Urban Poor and Physical Accessibility to Government Allopathic Dispensaries: A GIS Based Case Study of Bhubaneswar in Eastern India

Karmakar, M.,[1] Rath, K. Ch.,[2] and Das, N. R.,[3]
[1]NRHM, Dept. of Health and FW, Govt. of Odisha, Odisha, India, E-mail: mithun_karmakar@sify.com
[2]P. G. Department of Geography, Utkal University, Bhubaneswar, India
[3]Geoenvitech Research and Consultancy Services Pvt. Ltd., Bhubaneswar, India

Abstract
The urban poor live in slums in cities and Bhubaneswar, an eastern coastal city in India, is not an exception. The provision of health facilities (especially economically accessible government primary health care facilities in the form of dispensaries) have been increased, but not in accordance with the rapid growth and spatial expansion of the city. In this regard, the GIS can prove to be very useful in analyzing the spatial pattern of accessibility, deficiencies and gap/unserved areas through its multifaceted analytical tools. So to combat with the necessity of health care services and facilities for urban poor of a fast growing city like Bhubaneswar, there should be focus on updated facility planning with integration of GIS, which can ensure proper planning to cope with growth.

1. Introduction

In the year 1900, only 150 million people were living in cities, which increased to 290 billion in 2001. Since the year 2000, more than half of the world's population lives in urban or highly urbanized areas. The World Bank estimates that by 2030 the built-up area of industrialized countries will be expanded to some 5,00,000 square kilometers (Angel et al., 2005). A study of present and projected urban population of different regions in the world indicates that, the urbanization is at its highest level in Asia followed by Africa. In Asia, India and China are the major nations experiencing rapid urbanization (UN Habitat, 2008). As per the reports of UN-HABITAT, more than 900 million people can be classified as slum dwellers worldwide, most living under life- and health-threatening circumstances (UN Millennium Project, 2005). Almost one third of urban dwellers and one sixth of world population live in slums. The largest numbers of slum dwellers are found in Asia, with the largest clusters found in the two largest countries in the region, China and India. But the world's slum dweller population is dynamic. Although many countries have relatively small urban populations and concentrations of poverty in rural areas today, small- and medium-size cities and towns worldwide are witnessing some of the most substantial urban growth, frequently reflected in both the physical and numerical growth of slums (UN-HABITAT, 2003). Further, the "Urban Advantages" like employment opportunities; accessibility to education, health and other facilities; better economic and living conditions etc. does not extend to all urban dwellers. In fact, the slum dwellers are the most deprived ones.

2. Study Area: Bhubaneswar

In this context the present study attempts to assess the physical accessibility of government allopathic dispensaries for urban slum dwellers of Bhubaneswar city in eastern India. Bhubaneswar is the capital city of Odisha, an eastern coastal state of India. In 1948 the master pan of Bhubaneswar city was first prepared for a population of 40,000 over an area of 16.48 km^2 (Routray et al., 2000). But the 2001 census revealed the population of the city to be around 6.57 lakh. This rapidly increasing pressure of population, contributed by in-migration due to development of the city as a major centre of trade, commerce, technology and education; is resulting in a faster rate of developmental activities and there by rapid growth and expansion of the city. The present Bhubaneswar has grown in all directions. In view of the rapid growth, Bhubaneswar Development Authority was created in the year 1982 to control the development. Interestingly, the Development process could not be restricted within its development Plan area (i.e. 93 Revenue villages over 233 Sq. Km). The population growth of Bhubaneswar has been presented in Figure 1. The municipal area of Bhubaneswar has increased from 26.09 sq. km to 124.70 sq. km in a period of 40years

(i.e. from 1951 to 1991. The figures indicate that the rapid growth has taken place since 1948 within a short span of the time.

3. Urban Poor in Bhubaneswar

The urban poor basically live in slum or informal settlements in cities and Bhubaneswar is not an exception from this. So the growth of slums indicates the growth of urban poverty, which may be due to in-migration in search of employments, health, education etc. along with inequalities in economic pattern. As per a study on slum population by the Bhubaneswar Development Authority (BDA), considerable population amounting around 30% of total population is living in slums. The slum settlements in the city can be classified into slum colonies belonging to industrial workers, common slums, population squatting on the land belonging to Indian railways and other government agencies. Lack of civic services, unhygienic living conditions coupled with increase in housing stock deficit give rise to slum dwellings and its population (Shetty, 2011). The growth of slum pockets in Bhubaneswar over the years is given in Table 1.

Table 1: Growth of Slum Pockets in Bhubaneswar

Year	No of Slum Pockets	No of Households	Slum Population
1971	07	n. a.	n. a.
1981	23	n. a.	n. a.
1989	70	17,175	86,901
1991	86	21,003	1,10,112
1994	101	24,318	1,12,110
1996-97 (BPL Survey)	145	21,883	1,03,859
1999 (Post Cyclone)	190	38,160	1,90,865
2004 (BPL Survey)	229	42,430	2,12,320
2007	332	51,200	2,56,000
2008	377	60,126	3,08,614
Source: Bhubaneswar Development Authority, Bhubaneswar Municipality, General Administration Department			

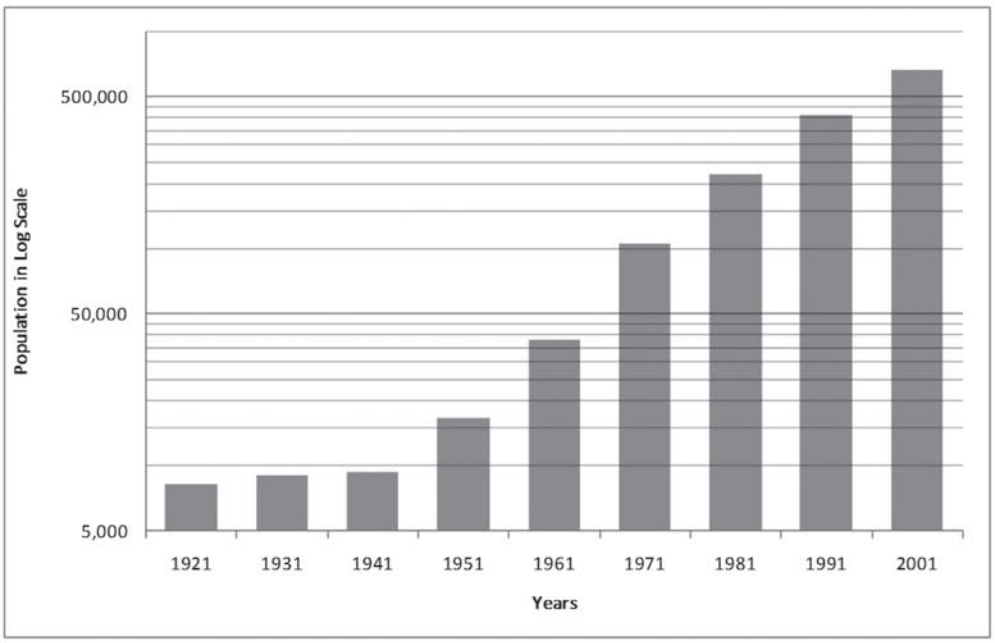

Figure 1: Population Growth in Bhubaneswar (Source: Draft Master Plan & Census)

4. Data and Methods

As the present study is an exploratory study that aims to measure the physical accessibility of government allopathic dispensaries for slum dwellers, the precise location of such health units and slums are the most important data required for the present study. So, extensive field visits accompanied by Global Positioning Systems (GPS) became the most important source of data collection. The GARMIN make handheld GPS have been used in the present study, which have been calibrated at bench mark station. The reports published by Bhubaneswar Municipal Corporation during 2008 described existence of 377 slum pockets in Bhubaneswar. In reference to this report, the slums have been identified, located and recorded using GPS. Similarly, the government allopathic dispensaries have been searched as per the existing list, identified and GPS coordinates have been recorded. The government allopathic dispensaries have been selected in the present study as the unit of health facility for measuring accessibility for urban slum dwellers. This is because, these health units are the primary health care centers, which act as the first point for seeking treatment of common diseases, diagnosis of major diseases and referral to major health units. These health units play a vital role in providing health care services to urban poor as these are economically accessible. In fact the services (consultation, immunization etc.) and often medicines provided in dispensaries are available free of cost. After the field survey, the GPS data have been downloaded to computers via interface cable and software (*Mapsource*). Then the data have been processed to import to GIS environment. Accessibility to health care is concerned with the ability of a population to obtain a specified set of health care services (Black et al., 2004). The use of Geographic Information Systems (GIS) for the measurement of physical accessibility is well established and has been applied in many areas including retail site analysis, transport, emergency service and health care planning (e.g. Wilkinson et al., 1998, Albert et al., 2000, Cromley and McLafferty, 2002 and Perry and Gesler, 2000). In the present study, the ARCVIEW GIS have been used along with its various add on modules and customization tools (Edit Tools, Spatial Analyst etc.) for mapping and analysis. The concept of point to point distance calculation and spider symbolization technique have been used to analyze and map the distance of each slum pocket from its nearest government allopathic dispensary. The distance concepts used for measuring physical accessibility generally include Euclidean distance, Manhattan distance, Shortest Network distance (in terms of travel distance or travel time) (Apparicio et al., 2008). However, in the present study, Euclidean distance has been considered as the measure of physical accessibility. This is because, in an urban context like Bhubaneswar, the physical barriers like topography, natural drainage etc. has very little impact on physical accessibility as the road connectivity is very good and further enhancing day by day. Further, the sample group discussions carried out during the study indicates that the slum dwellers usually do not prefer to travel beyond one kilometer for availing primary health care services.

5. Results and Discussion

Results of mapping reveal that there are 22 government allopathic dispensaries and 377 slum pockets in Bhubaneswar (Figure 2). As it has been discussed earlier, the dispensaries play a vital role in determining the health care seeking behavior as well as utilization of health care services for slum dwellers. However, a detailed study of spatio-temporal growth of Bhubaneswar along with the location of government health units providing primary health care services reveals that the urban growth has outpaced the provision of health care facilities, which need focal attention for planned development of health care services. In other words, the spatial distribution of government dispensaries is not in accordance with the rapid spatial expansion of the city. A multi layer point to point distance analysis has been done in GIS for measuring euclidean distance of each and every slum from their nearest dispensary. The slums have been categorised on the basis of this result (Figure 3), which describes that 201 slums are existing within 1 Km. distance of any government allopathic dispensary, 155 slums are existing beyond 1 Km. but within 2 Km. and 21 slums are beyond 2 Km. This indicates that 46.7 % of the total slum pockets of the city are beyond 1 Km. distance of any government allopathic dispensary. Further, the observations reveal that the spatial distribution of health units under study can be correlated with the spatio-temporal development of Bhubaneswar. In fact the spatio-temporal growth of Bhubaneswar may be classified under three different phases (Figure 2). The Bhubaneswar of 1st phase may be as it was during 1948, when the city was formed as capital of Odisha. The 2nd phase may be from 1948 to 1968 marked by the initiatives for development of master plan and development of various government offices like secretariate, heads of the departments etc.. In fact during 1968 the draft master plan was formulated and accordingly various development took place in sector/unit pattern at the central part of present Bhubaneswar in the areas of Saheed Nagar,

Satyanagar, Acharyavihar, Unit-2, Unit-3, Unit-9 etc. During 1983, the Bhubaneswar Development Authority (BDA) was formed and in 1988 the comprehensive development plan (CDP) was prepared to combat the rapid growth oupacing masterplan of 1968. However, beyond 1988, the spatial expansion of Bhubaneswar was so massive and rapid that it was beyond the vision of 1988 CDP. This rapid spatial expansion at its periphery is continuing till today. So this period (beyond 1968) can be termed as Phase-3, during which the number of slum pockets have increased from 7 to 377 with a nearly four times increase in slum population (Table 1). It is note worthy that, recently a comprehensive development and management plan has been developed by BDA and IIT, Kharagpur. The spatial distribution of dispensaries under study and slums overlaid on phase wise spatial growth of Bhubaneswar (Figure 2) indicate a planned development of health care service provision during the 1st and 2nd phase of planned growth of Bhubaneswar. However the distribution of health units under study in the areas developed during 3rd phase are not sufficient and well distributed enough to address the problem of physical accessibility of slum dwellers as there are only seven government allopathic dispensaries against 125 slums in this area (Table 2).

Table 2: Number of Govt. Allopathic Dispensaries and Slums Existing Presently Within Bhubaneswar of Different Spatio-Temporal Growth Phases

Spatial Extent of Bhubaneswar of Different Phases	Number of Govt. Allopathic Dispensaries Existing	Number of Slums Existing
Phase-1	04	76
Phase-2	12	176
Phase-3	07	125

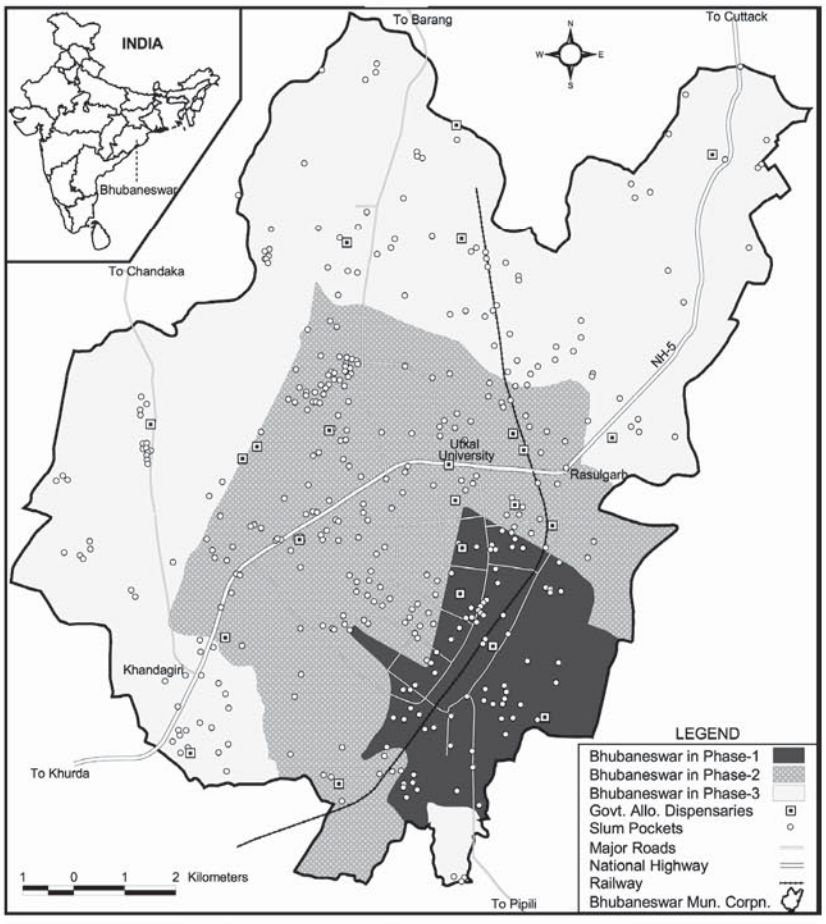

Figure 2: location of government allopathic dispensaries and slums in Bhubaneswar

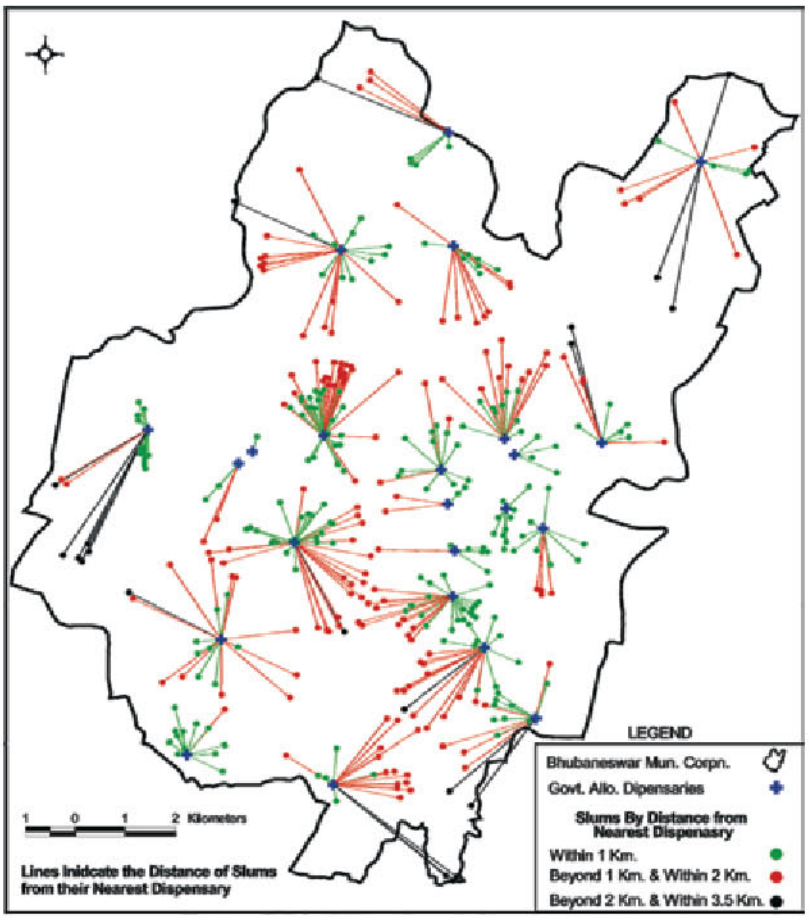

Figure 3: Analysis of accessibility of slums to government allopathic dispensaries in Bhubaneswar

6. Conclusion

The study indicates that the Bhubaneswar city is growing at a very faster rate. Accordingly the provision of health facilities (especially economically accessible government primary health care facilities) have increased, but not in accordance with the growth and spatial expansion of the city. On the basis of the observations of the study, it can be concluded that to combat with the necessity of health care services and facilities for urban poor of a fast growing city like Bhubaneswar, focus should be on updation of development plans accompanied with integration of GIS, which can ensure proper planning to cope with growth. In the context of urban poor of Bhubaneswar, as it is envisaged from the study, more number of government allopathic dispensaries will have to be setup in the areas developed during Phase 3 at suitable locations so that they can serve optimum slum population. While planning dispensaries in this area, attention should be given to locate them near boundaries of the municipal corporation area, so that they cope with future spatial growth and its demand.

References

Albert, D. P., Gesler, W. M., and Horner, R. D. 2000, 'Geographic Information Systems in Health Services Research', In D.P

Angel, S., Sheppard, S. C. and Civco, D. L., 2005, 'The Dynamics of Global Urban Expansion'. Washington, D.C., The World Bank.

Apparicio, P., Abdelmajid, M, Riva, M., and Shearmur, R., 2008, Comparing Alternative Approaches to Measuring the Geographical Accessibility of Urban Health Services: Distance types and aggregation-error issues, *International Journal of Health Geographics, doi:10.1186/1476-072X-7-7*

Black, M., Ebener, S., Aguilar, P. N., Vidaurre, M., and Morjani, Z. E, 2004, Using GIS to Measure Physical Accessibility to Health Care, WHO.

Cromley, E. K., and McLafferty, S. L., 2002, 'Analyzing Access to Health Services', *GIS and Public Health*, Guilford Press, New York.

Perry, B., and Gesler, B, 2000, Physical Access to Primary Health Care in Andean Bolivia, *Social Science Medicine*, 50(9):1177-88.

Routray, J. K., Rath, K. C., and Sahoo, N. N., 2000, Urban Land Development and Informal Settlement Planning: A Study on Bhubaneswar City in Eastern India, Orissa Chapter, Institute of Town Planners, India, Bhubaneswar and Asian Institute of Technology, Bangkok

Shetty, P., 2011, Health Care for Urban Poor Falls through Gap, *The Lancet*, Volume 377, Issue 9766, 627 – 628.

UN-HABITAT, 2003, The Challenge of Slums: Global Report on Human Settlements 2003. London: Earthscan Publications.

UN HABITAT, 2008, State of the World's Cities 2008/2009, Earthscan, London.

UN Millennium Project, 2005, A Home in the City. Task Force on Improving the Lives of Slum Dwellers.

Wilkinson, P., Grundy, C., Landon, M., and Stevenson, S. 1998, 'GIS and Health', In *GIS and Health*, edited by A. Gatrell and M. Loytonen, Taylor & Francis, London