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## Cost of ambulatory care by mobile health clinic run by a Medical College in India for the year 2008-09

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## Abstract

**Background:** The feasibility of using mobile health clinics (MHCs) to deliver health services in urban poor areas has to be explored as the health needs of the residents are not sufficiently addressed by the existing primary health care delivery system in India. **Objective:** To estimate the cost of providing primary health care services and the out of pocket expenditure (OOPE) incurred, while utilizing these services provided through the MHC based Urban Health Program of a Medical College in North India for the year 2008-2009. **Materials and Methods:** A cross-sectional study to estimate OOPE was conducted among 330 subjects selected from patients attending the mobile health care facility. For estimation of provider cost, 5 steps process involving identification of cost centres, measurement of inputs, valuing of inputs, assigning of inputs to cost centers, and estimation of unit cost were carried out. **Results:** Total annual cost of providing services under Urban Health Program in the year 2008-2009 was Rs. 7,691,943. Unit cost of providing outpatient curative care, antenatal care, and immunization were Rs. 107.74/visit, Rs. 388/visit and Rs. 66.14 per immunization, respectively. The mean OOPE incurred was Rs. 29.50/visit, while utilizing outpatient curative services and Rs. 88.70/visit for antenatal services. **Conclusion:** The MHC can be considered as a viable option to provide services to urban poor.

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## Full Text

### Introduction

The urban population of India is rising rapidly with a decadal growth rate of 31.8% in 2001-2011, more than double that of rural area. [1] Out of the total urban population, 23.6% are poor and they suffer from poor health outcomes similar to the rural population. [2],[3],[4] Factors responsible for this include limited access to health care, poor access to safe water supply and sanitation facilities, overcrowding, poor housing, inability to afford health care, etc. [5]

Despite having one-fourth of country's population, urban area has <4% of the government primary health care facility. [6] This has led to overburdening of secondary and tertiary level health facilities with patients seeking primary care. [7] The existing Urban Family Welfare Centers (UFWC) and Urban Health Posts (UHP) cover far greater population than that proposed by Krishnan committee. [8] Furthermore, due to dynamic nature of urban poor settlement, these fixed centres are not able to cater to the need of urban poor. In terms of functioning, 32% of UFWCs and Urban Health Posts were found to be below average. [9]

The urban health programme run by Centre for Community Medicine (UHP-CCM), All India Institute of Medical Sciences, New Delhi has been providing primary health care in urban slums in Delhi since 1973 through mobile health clinic (MHC). Review of literature showed that there was paucity in costing data about services provided through MHCs in India particularly in urban set up. Also, the knowledge about the out of pocket expenditure (OOPE) incurred by the patient while using a health service would help to predict how much the service would be utilized as higher OOPE will deter patients from using them. [10] Hence, this study was undertaken to find the cost incurred while providing services through the mobile clinic and also cost incurred by the beneficiaries while utilizing the services.

## Materials and Methods

### Study setting

Urban Health Program of CCM, All India Institute of Medical Sciences (AIIMS) under which a MHC provides primary health care services to six blocks of Dakshinpuri extension, Dr. Ambedkar Nagar, which is a resettlement colony in South Delhi. Services like outpatient curative care, antenatal-post natal checkup, family welfare and immunization are provided to the area through one MHC. The program also includes house visits by male and female health worker. Health education is provided at MHC and in the community in the form of health exhibition, role plays, health talks and group discussion. The service is provided by a team of one senior resident, four junior residents, one public health nurse, one supervising medical social service officer, one medical social service officer, four health workers, two lab attendants and one clinical attended. The consultation, medicines and vaccines are provided free of cost. Six faculty of CCM are responsible for administration and training of students.

### Study design

Cost analysis was carried out to estimate the cost of service provision and a cross-sectional survey was conducted to estimate OOPE incurred, while utilizing the services.

### Sample size and sampling procedure

Based on feasibility, it was decided to sample 1% of the annual outpatient visits, antenatal visits and immunization visit. On the basis of previous year utilization statistics, it was decided to study 200 outpatient visits, 65 antenatal/post natal visits and 65 immunization visits for estimating OOPE estimation. The sampling was carried out once a week for 50 weeks. As the average number of patients per day was 40-50, on each sampling day every 10<sup>th</sup> patient were recruited systematically after they had received the services from MHC.

### Costing methodology

#### Estimation of provider cost

The costing methodology followed was as per the World Health Organization guidelines. [11] For the estimation of provider cost, the units under the program to which various cost were assigned or the cost centers were identified and classified into overhead, intermediate and final cost centers. After identification of cost centers, inputs utilized in the program were identified. Capital inputs included the office buildings, vehicles, equipments, and furniture. The recurrent inputs included the salaries, medicines, vaccines, stationeries, building, and vehicle maintenance. Key informant interviews and registers were used to measure the inputs.

For valuing of various capital inputs, their replacement cost as per 2008-2009 price lists was used. For each capital inputs the annual equivalent cost was calculated by dividing the replacement cost by an annuitization fraction obtained from standard table given after taking into account a discount rate of 10% and useful life years of the input. [10] Information about salary was obtained from interviewing all personnel associated with the program. The rate contract for year 2008-2009 kept at the central store of AIIMS was used to value the medicines and stationeries. The operational and maintenance cost of vehicle and building were obtained interviewing key informants and checking registers kept at transport office and engineering section.

The costs of various inputs were assigned to cost centers based on the amount used or the time used. The estimated cost of overhead cost centers (Administration, transport, maintenance and store) and the intermediate cost centers (laboratory, pharmacy) were allocated to the final cost centers by step down allocation method. The allocation was made according to the proportion of person hours used in various cost centers out of the total person hours utilized in these cost centers. The information about the time spent by personnel in each cost centers were obtained using a self-administered questionnaire given to all personnel involved. After calculating the total cost of final cost centers, the unit cost of each services were calculated by dividing the total cost with the number of beneficiaries involved in various services which was obtained using registers (outpatient department [OPD] register, antenatal care (ANC) register and immunization register) and from annual census report of the area served.

#### Estimation of consumer cost/out of pocket expenditure

A pretested interview schedule was used to collect information about socio-demographic details of selected patients of MHC, the illness for which they were attending the clinic, the drugs and laboratory investigation prescribed, but were not available in the clinic. Socio-economic status was determined by using modified Kuppuswami scale. [12] Same patients were followed-up in their home after 7 days and were interviewed about the OOPE for the same illness episode after their visit to MHC. The reference time for the calculation of OOPE started from the day of the visit in MHC and terminated at end of 1 week or until the patient get admitted in any hospital. The costs that were included in the estimation were those of travel, medicines, investigations and outpatient consultation fees at any private or other health facility besides the MHC for the particular illness episode within the reference period. The cost incurred by patient for the disease episode before visiting MHC or any hospitalization within the reference period or other indirect expenses like wages lost in the illness period or for attending the clinic was not included. If the patient had not got the investigation done or had not bought the medications that were prescribed, the market price of the medicines or the investigation were taken for the sensitivity analysis.

Data were collected from January 2009 to December 2009. The ethical approval for the study was obtained from the ethics committee of AIIMS, New Delhi before starting data collection. Written informed consent was obtained from all the participants after explaining the study in Hindi. The data were entered in Microsoft excel spreadsheet and were analyzed using Microsoft excel and SPSS version 13. Total cost, unit costs and proportion of costs to different components of program were estimated.

## Results

#### Cost of providing services under Urban Health Program

The total annual cost the Urban Health Program was estimated to be Rs. 7,691,943 in year 2008-2009 [Table 1]. The annual cost of the capital inputs only 9.5% of the total cost. Of all the inputs, the personnel cost contributed the largest share (82.7%) of the total annual expenditure. The annual cost of vehicle and its maintenance contributed to 10.5% of the total annual cost. {Table 1}

The total cost of providing outpatient curative services contributed to 31% of annual cost of the program. In the year 2008-2009, a total of 19,189 outpatient consultations were held in MHC. The unit cost of providing curative services through MHC was Rs. 107.74 per outpatient visit [Table 2]. The population of the six blocks served under the program was 20,327 on December 2008, hence the per capita cost of providing outpatient curative service was Rs. 118.16/person. {Table 2}

Cost of providing immunization in year 2008-2009 [Table 2] was Rs. 1,175,080. This included the cost of conducting immunization session in MHC (Rs. 561,452) as well as the cost of supportive field services (Rs. 613,629). In the year 2008-2009 there were 1583 under five children in the study area and 8,488 immunizations were conducted in the MHC. The unit cost of providing immunization was Rs. 66.14 per vaccine administered and Rs. 742.31 per under five child in the area served. While providing antenatal/post natal services Rs. 454,868 and Rs. 351,273 were incurred at the ANC/PNC clinic at MHC and during house visits respectively. In the year 2008-2009 1,170 antenatal/postnatal consultations were conducted in MHC and there were 354 pregnant women in study area. The unit cost incurred for providing ANC/PNC services through MHC was Rs. 388.78/visit and Rs. 2,277.24 per pregnant women in the area served.

The total annual cost incurred for providing training was estimated to be Rs. 2,087,405. In the year 2008-2009, 54 students were trained under the program. The unit cost for providing training a MBBS student in urban health under the program was Rs. 38,655.66 per student in that year.

As a sensitivity analysis, the cost of the program was estimated by excluding the training component and considering only minimal staff required for functioning of the program (one faculty in charge, two junior resident, one medical social service officer, one public health nurse, one health worker, one lab technician, one pharmacist, one clinical attendant, one store keeper, one driver, and one cleaner). The total annual cost of Urban Health Program thus estimated was Rs. 4,402,174, which was 43% less than the actual cost incurred. The main reason for reduction in the cost was due to reduction in personnel cost. In the sensitivity analysis the personnel costs was estimated to be Rs. 3,435,254 which was 45% less than the actual personnel cost incurred.

#### Out of pocket expenditure incurred while utilizing services under UHP

A total of 335 participants visiting the MHC and satisfying the inclusion criteria were enrolled for the study during the study period. Out of them, 199 outpatient curative visits, 63 immunization visits and 63 antenatal visits were included for final analysis. Out of the total participants, 10 (3%) were excluded as they were lost on follow-up visit. The main reason for the lost to follow-up was wrong house address given by the participant at the time of registration at MHC OPD and nonavailability of the participants even after two visits to the house. Majority (72%) of the participant belonged to upper lower and lower socio-economic status.

The OOPE occurred in 27.6% of cases who utilized outpatient curative services, 28.6% of cases who utilized ANC/PNC services and in 1.6% of immunization services [Table 3]. The mean OOPE while utilizing, outpatient curative services was Rs. 29.5/visit. The mean OOP expenditure on antenatal visit was Rs. 84.7/visit and for immunization was Rs. 0.79. [Table 3]

Out of OOPE incurred in outpatient curative services, 63.4% was spent on purchasing medicines, 22.7% on lab investigation and 13.1% as doctor's fees while utilizing private facility. Only 0.6% was spent on travelling. Among those who utilized ANC/PNC services, 64.2% of OOPE were used for doing laboratory investigation and 30.4% used for purchasing medicines. Only 4.5% was spent on transport.

## Discussion

The total annual cost of providing the whole package of services through the UHP-CCM was estimated to be Rs. 7,691,943 for the year 2009. The cost of running MHC (Rs. 3,638,763) was higher than the expected recurrent cost of a MHC given in the guidelines for operationalization of Mobile Medical Units in rural areas under National Rural Health Mission (NRHM) which was Rs. 1,987,000/year. [13] The main difference for the high annual cost in the present study was due to high personnel costs (82.7%). Since the facility is a MHC, the high cost of transportation (10.5%) was also a reason for difference in annual cost.

The cost of providing curative care in the present study (Rs. 107.7/visit) was higher than the cost of curative services provided through fixed primary health centers in study by Anand et al. [14] (Rs. 69.2) but within the range seen in the study by Mathur et al. [15] (Rs. 35.5-112.7/visit in different PHCs) when adjusted for the year 2009. The reason for the higher rate in the present study was the high personnel cost involved. In the sensitivity analysis done with lesser staff, the unit cost reduced to Rs. 77.3 which was comparable to the cost incurred in other studies. In the study, the mean OOPE incurred while utilizing the outpatient curative services was Rs. 29.5. Thus the combined cost (provider and consumer cost) incurred per outpatient visit while utilizing the outpatient curative services under the Urban Health Program was Rs. 137. The OOPE in a community-based prospective study by Star et al. [16] in the same study setting showed that OOPE per medical visit in nonhospitalized cases was Rs. 408.6, which was much higher than OOPE in the present study. Considering that almost 80% of the study population in the Star et al. study used private health facility, it could be assumed that the large part of OOPE was incurred while using private health facility. But still, the cost was more than 3 times the combined cost (provider and consumer) incurred in utilizing the outpatient curative service under Urban Health Program.

The cost of providing ANC/PNC services was Rs. 388.8 per antenatal visit which was similar to the cost of antenatal care in Anand et al. study (Rs. 366.6) when adjusted for the year 2009. [14] The OOPE incurred in utilizing antenatal services in the UHP-CCM was Rs. 88.7/visit. Assuming that each pregnant woman make a minimum of three antenatal visits, the OOPE incurred would be Rs. 266.1. This was less than the OOP expenditure incurred for antenatal care in public health facility as per National Sample Survey 60 th round which when adjusted came to Rs 473. [17] Also, the combined cost (provider and consumer cost) incurred for three antenatal care visit provided under the Urban Health Program would be Rs. 1432.5. This cost is far less than the cost incurred in utilizing antenatal care service in private sector (Rs. 14,616) in the study by Dhar et al. which was also done in South Delhi. [18]

The strength of the study is that it was one of the few studies conducted in India to consider the cost incurred by the service provider as well as the clients and so it was possible to estimate the total cost incurred while utilizing the service. The study has certain limitations as certain indirect costs were not included in the study like time spent on travel by the personnel involved in the Urban Health Program and the wages lost due to the diseases.

The methods to reduce the cost of running the program could be brought down need to be considered. One of the ways to reduce the cost is by including only the minimum staff required for patient care services as shown in the sensitivity analysis. This resulted in a lower annual cost as well as unit cost. Also, if this model of service delivery to urban poor can be replicated in a set up where the salary of the personnel are lower than in the current setting of a medical college, the total cost and unit cost of services could accordingly decline.

On comparing the study results with existing literature, it can be concluded that the cost of providing services through the MHC based Urban Health Program was comparable to fixed clinic when the training component was excluded and but it was higher than the expected cost of running an MHC under NRHM. However, the program has been successful in reducing the OOP expenditure of the clients that utilized the services particularly the cost of travel. The combined cost from both provider side and consumer side was less than the cost incurred while utilizing a private facility. The cost of travel was also minimal while utilizing MHC.

Under the National Urban Health Mission it is proposed that MHC would be used to deliver health services to the under privileged urban population living in urban poor areas through Public Private Partnership. The study provides the cost estimate required for running a MHC in urban setup which may be useful for policy makers and nongovernmental organizations for designing a similar program. Also, the additional cost of a field outreach program which may increase the utilization of the MHC is also given in the study. The study will also benefit the Community Medicine department in Medical colleges in designing a training program in the urban health for under graduate medical students.

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**Table 1: Total annual cost UHP in the year 2008-2009**

Cost category	Input category	Annual cost (in Rs)	Share of total cost (%)
Capital cost Rs. 729,092.20 (9.5%)	Vehicle	523,480	6.8
	Building space	167,354	2.2
	Equipment and furniture	38,258	0.5
Recurrent cost Rs. 6,962,850.3 (90.5%)	Personnel	6,363,988	82.7
	Building operation and maintenance	76,208	1.0
	Vehicle operation and maintenance	285,206	3.7
	Medicines	189,407	2.5
	Supplies	48,042	0.6
<b>Total</b>		<b>7,691,943</b>	<b>100</b>

**Table 2: Total and unit cost incurred annually while providing different services under UHP-CCM**

Services provided through UHP	Cost of services through MHC (Rs.)	Cost of supportive field services (Rs.)	Total cost of services through UHP-CCM (Rs.)	Share of total (%)	Unit cost (Rs.)
Outpatient curative services	2,067,494	334,350	2,401,844	31.2	107.74/visit 118.16/person
Antenatal/postnatal services	454,868	351,273	806,141	15.3	388.78/visit 2,277.24 per pregnant women
Immunization services	561,452	613,629	1,175,080	10.5	66.14 per immunization 742.31 per under 5 child
Family welfare services	29,684	267,898	297,581	3.9	80.14 per eligible couple
Health education	316,528	398,626	715,154	9.3	35.18/person
Counseling	208,738	0	208,738	2.7	10.2/visit
Training			2,087,405	27.1	38,655.66/student
<b>Total cost</b>	<b>3,638,763</b>	<b>1,965,775</b>	<b>7,691,943</b>		

UHP-CCM-Urban Health Programme - Centre for Community Medicine, MHC - Mobile health clinic

**Table 3: Occurrence of OOPE among study population**

Services	OOP expenditure occurrence (N (%))	Mean OOPE per visit (Rs.)
Outpatient curative services (N= 199)	55 (27.6)	29.5
Antenatal/post natal services (N=63)	18 (28.6)	84.7
Immunization services (N=63)	1 (1.6)	0.79

OOPE - Out of pocket expenditure, OOP - Out of pocket