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## **INTRODUCTION**

The tremendous potential of GIS to benefit the health care industry is beginning to be realized. Both public and private sectors are developing innovative ways to utilize the data integration and spatial visualization power of GIS. GIS plays a critical role in determining where and when to intervene, improving the quality of care, Increasing accessibility of service, finding more cost-effective delivery modes, Preserving patient confidentiality while satisfying the needs of the research community for data accessibility.

### **Using GIS for Public Health**

In 1854, an English physician, John Snow, provided the classic example of how mapping can be used in epidemiological research. Public health uses of GIS include tracking child immunizations, conducting health policy research, Establishing service areas and districts. Clinical and administrative information can be presented in a visual and geographic manner that is readily understood. Data can be easily accessed using an Intranet or the Internet. Balancing individual privacy with data accessibility is the challenge for public health agencies. A case of South Carolina Department of Health and Environmental Control's program for managing geo-referenced health records. They aggregated health record data, so that the privacy of individual patients was preserved while allowing easy access to data. Quick access to medical records is crucial to effective treatment.

### **The Business of GIS in Health Care**

The use of GIS in the private health sector has grown substantially in the last decade. Private sector use now applications in marketing and business management as well as those concerned with patient care. Health care providers can no longer continue with the "build it, and they will come" fallacy. Health care is a repeat business. Though many hospitals and medical centers have operated under Reilly's law of retail gravity--more square footage equals a larger trade area to draw from. They have begun to realize that to be competitive they need to be located conveniently to their customer base. Using GIS for demographic analysis to estimate the demand for various types of services can benefit individual physicians. Physician specialties are more effectively marketed by locating offices near pools of potential patients. This type of analysis can be extended for use by managed health care providers. How consumers access the services of managed health care providers is controlled by geographic location. Matching physician

locations to where employees live or work assures that primary care physicians are available throughout the network. Employers favor providers with networks that minimize the distance employees must travel to obtain care.

**CASE STUDY 1:****Title: A Gis Based Analysis Of Health Care Services  
In The City Of Pune**

One of the important areas that need to be addressed as a part of the urban management process is health services. In spite of the various healthcare programs, still challenges appear in lack of management of facilities, optimum route to the hospital, slum area development and lack of knowledge about technologies. Health analysis and studies can be grouped into three main areas, which are different diseases, distribution of hospital in different areas and health care facility and utilization. This study concentrated on the two points of distribution and availability, and utilization of health care facility.

Health care facility and utilization include the optimal location of hospitals and clinics, the relationship between existing locations and health care needs and assessment of hospitals and the assessment of facilities.

This study is focused on the City of PUNE and the distribution of hospitals in the region. It results in recommendations of possible areas for the setting up of new hospitals and clinics.

**Objectives:**

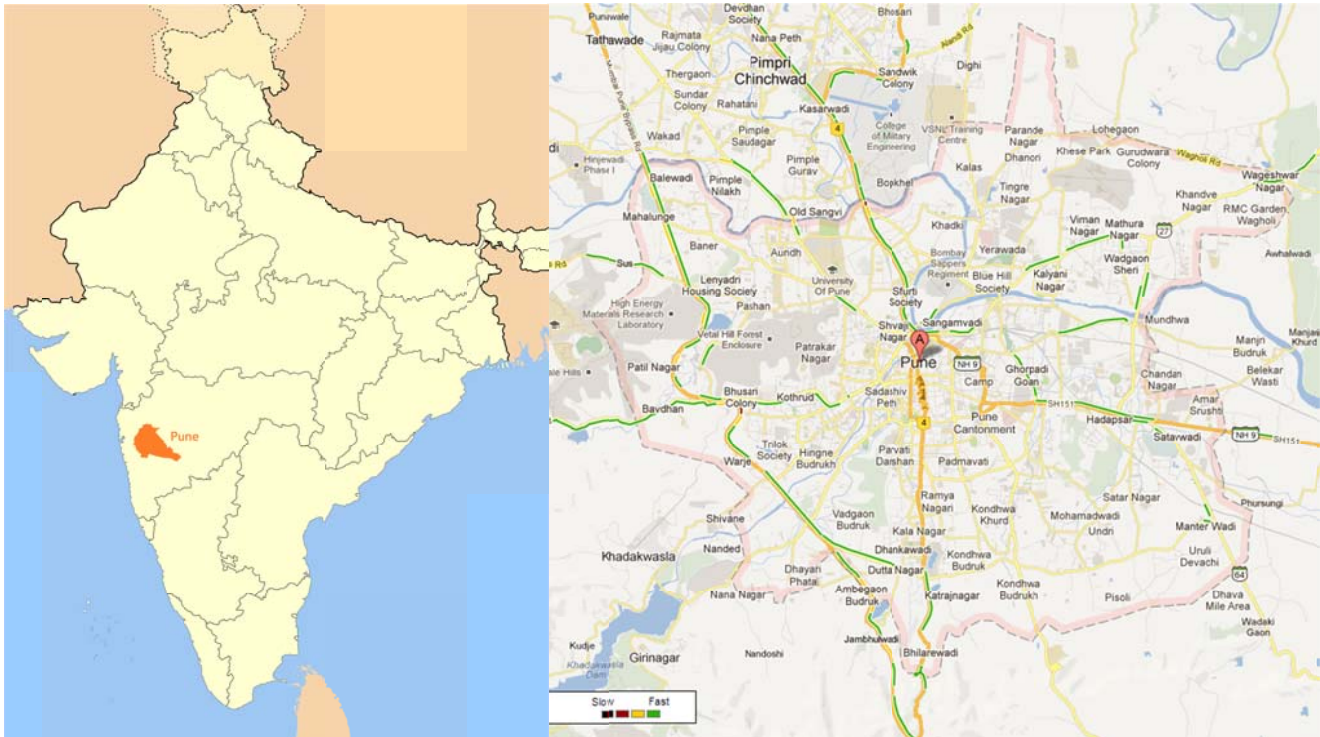
- 1) To analyze the services existing in the city of Pune.
- 2) To study the service area covered by each health center.

**Materials used:**

- 1) Survey of India map
- 2) road map
- 3) population data

**Software used:**

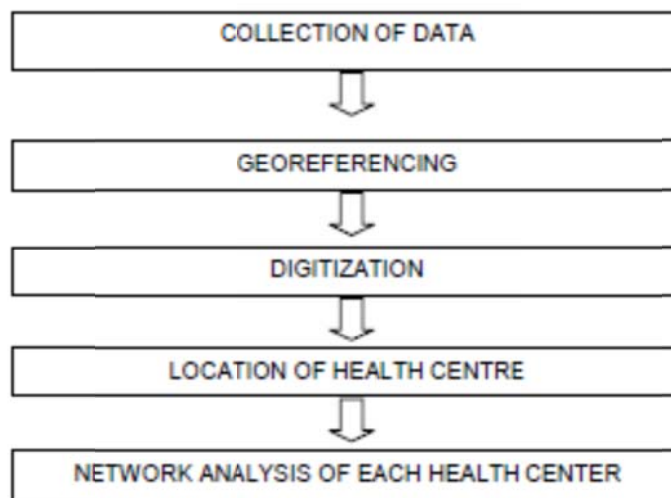
ARC GIS



### Area of the Study:

**Pune**, western India, It is the seventh largest city in India. It has a population of 5 million (2008) and covers an area of 450 km<sup>2</sup>. The health care facility which the focus of the study is in a good state but has not been updated in terms of its capacity for serving the population. Network analysis using Arc GIS software has been done and subsequently deprived areas have been identified.

### Methodology:



As explained in the chart, started by collecting data including the population data, road maps and the hospital information. Also the chief medical officer was consulted to know about the health care services existing in the Pune City.

The road map and the district map was geo-referenced using the survey of India Toposheet. The maps digitized using ArcGIS. Then a point feature layer was created of the hospitals. Then, a network analysis was done which determines the extent of service area of each.

### **Factors considered for the analysis**

- Population
- Area
- Travel Time

### **Result of the network analysis**

It was found although the central part of Pune was well served with the hospital, the western side of Pune are lacking in hospital services. The services of hospitals need to be more dispersed rather than concentrated in a particular area

### **Conclusion**

With the help of GIS we could find that although the hospitals in Pune City were sustainable, however needed an appropriate update in terms of their numbers. Also found that being a cosmopolitan city, although the roads are good there were problems due to congestion in a couple of areas. Further analysis should be taken into consideration factors like population, thorough road network analysis, urban dilate and disease prevalence which will be attempted in the future.

## **CASE STUDY 2:**

### **Title: Creating A GIS Application For Health Services At Jeddah City**

This study explores the possibilities of using GIS for private hospitals at Jeddah city, Saudi Arabia.

A GIS application is created to cover three main health planning issues which are distribution of health demand, classification of hospital patients the definition of hospital service area. Each one of these issues is covered using several GIS functions including network analysis and overlay analysis. The network analysis is used to produce drive-time hospital service area. Overlay analysis is applied to calculate the size of hospital served demand. All the produced models can be applied on any private or public hospital in Jeddah city. They can be used to build a spatial decision support system for hospitals in Jeddah city.

#### **Study area**

Jeddah city has a population of over 2.9 million people. There are two main types of health facilities at this city. They are called public and private health facilities. As public, 72 health centers and seven hospitals at Jeddah. The private health organizations provide 29 hospitals with a total capacity of 2,836 beds and also provide 151 clinics at different parts of the city. Both are faced with different planning issues that can be handled with GIS techniques.

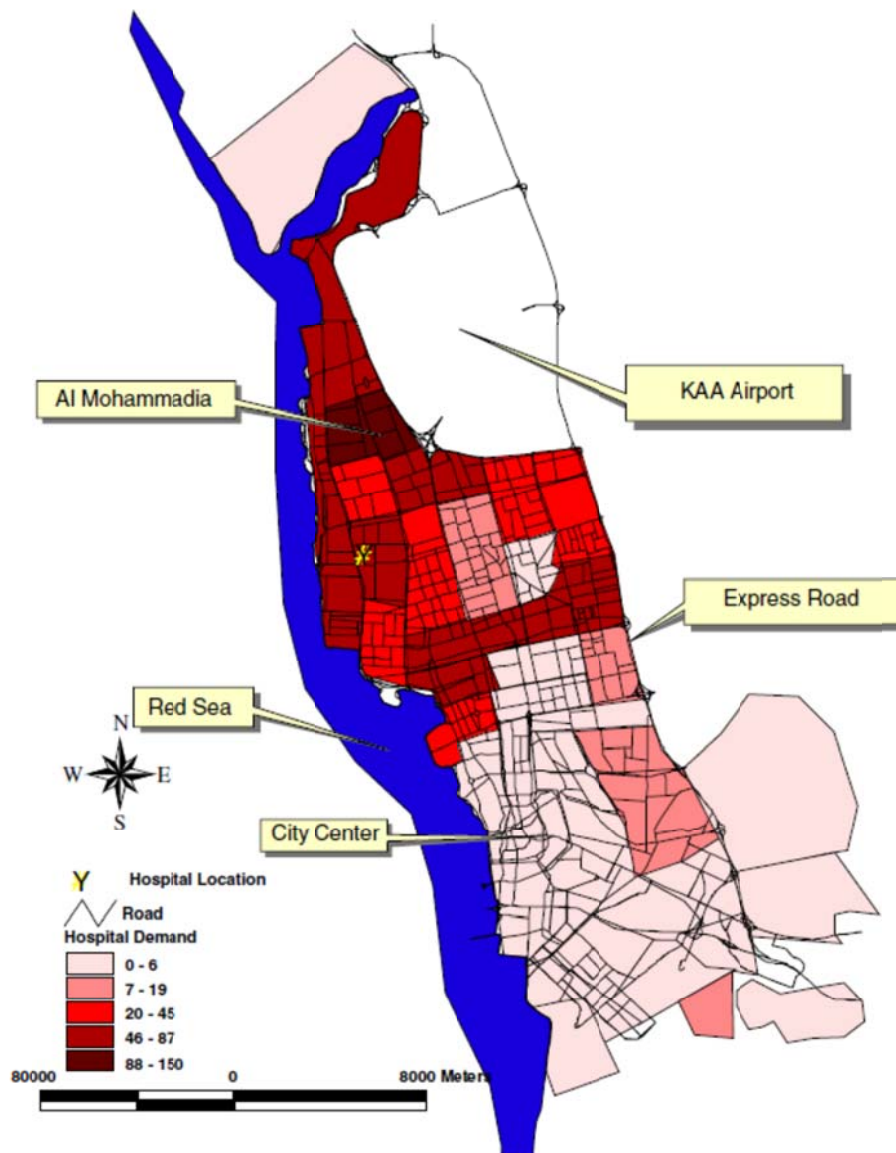


Figure: shows distribution of hospital demand

The study has selected one major private hospital and applies GIS on it. A number of factors were considered include accessibility to health demand data and the types of health services that are available at this hospital. In addition, all the planning issues that are dealt with at this hospital are relevant to the remaining hospitals of Jeddah city. This hospital has a capacity of 300 beds and 120 doctors working at different. It is located at the north of the city but expected to serve most parts of city districts!!



The study has selected three major planning issues and uses GIS for analyzing these issues.

The first issue is defining health demand location. GIS has different tools that can be used for defining any location on the map. ArcGIS software is used to define all hospital demands location. These data are collected on city districts level. Therefore, GIS coverage is digitized at the Arcmap application.

The following step was to enter the collected attributes about hospital demand. These include:

- number of patients,
- age–sex
- and hospital utilization types (emergency clinics patients, specialized and general clinics patients and admitted patients).

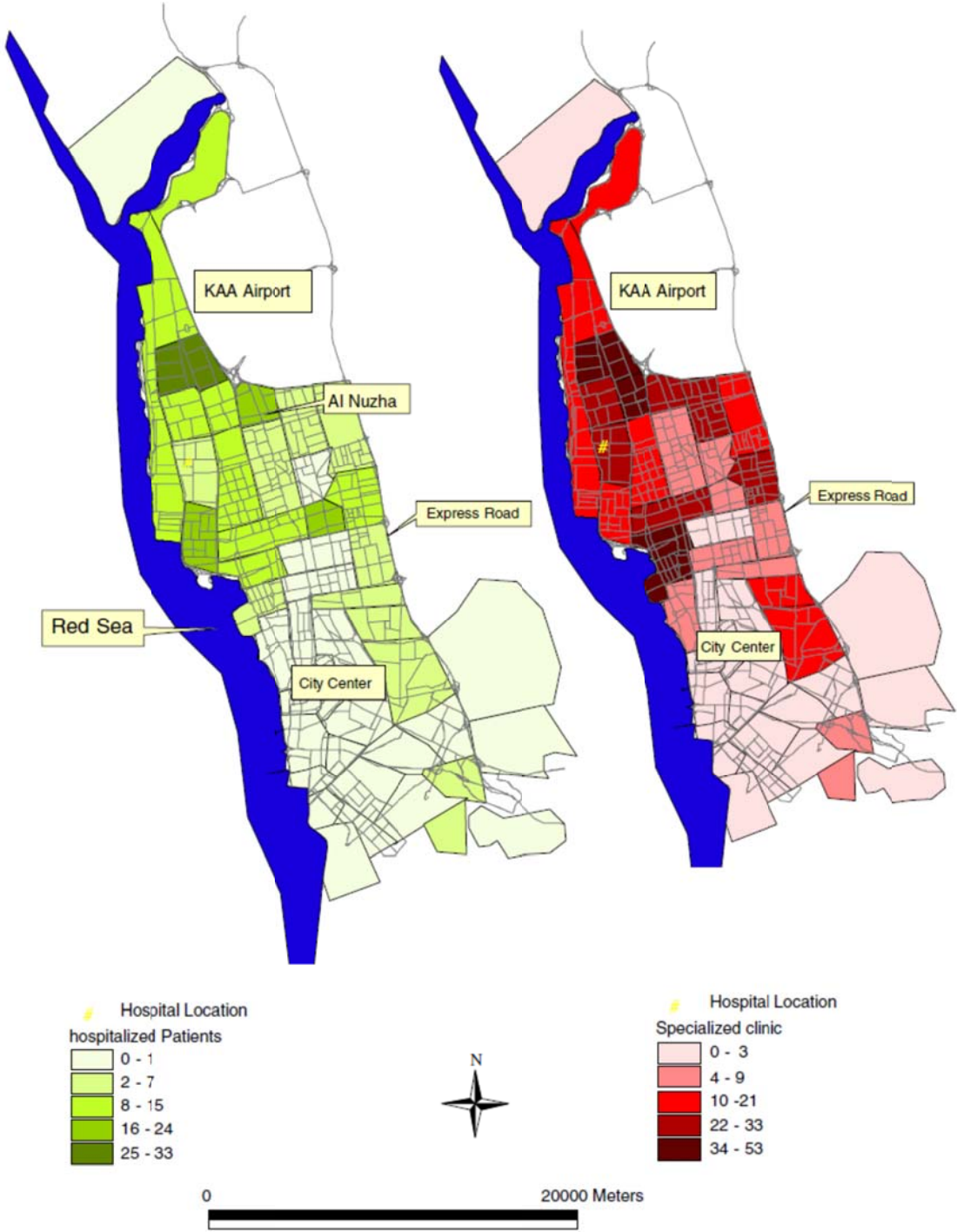


Figure shows Classification of hospitalized and specialized clinic patients

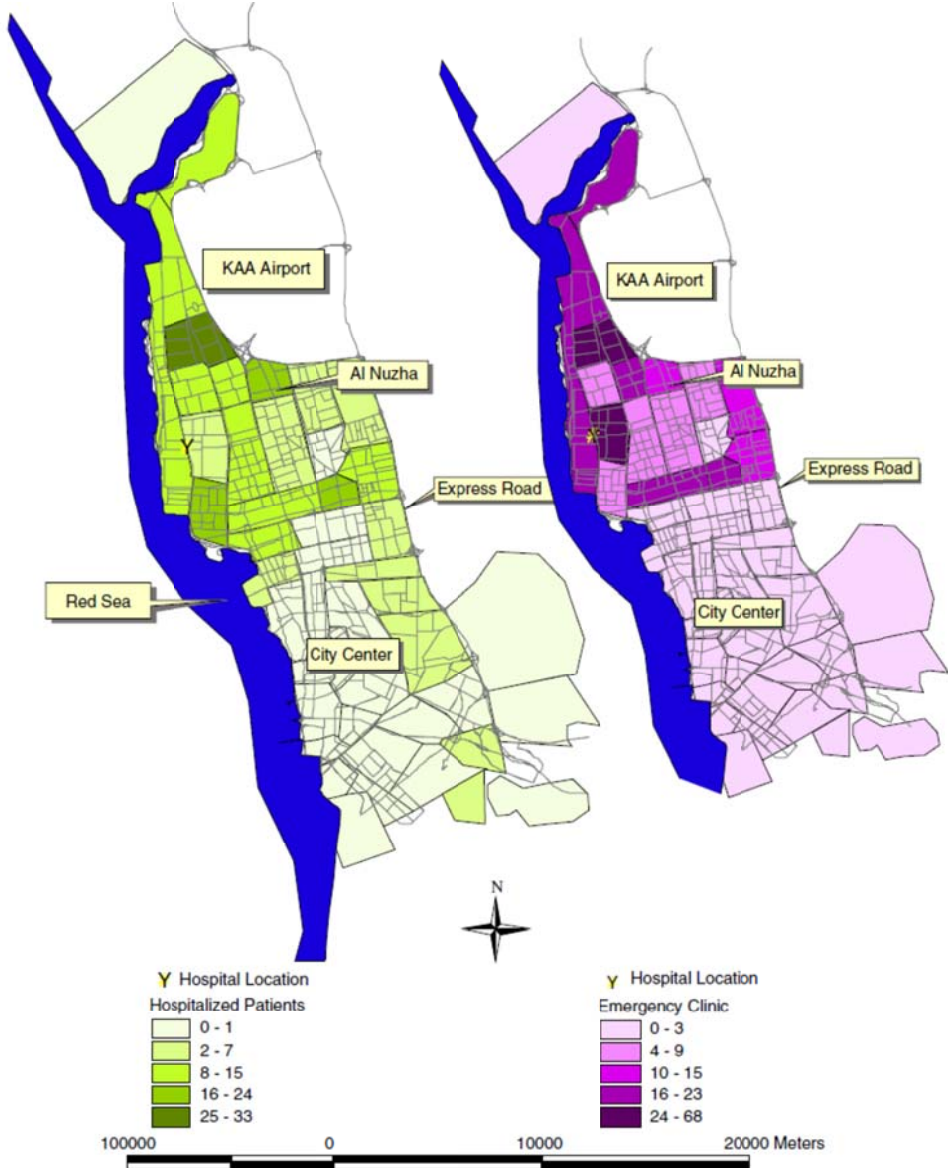


Figure shows Classification of hospitalized and emergency clinic patients

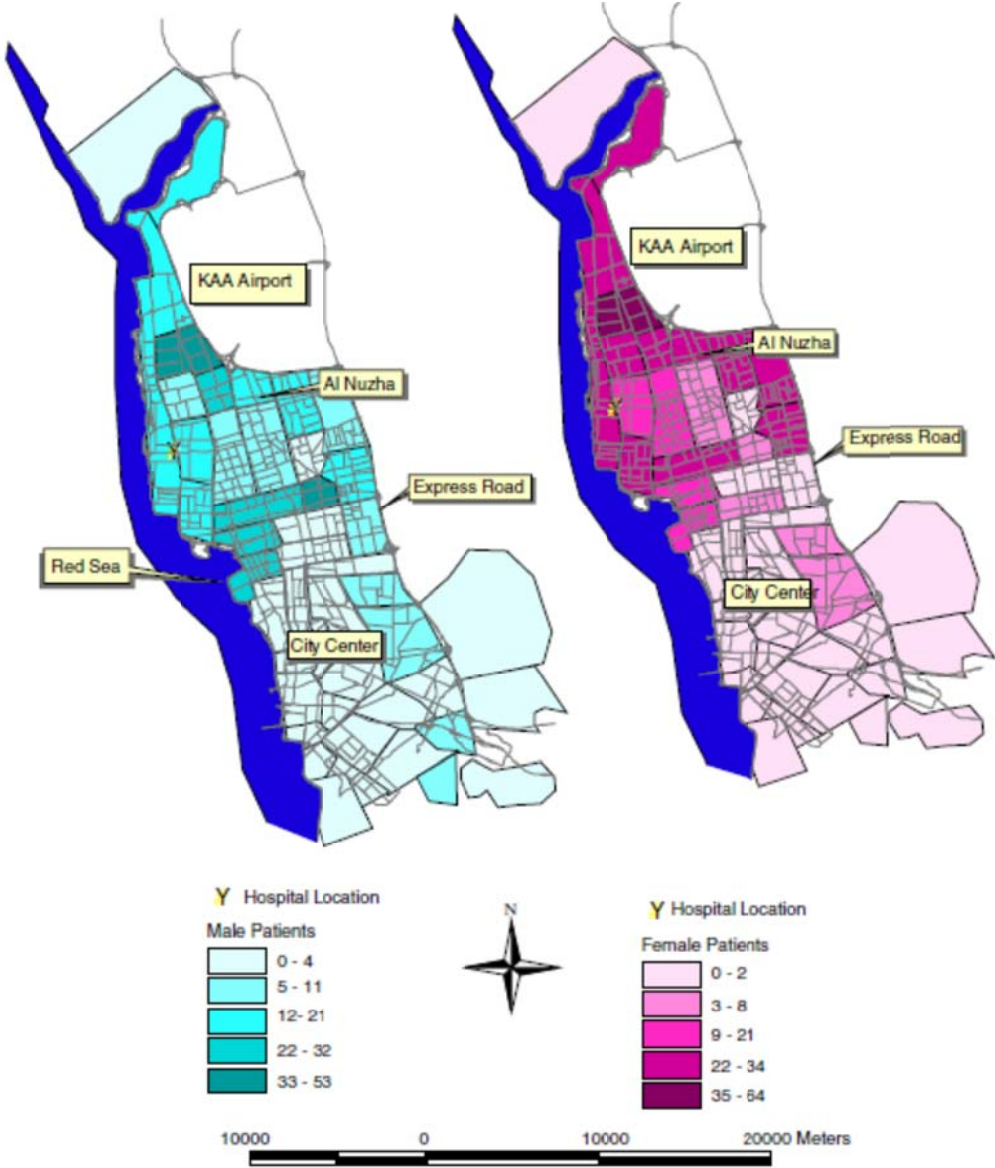


Figure shows Classification male and female patients



Figure shows 15-min drive service area

These data are linked to the demand coverage and used for the second issue of this application which is the classification of health demand.

The third main issue is defining hospital service area. This issue is covered using network analysis and overlay analysis.

These elements are used together to perform the required GIS functions.

### Results and discussion

This paper discusses a GIS application for hospital facility planning in Jeddah city. The application covers three main hospital issues that are location of health demand, types of patients and the extent of hospital

service area. Each one of these issues has a direct spatial dimension. Therefore, the use of GIS for analyzing and manipulating them was of greater value and benefit. For example, GIS is used to define all hospital demand location and produces an output showing city districts that are producing remarkable demand to the selected hospital. This output can be used by health planners to define the real catchment of health facilities. Classification of health demand is another important issue covered by this study. Patients are classified based on their usages for the selected hospital and the results of this classification show city districts such as Alzahra that have high hospitalization rates. The third main issue that was covered by the presented application is related to defining hospital service area. GIS is used to produce a 15-min drive-time service area for the selected hospital. This output is used further to define the amount of patients living inside hospital service area and to test the market share of the selected hospital.

## CONCLUSION

Tomorrow's Health Care: GIS has helped the health care industry manage resources and personnel in of the same ways it has helped other consumer service enterprises. Use of GIS for business function--marketing, sales, and facility and materials management will continue to grow. However, in the increasingly information-intensive environment of tomorrow's health care, the role of GIS will have greater importance due to its abilities to integrate a wide range of data sources, from legacy systems to image data, and to make complex data more quickly and easily understood.

## REFERENCES

- 1) Abdulkader A Murad, Creating a GIS application for health services at Jeddah city, Computers in Biology and Medicine 37 (2007) 879 – 889
- 2) Ankita Misra, Harshika kishore, ketki Barot, A GIS Based Analysis of Health Care Services in the City of Pune, symbiosis institute of geoinformatics.
- 3) Web site: Jeddah municipality \_ <http://www.Jeddah.gov.sa>
- 4) Web site: Ministry of health \_ <http://www.moh.gov.sa>
- 5) Web site: <http://www.esri.com/news/arcuser/>