# APPLICATION OF COST-BENEFIT ANALYSIS TECHNIQUE IN EVALUATION OF FAMILY PLANNING PROGRAMMES:
## A Case Study of the Family Welfare Programme in India Since the Mid-Sixties

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## DECLARATION

This is to certify that the dissertation entitled "APPLICATION OF COST -BENEFIT ANALYSIS TECHNIQUE IN EVALUATION OF FAMILY PLANNING PROGRAMMES: A CASE STUDY OF THE FAMILY WELFARE PROGRAMME IN INDIA SINCE THE MID-SIXTIES", submitted by Mr. Sanjay Kumar in partial fulfilment of the requirments for the award of the degree of **Master of Philosophy (M.Phil.)** of this University, is his original work and has not been submitted for the award of any other degree of this University or of any other University.

We recommend that this dissertation be placed before the examiners for evaluation.


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# INTRODUCTION

# INTRODUCTION

Rapid growth in the magnitude of population in many developing countries is one of the serious concern of today. Though the interrelationship between population and economic development is very complex and debatable, yet it has been widely recognised that the excessive pressure of population can severely impede efforts towards the economic development of a nation. Consequently, the economic implications of a high rate of population growth has led many governments to pursue the policy of population control through direct programmes for fertility reduction -- generally called family planning programmes. However it should be noted here that a population policy is not framed solely with reference to economic aspects, because the population field is a complex and sensitive area involving difficult ethical, political and social issues. Besides the economic aspects of population planning, other considerations -- demographic, medical, sociological, ethnic, religious etc. -- are also crucial to the evolution of population policies and their effective translation into fertility reduction.

Since the economic aspects are important for the formulation of a population policy, the economic rationale of implementing any programme for fertility reduction is generally examined. For this purpose evaluative techniques

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are needed to judge its desirability from the economic point of view . One of the techniques used for economic evaluation of projects/programmes is the Cost- Benefit Analysis technique. This technique is used for evaluating the programmes / projects of every sector of the economy including the family planning programmes.

## A.1 Cost-Benefit Analysis

Cost-Benefit Analysis (CBA) is the most widely used evaluative technique for making resource allocation decisions. Though this technique was developed by Jules Dupuit as far back as in 1844 in his classic paper on the utility of public works, its application in Family Planning Programmes is a fairly recent development.

The basic idea of CBA is to discover whether the benefits of a particular programme/project outweigh the costs and if so, by how much. Only those programmes/projects for which there is a surplus of benefits over costs are considered to be worth carrying out. Prest and Turvey (1965) define it as "a practical way of assessing the desirability of projects, where it is important to take a long view (in the sense of looking at repercussions in the further, as well as the nearer, future) and a wide view (in the sense of allowing for side effects of many kinds on many

persons, industries, regions etc.), i.e., it implies the enumeration and evaluation of all the relevant costs and benefits".

Thus a comprehensive CBA of a public programme requires that all the 'relevant' costs and benefits comprising 'external' costs and benefits in addition to user specific costs and benefits should be included. 'Externalities' have been a central concept within welfare economics and have served as a rationale for public sector investment decisions in many areas including health and Family Planning Programmes.

These identified relevant costs and benefits are then measured and essentially valued in money terms to make comparison between them possible. However, due to presence of market imperfections and externalities 'shadow' or 'accounting' prices which may reflect 'opportunity costs' or 'benefits forgone' are used in place of market prices. Use of 'opportunity cost' or 'benefit forgone' approach becomes necessary especially for areas like health, Family Planning, education, public utilities etc., where outputs are not marketed and also because of the presence of large externalities.

The costs incurred and benefits accrued to the society from a programme/project are not one shot phenomenon, but a

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stream of costs and benefits realized over the economic life of the programme/project. Therefore present values of cost and benefit streams are calculated by discounting them by an appropriate discount rate. The rate of discount to be used here is the 'social rate of discount' or 'social time preference rate', which represents society's collective preference for the present over future.

Finally, these aggregate discounted values of costs and benefits are compared using appropriate decision criterion to judge the desirability or viability or worth of the programme/project. The 'worth' of the programme may be judged in two alternative ways. Firstly, Soundness may be judged by comparing with ever existing option of doing nothing. Secondly, the programme/project may be compared with all other possible alternatives to determine whether it is the best use of resources.

Prest and Turvey (1965) suggest the following four equivalent ways of decision criteria:

(1) Select all projects where the present value of benefits exceeds present value of costs.

(2) Select all projects where the ratio of the present value of benefits to the present value of costs exceeds unity.

(3)   Select all projects where the constant annuity with the same present value as benefits exceeds the constant annuity (of the same duration) with the same present value as costs.

(4)   Select all projects where the internal rate of return exceeds chosen rate of discount.

First two criteria, namely Net Benefit Approach and Benefit-Cost Ratio approach respectively, are frequently used in the programme/project evaluation including the Family Planning Programmes.

The approach of CBA technique outlined above in a very simple form may give the impression that it is a very simple and useful approach for evaluating programmes/projects, but in reality, though its usefulness is not denied, the application of this technique poses many practical difficulties (particularly in a programme like family planning programme).

## A.2   Family Planning in India

By launching Family Planning Programme in 1951-52, India became the first country in the world to adopt a national policy of slowing down the rate of population growth through promotion of voluntary family limitations. In the first decade since its inception the programme based on

clinical approach made a very insignificant amount of progress due to several infrastructural and social constraints. The expenditure incurred on the programme during the first two plans were also very small in relation to total plan outlays. It is only after the census of 1961, that the likely serious consequences of accelerating population growth were recognised in the third plan. Both the plan allocation and the actual expenditure on the programme increased substantially. An 'extension approach' was adopted to assign high priority to the objective of 'stabilising the growth of population over a reasonable period' without specifying any clear target. The officials proposed the goal of reducing birth rate to 25 per 1000 (from 40 per 1000 ) in a decade , but this goal has not been achieved as of yet.

With the establishment of a full fledged Department of Family Planning in 1966 and introduction of IUDs in the methods of family planning, a new thrust to the programme was claimed. As a result 1966-69 saw a rapid increase in the expenditure and employment in the programme . However, Census of 1971 indicated yet another decade with high population growth rate ( more than 2 per cent). The basic strategy of the programme remained unchanged untill the mid-seventies, with the expenditure again increasing

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substantially in the fourth plan. The programme was pushed with 'highest priority' during the period of national emergency and with the announcement of the of the population policy in 1976 further 'thrust' was given. The programme was renamed 'Family Welfare Programme'(FWP) after the change of the government in the Centre in 1977. It saw a set back during this regime in terms of reduced number of acceptors. The programme was declared 'Wholly Voluntary' and also as an integral part of a comprehensive policy covering health, maternity and child care etc . The 1981 census results were again a set back to the programme as the growth rate of the population did not come down and remained at more than 2 per cent per annum. Since then the expenditure on the programme kept on increasing in each successive plans. However, even with a gigantic organisation and massive inputs, the programme has failed to yield the desired results. As the 1991 census shows, the annual average growth rate during the eighties came down by a marginal 0.1 percentage point and the total population grew to 844 million. Birth rate is still as high as 29.3 per 1000 (in 1990-91 ).

During the four decades of planning the share of Family Welfare/ Planning Programme in the total expenditure on Health and Family Welfare has increased substantially (Table

A.1). From a mere 0.15 % in the first plan its share increased to 44.1% in the seventh plan.

The apparent failure to meet the demographic goal set forth by the planners, despite the massive expenditure incurred on the programme, makes it plausible to assess the worth of the programme from the economic view point. Since CBA technique is widely used for programme evaluations, we have also attempted to apply this technique in evaluation of the Family Welfare Programme in India.

## A.3  Objective of the Study

This study has a two fold objective . One is to extend a widely accepted technique of Cost-Benefit Analysis for measuring the economic returns of investment to Family Planning Programmes. This has been done by applying the technique in evaluation of the Family Welfare Programme in India.

And the second is to indicate the assumptions and limitations inherent in this type of study. This objective is reflected mainly in the details of the methodological procedures followed by us.

## A.4  Period of the Study

A period of 24 years starting from 1966-67 to 1989-90 has been taken. 1966-67 has been taken as the starting year

of our study because of two reasons. Firstly, in this year with the establishment of a Department of Family Planning, the programme got a thrust for the first time. And secondly consistent data required for the evaluation of the programme are mostly available from this year. Lack of data after 1989-90 limits our period of study upto this year.

A.5  **Limitation of the Study**

(i)    Adjustments made due to lack of basic informations and data limit the reliability of our results.

(ii)   The framework of the study is of partial equilibrium nature.

(iii)  Most   of  the   forecasts  made  are  subject  to  a considerable margin of error.

A.6  **Plan of Presentation**

The study is presented in three chapters. Chapter I deals with the survey of available literature on the subject. Chapter II describes the detailed methodology adopted by us for the evaluation of FWP . This chapter is particularly important because it gives a synoptic view of the problems, assumptions and limitations associated with the application of CBA technique in evaluation of Family Planning Programmes. Chapter III presents our empirical findings, computed on the basis of different methods and

assumed scenarios, and their analysis. Finally the
conclusion which essentially contains a summary of our
findings.

## TABLE A.1

| PLAN | HEALTH EXPENDITURE | FAMILY WELFARE EXPENDITURE | TOTAL | SHARE OF HEALTH | SHARE OF WELFARE PROGRAMME |
|---|---|---|---|---|---|
| FIRST | 65.2 | 0.1 | 65.3 | 99.85 | 0.15 |
| SECOND | 140.8 | 5.0 | 145.8 | 96.57 | 3.43 |
| THIRD | 225.9 | 24.9 | 250.8 | 90.07 | 9.93 |
| ANNUAL(1966-67) | 140.2 | 70.4 | 210.6 | 66.57 | 33.43 |
| FOURTH | 335.5 | 278.0 | 613.5 | 54.69 | 45.31 |
| FIFTH | 760.8 | 491.8 | 1252.6 | 60.74 | 39.26 |
| ANNUAL(1979-80) | 223.1 | 118.5 | 341.6 | 65.31 | 34.69 |
| SIXTH | 2025.2 | 1387.0 | 3412.2 | 59.35 | 40.65 |
| SEVENTH | 3721.3 | 2936.3 | 6657.6 | 55.90 | 44.10 |

PATTERN OF INVESTMENT IN HEALTH AND FAMILY WELFARE PROGRAMME

(in Rs. Crores)

Source : Family Welfare Programme Year Book, Various Issues.

# CHAPTER 1

# Chapter I

## SURVEY OF LITERATURE

The World Bank financed work on India by **Coale and Hoover (1958)** may be regarded as the beginning of modern quantitative economic analysis of the impact of population trends on economic development. Their simple economic-demographic model deals with the economic implications of the path chosen by the economy from given alternatives of unchanged (higher) fertility and lower fertility paths. By making projections for the period 1956-86 they tried to show that if the economy chooses higher fertility path instead of lower one, growth in per capita income would essentially be lower due to lower savings and diversion of a part of investment to unproductive uses. The results of the study show that during the period of projections, income per consumer would increase by 95 percent in the lower fertility case, while under unchanged fertility assumption it would increase only by 38 per cent. However, by taking labour force aspect into account they reached the conclusion that after fifteen years GNP would be relatively more on the higher fertility path.

An alternative technique for measuring the economic implications of a reduction in the present high birth rates

was introduced by **Stephen Enke (1960a; 1960b; 1966)**. Using Cost Benefit Analysis technique Enke (1960a) made an attempt to estimate the value of permanently preventing a birth in India and to assess its impact on the economy's resources. Here the present discounted value of the consumption stream necessary to support a person through life is taken as a measure of the benefits of averting a birth. Recognising the facts that infants consume less than older people do, and that some infants do not survive long, some adjustments have also been made. However, Enke has not mentioned how the 'consumption values' have been assigned to different age groups. Present discounted value of the economic contribution that an additional person would have made through his life time -- measured in terms of marginal product of labour -- is taken as the cost to the economy. However, in Enke's scheme it hardly matters because already existing low marginal products of labour gives very small present value after discounting, since the working-age of a person starts at fifteen years of age. On the assumption of unchanged existing level of per capita annual consumption and marginal product of labour throughout the time horizon taken, Enke calculated the present value of permanently preventing a birth in 1961 at approximately Rs. 690 at 1960-61 prices, using a 10 per cent discount rate. His comparison of undiscounted average consumption and marginal

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product gives the value of a birth averted of about Rs.6000. In his later work Enke (1966) recognised the more realistic case of postponing the birth and tried to make some estimate of the "worth" of postponing a birth.

Assuming a capital-output ratio of 4 over 10 years, Enke calculated that if equivalent realesed resources were invested then the discounted value of the income stream, thus earned at the date of investment, was 5.86/4.0 times its original cost. Thus, according to this approach, the value of permanently preventing a birth was Rs. 788, if the consumption savings of only the first 20 years were considered and Rs. 1005 for a life time. However, later Enke (1966) assumed that depending on private saving propensities and government fiscal policies, only a third of such "released" consumption could be diverted into useful investment.

**Repetto (1968)** is of the view that Family Planning Programme in India is really an economic programme. Using a partial equilibrium model (basically similar to that of Enke's), he has attempted to explore the economic consequences of a reduction in the birth rate. His cost Benefit Analysis counts the discounted present value of resource cost of consumption expenditure and the social overhead capital occasioned in such fields as housing, water

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supply and sanitation, education etc., that is avoided, also as the benefits accrued to the society by averting births. Similarly, lost economic contributions measured in terms of present value of discounted marginal product of labour, are counted as the cost incurred, taking into account labour force participation rate and age-sex characteristics of the population. The only departure from earlier studies (Coale and Hoover, Enke) has been an attempt to explore the time phasing of benefits from a reduction in the number of births, in the sense of both the annual benefits in subsequent years per thousand births prevented in the current year, and in births prevented in the current year relative to the discounted value of the same number prevented in the subsequent year.

On the assumption that existing levels of estimated-per capita consumption and marginal product remain unchanged, Repetto calculated the Present Value of one thousand birth prevented in 1966, over a 50 year time horizon and with 10 percent discount rate, to be in the vicinity of Rs.1,500,000 in 1960-61 prices. This gives a value of averting a birth (i.e net benefit) at Rs.1500. This figure inflates to Rs.1875 and Rs.2475 at the respective growth rates of 1 percent and 2.5 percent, if it is assumed that over long periods of time the average annual rate of growth of per capita consumption will closely resemble that of the per

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capita marginal product of labour.

Out of this Rs. 1500, 10 percent can be attributed to the first five years and 66 percent to the first 15 years. Thus, Repetto concludes that preventing births has a substantial impact on economic growth within a short horizon of 15 years, 10 years or even 5 years and that returns to birth prevention are at least as rapid as those to major investments in industry, irrigation or other 'hard' projects.

**Simon (1969)** criticises Enke's method (1966) of estimating the value of preventing an incremental birth for its 'internal inconsistencies'. He contends that all the avoided consumption of the avoided child can not be put into social account, because most of it would be otherwise consumed by child's family and that at the high discount rate of 15 per cent used by Enke the effect of an added child on the marginal productivity of other workers is irrelevant. Moreover, he finds that such a high discount rate is inconsistent with other governmental decisions and a lower discount rate reduces the value of a prevented birth.

Thus Simon emphasizes on the consideration of entire macroeconomic system to find out the value of preventing a birth in the case when any discount rate is taken (5% or 10%

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or 15%) and that most of the released consumption does not redound to public consumption. This implies the complex task of estimating, first, how much more would be saved and invested productively by society if there were fewer children, then the effects of this savings through increases in the Capital-Labour ratio, and then the feed back through the circuit by way of the increases in average income. With the help of Coale and Hoover's work (1958), Simon made an attempt to complete this task. He compared the high fertility rate estimated by Coale and Hoover with one of the lower rates -- the lower rates were arrived at on the assumption of a decline (linear) of 50 percent in the birth rate over the period 1956-86 -- to get his estimates.

Taking these alternative projections and estimates of per consumer index number as well as the ratio of consumer equivalents of Coale and Hoover, total number of births and aggregate income respectively in each five year period have been obtained by him. Difference in aggregate income between the two plans, was then obtained.

Keeping in the view the facts that single births cannot be related to single sets of costs and revenues because their effects ramify and are felt only through the entire growth system, and that the effect of any one prevented birth depends on how many other births are also prevented,

he generated an estimate for the value of an avoided birth at 15 percent discount rate. Present value of the difference in aggregate income at this discount rate for the entire period was obtained. Relevant number of births has been obtained by multiplying discounted number of births (at 15 percent discount rate) by the money bonuses. Then, by dividing the present value of income (Rs.10 billion) by the number of discounted births (17.5 million) the author arrives at the finding that the economy as a whole would benefit even if it paid up to Rs.570 ($114) for each birth avoided. This value increases with the lower discount rate. The author also estimates from these figures that the expenditure of 10 cents per head will be about 40 times as productive as other development investment.

Basu's study (1968) is basically a Cost-Effectiveness Analysis of Indian Family Planning Programme. He has mainly estimated the number of births averted as a result of acceptance of family planning methods. Then on the basis of cumulative sterilizations and cumulative expenditure on Family Planning Programme upto 1967-68 a cost of Rs.109 per birth prevented has been estimated. Unit costs of each birth prevented during the three years period of 1965-66 to 1967-68 has also been estimated. Though Basu mentioned in his study that economic gain from preventing a birth was about Rs. 3,500, he did not describe how it was estimated.

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The Benefit-Cost Ratio, on the basis of cumulative expenditure and cumulative gain has been worked out. to be 32:1.

Another effort to evaluate the Family Planning Programme was made by **Seal and Bhatnagar (1973)**. They made an elaborate exercise to work out the number of births prevented as a result of acceptance of different Family Planning methods. The spread of these averted births over the years has also been estimated; to make them comparable they have also been discounted. By this method, the number of births averted by each method in each year has been worked out for the period 1963-64 to 1970-71.

Now to make comparisons of benefits and costs of Family Planning Programme, the benefit per birth averted for various year was estimated with the help of Repetto's (1968) figure of value per birth averted. Repetto's estimate of Rs. 1500 at 1960-61 prices was converted to Rs. 2700 at 1970-71 prices with the help of Wholesale Prices Index (WPI).

To obtain cost per birth averted, a methodwise break up of total Expenditure was obtained through a detailed study of the expenditure for the year 1968-69. The ratio of expenditure on different contraceptive methods was taken for this year and it was assumed to have remained unchanged over

the period of time. The results show that Benefit-Cost
Ratio is declining for Sterilizations and IUD insertions,
and increasing for conventional contraceptive. For Family
Planning Programme as a whole also it is declining.
However, Benefit-Cost Ratio ranking for 1970-71 at 10
percent rate of discount is in declining order starting from
sterilization to conventional contraceptions. Similarly,
Benefit-Cost Ratios for 18 states at 10 percent discount
rate for the period 1968-69 to 1970-71 have also been
estimated by them.

**Sivarama Raju (1976)** has, in his study, adopted an
approach similar to that of Seal and Bhatnagar. He also has
estimated the number of births averted by applying Cohort
Approach for the period 1963-64 to 1973-74. Repetto's
estimate of the value of a birth averted has been taken by
him as the measure of benefit. However, a detailed analysis
of cost per birth averted has been done in this study.
Taking break-ups of the expenditure incurred during the
period into fixed and variable costs per birth averted,
separate trend analyses have have been done for both. For
calculating Benefit-Cost Ratios, both the value of births
averted and expenditure incurred by the Programme have been
adjusted to constant prices at 1970-71 price level by using
the WPI. The results show an erratic trend for the period
taken, due to relative performance of the Programme.

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However, on an average, during 1963-74 Family Planning Programme in Andhra Pradesh shows a Benefit-Cost Ratio of 33.1:1. This justifies, Raju concludes, the huge amount invested in Family Planning and can also be regarded as an indicator of high economic efficiency of the Programme.

**Rani Gopal**'s work **(1984)** on Benefit-Cost Analysis of the Indian Family Welfare programme is another study in the row in which no actual attempt has been made to estimate the benefits of family planning programme. ·Here also only number of births averted has been estimated by the author and then Repetto's estimate of value per birth averted has been used to calculate year-wise total benefits for the period 1966-67 to 1978-79. Adjusting both, the value per birth averted and expenditure incurred on the Family Welfare Programme at constant prices (at 1970-71 = 100), the author has estimated the Benefit-Cost Ratio for each year. A declining trend with the growth rate of -17 per cent is obtained. The ratio has declined from 82.06 to 7.05 during the period 1966-67 to 1978-79. Further projected performance of the programme shows that the ratio will increase slightly to 11.31 by 1980-81, but again gradually decline to 8.75 by 2001. These results lead the author to the conclusion that the benefits are not increasing corresponding to the growth in expenditure and though the

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benefits are underestimated, the effectiveness of the programme is declining.

This study suffers from a serious flaw. The author has calculated yearly expenditure at constant prices (1970-71 = 100) by simply multiplying current expenditure by WPI, which is incorrect. This incorrectly deflates the expenditure figures of the period before 1970-71 and inflates post 1970-71 figures. As a result this incorrect exercise makes all the results of the study and their analyses incorrect. Correct figures of expenditure at constant prices may be derived by dividing the current expenditure by WPI and then multiplying this ratio by hundred. Substitution of correct figures in Rani Gopal's exercise gives a different picture. The Benefit-Cost Ratios show an erratic trend for the period. Though a decline from 60.74 in 1966-67 to 26.42 in 1978-79 is registered, there are substantial fluctuations during the period. The difference between two trends may be observed from the table (1.1)

More recently Cost-Benefit Analysis of the Family Planning Programme in India has been attempted by **Gupta and Talwar (1992)** by adopting a methodology used by **Chao et.al. (1984)**. This study is accomplished using three of the four components of the Fam Plan System of Models : Impact, Cost and Benefit.

They have carried out two sets of analyses to estimate returns from Family Planning Programme. The first set for the period 1971-2000 measures the costs of the Programme from 1971 through 1990 and benefits upto 2000. And the second set for the period 1991-2000 measures the expected costs and benefits from the programme in the future from 1991 to 2020 by continuing it to achieve NRR=1 during the period 2006-2011.

They have estimated the number of births averted by making two population projections-one with no Family Planning Programme in operation assumption and another with Family Planning Programme in operation assumption. The cost-benefit estimates have been calculated from projections over 30 years under the two sets of analyses. Benefits are measured in terms of expected savings in government expenditures from births averted in the six major social and public sectors of health, educations, food subsidies and social welfare, housing, transportation and energy (electricity). Costs are measured by actual and expected expenditure on the Family Planning Programme in the respective periods. A discount rate of 6 percent has been used to work out Benefit-Cost Ratios and Internal Rate of Return on the investment in Family Planning Programme has also been calculated for its comparison with other sectors for justifying investment in the Programme.

The results of the study show that for the period 1971-2000 the Benefit-Cost Ratio becomes greater than one by 1990 and reaches 4.64 by the year 2000 after starting from zero in 1971. For the period 1991-2020 Benefit-Cost Ratio obtains a value of 11.52 by starting at 0.01 in 1991. At the same time calculated Internal Rates of Return (IRR) shows reasonably good value of 18 percent for the period 1971-2000 and quite high value of 54 percent for the period 1991-2020.

Thus, on the basis of obtained results the authors conclude that Indian Family Planning Programme has been an excellent financial investment for the government and the nation. Hence they should not only be continued, but also be intensified in the future to achieve the goals set forth and to maximize the returns in the future.

This study is basically a financial analysis which estimates financial returns to the government (also claimed by the authors) on the investment made by it and does not take into account the costs and benefits to the society or economy as a whole.

The literature available on this subject is very limited. Though we have undertaken efforts to cover most of these studies, some more studies -- owing to their non-

availability could not be reviewed.Some evaluative studies of Indian Family Planning Programme by applying Cost-Effectiveness Analysis technique (Dass 1971; Rajan 1987 etc.) are also available but they are not reviewed here (despite the fact that CEA is considered to be a variant of CBA) because these evaluations do not assess the inherent worth of the Programme.

TABLE 1.1

BENEFIT-COST RATIOS

| YEAR | VALUE OF AVERTED BIRTHS IN Rs.LAKHS (AT 1970-71 PRICES) | RANI GOPAL'S ESTIMATE | | CORRECTED | |
|---|---|---|---|---|---|
| | | EXPENDITURE ON FAMILY WELFARE IN Rs.LAKHS (AT CONSTANT PRICES) | BENEFIT -COST RATIOS | EXPENDITURE ON FAMILY WELFARE IN Rs.LAKHS (AT CONSTANT PRICES) | BENEFIT -COST RATIOS |
| 1966-67 | 98496 | 1200.28 | 82.06 | 1621.50 | 60.74 |
| 1967-68 | 169236 | 2392.11 | 70.74 | 2870.46 | 58.96 |
| 1968-69 | 152118 | 2834.84 | 53.66 | 3342.28 | 45.51 |
| 1969-70 | 134406 | 3577.17 | 37.56 | 3816.90 | 35.21 |
| 1970-71 | 129438 | 4890.43 | 26.46 | 4890.43 | 26.47 |
| 1971-72 | 200988 | 6881.96 | 30.08 | 5848.07 | 34.37 |
| 1972-73 | 273240 | 9689.38 | 28.18 | 6862.99 | 39.81 |
| 1973-74 | 99900 | 9139.65 | 10.94 | 4140.72 | 24.13 |
| 1974-75 | 132678 | 10790.15 | 12.30 | 3547.63 | 37.40 |
| 1975-76 | 248616 | 13107.79 | 18.96 | 4659.75 | 53.35 |
| 1976-77 | 701703 | 31500.04 | 22.28 | 9795.14 | 71.64 |
| 1977-78 | 100602 | 17062.00 | 5.90 | 5023.52 | 20.03 |
| 1978-79 | 151092 | 20093.71 | 7.50 | 5659.18 | 26.70 |

Source:Computed from K. Rani Gopal(1984),Benefit-Cost Analysis of the Indian Family Welfare Programme,The Indian Economic Journal,Vol.31 No.34. pp.49-50.

# CHAPTER 2

## Chapter II

## METHODOLOGY

## The Approach

A Cost-Benefit Analysis of the Family Welfare Programme in India has been attempted in this study for the period 1966-67 to 1989-90. The benefits and costs of the FWP, to the society, are compared with the situation in which no such programme existed. This study adopts a significantly modified form of the methodology used by Zaidan (1971). Both costs and benefits arising from averted births through the provisions of Family Planning services have been estimated for each year of the period and then comparisons have been made between them to assess the worth of the programme.

Any programme creates a whole series of successive effects, resulting in the problem of finding out the 'cut-off' point as to which effects are to be included. In theory, all the effects should be included for a proper evaluation since any 'cut-off point' will have implications for the evaluation. A judgment is therefore required as to which effects are so minimal as not to affect the evaluation; boundaries have to be drawn around programme effects.

As valuation of intangible effects is problematic, only tangible effects have been considered here. The details are given below.

Benefits are measured in terms of (i) Consumption expenditure that would have been incurred if births were not averted and which are now available to the population and (ii) Savings in government expenditure in the two major social and public service sectors of health and education as a result of averted births. A time horizon of 70 years has been taken for the analysis. Actual data for the relevant variables have been used till the year they are available. After that two alternative situations have been assumed. In the first situation figures of relevant variables in future years have been assumed to remain at the same level as it was in the last year for which the data is actually available; and in the second, they are assumed to be growing at certain rates depending upon their past trends. All the figures are adjusted to 1970-71 price level by using Wholesale Price Index (WPI).

Averting a birth in a particular year results in streams of benefits over years. Since the benefits realized in the near future are likely to be preferred by individuals (or the society as a whole) to the benefits of an equal magnitude that occur in a later period, therefore technique

of discounting -- which allows these streams to be added by using differential weights to each year to reflect the view of future -- has to be applied. The present values, thus arrived at, are highly sensitive to the rate of discount chosen. But there is no agreement amongst the economists regarding the choice of the rate of discount which represents society's collective preference for present over future. Different rates have been used by different authors depending upon the purpose of their studies.

Taking these facts into consideration three alternative discount rates, viz. 6 percent, 10 percent and 12 percent, have been used in this study for obtaining the present values of benefits as well as costs. First two rates have been frequently used in the past studies on the subject, while the third is generally used by the Planning Commission in its evaluative studies.

The consumption benefits have been estimated after taking into account the fact that consumption by persons of different ages are different. The benefits from avoiding expenditure on health have been calculated on the assumption that the government spends equal amount on all the persons irrespective of their age. For estimating benefits from avoiding expenditure on education, primary and middle education only have been taken into account due to

nonavailability of consistent data on secondary education. It is assumed that education of a child begins at the age of 6 years. The child gets primary education upto the age of 11 years and then upto 14 years of age he gets middle level education. At both levels of education the number of total enrollments and the percentage of children enrolled from corresponding age group (Enrollment ratio) have also been taken into account.

The total of discounted values of each component of the benefits have been assigned as the benefits of averted births in that particular year.

The cost side of our study has two components. Firstly, the expenditure incurred on the Family Welfare Programme in each year and the second is the magnitude of the loss of output resulting from a smaller labour force as the result of the delayed effects of lower fertility (it is also taken as negative benefit). The loss of production resulting from births averted in a particular year is measured by the present value of marginal product of labour through their lives. Here, It is assumed that a person enters in the labour force at the age of 15 and contributes to production till the age of 60. For the marginal productivity of labour also two alternative situations have been taken for the future to serve our purpose?of

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calculation.   First situation assumes that the marginal
product of labour in future years will remain at the same
level as in the last year, for which actual data is
available, while in the second situation it is assumed to be
growing at the same rate as the per capita consumption
expenditure is growing.  On the basis of these assumptions
the present value of the marginal product of labour is
estimated as the cost of averted births (apart from FWP
expenditure) in a year.  Here again the present value has
been calculated at three alternative discount rates of 6%,
10% and 12%.  This exercise has been performed for each year
of our period of study.  While calculating benefits and
costs allowances have been made for the possibilities for
the child's death at various ages.

Besides the above mentioned costs and benefits, there
are some other 'initial' effects associated with the
programme.  There are some 'Secondary' effects also.
However in order to limit the scope of the study they have
not been considered.

After getting the estimates of benefits and costs of
averting births for each year of the period of our study an
attempt have been made to calculate the Benefit-Cost Ratios
for analysing the economic implications of the programme.

But one problem arises here.  We have taken the figures

of number of births averted and expenditure on FWP a government source -- the FWP year books. There the time-phasing of the births averted as a result of acceptance of family planning methods has not been given. Thus it is most likely that a fraction of births averted figure given for a year may be the result of expenditures incurred in previous years on family planning services. It makes the benefits of averted births in a particular year non comparable with the expenditure incurred on FWP in that year. Thus calculating the Benefit-Cost Ratios for each year will give substantially erroneous results. To obtain results with minimum of these possible errors, we have adopted a different approach. In this approach, which may be called 'cumulative approach', the Benefit-Cost Ratios have been calculated not for different years but, for different sub periods. Present values of benefits and costs have been obtained by applying discounting procedure (at 6%, 10% and 12%) for each sub period. These present values are then used for calculating Benefit-Cost Ratios.

This approach gives fairly correct estimates of Benefit-Cost Ratios though some possible errors in the extreme sub-periods are not ruled out.

Estimates of Benefit-Cost Ratios are sensitive to the treatment of loss in production as negative benefit or as

positive cost (called 'specification problem' by Birch and Donaldson,1987). Keeping this in mind we have calculated the Benefit-Cost Ratios for each sub-period according to two different methods. The first method which we call 'net method', takes widely applied 'value of births averted' approach, in which value of birth averted is the difference between resulted present value of expenditure avoided and present value of production lost. The cost side includes only the expenditure incurred to avert the birth through provisions of Family Planning Programme as the loss in production has been used as negative benefit. The second approach, also followed by Zaidan (1971), includes present value of production lost in the cost side (i.e. as positive cost) along with expenditure incurred on averting births and the benefit side includes present value of expenditures avoided. We call it 'Gross Method'.

As we have mentioned earlier, we have taken two different situations for calculating each component of benefit side and for that of marginal product of labour of cost side. With the help of those two situation, three scenarios have been assumed for final analysis.

Our first scenario deals with the case when per capita consumption expenditure, per capita government expenditure on education and health, and marginal product of labour, all

are based on situation I.   The second scenario deals with
the case when all the four are growing according to
situation II.   And the third scenario deals with the case
when the first three, i.e., the per capita consumption
expenditure, per capita government expenditure on education
and that on health are growing according to situation II
whereas the marginal product of labour is based on
situation I.

## 2.2 Detailed Steps

### 2.2.A Benefit Side

To estimate the benefits of a birth averted in the year
K, we have used following expression:

$$B_k = \sum_{i=0}^{69} \frac{Y_i}{(1+r)^i} + \sum_{i=0}^{69} \frac{H_i}{(1+r)^i} + \sum_{i=6}^{10} \frac{R_i}{(1+r)^i} + \sum_{i=11}^{13} \frac{M_i}{(1+r)^i} \quad (1)$$

Where

$Y_i = y_i \cdot p_i$, the anticipated consumption of an unborn child
  in year i, allowance being made for the possibilities
  of the child's death at various ages.

$y_i$ = annual consumption of child between ages i and (i+1)

$p_i$ = probability of survival between ages i and (i+1)

$H_i = h_i \cdot p_i$; the anticipated government expenditure on health
  of an unborn child in year i,

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$h_i$ = annual government expenditure on health per person between age i and (i+1)

$R_i$ = $r_i.p_i.v_i$, anticipated government expenditure on primary education of an unborn child in year i

$r_i$ = annual government expenditure on primary education per child between ages i and (i+1)

$v_i$ = enrollment ratio for primary level education in year i

$M_i$ = $m_i.p_i.z_i$; anticipated government expenditure on middle level education of an unborn child in year i

$m_i$ = annual government expenditure on middle level education per child between ages i and (i+1)

$z_i$ = enrollment ratio for middle level education in year i

$r$ = rate of discount

## 2.2 A1 Consumption

The first term of the expression (1) represents the present value of the consumption stream of a person through his life, which is avoided by averting a birth and hence have been taken as benefit accrued to the society. In order to calculate it data are required showing the average consumption of an individual at various ages. The probability of survival of the persons to these ages will also be required.

Since data on consumption in required form is not available, we have generated them by making adjustments in

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the available data. For the total consumption of the population, figures of Private Final Consumption Expenditure (PFCE) have been taken from various issues of NLational Accounts Statistics (NAS) published by Central Statistical Organisation (CSO). This has been done to avoid any possible double counting, which may arise if GNP minus gross capital formation is taken as the measure of consumption, since avoided government expenditure on some social and public services as separate benefits have also been taken separately. Per capita consumption figures have been obtained by dividing PFCE figures by estimated population of corresponding years given in NAS. Data of per capita consumption upto 1989-90 have been calculated from the actual data available for PFCE. For rest of the years of our time horizon, figures have been obtained under two alternative situations. First of it assumes that per capita consumption in future years will remain at the level of 1989-90. And in the second situation it has been assumed to be growing after 1989-90 at the rate of 3.2 per cent, which has been its actual growth rate in the decade of the eighties.

The task of deriving the consumption of individuals of different ages from the consumption figures of an average person has been accomplished with the help of table of daily

calorie requirements for the persons of different ages published by Indian Council of Medical Research (ICMR). It has been assumed that the actual expenditure on food, and hence the total consumption expenditure (since food is the largest item of consumption), conform to the established ratios of the caloric requirements of different ages. We are chiefly concerned here with the ratios, and have assumed these to be the same as those of actual levels of calorie intake. Given the ratios, the consumption of persons in different age groups has been computed by taking into account average consumption figures (per capita) and the age distribution of the population, and by ensuring that weighted average of per capita consumption of different age groups (Weighted by the proportion of persons in each age groups) equaled the national average. Age distributions of the population have been taken from the documents of census operations held in 1971 and 1981. Following this procedure, age-wise distribution of per capita consumption expenditure has been estimated for each year of our period of study. For probability of survival figures, life tables provided by census documents of 1971 and occasional papers of office of Registrar General of India have been used.

Using three alternative discount rates of 6 percent, 10 percent and 12 percent figures of benefits arising from

avoided consumption expenditure of an averted birth for each of the year have been calculated.

## 2.2 A2 Health

The second term of expression (1) measures savings in government expenditure on health services from averting a birth. To estimate this term per capita health expenditure figures have been obtained from various issues of **Health Information India** and **Health Statistics in India** published by the concerned ministry. The actual data are available upto 1986-87. For rest of the years of our time horizon two situations have been assumed. First situation is based on the assumption that in future years per capita expenditure on health remains at the level of 1986-87. And the second situation assumes it to be growing at the rate of 5.8 percent (the actual growth rate during 1966-87). Adjustments have been made by taking the probability of survival.

Estimates of benefits arising from avoided expenditure on health for each year have been derived through the discounting procedure.

## 2.2.A3 Education

The third term of the expression (1) measures the savings in government expenditures that would have been

incurred for providing primary education to the unborn child. The expenditures incurred by the government consists of recurring expenditures plus non-recurring expenditures. However, because of non-availability of consistent data of non-recurring expenditures (capital costs), only recurring expenditures have been taken into account in this exercise. Even the recurring expenditure data are available only upto 1983-84 . As the recurring expenditure is a function of number of students, per capita expenditure have been obtained by dividing recurring expenditure by number of total enrollments in each year. For the rest of the period of our time horizon, the figures of per capita expenditure have been obtained on the basis of two alternative situations. The figures obtained for the first situation are based on the assumption that in future years also they will remain at the 1983-84 level. While in the second situation they are assumed to be growing at the rate of 2.09 percent (based on the past trend).

These per capita expenditure figures have been multiplied by enrollment ratios (percentage of children of corresponding age group, i.e., 6 to 11 years) and probability of survival, to obtain the anticipated expenditure on the primary education of an unborn child in each year. Data on enrollment ratio are available upto 1989-90, and after that we have assumed that it will remain

at 100 per cent (in 1989-90 it was 99.96 per cent) during the rest of the years of our time horizon. Finally, three alternative estimates of benefits arising from avoided expenditure on primary education in the year k have been obtained by applying three alternative discount rates of 6%, 10% and 12%.

A similar procedure has been followed to estimate the savings in the government expenditure on middle level education by averting a birth (given by fourth term of the expression (1)). Here also recurring expenditure figures are available upto 1983-84 only. For rest of the period of our time horizon, two alternative situations have been assumed. In the first per capita expenditure on middle level education remains at the level of 1983-84. And in the second situation it has been assumed to be growing at a rate of (-)0.64 per cent. For the enrollment ratios in the future, we have made projections on the basis of available data. All the basic statistics on education have been taken from various government documents, namely, **Selected Educational Statistics, Education in India and Health Stastistics in India.**

## 2.2. B Cost Side

Costs of preventing a birth in the year 'k' have been given in the following expression.

$$C_k = \sum_{i=15}^{59} \frac{MP_i}{(1+r)^i} + E_k \qquad \cdots\cdots \quad (2)$$

Where,

$MP_i = mp_i.p_i$; anticipated marginal product of labour of the unborn child in year i

$mp_i$ = the marginal product of labour of an average person between ages i and (i+1).

$p_i$ = probability of survival between ages i and (i+1)

e = expenditure incurred on averting a birth through provisions of family planning services.

r = rate of discount.

### 2.2.B2  The Production Stream

The first term of the expression (2) represents the positive cost (or negative benefit) of preventing a birth in terms of reduced output in the long run resulting from loss of one potential member of labour force. Ideally, to measure this reduction one needs estimates of marginal product of labour for those years during which unborn child would have been a part of labour force. But non availability of any data on economy-wide marginal product of labour made our task very difficult. For our purpose, we have assumed that

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marginal product of labour in agriculture, may be a reasonably good substitute for economy-wide marginal product of labour. This assumption is based on the fact that around three-fourths of labour force in India is employed in agriculture. But data on marginal product of labour in agriculture are also not available. To overcome this problem, it has been assumed that wage rate in agriculture reflects the value of marginal product. This assumption is based on the qualitative evidence that landowners hire labour at positive wages, which means in their judgment the contribution of labour is equal to the wage rate. The Cobb-Douglas estimates show that as a maximum the marginal product equals the wage rate. However, industry and services sector have not been taken into account where marginal productivities are much higher. Thus, on the whole real wage rate in agriculture may be taken as a measure of marginal product of labour in India. At the most this will inflate our cost and reduce our net benefit (or Benefit-Cost Ratio).

Since data on economy-wide wage rate in agriculture are also not available, they have been computed by taking Jose's (1988) estimates for sex-wise wage rates for 16 states. Jose (1988) has computed daily money wage rates of male and female agricultural labourers for the period 1970-

71 to 1984-85 by using data from Agricultural Wages in India, published by Ministry of Agriculture. First of all, the wage rates for persons have been computed from given wage rates of male and female workers by weighing them with their respective percentage in total labour force (given by Jose,1988). After computing wage rates of persons for each state, we have obtained estimates of wage rates in agriculture for economy as a whole by weighing them with percentage of their agricultural workers in the total agriculture labour force of all the states taken together. Then the obtained wage rates are converted into annual figures. These annual figures are almost stagnant (at constant prices) for the whole period of 1970-71 to 1984-85. Thus for post 1984-85 situation I it is assumed to be stagnant at 1984-85 level. And, in the alternative situation (i.e.situation-II), they are assumed to be growing at the rate at which per capita consumption expenditure has been growing during the eighties, i.e. at 3.2 per cent per annum.

Keeping in mind the proportion of rural labour force in total work force, it has been assumed that a worker enters into labour force at the age of 15 years and continues to work till he attains the age of 60 years. Though it is true that contribution into production by a worker depends also on his age, but in the absence of any reliable estimate or

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criterion the distribution of marginal product into different age groups has not been taken into account. This hardly affects our final estimates. Finally, obtained estimates of marginal product of labour have been multiplied by probability of survival figures to compute the anticipated contribution by a marginal worker through his life. Then the present value of his contribution have been obtained (by using three alternative discount rates), in terms of lost production.

## 2.2.B2 Expenditure on Family Planning Services

Annual expenditures on Family Welfare Programme (FWP) have been taken from various issues of Family Welfare Programme Year Book. Expenditure incurred on preventing a birth has been calculated (as in the expression 2) by dividing the annual expenditures on FWP by number of births averted in respective years.

## 2.3 Benefit-Cost Ratio

Total benefits and costs of averting a birth have been computed by two methods, viz. the Net Method (taking marginal product as negative benefit) and the Gross Method (taking marginal product as positive cost). Total costs and total benefits resulting from all the births averted through the provisions of FWP have been calculated by multiplying

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number of births averted in each year with total cost and total benefits of averting a single birth in that year.

We could have calculated the Benefit-Cost Ratios for each year by dividing total costs and total benefits of that year. However, due to problem of time phasing of births averted 'Cumulative Approach' have been adopted.

## 2.3A Cumulative Approach

The procedure followed to make comparisons of costs and benefits is given below.

First of all the period of analysis (1966-67 to 1989-90) has been divided into 24 sub-periods, where the first sub-period consists of first year of our analysis (1966-67), the second, sub-period consists of first two years (1966-67 and 1967-68), the third of first three years (1966-67 to 1968-69) and so on.

Now, if benefits and costs arising from averting $n_i$ births in the year $k_i$ are $Bn_ik_i$ and $Cn_ik_i$ respectively, then present values of total benefits and total costs, $Bs_i$ and $Cs_i$ respectively, of sub-periods $S_i$ is given by,

$$Bs_i = \sum_i \frac{Bn_ik_i}{(1+r)^i}$$

$$\text{and } Cs_i = \sum_i \frac{Cn_ik_i}{(1+r)^i}$$

where, i = 0,1,2,......,23

and    r = rate of discount

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Then, Benefit-cost Ratios are given by $Bs_i/Cs_i$. Here also 3 rates of discount 6%, 10% and 12% have been used $Bn_ik_i\bar{s}$ and $Cn_ik_is$ used to calculate $Bs_is$ and $Cs_is$ respectively, have themselves been calculated by applying two alternative methods -- Net Method and Gross Method.

## 2.3.A1 Net Method

Under this approach $Bn_iK_i$ in the year $k_i$ is computed by substracting first term of expression (2) from expression (1) and then multiplying the obtained result by $n_i$ (no. of births averted in the corresponding year). The costs term $Cn_ik_i$ includes only total expenditure on Family Welfare Programme.

## 2.3.A2  Gross Method

This approach has been used by Zaiden (1971) also. $Bn_ik_i$ in this approach is obtained by multiplying expression (1) by $n_i$ (is no. of births averted in the year $K_i$). The costs ($Cn_ik_i$) are obtained by multiplying expression (2) by $n_i$.

## 2.3.A3  The Scenarios

Finally, the above two methods have been applied to calculate the Benefit-Cost Ratios for each sub-period under three Scenarios mentioned earlier in this chapter.

## TABLE 2.1

### BASIC STATISTICS

| YEAR | POPULATION IN LAKHS | BIRTHS AVERTED (IN LAKHS) | EXP. ON FWP AT CURRENT PRICES (Rs. LAKHS) | PVT. FINAL CONS. EXP. AT CURRENT PRICES (Rs. LAKHS) | PER CAPITA GOVT. EXP. ON HEALTH (IN Rs) | TOTAL DIRECT/ RECURRING EXP. BY TYPE OF INSTITUTION (Rs.THOUSANDS) | |
|------|------|------|------|------|------|------|------|
| | | | | | | PRIMARY | MIDDLE |
| 1966-67 | 4950 | 5.518 | 1342.6 | 2378500 | 3.93 | 1444559 | 965787 |
| 1967-68 | 5060 | 8.442 | 2652.3 | 2834400 | 4.51 | 1705502 | 1148096 |
| 1968-69 | 5180 | 12.584 | 3051.5 | 2838500 | 5.06 | 1862679 | 1319250 |
| 1969-70 | 5290 | 16.161 | 3618.42 | 3077600 | 5.81 | 2089720 | 1528669 |
| 1970-71 | 5410 | 19.172 | 4890.43 | 3254500 | 6.21 | 2345663 | 1709368 |
| 1971-72 | 5540 | 21.415 | 6175.56 | 3510100 | 6.39 | 2579875 | 1884691 |
| 1972-73 | 5670 | 25.317 | 7974.8 | 3868800 | 6.88 | 2898625 | 2104733 |
| 1973-74 | 5800 | 29.925 | 5784.59 | 4663800 | 7.72 | 3316858 | 2441963 |
| 1974-75 | 5930 | 30.299 | 6860 | 5650500 | 9.44 | 3848572 | 2926359 |
| 1975-76 | 6070 | 31.294 | 8940 | 5782200 | 10.63 | 4463148 | 3409672 |
| 1976-77 | 6200 | 37.228 | 17280 | 6007900 | 13.31 | 5374525 | 4069124 |
| 1977-78 | 6340 | 50.500 | 9700 | 6918300 | 15.05 | 5901932 | 4324089 |
| 1978-79 | 6480 | 49.281 | 11040 | 7524200 | 17.29 | 6549863 | 4707451 |
| 1979-80 | 6640 | 49.087 | 12180 | 8170400 | 19.91 | 7156249 | 5287051 |
| 1980-81 | 6790 | 49.329 | 14640 | 9929200 | 23.53 | 8384658 | 5478173 |
| 1981-82 | 6940 | 51.059 | 19220 | 11376500 | 27.86 | 9716133 | 6826234 |
| 1982-83 | 7090 | 54.709 | 29460 | 12517400 | 32.85 | 11319083 | 8030570 |
| 1983-84 | 7240 | 62.101 | 39210 | 14694800 | 37.20 | 12886963 | 9123632 |
| 1984-85 | 7390 | 72.686 | 42890 | 16209000 | 41.24 | N.A. | N.A. |
| 1985-86 | 7550 | 81.203 | 53654 | 17668300 | 47.28 | N.A. | N.A. |
| 1986-87 | 7700 | 90.008 | 57023 | 19774000 | 54.57 | N.A. | N.A. |
| 1987-88 | 7850 | 99.555 | 64214 | 22362900 | N.A. | N.A. | N.A. |
| 1988-89 | 8000 | 108.716 | 76446 | 26160300 | N.A. | N.A. | N.A. |
| 1989-90 | 8160 | 116.714 | 79385 | 28964000 | N.A. | N.A. | N.A. |

Sources : (i)NAS,Various Issues; (ii) Family Planning Year Book, Various Issues;
(iii) Health Information in India 1991; (iv)Health Statistics in India, Various
Issues; (v)Selected Educational Statistics, Various Issues.

# CHAPTER 3

# Chapter III

## RESULTS

### 3.1. Benefits Side

#### 3.1.1 Consumption

Alternative estimates of present value of anticipated consumption stream of an unborn child, computed for two assumed alternative situations, are summarised in the table (3.1). As is evident from the table, for both the situations these estimates show secular increasing trends over our period of analysis (1966-67 to 1989-90). The benefits resulting from averting a birth, measured in terms of avoided consumption, have been rising in each successive year since 1966-67.

#### 3.1.2 Health

Table (3.2) summarises the estimates of present value of anticipated government expenditure on health that the government would have incurred on an averted birth through his life. These estimates also show increasing trends in the cases of all the three alternative discount rates (6 per cent, 10 per cent and 12 per cent) for both the assumed situations.

### 3.1.3. Education

The estimates of benefits arising from savings in government expenditure on education (upto middle level) as a result of averting a birth, and measured in terms of present value of anticipated government educational expenses have been given in the table (3.3). These estimates are also rising in each successive year of the period 1966-67 to 1989-90.

### 3.1.4. Total Benefit

In our study the total benefits of preventing a birth is measured as sum total of the discounted streams of anticipated consumption expenditure and anticipated government expenditure on health and education of the unborn child. Estimates of these benefits are given in the table (3.4). First section of the table deals with the first of our two assumed situations. As the table shows, the total benefit of averting a birth has been growing over the period of our analysis at all the three discount rates used. A birth averted in 1966-67 gives alternative estimates of total benefit at Rs. 7897, Rs 4580 and Rs. 3275 using the respective discount rates of 6 per cent, 10 per cent and 12 per cent. And in 1989-90 they become as high as Rs. 10267, Rs. 6080 and Rs. 4982 respectively.

Second section of the table 3.4 contains the estimates of total benefit computed on the assumptions of situation II. Here also alternative estimates of total benefit have increasing trends at all the three alternative discount rates. Starting from Rs. 9128, Rs. 4853 and Rs. 3876 in 1966-67, these estimates, become Rs. 19684, Rs. 9452 and Rs. 7252 respectively, in 1989-90.

Largest contribution in the total benefit arising from averting a birth has been made by the benefits measured in terms of discounted consumption expenditure stream, in all the years (1966-67 to 1989-90) for both the situations. These results are arranged in table (3.5) and table (3.6), dealing with the situation I and the situation II respectively.

For both the situations, share of benefits arising from avoided consumption is more than 94 per cent in all the years at all the three alternative discount rates. However, the share falls (though marginally) in each successive year of the period at each discount rate. The share is lower at higher discount rates in each year.

Table (3.5) shows that the shares of rest of the two components in total benefit are very small. However, the share of savings in government educational expenditures is slightly higher than that of government health expenses in

this situation. Estimates for both the components show increasing trends over the years. However, estimates for share of educational expenses are lower at the higher discount rates used, while those for share of health expenses are higher.

For the second situation (table 3.6), educational expenses' shares show erratic trends, whereas health expenses' shares show increasing trends. However, these increases and fluctuations are of very small magnitude. The significant difference in this situation from the earlier one is that here estimates of educational expenses' share are lower at the higher discount rates used, while those of health expenses' share are higher.

On the whole, it may be said that in our scheme of analysis the major part of the total benefit is stemming from avoided consumption expenditure. However, its importance would have fallen had we included more items in the benefit side.

## 3.2. Cost Side

### 3.2.1. Production Stream

Estimates of present value of anticipated production stream of an unborn child, measured in terms of discounted

marginal product of labour, at the three alternative discount rates (6%, 10% and 12%) are given in table (3.7) for both the assumed situations.

In the case of the first situation estimates of lost production show rise upto year 1969-70 then after some years of stagnation again show rise in 1975-76 and remains stagnant thereafter upto 1989-90. While the estimates computed on the basis of assumption of our second situation show continuous rise during our period of study for all the three discount rates.

### 3.3. Net Benefit

Net Benefit or 'Value' of preventing a birth has also been calculated here by subtracting discounted stream of anticipated production of an unborn child from total of discounted streams of his anticipated expenditures (consumption, health and education). Since we have two estimates for each benefit and cost because of the two assumed situations, we could also obtain different estimates of the 'value' of preventing a birth.

### 3.3.1. Case I

Table (3.8) contains the estimates of 'value' of an averted birth, when estimates of both benefits and costs are computed on the assumptions of the first situation of our

analysis. Alternative estimates of value of a birth averted in 1966-67 in this case are Rs. 3362 (6% discount rate), Rs.2810 (10% discount rate) and Rs. 2562 (12% discount rate). These estimates show increasing trends for each discount rate over the period 1966-67 to 1989-90. In 1989-90 the alternative estimates of value of a birth averted are Rs. 4993, Rs. 4043 and Rs. 3646 respectively.

### 3.3.2. Case II

In this case the 'values' are estimated by taking the benefit estimates of situation II and cost estimates of situation I (table 3.9). As the table shows, estimates in this case also show increasing trends over the years but they are substantially higher than the estimates of corresponding years in the case I. At 10 per cent discount rate the value of preventing a birth in 1966-67 is Rs. 3083, while that in 1989-90 it is Rs. 7415. The increase in the later years are much higher in this case. It implies that given the assumptions of this case 'net benefit' of preventing a birth will grow in future.

### 3.3.3. Case III

In this case estimates of both benefits and costs are computed on the assumption of situation II (i.e., all the measures of benefits and costs are growing at certain

assumed rates). The estimates of 'value' of preventing a birth in this case are lower than those in the corresponding years of the other two cases (table 3.10). For the year 1966-67 the estimates are Rs. 2669, Rs. 2609 and Rs. 2461 at discount rates 6 per cent, 10 per cent and 12 per cent respectively. These estimates show declining tendency during the first few years (upto 1971-72), then start increasing. In 1989-90 they attain the values of Rs. 4012, Rs. 4143 and Rs. 3931 at the three discount rates respectively.

A fourth case could have also been considered by taking estimates of benefits computed on the assumption of situation I (i.e., on the assumption that per capita consumption and per capita government expenditures on health and education are stagnant in the future years at the level of the year for which the actual data is last available) and estimates of cost computed on the assumption of situation II (i.e., the marginal product of labour is increasing at the rate of 3.2 per cent per annum in the future years, which is also the actual growth rate of per capita consumption expenditure during the eighties). But in our view, .this is one of the most unlikely cases for India. We have therefore, not considered this case.

In these exercises (case I to case III) we have attempted to find out the value of preventing a birth for each year of our analysis. Since these 'values' are different in each year, it implies that for greater accuracy in any attempt of doing Cost-Benefit Analysis of a Family Planning Programme one should take the 'value' of the corresponding year for of which cost per birth averted is taken. However, Most of the evaluative studies of Family Planning Programme in India (Seal and Bhatnagar 1973, Sivarama Raju 1976, Rani Gopal 1984 etc.) have taken Repetto's (1968) figure for the 'value of preventing a birth' in 1966 for obtaining benefit-cost ratios in later years also, which is not proper.

## 3.4. The Total Cost and Benefit of FWP

So far we have talked only about the costs and benefits of averting a single birth. The total costs and benefits of FWP can be obtained by simply multiplying costs and benefits figures of averting a birth by the number of total births averted in respective years. Since all the above mentioned trends (related to a single averted birth) are of rising nature and the number of births averted through the provisions of FWP has also been increasing over the years, therefore, all the trends of the total costs and benefits of FWP are also rising. Two important tables (3.11) and (3.12)

give figures for the total benefits and the total production lost arising from the total number of births averted through the provisions of FWP respectively. With the help of these two tables and figures of expenditure on FWP, the rest of the calculations to obtain Benefit-Cost Ratios have been done.

## 3.5. Benefits-Cost Ratio

As has already been mentioned in the last Chapter, we have adopted a 'Cumulative Approach' to make comparison between benefits and costs of family welfare programme. This approach has been adopted to minimise the errors, which may arise due to the time phasing of the number of births averted figures, taken from official sources. The comparisons have been made under the three different scenarios.

## 3.5.A Scenario 1

Benefit-Cost Ratios for different sub periods have been calculated according to both Net Method and Gross Method. The estimates of benefits and costs have been calculated on the basis of our assumed situation I.

### 3.5.A1 Net Method

Benefit Cost Ratios (BCRs) for different sub periods show high values at all the three alternative discount rates

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(Table 3.13). The BCRs for all the three alternative discount rates ( 6% , 10% and 12% ), after decreasing slightly in the second sub-period (1966-67 to 1967-68), keep on rising upto the last sub-period. The BCRs for the first sub-period are 11.44, 9.56 and 8.72 at the three alternative discount rates 6%, 10% and 12% respectively. In the last sub period ( i.e for the whole period of our analysis ) they become 24.96, 18.83 and 16.3 respectively. Thus , these estimates of BCRs imply that investment in Family Welfare Programmes gives very high returns and these are increasing over time. A policy recommendation in this case may be that this programme ( FWP ) should not only be continued but more investment be made to get more returns.

### 3.5.A2. Gross Method

Benefit- Cost Ratios obtained by applying this method give somewhat different picture (table 3.14) . Though BCRs are increasing for the successive sub periods , except a fall in the second and third sub periods , their magnitudes are substantially less than those calculated by the Net Method for the Corresponding sub-periods. At 6% discount rate the value of BCR in first sub-period (1966-67 ) was 1.63 and it increased to 1.79 for the period 1966-67 to 1989-90. The magnitude of the increase in each successive sub-periods are so small that the BCR seems to be almost

stagnant over the time. This is true for other two discount rates also. However BCRs calculated by this method show higher value for higher discount rates. This tendency is in sharp contrast to that in Net Method. These results imply that though over the period ( 1966-67 to 1989-90 ) the Family Welfare Programme has given more benefits to the economy than the cost incurred by it, but the returns on investments in this programme has almost been stagnant. The policy implication in this case is that the programme should be continued with an attempt to make it more cost-efficient.

### 3.5.B. Scenario 2

The estimates of benefits and costs under this scenario have been calculated on the basis of our assumed situation II.

### 3.5.B1. Net Method

For all the discount rates (6%, 10% and 12%) BCRs estimated by this method give good values (Table 3.15). The benefits are at least 8 times higher than the costs for each discount rate. For initial sub-periods these ratios show some fluctuations (upto 1972-73), thereafter they keep on growing. In 1966-67 the value of BCRs were 9.08 (6% discount rate), 8.88 (10% discount rate) and 8.37 (12% discount rate)

and by 1989-90 they increased to 17.44, 16.67 and 15.18 respectively. These estimates imply that over the period, investment in Family Welfare Programmes has been proving to be a good investment. In other words, returns on the investments have been substantially high and increasing. However the values of the ratios of this scenario are lower than those of the first scenario for the corresponding sub-periods.

### 3.5.B2 Gross Method

Benefit Cost Ratios calculated by this method are summarised in the table (3.16 ). The ratios are not only very small compared to those calculated by the Net Method, they also show decreasing tendency in the subsequent sub-periods. At 10% discount rate the BCR in 1966-67 was 1.91 and by 1989-90 it was reduced to 1.73. Similarly , for the rest of the two discount rates , the ratios show declining tendency. However the magnitudes of the decline are very small. These results imply that though the Family Welfare Programme is beneficial from economic point of view (since BCR is greater than 1), the returns on investment are marginally declining over the period.

### 3.5.C Scenario 3

This scenario deals with the benefits and costs

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computed on the assumption that the per capita consumption expenditure, per capita government expenditure on health and per capita government expenditure on education are growing according to the assumption of the situation II. At the same time it is also assumed that marginal product of labour in the future years is based on the assumptions of situation I.

### 3.5.C1. Net Method

The Benefit Cost Ratio compute on the assumption of this scenario are quite high (Table 3.17). For the first sub-period (1966-67) their estimates for the three alternative discount rates (6%, 10% and 12% are 15.63, 10.94 and 9.23 respectively). In successive periods ( except the second ) the ratios keep on increasing. For the period 1966-67 to 1989-90, they reached at the alternative figures of 53.96, 26.19 and 20.38 respectively. These estimates of BCRs again lead to the conclusion that Family Welfare Programme (FWP) is highly desirable since benefits of this Programme is not only high but also rising over the time.

### 3.5.C2 Gross Method

The ratios are much smaller in this case compared with those calculated by the Net Method (Table 3.18). However, they are higher than the corresponding figures of the other

two scenarios. The estimates of the BCRs show rising tendency in the subsequent sub-periods of our analysis. Even the magnitudes of increase is higher in this scenario. At the discount rates of 6%, 10% and 12% the alternative estimates are 1.89, 2.35 and 2.66 for 1966-67 and 2.76, 3.15 and 3.47 for the sub-period 1966-67 to 1989-90. This does not only show the desirability of the programme but also implies that a more vigorous effort should be made in the future.

A fourth scenario could have also been assumed by taking situation I for the components of benefits (i.e per capita expenditures on consumptions, health and education will remain at the level of the year actual data for which is last available) and situation II for the marginal product of labour (i.e in the future it will grow at the actual growth rate of per capita consumption expenditure in the eighties). But in our view, this scenario is not plausible for a democratic country like India. Thus, we have left this scenario from our analysis.

### 3.6. Summary

It is clear from the results that Family Welfare Programme in India has been beneficial from the economic point of view over the period of our analysis, i.e. 1966-67 to 1989-90. In most of the cases the returns (measured in

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terms of Benefit-Cost Ratios) have been increasing over the years. However, the magnitude of the returns on the investment made in the FWP are highly sensitive to the method adopted.

TABLE 3.1

| PRESENT VALUE OF ANTICIPATED CONSUMPTION STREAM OF AN UNBORN CHILD (in Rs.) | | | | | |
|---|---|---|---|---|---|
| | SITUATION I | | | SITUATION II | | |
| YEAR | DISCOUNT RATES | | | DISCOUNT RATES | | |
| | 6% | 10% | 12% | 6% | 10% | 12% |
| 1966-67 | 7652.67 | 4425.15 | 3596.58 | 8822.74 | 4665.07 | 3713.75 |
| 1967-68 | 7701.14 | 4448.59 | 3613.01 | 8983.55 | 4718.59 | 3746.81 |
| 1968-69 | 7747.11 | 4468.76 | 3625.67 | 9151.14 | 4772.32 | 3778.33 |
| 1969-70 | 7793.61 | 4489.31 | 3638.44 | 9329.19 | 4830.28 | 3812.48 |
| 1970-71 | 7846.73 | 4514.50 | 3654.83 | 9524.51 | 4897.14 | 3853.05 |
| 1971-72 | 7907.26 | 4546.99 | 3678.17 | 9738.65 | 4976.03 | 3903.77 |
| 1972-73 | 7969.81 | 4582.01 | 3703.97 | 9967.09 | 5062.71 | 3960.55 |
| 1973-74 | 8045.91 | 4629.85 | 3741.99 | 10222.22 | 5168.04 | 4033.61 |
| 1974-75 | 8127.68 | 4685.13 | 3787.85 | 10497.09 | 5287.25 | 4119.10 |
| 1975-76 | 9052.47 | 5116.36 | 4112.54 | 12109.69 | 5846.16 | 4498.22 |
| 1976-77 | 9154.77 | 5193.46 | 4180.29 | 12471.98 | 6011.09 | 4621.39 |
| 1977-78 | 9249.75 | 5266.04 | 4244.41 | 12846.13 | 6181.02 | 4748.03 |
| 1978-79 | 9327.22 | 5322.89 | 4293.31 | 13222.55 | 6345.36 | 4867.13 |
| 1979-80 | 9403.71 | 5380.83 | 4343.85 | 13618.86 | 6521.73 | 4996.26 |
| 1980-81 | 9381.53 | 5390.52 | 4359.47 | 14050.18 | 6725.87 | 5151.57 |
| 1981-82 | 9468.80 | 5464.72 | 4428.26 | 14502.51 | 6943.43 | 5318.60 |
| 1982-83 | 9546.82 | 5532.65 | 4491.91 | 14969.11 | 7169.00 | 5491.25 |
| 1983-84 | 9609.85 | 5587.94 | 4543.88 | 15445.74 | 7394.87 | 5664.28 |
| 1984-85 | 9663.63 | 5635.73 | 4589.04 | 15937.59 | 7628.62 | 5842.436 |
| 1985-86 | 9535.81 | 5678.71 | 4630.34 | 16448.33 | 7873.45 | 030.07 |
| 1986-87 | 9751.22 | 5717.45 | 4486.23 | 16980.86 | 8131.47 | 6229.05 |
| 1987-88 | 9782.49 | 5747.66 | 4697.80 | 17529.16 | 8396.64 | 6433.366 |
| 1988-89 | 9799.11 | 5764.15 | 4714.23 | 18089.71 | 8665.22 | 639.25 |
| 1989-90 | 9801.26 | 5766.29 | 4716.37 | 18664.32 | 8938.24 | 6847.43 |

Sources :(i)NAS, Various Issues; (ii)Recommended Dietary Intakes for
Indians Table 1 p.64 ICMR (1990); (iii)Life Tables : (a) Census of
India (1971) Series 1 India Paper 1 of 1977 RGI;(b)SRS Based Abridged
Life-Tables 1981-85 Occasional Paper No. 1 of 1989 RGI (v)
Health Information in India 1991 (vi) Economic Survey, Various
Issues.

TABLE 3.2

## PRESENT VALUE OF ANTICIPATED HEALTH EXPENSES STREAM ON AN UNBORN CHILD
(in Rs.)

| YEAR | SITUATION I | | | SITUATION II | | |
|------|-------------|---|---|--------------|---|---|
| | DISCOUNT RATES | | | DISCOUNT RATES | | |
| | 6% | 10% | 12% | 6% | 10% | 12% |
| 1966-67 | 116.51 | 65.68 | 53.10 | 177.75 | 78.05 | 59.18 |
| 1967-68 | 120.36 | 68.38 | 55.42 | 187.53 | 82.28 | 62.35 |
| 1968-69 | 124.36 | 71.26 | 57.92 | 197.98 | 86.86 | 65.81 |
| 1969-70 | 128.02 | 73.82 | 60.10 | 208.64 | 91.33 | 69.08 |
| 1970-71 | 131.39 | 77.00 | 61.99 | 219.59 | 95.72 | 72.19 |
| 1971-72 | 134.90 | 78.53 | 64.03 | 231.32 | 100.51 | 75.63 |
| 1972-73 | 138.79 | 81.38 | 66.49 | 244.13 | 105.99 | 79.66 |
| 1973-74 | 143.07 | 84.66 | 69.38 | 258.06 | 112.19 | 84.33 |
| 1974-75 | 148.01 | 88.68 | 73.04 | 273.46 | 119.46 | 90.01 |
| 1975-76 | 168.31 | 100.06 | 82.41 | 341.32 | 141.22 | 104.95 |
| 1976-77 | 173.68 | 104.68 | 86.74 | 361.53 | 150.46 | 112.17 |
| 1977-78 | 178.09 | 108.42 | 90.21 | 381.93 | 159.33 | 118.92 |
| 1978-79 | 182.27 | 112.03 | 93.59 | 403.37 | 168.61 | 125.97 |
| 1979-80 | 185.58 | 114.83 | 96.17 | 425.26 | 177.69 | 132.68 |
| 1980-81 | 189.27 | 118.09 | 99.25 | 448.96 | 187.90 | 140.41 |
| 1981-82 | 193.19 | 121.69 | 102.70 | 474.44 | 199.19 | 150.00 |
| 1982-83 | 196.72 | 125.00 | 105.91 | 501.19 | 211.01 | 158.19 |
| 1983-84 | 199.10 | 127.21 | 108.05 | 528.55 | 222.65 | 166.94 |
| 1984-85 | 201.28 | 129.29 | 110.08 | 557.62 | 235.16 | 176.43 |
| 1985-86 | 203.24 | 131.21 | 111.99 | 588.51 | 248.63 | 186.71 |
| 1986-87 | 204.38 | 132.35 | 113.12 | 620.79 | 262.55 | 197.29 |
| 1987-88 | 204.38 | 132.35 | 113.12 | 654.31 | 276.73 | 207.95 |
| 1988-89 | 204.38 | 132.35 | 113.12 | 689.65 | 291.67 | 219.18 |
| 1989-90 | 204.38 | 132.35 | 113.12 | 726.89 | 307.42 | 231.01 |

Sources : (i) Health Information in India , Various Issues ; (ii)
Health Statistcs in India , Various Issues ; (iii) Life Table :
Census of India
(1971) Series 1 India Paper 1 of 1977 RGI,(iv) SRS Based Abridged
Life-
Tables 1981-85 Occasional Paper No. 1 of 1989 RGI; (vi) Economic
Survey , Various Issues.

| | TABLE 3.3 |
|---|---|

| PRESENT VALUE OF ANTICIPATED EDUCATIONL EXPENSES GOVERNMENT STREAM ON AN UNBORN CHILD (in Rupees) | | | | | | |
|---|---|---|---|---|---|---|
| | SITUATION I | | | SITUATION II. | | |
| YEAR | DISCOUNT RATES | | | DISCOUNT RATES | | |
| | 6% | 10% | 12% | 6% | 10% | 12% |
| 1966-67 | 128.45 | 89.90 | 75.79 | 128.44 | 110.33 | 103.31 |
| 1967-68 | 130.21 | 91.25 | 76.95 | 130.21 | 91.25 | 76.95 |
| 1968-69 | 134.42 | 94.39 | 79.67 | 134.42 | 94.39 | 79.67 |
| 1969-70 | 142.64 | 100.45 | 84.92 | 142.64 | 100.45 | 84.92 |
| 1970-71 | 149.73 | 105.65 | 89.40 | 149.73 | 105.65 | 89.40 |
| 1971-72 | 154.67 | 109.18 | 92.42 | 155.22 | 109.52 | 92.68 |
| 1972-73 | 158.73 | 112.10 | 94.91 | 159.72 | 112.73 | 95.41 |
| 1973-74 | 162.20 | 114.16 | 96.50 | 163.57 | 115.05 | 97.21 |
| 1974-75 | 168.81 | 118.67 | 100.24 | 170.14 | 119.55 | 100.95 |
| 1975-76 | 190.08 | 113.67 | 112.92 | 191.93 | 134.93 | 113.98 |
| 1976-77 | 198.26 | 139.64 | 118.07 | 201.01 | 141.59 | 119.71 |
| 1977-78 | 204.27 | 143.85 | 121.62 | 208.48 | 146.91 | 124.24 |
| 1978-79 | 210.10 | 147.89 | 125.01 | 216.42 | 152.57 | 129.05 |
| 1979-80 | 215.29 | 151.41 | 127.93 | 223.86 | 157.83 | 133.51 |
| 1980-81 | 220.07 | 154.61 | 130.57 | 230.94 | 162.82 | 137.73 |
| 1981-82 | 224.99 | 157.93 | 133.32 | 238.19 | 167.95 | 142.08 |
| 1982-83 | 229.51 | 160.92 | 135.77 | 245.04 | 172.77 | 146.15 |
| 1983-84 | 233.70 | 163.63 | 137.97 | 251.54 | 177.28 | 149.94 |
| 1984-85 | 237.95 | 166.36 | 140.17 | 258.09 | 181.83 | 153.75 |
| 1985-86 | 242.37 | 169.19 | 142.45 | 264.82 | 186.48 | 157.66 |
| 1986-87 | 246.96 | 172.14 | 144.83 | 271.73 | 191.26 | 161.67 |
| 1987-88 | 251.73 | 175.20 | 147.30 | 278.83 | 196.17 | 165.78 |
| 1988-89 | 256.70 | 178.39 | 149.87 | 286.13 | 201.22 | 170.01 |
| 1989-90 | 261.87 | 181.719 | 152.54 | 293.63 | 206.40 | 174.35 |

Sources : Computed from (i) Education in India , various issues ; (ii) Selected Educational Statistics ,various issues ; (iii) Life Tables : Census of India (1971) Series 1 India Paper 1 of 1977 RGI (iv) SRS Based Abridged Life-Tables 1981-85 Occasional Paper No. 1 of 1989 RGI (v) Health statistics in India, various issues; (vi)Health Information in India, various issues; and(vii)Economic Survey,Various Issues.

TABLE 3.4

TOTAL OF PRESENT VALUES OF ANTICIPATED EXPENDITURE STREAM OF/
ON AN UNBORN CHILD (IN Rs. LAKHS)

| YEAR | SITUATION I | | | SITUATION II | | |
| | DISCOUNT RATES | | | DISCOUNT RATES | | |
| | 6% | 10% | 12% | 6% | 10% | 12% |
|---|---|---|---|---|---|---|
| 1966-67 | 7897.62 | 4580.72 | 3725.46 | 9128.93 | 4853.44 | 3876.2 |
| 1967-68 | 7951.70 | 4608.21 | 3745.38 | 9301.30 | 4892.11 | 3886.1 |
| 1968-69 | 8005.89 | 4634.40 | 3763.26 | 9483.54 | 4953.56 | 3923.8 |
| 1969-70 | 8064.27 | 4663.59 | 3783.47 | 9680.46 | 5022.06 | 3966.5 |
| 1970-71 | 8127.85 | 4696.24 | 3806.22 | 9893.83 | 5098.50 | 4014.6 |
| 1971-72 | 8196.83 | 4734.71 | 3834.62 | 10125.2 | 5186.06 | 4072.1 |
| 1972-73 | 8267.33 | 4775.49 | 3865.37 | 10370.9 | 5281.42 | 4135.6 |
| 1973-74 | 8351.17 | 4828.68 | 3907.87 | 10643.8 | 5395.28 | 4215.2 |
| 1974-75 | 8444.49 | 4892.48 | 3961.14 | 10940.7 | 5526.27 | 4310.1 |
| 1975-76 | 9410.86 | 5350.09 | 4307.88 | 12642.9 | 6122.31 | 4717.1 |
| 1976-77 | 9526.70 | 5437.78 | 4385.09 | 13034.5 | 6303.14 | 4853.3 |
| 1977-78 | 9632.10 | 5518.31 | 4456.25 | 13436.5 | 6487.26 | 4991.2 |
| 1978-79 | 9719.59 | 5582.81 | 4511.90 | 13842.3 | 6666.53 | 5122.1 |
| 1979-80 | 9804.58 | 5647.07 | 4567.95 | 14268.0 | 6857.25 | 5262.5 |
| 1980-81 | 9790.87 | 5663.23 | 4589.29 | 14730.1 | 7076.59 | 5429.7 |
| 1981-82 | 9886.97 | 5744.34 | 4664.28 | 15215.1 | 7310.57 | 5609.7 |
| 1982-83 | 9973.05 | 5818.57 | 4733.60 | 15715.3 | 7551.88 | 5795.6 |
| 1983-84 | 10042.7 | 5878.78 | 4789.90 | 16225.8 | 7794.80 | 5981.2 |
| 1984-85 | 10102.9 | 5931.39 | 4839.29 | 16753.3 | 8045.60 | 6172.6 |
| 1985-86 | 9981.41 | 5979.12 | 4884.78 | 17301.7 | 8308.55 | 6374.4 |
| 1986-87 | 10202.6 | 6021.94 | 4744.18 | 17873.4 | 8585.28 | 6588.0 |
| 1987-88 | 10238.6 | 6055.22 | 4958.22 | 18462.3 | 8869.54 | 6807.1 |
| 1988-89 | 10260.2 | 6074.89 | 4977.21 | 19065.5 | 9158.11 | 7028.4 |
| 1989-90 | 10267.5 | 6080.36 | 4982.04 | 19684.8 | 9452.06 | 7252.8 |

Sources : All the Sources of Tables 3.1, 3.2 and 3.3.

| TABLE 3.5 |
| :-: |

| SHARE OF CONSUMPTION ,EDUCATION AND HEALTH |
| :-: |

| SITUATION I |
| :-: |

| YEAR | CONSUMPTION DISCOUNT RATES | | | EDUCATION DISCOUNT RATES | | | HEALTH DISCOUNT RATES | | |
| :-: | :-: | :-: | :-: | :-: | :-: | :-: | :-: | :-: | :-: |
| | 6% | 10% | 12% | 6% | 10% | 12% | 6% | 10% | 12% |
| 1966-67 | 96.9 | 96.6 | 96.5 | 1.63 | 1.96 | 2.03 | 1.48 | 1.43 | 1.43 |
| 1967-68 | 96.8 | 96.5 | 96.5 | 1.64 | 1.98 | 2.06 | 1.51 | 1.48 | 1.48 |
| 1968-69 | 96.8 | 96.4 | 96.3 | 1.68 | 2.04 | 2.12 | 1.55 | 1.54 | 1.54 |
| 1969-70 | 96.6 | 96.3 | 96.2 | 1.77 | 2.15 | 2.24 | 1.59 | 1.58 | 1.59 |
| 1970-71 | 96.5 | 96.1 | 96.0 | 1.84 | 2.25 | 2.35 | 1.62 | 1.62 | 1.63 |
| 1971-72 | 96.5 | 96.0 | 95.9 | 1.89 | 2.31 | 2.41 | 1.65 | 1.66 | 1.67 |
| 1972-73 | 96.4 | 96.0 | 95.8 | 1.92 | 2.35 | 2.46 | 1.68 | 1.70 | 1.72 |
| 1973-74 | 96.3 | 95.9 | 95.8 | 1.94 | 2.36 | 2.47 | 1.71 | 1.75 | 1.78 |
| 1974-75 | 96.2 | 95.8 | 95.6 | 2.00 | 2.43 | 2.53 | 1.75 | 1.81 | 1.84 |
| 1975-76 | 96.1 | 95.6 | 95.5 | 2.02 | 2.50 | 2.62 | 1.79 | 1.87 | 1.91 |
| 1976-77 | 96.1 | 95.5 | 95.3 | 2.08 | 2.57 | 2.69 | 1.82 | 1.92 | 1.98 |
| 1977-78 | 96.0 | 95.4 | 95.2 | 2.12 | 2.61 | 2.73 | 1.85 | 1.96 | 2.02 |
| 1978-79 | 96.0 | 95.3 | 95.2 | 2.16 | 2.65 | 2.77 | 1.88 | 2.01 | 2.07 |
| 1979-80 | 95.9 | 95.3 | 95.1 | 2.20 | 2.68 | 2.80 | 1.89 | 2.03 | 2.11 |
| 1980-81 | 95.8 | 95.2 | 95.1 | 2.25 | 2.73 | 2.85 | 1.93 | 2.09 | 2.16 |
| 1981-82 | 95.8 | 95.1 | 94.9 | 2.28 | 2.75 | 2.86 | 1.95 | 2.12 | 2.20 |
| 1982-83 | 95.7 | 95.1 | 94.9 | 2.30 | 2.77 | 2.87 | 1.97 | 2.15 | 2.24 |
| 1983-84 | 95.7 | 95.1 | 94.9 | 2.33 | 2.78 | 2.88 | 1.98 | 2.16 | 2.26 |
| 1984-85 | 95.7 | 95.0 | 94.8 | 2.36 | 2.80 | 2.90 | 1.99 | 2.18 | 2.27 |
| 1985-86 | 95.5 | 95.0 | 94.8 | 2.43 | 2.83 | 2.92 | 2.04 | 2.19 | 2.29 |
| 1986-87 | 95.6 | 94.9 | 94.6 | 2.42 | 2.86 | 3.05 | 2.00 | 2.20 | 2.38 |
| 1987-88 | 95.5 | 94.9 | 94.7 | 2.46 | 2.89 | 2.97 | 2.00 | 2.19 | 2.28 |
| 1988-89 | 95.5 | 94.8 | 94.7 | 2.50 | 2.94 | 3.01 | 1.99 | 2.18 | 2.27 |
| 1989-90 | 95.5 | 94.8 | 94.7 | 2.55 | 2.99 | 3.06 | 1.99 | 2.18 | 2.27 |

Sources : Computed from (i) NAS ,Various Issues; (ii)Recommended Dietary Intakes for Indians Table I p. 64 ICMR; (iii) Life Tables : Census of India (1971) Series 1 India Paper 1 of 1977 RGI; (iv) SRS Based Abridged Life-Tables 1981-85 Occasional Paper No. 1 of 1989 RGI ; (v) Health Information in India ,Various Issues ; (vi) Economic Survey, Various Issues; (vii)Health Statistics in India, Various Issues; (viii)Education in India, Various Issues.

TABLE 3.6

## SHARE OF CONSUMPTION, EDUCATION AND HEALTH

### SITUATION II

| YEAR | CONSUMPTION DISCOUNT RATES | | | EDUCATION DISCOUNT RATES | | | HEALTH DISCOUNT RATES | | |
|------|------|------|------|------|------|------|------|------|------|
| | 6% | 10% | 12% | 6% | 10% | 12% | 6% | 10% | 12% |
| 1966-67 | 96.6 | 96.1 | 95.8 | 1.41 | 2.27 | 2.67 | 1.95 | 1.61 | 1.53 |
| 1967-68 | 96.6 | 96.5 | 96.4 | 1.40 | 1.87 | 1.98 | 2.02 | 1.68 | 1.60 |
| 1968-69 | 96.5 | 96.3 | 96.3 | 1.42 | 1.91 | 2.03 | 2.09 | 1.75 | 1.68 |
| 1969-70 | 96.4 | 96.2 | 96.1 | 1.47 | 2.00 | 2.14 | 2.16 | 1.82 | 1.74 |
| 1970-71 | 96.3 | 96.1 | 96.0 | 1.51 | 2.07 | 2.23 | 2.22 | 1.88 | 1.80 |
| 1971-72 | 96.2 | 96.0 | 95.9 | 1.53 | 2.11 | 2.28 | 2.28 | 1.94 | 1.86 |
| 1972-73 | 96.1 | 95.9 | 95.8 | 1.54 | 2.13 | 2.31 | 2.35 | 2.01 | 1.93 |
| 1973-74 | 96.0 | 95.8 | 95.7 | 1.54 | 2.13 | 2.31 | 2.42 | 2.08 | 2.00 |
| 1974-75 | 95.9 | 95.7 | 95.6 | 1.56 | 2.16 | 2.34 | 2.50 | 2.16 | 2.09 |
| 1975-76 | 95.8 | 95.5 | 95.4 | 1.52 | 2.20 | 2.42 | 2.70 | 2.31 | 2.22 |
| 1976-77 | 95.7 | 95.4 | 95.2 | 1.54 | 2.25 | 2.47 | 2.77 | 2.39 | 2.31 |
| 1977-78 | 95.6 | 95.3 | 95.1 | 1.55 | 2.26 | 2.49 | 2.84 | 2.46 | 2.38 |
| 1978-79 | 95.5 | 95.2 | 95.0 | 1.56 | 2.29 | 2.52 | 2.91 | 2.53 | 2.46 |
| 1979-80 | 95.5 | 95.1 | 94.9 | 1.57 | 2.30 | 2.54 | 2.98 | 2.59 | 2.52 |
| 1980-81 | 95.4 | 95.0 | 94.9 | 1.57 | 2.30 | 2.54 | 3.04 | 2.66 | 2.59 |
| 1981-82 | 95.3 | 95.0 | 94.8 | 1.57 | 2.30 | 2.53 | 3.12 | 2.72 | 2.66 |
| 1982-83 | 95.3 | 94.9 | 94.7 | 1.56 | 2.29 | 2.52 | 3.19 | 2.79 | 2.73 |
| 1983-84 | 95.2 | 94.9 | 94.7 | 1.55 | 2.27 | 2.51 | 3.26 | 2.86 | 2.79 |
| 1984-85 | 95.1 | 94.8 | 94.7 | 1.54 | 2.26 | 2.49 | 3.33 | 2.92 | 2.86 |
| 1985-86 | 95.1 | 94.8 | 94.6 | 1.53 | 2.24 | 2.47 | 3.40 | 2.99 | 2.93 |
| 1986-87 | 95.0 | 94.7 | 94.6 | 1.52 | 2.23 | 2.45 | 3.47 | 3.06 | 2.99 |
| 1987-88 | 94.9 | 94.7 | 94.5 | 1.51 | 2.21 | 2.44 | 3.54 | 3.12 | 3.05 |
| 1988-89 | 94.9 | 94.6 | 94.5 | 1.50 | 2.20 | 2.42 | 3.62 | 3.18 | 3.12 |
| 1989-90 | 94.8 | 94.6 | 94.4 | 1.49 | 2.18 | 2.40 | 3.69 | 3.25 | 3.19 |

Sources : Same as in the Table 3.5 .

TABLE 3.7 . .

| PRESENT VALUE OF ANTICIPATED PRODUCTION STREAM OF AN UNBORN CHILD[*] | | | | | |
|---|---|---|---|---|---|
| | SITUATION I | | | SITUATION II | | |
| YEAR | DISCOUNT RATES | | | DISCOUNT RATES | | |
| | 6% | 10% | 12% | 6% | 10% | 12% |
| 1966-67 | 4535.41 | 1769.93 | 1163.15 | 6459.41 | 2243.77 | 1415.0 |
| 1967-68 | 4583.27 | 1796.72 | 1183.35 | 6688.65 | 2328.35 | 1470.1 |
| 1968-69 | 4609.27 | 1811.46 | 1194.53 | 6910.57 | 2407.40 | 1520.6 |
| 1969-70 | 4618.34 | 1816.66 | 1198.50 | 7131.15 | 2484.11 | 1569.0 |
| 1970-71 | 4618.34 | 1816.66 | 1198.50 | 7359.35 | 2563.60 | 1619.2 |
| 1971-72 | 4618.34 | 1816.66 | 1198.50 | 7594.85 | 2645.60 | 1671.0 |
| 1972-73 | 4618.34 | 1816.66 | 1198.50 | 7837.88 | 2730.30 | 1724.5 |
| 1973-74 | 4618.34 | 1816.66 | 1198.50 | 8088.69 | 2817.67 | 1779.7 |
| 1974-75 | 4618.34 | 1816.66 | 1198.50 | 8347.53 | 2907.84 | 1836.6 |
| 1975-76 | 5274.21 | 2036.85 | 1335.99 | 10084.00 | 3415.34 | 2136.9 |
| 1976-77 | 5274.21 | 2036.85 | 1335.99 | 10406.64 | 3524.63 | 2205.3 |
| 1977-78 | 5274.21 | 2036.85 | 1335.99 | 10739.66 | 3637.42 | 2275.9 |
| 1978-79 | 5274.21 | 2036.85 | 1335.99 | 11083.32 | 3753.82 | 2348.7 |
| 1979-80 | 5274.21 | 2036.85 | 1335.99 | 11438.00 | 3873.94 | 2423.9 |
| 1980-81 | 5274.21 | 2036.85 | 1335.99 | 11804.00 | 3997.91 | 2501.4 |
| 1981-82 | 5274.21 | 2036.85 | 1335.99 | 12181.73 | 4125.84 | 2581.4 |
| 1982-83 | 5274.21 | 2036.85 | 1335.99 | 12571.55 | 4257.87 | 2664.1 |
| 1983-84 | 5274.21 | 2036.85 | 1335.99 | 12973.84 | 4394.12 | 2749.3 |
| 1984-85 | 5274.21 | 2036.85 | 1335.99 | 13389.00 | 4534.73 | 2837.3 |
| 1985-86 | 5274.21 | 2036.85 | 1335.99 | 13817.45 | 4679.84 | 2928.1 |
| 1986-87 | 5274.21 | 2036.85 | 1335.99 | 14259.61 | 4829.60 | 3021.8 |
| 1987-88 | 5274.21 | 2036.85 | 1335.99 | 14715.92 | 4984.15 | 3118.5 |
| 1988-89 | 5274.21 | 2036.85 | 1335.99 | 15186.82 | 5143.64 | 3218.3 |
| 1989-90 | 5274.21 | 2036.85 | 1335.99 | 15672.80 | 5308.24 | 3321.3 |

Sources : (i) Jose A.V. Agricultral Wages in India EPW June 25,1988
(ii) Economic Survey, Various Issues.

[*] in Rs.

|  | TABLE 3.8 |
| --- | --- |

**'VALUE' OF PREVENTING A BIRTH (in Rs.)**

| | CASE I |
| --- | --- |

| YEAR | DISCOUNT RATES | | |
| --- | --- | --- | --- |
| | 6% | 10% | 12% |
| 1966-67 | 3362.21 | 2810.79 | 2562.32 |
| 1967-68 | 3368.43 | 2811.49 | 2562.03 |
| 1968-69 | 3396.63 | 2822.94 | 2568.72 |
| 1969-70 | 3445.93 | 2846.93 | 2584.97 |
| 1970-71 | 3509.51 | 2879.58 | 2607.71 |
| 1971-72 | 3578.49 | 2918.04 | 2636.12 |
| 1972-73 | 3649.00 | 2958.83 | 2666.87 |
| 1973-74 | 3732.83 | 3012.01 | 2709.36 |
| 1974-75 | 3826.15 | 3075.81 | 2762.63 |
| 1975-76 | 4136.65 | 3313.24 | 2971.88 |
| 1976-77 | 4252.49 | 3400.93 | 3049.10 |
| 1977-78 | 4357.89 | 3481.46 | 3120.25 |
| 1978-79 | 4445.38 | 3545.96 | 3175.91 |
| 1979-80 | 4530.37 | 3610.22 | 3231.95 |
| 1980-81 | 4561.66 | 3626.38 | 3253.29 |
| 1981-82 | 4612.76 | 3707.50 | 3328.29 |
| 1982-83 | 4698.84 | 3781.72 | 3397.60 |
| 1983-84 | 4768.44 | 3841.93 | 3053.91 |
| 1984-85 | 4828.66 | 3894.54 | 3503.30 |
| 1985-86 | 4707.20 | 3942.27 | 3548.79 |
| 1986-87 | 4928.35 | 3985.09 | 3408.19 |
| 1987-88 | 4964.39 | 4018.37 | 3622.23 |
| 1988-89 | 4985.98 | 4038.04 | 3641.22 |
| 1989-90 | 4993.30 | 4043.51 | 3646.04 |

Sources : All the Sources of Tables 3.1,3.2,3.3 and 3.7.

| | TABLE 3.9 | | |
|---|---|---|---|

| | | | |
|---|---|---|---|
| | 'VALUE' OF PREVENTING A BIRTH (in Rs.) | | |

| | CASE II | | |
|---|---|---|---|

| YEAR | DISCOUNT RATES | | |
|---|---|---|---|
| | 6% | 10% | 12% |
| 1966-67 | 4593.52 | 3083.50 | 2713.09 |
| 1967-68 | 4718.03 | 3095.39 | 2702.76 |
| 1968-69 | 4874.28 | 3142.10 | 2729.28 |
| 1969-70 | 5062.13 | 3205.39 | 2767.97 |
| 1970-71 | 5275.50 | 3281.84 | 2816.14 |
| 1971-72 | 5506.86 | 3369.39 | 2873.58 |
| 1972-73 | 5752.61 | 3464.76 | 2937.12 |
| 1973-74 | 6025.51 | 3578.62 | 3016.65 |
| 1974-75 | 6322.34 | 3709.60 | 3111.56 |
| 1975-76 | 7368.73 | 4085.46 | 3381.15 |
| 1976-77 | 7760.30 | 4266.29 | 3517.28 |
| 1977-78 | 8162.33 | 4450.41 | 3655.20 |
| 1978-79 | 8568.12 | 4629.69 | 3786.15 |
| 1979-80 | 8993.77 | 4820.40 | 3926.46 |
| 1980-81 | 9455.88 | 5039.97 | 4093.71 |
| 1981-82 | 9940.93 | 5273.72 | 4273.78 |
| 1982-83 | 10441.13 | 5515.03 | 4459.59 |
| 1983-84 | 10951.61 | 5757.95 | 4645.17 |
| 1984-85 | 11479.09 | 6008.75 | 4836.62 |
| 1985-86 | 12027.45 | 6271.70 | 5038.45 |
| 1986-87 | 12599.17 | 6548.43 | 5252.01 |
| 1987-88 | 13188.10 | 6832.69 | 5471.10 |
| 1988-89 | 13791.28 | 7121.26 | 5692.43 |
| 1989-90 | 14410.62 | 7415.21 | 5916.80 |

Sources :Same as Table 3.8 .

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| TABLE 3.10 |
| --- |

| 'VALUE' OF PREVENTING A BIRTH (in Rs.) |
| --- |

| CASE III |
| --- |

| YEAR | DISCOUNT RATES | | |
| --- | --- | --- | --- |
| | 6% | 10% | 12% |
| 1966-67 | 2669.52 | 2609.67 | 2461.16 |
| 1967-68 | 2612.65 | 2563.76 | 2416.05 |
| 1968-69 | 2572.97 | 2546.17 | 2403.24 |
| 1969-70 | 2549.31 | 2537.94 | 2397.49 |
| 1970-71 | 2534.49 | 2534.89 | 2395.45 |
| 1971-72 | 2530.35 | 2540.42 | 2401.08 |
| 1972-73 | 2533.06 | 2551.12 | 2411.15 |
| 1973-74 | 2555.15 | 2577.61 | 2435.50 |
| 1974-75 | 2593.15 | 2618.43 | 2473.45 |
| 1975-76 | 2558.99 | 2706.97 | 2580.22 |
| 1976-77 | 2627.87 | 2778.50 | 2647.96 |
| 1977-78 | 2696.89 | 2849.84 | 2715.31 |
| 1978-79 | 2759.00 | 2912.72 | 2773.43 |
| 1979-80 | 2829.99 | 2983.31 | 2838.59 |
| 1980-81 | 2926.08 | 3078.68 | 2928.28 |
| 1981-82 | 3033.41 | 3184.73 | 3028.30 |
| 1982-83 | 3143.79 | 3294.00 | 3131.51 |
| 1983-84 | 3251.99 | 3400.68 | 3231.83 |
| 1984-85 | 3364.30 | 3510.87 | 3335.30 |
| 1985-86 | 3484.21 | 3628.71 | 3446.34 |
| 1986-87 | 3613.78 | 3755.68 | 3566.20 |
| 1987-88 | 3746.39 | 3885.39 | 3688.59 |
| 1988-89 | 3878.68 | 4014.47 | 3810.13 |
| 1989-90 | 4012.03 | 4143.82 | 3931.51 |

Sources : Same as Table 3.8 .

TABLE 3.11

TOTAL OF PRESENT VALUE OF ANTICIPATED EXPENDITURE STREAMS OF/ON TOTAL BIRTHS
AVERTED (IN Rs. LAKHS)

| YEAR | SITUATION I | | | SITUATION II | | |
| | DISCOUNT RATES | | | DISCOUNT RATES | | |
| | 6% | 10% | 12% | 6% | 10% | 12% |
|---|---|---|---|---|---|---|
| 1966-67 | 43579.04 | 25276.42 | 20557.11 | 50373.42 | 26781.28 | 21389.07 |
| 1967-68 | 67128.29 | 38902.54 | 31618.47 | 78521.54 | 41299.23 | 32806.55 |
| 1968-69 | 100746.16 | 58319.35 | 47356.81 | 119340.91 | 62335.66 | 49377.23 |
| 1969-70 | 130326.64 | 75368.27 | 61144.65 | 156445.96 | 81161.44 | 64102.23 |
| 1970-71 | 155827.16 | 90036.37 | 72972.76 | 189684.57 | 97748.43 | 76968.73 |
| 1971-72 | 175535.13 | 101393.73 | 82118.44 | 216831.00 | 111059.40 | 87203.62 |
| 1972-73 | 209303.97 | 120901.09 | 97859.61 | 262561.17 | 133709.79 | 104701.56 |
| 1973-74 | 249908.78 | 144498.10 | 116942.91 | 318517.13 | 161453.76 | 126138.63 |
| 1974-75 | 255859.63 | 148237.12 | 120018.43 | 331491.70 | 167440.30 | 130590.55 |
| 1975-76 | 294503.30 | 167425.63 | 134810.75 | 395648.12 | 191591.60 | 147618.29 |
| 1976-77 | 354660.05 | 202437.72 | 163248.15 | 485248.58 | 234653.15 | 180677.67 |
| 1977-78 | 486421.07 | 278674.79 | 225040.54 | 678545.35 | 327606.81 | 252055.09 |
| 1978-79 | 478991.05 | 275126.43 | 222350.94 | 682163.74 | 328533.59 | 252424.16 |
| 1979-80 | 481277.25 | 277197.61 | 224226.77 | 700372.31 | 336601.88 | 258318.02 |
| 1980-81 | 482973.66 | 279361.42 | 226384.99 | 726620.42 | 349080.96 | 267841.92 |
| 1981-82 | 504818.98 | 293300.50 | 238153.44 | 776869.98 | 373270.58 | 286429.46 |
| 1982-83 | 505615.78 | 318327.90 | 258970.26 | 859770.46 | 413155.62 | 317070.83 |
| 1983-84 | 623658.71 | 365078.36 | 297457.55 | 1007639.8 | 484064.85 | 371436.26 |
| 1984-85 | 734336.87 | 431128.68 | 351748.66 | 1217730.5 | 584802.68 | 448662.45 |
| 1985-86 | 810520.70 | 485522.18 | 396658.79 | 1404946.8 | 674679.35 | 517623.97 |
| 1986-87 | 918311.74 | 542022.43 | 427014.26 | 1608747.4 | 772743.94 | 592973.44 |
| 1987-88 | 1019303.8 | 602827.13 | 493616.00 | 1838014.7 | 883007.08 | 677679.91 |
| 1988-89 | 1115446.8 | 660438.04 | 541103.28 | 2072723.9 | 995632.96 | 764102.61 |
| 1989-90 | 1198361.5 | 709662.59 | 581473.59 | 2297495.6 | 1103187.5 | 846502.19 |

Sources : Same as in Table 3.1,3.2, and 3.3 and FWP in India,Year Book, Various Issues.

## TABLE 3.12

| | SITUATION I | | | SITUATION II | | |
|---|---|---|---|---|---|---|
| | DISCOUNT RATES | | | DISCOUNT RATES | | |
| YEAR | 6% | 10% | 12% | 6% | 10% | 12% |
| 1966-67 | 25026.39 | 9766.50 | 6418.24 | 35643.03 | 12381.11 | 7808.39 |
| 1967-68 | 38691.96 | 15167.93 | 9989.85 | 56465.55 | 19655.96 | 12410.25 |
| 1968-69 | 58003.03 | 22795.42 | 15032.02 | 86962.63 | 30294.68 | 19134.84 |
| 1969-70 | 74636.94 | 29359.10 | 19369.03 | 115246.5 | 40145.75 | 25356.32 |
| 1970-71 | 88542.75 | 34829.07 | 22977.73 | 141093.4 | 49149.43 | 31043.11 |
| 1971-72 | 98901.68 | 38903.85 | 25665.98 | 162643.6 | 56656.38 | 35784.55 |
| 1972-73 | 116922.4 | 45992.47 | 30342.54 | 198431.6 | 69123.02 | 43658.56 |
| 1973-74 | 138203.7 | 54363.66 | 35865.25 | 242054.1 | 84318.78 | 53256.31 |
| 1974-75 | 139930.9 | 55043.09 | 36313.49 | 252921.8 | 88104.51 | 55647.40 |
| 1975-76 | 165051.1 | 63741.16 | 41808.61 | 315567.2 | 106879.7 | 66873.02 |
| 1976-77 | 196348.2 | 75827.83 | 49736.40 | 387418.4 | 131215.1 | 82099.26 |
| 1977-78 | 266347.5 | 102860.9 | 67467.72 | 542352.4 | 183689.8 | 114931.9 |
| 1978-79 | 259918.3 | 100377.9 | 65839.14 | 546197.1 | 184992.0 | 115746.6 |
| 1979-80 | 258895.1 | 99982.83 | 65579.16 | 561456.5 | 190160.2 | 118980.3 |
| 1980-81 | 260171.4 | 100475.7 | 65903.27 | 582279.6 | 197212.8 | 123393.0 |
| 1981-82 | 269295.8 | 103999.5 | 68214.54 | 621987.0 | 210661.3 | 131807.5 |
| 1982-83 | 288546.7 | 111434.0 | 73090.92 | 687776.7 | 2329943.7 | 145749.3 |
| 1983-84 | 327533.6 | 126490.3 | 82966.59 | 805688.2 | 272897.3 | 170736.3 |
| 1984-85 | 383361.1 | 148050.4 | 97108.09 | 973192.8 | 329611.6 | 206232.8 |
| 1985-86 | 428281.6 | 165398.2 | 108486.7 | 1122018 | 380017.4 | 237771.0 |
| 1986-87 | 474721.0 | 183332.7 | 120250.1 | 1283478 | 434702.5 | 271986.7 |
| 1987-88 | 525073.9 | 202778.5 | 133004.9 | 1465042 | 496196.7 | 310462.6 |
| 1988-89 | 573390.9 | 221438.1 | 145243.9 | 1651050 | 559195.8 | 349880.2 |
| 1989-90 | 615574.0 | 237728.8 | 155929.2 | 1829235 | 619545.4 | 387640.0 |

PRESENT VALUE OF ANTICIPATED PRODUCTION STREAM OF TOTAL BIRTHS AVERTED
(in Rs. Lakhs)

Sources : Same as Table 3.7 and Health Information in India 1991.

| TABLE 3.13 |
| --- |

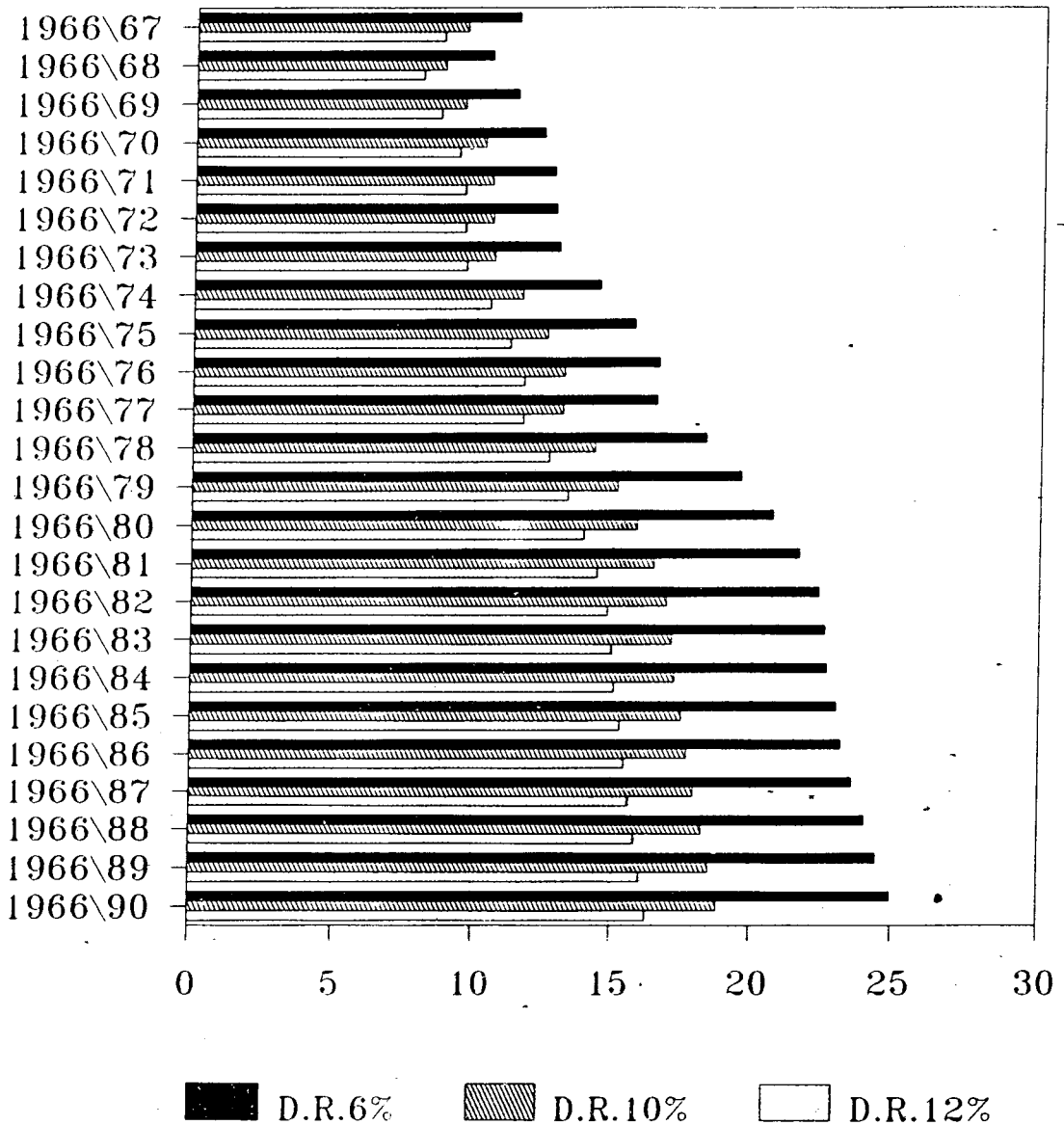| BENEFIT-COST RATIO OF FAMILY WELFARE PROGRAMME |
| --- |

| SCENARIO I |
| --- |

| | NET METHOD | | | GROSS METHOD | | |
| --- | --- | --- | --- | --- | --- | --- |
| YEAR | DISCOUNT RATES | | | DISCOUNT RATES | | |
| UPTO | 6% | 10% | 12% | 6% | 10% | 12% |
| 1966-67 | 11.44 | 9.57 | 8.72 | 1.64 | 2.22 | 2.56 |
| 1967-68 | 10.48 | 8.77 | 7.99 | 1.62 | 2.18 | 2.50 |
| 1968-69 | 11.42 | 9.50 | 8.65 | 1.63 | 2.20 | 2.53 |
| 1969-70 | 12.39 | 10.24 | 9.30 | 1.64 | 2.23 | 2.57 |
| 1970-71 | 12.76 | 10.51 | 9.53 | 1.65 | 2.24 | 2.58 |
| 1971-72 | 12.84 | 10.55 | 9.55 | 1.66 | 2.24 | 2.59 |
| 1972-73 | 12.97 | 10.62 | 9.60 | 1.66 | 2.25 | 2.59 |
| 1973-74 | 14.43 | 11.65 | 10.48 | 1.68 | 2.29 | 2.64 |
| 1974-75 | 15.72 | 12.55 | 11.23 | 1.69 | 2.32 | 2.68 |
| 1975-76 | 16.62 | 13.17 | 11.74 | 1.70 | 2.33 | 2.70 |
| 1976-77 | 16.55 | 13.14 | 11.72 | 1.70 | 2.33 | 2.71 |
| 1977-78 | 18.31 | 14.30 | 12.66 | 1.72 | 2.36 | 2.75 |
| 1978-79 | 19.58 | 15.13 | 13.34 | 1.73 | 2.38 | 2.78 |
| 1979-80 | 20.74 | 15.87 | 13.93 | 1.74 | 2.40 | 2.80 |
| 1980-81 | 21.70 | 16.49 | 14.43 | 1.74 | 2.42 | 2.83 |
| 1981-82 | 22.41 | 16.96 | 14.81 | 1.75 | 2.43 | 2.84 |
| 1982-83 | 22.62 | 17.14 | 14.96 | 1.75 | 2.44 | 2.86 |
| 1983-84 | 22.71 | 17.26 | 15.07 | 1.76 | 2.45 | 2.87 |
| 1984-85 | 23.06 | 17.51 | 15.28 | 1.77 | 2.47 | 2.89 |
| 1985-86 | 23.23 | 17.70 | 15.45 | 1.77 | 2.48 | 2.90 |
| 1986-87 | 23.62 | 17.97 | 15.62 | 1.78 | 2.49 | 2.91 |
| 1987-88 | 24.07 | 18.26 | 15.86 | 1.79 | 2.51 | 2.93 |
| 1988-89 | 24.47 | 18.53 | 16.07 | 1.79 | 2.52 | 2.94 |
| 1989-90 | 24.97 | 18.84 | 16.31 | 1.80 | 2.53 | 2.96 |

Sources : Calculated from Tables 2.1, 3.11 and 3.12 .

# BENEFIT-COST RATIO
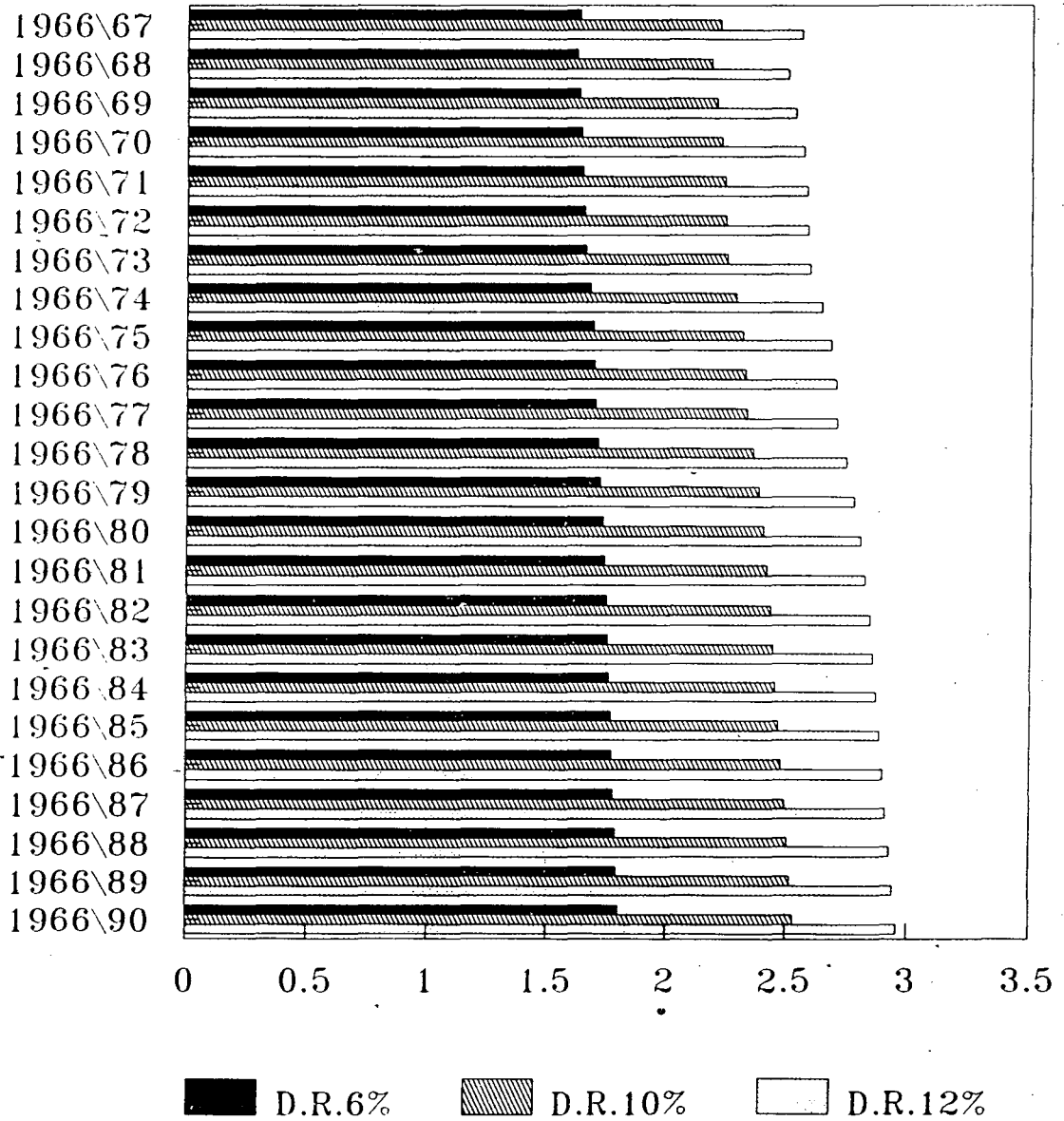## SCENARIO I
## NET METHOD

SUB PERIOD



D.R.= DISCOUNT RATE

# BENEFIT-COST RATIO
## SCENARIO I
## GROSS METHOD

SUB PERIOD



| | 0 | 0.5 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 |

**■ D.R.6%**  **▨ D.R.10%**  **☐ D.R.12%**

D.R.= DISCOUNT RATE

| | TABLE 3.14 | |
|---|---|---|

| BENEFIT-COST RATIO OF FAMILY WELFARE PROGRAMME |
|---|

| SCENARIO II |
|---|

| YEAR UPTO | NET METHOD DISCOUNT RATES | | | GROSS METHOD DISCOUNT RATES | | |
|---|---|---|---|---|---|---|
| | 6% | 10% | 12% | 6% | 10% | 12% |
| 1966-67 | 9.08 | 8.88 | 8.38 | 1.35 | 1.91 | 2.27 |
| 1967-68 | 8.21 | 8.05 | 7.60 | 1.33 | 1.87 | 2.20 |
| 1968-69 | 8.81 | 8.66 | 8.16 | 1.33 | 1.86 | 2.20 |
| 1969-70 | 9.42 | 9.27 | 8.73 | 1.32 | 1.86 | 2.20 |
| 1970-71 | 9.56 | 9.44 | 8.89 | 1.32 | 1.84 | 2.18 |
| 1971-72 | 9.49 | 9.41 | 8:87 | 1.31 | 1.83 | 2.16 |
| 1972-73 | 9.46 | 9.41 | 8.87 | 1.30 | 1.81 | 2.15 |
| 1973-74 | 10.40 | 10.27 | 9.64 | 1.30 | 1.82 | 2.15 |
| 1974-75 | 11.22 | 11.01 | 10.29 | 1.30 | 1.82 | 2.16 |
| 1975-76 | 11.63 | 11.45 | 10.69 | 1.29 | 1.80 | 2.15 |
| 1976-77 | 11.39 | 11.34 | 10.62 | 1.28 | 1.78 | 2.12 |
| 1977-78 | 12.40 | 12.25 | 11.42 | 1.27 | 1.78 | 2.12 |
| 1978-79 | 13.12 | 12.91 | 11.99 | 1.27 | 1.77 | 2.12 |
| 1979-80 | 13.79 | 13.51 | 12.51 | 1.26 | 1.77 | 2.11 |
| 1980-81 | 14.40 | 14.03 | 12.95 | 1.26 | 1.76 | 2.11 |
| 1981-82 | 14.86 | 14.44 | 13.30 | 1.26 | 1.76 | 2.11 |
| 1982-83 | 15.00 | 14.61 | 13.46 | 1.26 | 1.75 | 2.10 |
| 1983-84 | 15.10 | 14.75 | 13.59 | 1.25 | 1.75 | 2.10 |
| 1984-85 | 15.39 | 15.01 | 13.82 | 1.25 | 1.75 | 2.09 |
| 1985-86 | 15.64 | 15.25 | 14.02 | 1.25 | 1.74 | 2.09 |
| 1986-87 | 16.02 | 15.56 | 14.28 | 1.25 | 1.74 | 2.09 |
| 1987-88 | 16.46 | 15.92 | 14.58 | 1.25 | 1.74 | 2.09- |
| 1988-89 | 16.90 | 16.27 | 14.86 | 1.25 | 1.74 | 2.09 |
| 1989-90 | 17.45 | 16.68 | 15.18 | 1.25 | 1.74 | 2.09 |

Sources : Same as Table 3.13

# BENEFIT—COST RATIO
## SCENARIO II
## NET METHOD

SUB PERIOD

| | |
|---|---|
| 1966\67 | |
| 1966\68 | |
| 1966\69 | |
| 1966\70 | |
| 1966\71 | |
| 1966\72 | |
| 1966\73 | |
| 1966\74 | |
| 1966\75 | |
| 1966\76 | |
| 1966\77 | |
| 1966\78 | |
| 1966\79 | |
| 1966\80 | |
| 1966\81 | |
| 1966\82 | |
| 1966\83 | |
| 1966\84 | |
| 1966\85 | |
| 1966\86 | |
| 1966\87 | |
| 1966\88 | |
| 1966\89 | |
| 1966\90 | |

0        5        10        15        20

▓ D.R.6%    ▨ D.R.10%    ☐ D.R.12%
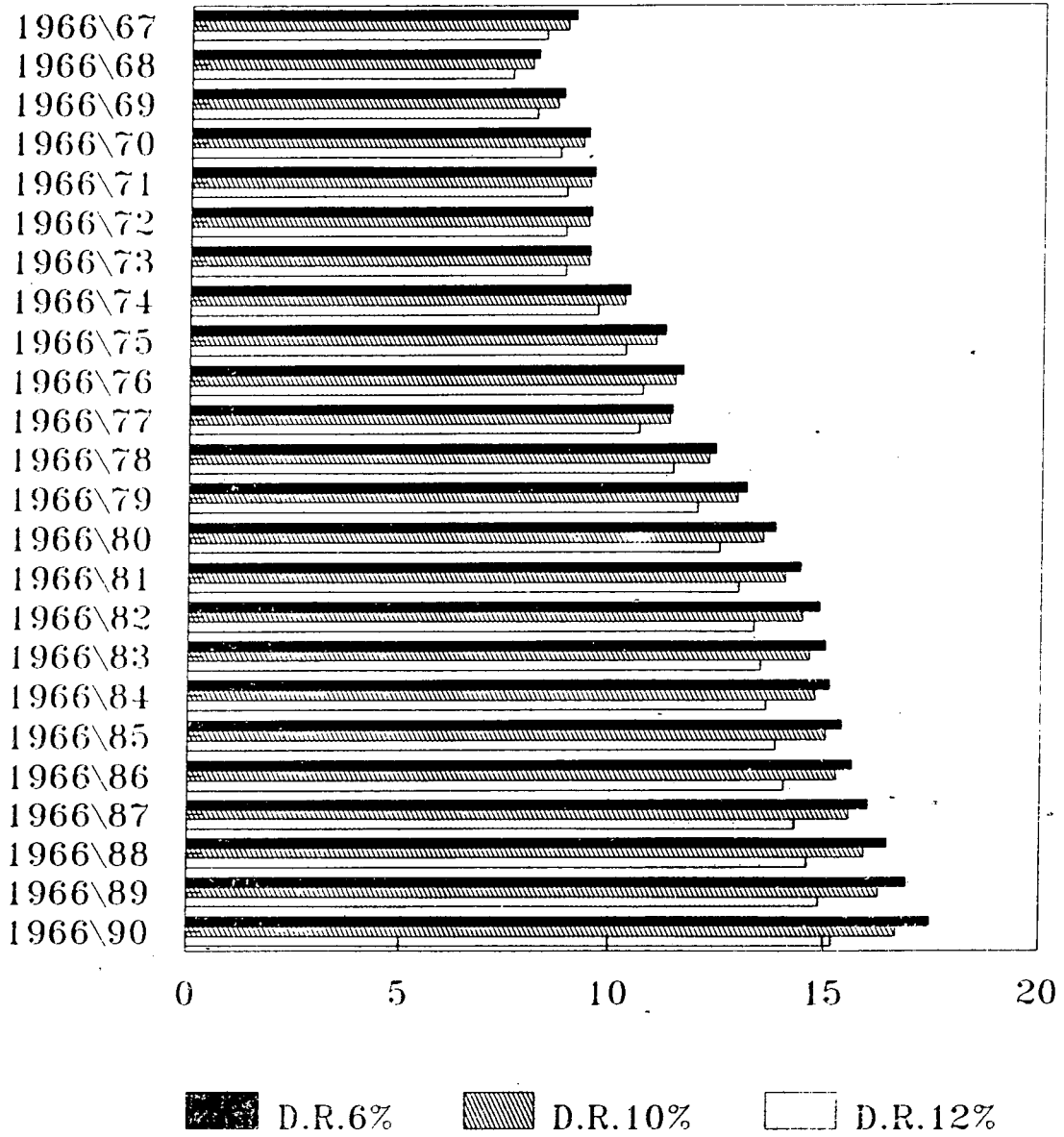
D.R.= DISCOUNT RATE

# BENEFIT-COST RATIO
## SCENARIO II
## GROSS METHOD

SUB PERIOD



| | D.R.6% | | D.R.10% | | D.R.12% |
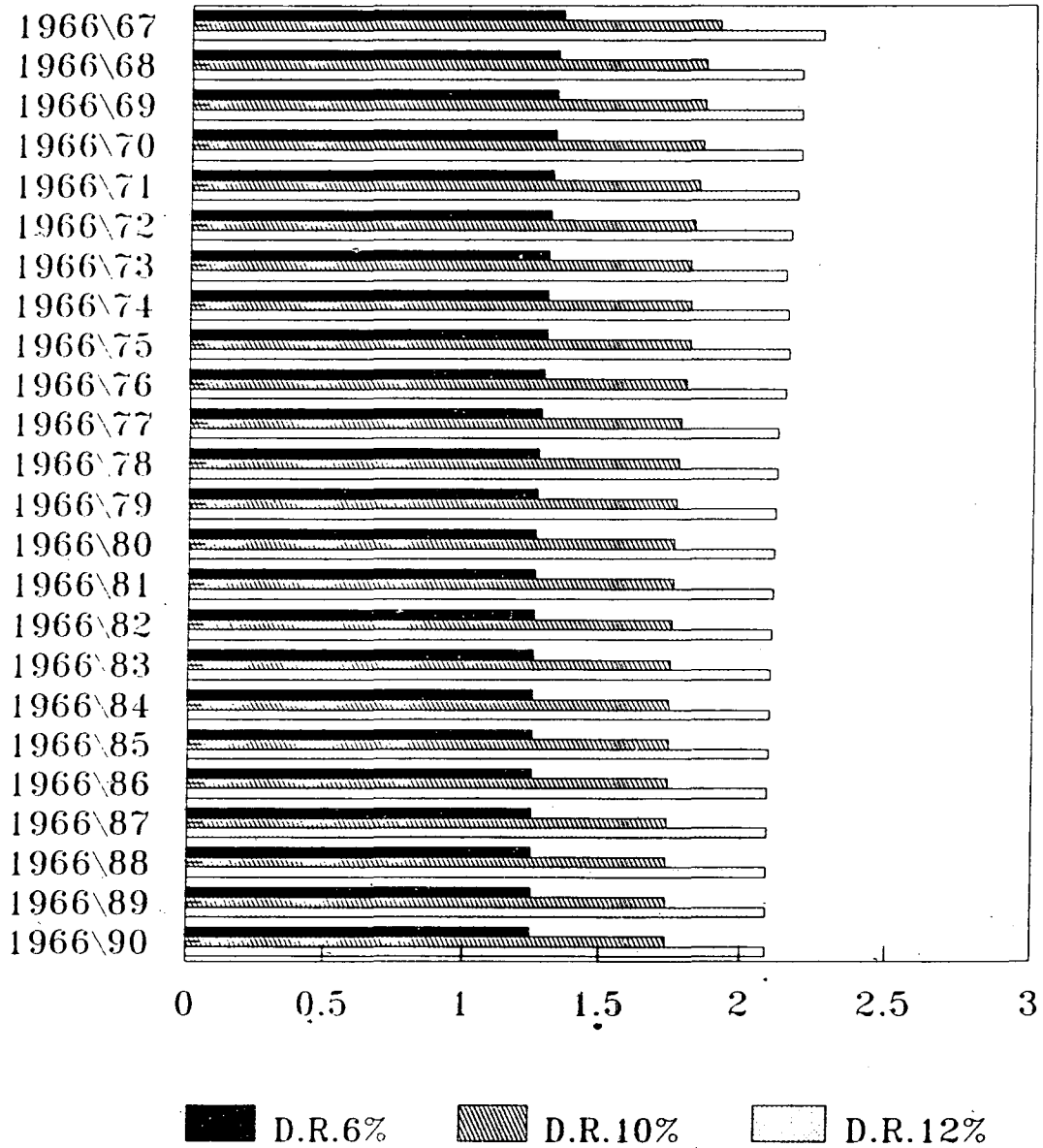
D.R.= DISCOUNT RATE

## TABLE 3.15

### BENEFIT-COST RATIO OF FAMILY WELFARE PROGRAMME

#### SCENARIO III

| YEAR UPTO | NET METHOD DISCOUNT RATES | | | GROSS METHOD DISCOUNT RATES | | |
|---|---|---|---|---|---|---|
| | 6% | 10% | 12% | 6% | 10% | 12% |
| 1966-67 | 15.63 | 10.49 | 9.23 | 1.89 | 2.35 | 2.66 |
| 1967-68 | 14.53 | 9.64 | 8.45 | 1.89 | 2.32 | 2.60 |
| 1968-69 | 16.09 | 10.50 | 9.16 | 1.91 | 2.35 | 2.64 |
| 1969-70 | 17.72 | 11.40 | 9.86 | 1.94 | 2.38 | 2.68 |
| 1970-71 | 18.52 | 11.77 | 10.17 | 1.97 | 2.40 | 2.70 |
| 1971-72 | 18.90 | 11.89 | 10.24 | 1.99 | 2.42 | 2.71 |
| 1972-73 | 19.38 | 12.06 | 10.35 | 2.02 | 2.44 | 2.73 |
| 1973-74 | 21.90 | 13.34 | 11.35 | 2.06 | 2.49 | 2.79 |
| 1974-75 | 24.20 | 14.48 | 12.23 | 2.09 | 2.53 | 2.85 |
| 1975-76 | 26.16 | 15.32 | 12.85 | 2.13 | 2.56 | 2.88 |
| 1976-77 | 26.66 | 15.43 | 12.91 | 2.16 | 2.58 | 2.90 |
| 1977-78 | 30.25 | 16.99 | 14.05 | 2.21 | 2.64 | 2.96 |
| 1978-79 | 33.05 | 18.17 | 14.91 | 2.25 | 2.68 | 3.00 |
| 1979-80 | 35.68 | 19.25 | 15.68 | 2.29 | 2.72 | 3.05 |
| 1980-81 | 38.09 | 20.22 | 16.37 | 2.33 | 2.76 | 3.09 |
| 1981-82 | 40.11 | 21.03 | 16.93 | 2.37 | 2.80 | 3.13 |
| 1982-83 | 41.27 | 21.49 | 17.25 | 2.41 | 2.83 | 3.16 |
| 1983-84 | 42.32 | 21.90 | 17.54 | 2.45 | 2.87 | 3.20 |
| 1984-85 | 43.95 | 22.52 | 17.96 | 2.50 | 2.91 | 3.24 |
| 1985-86 | 45.47 | 23.10 | 18.35 | 2.54 | 2.96 | 3.28 |
| 1986-87 | 47.35 | 23.80 | 18.82 | 2.60 | 3.00 | 3.33 |
| 1987-88 | 49.46 | 24.58 | 19.33 | 2.65 | 3.05 | 3.38 |
| 1988-89 | 51.56 | 25.34 | 19.83 | 2.71 | 3.11 | 3.43 |
| 1989-90 | 53.97 | 26.19 | 20.39 | 2.77 | 3.16 | 3.48 |

Sources : Same as Table 3.13 .

# BENEFIT-COST RATIO
## SCENARIO III
## NET METHOD

SUB PERIOD



Bar chart with vertical axis labeled by sub periods from 1966\67 to 1966\90, and horizontal axis from 0 to 70. Legend: ▓ D.R.6%  ▨ D.R.10%  ☐ D.R.12%

Sub periods (top to bottom): 1966\67, 1966\68, 1966\69, 1966\70, 1966\71, 1966\72, 1966\73, 1966'74, 1966\75, 1966\76, 1966\77, 1966\78, 1966'79, 1966 80, 1966\81, 1966\82, 1966\83, 1966 84, 1966\85, 1966\86, 1966\87, 1966 88, 1966\89, 1966'90

Horizontal axis: 0  10  20  30  40  50  60  70

Legend: D.R.6%    D.R.10%    D.R.12%

D.R.= DISCOUNT RATE

82
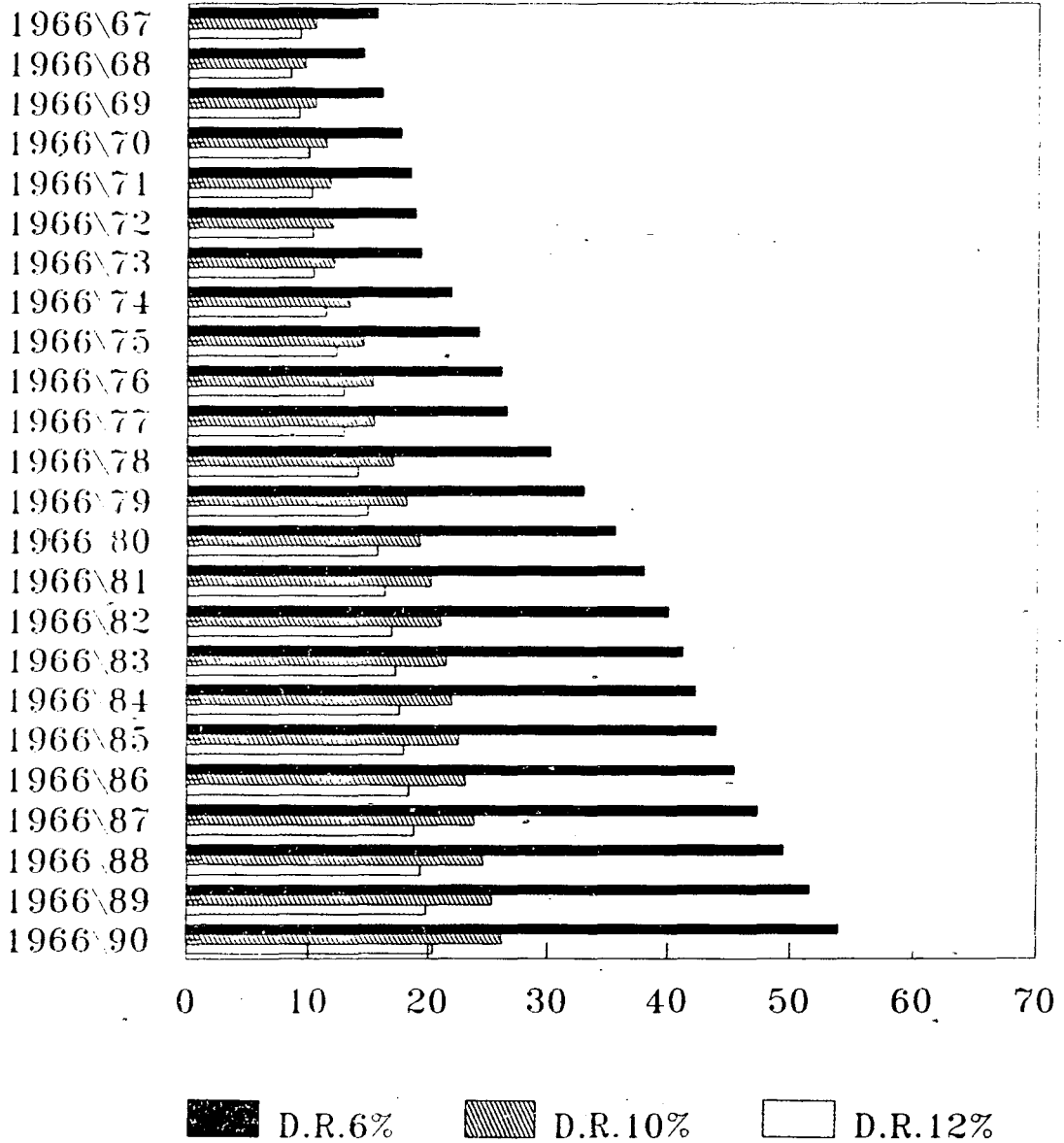
# BENEFIT-COST RATIO
## SCENARIO III
## GROSS METHOD

SUB PERIOD



| | |
|---|---|
| ▇ D.R.6% | ▨ D.R.10% | ☐ D.R.12% |
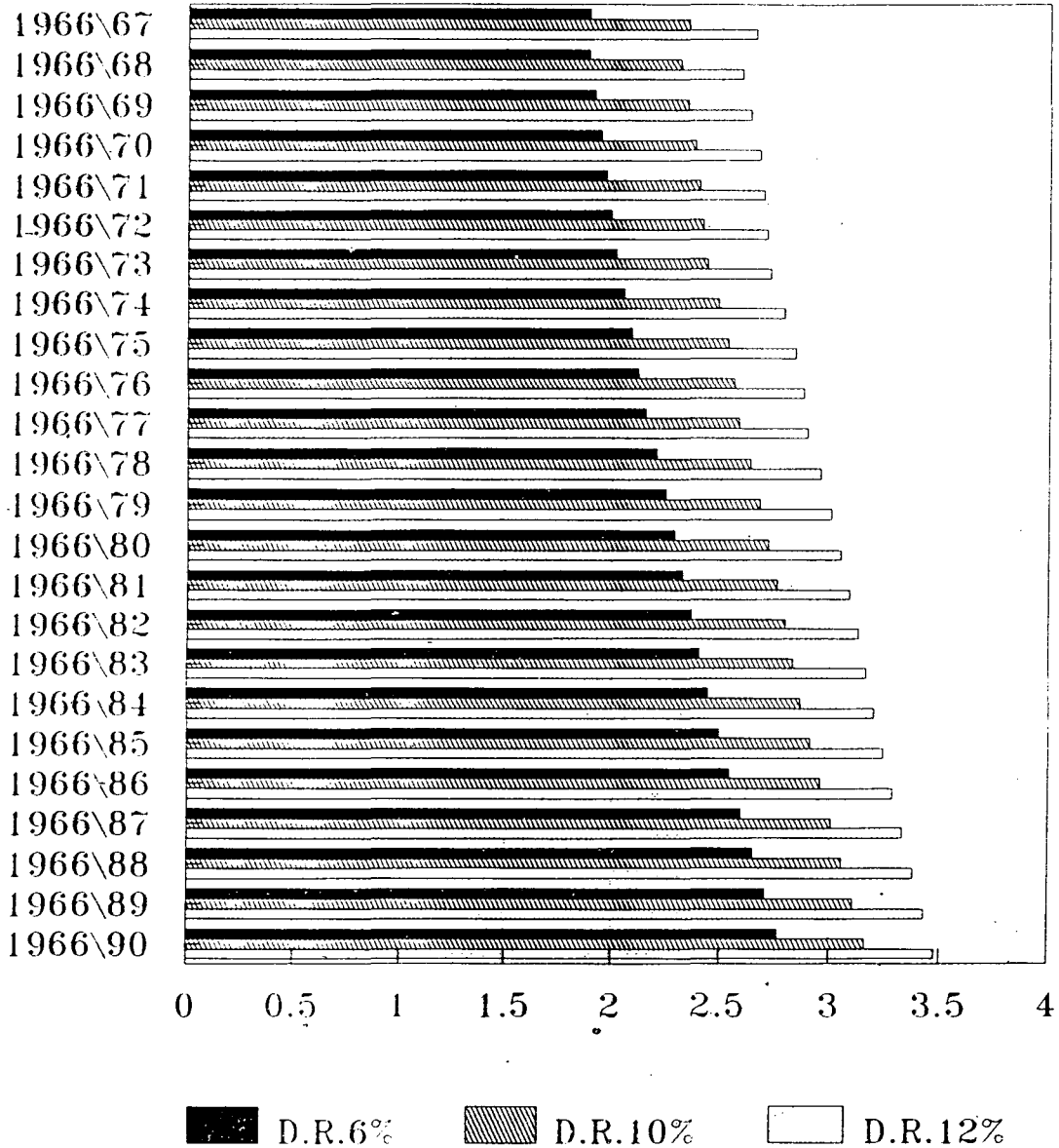
D.R.= DISCOUNT RATE

# CONCLUSION

## CONCLUSION

The need for economic evaluation of family planning programmes arises from the fact that the economic aspects are important for the formulation of population policies. To evaluate a programme from economic point of view an appropriate evaluative technique is needed. Cost-Benefit Analysis ( CBA ) technique is widely used in different sectors of the economy for programme/project evaluations. Hence application of this technique has been extended for evaluating Family Welfare Programmes ( FWP ) in India from an economic point of view.

Family Planning Programme ( later named Family Welfare Programme ) was launched in India by the government , way back in 1951-52 with the objective of reducing the rate of population growth. But in its four decades of operation the programme has failed to acheive the desired results. The demographic goal set forth by the planners has not been met. However the expenditure incurred by the government on the programme since its inception , increased substantially in each successive plan. The failure of the programme on the demographic front despite heavy investment in it, provides sufficient ground for evaluation of the programme from an economic point of view.

The earlier studies on the subject may be divided into three categories. The studies in the first category (Enke 1960a; Repetto 1968 etc) mainly deal with the estimation of 'value' of preventing a birth. Using one of these 'values' the studies in the .second category ( Seal and Bhatnagar 1973; Sivarama Raju 1976; Rani Gopal 1984; etc ) have tried to evaluate the Family Planning Programme in India in the later years. This approach is not satisfactory, as shown in the present study, because the 'value' of preventing a birth changes every year. Third category consists of the studies ( Gupta and Talwar 1992 etc ), which judge the financial soundness of the programme. This type of studies do not take the social costs and benefits into account , but the costs and benefits of the agency ( in this case the government ) conducting the programme are considered only.

In the present study attempt has been made to evaluate the Family Welfare Programme ( FWP ) by applying CBA technique for the period 1966-67 to 1989-90. The benefits and costs of the FWP, to the society, have been compared with the situation in which no such programme existed.

Since a comprehensive CBA requires that all the relevant costs and benefits should be taken into account, a satisfactory set of social welfare criteria for birth prevention ( through the provisions of FWP ) is needed. In

this study, benefits have been measured in terms of avoided expenditures resulting from prevention of births. It includes (i) the consumption expenditures that would have been required for averted births and which are now available to the population and (ii) the government expenditures on health and education that would have been incurred on averted births. The cost side of the study includes loss of production resulting from smaller labour force as the delayed effect of lower fertility - measured in terms of marginal product of labour - and the expenditure incurred on the FWP. Important variables such as the utility of children, total output, income distribution etc. should have also been included, but due to problems of measurement and valuation they could not be included. Other 'initial effects' and all the 'secondary effects' have not been included in order to limit the scope of the study and make it more focussed. Zaidan's ( 1971 ) work tried to capture the 'secondary effect' of Family Planning Programmes , but it took into account the secondary effects of the benefit side only and ignored that of the cost side completely. This practice biases the results in favour of benefits.

In our scheme of analysis the benefits measured in terms of avoided consumption expenditure has the largest share (more than 90 per cent ) in each year of our period of analysis. Similarly, in the cost side, loss of

production also gives a substantial amount. This implies that the consideration of 'externalities' of the programme are much more important for assessing its desirability from an economic point of view. Even after drawing boundaries around the effects of the programme, several problems related to measurement and valuation of the relevant variables arose. Several adjustments and assumptions have been made to overcome these difficulties. This shows limitations on the applicablity of CBA technique in evaluation of Family Welfare Programme.

To see the sensitivity of our results, alternative situations regarding the value of relevant variables in future years have been assumed. Apart from that, different discount rates have been used. And finally, Benefit-Cost Ratios have been calculated by different methods under different scenarios. 'Cumulative Approach' has been followed to minimise any errors arising from the possibility of time phasing of number of births averted figures.

The results of the study show that for the period of analysis ( 1966-67 to 1989-90 ), the benefits of the FWP out weigh the costs. The BCR are not only high ( greater than one ) for each sub-period, but they also increase over the period ( barring few years in the beginning ) for all the

three scenarios assumed by us. However the size of BCRs and the magnitude of their increase are highly sensitive to the different assumptions made, methods and discount rates used.

If the loss in production resulting from averting a birth is considered as negative benefit ( Net Method ), the BCRs show very high values for each sub-period under all the three assumed scenarios at all the three discount rates used. The magnitude of the increase in BCRs over the period are also high. However BCRs calculated by this method are lower at higher discount rates. On the other hand if the loss in production is considered a positive cost to the society ( Gross Method ), the BCRs show much lower values. They show very marginal increase ( almost stagnant ) in their magnitude over the period. They show even a decreasing tendency for scenario two. Moreover the BCRs calculated by this method are higher at higher discount rates.

Therefore different inferences may be drawn from the different results obtained by the study. On the whole it may be said that over the years ( from 1966-67 ) Family welfare Programme has been beneficial for the soceity from the economic point of view. However, keeping in mind its failure to achieve the demographic goals, it may be said that there is ample scope for improvement in it.

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