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## Travel pattern of health utilization to primary health care centres in Madurai district

**C Vinothini, Dr. V Saravanabavan and Dr. D Balaji**

### Abstract

Medical geography as an interdisciplinary field of study concerned with variations of disease incidence as expressed in mortality or morbidity with the demonstration of possible cause and effect relationship with health utilization, elements of physical, biological and socio-cultural environments in space. The main objectives of the study are; a. To analyze the patient perception and satisfaction level who avail these PHC healthcare services. b. To analyze the travel Behavior pattern of patients from their residence to the PHC with respect to their age and sex indicators. The study area Madurai district lies between 9° 30' north to 10° 30' North latitudes and 77° 30' east to 78° 30' East longitudes. The data for the present study was collected from primary and secondary source. The random sampling technique is adopted to collect the primary data in all 13 blocks of Madurai district. Altogether about 260 sample respondents have been interviewed from the study area for the Questionnaire method. The data has been analysed by means of Descriptive statistical techniques and to identify the proximity of the health centres buffer method, multiple ring buffer method, overlay analysis are prepared by Arc GIS 10.3 software platform. To identify health service area in Madurai District, spatial analysis techniques were applied. The Study describes about patients perception and utilization of travel behavior pattern among sex and age variation and healthcare planning of PHC's in Madurai District.

**Keywords:** Patients perception PHC, age and sex travel, GIS, buffering, overlay analysis

### 1. Introduction

The health care system is intended to deliver health care services [1, 2] It constitutes the management sector and involves organizational matters. It operates in the context of socio-economic and political framework of the area. The scope of health services varies widely from country to country and is influenced by general and ever changing national, state, and local health problem, needs and attitudes as well as resources to provide these service [3, 4, 5, 6]. The major purpose of health services is to improve the health status of the population [7, 8, 9]. Medical Geography is thus concerned with the distribution and comparison of various indices of disease in human populations with relationship to other element of physical, biological and cultural environment [10-14].

Health is influenced by a number of factors such as adequate food, housing, basic sanitation, healthy life styles, protection against environmental hazards and communicable disease [15-19]. The frontiers of health extend beyond the narrow limits of medical care. Health care embraces a multitude of services provided to individuals or communities by agents of health services or professions, for the purpose of promoting, maintaining, monitoring or restoring health [20-23]. Health care chiefly refers to those personal services that are provided directly by physicians or rendered as the result of physician's instructions. Health care is a public right and it is the responsibility of the government to provide this care to all people in equal measure [24].

Health care systems are designed to meet the health needs of the community through available knowledge and resources [25-27]. In recent years, two major themes have emerged in the delivery of health services; Firstly, health services should cover the full range of preventive curative and served rural people and urban poor [28, 29].

The purpose of health care services is to improve the health status of the woman [30]. In the light of WHO's goal of "Health for ALL" have been fixed in terms of mortality and morbidity reduction, increase in expectation of woman's life, decrease in population growth rate, improvements in nutritional status, provision of basic sanitation, health manpower requirements and resources development and certain other parameters such as food production, literacy rate, reduction in poverty level etc. [31]

PHC addresses the broader determinants of health and focuses on the comprehensive and interrelated aspects of physical, mental and social health and wellbeing. PHC addresses the broader determinants of health and focuses on the comprehensive and interrelated aspects of physical, mental and social health and wellbeing (WHO). The most widely studied aspects of Medical Geography in India has been certainly the traditional approach of the study and analysis of the spatial distribution of health care centres and patterns behavior pattern among different age, and sex groups [32]. Limited availability of health care facilities and services and perceived low quality of care mean that those in need of health care services frequently had to travel for health care. The barrier of geographic distance was worsened by transportation problems. We also observed that where health services were available most people could not afford the cost [33]. The primary audience is the federal/provincial/territorial (FPT) health sector, although the guidance may also be of use to regional and local health authorities, health professional associations, and others involved in the delivery of health care [34]. Distance is an important factor in the consumers travel pattern between separate locations thus affecting the spatial

interaction of consumers [35]. GIS is an effective tool to support spatial decision-making in public health through applying the evolving analytical approaches to dealing with healthcare planning issues. This requires a literature review before preparing relevant studies, particularly because of the continuous development of GIS technologies.

## 2. Study Area

Madurai district is located in the central part of southern Tamilnadu of India. It is bordered by Dindigul and Tiruchirappalli district on the north, Sivagangai district on the east, Virudhunagar on the south and Theni on the west. Madurai district is at  $9^{\circ} 30'$  and  $10^{\circ} 50'$  of North Latitude and from  $77^{\circ} 00'$  to  $78^{\circ} 30'$  of East longitude. (Fig 1). The total geographical area is 384,680 hectares. The total population is about 3038252 as per 2011 census. Madurai district in Tamilnadu is selected for the present study. This district is a combination of urban and rural region. According to last census the study area has a total population of 1,470,755, spread over an area of 147.97 km. The study area is the most famous cultural district of Tamilnadu and India. It has 11 taluks, 13 blocks and 665 revenue villages.

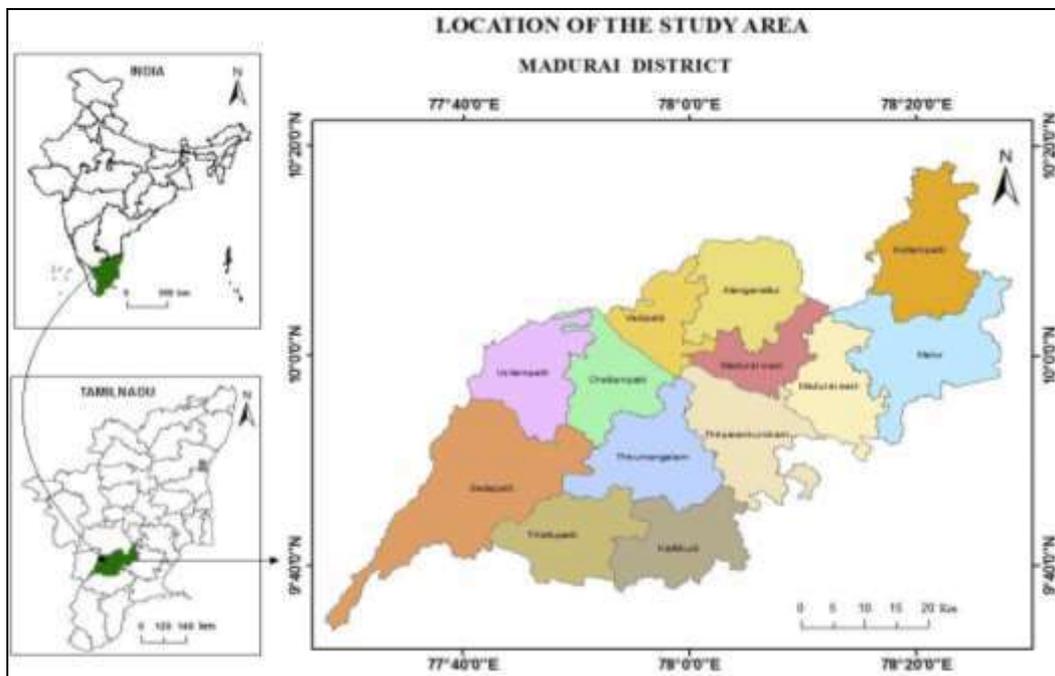


Fig 1: Location of the Study Area

## 3. Aims and Objectives

The main objectives of the study are

- To analyze the perception and satisfaction level of patients who avail these PHC healthcare services.
- To analyze the travel Behavior pattern of patients from their residence to the PHC with respect to their age and sex indicators.

## 4. Methodology

To fulfill the above objectives, the information has been collected from both Primary and Secondary sources. The most important tool of analysis is the cartographic interpretation and analysis of data with the help of maps. The Primary data collection for the purpose of this study was done in the form of Questionnaire survey in selected four major health centres of the study area based on

Stratified area random procedure. The data collected were taken using the method of random sampling based on total number of patients on both age and sex, and a total of 260 samples were drawn in the year 2021. The units were almost uniformly (each 20 samples) drawn from the total by following the spatial distribution of patients within the selected health care centre. The main sources of secondary health data were collected at joint director of health, and demographic data sources obtained from the respective health statistical offices in Madurai. In fact, the information often has to be collected at first hand by Questionnaire method. Thus desire line maps usually illustrate pattern of movement undertaken for some specific behavior purpose. Graphical techniques such as Overlay and Buffer analysis using GIS and suitable statistical techniques were used to analyse the data.

**5. Result and Discussion**

**5.1 Spatial Distribution of Health Care Centres in Madurai District**

Madurai district is well developed in its health care system. The study area has 54 PHCs. There are a few private clinics in the study area, which serve the increasing health needs of the people. The sample survey, conducted in the study area, about 72.98% of the respondent reside near to the health centre (With in 3 km) and about 23.17% reside 3 to 4 km from the hospital. Around 3.85% of the respondent reside more than 5 km from the health centre. The study area is well connected with all its village panchayats via; roads. The mode of transport which people use to reach the health centre is also an important aspect to be analyzed.

About 46% of the responds reach the health care by walk and about 38% of them reach by bus. About 11% of them reach by two wheelers and 5% of them use other modes of travel. The patient’s perception point of view of about 65% of the respondents took only within 30 minutes to reach the health centre and 23% of them were of the opinion that they took 30-45 minutes to reach the health centre. Likewise 5% of the respondents needed more than 45 minutes and only 7% of them reached within 15 minutes. The medical availability at free of cost in the health centres are another measure to check the efficiency of the respective health centre.

About 58% of the respondents stated that they have to wait for 15 minutes to see the doctor and 29% of them stated that it took 30 minutes to see the doctor. Likewise 8% of them stated they have to wait for 30-45 minutes and 5% of them stated that it took more than 45 minutes to see the doctor for treatment.

**5.2 Perception on Treatment in Madurai District PHC**

About the perception on treatment, about 84% of the respondents state that it was satisfactory and 54% of them state that it was highly satisfactory. Likewise, 40% of them state that is was good treatment. About 54% of them said that the treatment was very good. And the rest 6% of them

said that treatment was bad (not satisfactory). The treatment in the PHCs of Madurai district is completely free. All the medicines available in PHCs are also free of cost. Most of PHC’s provide all types of medicines for the patients. So 99% are satisfied with the availability of medicines and only 1% of them are not fully satisfied. Among the respondents 45.4% said that their condition was very bad and 54.6% of their said it was worst before the treatment. Most of them have an opinion that they have recovered from the disease. About 56.3% of the people have recovered and 12.7% of the respondents have completely recovered. While 27.2% of the respondents have somewhat recovered and 1.8% of them have not at all recovered and the remaining 1.8% of respondents is in the same condition as before.

The major problem of all PHCs is less number of doctors and their regularity. Absence of doctors is a major problem faced by the respondents. About 49% of the respondents state that the doctor’s manpower is inadequate and 40% state that the doctor’s man power is inadequate. Likewise 6% of them state that doctor’s are highly inadequate and the remaining 5% opinioned that doctors are more than adequate.

**5.3 Sex Wise Travel Pattern: Using Overlay and Buffer Analysis**

There are three buffer zones are created to represent the travel pattern of each PHC in Madurai district. The first buffer zone represented area up to 1 KM from the PHC. This is highly accessible area and shows maximum utilization. The second buffer represents area up to the average distance from the area of the maximum utilization. The second buffer zone is less accessible compared to the zone of maximum utilization. The third buffer zone extends from the second buffer zone up to 2KM. (Fig 4). This is the zone of very low accessibility. The patients coming from this region are usually males. (Fig 2) Female prefer very short distance travel. (Fig 3).>64 and 0-14 year age group also travel very short distance to reach the PHC. (Fig \$) (Table 1).

**Table 1:** Sex Wise Travel Patteren – Madurai District

S. No	Blocks Name	Male		Female	
		Distance in Km	Distance in%	Distance in Km	Distance in%
1	Kottampatti	21.25	7.04	36.5	9.14
2	Thirumangalam	18.8	6.23	43.9	10.99
3	Madurai-west	23.45	7.77	17.25	4.32
4	Melur	30.7	10.17	17.4	4.36
5	Madurai-east	21.09	6.99	21.6	5.41
6	Vadipatti	23.8	7.88	30.4	7.61
7	Alanganallur	22.4	7.42	38.8	9.71
8	Kallikudi	20.4	6.76	30.9	7.74
9	Thirumangalam	16.3	5.40	40.6	10.17
10	Usilampatti	22.3	7.39	28	7.01
11	Chellampatti	24.7	8.18	29.7	7.44
12	Sedapatti	18.4	6.09	36.8	9.22
13	T.Kallupatti	38.18	12.68	27.4	6.88
Total		X=301.7	> $\bar{x}$ =46.68	X=399.25	> $\bar{x}$ =56.97
		$\bar{x}$ =23.21	< $\bar{x}$ =53.32	$\bar{x}$ =30.71	< $\bar{x}$ =43.03

Source: Compiled by Author

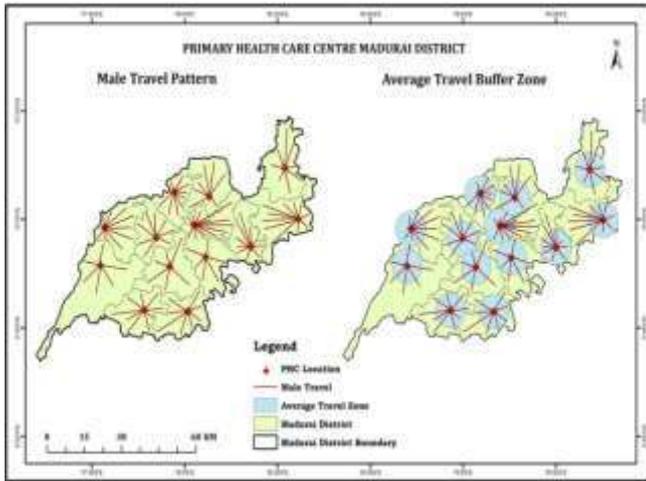


Fig 2: Male Travel Pattern

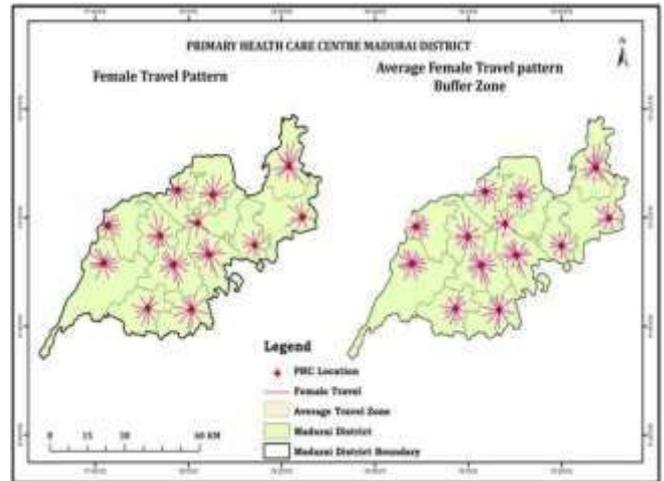


Fig 3: Female Travel Pattern

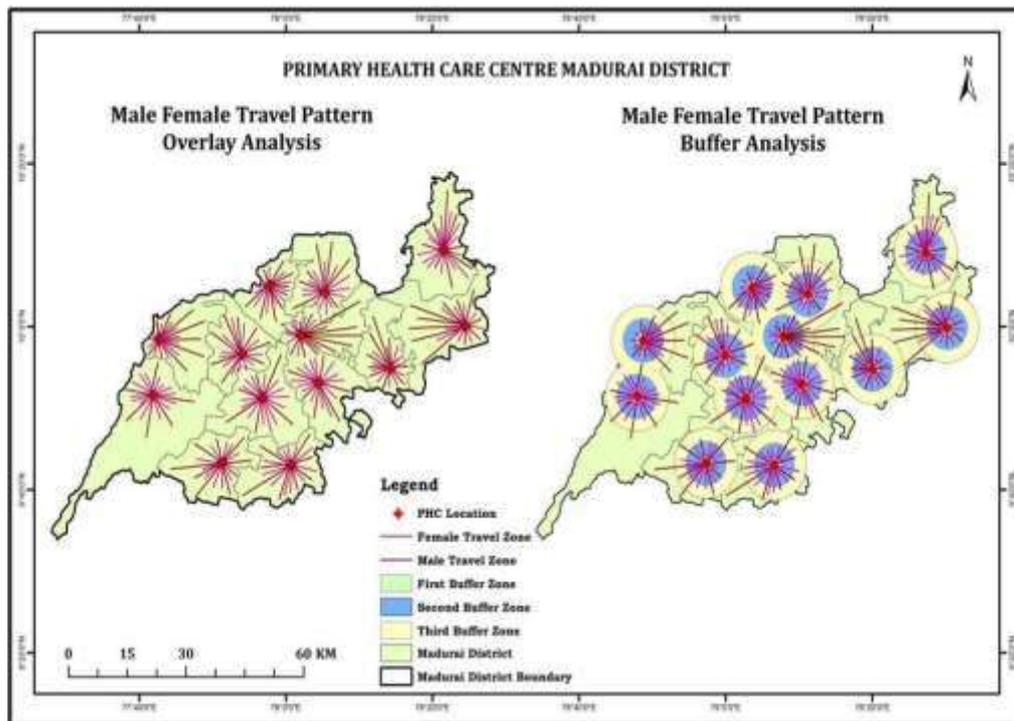


Fig 4: Male and Female Travel Pattern

**5.4 Age Wise Travel Pattern: Using Overlay and Buffer Analysis**

There are three buffer zones. The first buffer zone extends up to 1 KM from the PHC which shows frequent travel of age group belonging to >64 and 0-14 years of age. (Fig 9). In all the thirteen PHCs first buffer zone is the maximum accessible region and second buffer zone is average accessible and third buffer zone is in accessible. Only limited numbers of people come from the third buffer zone and mostly they are male patients. This travel pattern reveals the general movement pattern of patients in Madurai district to the health centre.

This includes both male and female patients from the overall analysis it is clear, that male patients travel longer distance and females travel short distance to reach the health centre. The longest distance (6.8KM) is Alanganallur block. The highly accessible blocks are, North-western part of Chellampatti, Vadipatti, Kalikudi, T. Kallupatti, and the central tip of the Madurai west and Madurai east. Thirumangalam, Thiruparangundram blocks are medium

accessible and Kottampatti, Melur, Sedapatti blocks are very low accessible. (Table 2).

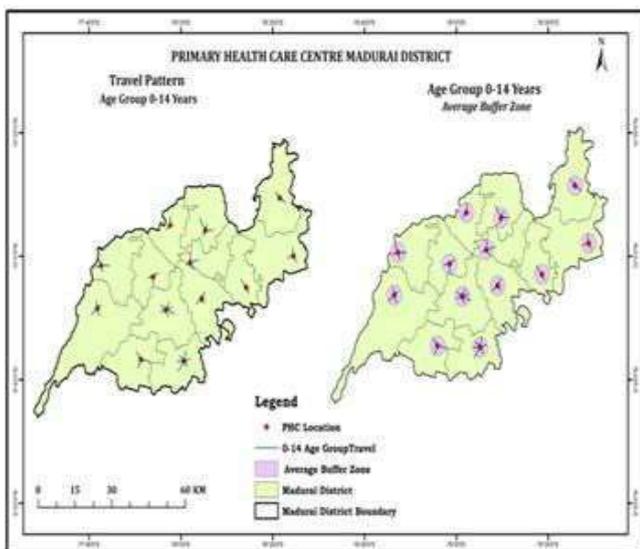
The overlay analysis of different age groups and sex pattern has helped to reveal and identify the travel behavior of the patients. The age structure is one of the prominent factors in healthcare studies and health analysis. Among the total respondents the age groups belonging to 15-34 constitute the highest percentage of the patients i.e., 35.41%. (Fig 6). The age group of 35- 64 is of higher percentage i.e., 29.82% (Fig 7).

The age group >64 constitute 18.59% of the patients ;( Fig 8) the age group belonging to 0-14 has the lowest percentage i.e. 16.18%. (Fig 5). In the sample survey method conducted, 260 patients are distributed over 13 PHCs. It was evident that the patients were almost satisfied with the health care facilities available and medicines in the district. About 72.08% of the respondents reside near the health centre (<3KM) and about 26.92% reside (>3KM) from the hospital and 5% of the people reside 5-6.8 KMS of the PHC. (Table 2).

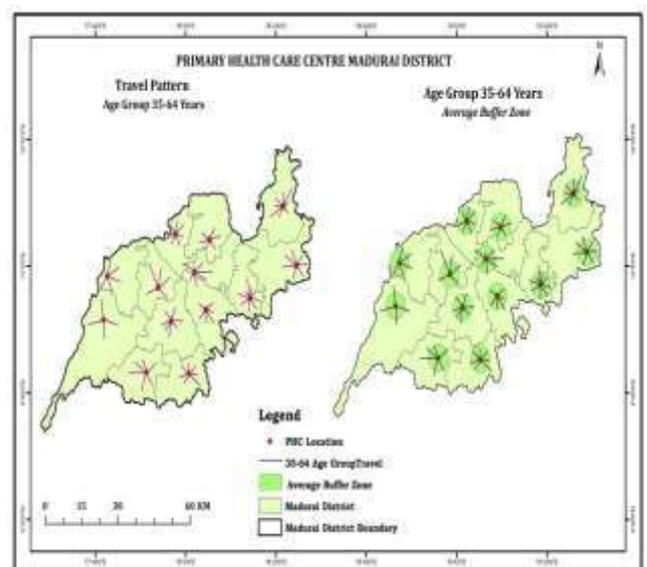
**Table 2:** Age Wise Travel Pattern – Madurai District

S. No	Blocks Name	0-14		15-34		35-64		>64	
		Distance in Km	Distance in %	Distance in Km	Distance in %	Distance in Km	Distance in %	Distance in Km	Distance in %
1	Kottampatti	3.1	2.74	27.7	11.18	20.45	9.79	6.7	5.15
2	Thirumangalam	8.3	7.33	25.2	10.29	17.9	8.57	11.3	8.69
3	Madurai-west	9.85	8.69	15.75	6.35	15.05	7.21	2.9	2.23
4	Melur	5.9	5.21	20.9	8.43	14.6	6.99	6.7	5.15
5	Madurai-east	4.8	4.24	16.4	6.62	13.36	6.39	3.39	2.60
6	Vadipatti	3.9	3.44	26.4	10.65	16.3	7.80	7.6	5.84
7	Alanganallur	12.1	10.69	18.7	7.54	18.7	8.96	11.7	8.99
8	Kallikudi	14.9	13.15	14.2	5.73	13.8	6.61	8.4	6.4
9	Thirumangalam	13	11.48	16.2	6.54	20.3	9.72	7.4	5.69
10	Usilampatti	9.3	8.21	10.3	4.16	13.8	6.61	17.9	13.76
11	Chellampatti	7.1	6.27	19.2	7.75	13.4	6.42	15	11.53
12	Sedapatti	10.1	8.92	16.7	6.74	12.9	6.18	15.5	11.98
13	T.Kallupatti	10.88	9.63	20.2	8.02	18.2	8.75	15.6	11.99
	<b>Total</b>	X=113.23	> $\bar{x}$ =70.77	X=247.85	> $\bar{x}$ =56.32	X=208.76	> $\bar{x}$ =53.59	X=130.09	> $\bar{x}$ =66.94
		$\bar{x}$ =8.71	< $\bar{x}$ =29.23	$\bar{x}$ =19.06	< $\bar{x}$ =43.68	$\bar{x}$ =16.05	< $\bar{x}$ =46.41	$\bar{x}$ =10	< $\bar{x}$ =33.06

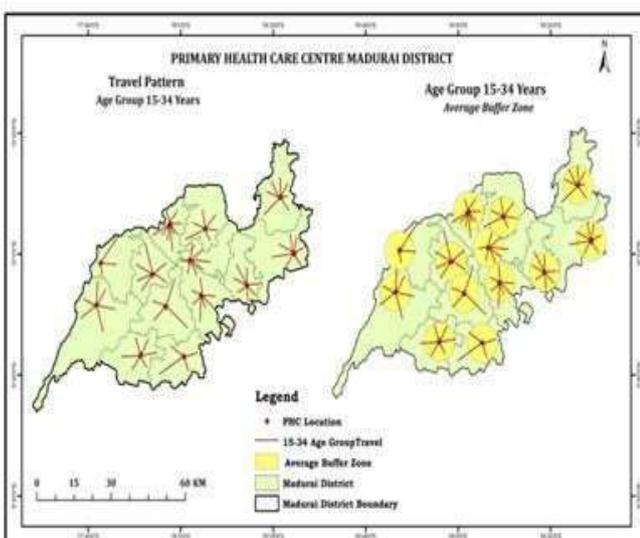
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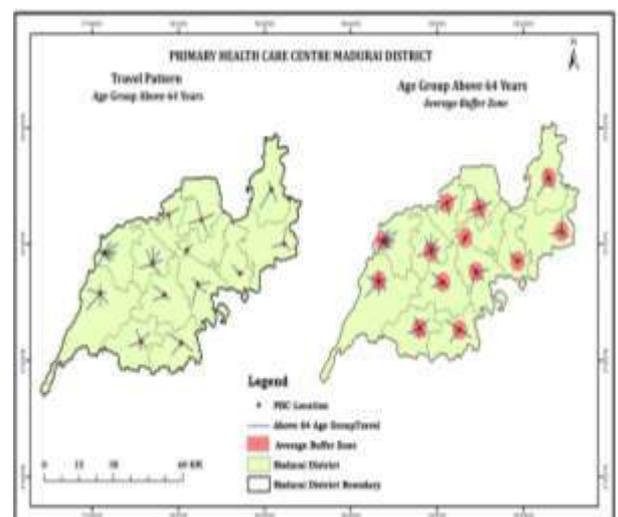
**Fig 5:** Travel Pattern of 0-14 age group



**Fig 7:** Travel Pattern of 35-64 age group



**Fig 6:** Travel Pattern of 15-34 age group



**Fig 8:** Travel Pattern of above 64 age group

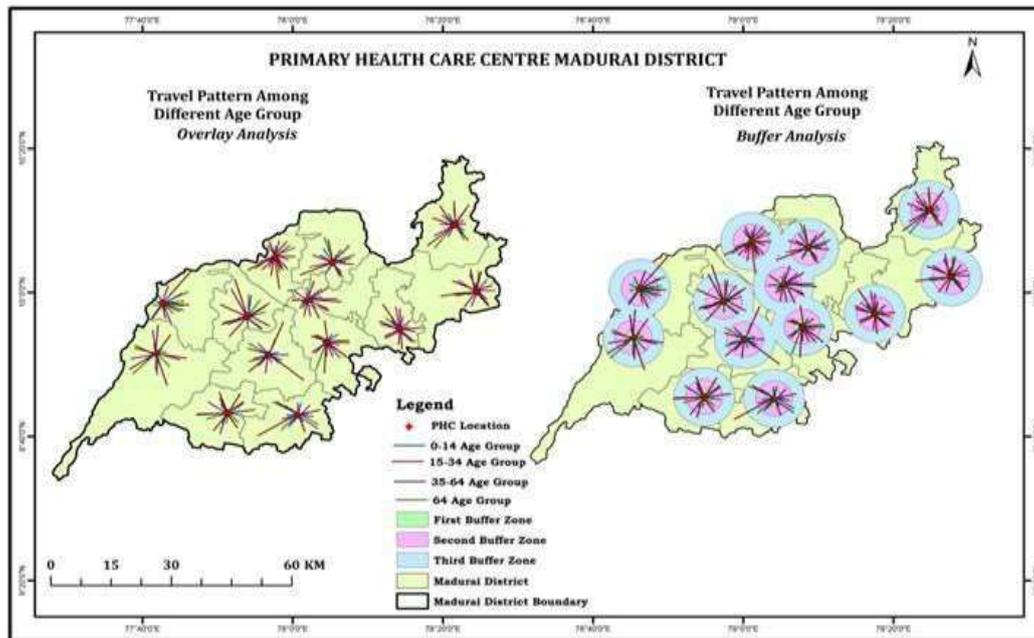


Fig 9: Overlay and Buffer analysis of Travel Pattern of different age groups

## 6. Conclusion

Health is a multidimensional process involving the well being of the whole person in the context of his environment. The promotion and protection of health of people is essential for a sustained economic and social development, thus contributing for a better quality of life. The intra regional travel pattern reveals the general movement of patients inside Madurai district to avail the health services, with respect to that of direction. In centres males travel considerably long distance based on different age wise travel behavior pattern in all centres of the study area.

The individual perception of the patients is that they are satisfied with the medical facilities available in Madurai district. This study deals with the analysis of social and economic background of the respondents and the individual perception of each respondent and the satisfaction level of the accessibility of PHCs in Madurai district. Most of the female patients prefer short distance to reach PHC. Only very number of them is from the third buffer zone. The age structure of the respondents reveals a variation in the utilization rate of health care facilities. The major problems faced by the PHCs are the maximum work load to come to duty by doctors and medical staff. Non availability of staff and staff vacancies not being filled is also a problem. In order to overcome this problem, it is suggested to appoint Doctors and other health workers. The promotion and protection of health of people is essential for a sustained economic and social development, thus contributing for a better quality of life.

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## Ethical approval

Ethical approval not required. This article does not contain any studies with human participants or animals performed by any of the authors.

## Conflict of Interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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