

TIME UTILIZATION OF MEDICAL OFFICERS IN THE CGHS DISPENSARIES

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ABSTRACT

The physicians in the delivery of medical care to the patients are the pivot around whom the health services revolve. This paper has tried to identify the activities performed by physicians and to examine the present pattern of utilization of this expensive resource providing services to the closed population of Central Government Health Scheme beneficiaries. The study was conducted in four sampled dispensaries of CGHS where in all twenty-three medical officers are working. They were observed in rounds during the working hours. The Time Study technique adopted for the observations indicated that Medical Officers spend maximum time in prescription writing and taking history for the patient whereas other essential consultative activities are not dealt with adequately. This may be due to heavy workload, yet there is ample scope for better utilization of the time of Medical Officers to provide adequate medical care to the patients,

Of all the human resources involved in the health services system of the country, the modern physician is considered to be the most crucial. The physician is not only

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the leader of the health services but is the pivot around whom the health service revolves. Moreover, physician manpower is the most and disproportionately expensive resource in relation to other categories of health workers. It is of vital importance, therefore, that the dynamics of this strategic human resource be given top priority in medical manpower study.

This is particularly so in the dispensaries because the dispensaries and outpatient departments of hospitals providing ambulatory care to the patients have been facing the problem of excessive workload for the medical officers particularly in Delhi. With the scarce resources it is essential however, that the available resources are utilized at the optimum level, especially manpower resources, to meet the demand for medical care. For this it is essential that the present pattern of utilization of this resource needs to be studied. Very often the technique used in such a situation is a work measurement technique which provides the numerous improvements in layout and day-to-day management of institutions providing services to the community.

With mounting interest in the work study to improve work environment and effectiveness and utilization of resources in the field of health, in India, number of studies have been carried out for the physicians and nurses working in different types of health institutions such as PHCs, hospitals etc.

The present study has, therefore, been undertaken to examine the utilization pattern of medical officers of the dispensaries of Central Government Health Scheme (CGHS) providing services to a defined group of community in Delhi. The specific objectives of the study were:

- i. to identify the type of activities performed by medical officers;
- ii. to examine the time spent in those activities; and
- iii. to suggest the measures for better utilization of medical officers in the dispensaries.

Materials and Methods

The 61 allopathic dispensaries under the Central Govern-

ment Health Scheme (Contributory Scheme) scattered all over Delhi were stratified on the basis of the clientele they served, namely, (1) predominantly upper class, (2) predominantly middle class, and (3) predominantly lower class. For the purpose of the study, a sample of four dispensaries out of 61 dispensaries was selected in such a way that all the three strata dispensaries were represented in the sample. The criteria for the selection of dispensaries were:

- i. easily accessible to the beneficiary population;
- ii. fairly representative of their clientele; and
- iii. cover the localities with a similar environmental conditions.

Methods of Data Collection

The methods of data collection adopted for the study were preliminary discussions and the time study of the medical officers working in the sampled dispensaries.

- i. *Preliminary discussion:* A preliminary discussion was held with the authorities responsible for the coordination of the work of these dispensaries under the scheme (Director, Central Government Health Scheme) for the purpose of understanding the policies, procedures and general working of these dispensaries in Delhi. A preliminary visit was paid to each of the dispensary to be studied to meet medical officers concerned and identify the activities performed by them. The purpose and nature of the study was explained further and the working system of the dispensary was understood.
- ii. *Time study:* To achieve the stated objectives of the study, the various activities of medical officers in selected dispensaries were observed during working hours for a period of four weeks. For this purpose, technique of work measurement by time study was adopted.

The medical officers working in dispensaries perform same activities repetitively with each patient except in rare cases. Hence it was thought essential to include all the

medical officers working in the dispensaries to take care of these variations as well as to develop time standards which have not been discussed in the present paper.

To ensure that any variation in time utilization pattern is fully taken into account the activities as carried out by different medical officers at different times during the day on different shifts were observed.

To reduce the bias and to make the data statistically significant, the technique of randomization was adopted for the observation of medical officers in each dispensary as well as the dispensaries on different days of the week, in this study. The randomization was so done that each of the week days was observed in each dispensary. The medical officers were observed in rounds of 30 minutes each, during which period the observer recorded a complete description of method of providing medical care to the beneficiaries, breaking down the operation into elements and timing them. The elements represented the activities the medical officers performed during the examination of beneficiary patients and providing medical care to the beneficiaries. A work cycle, therefore, starts at the first element of activity and continues to the same point in repetition of the activity (patient in this case). The detailed breakdown of the elements (activities) is as under:

- i. History taking.
- ii. Physical examination.
- iii. Investigations advised.
- iv. Prescription writing including writing of special chits for restricted medicine.
- v. Advice to the patient.
- vi. Family planning and health education advice.
- vii. Waiting for the patient.
- viii. Away from duty.
- ix. Domiciliary visit.

- x. Administrative duty.
- xi. Any other activity.

The activities (i) to (vi) comprise the direct medical care activities while the rest are activities not directly related to medical care of the beneficiaries. The starting and finishing times of each activity were recorded with the help of a stop watch by cumulative time method. The individual elements (activities) time was obtained by successive subtraction after the study is completed.

Limitations of the Study

This study is based on the data collected during the months of January/February, and only on four dispensaries. Their generalisability, therefore, to the whole year and for all the dispensaries, in Delhi may be restrictive. However, the trends are still generalisable.

Findings

In all 23 medical officers of four sampled dispensaries were observed in rounds for 7584 minutes 10 seconds for 2115 patients. Of these 2115 patients 55.94 per cent were the old patients and remaining 44.06 per cent were the new patients. Adults above the age of 14 years represented 70 per cent patients and remaining were children. The 85.67 per cent of the patients came themselves to the dispensary for the medical care whereas 12.84 per cent were represented by their relatives and remaining by the servants.

The average observed time per doctor was 329 minutes 30 seconds, and the average number of patients observed per doctor was 92. The time period for which medical officers were observed varied with each other because whenever the medical officer was absent he could not be observed reducing his time observed while increasing the time for others who shared the workload in his absence.

Time utilization pattern of medical officers: On the basis of the observed time for each medical officer in the sampled dispensaries and the total time spent by him in individual activity as found by time study, the percentage distribution of time spent in these activities was worked out.

Direct medical care to the patient is the major service being provided by the dispensaries. It was observed that on an average 53.3 per cent time was spent by medical officers in medical care activities for the patients. The medical care activities comprise of history taking, physical examination, investigation advised, prescription writing, advice to the patient and Family Planning and Health Education advice as stated earlier. It has been observed that the medical officers mainly performed two activities, namely, history taking and prescription writing including the issue of special chits for restricted medicines.

The Figure 1 presents that out of the total time spent on medical care activities, 53.3 per cent by the medical officers 86.93 per cent of the time was spent in performing the activities of history writing and prescription writing only. The time spent on physical examination was

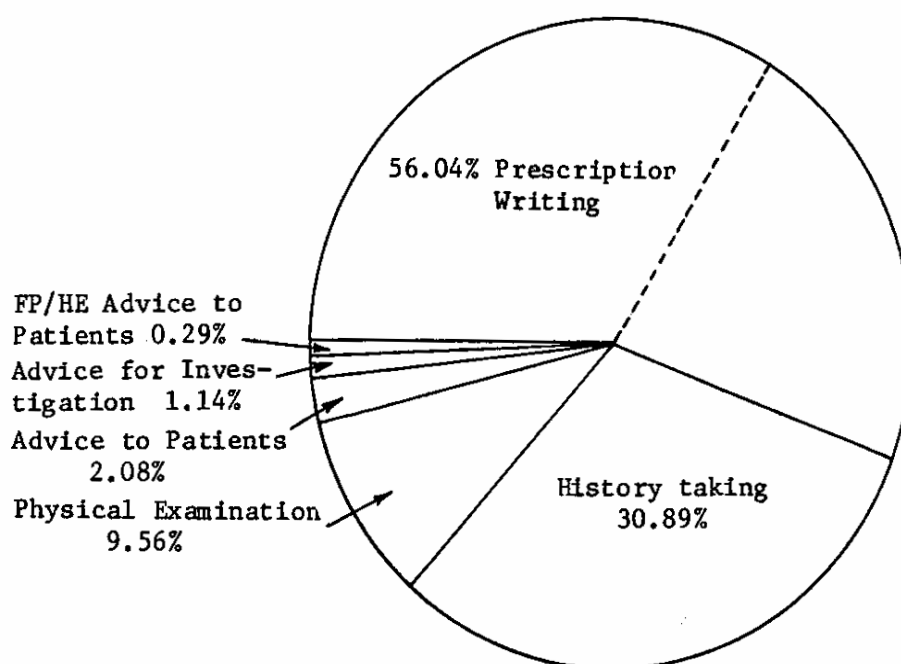


FIGURE 1

PERCENTAGE DISTRIBUTION OF TIME SPENT BY MEDICAL OFFICERS ON DIRECT MEDICAL CARE ACTIVITIES

found to be only 9.58 per cent and for advice to the patients 2.08 per cent. The medical officers were hardly observed performing activity related to Family Planning and Health Education advice to the patients. However, it was also observed that in about 40 per cent of patients the advice to them regarding instructions for taking medicines were given simultaneously, while writing the prescription including the special chits for restricted medicines.

In addition to the direct medical care activities, the medical officers were observed to spend their time in other activities such as administrative duty, domiciliary visits, and revisits of the patients for alternative medicines or special chits etc. Figure 2 represents the distribution of the time of the medical officers in these activities.

Revisits by patients took 1.79 per cent of their time. It was found that whenever the prescribed medicines were not

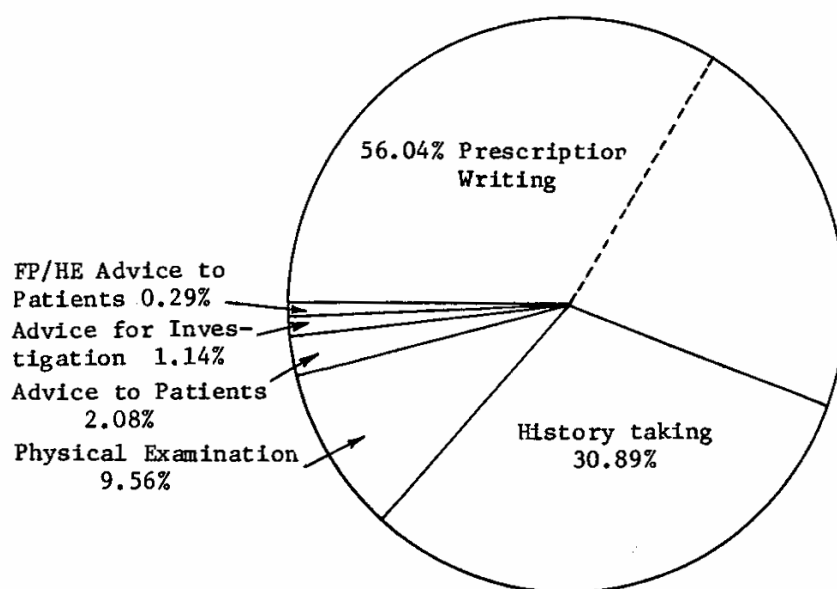


FIGURE 2
PERCENTAGE DISTRIBUTION OF TIME SPENT BY MEDICAL
OFFICERS ON DIFFERENT ACTIVITIES

available in the dispensary, the patients returned to the doctor for alternative medicines. This activity could be avoided by proper management. Sometimes the patient is not given proper instructions; therefore, he/she again comes to the doctor for clarification.

Administrative duties took 2.56 per cent of their time of which 83 per cent was for the medical officers' in charge dispensaries. These duties were performed by the medical officer in charge of the dispensary only, but whenever he was on leave this work was carried out by the next senior doctor in the dispensary.

They also spent 2.17 per cent of their time in domiciliary visits during the working hours. Most of these visits were emergency calls and had to be attended to leaving the patients in dispensaries to wait for the consultation. However, the calls were also attended outside the working hours which were not included for the purpose of this study.

Telephone calls took away 1.26 per cent of their time. Two per cent of these calls were attended by the medical officer in charge of the dispensaries which included both incoming and outgoing calls.

Further 6.1 per cent of their time was spent in activity termed as away from duty. This period was spent outside their consultation rooms either to meet their personal needs like toilet, taking tea, etc. or to attend to their own work. The patients however, were waiting all the time outside the consultation room of the doctor.

Miscellaneous activities consumed 1.58 per cent of the time of the medical officers. These activities included issue of medical certificates, discussions with medical representatives etc.

The medical officers were observed to be idle for 31.21 per cent of their time of which 18.37 per cent was during the beginning of the morning and the evening shifts since the patients after registration could reach them only after about 15 minutes of the opening of the dispensary, the rest of the time (12.84%) they were waiting for the patients.

The time utilization pattern of the medical officers

varied between the dispensaries and within the dispensaries of different strata's which is presented in Table 1.

It may be pointed out that activity of the revisit of the patient contributed nearly the same percentage of the time in all the dispensaries varying from 0.1 to 6.6 per cent. The activity of waiting for patients was high in strata-I dispensaries (14.1 to 22.4%) as compared to stratum-II (1.9 to 17.5%) and stratum-III (2.5 to 18.6%). This is mainly because stratum-I dispensary caters to the needs of predominantly upper class clientele who hardly visit the dispensary in person but mainly get their medicines collected through their servants after telephone conversation with the medical officer of the dispensary. The activity (away from duty) was high in stratum-II dispensaries (2.7 to 25%) as compared to stratum-I (0 to 10%) and stratum-III (0 to 10.2%).

Doctors working in stratum-I dispensary were observed to spend 1.0 to 5.5 per cent of their time in telephone calls whereas in dispensaries stratum-II and III the medical officers in charge only spent 1.5 to 2.6 per cent of their time in this activity.

Discussion

Time utilization pattern of the- Medical Officers: Findings of this study reveal that medical officers spent 53.31 per cent of their time in activities related to direct medical care to the patients. Of the total time spent on these activities, they spent 30 per cent on history taking, 9.56 per cent on physical examination, 1.14 per cent as advice for investigations, 56.04 per cent for prescription writing, 2.08 per cent for advice and instructions to the patients and 0.29 per cent for family planning/health education advice to the patients. The rest of their time *i.e.* 46.69 per cent was spent on other activities not related to direct medical care to the patient. The break-up of this time is that 31.11 per cent of their time was unoccupied as they waited for patients, 6.10 per cent of time they were away from duty, 2.56 per cent time was spent on administrative duty, 2.17 per cent in domiciliary visits, 1.28 per cent in telephone calls, 1.79 per cent for attending to revisits of the patients and 1.58 per cent in miscellaneous activities.

TABLE 1

PERCENTAGE DISTRIBUTION OF THE TIME SPENT BY MEDICAL OFFICERS IN DIFFERENT ACTIVITIES

Stratum	Dispensaries	Medical Officers	Total observed in minutes & seconds	Percentage of time spent in activities								
				Direct medical care	Waiting for patient	Away from duty	Domiciliary visits	Administrative duty	Telephone calls	Revisit of patients	Miscellaneous	Idle
I	1	1	328.10	46.1	19.4	2.0	0.0	2.0	4.5	3.6	0.5	21.9
		2	223.80	33.5	22.4	10.0	0.0	0.0	1.6	0.3	0.5	32.2
		3	364.10	52.3	22.3	2.1	0.0	1.4	1.0	0.8	0.4	19.7
		4	488.15	48.9	14.1	6.0	3.8	5.4	5.2	0.4	1.5	14.7
		5	339.00	38.9	17.9	0.0	15.3	0.0	5.5	1.0	0.2	21.2
II	2	1	252.10	37.5	17.2	25.1	0.0	0.0	1.5	0.9	0.0	17.8
		2	248.10	53.2	1.9	18.6	0.0	0.0	0.0	2.6	1.6	22.1
		3	292.13	66.7	8.9	6.5	0.0	0.0	0.0	1.3	1.3	15.3
		4	256.30	57.6	2.1	11.4	5.8	0.0	0.0	2.1	3.5	17.5
		5	216.35	59.3	4.2	9.5	0.0	0.0	0.0	1.7	0.0	25.3
		6	475.15	49.2	10.6	9.4	0.0	13.1	1.5	4.5	2.2	9.5
		7	427.10	49.8	17.4	4.5	0.0	0.0	0.0	1.8	2.3	24.2
		8	45.10	66.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.2
II	3	1	52.17	39.4	10.5	6.9	5.2	11.7	1.8	2.0	3.5	19.0
		2	577.17	58.2	17.5	2.2	0.4	0.9	0.0	1.7	1.8	17.3
		3	224.30	56.3	7.3	8.9	0.0	0.0	0.0	0.1	0.7	26.7
		4	587.00	58.3	17.2	2.7	4.9	0.0	0.0	1.9	0.0	17.2
III	4	1	239.24	23.6	4.5	0.0	0.0	6.5	2.6	2.6	1.2	25.0
		2	356.15	57.4	7.9	10.2	3.9	0.0	0.0	2.3	1.5	16.8
		3	375.30	61.7	8.9	4.0	0.0	0.0	1.2	0.3	7.9	16.0
		4	334.30	72.9	2.5	1.4	0.0	3.3	0.0	0.0	1.2	17.9
		5	392.21	61.1	18.6	2.4	0.0	0.0	0.0	0.0	1.7	15.3
		6	318.28	57.2	13.6	6.5	2.2	0.0	0.0	1.7	0.0	18.8

Functional analysis of health services conducted in the Narangwal project by Johns Hopkins University in 1970 found that 23.12 per cent of medical officers' time in one region and 31.2 per cent in another was spent on medical care in outpatients department of the primary health centers*. On the contrary it was also found that on an average a medical officer in primary health centre spent 10.65 per cent of his time in curative medical care, 14.05 per cent in administrative duty and 35.59 per cent away from duty[^]. In another study it was, on the other hand, found that, primary health centre medical officer spent 20.13 per cent of his time in medical care, 5.05 per cent in administrative duties and 35.19 per cent without any specific work[^]. A research study on District Health Administration revealed that the PHC medical officers spent 25.62 per cent of their time on clinical duties in outpatients department, while for 49.58 per cent of their time they were without any work or were absent from duty^{1*}. Yet in another study conducted in CGHS dispensaries in Delhi it was, however, found that the effective utilization of their medical officers was 50 per cent in normal periods and 75 per cent in rush periods.

In spite of considerable variations in the findings of all the above quoted studies, one can still discern a distinct pattern of utilization of medical officers' time for medical care services in the dispensaries of primary health centers. The medical officers on the whole spent about 40 to 50 per cent of their time for providing consultations to the patients while 24.5 per cent of the time they were either idles or away from duty. Significant percentage of time was spent in waiting for patients (12.8%) and revisit of patients (1.8%). Thus, there is ample scope for further utilization of their time to provide more attention to their patients and cover some of the essential activities like physical examination of the patients more adequately. If the idle time is utilized by proper management, the effective consultation time per patient can be more or less doubled without additional inputs. This would then influence the quality aspect of the care of patients, its efficiency and effectiveness.

Summary

Time utilization pattern of medical officers in the Central Government Health Scheme dispensaries was studied in 4 sampled allopathic dispensaries of CGHS. The 23 medical officers working in the sampled dispensaries were observed in rounds for 126.5 hours during the routine working hours of the 4 weeks study period. The activities performed by the

medical officers were linked with the help of time study technique.

During the period of study the medical officers examined 2115 patients and the effective consultation time spent by medical officers for patients varied between 1 to 2 minutes per patient which is quite low. It was observed that they spent only 50 per cent of their time in the medical care activities and rest of the time they were either unoccupied or performing other activities such as administration, revisits of the patients, attending telephone calls etc.

Among the medical care activities performed by the medical officers the maximum time was spent on activities of history taking and prescription writing, whereas other activities of consultation such as physical examination, advice to patient regarding special investigation, diet, medicine etc. were inadequately dealt with.

Thus, there is an ample scope for better utilization of the time of medical officers to provide adequate medical care to the patients.

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HEALTH SERVICES OF NIGERIAN UNIVERSITIES'

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ABSTRACT

A Nigerian university is a complex organization with people, machines and other facilities forming a district and recognizable entity in a community with a population of about 20,000 comprising of students, varied staff and their dependents. This population is equivalent to an average - sized urban Nigerian town.

The health status of such a community becomes the responsibility of the university authorities. Due to the nature of disease patterns in Nigeria, comprehensive medical practice with more emphasis on preventive and promotive health services is advocated for Nigerian universities. It is also necessary to make use of such facilities for teaching and research purposes in order to maximize the benefits from the available health resources. With counseling for personal and social problems strengthened through the increased involvement of the Hall Wardens and Advisers, it is hoped that the university health services will contribute their share towards the general wellbeing of the various Nigerian populations.

A University is an institution of higher learning. It has a complex organization comprising of both undergraduate and postgraduate students, varied staff members such as teachers, administrators and service-oriented personnel. There are buildings, equipment and other facilities which

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include heavy machineries, radio-active materials, chemicals, vehicles, air. Conditioners, electricity industrial gases, game rooms, fields and arenas A university, although part of the community in which it exists, nevertheless, forms its own distinct and recognizable entity just as other organisations and industries do. Its population of students, staff and all their children, other relations and household staff is well near 20,000 in any of the older Nigerian universities. Therefore, their health status must be of concern to the university authorities and administrators, if maximum good health and performance are expected of the members.

Functions of a University Health Care System;

A university health service should aim at protecting its members against the health hazards arising from its complex environment. It should also contribute to the ideals of the World Health Organization's definition of health by helping its members to adjust and adapt to their environment. The points to remember are that such a health care system must be by team effort with the active co-operation from all sections of the university; it must be primarily a preventive and promotive health service and must act in an advisory capacity to the university authorities as occasions arise. The system must be able to identify the sources and location of specific hazards, for example, radio-active materials in the university environment. Therefore, the principles and practice of an occupational health service must be applied to the Nigerian universities due to their complex organizational and industrial compositions.

Preventive Health Programme

Pre-employment and pre-admission medical examinations must be carried out so as to help the selective placing of personnel to their jobs and also to ensure that the students are fit to undertake their academic courses. These examinations should help to identify the risk people for continuous monitoring of their health, and also to identify those that may add to the health hazards of the university population, for example, open tuberculosis patients. Such examinations will also help to establish baseline data for the university community's right from the first day of residences in the various campuses. The examination should include full blood analysis, hemoglobin and sickle cell estimation, sputum test

for acid fast bacilli, urine examination for sugar and albumin, stool for organisms and chest X-ray to determine lung heart and general chest pathology.

Those resuming their studies or work after sick leave should ideally be examined to make sure that they are well enough to resume their normal daily activities, and also that they do not constitute any dangers to their health and those of others. Assessment of those students seeking transfers to other departments or faculties on medical grounds must be done in order to help the counseling duties of the administration and health personnel.

Health Maintenance (routine health screening)

There should be yearly medical examinations for all students and staff and also periodic examinations of those students and workers, exposed to known controlled hazards, for example, ionizing radiation and toxic chemicals in laboratories and teaching hospitals. Those with known conditions, especially those that are progressive, for example, diabetes and hypertension should be routinely monitored. Request medical examinations may be applied for either by the students, staff or administrators for physical, psychological or psychiatric reasons. This type of examination is of particular interest to the various Faculty Boards and Senate of a university before, during and after the promotional and final university examinations.

We should aim at immunizing the whole university population especially those at risk, for example, medical, agricultural and veterinary students and staff with tetanus toxoid and offer BCG to the mantoux negative adult members. BCG at birth plus triple and poliomyelitis vaccines should also be offered to the children at the appropriate ages.

The "eat as you pay" systems operating in the Nigerian universities may cause sub-nutrition and anemia in students. Their studies may, therefore, suffer if, the university health services are not mindful of this. Hemoglobin estimations for all students reporting at the sick bays is advocated.

Environmental Control

Identification of hazards and harmful environment must

be thorough as there is still filth and dirt strewn all over the place even in the university campuses. The environment must be monitored for such hazards as ionizing radiations, chemicals, excessive noise, flies, mosquitoes and cockroaches. In planning for new departments, facilities and processes, anticipation of potential hazards is very essential. Therefore, the health services must be involved at the early stages of such planning processes.

Sanitary problems of both the hostels, houses and the general environment must be constantly supervised. Fly and mosquito proof doors and windows must be standard features of these buildings, including the kitchens and dining halls. Preparation and handling of food and diet must be regularly monitored. Special examinations of food handlers should be regularly done.

The available water should be monitored regularly for bacterial counts and other pollutants. Sewage disposal systems and septic tanks should not be allowed to be blocked by instituting regular checks. Pest control methods for insects and animals should be carried out.

Medico-Social Problems

These include absence from work and lectures, retirement from work and the resulting financial and stress problems, motivation of students and staff towards studies and work, the ageing worker and the increasing stressful situations both at work and studies including examinations. These problems must be looked into so as to minimize them by adequately adopted judicious methods of tactful handling and counseling.

Counseling

This is perhaps an area that has been grossly neglected by the university authorities and its health services. Counseling should be done for personal and social problems, through the Hall Wardens and Hall Advisers. Environmental, administrative, health and choice of career advice should be routinely offered to both staff and students.

Medical Records

The confidentiality of medical records must follow the

usual patterns as outlined elsewhere, especially in a community where extended family systems exist and people tend to know and hear about one another more readily. Statistical records of injuries, treatment schedules and results of routine medical examinations must be regularly recorded for meaningful inter-pretation of the health of the university communities.

Education and Training

The medical staff, first aiders, catering personnel safety advisers, fire and rescue disaster teams must be adequately* trained for their roles in the university health status. Formal and informal methods should be used for maximum results. Formal methods include organized lectures, seminars and conferences, while informal methods include health posters placed at strategic points in the campuses.

Curative Medicine

The pattern of curative services is universal and needs no special mention. However, it is advocated that first aid units must be established in all the departments and that suitably selected trained personnel must man these units. This idea will save the time used for attendances at the sick bays for minor ailments and accidents. Weekly scrutiny and transference of such first aid records to the central university health service data system may be instituted.

Adequate ambulance facilities for referrals to the teaching hospitals about 10-20 km. must be available for 24 hours a day. The problem of trying to locate the nurse, ambulance driver and the doctor on duty should be solved by building call duty accommodation for these personnel on or adjacent to the health services premises.

Evaluation of disabilities from any source claims assessments of any type, liaison with other health institutions in the locality plus communicable diseases control in such Nigerian environment must be strengthened.

Research and Teaching

These must be undertaken as the university health services are parts of the university complexes where service,

research and teaching are complementary. Research must be conducted into administrative, wastage areas in the services offered, sickness absence for both staff and students and the health status of the university community. Teaching could be conducted on outpatient basis for both medical and veterinary students.

Conclusion

An older university community forms a distinct Nigerian population of near 20,000; this is the size of an average sized urban town. The nature of its composition makes it imperative that the health status of such a population must be the concern of its authority. The University population has higher socio-economic status than the general population. Their adequate health care systems will ensure fairly better health status of the community.

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A STUDY ON MULTIPURPOSE HEALTH WORKERS SCHEME IN FIVE FIELD PRACTICE DEMONSTRATION AREAS OF MAHARASHTRA**

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ABSTRACT

This paper describes the implementation of Multipurpose Workers Scheme in five Field Practice Demonstration Areas FPD Asl of Maharashtra State, the nature of multipurpose house visiting achieved by the field staff and the impact they have had on the performance of individual programmes integrated in the MPW scheme.

Despite shortcomings in actual training status, worker population ratios achieved, and availability of drugs and supplies, the study reveals an increase in performance of almost all health programmes, following implementation of scheme.

. Maharashtra had completed Central Training Institute and Health and Family Welfare Training Centre level training programmes under Multipurpose Workers Scheme (MPW) in its five phase I districts of Kolhapur, Ratnagiri, Amraoti, Akola and Wardha by 1974. Thereafter, however, Maharashtra, State health authorities decided to defer further implementation of the MPW Scheme till its performance could be evaluated in the five Field Practice Demonstration Areas (FPDAs) attached to CTI Nagpur and four HFWTCs at Nagpur, Pune, Nasik and Aurangabad, where the scheme was to be fully

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***This is the first of a series of papers reporting findings from "Study on Multipurpose Health Workers Strategy" - A WHO/UNICEF/NIHFW Collaborative Research - under Dr. Sharad Kumar, Director, NIHFW, as Principal Investigator. This project was set up in 1975 to monitor implementation of scheme in U.P., Maharashtra and Andhra Pradesh.*

implemented on a pilot project basis.

The research team of the National Institute of Health and Family Welfare played an external evaluator role and studied the performance of multipurpose workers between October-December, 1976 i.e. nine months to one year after MPW scheme had been fully implemented in these five FPDAs. This paper is based on this evaluator study.

Aims

The broad aim of the study was to assess the impact of multipurpose workers training on actual performance of the field staff in the five FPDAs.

Specific Objectives

The study was conducted with the following objectives:

1. To study the extent and nature of implementation of MPW Scheme in the five FPDAs with particular reference to:
 - i. training status of field staff;
 - ii. Redistribution of area and population;
 - iii. Work pattern and schedule of field staff as multipurpose workers; and
 - iv. Availability of modified records and returns, kits, drugs and supplies.
2. To observe the emphasis being laid on different health programmes by the multipurpose field workers, and the nature of activities being performed in each programme; and
3. To compare programme performance of multipurpose *visa-vis* Unipurpose field staff.

Methodology

The following methodology was employed:

1. Interviews* were conducted of faculty of HFWTCs covering the FPDAs, MO (PHCs) , and field staff to obtain data for objective 1 above. The total number of persons interviewed was 45 i.e. five' principals of training institutions, seven MPHSs** (Male), three MPHSs (Female), 20 MPWs (Male) , and ten MPWs (Female)
2. Observation study on structured schedules for three continuous working days was done to collect data for objective No. 2 above. This was done on the same field staff which was earlier interviewed. Forty workers belonging to different unipurpose categories were observed for 120 working days or 600 working hours.
3. Record study was made of monthly reports of the five FPDAs, six months preceding and following the date of full implementation of MPW Scheme in order to obtain data for objective No. 3 above. The staff strength in all FPDAs remained the same during these two periods under comparison.

Study Findings

Extent and nature of implementation: At the time of study, out of the ten MOs (PHCs) in position in the five FPDAs, only two had been trained. Out of the 31 Filed Supervisors and 112 Field Workers in position, only 21 (67.7%) and 94 (83.9%) had been trained, respectively. The unipurpose categories that were available in the FPDAs had been converted to the two-tier categories of Health Supervisors (Male and Female) and Health Workers (Male and Female) as envisaged in the MPW Scheme. In the absence of trained MOs in the FPDAs, the faculty of CTI and HFWTCs supervised the collection of baseline data on each of their FPDAs on items like population, number of households, and distance between the villages etc. , in order to reorganize

**Ten Medical Interns were recruited for each of the 5 FPDAs and given brief orientation training to equip them with skills to do the interviews and observation study.*

***MPHS - Multipurpose Health Supervisor,*

the sectors (area covered by a supervisor) and sections (area covered by a worker) on the pattern of the Multipurpose Scheme. The position that emerged is indicated in Table 1.

It will be noted that the envisaged ratio of one male worker to 6-7000 population was achieved in only two FPDAs Phulambri and Wagholi. In the remaining three, the population being served by one male worker was significantly higher and in one of them Trimbak, the male worker was actually faced with almost 10,000 population (what was served by unipurpose Malaria Worker prior to the scheme),

Regarding female worker, it will be noted that the prescribed ratio of 1:8000 was achieved only in FPDA Wagholi, The ratio of 1:10,000 prescribed, under Minimum Heeds Programme was achieved in FPDAs - Phulambri and Borkhedi, However, the population per female worker in FPDA - Kalmeshwar was as high as 22,000,

It will be further noted that in 2 FPDAs, male supervisors were incharge of as many as 6 workers, as against the prescribed ratio of 4 workers to one supervisor. The situation was worse on female side with one supervisor having as many as 12 workers to supervise in one FPDA,

The State Government had developed a modified version of records to be used by multipurpose field staff. These had been supplied to the CTIs and HFWTCs for use in the FPDAs. Such records were available only at two FPDAs - Phulambri and Trimbak, In the remaining three FPDAs, they had not reached the workers at the time of study.

The male field workers were expected under MPW Scheme to make monthly visit to each house under their charge. In four FPDAs, they were doing so village-wise i.e. they completed the month's work in a particular village before shifting to another in their area. However, it was in FPDA – Phulambri, that the male workers were observed to visit different villages of their area on each succeeding day. This led to each village being visited at shorter intervals than in the Case of other four FPDAs.

The female workers were observed to do home visiting according to a planning and appointment schedule. Their home visits in a village were, therefore, not according to

TABLE 1

DISTRIBUTION OF AREA AND POPULATION ACCORDING TO MPW SCHEME IN 5 FPDAs OF MAHARASHTRA

Name of FPDAs	Population of PHCs (as available at PHC records)	Ratio of male workers to population	Ratio of female workers to population	Ratio of female workers to intensive population	Ratio of male workers to one supervisor	Ratio of female workers to one supervisor
Kalmeshwar	88,000	1:5300-8800	1:22000	1:2000-4500	4:1	2:1
Borkhedi	76,000	1:6100-8000	1:10857	N.A.	3:1	7:1
Wagholi	93,882	1:5000-7000	1:7824	1:2000-4200	6:1	6:1
Phulambri	88,676	1:4000-6000	1:9852	1:2500-3500	4:1	4:1
Trimbak	1,55,000	1:6100-9500	1:12917	1:3200-4400	6:1	12:1

sequential order of house numbers, but according to the needs of their registered cases. However, they were also observed to make five to ten other visits on each home visiting day and thus, they visited every house in their intensive area once in three months.

The working hours for home visiting were from 7.30 a.m. to 12.30 p.m.

The bags gifted by UNICEF as a trial kit for basic health workers in NMEP had been issued to the workers at three FPDAs - Phulambri, Wagholi and Trimbak. Such bags could not be supplied to the other FPDAs due to their limited availability. There the workers were observed to use old NMEP bags. None of the female workers except at FPDA-Phulambri had been supplied with kit bags, and they, therefore, used the old midwifery kit containers.

Effectiveness of multi-purpose home visiting: The average number of houses visited per day by multipurpose workers of different erstwhile unipurpose categories is shown in Table 2.

The prescribed number of 50-60 houses to be visited per day by male workers and 25—30 houses per day by female workers had been achieved in only three out of a total five PHCs.

On an average, around 25 per cent houses were found locked by the male workers - range being 11 to 39 per cent and 10 per cent by the female workers - range being 1 to 18 per cent.

The home visiting schedule was, therefore, resulting in a fairly high level of wasted effort for the male workers. The home visiting pattern of female workers undertaken for very specific purposes and perhaps with prior intimation to the family faced this problem much less.

The most fruitful period of home visit for both male and female workers was observed to be from 7.30 a.m. to 9.30 a.m. An increasing number of houses were found locked after this. Selective home visiting by male workers and altering its time to suit the community, would, therefore, make this field activity more effective.

TABLE 2

AVERAGE NUMBER OF HOUSES VISITED PER DAY BY THE WORKERS AND AVERAGE NUMBER OF HOUSES FOUND LOCKED OUT OF TOTAL VISITS

Name of FPDAs	MALE				FEMALE	
	Vaccinators		Malaria Surveillance Workers		ANMs	
	Average No. of houses visited per day	Average No. of locked houses	Average No. of houses visited per day	Average No. of locked houses	Average No. of houses visited per day	Average No. of locked houses
Kalmeshwar	35.7	3.8 (10.6)	25.5	33.2 (12.5)	28.8	2.5 (8.7)
Borkhedi	38.5	5.3 (13.8)	23.5	3.0 (12.8)	25.3	3.2 (12.6)
Wagholi	42.5	10.7 (25.2)	60.0	16.5 (27.5)	27.3	5.0 (18.3)
Phulambri	55.8	14.7 (26.3)	50.0	19.3 (38.6)	16.3	0.2 (1.2)
Trimbak	58.5	18.2 (31.1)	62.5	15.2 (24.3)	22.2	1.3 (5.8)
Average	46.2	10.5 (22.8)	44.3	11.4 (25.8)	24.0	2.5 (9.6)

Figures in the brackets denote the percentage of locked houses.

The average time spent and number of programmes attended by different unipurpose categories on a multipurpose home visit is shown in Table 3.

There was not much difference in overall averages of time per visit between different categories. The average time spent per visit ranged from 2.65 minutes to 12.38 minutes. The difference in time per home visit was due to various local factors and number of programmes attended in each house.

The duration of a home visit also depended upon the increased time needed for actual delivery of physical services in some, as compared to visits which ended in enquiries only. This is shown in Table 4,

In two houses out of five, some physical services were delivered by the male workers, and in one house out of two by the female workers.

The average time spent on a house visit without physical service was 3.48 minutes for the male workers, and 5.87 minutes for the female workers. The average time per house visit with some physical service was 10.18 minutes for males and 12.31 minutes for female workers. The female workers, therefore, tended to spend more time per house visit than their male counterparts.

TABLE 3

AVERAGE TIME SPENT (IN MINUTES) PER ONE HOME VISIT BY THE MULTIPURPOSE-WORKERS AND THE AVERAGE NUMBER OF PROGRAMMES ATTENDED (IN BRACKETS)

Name of the FPDAs	<u>Erstwhile Categories</u>		
	Vaccinators	M SWs	ANMs
Kamleshwar	6.64(4.78)	10.04(5.30)	9.43(7.74)
Borkhedi	6.75(8.88)	12.38(8.96)	9.67(7.71)
Wagholi	3.97(3.51)	2.65(4.57)	5.94(4.25)
Phulambri	6.13(5.22)	7.21(6.75)	12.27(8.70)
Trimbak	5.78(5.89)	4.08(4.56)	7.92(4.58)
Average	5.85(5.66)	7.27(6.03)	9.04(6.60)

The number of home visits in which some physical services was given, and the average number of persons served per visit are shown in Table 5.

On an average, the female workers were tending to give physical services in a higher proportion of their home visits

TABLE 4
DISTRIBUTION OF HOME VISITS WITH AND WITHOUT PHYSICAL SERVICES ACCORDING TO DURATION

Time taken (in minutes)	Home visits with simple enquiries		Home visits with enquiries and physical services	
	Male	Female	Male	Female
1-3	812	110	115	19
4-6	317	119	212	71
7-9	54	27	129	43
10-12	46	36	138	58
13-15	12	12	72	53
More than 15	16	15	133	82
Total No. of homes visited	1257	319	799	326
Average time taken in each home (in min.)	3.48	5.87	10.18	12.31

TABLE 5
AVERAGE NUMBER OF PERSONS SERVED BY MP WORKERS* DURING HOME VISITS**

Name of the FPDAs 100 houses	Total No. of houses visited		No. of persons served		Average number of persons served per	
	M	F	M	F	M	F
Kamleshwar	325		158		57	54
Borkhedi	322		131		89	80
Wagholi	452		134		120	64
Phulambari	431		97		131	79
Trimbak	526		125		140	88
Average	411		129		107	74

*Male Workers = 4; Female Workers = 2 in each FPDA

**Period of observation per worker = 3 days

***The figures are of homes which were not found locked

than male workers. On the whole, some kind of physical services were rendered to the inmates in 40 to 50 per cent of houses visited. Also more than one person was served per home visit only by female workers in two FPDAs – Phulambri and Trimbak. In all other FPDAs, the average number of persons served per home visit was less than one.

Programme activities: The number and nature of health programme activities performed by field staff as multipurpose workers are given below:

The programmes undertaken for implementation were: (a) smallpox eradication, (b) malaria eradication, (c) medical care/minor ailments, (d) MCH, (e) family planning, (f) nutrition, (g) immunization, (h) environmental sanitation, (i) notifiable diseases, (j) vital statistics, and (k) health education.

The male workers were responsible for delivery of all the programmes, except MCH. The female workers were not normally expected to undertake any physical services in malaria programme and environmental sanitation.

The relative emphasis being placed upon -different health programmes by the field staff as multipurpose workers is shown in Table 6.

TABLE 6
ATTENTION GIVEN TO DIFFERENT HEALTH PROGRAMMES BY THE MULTIPURPOSE WORKERS DURING HOME VISITS

Programmes Attended	MPWs(Male)		MPWs(Female)	
	No. of houses in which attended	Percentage	No. of houses in which attended	Percentage
Malaria E.P.	1982	96.4	564	87.4
Smallpox E.P.	1669	81.2	407	63.1
Medical Care	1457	70.9	540	83.7
Immunisation	1230	59.8	465	72.1
Family Planning	851	41.4	269	41.7
Nutrition	610	29.7	410	63.3
Env. Sanitation	808	39.3	295	45.7
M.C.H.	411	20.0	332	51.5
Vital Statistics	685	33.3	256	39.7
Notifiable Diseases	686	33.3	238	36.9
Health Education	1215	59.1	438	67.9
Total No. of houses Visited	N=2056		N=645	

Malaria, smallpox and medical care programmes received the highest attention of both male and female workers during their home visits. Immunization and health education programmes came next, although both of them received higher emphasis from the female workers as compared with their male counterparts. Nutrition and MCH programmes were two programmes which received much greater emphasis by the female workers (63.3 and 51.5%). These were followed by family planning to which both male and female workers paid the same amount of emphasis (41.7%). Environmental sanitation, vital statistics and notifiable diseases were three programmes which appeared to have received the least emphasis from both male and female workers although even for these, the emphasis being given by female workers was consistently higher.

The nature of home visit activities in malaria programme is shown in Table 7.

The number of slides taken (317) was around 89 per cent of the number of fever cases detected (356). Also presumptive treatment was given to 288 (90%) of the cases in whom slides were taken (317). There was, therefore, a discrepancy of around 10 per cent at each of the two major steps that had to be taken by multipurpose workers, following the detection of fever cases.

The nature of home visit activities in smallpox programme is shown in Table 8.

TABLE 7

DISTRIBUTION OF ACTIVITIES OBSERVED TO BE PERFORMED IN MALARIA PROGRAMME BY MP WORKERS DURING HOME VISITS

Nature of activities performed	Number of activities	Percentage
Enquiry made	2543	72.6
Fever cases examined	356	10.2
Slides taken	317	9.0
Treatment given	288	8.2
Total number of observed activities	3504	100.0

Primary and revaccinations constituted 22.7 per cent of the total activities with revaccination being done around two and half times more than primary vaccinations. Physical examination to verify take of primary vaccination done on previous home visits constituted 3.8 per cent of the total activities.

The nature of home visit activities in medical care is shown in Table 9.

Of the total of 2,970 activities connected with medical care observed to be performed, 575 (19.4%) consisted of minor ailments attended. Thus, 1 worker attended to an average of six cases per day*. There were 460 referrals to the PHCs, comprising 15.4 per cent of the total medical care activities - an average of around five referrals per multipurpose worker per day.

The nature of home visit activities in immunization is shown in Table 10.

The actual giving of immunization constituted only 192 (7.8%) of the total activities, implying over 2 DPT immunizations per multipurpose worker per day.

The nature of home visit activities in family planning is shown in Table 11.

TABLE 8

DISTRIBUTION OF ACTIVITIES OBSERVED TO BE PERFORMED IN SMALLPOX PROGRAMME BY MP WORKERS DURING HOME VISITS

Nature of activities	Number of activities Performed	Percentage
Enquiry made	2034	73.5
Primary vaccination done	175	6.3
Revaccination done	453	16.4
Inspection done	105	3.8
Total number of observed activities	2767	100.0

* Since 30 workers were observed for 3 working days $575/90$ = average number of medical care cases handled per worker per day.

TABLE 9

DISTRIBUTION OF ACTIVITIES OBSERVED TO BE PERFORMED
IN MEDICAL CARE PROGRAMME BY MP WORKERS DURING HOME VISITS

Nature of activities	No. of activities Performed	Percentage
Enquiry made	1935	65.2
Minor ailment attended	575	19.4
Cases referred	460	15.4
Total number of observed Activities	2970	100.0

TABLE 10

DISTRIBUTION OF ACTIVITIES OBSERVED TO BE PERFORMED IN IMMUNISATION
PROGRAMME BY MP WORKERS DURING HOME VISITS

Nature of activities	Number of activities Performed	Percentage
Enquiry made	1637	66.7
Advice given	627	25.5
Triple-antegin given	192	7.8
Total No. of observed activities	2456	100.0

TABLE 11

DISTRIBUTION OF ACTIVITIES OBSERVED TO BE PERFORMED IN FAMILY PLANNING
PROGRAMME BY MP WORKERS DURING HOME VISITS

Nature of activities	Number of activities Performed	Percentage
E.C. advised	893	65.7
Nirodh given	174	12.8
Follow up service	293	21.5
Total No. of observed activities	1360	100.0

On an average, one multipurpose worker per home visiting day was attempting to motivate ten eligible couples, was giving follow up service to around three family planning acceptors, and distributing Nirodh to around two persons.

The nature of home visit activities in nutrition is shown in Table 12.

On an average, one multipurpose worker per working day was distributing vitamin A/AD tablets to six times the number of cases as compared with iron/folic acid tablets.

The nature of home visit activities in environmental sanitation is shown in Table 13.

TABLE 12
DISTRIBUTION OF ACTIVITIES OBSERVED TO BE PERFORMED IN NUTRITION PROGRAMME
BY MP WORKERS DURING HOME VISITS

Nature of activities	Number of activities performed	Percentage
Vlt. A Solu./A.D. tablets	556	38.0
Iron tablets/folic acid	98	6.7
Education given	808	55.3
Total No. of observed activities	1462	100.0

TABLE 13
DISTRIBUTION OF ACTIVITIES OBSERVED TO BE PERFORMED IN ENVIRONMENTAL
SANITATION PROGRAMME BY MP WORKERS DURING HOME VISITS

Nature of activities	<u>Number of activities performed</u>			
	<u>Male</u>	<u>Percent</u>	<u>Female</u>	<u>Percent</u>
Advice given	802	99.4	286	100
Wells disinfected	5*	0.6	-	-
Total number of observed activities	807	100.0	286	100

*For male workers only

Actual disinfection of wells constituted a very negligible proportion of total activities in the sanitation programme, which were wholly in the form of advice.

The nature of home visit activities in MCH programme is shown in Table 14.

Male workers were registering and referring ante-natal cases and also giving ante-natal, TT injections to some extent.. However, they were not observed to register infants. Specific maternal activities were also more than double than those of child health activities performed by the female staff. Registration of infants was the least performed activity.

The nature of home visit activities in vital statistics programme is shown in Table 15.

Simple enquiries constituted the major proportion of the activities connected with vital statistics. The recording of births was three times that of deaths.

The nature of home visit activities in notifiable diseases is shown in Table 16.

Of the 25 cases detected, only 9 (35%) were notified. In actual field practice, there were only 2 diseases to be notified viz. cholera and smallpox.

Finally of the total 23,761 activities observed to be performed in respect of 11 programmes, health education activities in the form of person to person or group talk constituted 1,637 (6.8%).

Programme performance by record study: The impact of multipurpose functioning by the field staff by the output in different health programmes is shown in Table 17.

All the health programmes, except NMEP and NSEP, showed an increase in the six months period of multipurpose functioning in respect of output, as compared with the preceding six months of unipurpose functioning. The increase in performance ranged from 4 to 313 per cent.

The most notable improvements were recorded in immunization programme, family planning and MCH programmes. The slight decline observed in NMEP could be attributed to seasonal fluctuations in the incidence of malaria during the study period. Decline in smallpox was obviously due to its eradication.

TABLE 14
DISTRIBUTION OF ACTIVITIES OBSERVED TO BE PERFORMED IN MCH PROGRAMME BY
MULTIPURPOSE WORKERS DURING HOME VISITS

Nature of activities	Number of activities performed			
	M(N=20)	Per cent	F(N=10)	Per cent
Enquiry made	399	84.9	298	54.0
New mothers registered	15	3.2	35	6.3
Mothers referred*	37	7.9		
T.T. Given	19	4.0	42	7.6
Mothers examined**	-		63	11.4
Postnatal visit**	-	-	32	5.8
Infant registered**	-	-	9	1.7
Infant attended**	-		73	13.2
Total number of observed activities	470	100.0	552	100.0

*Applicable to male workers only. **Activities 5 to 8 were exclusively meant for female workers.

TABLE 15
DISTRIBUTION OF ACTIVITIES OBSERVED TO BE PERFORMED IN VITAL STATISTICS
PROGRAMME BY MP WORKERS DURING HOME VISITS

Nature of activities	Number of activities Performed	Percentage
Enquiry made	935	91.3
Births recorded	66	6.4
Deaths recorded	23	2.3
Total number of observed activities	1024	100.0

TABLE 16
DISTRIBUTION OF ACTIVITIES OBSERVED TO BE PERFORMED IN NOTIFIABLE DISEASES
PROGRAMME BY MP WORKERS DURING HOME VISITS

Nature of activities	Number of activities performed	Percentage
Enquiry made	928	96.5
Cases detected	25	2.6
Notified	9	0.9
Total number of observed activities	962	100.0

TABLE 17

OUTPUT IN DIFFERENT PROGRAMMES SIX MONTHS BEFORE AND AFTER THE IMPLEMENTATION OF THE MPW SCHEME IN FIVE FPDAs OF MAHARASHTRA*

Programmes	Six months before	Six months after	% increase or decrease
Malaria E.P.			
No. of slides collected	5552	4853	-12.6
Smallpox E.P.			
P.V. done	10992	9467	-13.9
R.V. done	26739	24334	- 9.0
Immunization			
Triple antigen	1075	4439	+312.9
Family Planning Programme			
Eligible couples contacted	15419	16064	+4.2
Nirodh given (dozen)	6306	15526	+146.2
Sterilization done	3009	5666	+88.3
Nutrition			
Vitamin "A" solution	4013	7158	+78.4
Environmental Sanitation			
Wells disinfected	897	985	+9.8
M.C.H.			
Mothers registered	767	1450	+89.0
Mothers examined	1111	1470	+32.3
T.T. given	1389	1989	+43.2
Vital Statistics			
Birth recorded	2198	3182	+44.8
Deaths recorded	737	983	+33.4
Notifiable diseases			
Cases detected	28	60	+114.3

*The number of the field workers in position remained the same during these two periods under comparison.

Multipurpose functioning of the field staff, therefore, had no adverse effect on the performance of health programmes. In respect of the majority of the health programmes it showed an improvement. This was despite the fact that medical care had been added to the job description of field staff under multipurpose scheme.

Discussion

The study showed that although the Principals of the training institutions did not enjoy administrative control over the FPDAs, they were nevertheless able to organize the delivery of health care on the pattern of multipurpose workers scheme. The actual worker-population ratios achieved were much higher than those prescribed by the Government of India, and in three FPDAs it reached the level of 10,00.0 per male worker. It was 1:22,000 per female worker in one FDA.

The average productivity of male workers was found to be on a home visiting day, 35 houses actually visited with five-six different programmes attended and not more than one person served in each house visit.

The prescribed beat schedule of 50-60 houses per day was completed in one village, before going on to another, by male workers in four FPDAs. This resulted in one village being visited by them after an interval of around one month. However, in Phulambri, the male workers daily changed their village for house visiting purpose, resulting in each village being visited by them at least once or twice a week, thereby making their services more accessible to the community.

The female workers were not following a beat schedule. Their house visiting of 15 to 20 houses per day, was according to the "planning and appointment schedule" which was a selective one based upon the needs and requirements of individually registered cases. As a result, they visited fewer houses but to a better purpose.

The average time spent on a house visit by male workers was around 6-7 mts. and that of female workers was around 9 mts. However, this masked the fact that the majority of visits ended in simple enquiries, and were of much shorter duration of around 3 mts. It was only the visits in which

some physical services were rendered which had average duration of around 10 rats. This applied to both male and female workers, although such visits were higher in the case of females (.50%) as compared with males (38%).

The rendering of actual services, constituted a small proportion of the total observed activities, being lowest in sanitation (0.6%) and highest in MCH programme activities of female field staff (46%). The nutrition programme also showed a high proportion of service activities by way of distribution (45%) of nutritional supplements by both male and female workers.

In the absence of baseline information on actual health care needs of the population, it was difficult to judge whether the amount of services rendered in different programmes by the multipurpose staff fully catered to the needs of the household members at the time of the visit.

In the malaria programme, the discrepancy of around 10 per cent being observed between the number of fever cases detected and the number of slides taken, and between these and the number of cases to. Whom presumptive treatment was given, obviously called for closer supervision to see the extent to which this was due to remedial factors, such as short supply of chloroquin.

"The high rate of referrals of medical care cases, around 5 of the average 6 encountered during one home visit day, merits study of causes. If it was due to the short supply of drugs to the workers rather than the severity of the ailment, it could lead to community dissatisfaction.

Motivational activities in family planning were observed to be quite high and were being rendered to around ten eligible couples per working day.

The preponderance of maternal health in the total MCH activities was difficult to understand since the infants and toddlers in a community at any given time for outnumber the expectant or post-natal mothers. Child health services being purely promotive and preventive were unlikely to be high felt-needs of the rural communities. Particular emphasis on this had to be deliberately paid by the multipurpose workers in order to improve child rearing practices and health status

of rural infant and preschool children. The only child health activity being performed to any extent in the field was that of DPT immunization. Total registration of infant and preschool children, periodic assessment of their growth and development, and detection of malnutrition and other defects appeared to be almost completely neglected. In this connection, it might be suggested that the existing job description of the male workers could be reconsidered to include their helping in the registration of 0-4 years age group in the local sub centre, in the same manner, as they were helping in the registration of ante-natal mothers. The possibility of male workers being trained to detect malnutrition in infants and toddlers could also be explored.

Sanitation activities were almost purely advisory, and no demonstration activity was observed.

Of the twenty five cases of notifiable diseases, the workers did not take any on-the-spot control measures and notified only nine. Also, there was little health education activity in general. All these programmes, therefore, needed greater emphasis by the workers.

Output in all health programmes showed considerable increase, as a result of multipurpose functioning of the field staff. Slight declines were observed only in malaria and smallpox programmes. However, former could be due to seasonal fluctuations. Also, eradication of smallpox obviously had its own effect on reduction of output in this programme.

Suggestions

The redistribution of area and population revealed higher worker-population ratios than originally envisaged. Urgent steps should be taken to convert existing ANM and SI courses to those of MPHWs so that their graduates may be available for recruitment.

A fairly high percentage of the population went uncovered due to locked houses despite a beat schedule of the male workers. It is suggested that each one of the 20 working days set apart for home visiting be divided into two halves. The first half comprising the early morning hours, when locked houses are fewer, could be devoted to the beat

schedule. The second half could be devoted to the running of a clinic in an appointed place in the village, which would be made known to the villagers and which would obviously be used by those families having fever cases, or any other medical care needs.

This would ensure (a) ability of the supervisors to locate the worker, and (b) ability of any member of the rural community to locate him according to their needs.

This suggestion may be implemented on an experimental basis, to study its comparative impact with a control area, on:

- i. Performance of health programmes;
- ii. Community satisfaction; and
- iii. Workers satisfaction.

It is suggested that (a) male multipurpose workers be entrusted with the job of assisting in the registration of infants and toddlers; (b) multipurpose training be strengthened especially with regard to monitoring of physical growth and development, and detection and management of different stages of malnutrition in age group 0-5 years.

STUDY OF AN INNOVATOR AND CHANGE AGENT OF CONTRACEPTION

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ABSTRACT

A case study in a modernized village was conducted to study the innovation and change agent of contraception. The village is 18 kms. Away from the nearest Primary Health Centre and 5 kms, away from the Sub-centre The people of the village are Hindus and among them mostly belong to the Naidu Caste, and involved in agricultural work. Mrs. Logambal, a Naidu farmer and a moderately progressive woman, who emerged as a powerful satisfied innovator and a change agent was chosen for this study. Due to her own initiative and partly through planned interactions she was highly useful in removing the fear and anxiety of eligible women to adopt sterilization.

The implications of this study are that villages which are far away from either the Primary Health Centre or Sub-centre may be provided a few satisfied adopters who have reputation, status and enthusiasm to help the health staff in creating social support and to function effectively as a link between the people and the workers. Efforts should be made to identify various factors involved in the process of adoption and to manipulate them effectively to change the behavior of the clients.

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Mrs. Logambal is a moderately progressive woman with an extrovert nature and a pleasing appearance. Being fairly clean and courageous, besides dominating in conversation, she wins the heart of most of her neighbours. Though, she has no attributes contributory to her leadership, her virtues and afore-mentioned qualities make her a referent to others in the village. She has studied only up to class four and her husband completed class six. Her innovative nature made her spell out the name of her husband without any reservation to whomsoever she talked. In this part of the country, generally most of the women do not utter the name of their husbands. Women believe that it is a sign of disrespect towards their husbands if, they mention the name of their husbands to another person. Mrs. Logambal is the second wife of her husband who married her after the death of his first wife. At the time of marriage she was only 14 years old and her husband's age was 29.

Her village is connected by motorable roads and has electricity and postal facilities. It is 18 kilometers away from the nearest Primary Health Centre and 5 kilometers away from the sub-centre. There is no other medical facility available in nearby places. In this village all the people are Hindus and among them mostly belong to the Naidu caste and the rest are the Vellala Pillai, Urali, Asari, Vannan (Washerman) and Servai castes. They have a small common temple located at the central place in the village. These diverse castes profess different avocations. The predominant Naidu populations do agricultural work as owners or tenant cultivators or as agricultural laborers. Mrs. Logambal is one of the Naidu farmers owning a few acres of land. Besides doing agriculture, she raises a few fowls, sheep and a pair of buffaloes to meet her family's minimum economic needs. Her house is a tiled structure situated in a small plot of land in the heart of the village.

Communication and Awareness

She received information on different methods of contraception through a number of sources. She had knowledge about much temporary and permanent contraception and heard about condom through an adopter-relative. She learnt about pill, loop and female sterilization from a Maternity Assistant. She had a favorable attitude to condom and female

sterilization, negative attitude to pill and a conditional one for the IUD. Pills, she felt, would not be practicable for rural women as will be difficult for them to remember it to use it daily. An IUD would be suitable for certain women's body condition for spacing births and hence not suitable in her view. She had no reservation about female sterilization. About vasectomy she believed that it makes men weak thereby they are unable to do hard manual work in the field. Her other sources of information included mass media, namely, the radio and the newspaper. She felt that these sources provide only certain general information such as what are the advantages of a small family, how big families deteriorate health and happiness leading to poverty and misery.

She discussed with her husband on a number of occasions about the desirability of adopting sterilization. In spite of his persistent resistance, she continued to persuade him unabatedly. Her husband believed that sterilization would affect his health which may lead to many complications resulting in even death. He had in mind a local case of a man who died shortly after sterilization during the early stage of the programme. In addition he had already lost his first wife and feared that he would lose his second wife if, she adopted sterilization. All other available methods were equally not acceptable to him though not for his wife. However, she felt that if, condom or IUD were available during her early part of married life she would have definitely used one of them and prevented at least a few of her unwanted conceptions.

Course of Events

Though she conceived nine times and delivered eight issues - four male and four female - now she had only two daughters and two sons, as the rest died during their infancy and early childhood. The last pregnancy was terminated in the third month after conception. The eldest of her children, a daughter was married at the age of 20 and is living now with her husband in another village. The second daughter and two sons are studying in the school. After four children survived, she and her husband felt that they got enough children and wanted to avoid any future conception but they differed on the means to achieve their goal. The husband was against vasectomy and wanted to adopt any other suitable method which is free from complications and risk.

When she conceived for the ninth time, she was very much worried and did not like to have any more child. She said that most of her conceptions, after her fourth child, were not planned but accidental. During the early part of her ninth pregnancy she paid a visit to her aunt in another village and discussed with her about the unhappiness of being pregnant again. Her aunt in turn advised her to terminate her conception and also to undergo sterilization along with it. She added that sterilization would provide relief to her stomach-pain and a permanent solution to all future unnecessary conceptions. In addition to her aunt, some of her other relatives said that many people adopted female sterilization in her village and all of them are fully satisfied with it.

After returning to her village she slowly made up her mind to terminate her three months old conception. When she conveyed her desire to her husband he angrily shouted at her and discouraged her again. Hence, she secretly prepared a jelly like mixture consisting of gingili, jiggery and millet and consumed it every morning in an empty stomach for four days. This mixture was a traditional and popular aborti-facient known to many women in rural areas. She used it without any success. After experiencing the failure of the indigenous aborti-facient she approached a homeopath, - an abortionist - in a neighboring village. For fear of opposition from her husband she secretly met the homeopath through the maternity assistant. He gave two undisclosed injections and charged rupees ten. As she returned home, bleeding started. She did not tell anything about it to her husband, even though she suffered for few days on account of the post abortion complications. The abortionist did not visit her even after reporting to him about her complications and instead he demanded another rupees ten to give the follow-up treatment. After receiving another installment of rupees ten he sent certain medicines, which of course gave relief to her.

Her ninth conception was turning point in her reproductive life. After the termination of her ninth conception she was quickly reaching towards a firm decision in favor of sterilization even against the opposition of her husband. Her favorable predisposition got reinforced on account of the frequent education by the maternity assistant and the health visitor. She had full confidence in the maternity assistant as she helped her to undergo the previous abortion,

and was sympathetic to her difficulties and provided timely drugs for many of her minor ailments. Maternity assistant on her part incessantly advised her even after abortion. Further, the respondent also feared that she would again conceive if, no preventive effort was made soon. Added to these, entire she wanted to avoid the embarrassment of being pregnant after her daughter became an adult person. Over and above, at least one of her close relatives, her maternal aunt, strongly advised her to accept sterilization. Forty five days after her induced abortion, once again the maternity assistant approached her and suggested to go in her company for sterilization in the Kasturba hospital. She agreed and promised to meet her next day early morning at her residence, irrespective of her husband's consent. During the same night, she arranged everything to go to the hospital and formally informed her husband about her plan but again he objected-. He said "Namma Kirakam Ippo Sari Illai" i.e., our star is not favorable to us now, and hence you don't go now.

Early morning, the next day, while her husband was asleep she left the house and met the maternity assistant at her residence with the aim of reaching the hospital before her husband could know about her whereabouts. By the time, she reached the Centre, her husband had got up and Immediately proceeded to the maternity centre along with his youngest son to prevent her from undergoing sterilization. The maternity assistant's husband encountered him first and he argued with him for some time and pacified him to some extent. As Mrs. Logambal was adamant in her decision, after a heated exchange between the spouses, her husband returned home leaving his son with the mother. The maternity assistant and the client with her son together proceeded to the Kasturba hospital, a voluntary hospital situated in the same district. At the hospital she was put under thorough medical examination and treated first for her stomach-ache and later on the doctor arranged for her sterilization. She was sterilized on 23-5-1976 without any complications. During the first few days of her hospitalization the maternity assistant gave company at the hospital and looked after her as well as her son.

Mrs. Logambal valued very much the help of the maternity assistant, and particularly her presence at the hospital. After the operation, when she was carried on a stretcher in a semi-conscious condition, her son cried shouting my mother

is dead, who will look after me". She felt that if, the maternity assistant was not there at that time she would have broken down and something would have happened to her. On the third day after sterilization, her husband visited her at the hospital. He was still angry with her. She turned his attention to a few women lying near her bed and said they all adopted sterilization". He spoke to a few of them and slowly his anger subsided and enquired about her necessities and well-being. While discharging her, the doctor advised her to regulate her food as her stomach—ache was due to peptic ulcer. On the advice of the doctor Mrs, Logambal bought a buffalo and regularly used milk and curd to normalize her ulcer and followed the treatment systematically.

Doctor Promotes Satisfaction to Adopter

After sterilization, for about a month no one in the village had any chance to know about the news of her sterilization. On hearing about her adoption from the maternity assistant, the local Primary Health- Centre doctor visited her to provide the follow-up service, though she was sterilized in a different hospital. She was very much pleased by the prompt service given by the lady doctor.

The doctor's visit to the house of Mrs. Logambal aroused curiosity in many women as to why the lady doctor visited her house alone and not theirs. Generally in the village if, any outsider visited one house the news would spread throughout the village even before the departure of the visitor. The lady doctor's visit to her house was a matter of pride and prestige besides gratifying to her and she told the neighbors the purpose of the doctor's visit and said that if, they undergo sterilization the doctor would visit them also. The visit of the doctor, gave a big publicity to her sterilization in the whole village. The doctor continued to visit her occasionally, sent medicines to her through the maternity assistant and enquired about her to most people whom she met from her village. She gratefully remarked: "That doctor (referring to the lady doctor) visited my house even during the night and gave me all medicines. She sends medicines through her assistants too and enquired about me through all persons who visited the Primary Health Centre from my village". Thus, the ideal doctor—client relationship in this case not only increased the post—adoption satisfaction of

Mrs. Logambal but also enhanced confidence in the programme among the rest of the non-adopters.

Innovator Emerges as a Change Agent

Mrs. Logambal emerged as a powerful satisfied innovator and a change-agent partly due to her own initiative and partly through planned interactions. On her part she helped the maternity assistant and the lady doctor to get more cases from her own village as a reciprocal gesture for the help she received from them. For first few years, after her adoption, she motivated five or six cases and got them sterilized but later on her interest in motivation slowly declined. Meanwhile a planned interaction through organized group meetings between satisfied adopters and non-adopters was introduced in this village as a part of an action research, which was conducted by all of us together.

During the four planned group meetings arranged later on in this village, she was actively involved in all the meetings knowing full well that she is a progressive innovator and possessed potentiality to further the cause of diffusion. She forcefully argued in all the meetings in favor of sterilization. She said "If I had not done sterilization - I would have died out of periodic stomach-ache". I am feeling better after sterilization. I have less problems and I am able to manage the family with our present resources. She added "If I have known well about family planning after my third or fourth delivery I would definitely have adopted it long ago. I am fully convinced that it is good for health and family and I request all of you to adopt it soon". Her plea in the meetings was heard by others with rapt attention and seriousness. This stimulated the other three adopters, who also participated in the group meetings talked similarly. While Mrs. Logambal spoke spontaneously in the group meetings, without any prior briefing, other adopters had to be briefed as to how they could impress upon their local non-adopters revealing their experiences during and after sterilization. Many voices of adopters particularly her own influenced many potential clients in favor of sterilization.

So far she discussed with 21 eligible women in her own village but not with anyone outside her village, except with two of her relatives who adopted sterilization later on in a

nearby village. Of all her discussants, a little over one third belonged to her own caste and an equal number belonged to other castes, whose caste status was more or less equal to her own in the caste hierarchy and the rest belonged to lower castes. Among her discussants, so far, 19 eligible women adopted sterilization. However, she did not claim that her advice alone was responsible for all of their adoption. But she admitted that a few earlier adopters particularly her relatives were largely influenced by her own effort: for others to her influence was a decisive factor though not the sole factor.

She talked on many occasions with each one of her discussants both voluntarily and on their initiative both in the agricultural field and in the village. It was a good opportunity for the villagers to discuss such matters while working in the field. These discussions were in addition to what transpired between them in the organized group meetings. She felt that such planned group meetings between the adopter and non-adopter should be arranged frequently and they are highly rewarding in many respects.

Her roles, she admitted, were many and useful mainly to remove the anxieties and fears of eligible women besides clarifying their doubts. Of course, she also imparted certain knowledge on sterilization and other factors related to it during the course of her discussion with others. For different women's adoption she played different roles. On one occasion she took the two cases to the hospital and helped them to undergo the sterilization. She facilitated meeting between willing cases and the maternity assistant for taking the former to the clinic for sterilization. Besides she gave information to a number of women about the clinic facilities available there and route to reach the Health Centre and so on. On the whole, she acted as a link between the Family Planning workers and the eligible couples in her village. Even today her interest in motivating couples to accept sterilization continued to be a force in this village. In the recent past she motivated two women for sterilization. But on the way to the hospital unfortunately the vehicle developed a problem and they had to be brought back to the village. This was considered as a bad omen for their sterilization and these two women postponed their adoption for an year waiting for an auspicious occasion. In the village such, belief in omen is common and it affected the behavior of

people mostly against adoption and also delayed adoption. Even while she was discussing with us, she pointed to another woman, who was present there and said "I told this lady to accept it and she is willing to do so, but her husband and mother-in-law are not allowing her to accept sterilization as she has now only one son and a daughter. Her in-laws want at least two sons". On the whole most of her discussants on enquiry admitted that the discussion they had with Mrs. Logambal was highly useful in removing their fear and anxiety as also helped in many other ways to adopt sterilization.

Outcome and Implications

As several villages are far away from either the Primary Health Centre or Sub-Centre, it is highly imperative to groom a few satisfied adopters who have reputation, status and enthusiasm to help the health staff in villages wherever necessary. They may be given all the necessary information on family planning and also a monthly honorarium or other support to keep up their enthusiasm to work for the programme. As the worker will be visiting villages only once in a month, a "Formal representative" of a worker from the local community will help very much in creating social support besides helping to provide effective delivery of services, dissemination of information, distribution of contraceptives, and drugs to needy people. Further, often workers are not intimately known to the community at large and hence an adopter could function effectively as a link between the people and the worker. At the Primary Health Centre also, the doctor should not only enquire about the patients, whom he meets daily, but it is desirable and rewarding to enquire through them about the well-being of other clients in their respective villages. It has a salutary effect for developing confidence in the programme among the people. For enlisting support from eligible women for sterilization it is found to be necessary for the worker to meet the villagers' health and personal needs first, like helping them to undergo abortion etc., before trying to motivate them to adopt contraception. As the factors involved in the process of adoption are many and varied and include favorable, unfavorable, personal and impersonal efforts should be made to identify all of them to manipulate effectively to change the behavior of the clients.

Acknowledgement

We thank the administration of the Gandhigram Institute for the facilities received for conducting this study.

A GENERALIZED PARITY DEPENDENT MODEL FOR COUPLE FERTILITY

S.N. Singh* and I.J. Singh**

ABSTRACT

A probability distribution for the number of conceptions to a female during a given time interval since marriage has been derived assuming fecund ability to be parity dependent. The distribution involves several parameters. A procedure for finding the estimate of some of the parameters has been outlined. The model has been applied to some observed distributions. The use of the model in the evaluation of family planning programme is also illustrated.

In recent years, a number of papers have been proposed to study the variation in the number of births to females through probability models which are based on varying sets of assumptions. The probability models propounded by Dandekar and Singh for describing the variation in the number of births to a female during a specified period of time are based on the assumption of one to one correspondence between a conception and a live birth^{1, 2, 3,4,5,6}. Sheps and Perrin, Singh and Bhattacharya Singh *et al.* have considered distributions which account for foetal losses^{7, 8, 9}, in these models, the parameters of reproduction have been assumed to be constant at least for the period under consideration. Empirically, it has been observed that among others fecund ability and sterility depend on factors such as age and parity of the female. Singh *et al.* have derived a probability model for the

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number of birth's to a couple during time interval $(0,T)$ on the assumptions that the conception rate is a function of parity and there is a one to one correspondence between a conception and a live birth.¹⁰ Obviously the model does not account for foetal losses, A model making allowance for different types of pregnancy outcomes may be more realistic to describe the phenomenon and may provide better estimate of fecund ability.

The purpose of this paper is to generalize the probability model given by Singh *et al*, considering two types of pregnancy outcomes. For the convenience of derivation of the model a conception is called complete if, it results in a live birth otherwise it is known as incomplete. The model and the application, estimation procedure for the conception rate and proportion of fecund couples are given hereunder.

Model

Let $X(T)$ denote the number of conceptions to a female during the time interval $(0,T)$ of length T since marriage, The probability distribution of $X(T)$ is based on the following assumptions:

1. The female has led a married life throughout the period of observations.
2. The probability that the first conception occurs during the time interval $(t,t+t)$ is $m_0 \Delta t + O(\Delta t)$, where m_0 - is the conception rate in the beginning, $m_0 > 0$, $t > 0$. The probability of more than one conception during the short time interval is $O(\Delta t)$,
3. Let p be the probability that a conception is complete i. e. the conception results in a live birth, so that $(1 - p)$ is the probability of an incomplete conception.
4. Every conception involves a period of temporary sterility called the rest period which includes the duration of pregnancy and the following post-partum amenorrhea. Let h_1 and h_2 ($h_1 < h_2$) be the rest periods associated with incomplete and complete conceptions respectively which are assumed to be constant as a first approximation.

5. Given $X(t) = r$, $r = 1, 2, \dots$, the conditional probability of a conception during the time interval $(t, t + \Delta t)$ is $m_r \Delta t + o(\Delta t)$ if r^{th} conception is incomplete and has occurred prior to $(t - h_1)$ or it is complete and has occurred prior to $(t - h_2)$; zero otherwise, where m_r is the conception rate after the r^{th} conception.
6. Let a_0 be the probability that the female is exposed to the risk of conception and $1 - a_0$ is the probability that she is primarily sterile or chooses to be so during $(0, T)$. Again let $(1 - a_r)$ be the probability that she becomes sterile or chooses to be so till the end of the observational period following the termination of the r^{th} pregnancy. This may be either due to secondary sterility or due to the use of contraceptive of hundred per cent effectiveness.

As explained in Singh and Bhattacharya, the maximum number of conceptions to a female during the given time interval $(0, T)$ cannot be more than n , where $n = [T/h_1]$ if $[T/h_1] = T/h_1$, otherwise it is equal to $[T/h_1] + 1$, where $[T/h_1]$ stands for the greatest integer not exceeding T/h_1 , $h_1 < h_2$.⁸

Now $X(T)$ can take values $0, 1, 2, \dots, n$. Under the assumptions 1, 2, 3, 4, 5, and 6, the probability function P_r , that is $P[X(T) = r]$ of $X(T)$ is given by:

$$P_0 = 1 - a_0 + a_0 e^{-m_0 T} \quad (2.1)$$

$$P_r = a_0 \cdot a_1 \cdots a_{r-1} \left[\sum_{j=0}^{P_r-1} \binom{r-1}{j} \theta^j (1-\theta)^{r-j-1} \left\{ \sum_{s=0}^{r-1} \frac{\left(\prod_{\substack{i=0 \\ i \neq s}}^{r-1} m_i \right) (j - e^{-m_s(T-jh_2 - r-jh_1)})}{\prod_{\substack{i=0 \\ i \neq s}}^{r-1} (m_i - m_s)} \right\} \right]$$

$$a_0 \cdot a_1 \cdots a_r \left[\sum_{j=0}^{P_r} \binom{r}{j} \theta^j (1-\theta)^{r-j} \left\{ \sum_{s=0}^r \frac{\left(\prod_{\substack{i=0 \\ i \neq s}}^r m_i \right) (1 - e^{-m_s(T-jh_2 - r-jh_1)})}{\prod_{\substack{i=0 \\ i \neq s}}^r (m_i - m_s)} \right\} \right]$$

$$r = 1, 2, \dots, n-1, \text{ where } P_r = \min \left[r, \frac{T - rh_1}{h_2 - h_1} \right] \quad (2.2)$$

where the quantity $\left[\frac{T-rh_1}{h_2-h_1} \right]$ is the maximum possible number of conceptions during time interval (0,T) (see also in Singh and Bhattacharya⁸)

$$P_n = 1 - P[X(T) \leq (n-1)] \quad \dots\dots\dots (2.3)$$

Proof

Let the successive conceptions occur at the times $(Z_1, Z_2, \dots, Z_r, Z_{r+1}, \dots)$. Obviously $Y_r = (Z_{r+1} - Z_r)$ is the time between the r th and $(r+1)$ th conceptions and it is the sum of two parts: a time S_r , during which no additional conceptions can occur *i.e.* the rest period following the r th conception and time T_r , which is the time between the restart of fecundable state after the r th conception and the time of $(r+1)$ th conception. Let T_0 be the time of first conception from the start of the observational period, here $T_0 = Z_1$ and $S_0 = 0$. We define two quantities E_r and N_r by:

$$E_{r+1} = \sum_{j=0}^r T_j, \quad N_r = \sum_{j=1}^r S_j, \quad N_0 = 0, \quad r \geq 0 \dots\dots\dots (2.4)$$

From the assumptions (1) and (2) the T_0 , *i.e.* the time from marriage to first conception follows an exponential distribution^{3,4} hence the probability that T_0 is less than or equal to t is -

$$P[T_0 \leq t] = 1 - e^{-\alpha t} \dots\dots\dots (2.5)$$

Since each of two sequences $\{T_r, r \geq 0\}$ and $\{S_j, j \geq 1\}$ are mutually independent random variables, it follows that

$$Z_{r+1} = \sum_{j=0}^r T_j + \sum_{j=1}^r S_j \dots\dots\dots (2.6)$$

forms a set of independent random variables. Since E_{r+1} is the sum of $(r+1)$ mutually independent random variables which are distributed exponentially. The distribution function of $\sum_{j=0}^r T_j$ denoted by $F_{r+1}(t)$ can easily be obtained as

$$F_{r+1}(t) = P[E_{r+1} \leq t] = \sum_{\delta=0}^r \frac{m_0 \cdot m_1 \cdots m_r \int_0^t e^{-m_\delta x} dx}{\prod_{\substack{i=0 \\ i \neq \delta}}^r (m_i - m_\delta)} \quad (2.7)$$

where all m_r 's are distinct (Feller¹¹, Singh *et al*¹⁰) S_j have a common two point distribution given by

$$\left. \begin{aligned} P[S_j = h_1] &= 1 - \theta \\ P[S_j = h_2] &= \theta, 0 \leq \theta \leq 1 \end{aligned} \right\} \quad (2.8)$$

It can easily be seen that

$$G_r(T) = P[\eta_r \leq t] = \sum_{j=0}^{l_r} \binom{r}{j} \theta^j (1-\theta)^{r-j} \quad \text{where } l_r = \min \left[r, \frac{t - r h_1}{h_2 - h_1} \right] \quad (2.9)$$

Now the distribution function of Z_{r+1} is

$$H_{r+1}(T) = \int_0^t F_{r+1}(t-x) dG_r(x) \quad (2.10)$$

Using (2.7) and (2.9) we get

$$H_{r+1}(T) = \sum_{j=0}^{l_r} \binom{r}{j} \theta^j (1-\theta)^{r-j} \left\{ \sum_{\delta=0}^r \frac{\left(\prod_{\substack{i=0 \\ i \neq \delta}}^r m_i \right) (1-e^{-m_\delta(t-jh_2-rjh_1)})}{\prod_{\substack{i=0 \\ i \neq \delta}}^r (m_i - m_\delta)} \right\} \quad (2.11)$$

$t > jh_2 + rj h_1$

Since $a_0, a_1, \dots, a_r$ is the probability that a female will not become sterile upto the occurrence of r^{th} pregnancy, the probability that a female will conceive at least $(r+1)$ times during $(0, T)$ is

$$H_{r+1}(T) = a_0 \cdot a_1 \cdots a_r \left[\sum_{j=0}^{l_r} \binom{r}{j} \theta^j (1-\theta)^{r-j} \left\{ \sum_{\delta=0}^r \frac{\left(\prod_{\substack{i=0 \\ i \neq \delta}}^r m_i \right) (1-e^{-m_\delta(t-jh_2-rjh_1)})}{\prod_{\substack{i=0 \\ i \neq \delta}}^r (m_i - m_\delta)} \right\} \right] \quad (2.12)$$

Now the probability of r conceptions during the time interval $(0, T)$ is given by

$$P[X(T) = r] = H_r(T) - H_{r+1}(T), \quad r = 0, 1, 2, \dots, n-1.$$

$$P[X(T) = n] = H_n(T), \quad \text{where } H_0(T) = 1, \quad H_1(T) = a_0(1 - e^{-m_0 T})$$

For $\theta = 1$, the probability expressions reduce to one proposed by Singh *et al*:¹⁰

Application

Though the probability model is derived to take account of the incomplete as well as complete conceptions, it may be applied to other situations with similar characteristics. For example, its application may be seen to describe the distribution of births classified* into two groups (a) the births where the infant dies within a year, (b) other births. Let $(1-\theta)$ and θ be the respective proportions and let h_1 and h_2 be the corresponding rest periods. It is well known that h_1 is less than h_2 . It is also reported that the average lengths of the birth intervals for the first few parities except the first, are approximately the same and the first interval is usually larger especially when the age of female at marriage is less than 16 years^{7&12} (see Sheps, Jain and others). Also the incidence of secondary sterility up to the females age 30 is nominal⁹. For such a population it seems reasonable to assume that during the time interval $(0, T)$ $m_r = m$ $r=1, 2, \dots$, $m_0 < m$ and $(1-a_r)=1$ for $r = 1, 2$. Under these assumptions the distribution function for the number of births to a female during $(0, T)$ becomes:

$$H_1(T) = a_0(1 - e^{-m_0 T}) \quad (3.1.1)$$

$$H_{r+1}(T) = a_0 \sum_{j=0}^{\ell_r} \binom{\ell_r}{j} \theta^j (1-\theta)^{\ell_r-j} \left[\left(\frac{m}{m-m_0} \right)^r \left(1 - e^{-m_0(T-jh_2-rjh_1)} \right) - m_0 \left\{ \sum_{s=0}^{r-1} \frac{m^s}{(m-m_0)^{s+1}} \right. \right.$$

$$\left. \left(1 - e^{-m(T-jh_2-rjh_1)} \sum_{u=0}^{r-1} \frac{\{m(T-jh_2-rjh_1)\}^u}{u!} \right) \right\} \quad (3.1.2)$$

$r = 1, 2, \dots, n-1,$

Again, if the sample is taken from a population which is a mixture of two populations (i) females have longer duration of P.P.A., but it becomes shorter in case of infant deaths; (ii) the duration of P.P.A. is shorter and is not affected by the type of the termination of pregnancy⁹, let π AND $(1-\pi)$ be the proportions of the respective subgroups. Thus:

$$P[X(T) = r] = \pi \left[P\{X(T) = r/h_1, h_2, \pi\} \right] + (1-\pi) \left[P\{X(T) = r/h_1, h_2, \pi'\} \right] \quad \text{--- (3.1.3)}$$

If $\theta' = \theta$, $h_1' = h_2' = h_1$ and $m = dm_0$ where d is constant, we have

$$n_{r+1}(T) = \pi \left[\sum_{j=0}^r \binom{r}{j} \theta^j (1-\theta)^{r-j} \left\{ 1 - \left(\frac{d}{d-1}\right)^r e^{-mo(T-jh_2-r-jh_1)} + e^{-dm_0(T-jh_2-r-jh_1)} \sum_{\delta=0}^{r-1} \frac{d^\delta}{(d-1)^{\delta+1}} \right. \right.$$

$$\left. \sum_{u=0}^{r-\delta-1} \frac{\{dm_0(T-jh_2-r-jh_1)\}^u}{u!} \right\} + (1-\pi) \left[1 - \left(\frac{d}{d-1}\right)^r e^{-mo(T-rh_1)} + \right.$$

$$\left. e^{-dm_0(T-rh_1)} \sum_{\delta=0}^{r-1} \frac{d^\delta}{(d-1)^{\delta+1}} \sum_{u=0}^{r-\delta-1} \frac{\{dm_0(T-rh_1)\}^u}{u!} \right] \quad \text{--- (3.1.4)}$$

The model involves several parameters. It is difficult to estimate all the parameters h_1 , h_2 , θ , a_0 , d , m_0 & π . When any distribution is applied to observed data, reasonable values of parameters which are assumed to be known at the time of estimation are used. We therefore, assume that h_1 , h_2 , θ and π are known. The method of estimating remaining parameters a_0 , m_0 , d is the same as given by Singh et al. 10. To elaborate, it is represented below:

Suppose that $\hat{a}_0$, $\hat{m}_0$ and $\hat{d}$ are the estimates of the parameters a_0 , m_0 and d respectively. For given values of the parameters h_1 , h_2 , θ and π , the estimates $\hat{a}_0$, $\hat{m}_0$ and $\hat{d}$ can be obtained by equating mean, variance and observed proportion of fecund couples with zero conception to their respective

theoretical expressions.

$$\bar{x} = \sum_{r=0}^n r \cdot P_r = a_0 F_1(m_0, d) \text{ (say)} \dots \dots \dots (3.2.1)$$

$$s^2 = \sum_{r=0}^n r^2 P_r - a_0 F_1(m_0, d) = F_2(a_0, m_0, d) \text{ (say)} \dots \dots (3.2.2)$$

$$\text{and } f_0 = 1 - a_0 + a_0 e^{-m_0 T} \dots \dots \dots (3.2.3)$$

Where $\bar{x}$, s^2 and f_0 are the mean, variance and the observed proportion of couples with zero conception respectively, $F_1(m_0, d)$ and $F_2(a_0, m_0, d)$ are the functions of m_0 , d and a_0 , m_0 and d respectively.

For large T , an approximate expression for the mean of the distribution similar to that of Singh *et al.*¹⁰ can be obtained as

$$\bar{x} \simeq a_0 \left[\bar{\lambda} \left\{ 1 + \frac{d m_0 T'}{1 + d m_0 \bar{h} (1 - \bar{h}/2T')} \right\} + (1 - \bar{\lambda}) \left\{ 1 + \frac{d m_0 T''}{1 + d m_0 \bar{h}_1 (1 - \frac{\bar{h}_1}{2T''})} \right\} \right]$$

$$\text{where } T' = T - \bar{h} - 1/m_0, \bar{h} = \theta h_2 + (1 - \theta) h_1, T'' = T - h_1 - 1/m_0 \dots \dots (3.2.4)$$

Now $\hat{m}_0$ can be obtained from the equation (3.2.3) for an assumed value of a_0 . With the help of the equation (3.2.4) and from the estimate of a_0 and m_0 , an estimate of d is obtained. A set of such values of $\hat{a}_0$, $\hat{m}_0$ and $\hat{d}$ which satisfy the equation (3.2.3), and (3.2.4) may be taken as first approximation. Further a suitable set of values of $\hat{a}_0$, $\hat{m}_0$ and $\hat{d}$ can be chosen such that the equations (3.2.1), (3.2.2) and (3.2.3) are satisfied.

The probability model has been applied to two sets of observations according to effective marriage durations of the females. One of them is taken for marriage duration (12-20) years and others for greater than 20 years in first 9 years of currently married females below fifty, years of age. In order to apply the model to the data, we take h_1 - 1 year (9 months for gestation and 3 months. for P.P.A.), h_2 = 1.75 years (9 months for gestation and 12 months for P.P.A.), θ = .80, π = .50. In this case T = 8.25 years because conception occurred after 8.25 years will not produce birth within a given fixed period. Table 1 show that the value of X^2 is

TABLE 1

E.M.D. WISE DISTRIBUTION OF THE OBSERVED AND THE EXPECTED NUMBER OF BIRTHS IN FIRST 9 YEARS FROM MARRIAGE

Number of births	E.M.D. (12-20), $\hat{a}_0 = .984$, $\hat{m}_0 = .36$, $\hat{d} = 1.48$		E.M.D. 20 +, $\hat{a}_0 = .98$, $\hat{m}_0 = .358$, $\hat{d} = 1.19$	
	Observed number of women	Expected number of women	Observed number of women	Expected number of women
0	37	37.1	31	31.0
1	89	84.3	91	84.1
2	189	175.8	152	151.1
3	155	174.4	113	124.0
4	67	70.5	38	33.5
5	24	20.0	9	12.3
6	3	3.9	2	-
7	2	-	-	-
Total	566	566.0	436	436.0
E.M.D. = Effective Marriage Duration			$\chi^2 = 2.30$	
			D.F. = (2)	

insignificant at five per cent level of significance. If agreement between the observed and the expected frequencies is a criterion for the suitability of a model then the proposed model is the better approximation for the situation.

Use of Model in the Evaluation of Family Planning Programme

The model which has been derived in section 2 can be used for measuring the changes in fertility for a group of females who are using birth control methods of varying effectiveness or trying to limit their family size by abortion, sterilization, etc

Table 2 illustrates the percentage reduction in the average number of conception in first 15 years of marriage to couples with $m_0=0.50$, $s=0.80$, $h_1=0.75$ year, $h_2=1.75$ years under following schemes:

A. No contraception and no sterility i.e. $a_i=1$, $m_i=m_0$, $i=0, 1, 2$,

TABLE 2
THE PROBABILITY OF EXACTLY X CONCEPTIONS IN THE PERIOD OF 15 YEARS UNDER
DIFFERENT SCHEMES

Number of Conceptions	Probabilities under schemes			
	A	B	C	D
0	0.00055	0.00055	0.00055	0.00055
1	0.00885	0.00885	0.00885	0.00885
2	0.05599	0.05599	0.05599	0.05599
3	0.17914	0.36801	0.55687	0.69175
4	0.30826	0.31504	0.26593	0.18297
5	0.28301	0.18228	0.09128	0.05870
6	0.13193	0.05906	0.01851	0.00119
7	0.02918	0.00948	0.00192	-
8 and over	0.00309	0.00073	0.00010	-
Average number of Conceptions	4.33	3.82	3.44	3.25
Percentage reduction In conceptions	-	11.78	20.55	24.94

*6 and more conceptions

- B. Twenty five per cent of the couples from among the remaining fecund couples becoming sterile or use of hundred per cent effective contraceptives at each pregnancy following the third conception and onwards i.e. $a_0=a_1=a_2=1$, $a_i=0.75$ for $i=3,4,5$, and $m_i=m_0$ for $i=0,1,2,3$
- C. Fifty percent of the couples from among the remaining fecund couples becoming sterile or using hundred per cent effective contraceptives at each pregnancy after the third conception and onwards i.e. $a_0=a_1=a_2=1$, $a_i=0.50$ for $i=3,4,5,\dots$ and $m_i=m_0$ for $i=0,1,2,3,\dots$
- D. All the couples use contraceptives of 60 per cent effectiveness after the third conception i.e. $a_i=1$, $i=0, 1, 2$, $m_0=m_1=m_2=0.50$ and $m_i=0$ for $i=3, 4, 5$,

Table 3 shows the percentage reduction in the average number of births in first 10 years of marriage to couples by introducing different abortion rates. The probabilities of different order of conceptions are computed by taking the -

TABLE 3
THE PROBABILITIES OF EXACTLY X CONCEPTIONS IN THE PERIOD OF 10 YEARS
UNDER DIFFERENT ABORTION RATES

Number of Conceptions	6-1.00	9-0.80	9-0.60	8=0.40
0	0.057191	0.057191	0.057191	0.057191
1	0.057362	0.051465	0.045568	0.039670
2	0.247125	0.218738	0.191887	0.166573
3	0.389118	0.354210	0.318599	0.282638
4	0.222921	0.250142	0.265475	0.269764
5	0.026148	0.063084	0.102231	0.139719
6	0.000135	0.004994	0.016979	0.031107
7 and over	-	0.000176	0.002070	0.013293
Average conceptions	2.74	2.90	3.07	3.28
Average births	2.74	2.32	1.84	1.31
Percentage reduction	-	15.3	32.8	52.2

*6 and more conceptions

hypothetical values of $m_0=0.50$, $m_i=0.60$, for $i=1,2,3,\dots$, $h_1=0.75$ year, $h_2=1.75$ years and $a_i=0.98$, for $i=0,1,2,3$, On considering the abortion rates i.e. 20%, 40% and 60% the average number of conceptions will increase because the rest periods associated with abortion will be shorter. Thereafter the average number of births is calculated in different abortion and then the percentage reduction in the average number of births is shown in Table 3.

Acknowledgement

The authors are thankful to the editors and the referees for useful suggestions.

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**INFORMATIONAL AND DOCUMENTATIONAL NEEDS
FOR SOCIAL ASPECTS OF POPULATION
GROWTH AND POLICY****

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ABSTRACT

The issue of population growth and the consequent policy needs to be examined from both the conceptual and empirical perspectives. The task is not merely to monitor what has been or is being done about it by the Government, The need for information and documentation with respect to the social aspects of population growth and policy follows from this approach. The construction of a base with all valid information and documentation, therefore, becomes a task of primary importance.

Since 1950 India is concerned with the planning of its population. Planning means a course of induced change involving the following stages in a sequencer (1) statement of the objectives,(2) specification of the goal with reference to the objective and set targets successively to arrive at the goal, (3) formulation of appropriate methods to fulfill the targets and finally achieve the goal,(4) execution of the methods,(5) evaluation of the results of execution,(6) appraisal of the validity, relevance and efficiency of execution of the methods leading to, (7) completion of the course of planning successfully. In this spiral-like exercise, fallacies may occur at any stage of a course of planning and affect its usefulness. We should, therefore, examine the issue of population growth and the consequent policy from both the conceptual and empirical perspectives. Our task is not merely to

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***Key-note paper presented at the National Workshop on Documentation in the Field of Health and Family Welfare, held in November 1977 at New Delhi.*

monitor what has or is being done about it by the government. The need for information and documentation with respect to the social aspect of population growth and policy follows automatically from this approach.

Let us begin with the concept of family to be planned. We are not concerned in this case with the family as a social institution, but with a couple (man and woman) and the children they produce: their familial background is a matter of reference, not of definition. This is obvious, but its implications are not always appreciated. As a result, we obtain fanciful image of the family with reference to population growth; for example, the unrestrained procreating propensity of the Asiatic governed by the desire to produce large families, the cultural barriers to family planning in underdeveloped countries with reference to normative extended family organization, and a high development of parental impulse. Institutionalized in the authority of the joint family. Statements of this kind are made in India and abroad, and with or without academic trimmings, although some information is now available to suggest that from the beginning of the present century, at any rate, an Indian couple produces, on an average four surviving children. This means that from a time long before a population policy was considered, an in-built constraint is in operation in society. We have similar information regarding virtually all developing societies; but such information, as for India, is not yet precise and well documented. Consequently, we fail to answer decisively certain basic questions in formulation of a population policy; such as: what are the selective processes in operation in society, and how and why are these processes initiated and sustained by the people on their own volition.

Constraints

However, the constraint already in operation does not meet the demand of bringing the population growth to the replacement level of two children per couple. On two main counts, therefore, a population policy is advocated: (1) the population growth-rate affects adversely the present rate of economic growth, as usually measured by GNP per capita; and (2) the rapid increase in population affects the course of social development by creating problems in providing adequate education, health facilities, and social and cultural amenities to bring the people on par with those in the developed

countries. Fallacies may be pointed out with respect to both the postulates:

1. The concept of economic development should be such that a drastic reduction in the couple-children ratio need not be of primary relevance to the society. Moreover, if family planning is emphasized in isolation, it will deflect our attention from an effective course of economic development.
2. GNP per capita is not an appropriate indicator of economic development; instead, an equitable distribution of GNP, rather than a forced reduction of the couple-children ratio, should be the programme for social engineering in India.
3. Before accepting it as a fact, we should critically examine the extent to which population growth puts obstacles in the path of social development. Are there not other factors more relevant in this context; for example, the bureaucratic inefficiency and mismanagement, as also the devious maneuvers of the "interest groups" impeding the welfare of the masses?

Placed against these and other similar fallacies, the advocacy of a population policy tends to attain a secondary importance. That may be illusory; nevertheless, we require appropriate information and documentation on the contra-indications to a population policy.

- In this context, we ought to examine the relevance, and even the validity, of the picture drawn of the teeming millions of the third world eating up all world resources and yet still starving. It has been pointed out that a marked inequality in the distribution of material goods (and especially food) has emerged on the world-scale owing to the profit motive of the monopolists operating through the media of private corporations and even a few domineering nation-States of contrary political ideology. A pertinent question has also been raised about the fear of the powerful nations at the prospect of the weaker nations becoming too populous. All such views, however, require adequate data-base and careful documentation.

We also lack, unequivocal information and documentation regarding similar issues concerning Indian society and its minority groups in particular. Is it a fact or a fiction that the Indian Muslims deliberately augment their fertility rate on political or religious grounds? Is it true for only a handful of Muslim elite or also for the masses? And, if it were true for both, do the political and religious motivations operate differently for the elite and the masses? Answers to these and allied questions regarding the minority communities in India are of substantial importance to frame a proper population policy, of which the central point is fast growth-rate.

Once we adopt this approach, we should not be exclusively concerned with the issue of reduction of population growth. We should identify also those segments of Indian population which require an enhanced growth-rate; for example, some of those earliest settled ethnic groups, euphemistically called Giri-Varanasi (mountain-forest-dwellers), which are said to be facing extinction. However, on their account, we have more display of emotion than precise and comprehensive information and documentation.

Proceeding in this manner with the issue of population growth and the consequent, policy, we face a crucial question: Is family planning an issue of management *per se*, as it has more or less been the case over the last three decades and both nationally and internationally? Alternatively, does the issue demand continuous interaction among theory, empirical research, and action-programmes so as to locate the soft spots and the hard spots in the social organism through which the growth of population is retarded and accelerated, respectively?

To be sure, basic research to unfold the contextual social reality has not been ignored both nationally and internationally. However, we are meeting because there is still a felt-need for it while the policy of management has not attained the desired success in spite of spending colossal amount of money, resources and energy, and sometimes coercing the people to meet what was regarded to be the most urgent "national" demand. Hence, instead of providing a low profile to basic research, we should investigate: (1) how the desired social change can be so induced through the soft spots in the social organism that it becomes a self-generating

process, and (2) how the hard spots can be turned into soft spots in the same context. For, unless we plan to adopt coercive methods, it is only through this approach that the family planning movement can become successful in place of remaining a perennial concern of the bureaucracy to feed the people from above with ideas and actions.

As found with reference to other aspects of social change, the people will adopt a planning measure and pursue it on their own volition provided it fits in with their concept of rationality, which can be defined as the optimization of the relation among ends, means and processes. The concept of rationality, therefore, may vary between the people and the planners, for they have different sets of experience and expectation. Determining the manner in which the experience and expectation of the people and of the planners can be brought together is, therefore, our substantial task.

Salient Characteristics

The planners and administrators are not unmindful of this task. Their managerial orientation, however, is inclined toward synchronizing their own expectation with that of the people by emphasizing those aspects of life which may not be of prime importance to the people in the present circumstances. For example, the central slogan of the family planning movement has been "a small family is a happy family", wherein the "small family" was firstly visualized as formed with two or three children and later, more drastically, as formed with two children only. But does that ideal meet the optimization process between ends and means of the common man? Does that rationale vary from one social stratum to another? Have we been able to identify those strata and inform ourselves of their behavioral and perceptual characteristics *vis-a-vis* India's growth of population?

Let us now examine some of the salient characteristics of Indian society to answer the questions we have posed and ascertain the contextual need for further information and documentation.

The available data, however imprecise, suggest that the average of 4 surviving children per couple is conditioned by the desire of the people to have 2 sons which enforces the binomial probability of 2 sons and 2 daughters for the

society *en masse*. The associated data suggest further that the desire for sons is primarily governed by the necessity of the people for their security and survival in old age while they cannot afford to have many sons and daughters. Now, should we not make these two basic pointers to a population policy precise, unequivocal and comprehensive, or reject them in case of any powerful contra-indication?

Assuredly, the people would be motivated by other desires than security-survival to limit or enlarge their family-size. One of them is promptly mentioned by the planners, administrators and the social scientists, viz. the need for sons to the Hindus for manes and to the Muslims to enhance their social prestige. No doubt, the ideas and beliefs transmitted through generations (defined as tradition) have a role to play in peoples' lives. The Hindus may want sons for their peace in after-life. Sons signifying social prestige may be a lurking phenomenon for Indians of all faiths. Nonetheless, there is a question of priority in needs and beliefs based on what the people can or cannot afford under the given circumstances. To what extent, therefore, is the people's desire for 2 sons intensified or diminished by their immediate needs or aspiration for better living standards, and the corresponding value preferences for the present and the after-life?

Several trends of inter-relationships among the societal variables concerning the above and allied questions are suggested from the available information. Accordingly, many hypotheses may be formulated to appraise the contextual reality, and some of them will be found to be valid after testing. But it is the relativity of diverse structural, behavioral and perceptual variables which is pertinent to draw an efficient inference on what will it be of family planning while unilateral stress on any one of them would merely generate futile polemics. Our task, therefore, is to formulate a series of alternate hypotheses and test not merely their validity but also their relative efficiency with respect to issues like the comparative importance of the security survival factor to other material and non-material factors in the context of family planning and with reference to the corresponding motivation and action of the people. Needless to say, we need for this purpose a far more precise, unequivocal and comprehensive data-base than we possess presently.

Some data are available today to identify social strata expressing different kinds of motivation and/or action of the people to family planning. These strata may be arranged along an axis at the one end of which is the personal choice of a son or a daughter (or none) by a thin stratum of couples belonging to the modern elite; at the other end, there is the felt-need to produce as many sons as possible by the poorest stratum of society as well as by the traditional elite. The latter two categories are motivated differently to produce large families: those at the sub-marginal level of existence desire the maximum possible number of working hands to survive mainly as casual laborers in their present (and not in their old) age; the landed and the business aristocracy, on the contrary, would require many sons to retain the landed property and look after family business. In-between these two categories, there is the vast mass of people whose rationale demands 2 sons and the consequent action produces A surviving children on an average. Now, how can we more and more precisely identify these (and perhaps more appropriately categorized) social strata on the axis of no son at one end and as many sons as possible at the other, in order that a social policy - with appropriate built-in differentials - may be formulated more and more unambiguously.

The way of life epitomized by the college-educated wives appears to denote the soft spot in Indian society to transform the family planning movement into a self-generating process¹. But is the college education of women a casual variable in this context or a concomitant variable? If, it is a concomitant variable, as it is likely to be, which casual factor in the social dynamics expresses the concomitance between higher education of women and the course of family planning desired by the planners at the moment? For, it is an understanding of this casual factor, and not a spontaneous identification of a social category expressing a confounding of the structural, behavioral and perceptual variables (like the college-educated wives), which should denote unequivocally how the self-generating process observable in a thin social stratum only can be nurtured and spread to cover the entire social organism. On this point, we are distinctly short of information and documentation.

The basic issue in current population growth refers to the desire of the common people for security and survival in old age. This denotes the dominant structural, behavioral

and perceptual feature of Indian society which is to be taken into account before any drastic change can be effected in the reproductive pattern of the people. But nothing is constant for all places (sthana), time (kala), and object (patra, the people in the present context): the three dimensions of variation to be always taken into account to appraise reality along the dynamism of life-process. Qualitative changes occur at critical levels of these three dimensions considered together. Therefore, at what level of social development of the Indian people would the security-survival factor lose its dominance, and even its relevance, to the reproductive behavior of the masses? Which factor or factors are, then, likely to dominate the social scene with reference to the growth or decay of the population?

Questions like the above ones are usually regarded to be far-fetched and, therefore, left in the realm of conjectures and speculation. They, however, can be answered on a probability basis from a systemic appraisal of the aspect of social reality under reference; namely, what are the promoting and retarding processes in induced and non-induced family planning, and how and why do they take place? It is necessary to consider this circuit of what-how-why questions of diagnostic research in order that the course of induced change through the family planning movement does not astray because of wrong equations among the ends, means, and processes. Moreover, it is only in this way that we can construct the base to answer the question what will it be of population growth by explaining how and why this aspect of reality has emerged on the social scene. Also, it is only from a precise, unequivocal and comprehensive answer to the will it be question that we can formulate an appropriate policy to answer the what should it be question in the same context. Otherwise, any amount of monitoring of a piece of engineering geared to an assumed base (which may be fallacious) would be futile. This is perhaps what has happened with regard to the family planning movement in India. The social aspect of population growth, thus, becomes the kingpin to devise an appropriate, population policy, and the construction of the aforementioned base with all valid information and documentation becomes our primary task.

The base, of course, will shift continually because the casual factor explaining changes in social organism are not

invariant. At the same time, these factors must be systemically related to denote not merely their validity but also their relative relevance, necessity, efficiency and, eventually, sufficiency in the given context. Clearly, what is casual today in regard to the family planning movement in India may be concomitant tomorrow and casual the day after, and *vice versa*: the days standing for the successive stages of change in the structural, behavioral and perceptual characteristics of the people concerned. Therefore, the shifting of the base to answer the question what will it be in successive stages is also systemically related to the never-ending course of accumulation of knowledge. Moreover, to understand the shift, the preceding and the current bases must be laid as precisely, unequivocally and comprehensively as possible at the existing and continually accumulating state of knowledge. There is no end to this pursuit while it cannot be a matter of assumption or spontaneous inspiration at any one point in time. Hence, finally, it is in this perspective that we should consider the informational and documental needs for social aspects of population growth and policy.

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