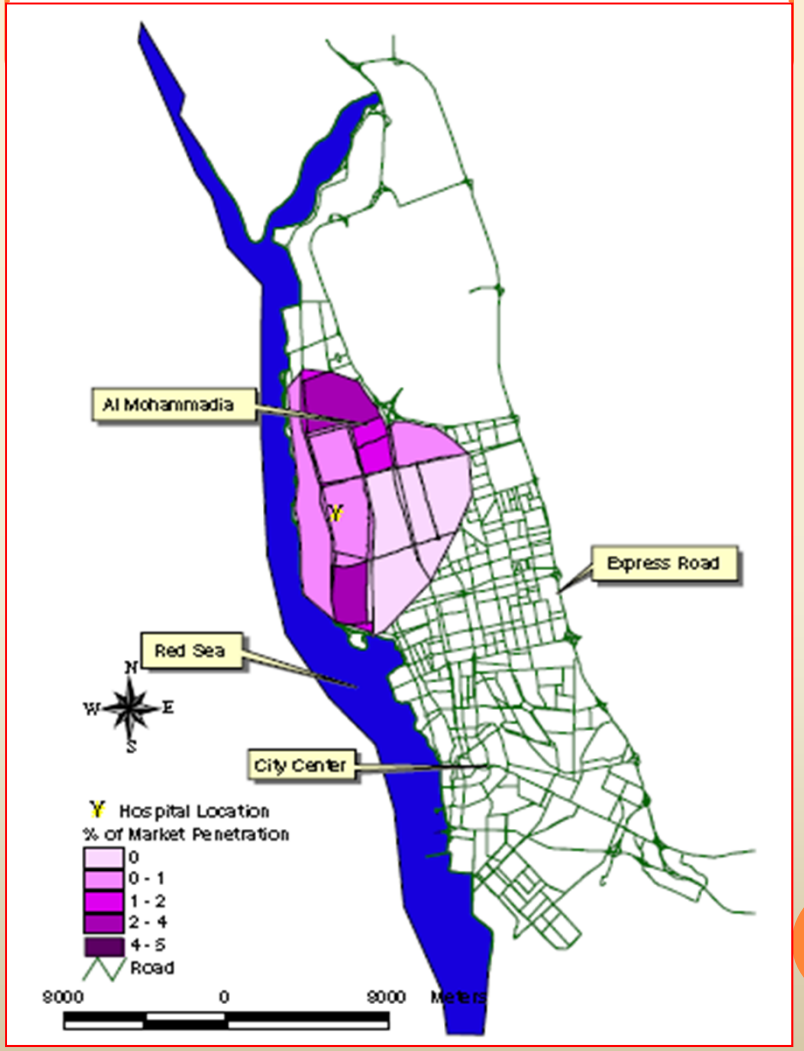


RESULTS AND DISCUSSION

❑*Hospital Service Area*

- Dividing existing size of patients over number of households living inside hospital service area and multiplying the result by 100
- there is some districts located inside hospital service area but are not producing high demand

Market penetration of private hospital



CONCLUSION

- This project explains application of GIS for hospital facility planning in Jeddah city
- This study includes three main hospital issues that are location of health demand, types of patients and the extent of hospital service area.
- classification of health demand that is described by several health studies.
- Defining hospital service area is used to produce a 15-min drive-time service area for the selected hospital. Also, these results are used to define patients living inside hospital service area
- This project is used further to define the amount of patients living inside hospital service area and to test the market share of the selected hospitals

THANK YOU