WOMEN'S ECONOMIC ROLES AND CHILD SURVIVAL A CASE STUDY OF SOUTH INDIA

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CERTIFICATE

This is to certify that this thesis, "**WOMEN'S ECONOMIC ROLES AND CHILD SURVIVAL- A CASE STUDY OF SOUTH INDIA**" submitted for the award of the Degree of Doctor of Philosophy in Economics of the University of Calicut is a bonafide record of research done by **Mr. JAYAMOHAN M.K.,** under my supervision and no part of this has been submitted for any degree before.

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DECLARATION

I, **JAYAMOHAN M.K.**, do hereby declare that this thesis entitled **WOMEN'S ECONOMIC ROLES AND CHILD SURVIVAL- A CASE STUDY OF SOUTH INDIA** is a bonafide record of research work done by me under the guidance of Dr. K.R. Lakshmy Devi, Professor, Department of Economics, University of Calicut.

I also declare that this has not been submitted by me fully or partly for the award of any Degree, Diploma, Title or recognition before.

Kozhikode, **JAYAMOHAN M.K.**

Dedicated to

My Family Members and Friends

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Jayamohan M.K.

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ABBREVIATIONS

ANC	Antenatal Care
ANM	Auxiliary Nurse Midwife
ARI	Acute Respiratory Infection
ASFR	Age Specific Fertility Rate
BCG	Bacille Calmette Guerin (Vaccination for TB)
CEB	Child Ever Born
CM	Child Mortality
CS	Child Survival
DHS	Demography and Health Survey
DPT	Diphtheria Polio and Tetanus
ICDS	Integrated Child Development Services
IFA	Iron and Folic Acid tablets
IIPS	International Institute of Population Sciences
IM	Infant Mortality
LHV	Lady Health Visitor
MDG	Millennium Development Goals
MM	Maternal Mortality
MOHFW	Ministry of Health and Family Welfare
NFHS	National Family and Health Survey
ORS	Oral Rehydration Salt
ORT	Oral Rehydration Therapy
PCA	Principal Component Analysis
TB	Tuberculosis
TBA	Traditional Birth Attendant
TFR	Total Fertility Rate
TT	Tetanus Toxoide
UNICEF	United Nation’s Children Fund
USAID	United States Agency for International Development
WB	World Bank

WHO	World Health Organisation

CHAPTER I

INTRODUCTION AND DESIGN OF THE STUDY

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INTRODUCTION AND DESIGN OF THE STUDY

1.1 The Background

"*When woman moves forward,*
the family moves,
the village moves and the nation moves"

Pandit Jawaharlal Nehru

India is witnessing an acceleration of development and the country's future prosperity is linked to the health of the nation and its people. In this context health needs and aspirations of women and their children are a major area of concern by researchers and policy makers.

Traditionally, a woman's place has been at home and a generation ago, her employment outside the home was looked down upon by the society. Now this situation has changed. Women have started seeking employment outside their homes through gross economic necessity followed by the desire to raise economic status, to have an independent income, to make use of education, to pursue a career etc (Sivakami 1997).The empirical evidence and experiences show that the active participation of women in

economic activities is a prerequisite for development and demographic features at the community level.

Employment gives economic status to women, and economic status paves the way for social status. These two are essential for a woman to succeed and survive in the dynamic society. It is an accepted fact that only when women are in the main stream of progress, can any economic and social development be meaningful. The participation of women in economic activities, particularly outside the home, is often posited as an important enabling factor in the economic and social empowerment of women. Not only can employment be a source of economic independence, but it can help to give women a sense of self-worth (Sunitha Kishor, Kamala Gupta, 2004).

The celebrated work of Boserup (1970) reviewed the role of women in economic development, followed by International women's conference in Mexico City in 1975, helped to accelerate the emergence of growing number of studies on the status of women in the third world. These studies indicate, almost unanimously, that women occupy a lower status, socially and economically, both in the household and society. Women have a smaller range of opportunities than men within the diversifying labour market. They are found largely in the informal sector, where pay is low

and unsteady and social security is not available (Boserup, 1970).Work force participation of women and their role in the development process have emerged as one of the focal points of debate in the recent times.

The majority of women in India enter the labour force due to economic compulsions and the benefits of their economic contributions are likely to be mediated by the socio-cultural context of women's work and their total work burden (Bardhan 1985, Desai and Jain 1994, Kabeer 1999).With an increase in the labour force participation, the dual role of women in developing countries, both as income earner and family care provider has emerged as an important factor. Since mother usually is the primary care provider for children, increasing women's participation in economic activities outside home may impact the family and particularly the child (Sivakami, 2000).Participation of women in economic activities has several advantages for women and their families, the greatest of which is associated with the access to and control of income.

In demographic literature, there are many discussions on the relationship between women's economic roles and child survival. Most of the researches in India suggest that women's employment may have at least one disadvantage; the survival of young children appears to be negatively affected if women work(Basu and Basu1991,Sunitha Kishor 1992).The

mother's employment is seen as affecting the family through changes in care received by children. If a woman is working she is less likely to spend time on feeding children, nursing them, breast feeding and playing with them. In the past, older siblings or grandparents were usually available to take care of young infants while the mother was employed; however because of social change and modernization, the extended family has become less common. All these factors contribute to poor child health.

The ways in which women's employment influences child bearing vary widely and depend on different factors like socio-economic status of the family, biological factors, cultural practices etc (Binitha V Thampi, 1996).The mother's work status determines the amount of time and care a mother can give to her child, and it may determine the amount of resources/income available to the mother and thus her access to various goods and services.

1.2 Importance of the study

The concept of women empowerment has become the focal point of numerous studies in demographic literature. Greater concern from the government and international bodies have contributed to increasing level of female participation in economic activities all over the world.

The relationship between women's economic roles and child survival remains dichotomous. On the one hand, women's participation in economic activities may adversely impact child health as the child will not get full attention from its mother. On the other hand the mother's participation in economic activity enhances the family income which in turn has a positive impact on child nutrition and health. Thus the ultimate outcome of female participation in economic activity on child survival depends on the relative influence of these two routes of causation.

After reviewing the available literature on the relationship between women's economic roles and its impact on child survival it is seen that, it has not received more than a passing attention even though various data analyses have found a negative association between mother's employment status and her children's survival. This situation is in sharp contrast to the large and still growing interest in the positive association between maternal education and child survival (Basu and Basu, 1991).These sharply contrasting schools of thought indicate the continued need for study of the relationship between women's economic roles and child survival. Further study is needed to identify some of the ways in which women's economic activity may be good or bad for their children.

1.3 Objectives of the study

The broad and basic objective of the study is to examine the relationship between women's economic roles and child survival in South India. To realize this broad objective, the study seeks;

1. To identify the determinants of infant and child mortality in South India
2. To examine the Socio - economic status of women in South India with selected indicators.
3. To examine differentials in child survival in relation to different economic roles performed by women.
4. To identify the gender difference in child survival in South India

1.4 Hypotheses

After reviewing the available empirical and theoretical works, the following hypotheses are formulated and tested.

H1.Despite its many advantages, the work force participation of women is associated with increased mortality for infants and young children.

H2. Of the socio economic factors, mother's time with children is the major determinant of child survival.

H3.There is no gender differentials in child survival in south India.

1.5 Data Sources

The data used for analysis in this study are from National Family and Health Survey round 2 (NFHS 2) of 1998-99 and National Family and Health Survey round 3 (NFHS 3) of 2005-06. Different organizations collected data for NFHS under the coordination of International Institute of Population Sciences (IIPS) Mumbai. The NFHS is one of a series of fairly comparable Demographic Health Surveys (DHS), available for about seventy low and middle income countries. Among the world's largest health survey NFHS were funded by United States Agency for International Development (USAID) in India with additional fund from United Nations Children Fund (UNICEF). These surveys provide data on fertility, family planning, maternal and child health, nutrition and infant and child mortality and related issues. The household sample survey covered over nearly 99% of country's population. Following strict parameters of questioning, ever married women aged between 15 and 49 were interviewed in local languages. Table 1.1 shows the household and women samples collected for NFHS 2 and NFHS3.

TABLE 1.1

NUMBER OF HOUSEHOLDS AND WOMEN INTERVIEWED IN SOUTH INDIA (NFHS 2 AND NFHS 3)

States	Number of Households interviewed		Number of women interviewed		Household response rate		Women response Rate	
	NFHS 2	NFHS 3	NFHS 2	NFHS 3	NFHS 2	NFHS 3	NFHS 2	NFHS 3
All India	**91,196**	**109,041**	**89,199**	**124,385**	**97.5**	**97.7**	**95.5**	**94.5**
Andhra Pradesh	3,872	6668	4,032	7128	99.4	97.8	98.2	93.5
Karnataka	4,273	3342	4,374	6008	97.1	96.7	94.7	92.3
Kerala	2,834	3023	2,884	3566	98.0	99.3	92.9	96.4
Tamil Nadu	5,281	6344	4,676	5919	99.8	98.6	99.7	97.6

Source: NFHS 2 and NFHS 3

Household Response Rate is calculated by using the following formula

Household Response Rate = Number of households with a completed household interview /Sum of number of households with a completed household interview, households that live in the dwelling but no competent respondent was at home, households with permanently postponed or refused interviews, and households for which the dwelling was not found.

Women's Individual Response Rate is calculated by using the following formula

Women's Individual Response Rate	=	Number of eligible women with a completed individual interview/Sum of number of eligible women with a completed individual interview, eligible women not interviewed because they were not at home, eligible women with permanently postponed or refused interviews, eligible women with partially completed interviews, eligible women for whom an interview could not be completed due to incapacitation and for other reasons.

1.6 The settings/Profile of the study area

The field of investigation for the study is south Indian states. South India is a socio-political region of India that comprises the four Indian states of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu and the Union Territory of Pondicherry, whose inhabitants are collectively referred to as South Indians. This region includes the entire Indian Peninsula, south of the Vindhya ranges. The Narmada and Mahanadi rivers form the northern boundaries of the region, while the Arabian Sea, Indian Ocean and the Bay of Bengal surround the peninsula in the west, south and east respectively.

1.7 Coverage:

Women eligible for interview, usually women who are between the ages of 15 and 49 who slept in the household the night before the survey. In ever-married samples, women are eligible for interview only if they have ever been married or lived in a consensual union.

1.8 Methodology

Appropriate statistics and econometric methods are used in the present study for analysis. Different models and statistical methods are being used for investigating the association between different variables, which are listed below.

i)The Percentage Annual Rate of Change

The percentage annual rate of change over the period is the discrete rate of change derived from the trend coefficients of regressions of the log of mortality on time. This is used to assess the trend in Infant Mortality. The computation procedure is given below.

Semi log trend model used is

$Logy=a+ b_t$

Where;

Y =Infant Mortality

t = time variable

a and *b* are parameters to be estimated

The above model was estimated by the method of least squares. The compound growth rate was calculated by using the formula

$$CGR = (\text{antilog } b\text{-}1) \times 100$$

ii) Cox Proportional Hazard Model

In order to examine the determinants of infant and child mortality in South India, the Cox proportional hazard model (Cox and Oakes 1984, and Collet1994) is used. This model is used in the sixth chapter. The model specification and further explanation is given in that chapter.

1.9 Operational Definitions and Concepts

The definitions of different concepts and variables used in this study are given below.

Child Survival

The variable child survival (CS/CEB) is defined as the proportion of children surviving to total children ever born for women who are ever married during the period of investigation.

Infant and Child Mortality

All mortality rates presented in this study are probabilities of dying between two exact ages. Details are given below

Infant Mortality

The probability of dying between birth and exact age one

Child Mortality

The probability of dying between exact age one and five

Neonatal Mortality

The probability of dying between birth and one month of age.

Post Neonatal Mortality

The probability of dying after the first month of life but before age one.

1.10 Delimitation

The study covers a research problem which identifies the association between women's economic roles and child survival, but its scope of analysis is delimited to the households living within the boundary of South Indian states viz. Kerala, Tamil Nadu, Karnataka and Andhra Pradesh

1.11 Limitations

Being a social science research, this study is not free from limitations. The researcher admits the following limitations in this study.

Data Quality

Retrospective data of any kind are subject to errors arising from faulty respondent recall, and birth history data are particularly vulnerable to several problems related to reporting.

Study area

The present study exempted the union territory of Pondicherry under the profile of study area. Though it falls within the boundary of South India, there are problems related to data available.

Concepts and Definitions

The study strictly followed all the definitions given in National Family and Health Survey (NFHS) about different variables. These definitions may have some differences with other surveys.

1.12 Chapter scheme

The research report is organized in seven chapters. Following the introduction, the second chapter reviews related literature. In this chapter both conceptual issues and empirical works are reviewed.

The third chapter, under the title infant and child mortality trends in South India explains the trends in infant and child mortality in India and rest of the world in general and South India in particular.

The fourth chapter on Economic status of women in south India explains the economic status of women in relation to employment, education, maternal health and decision making.

The fifth chapter entitled determinants of Infant and child mortality in south India examines the factors which determine survival status of infants and children.

The sixth chapter is devoted to an econometric analysis of women's economic roles and child survival. In that chapter, the Cox proportional Hazard model is used. That model helps to examine the association between women's economic activities and its impact on the survival of their children.

The seventh chapter is a summary of findings and conclusions. A brief summary of major findings and conclusions are given in that chapter.

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CHAPTER II

REVIEW OF RELATED LITERATURE

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In this chapter an attempt is made to review some of the relevant works in the field of women empowerment and related issues. After the international women's conference in the Mexico City in 1975 there were many studies about different issues related to women empowerment. Since, the area of research concerns women's economic roles and child survival, the emphasis is being given to works in this and related areas.

2.1 Women and Work: Conceptual Issues

During last three decades, there has been large number of studies in the field of women and work. Most of these studies raised the issues related to the measurement of women's work. Most of the surveys considered women, who work in activities which are commonly performed by men are much more likely to be counted as working. This type of estimation and analysis has undergone criticism from different researchers. They referred women as "invisible workers" because of the failure to enumerate domestic labour in the census and the national accounts. Invisibility of women's work arises because of two factors viz. conceptual and data collection. Conceptually women's work tends to be regarded as non-productive and

secondary to men's work. The issue related to data collection is lack of recognition of women's contribution to the household. This invisibility of women's work which is the predominance in the household domain placed women at the lower rungs of labour market.

Desai and Jain(1994) in their study on rural South India, noted that with the supposed conflict between children's need for care and mother's need for income, the role of domestic labour of women tended to be ignored. In addition to domestic activities like cooking and cleaning, women spent considerable time on other activities like the making of cow dung cakes, collection of fire wood etc. which are rarely considered as economic activity. Although these activities are highly productive, they are called "marginal economic activity" or "expenditure saving activity".

Some of the researchers are of the opinion, that the production of commodities that have exchange value is viewed as economic activity, whereas the production of use value commodities are not considered so. Since most of women's domestic and interrelated tasks do not have exchange value, their activities are relegated as non-work. This approach has several implications. In addition to undermining women's contribution ,the exclusion of use value production renders the economic analysis incomplete, leads to the distortion in the measurement of

economic activity and can reinforce ideological biases that undervalue women' work.

In his study, Richard Anker (1983) listed out two biases that might affect the reporting of women's work. One is the enumerator bias and the other is respondent bias. Enumerator bias occurs when the enumerator happens to be a male from a higher social class than the respondent. In this case, the enumerator may affect by steering the respondent towards what the former considers as the correct answer. Respondent bias occurs when both the enumerator and respondent happen to be males who may hold the perception of women as housewives which may bias the results. In addition Duvvury (1989) reveals that, in societies where female work participation is considered as loss of status, there is an incentive to deny women's work participation even if they are actually involved in outside work.

The Human Development Report (1995), argues that undervaluation of women's work arises partly due to the restricted definition of value itself. It notes that value of much of the house work performed by women transcends market value. It came to conclude that, if women's unpaid work were properly valued, it is quite possible that women would emerge in most societies as main bread winners or at least equal bread winners since they put in more hours of work than men.

Krishnaji (1990) states that the definition of work that centers on economic activity is inappropriate for economies like India where most of the working women tend to be concentrated in non-marketed, non-monetised subsistence based activities.

2.2 Pressure on Women Work

A mother's decision to work will be influenced by her earning potential, her own characteristics, and those of her husband. The presence of young children imposes a constraint to her work because they must be cared for at all times. Therefore, the price and availability of child care are expected to affect her decision to seek employment. Moreover, if a mother's preferences for work are related in unobservable ways to her preferences for child care, then the choice of her work status could be made simultaneously with her child care decision.

Most of the studies in this area reveal that women in poor households are going for work due to sheer economic necessity .A United Nations study noted the stress factor (ie., economic necessity) as an important factor in explaining the higher infant and child mortality for economically active women. The study also reveals that the lower survival rates of the children of those women who are active in economic activities are due to the absence of basic economic needs and not because of child neglect.

2.3 Women's Time and Child Survival

Time allocation studies show that women in developing countries face severe time constraints for their child care. This section follows different lines of argument about mother's time allocation to child care and health related activities.

A world survey conducted by the initiative of Sivard (1985) for World Priorities concludes that, as a rule, women work longer hours than men. Many carry triple workload in their household, labour force, and reproductive roles. Rural women often work an average of 18 hours a day. And, these extremely busy, low income women living to a great extent in rural parts of the developing world.

Time allocation studies concerning the productive and reproductive responsibilities of low income women in developing countries are the best source of information available concerning a mother's time allocation to her child care. One study from Philippines by Ho (1979) found that except during the first year of the child's life, the time spent by mothers on the care of young children draws little time from their market production, and significantly more time from their leisure; when the child is less than a year old, the same reduction in leisure time occurs but there is an

additional reduction in market time to compensate for even longer child care time.

One study in Cameroon by Bryson (1979) cited that 12% women employed for wages had quit work at some point in order to care for a child who was ill over a prolonged period.Paolisso, Ngare and Timiyan (1989) report from a time allocation study in Kenya that during periods of peak agricultural activity, mothers reduced the amount of time they spent holding infants and that this seemed to be associated with an increase in infant diarrhea. Similarly, Popkin and Doan (1990) found an association between the efficiency and food utilization by children and the quality and quantity of maternal time they received.

By evaluating the time use data from twenty countries, Gershuny (2000) concluded that time spent on child care activities by men and women decreased between 1960 and 1984, but increased thereafter. In contrast, research by Klevmarken and Stafford (1999) suggests that the time spent by parents with their children decreased in Sweden between 1984 and 1993.

2.4. Mother's Workforce Participation and Child Survival

In demography literature, different studies reveal the unpleasant implications of mother's work force participation on child survival.

Despite its many advantages, the participation of women in economic activities in developing economies especially in India has been associated with increased infant and child mortality. In this section some relevant works in this field are being reviewed.

Sunitha Kishor and Sulabha Parasuraman (1998) in their subject report on NFHS 1 reveals the relationship between mother's employment and mortality of children in India. It varies according to whether the focus is on the probability of death before age one or between ages one and four. This study finds that infant mortality does not vary by whether a mother is employed or not per se, but mother's employment does have negative consequences for infant survival if mother works away from home for cash. The negative influence on infant mortality of work away from home for cash is due to its strong negative effect on the survival chances of male infants. In this report the authors also examined the effect of employment on child survival by area of residence. It becomes clear that survival of infant girls varies by mother's employment, but the opposing effect of employment on female infant mortality in rural and urban areas may be canceling each other out. An infant daughter's chances of survival if the mother works are significantly reduced in urban areas but increased in rural areas, although the effect is not significant in rural areas.

Krishnaji (1995) in his article used 1981 census data to analyse the levels and gender differentials in child mortality across the rural parts of the Indian states in relation to the work status and work participation rates among women and two other correlates of mortality viz. fertility and female literacy. He found that in all the states, working mothers experience a greater child loss than non- working mothers. He arrived at the conclusion that in India work among women can be closely identified with poverty and this identification of poverty of a lasting kind with working mother's results in a poor nutrition and health care among their children.

The study conducted at Centre for Development Studies by Zachariah, Irudaya Rajan et al (1994) focused on demographic changes in Kerala in the 1980s and its determinants. The authors found that in Kerala if a woman was working, the mortality risk for the child during infancy and childhood was higher than if she was not working. The cause being that the working woman had a shorter duration of breast feeding and less time with the child. The researchers noted that infant mortality rate for working and non-working mothers are fifty-four and twenty-nine respectively for the period 1980-89.In a study of a slum population in Delhi, Basu and Basu (1991) also found higher risk of child mortality for working mothers at least in the poorest section of the population.

Sivakami (1997) investigated the relationship between female work participation and child health in rural Tamilnadu. She took a sample of 150 ever married women, of which seventy-five were working and seventy-five non-working. Her result showed that the working women spent on an average 1.7 hours less than the non-working women on child care. The duration of breast feeding also was shorter among the working women. The morbidity rates were higher for the children of working women than for the children of non-working women. In her model, the logistic regression results showed that the children of working women were at a significantly greater risk of morbidity even when socio-economic factors were controlled.

A study on women in landless agricultural labourers household by Mencher (1988) reveals the different ways in which men's and women's incomes are spent. The results indicate that a very high percentage of the income earned by female goes to household maintenance, whereas a lower percentage of male income is comparably spent.

Desai and Jain (1994) examined the role of female employment in child care and health in the villages of Karnataka state. They reached the conclusion that in villages, children whose mothers are wage workers are less likely to be immunized and more likely to suffer from poor nutrition

than children whose mothers are family workers or housewives. They also found that mother's time in specific activities such as feeding or bathing children did not differ much by work status, but the mother's leisure time was affected by her work.

By taking data from twenty-eight countries in Fertility Survey, Hobcraft et al (1984) found a negative association between mother's workforce participation and child mortality in almost all countries under consideration. This negative relationship between these variables , according to them is, working women in many developing countries were generally less educated and are from lower socio-economic strata. However even after the other socio-economic factors were controlled, the net effect of work participation on child survival was found to be negative.

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CHAPTER III

INFANT AND CHILD MORTALITY TRENDS IN SOUTH INDIA

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INFANT AND CHILD MORTALITY TRENDS IN SOUTH INDIA

This chapter explains the trends in infant and child mortality in India and rest of the world in general and South India in particular.

3.1 World Trends in Infant Mortality, 1960-2006

This sub section gives a brief explanation about the trends in infant mortality in India in comparison with rest of the world. Most of the countries of the world are trying to reduce infant and child mortality too slowly to meet the United Nations Millennium Development Goals (MDG) of a two thirds reduction by 2005 compared with 1990.

Every year about 11 million children die, of which 10 million are in the developing world and nearly 2 million in India alone(UNICEF,1999).Table 3.1 shows the infant mortality rates for three broad economic regions of the world and India. This comparison will give an understanding of India's position in comparison with rest of the world. The table shows that there has been a steady reduction in mortality resulting in a halving of the rate in just thirty years. The percentage annual rate of change over the period shows the rate of decline of infant mortality rate in different economic regions. The rate of decline of high income countries is better than that of low and middle income countries. India's performance is better than that of low income countries during the last forty six years.

TABLE 3.1

WORLD TRENDS IN INFANT MORTALITY, 1960-2006

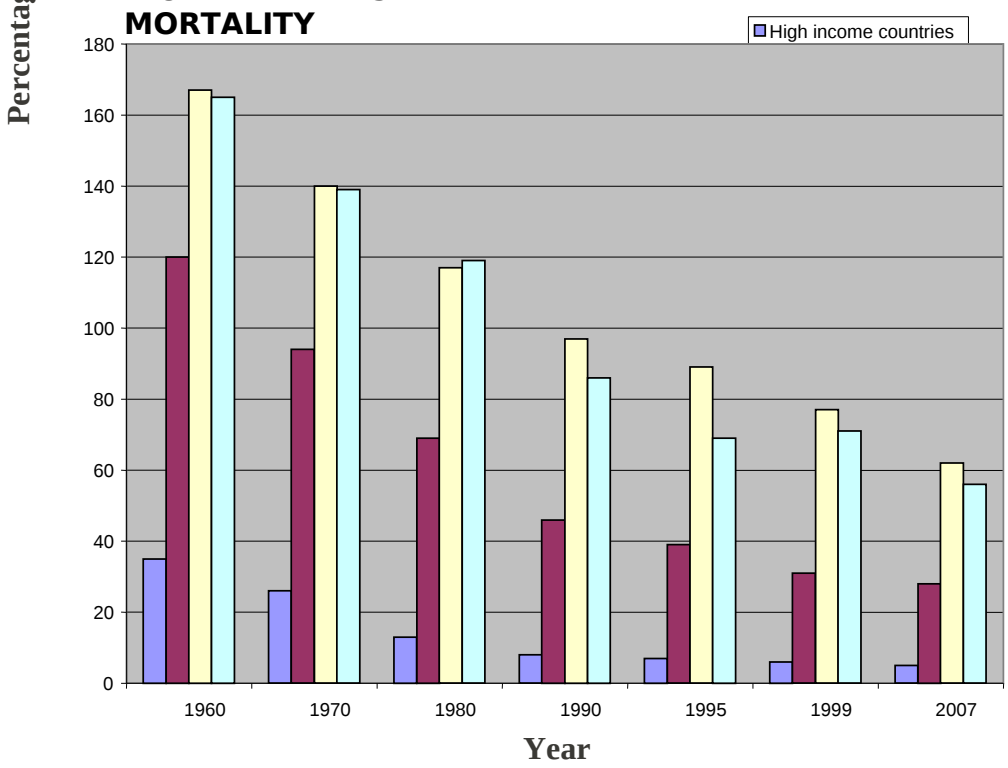
Year	High income countries	Middle income countries	Low income countries*	India
1960	35	120	167	165
1970	26	94	140	139
1980	13	69	117	119
1990	8	46	97	86
1995	7	39	89	69
1999	6	31	77	71
2006	-	-	-	57
% annual rate of change over the period*	-3.7	-2.8	-1.6	-1.9

Source: World Bank, 1998 and 2001 and NFHS 3

** The percentage annual rate of Change over the period is the discrete rate of change derived from the trend coefficients of regressions of the log of mortality on time*

- Data not available

FIG 3.1
WORLD TRENDS IN INFANT MORTALITY



3.2 Infant and Child Mortality by State

This sub section examined the infant and child mortality rates by 29 states between NFHS II and NFHS III. Table 3.2 shows infant and child mortality changes during these two surveys. Infant mortality is reduced by 15.68 % during this period in India. The performance of some of the states is better than that of Indian average, like Goa with 58.31 % reduction and Meghalaya with 49.89 % reduction. The infant mortality of Kerala and Goa with 15.3 out of 1000 live births is the lowest among all Indian states during 2005-06.

The reduction of child mortality in India during this two survey period is 37.20 % Tamil Nadu with a reduction of 66.67 % of child mortality stands first among all Indian states. Kerala with a reduction of 61.54 % is also performed well. Child mortality is lowest in Kerala with 1.0 during 2005-06 and highest in Arunachal Pradesh with 28.8

TABLE 3.2

INFANT AND CHILD MORTALITY BY STATE, 1998-99 AND 2005-2006

	Infant Mortality		% change	Child Mortality		% change
	1998-99	2005-06		1998-99	2005-06	
All India	**67.6**	**57.0**	**-15.68**	**29.3**	**18.4**	**-37.20**
North						
Delhi	46.8	39.8	-14.96	9.0	**7.3**	-18.89
Haryana	56.8	41.7	-26.58	21.2	11.1	-47.64
Himachal Pradesh	34.4	36.1	4.94	8.3	5.6	-32.53
Jammu and Kashmir	65.0	44.7	-31.23	16.1	6.8	-57.76
Punjab	57.1	41.7	-26.97	15.9	10.8	-32.08
Rajasthan	80.4	65.3	-18.78	37.6	21.5	-42.82
Uttranchal	-	41.9	-	-	15.5	-
Central						
Chhattisgarh	-	70.8	-	-	21.0	-
Madhya Pradesh	86.1	69.5	-19.28	56.4	26.5	-53.01
Utter Pradesh	86.7	72.7	-16.15	39.2	25.6	-34.69
East						
Bihar	72.9	61.7	-15.36	34.7	24.7	-28.82
Jharkhand	-	68.7	-	-	26.1	-
Orissa	81.0	64.7	-20.12	25.5	27.6	8.24
West Bengal	48.7	48.0	-1.44	19.9	12.2	-8.69

Continued . . .

	Infant Mortality		% change	Child Mortality		% change
	1998-99	2005-06		1998-99	2005-06	
North East						
Arunachal Pradesh	63.1	60.7	-3.80	37.4	28.8	-22.99
Assam	69.5	66.1	-4.89	21.4	20.2	-5.61
Manipur	37.0	29.7	-19.73	19.9	12.6	-36.68
Meghalaya	89.0	44.6	-49.89	36.2	27.1	-25.14
Mizoram	37.0	34.1	-7.84	18.4	19.5	5.98
Nagaland	42.1	38.3	-9.03	22.7	27.5	21.15
Sikkim	43.9	33.7	-23.23	28.4	6.7	-76.41
Tripura	-	51.5	-	-	8.2	-
West						
Goa	36.7	15.3	-58.31	10.5	5.0	-52.38
Gujarat	62.6	49.7	-20.61	24.0	11.9	-50.42
Maharashtra	43.7	37.5	-14.19	15.0	9.5	-36.67
South						
Andhra Pradesh	65.8	53.5	-18.69	21.0	10.2	-51.43
Karnataka	51.5	43.2	-16.12	19.3	12.1	-37.31
Kerala	16.3	15.3	-6.13	2.6	1.0	-61.54
Tamil Nadu	48.2	30.4	-36.93	15.9	5.3	-66.67

Source: NFHS 2 and NFHS 3
- Data not available

3.3 Infant and Child Mortality in South India

This section examines the infant and child mortality in South Indian states and a comparison also made with all India average. Table 3.3 shows infant and child mortality trends during NFHS 2 and NFHS 3 in south India. During 2005-06 infant mortality in all South Indian states is less than Indian average. Kerala is the lowest with 15.3 and Andhra Pradesh is the highest with 53.5.As far as the reduction in infant mortality during this period is concerned, Indian average is 15.68% and except Kerala the reduction of all other south Indian states is above Indian average. In case of child mortality Kerala is the lowest with 1.0 and Karnataka with 12.1 the highest. The reduction in child mortality of Tamil Nadu is 66.67 % and it is the highest among south Indian states.

TABLE 3.3

INFANT AND CHILD MORTALITY IN SOUTH INDIA 1998-99 AND 2005-2006

States	Infant Mortality		% Change	Child Mortality		% Change
	1998-99	2005-06		1998-99	2005-06	
All India	**67.6**	**57.0**	**-15.68**	**29.3**	**18.4**	**-37.20**
Andhra Pradesh	65.8	53.5	-18.69	21.0	10.2	-51.43
Karnataka	51.5	43.2	-16.12	19.3	12.1	-37.31
Kerala	16.3	15.3	-6.13	2.6	1.0	-61.54
Tamil Nadu	48.2	30.4	-36.93	15.9	5.3	-66.67

Source: NFHS 2 and NFHS 3

FIG 3.2
INFANT MORTALITY TRENDS IN SOUTH INDIA

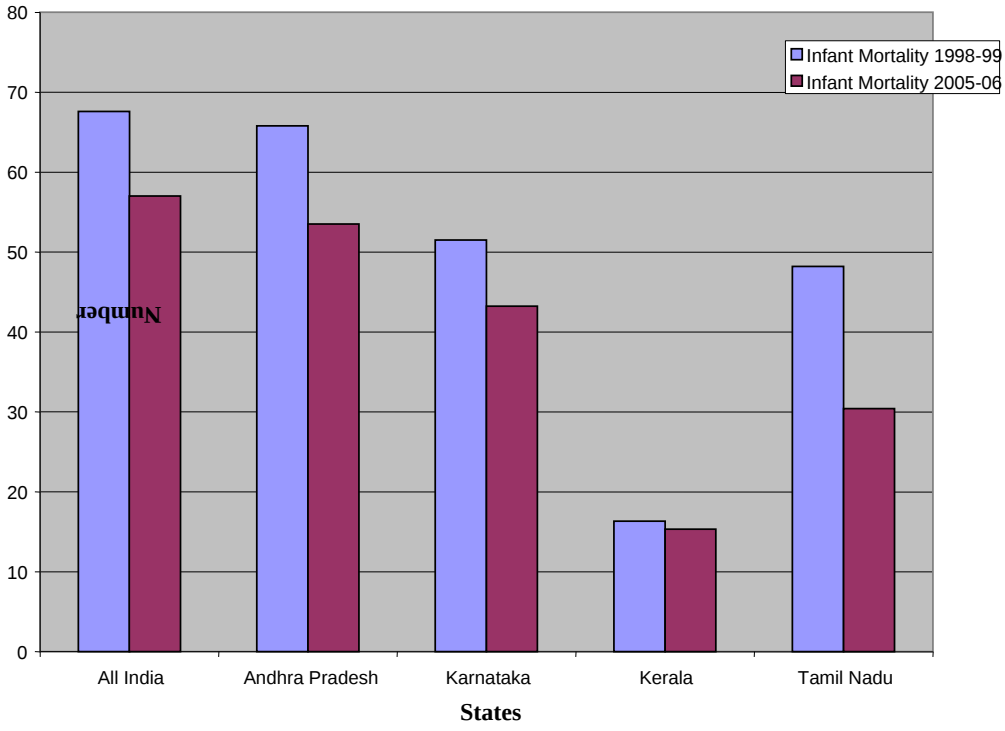
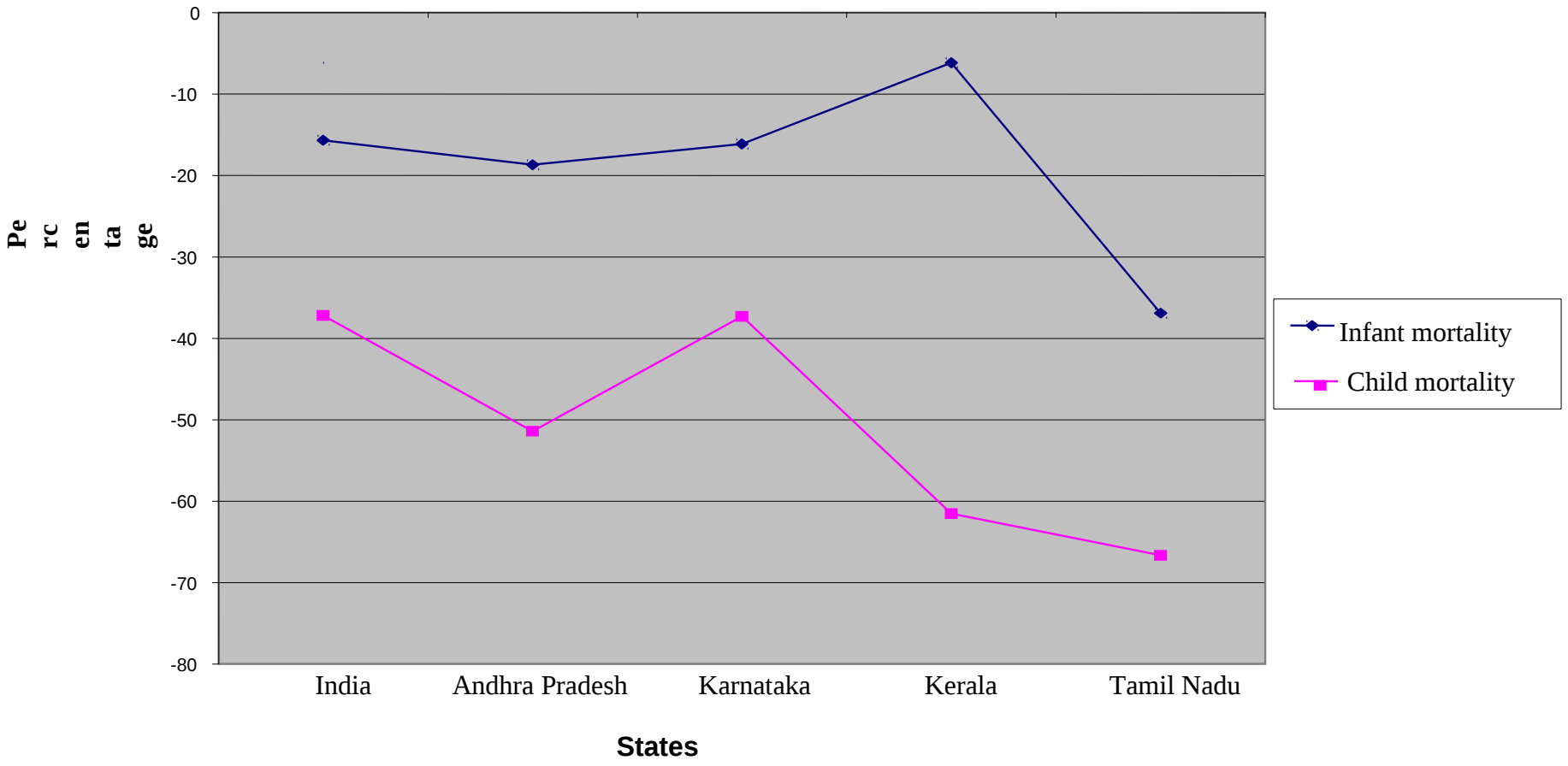


FIG 3.3
REDUCTION IN INFANT AND CHILD MORTALITY IN SOUTH INDIA FROM 1998-99 TO 2005-06



3.4. Neonatal and Post Neonatal Mortality in South India

Neonatal mortality is the probability of dying in the first month of life, and post neonatal mortality is the probability of dying after the first month of life but before the first birth day. These two categories of mortality come under the definition infant mortality. But this separate analysis is useful to identify the link between determinants of mortality like mother's health, after delivery care, vaccination etc to infant mortality. Table 3.4 shows the trend and percentage changes in the neonatal and post neonatal mortality in south India during the period 1998-99 and 2005-06.Just like other mortality indicators, Kerala is the lowest in neonatal and post neonatal mortality. In the case of neonatal mortality among south Indian states Andhra Pradesh is above Indian average with 43.8 in 1998-99 and 40.3 in 2005-06.Tamil Nadu with a reduction of 45.11% stood first in neonatal mortality reduction among south Indian states during this period. Even though Kerala ranks first in lowest post neonatal mortality during this period, it increased by 52 % compared with 1998-99to 2005-06. The neonatal mortality reduction in India was 10.4 percentages during this period. All south Indian states except Andhra Pradesh could reduce the neonatal mortality above Indian average. With respect to the percentage change in neonatal mortality among south Indian states, Karnataka performed well with a reduction of 22.10 % even then the neonatal

mortality of Karnataka is 28.9 which is still higher compared with Kerala and Tamil Nadu.

TABLE 3.4

NEONATAL AND POST NEONATAL MORTALITY IN SOUTH INDIA 1998-99 AND 2005-2006

State	Neonatal Mortality		Percentage Change	Post Neonatal Mortality		Percentage Change
	1998-99	2005-06		1998-99	2005-06	
All India	**43.4**	**39**	**-10.14**	**24.2**	**18.0**	**-25.62**
Andhra Pradesh	43.8	40.3	-7.99	22.1	13.2	-40.27
Karnataka	37.1	28.9	-22.10	14.4	14.3	-00.69
Kerala	13.8	11.5	-16.67	2.5	3.8	52.00
Tamil Nadu	34.8	19.1	-45.11	13.3	11.2	-15.79

Source: NFHS 2 and NFHS 3

FIG 3.4
NEONATAL AND POST NEONATAL MORTALITY IN SOUTH INDIA

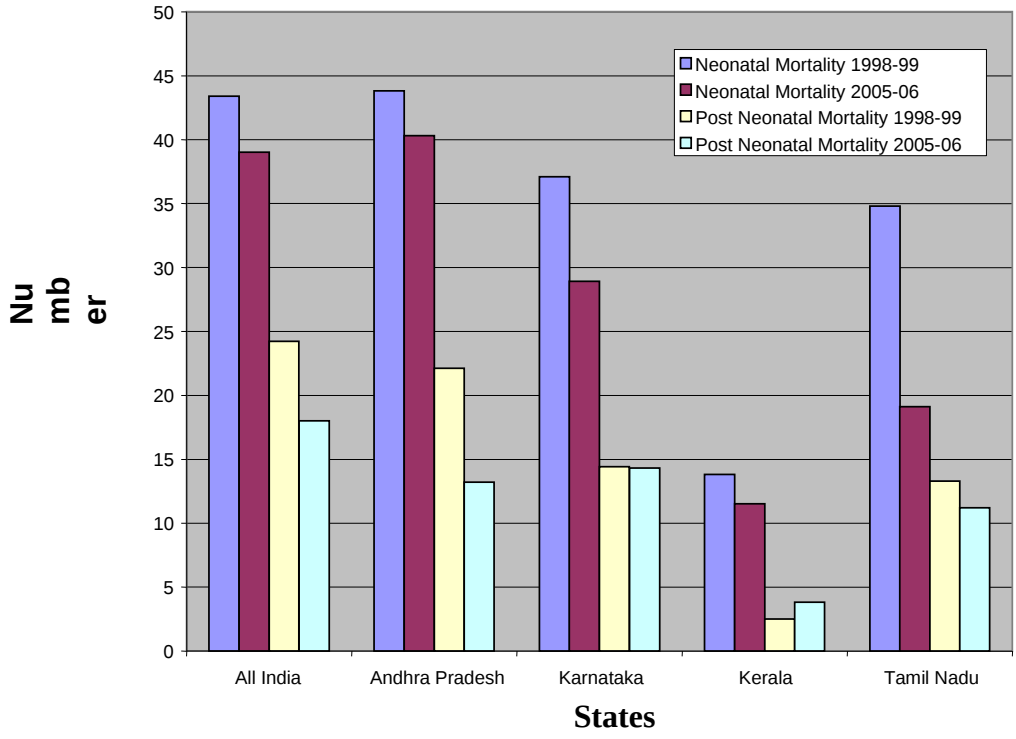


FIG 3.5
NEONATAL AND POST NEONATAL MORTALITY REDUCTION IN SOUTH INDIA FROM 1998-99 TO 2005-06

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CHAPTER IV

SOCIO ECONOMIC STATUS OF WOMEN IN SOUTH INDIA

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SOCIO ECONOMIC STATUS OF WOMEN IN SOUTH INDIA

This chapter explains the socio economic status of women in relation to employment, education, economic status, and decision making. All these empowerment variables are explained in the following discussion. Female empowerment that improves for children is sometimes different from the empowerment that achieves positive outcomes for women themselves (A.M.Basu and G.B.Koolwal, 2005). The former are in a sense of more of a function of women's ability and heightened sense of responsibility rather than simply an outcome of their ability to have their own way. That is, these abilities and responsibilities may be more easily ceded to women who are nevertheless not free agents in the way that they conduct their own lives (A.M.Basu and G.B.Koolwal, 2005).The following discussion explains a set of outcome measures that contribute to both maternal and child health and then consider measure that are more child- specific – survival status .

4.1 Employment

Employment can be considered as a shield for women to escape from all social evils. Thus female employment and their role in the development process have emerged as one of the focal points of debate in many studies. The pioneering work of Boserup (1970), which reviewed the role of women in economic development, and the International Women's Conference in Mexico City in 1975, both helped to accelerate the emergence of growing number of studies in this field. These studies indicate, almost unanimously, that women occupy a lower status socially and economically. The present investigation also explains a dismal picture on women employment.

Paid employment of women has been recognized as an important tool for population stabilization in India (Ministry of Health and Family Welfare, 2000).However, the empowering effects of employment for women, in particular, are likely to depend on their occupation, the continuity of their work force participation, and their income earning level.

NFHS 3 asked respondents many questions related to their employment status. First, the respondents were asked if they had done any work in the seven days preceding the survey. In order to minimize the underreporting of women's work, respondents were asked an additional question to probe

for informal work participation in the past seven days. Persons found to be not employed in the past seven days were asked if they were employed at any time in the 12 months preceding the survey. Employed persons were then asked about their occupation and about the type of payment they received for the work.

Table 4.1 depicts the employment status of women in South India. Currently employed persons are persons who were employed in the seven days preceding the survey and include those who did not work in the past seven days but who were absent from their regular work due to illness ,leave or any other reason. The Table 4.1 shows a dismal picture of employment status. All four South Indian states except Kerala show that statistics of currently employed women are above Indian average.Kerala is in the lowest with 27.9 %.But in terms of percentage earnings cash out of employment Kerala ranks first position with a percentage of 91.3 and Karnataka is in the last position with 72%.

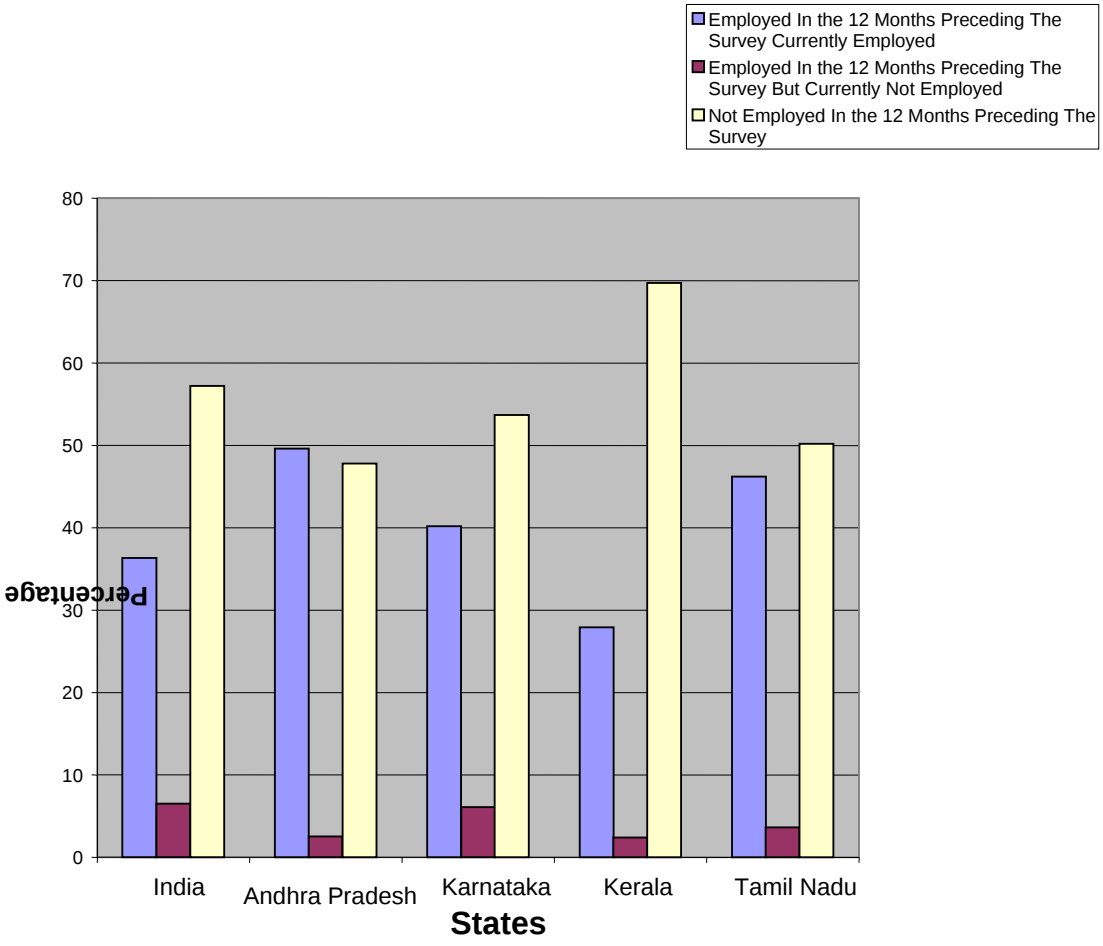
TABLE 4.1

EMPLOYMENT STATUS OF WOMEN IN SOUTH INDIA, 2005-2006

State	Employed in the 12 Months Preceding the Survey		Not Employed in the 12 Months Preceding the Survey (%)	Total (%)	Percentage Earning Cash out of Employment (%)
	Currently Employed (%)	Currently Not Employed (%)			
India	***36.3***	***6.5***	***57.2***	***100***	***64.2***
Andhra Pradesh	*49.6*	*2.5*	*47.8*	*100*	*83.6*
Karnataka	*40.2*	*6.1*	*53.7*	*100*	*72.0*
Kerala	*27.9*	*2.4*	*69.7*	*100*	*91.3*
Tamil Nadu	*46.2*	*3.6*	*50.2*	*100*	*89.9*

Source NFHS 3

FIG 4.1
EMPLOYMENT STATUS OF WOMEN IN SOUTH INDIA



4.2 Education

Education has long been recognized as a crucial factor influencing women's child bearing patterns. An extensive demographic literature has been devoted to examining the role of female education in promoting sustained fertility decline (Cochrane, 1979; Jeejeboy, 1992).Mother's education has been found to be positively associated with the greater survival of children (Bicego and Boerma 1991; Caldwell 1979, Hobcraft 1996).The evidence accumulated provides a compelling rationale for advocating increased investment in education and the elimination of institutional and cultural barriers to women's access to schooling in the formulation of policies aimed at promoting development and reducing fertility (United Nations, 1987).

Table 4.2 explains the educational attainment and literacy of women in South India. In both indicators Kerala stood in first place. The literacy among women in Kerala is 93% which shows a greater difference compared to other three states. Sixty two percentages of women in Kerala completed secondary education and 25.7% completed higher education. Andhra Pradesh with 37.8% is the lowest in secondary education of women and only 8.8% completed higher education. The literacy rate of Tamil Nadu is 69.4%, which is the second position among south Indian States. Literacy rate of Andhra Pradesh is 49.6% which is even lower than Indian average.

TABLE 4.2

WOMEN'S LEVEL OF EDUCATION AND LITERACY IN SOUTH INDIA, 2005-2006(Percentage)

States	No Education	Primary	Secondary	Higher	Total	Percentage Literate
India	***40.6***	***8***	**39.5**	**12**	**100**	**55.1**
Andhra Pradesh	*45.4*	*8.1*	37.8	*8.8*	100	*49.6*
Karnataka	*33.6*	*8.4*	44.5	*13.5*	100	*59.7*
Kerala	*3.9*	*7.8*	62.6	*25.7*	100	*93*
Tamil Nadu	*21.7*	*10.1*	49	*19.2*	100	*69.4*

Source: NFHS 3

FIG 4.2 WOMEN'S LEVEL OF EDUCATION

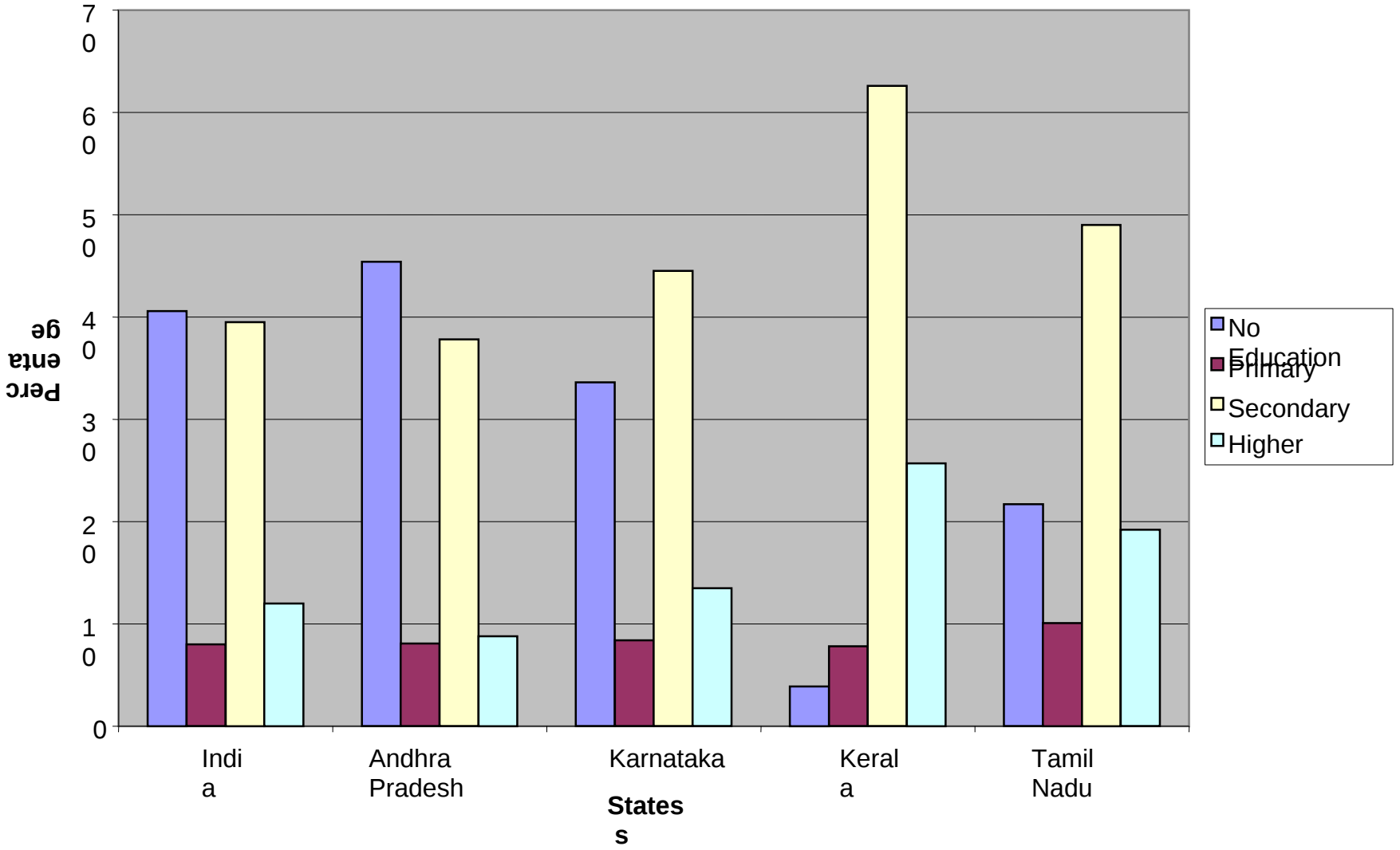
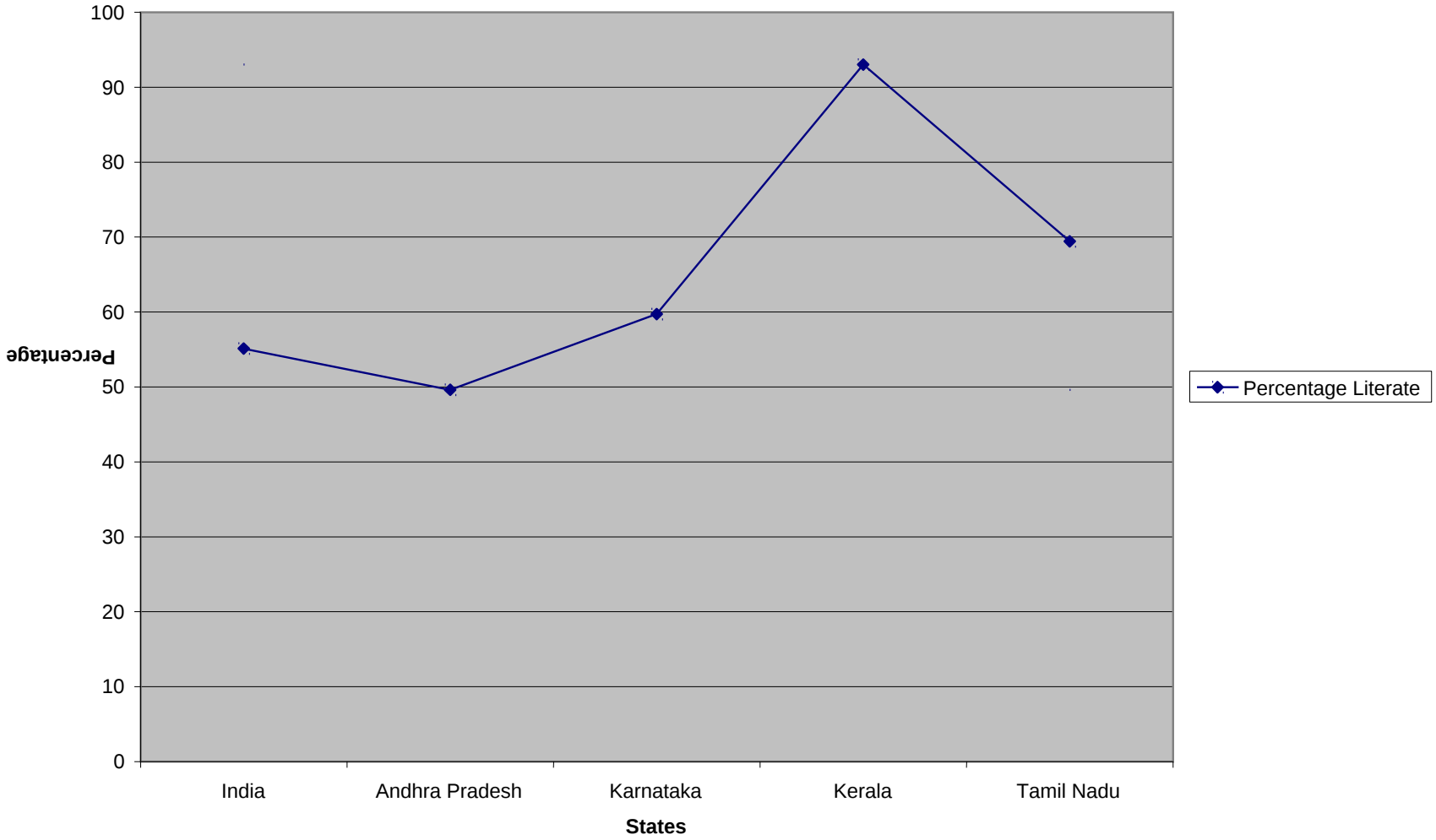


FIG 4.3
LITERACY RATE OF WOMEN IN SOUTH INDIA



4.3 Economic Status of women

This sub section is devoted to explaining the economic status of women in South India. Economic status has been long thought to be associated with health status. There are three principal indicators of economic status: household income, household consumption expenditures, and household wealth. In this analysis, in order to assess the economic status, the researcher has used household wealth as an indicator of economic status. The Demography and Health Survey (DHS) wealth index is an attempt to make better use of existing data in the Demography and Health Surveys in a systematic fashion to determine a household's relative economic status.

As a measure of economic status, wealth has several advantages. It represents a more permanent status than does either income or consumption. In the form that it is used, wealth is more easily measured (with only a single respondent needed in most case) and requires far fewer questions than either consumption expenditure or income.

4.3.1 Philosophy of the Wealth Index

Wealth or its equivalent, net assets, is theoretically a measurable quantity. One can imagine making a list of all assets (including both physical and monetary assets), assigning them a value based on the market, depreciating them, and summing the values (Shea Oscar Rutstein and Kiersten Johnson,

2004).However this procedure has the same problems as income and expenditures. Though wealth can be considered as an underlying unobserved variable, fortunately there is another way to measure relative wealth ascertain a household's relative economic status. One then needs to have indicator variables that are associated with a household's relative position in the distribution of the underlying wealth factor. NFHS 3 have collected a number of such indicator variables.

4.3.2 Construction of the Wealth Index

There are several steps to the construction of the wealth index: Determination of indicator variables, dichotomization, calculation of indicator weights and the index value and calculation of distribution cut points.

In this study each household asset is assigned a weight (factor score) generated through Principal Component Analysis(PCA).The resulting asset scores are standardized in relation to a normal distribution with mean zero and standard deviation of one. The sum of the scores of the assets possessed by each household resulted in that household's Wealth Index Factor or Score.

The data consists of household ownership of items ranging from a mattress or chair, motorcycle or car, to the house itself; dwelling characteristics

such as water source, sanitation facilities, and household construction materials; and whether a household member had a bank or post office account.

The items used to create the Wealth Index are drinking water source ,non-drinking water source, toilet facility, household electrification, household possessions, type of cooking fuel ,main floor material, main roof material, main wall material , type of windows, number of de jure members per sleeping room, and household member having a bank or post office account.

The sample was then divided into *population quintiles*, with each quintile given a rank from one (poorest) to five (wealthiest). These quintiles are based on the distribution of the *de jure* household population.

The cut-off points at which the quintiles were formed were calculated by obtaining a weighted frequency distribution of households, the weight being the product of the number of de jure members in the household and the sampling weight of the household.Thus, the distribution represents the national household population, where each member is given the wealth index score of his or her household.

Table 4.3 of Housing Characteristics of households gives an understanding of living condition of households in South India. It covers information on

housing characteristics like electricity, water sources, toilet facility, cooking fuel and types of living houses. All these indicators together constitute the wealth index. Kerala showed a greater position in access to electricity, toilet facilities and living house condition. The toilet facility of Kerala with coverage of 96.1% of the population is a notable statistics compared to other three states. Andhra Pradesh and Tamil Nadu are the lowest in terms of toilet facility and below the Indian average.

Ninety four percentage of the respondents in Andhra Pradesh have the access to improved sources of drinking water next to Tamil Nadu with 93.5%.Improved sources of drinking water includes, water piped into the dwelling, yard or plot, water available from a public tap or standpipe, a tube well or borehole, a protected dug well, a protected spring and rain water.

Only 69.1% of respondents in Kerala have the access to improved drinking water sources. There is no notable difference in the statistics of electricity coverage among south Indian states. Kerala with 91% is the highest and Andhra Pradesh with 88.4% is the lowest.

Smoke from solid cooking fuel is a serious health hazard. Solid cooking fuels include coal/lignite, wood, straw, shrubs, grass, agricultural crop waste and cow dung. To study the potential for exposure to cooking smoke

from solid fuel NFHS 3 collected information on the type of fuel used for cooking. Table 4.3 shows that 71.4% of respondents in Kerala are exposed to smoke from cooking fuel. This is found to be the major cause of the increasing number of asthma patients in Kerala. As far as fuel using is concerned Tamil Nadu is in a better position with only 60.5% are exposed to solid fuel compared with other states.

TABLE 4.3.

HOUSING CHARACTERISTICS OF HOUSEHOLDS IN SOUTH INDIA, 2005-2006(Percentage)

State	Percentage					Mean number of persons per room used for sleeping
	With electricity	With improved source of drinking water	With toilet facility	Using solid fuel for cooking	Living in a pucca house	
India	***67.9***	***87.9***	***44.6***	***70.8***	**45.9**	**3.3**
Andhra Pradesh	*88.4*	*94.0*	*42.4*	*66.3*	*56.3*	*3.2*
Karnataka	*89.3*	*86.2*	*46.5*	*63.8*	*55.1*	*3.4*
Kerala	*91.0*	*69.1*	*96.1*	*71.4*	*85.1*	*2.2*
Tamil Nadu	*88.6*	*93.5*	*42.9*	*60.5*	*69.9*	*2.9*

Source: NFHS 3

In terms of living house condition NFHS 3 considered many aspects. Table 4.3 shows the percentage of population living in a pucca house. Houses made with high quality materials throughout, including the floor, roof and exterior walls are called a pucca house. In Kerala 85.1% of respondents live in safe housing conditions. Only 55.1% of respondents in Karnataka are living in a pucca house and that is the lowest among south Indian states.

The mean number of persons per room used for sleeping is an indicator that assesses the level of crowding in a house. The number of persons per sleeping room lies in the range of 2.2 to 3.4 in south Indian states. In Kerala the average number of persons sleeping in a room is 2.2 which is the lowest among South Indian states. Karnataka with 3.4 persons per room is the highest and it is above Indian average.

Table 4.4 shows the wealth quintiles of south Indian states. The wealth index is used to assess the economic status of households. It is an indicator of the level of wealth that is consistent with expenditure and income measures (Rutstein, 1999). The wealth index was constructed using household asset data and housing characteristics[1].

[1] NFHS 3 wealth index is based on the following 33 assets and housing characteristics: household electrification ,type of windows, drinking water sources, type of toilet facility ,type of flooring, material of exterior walls, type of roofing, cooking fuel, house ownership, number of members per sleeping room, ownership of a bank or post office account, mattress, a pressure cooker ,a chair, a cot/bed, a table, an electric fan, a radio/transistor, a black and white TV, a colour TV, a sewing machine, a mobile phone, any other telephone, a computer, a refrigerator ,a watch or clock ,a bicycle, a motor cycle/scooter, an animal drawn cart, a car, a water pump, a tresher, and a tractor

TABLE 4.4

WEALTH QUINTILES OF HOUSEHOLDS IN SOUTH INDIA, 2005-2006(Percentage)

State	Wealth Quintiles					Total
	Lowest	***Second***	***Middle***	***Fourth***	***highest***	
India	***20.0***	***20.0***	***20.0***	***20.0***	**20.0**	**100**
Andhra Pradesh	*10.8*	*17.6*	*29.2*	*25.4*	*17.1*	*100*
Karnataka	*10.8*	*22.2*	*24.0*	*23.2*	*19.8*	*100*
Kerala	*1.0*	*4.1*	*12.2*	*37.8*	*44.8*	*100*
Tamil Nadu	*10.6*	*15.6*	*29.9*	*24.4*	*19.5*	*100*

Source: NFHS 3

FIG 4.4

HOUSING CHARACTERISTICS OF HOUSEHOLDS IN SOUTH INDIA

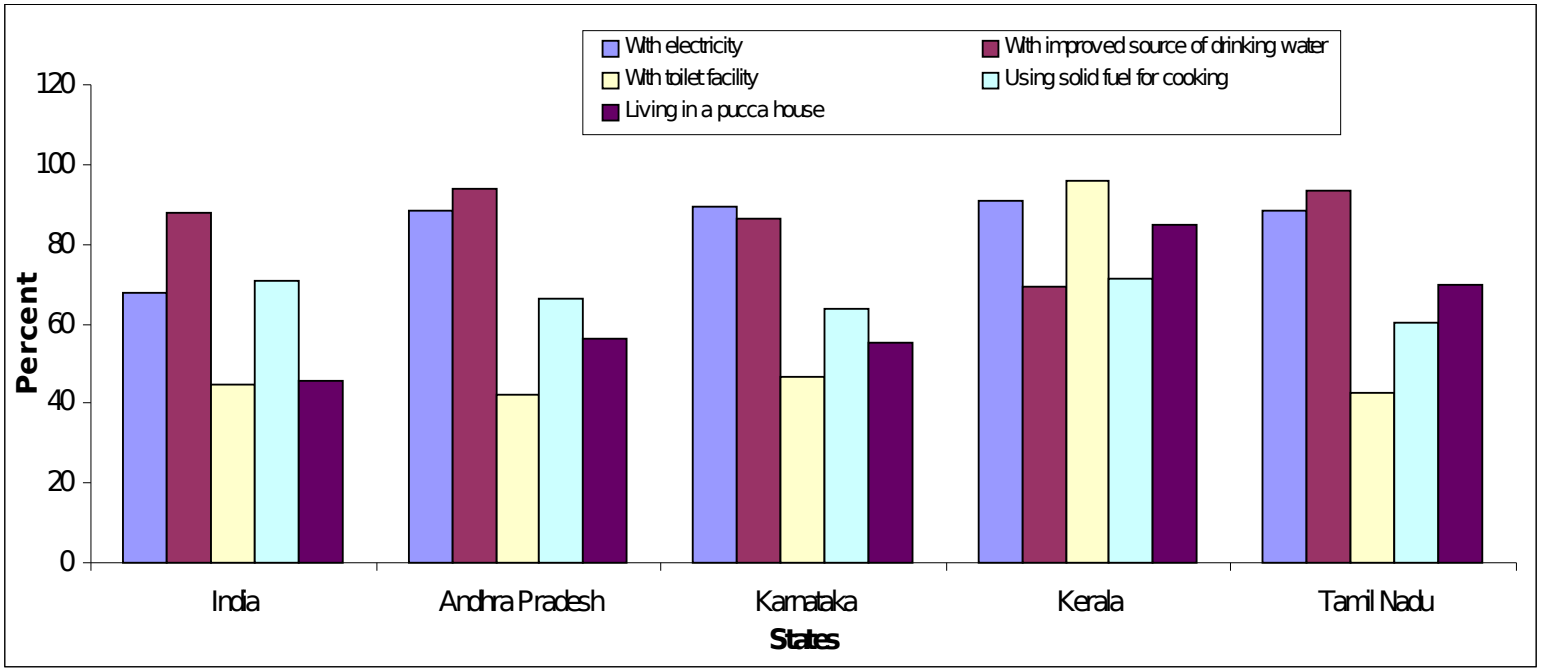


FIG 4.5
HOUSEHOLDS WEALTH QUINTLES SOUTH INDIA

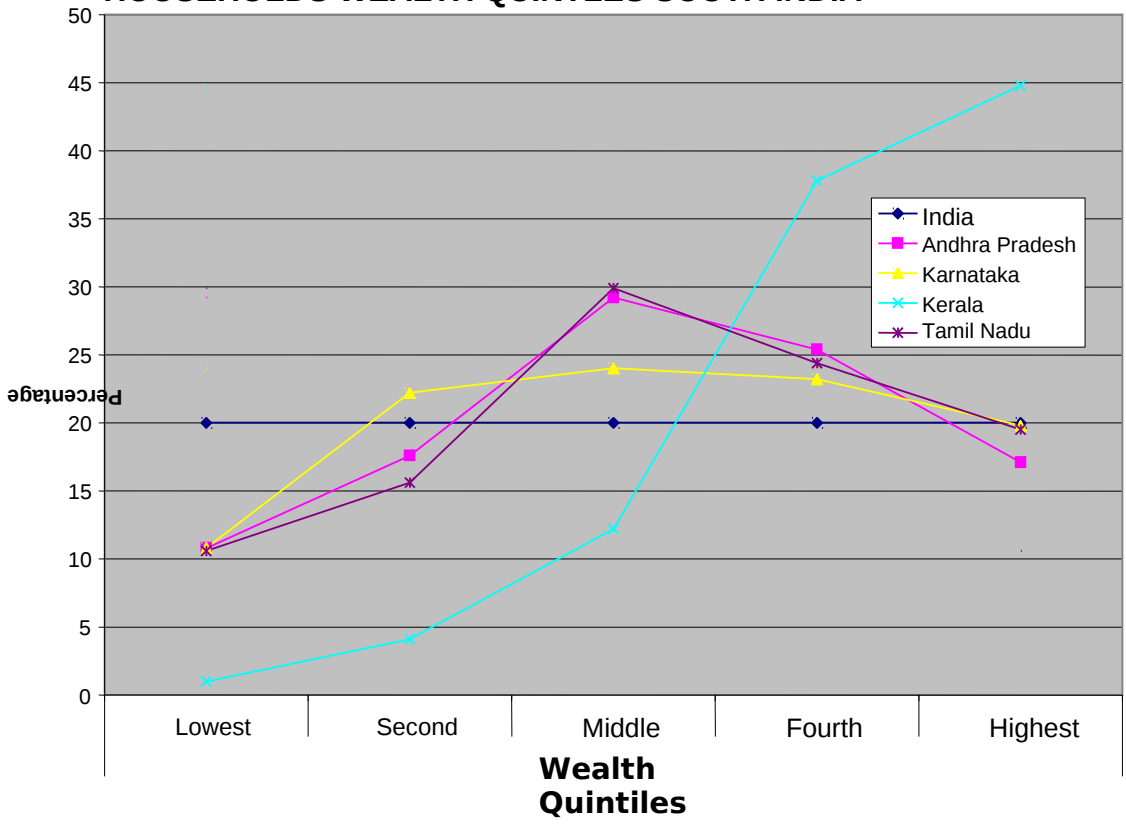


Table 4.4 presents the population separated into wealth quintiles by south Indian states. In Kerala 44.8% of the respondents belongs to the highest wealth quintiles and only 1% is coming under the lowest quintiles. The percentage of respondents belongs to the lowest quintiles in other three south Indian states are almost equal with a narrow range between 10.6% and 10.8%.In Andhra Pradesh only 17.1% of respondents are living under the highest wealth quintiles next to Tamil Nadu with 19.5% and Karnataka with 19.8%.

4.4 WOMEN'S PARTICIPATION IN DECISION MAKING

Decision making in households, particularly by those who participates in and has control over the process, is an aspect of gender relations that has greater influence on women empowerment. This section is devoted to explaining the decision making power of women in south India. NFHS 3 asked many questions to extract the decision making power of respondents and collected information from respondents on their participation in four different types of decisions.

- Their own health care,
- Making large household purchase,
- Making household purchase for daily needs,
- Visit to family or relatives.

Decisions about the large purchases and purchases for daily needs were meant to tap into economic decision making in the household. Economic independence is an important indicator of female autonomy in much of the demographic literature. The assumption is that it leads to a greater control by women over how resources are allocated and, hence, a greater control over their own lives.

Decisions about women's own health care were thought to be fundamental to their self interest and of direct relevance for bringing health and nutrition related changes.NFHS 3 collected data on a large number of indicators on women's decision making. Information was collected on the magnitude of a woman's earnings, control over the use of her own earnings, participation in household decision making, knowledge and use of micro-credit programmes, and freedom of movement. Table 4.5 gives the statistics on different decision making indicators. About the decision making on their own health, 75.3% of women are taking decision alone or jointly with their husbands in Kerala, which is the highest in, this category. Only 53.3% of women in Karnataka are participating in the decision making about her health care. Making decision about major household purchases Tamil Nadu is in the first place with 63.3%.Another major information on the freedom of movement is permission for visiting her family. In this statistics, 78.4% of women in Kerala are taking decision by

themselves or with their husbands. Statistics on decision about all these four indicators together shows that all south Indian states, except Karnataka are above Indian average.

TABLE 4.5

WOMEN'S PARTICIPATION IN DECISION MAKING

States	*Percentage of women who usually make specific decisions alone or jointly with their husband*					
	Own health care	Making major household purchase	Making purchase for daily household needs	Visit to her family or relatives	Percentage who participates in all four decisions	Percentage who participates in none of the four decisions
India	**62.2**	**52.9**	**60.1**	**60.5**	**36.7**	**20.5**
Andhra Pradesh	61.8	52.7	60.4	65.5	40.4	24.3
Karnataka	53.3	50.5	56.4	55.9	35.2	26.9
Kerala	75.3	61.8	65.9	78.4	47.2	10.8
Tamil Nadu	73.2	63.3	77.8	76.7	48.8	8.2

Source: NFHS 3

TABLE 4.6

WOMEN'S ACCESS TO MONEY AND CREDIT

States	Women's access to money		Women's knowledge and use of micro credit programme	
	Percentage who have money and that they can decide how to use	Percentage who have a bank account that they themselves use	Percentage who know of a micro credit programme	Percentage who have taken a loan from a micro credit programme
India	**44.6**	**15.0**	**38.6**	**4.0**
Andhra Pradesh	48.6	18.0	59.6	16.3
Karnataka	60.3	22.1	55.0	9.2
Kerala	20.7	27.0	82.6	8.0
Tamil Nadu	25.4	15.8	79.0	13.4

Source: NFHS 3

To understand about women's access to financial resources, NFHS 3 asked all respondents whether they have any money of their own that they alone can decide how to use and whether they have a bank or savings account that they themselves use. Table 4.6 depicted women's access to money and their knowledge of micro credit programmes. In Karnataka 60.3% of women have money and they can decide how to use it. In Kerala only 20.7% of women have the access and that is the lowest among south Indian states. But in case of bank account, 27% of women in Kerala have bank account. Another question on access to finance is about knowledge on micro-credit programmes and percentage that have taken loan from these programmes. In Kerala 82.6% of respondents are aware of these programmes but only 8% have availed loan from that.

TABLE 4.7

CONTROL OVER WOMEN'S CASH EARNINGS, 2005-2006(PERCENTAGE)

State	***Alone or jointly with their husband decide how their own earnings are used***
India	***80.9***
Andhra Pradesh	*68.8*
Karnataka	*71.5*
Kerala	*89.7*
Tamil Nadu	*87.5*

Source NFHS 3

For women, earning cash is not likely to be a sufficient condition for financial empowerment. Financial empowerment also requires control over the use of one's earnings. Table 4.7 is devoted to this particular indicator. Kerala and Tamil Nadu show a significant position in that. In Kerala 89.7% of women decide how to spend their earnings jointly with their husband or alone. Andhra Pradesh is in the lowest position in this regard. Only 68.8% of women have the freedom to decide how to spend their earnings.

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CHAPTER V

DETERMINANTS OF INFANT AND CHILD MORTALITY IN SOUTH INDIA

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DETERMINANTS OF INFANT AND CHILD MORTALITY IN SOUTH INDIA

This chapter examines the determinants of infant and child mortality in South India. Most of the demography and health literatures use infant and child mortality variables as a measuring tool of child survival. The following sub sections examine the determinants of both infant and child mortality. Using data on changes in those determinants, the researcher examined the factors behind falling infant and child mortality in South India and the mortality differential between states.

5.1 Determinants of Infant and Child Mortality

The selection of determinants of infant and child mortality was based on the review of previous studies. This literature has found four main groups of determinants of infant and child mortality: biological, behavioural, environmental, and socio-economic factors.

i) Biological Factors

The biological factors that influence infant mortality are: multiple births, mother's age, length of preceding birth interval and sex of the child. The higher mortality of children from multiple births, especially during the neonatal period (first month of life), is common in areas of the developing world (Edoardo Masset and Howard White 2004).

a)Birth Interval

Birth interval is defined as the length of time between two successive live births, that indicate the pace of childbearing. Short birth intervals may adversely affect mother's health and her children's chances of survival. Recent research has shown that the optimal birth interval is 3-5 years for reducing neonatal and infant mortality (Rutstein, 2005) and achieving optimal nutrition outcomes. Table 5.1 depicts the percentage distribution of births during the five years preceding the survey by birth interval. In India 11.4% of births occur within 18 months of a previous birth and nearly 28% occur within 24 months. All south Indian states except Kerala are near to Indian average in birth interval. In Kerala only 5.9% births occur in less than 18 months. Only 19% births occur within 24 months.26.5% of births in Kerala occur with an interval of 5 years and above. The median birth interval in India is 31.1% and in Kerala it is 41.2%, which is the highest among all south Indian states. In demography literature the optimal birth interval is 36-59 months. In Andhra Pradesh only 27.7% of births have this optimal interval. In Karnataka the births in the optimum period is only 27.1% and in Tamil Nadu it is 28.6%. In Kerala the births taken place with in the optimal period is 34%, which is the highest in South Indian states. The median birth interval in Andhra Pradesh, Karnataka and Tamil Nadu ranges between a narrow margin of 30.3 to 31.4 months.

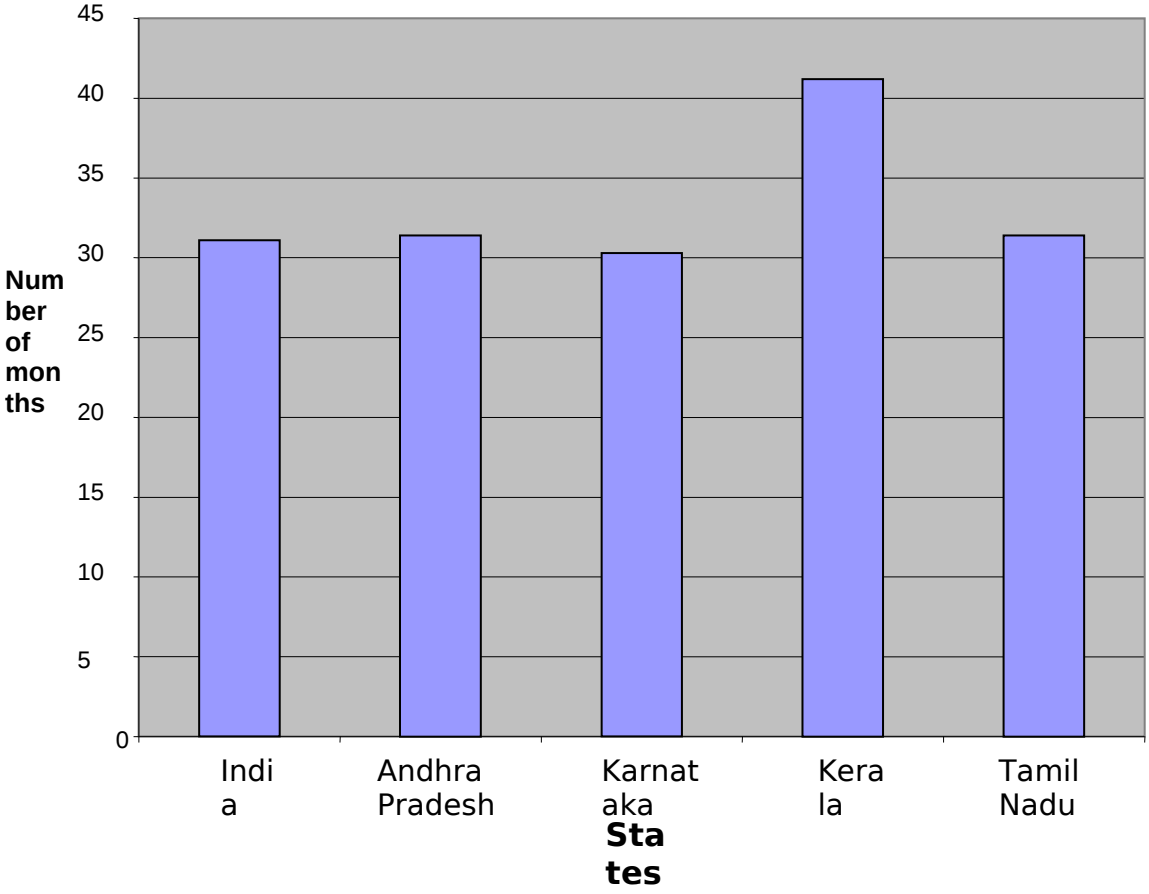
TABLE 5.1

BIRTH INTERVALS IN SOUTH INDIA (Percentage)

States	*Months Since Preceding Birth*						*Median Number of Months Since Preceding Birth*
	7-17	**18-23**	**24-35**	**36-47**	**48-59**	**60+**	
India	**11.4**	**16.3**	**33.6**	**19.2**	**9.1**	**10.4**	**31.1**
Andhra Pradesh	12.3	19.0	29.4	18.7	9.0	11.7	31.4
Karnataka	11.2	16.7	35.4	19.1	8.0	9.6	30.3
Kerala	5.9	12.9	20.6	21.3	12.7	26.5	41.2
Tamil Nadu	11.2	14.9	32.5	19.3	9.3	12.8	31.4

Source: NFHS 3

FIG 5.1
MEDIAN NUMBER OF BIRTH INTERVALS (MONTHS) IN SOUTH INDIA



b) Reported Birth Weight

Complications at birth and low birth weight are considered among the most important determinants of higher risk of death of twins (Sullivan, 1994). Table 5.2 shows the percentage distribution of births by reported birth weight. It is based on either a written record or the mother's recall .The percentage of births with a reported birth weight varies considerably across south Indian states from a low of 62.7% in Andhra Pradesh to a high of 97% in Kerala. All four south Indian state's birth weights are some what similar to Indian average. Above 80% of babies in all states have 2.5 kg or more weights at the time of birth. Nearly 20% are under weighted at the time of birth.

TABLE 5.2

PERCENTAGE DISTRIBUTION OF BIRTHS WITH A REPORTED BIRTH WEIGHT 2005-2006

State	*Percentage distribution of births with a reported birth weight*[1]			*Percentage of live births whose birth weight was reported*
	Less than 2.5 KG	2.5 KG or more	*TOTAL*	
India	**21.5**	**78.5**	**100**	**34.1**
Andhra Pradesh	19.4	80.6	100	62.7
Karnataka	18.7	81.3	100	62.9
Kerala	16.1	83.9	100	97.0
Tamil Nadu	17.2	82.8	100	88.4

Source: NFHS 3

1. Based on either a written record or the mother's recall

c) Mother's Age at Birth and Fertility Rates

There is a U-shaped relationship between mortality and mother's age at birth. Infant mortality tends to be high for children born to young mothers and again, but to a lower extent, those at older ages. The higher mortality of children born to old mothers may be the result of a deterioration of the reproductive system with age, while the higher child mortality at very young maternal ages may occur because mothers have not fully developed to manage a birth (Pebley and Strupp, 1987).This effect may be found to be large in societies, like India, where women are giving birth to children at extremely young ages. Table 5.3 and 5.4 give some statistics on these indicators. Table 5.3 shows the extent of teenage pregnancy and motherhood in south India. The marriage of girls at young ages leads to teenage pregnancy and motherhood. Young women who become pregnant and have births experience a number of health, social, economic and emotional problems. In addition to the relatively high level of pregnancy complications among young mothers because of physiological immaturity, inexperience associated with child care practices also influences maternal and infant health (NFHS 3 Report, 2005-06).

Table 5.3 explains the proportion of women aged 15 -19 who have had a live birth, and who are currently pregnant with their first child. In India,

one in every six women aged 15-19 have begun child bearing. Kerala and Tamil Nadu are in a sound position in this regard. In Kerala the teenage pregnancy are only 2.9% and in Tamil Nadu it is 4.8%.Teenage pregnancy percentage of other two south Indian states are above Indian average with 12.7% in Andhra Pradesh and 12.8% in Karnataka.

TABLE.5.3

TEENAGE PREGNANCY AND MOTHERHOOD IN SOUTH INDIA

States	*Percentage who*		
	Have had a live birth	Are pregnant with first Child	Have begun child bearing
India	**12.1**	**3.9**	**16.0**
Andhra Pradesh	12.7	5.4	18.1
Karnataka	12.8	4.3	17.0
Kerala	2.9	2.9	5.8
Tamil Nadu	4.8	2.9	7.7

Source: NFHS 3

Table 5.4 shows Age Specific Fertility Rates(ASFR) in south India .NFHS 3 provides estimates of age specific fertility rates and Total Fertility Rates(TFR) for the three years period preceding the survey. The ASFR for any specific age group is calculated by dividing the number of births to women in that age group during the period 1-36 months preceding the survey by the number of women –years lived by women in that age group during the same three years time period. The TFR is a summary measure, based on the ASFRs, that indicates the number of children a woman would bear during her reproductive years if she were to experience the ASFRs prevailing at the time of the survey. Mathematically, the TFR is five times the sum of all the ASFRs for the five year age groups. The TFR of Karnataka with 2.07 is the highest in south India and Andhra Pradesh with 1.79 is the lowest. The TFR of all the south Indian states is lower than Indian average of 2.68.

TABLE 5.4

AGE SPECIFIC FERTILITY RATES (ASFR) AND TOTAL FERTILITY RATES (TFR) IN SOUTH INDIA

State	15-19	20-24	25-29	30-34	35-39	40-44	45-49	Total Fertility Rate(TFR)
India	**0.090**	**0.209**	**0.139**	**0.062**	**0.025**	**0.007**	**0.003**	**2.68**
Andhra Pradesh	0.098	0.168	0.058	0.021	0.009	0.003	0.000	1.79
Karnataka	0.086	0.175	0.101	0.040	0.010	0.002	0.000	2.07
Kerala	0.035	0.144	0.141	0.052	0.012	0.001	0.000	1.93
Tamil Nadu	0.056	0.151	0.109	0.034	0.008	0.001	0.000	1.80

Source NFHS 3

d) Birth Order

Children born after a short interval to the previous birth, generally present higher mortality rates. The key factor determining this relationship is the physical and nutritional depletion of mothers (Boerma and Bicego, 1993). The complex relationship between birth order and mortality is not well understood. In general, mortality is higher among first birth, which is usually explained by the observation that many mothers have their first child before having reached physical and reproductive maturity (Sullivan, 1994). For children, rather than infants, there is often a higher risk associated with being a higher birth order child.

Usually the relationship between birth order and mortality at early ages takes a U shaped form. Mortality is high for first born children and births of very high orders and is low for births of order 2 or 3.First order births are more likely to have a difficult birth process than later births, thus increasing the risk of neonatal mortality. The influence of birth order on child survival is explained in the sixth chapter.

ii) Behavioural Factors

This subsection explains the behavioural factors that determine infant mortality. According to UNICEF (1999), 73% of deaths of children under five are a consequence of low-cost treatable diseases. Deaths caused by

respiratory diseases, diarrhoea, measles, tetanus and pertussis, which account for more than 60 % of all deaths of children in developing countries, could be easily avoided by the use of antibiotics, immunisation and Oral Rehydration Salts(ORS).

a) Children Vaccination Coverage

Immunisation of children against preventable diseases like Tuberculosis (TB), Diphtheria, Whooping Cough, Tetanus, Polio and Measles is crucial to reducing infant and child mortality. NFHS 3 collected information on vaccination coverage for all living children born in the five years preceding the survey. According to the guidelines developed by the World Health Organisation (WHO), children are considered fully vaccinated when they have received a vaccination against TB (BCG) three doses of the diphtheria, Whooping cough (Pertussis), and tetanus (DPT) vaccine, three doses of the Poliomyelitis (Polio) vaccine and one dose of the Measles vaccine by the age of 12 months. Beenstock and Sturdy (1990) found that vaccination and the usage of medical facilities are important determinants of infant mortality in rural India. Hanmer et al. (2003) find immunisation to be a robust determinant of infant and child mortality in cross-country regressions.

Table 5.6 shows vaccination coverage rate for each recommended vaccination. The percentage of children who are fully vaccinated ranges from 46% in Andhra Pradesh and 80.9% in Tamil Nadu among south Indian states. In Tamil Nadu there is no child without taking any one of the recommended vaccinations. In Karnataka 6.9% children are living without taking any of these vaccinations and it is the highest among South Indian states.

TABLE 5.5

CHILDREN VACCINATION IN SOUTH INDIA, 2005-2006

Percentage of children age 12-23 months who received specific vaccines at any time before the survey (according to a vaccination card or mother's report).

State	*BCG*	*DPT*			*POLIO* [1]				*Measles*	*All basic vaccinations* [2]	*No vaccinations*
		1	**2**	**3**	**0**	**1**	**2**	**3**			
India	**78.1**	**76**	**66.7**	**55.3**	**48.4**	**93.1**	**88.8**	**78.2**	**58.8**	**43.5**	**5.1**
Andhra Pradesh	92.9	92.6	76.4	61.4	68.3	96.2	94.5	79.2	69.4	46.0	3.8
Karnataka	87.8	86.7	81.5	74.0	75.1	91.8	87.9	73.8	72	55.0	6.9
Kerala	96.3	94	90.8	84.0	86.7	94.5	88.6	83.1	82.1	75.3	1.8
Tamil Nadu	99.5	98.9	97.7	95.7	94.5	99.6	96.3	87.8	92.5	80.9	0.0

Source: NFHS 3

1. Polio 0 is the polio vaccination given at the birth

2. BCG, measles, and three doses each of DPT and polio vaccine (excluding polio vaccine given at birth)

b) Prevalence and Treatment of ARI

Acute Respiratory Infection (ARI) is one of the leading causes of childhood mortality. Early diagnosis and treatment with antibiotics can prevent a large proportion of deaths caused by ARI. Table 5.7 explains the prevalence and treatment of ARI in south India. In NFHS 3 the prevalence of ARI was estimated by asking mothers whether their children under age five years had been ill with a cough accompanied by short, rapid breathing which was chest related in the two weeks preceding the survey. These symptoms are compatible with ARI. Table 5.7 shows that children with ARI symptoms in South India vary from 1.7% in Karnataka to 3.7% in Tamil Nadu. In Kerala 88.8% of children received treatment for ARI from a health facility or provider. In Andhra Pradesh only 58.5% children got treatment for these symptoms, which is the lowest in south India.

TABLE 5.6

PREVALENCE AND TREATMENT OF SYMPTOMS OF ARI IN SOUTH INDIA, 2005-2006

State	***Children under five with symptoms of ARI*** [1]	***For whom the treatment was sought from a health facility or provider*** [2]	***Who received antibiotics***
India	*5.8*	*69.0*	*12.5*
Andhra Pradesh	*2.0*	*58.5*	*35.3*
Karnataka	*1.7*	*68.9*	*27.3*
Kerala	*2.7*	*88.8*	*33.2*
Tamil Nadu	*3.7*	*75.3*	*6.5*

Source: NFHS 3

1. *Symptoms of ARI (cough accompanied by short, rapid breathing which was chest-related) are considered a proxy for pneumonia*

2. *Excludes pharmacy, shop and traditional practitioner*

c) Maternal Care Indicators

The knowledge and use of pre- and post-natal care seems to be the most important determinant of infant and child mortality. Das Gupta (1990) found a highly significant correlation between immunisation, knowledge of rehydration methods and lower mortality risk in rural Punjab. Murthi *et al.* (1995) report that the availability and use of medical facilities affect child mortality in India.

In this study, the researcher has used tetanus immunisation and the number of antenatal visits to assess the impact of prenatal care on the reduction of infant mortality. Table 5.8 shows percentage distribution of women who had a live birth in the five years preceding the survey by Antenatal Care (ANC) provider during pregnancy for the most recent live birth. NFHS 3 asked women who had a birth during the five years preceding the survey whether they consulted anyone for antenatal care for their recent birth and from where they received antenatal care.

Table 5.8 shows that 98.1% of women in Kerala received doctor assisted antenatal care which is the highest and 79.1% in Karnataka is the lowest in south India.

Nearly 10% of women in Karnataka have not received any antenatal care during pregnancy.

TABLE 5.7

ANTENATAL CARE PROVIDER IN SOUTH INDIA, 2005-2006

(Percentage distribution of women who had a live birth in the five years preceding the survey by antenatal care (ANC) provider during pregnancy for the most recent live birth.)

State	***Doctor***	***ANM/Nurse/ Midwife/ LHV***	***Other Health Personnel***	***Dai/ TBA***	***Anganwadi/ ICDS Worker***	***Other***	***No One***	***Missing***	***Total***
India	**50.2**	**23**	**1.0**	**1.2**	**1.6**	**0.1**	**22.8**	**0.1**	**100**
Andhra Pradesh	87.5	6.4	0.2	0.2	0.3	0.0	5.2	0.2	100
Karnataka	79.1	9.6	0.4	0.5	0.4	0.3	9.4	0.3	100
Kerala	98.1	0.5	0.5	0.4	0.2	0.1	0.1	0.1	100
Tamil Nadu	83.6	14.3	0.0	0.0	1.0	0.0	1.1	0.0	100

Source: NFHS 3

Table 5.9 explains the type and number of antenatal care visits. The WHO recommends that all pregnant women should have at least four antenatal care assessments by or under the supervision of a skilled attendant (WHO, 2006).These assessments should be spaced at regular intervals throughout pregnancy, commencing as early as possible in the first trimester. Table 5.8 shows that the percentage of women who visited three or more times for antenatal care vary from 79.5% in Karnataka to 95.9% in Tamil Nadu. Table 5.10 also explains the antenatal care indicators in south India. Table 5.10shows that 63.6% of women in Kerala received all recommended antenatal care during their pregnancy. At the same time only 28.2% of women from Andhra Pradesh received all recommended types of antenatal care. The births delivered in a health facility vary from 99.3% in Kerala to 64.4% in Andhra Pradesh. Column no. 3 in this table gives statistics on assistance received by the women at the time of delivery. In Kerala 99.4% of deliveries are assisted by a health professional. At the same time in Karnataka only 69.7% of deliveries are assisted by a health professional.

TABLE 5.8

ANTENATAL CARE VISITS IN SOUTH INDIA, 2005-2006

(Percentage of women who received different types of Antenatal Care (ANC) during pregnancy for their most recent live birth.)

State	***At least one ANC visit***	***Three or more ANC visits***	***ANC visit in the first trimester of pregnancy***	***Who received information about specific pregnancy complications***	***Who received two or more TT injections during the pregnancy***	***Who received one TT injection during the pregnancy and at least one more in the three years prior to the pregnancy***	***Percentage given or bought IFA****	***Who took IFA for at least 90 days***	***Percentage who took an intestinal parasite drug***
India	*76.4*	*52*	*43.9*	*36*	*76.3*	*1.5*	*65.1*	*23.1*	*3.8*
Andhra Pradesh	*94.3*	*85.4*	*66.1*	*49.9*	*85.3*	*0.4*	*76.6*	*41.2*	*4.6*
Karnataka	*89.3*	*79.5*	*70.9*	*47.6*	*78.6*	*0.9*	*74.3*	*39.3*	*6.8*
Kerala	*94.4*	*93.6*	*91.9*	*72.9*	*88.7*	*1.9*	*96.4*	*75.1*	*10.1*
Tamil Nadu	*98.6*	*95.9*	*75.3*	*84.4*	*95.9*	*2.0*	*91.9*	*41.6*	*6.5*

**IFA Iron and Folic Acid Tablets*

Source: NFHS 3

TABLE 5.9

METERNAL CARE INDICATORS IN SOUTH INDIA, 2005-2006

(Maternal care indicators for births during the five years preceding the survey in South India)

State	Who received all recommended types of antenatal care [1]	Births delivered in a health facility	Deliveries assisted by health personnel [2]	Deliveries with a post natal check-up [3]	Deliveries with a post natal check-up within two days of birth
India	**15**	**38.7**	**46.6**	**41.2**	**37.3**
Andhra Pradesh	28.2	64.4	74.9	73.3	64.1
Karnataka	29.6	64.7	69.7	66.9	58.5
Kerala	63.6	99.3	99.4	87.4	84.9
Tamil Nadu	34	87.8	90.6	91.3	87.2

Source: NFHS 3

1. *For the last live birth in the five years preceding the survey, mother received three or more antenatal check-ups (with the first check-up within the first trimester of pregnancy),received two or more tetanus toxoid injections, and took iron and folic acid tablets or syrup for three or more months*

2. *Doctor, auxiliary nurse midwife, nurse, midwife, lady health visitor, or other health personnel*

3. *Based on the last live birth in the five years preceding the survey. Postnatal check-ups are checks on the women's health within 42 days of the birth.*

As a proxy of postnatal care for the analysis of child mortality, the researcher included mother's knowledge of Oral Rehydration Salts (ORS). Studies have found mother's knowledge of health care to have a significant impact on nutrition (Christiaensen and Alderman, 2001). Knowledge of ORS might thus be similarly expected to affect mortality. As an effective response to dehydration caused by diarrhea is a prompt increase in the child's fluid intake through some form of Oral Rehydration Therapy (ORT), which may include the use of ORS. Table 5.11 shows the knowledge of ORS among women who gave birth in the five years preceding the survey. The knowledge about ORS in Kerala among women are 90.35% which is the highest and the lowest in Andhra Pradesh with only 66.9%.

TABLE 5.10

KNOWLEDGE OF ORS AMONG WOMEN IN SOUTH INDIA

States	*Percentage of women who know about ORS packets*
India	**73.0**
Andhra Pradesh	66.9
Karnataka	71.9
Kerala	90.3
Tamil Nadu	74.2

Source NFHS 3

d) Breastfeeding Practices

There are good reasons to believe that mother's milk, which is highly nutritious and rich in illness-preventive substances, has important effects in reducing infant mortality. In the present investigation, the researcher included breast feeding also as an important determinant of mortality of infants and children. The government of India recommends that initiation of breast feeding should begin immediately after child birth, preferably within one hour (Ministry of Women and Child Development, 2006).NFHS 3 collected information on breast feeding and complementary feeding. Table 5.12 gives some statistics on that.The statitistics shows that above 95% of children in South India are getting enough breast milk during their infancy.

TABLE 5.11

BREAST FEEDING IN SOUTH INDIA (*Percentage)*

States	Ever breastfed	Within half an hour of birth	Within one hour of birth	Within one day of birth	Who received a prelacteal feed
India	95.7	23.6	24.5	55.3	57.2
Andhra Pradesh	95.5	24.4	24.6	58.1	42.7
Karnataka	96.3	35.1	35.7	74.6	29.2
Kerala	97.4	56.1	56.5	95.7	10.8
Tamil Nadu	94.5	57.7	58.8	91.0	20.6

Source: NFHS 3

iii) Environmental Factors

Environmental factors included in the present analysis are toilet facility, water sources and fuel used for cooking. Better access to all these basic amenities are not only an important measure of the socio economic status of the household but also fundamental to the health of its members. Absence of these environmental factors contribute to different types of diseases. Acute Respiratory Infections (ARI) and diarrhoea are the most important killers of children under the age of five in India and worldwide (IIPS, 2000). Air, water, food and fingers are the principal ways through which respiratory and intestinal diseases are transmitted. As suggested by the Mosley -Chen framework for the analysis of child survival in developing countries (Mosley and Chen, 1984), the physical environment to which children are exposed is likely to have an influence on mortality. Data are most commonly included on the type of water supply. For example, Merick (1985) found a significant effect of the access to piped water on differences in child mortality in urban Brazil. In the case of India, Sunitha Kishor and Sulabha Parasuraman (1998) use a combined water and toilet facility index, which they find to have a significant impact on both infant and child mortality.

In the present study the researcher used the absence of an accessible source of water, and use of surface or rainwater, as a general sign of water contamination through which various diseases can be transmitted. Finally, it is considered that the use of unsafe fuel like dung, wood or coal for cooking as a possible concurring cause in the production of respiratory diseases. Although such a variable has not commonly been used, indoor air quality is particularly relevant in households with small houses and room for cooking. The statistics on these environmental factors are explained in chapter 4 of socio economic status of women in south India.

iv) Socio-Economic Factors

This sub section examines the infant mortality by major socio economic factors. The socio-economic factors included here are mother's education and economic wellbeing. The correlation between mother's education and child mortality is well documented in a large number of studies and for various countries. Children of illiterate women have a much higher probability of dying at all ages and the older the child, the greater the difference in mortality between mothers of different educational levels (Sullivan, 1994). Education can be highly correlated with income, but as an explanatory variable should be able to capture the knowledge and the usage of health care methods and facilities. Mother's education is usually

found significant when included as explanatory variable in regression models (Retherford, 1989, Pebley and Stupp, 1987) or is generally correlated with low levels of children mortality (Shiva Kumar, 1995, Boerma and Bicego, 1993).The educational achievement of women in south India is depicted in chapter 4 in the subsection 4.2 and Table 4.2.

The wealth indicator used here is a simple score index based on the possession of durable goods. The index is obtained by summing dummy variables representing the ownership of a given good, scaled to one divided by the number of goods used in the index. Economic status of women in south India is clearly examined in chapter 5 .In order to asses the economic status, a wealth index is being constructed and it is explained in the sub section 4.3 and Table 4.4

The NFHS does not contain data on income or expenditure, but there is extensive information on a variety of assets owned by each household, which is used to construct a wealth index. In this research the wealth index is constructed based on the possession of durable goods. Whilst income is more commonly used when available, all the variables included in the index are correlated to income.

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CHAPTER VI

AN ECONOMETRIC ANALYSIS OF WOMEN'S ECONOMIC ROLES AND CHILD SURVIVAL

CHAPTER VI

AN ECONOMETRIC ANALYSIS OF WOMEN'S ECONOMIC ROLES AND CHILD SURVIVAL

This chapter is devoted to explaing the models used to test the hypothesis and research questions. To identify the causation between economic roles of women and child survival, the Cox Proportional Hazard model is used. In the present analysis all the determinants of infant and child mortality are considered along with the factors related to women's economic roles.

6.1 Cox Proportional Hazard Model: Specification

A Cox model is a well-recognized statistical technique for exploring the relationship between the survival of a patient and several explanatory variables (Stephen J Walters, 2004). Nowadays this model is widely used in researches in the field of demography and health to assess the survival status. This model is preferred to a standard regression model on account of its treatment of censored observations. When child mortality is analysed using a logistic regression model, as is common in the literature, only those children who were born five years before the survey can be included in the study. Children born more recently have not been fully exposed to the risk of dying and mortality measurements would be underestimated if they

were included in the study. However, discarding these observations has two major disadvantages. The first is the loss of information from dropping observations. The second is an increase in measurement bias.

In order to simplify the exposition of Cox model, suppose there are two groups of children:

The mothers of the children of the first group (*y*) have been immunised against tetanus during pregnancy, while mothers of the children in the other group (*n*) have not (Edoardo Masset and Howard White 2004).

The Cox model assumes that the hazard of death at time *t* for the children with non-immunised mothers is proportional to the hazard of the children with immunised mothers by the same factor ψ at every time *t*:

$$h_n(t) = \Psi\, h_y(t) \quad \text{.....(1)}$$

Where;

hn and *hy* are the hazards (probabilities of dying) for the two groups and the ψ is the hazard ratio.

If ψ >1, the hazard of death is larger for children whose mothers are not immunized relative to those whose mothers have been immunised, so that maternal tetanus immunisation reduces infant mortality.

If ψ <1 or ψ =1, the death hazard of the children with immunized mothers would be higher or equal to the hazard of those whose mothers are not immunised, in which case tetanus immunisation would be of no use (ψ =1), or even harmful (ψ<1).

The model can be extended and generalised to more than one explanatory variable. It is practically useful to model the hazard ratio in logarithmic form as a function of a set of x variables, whose values are observed for ***i*** individuals:

$$\log\left[\frac{h_j(t)}{h_o(t)}\right] = \sum_{ij} \beta_j x_i \quad \text{..... (2)}$$

The *j* coefficients β' represent the change in the logarithm of the hazard ratio, for a unit change in the explanatory variable *x*. The advantage of writing β as the logarithm of the hazard ratio is that the relative hazard ratio will always be positive: larger than one for β positive and less than one for β negative. The estimated hazard function for each individual becomes:

$$h_i(t) = e^{\left(\sum \beta_j x_j\right)} h_0(t) \quad \text{..... (3)}$$

Where,

xi is one, if the mother of the *i* th child has been immunised and zero otherwise.

The values of *ho (t)* constitute the 'baseline hazard function' (reference category) which is the hazard function of an individual for whom all the variables included in the model are zero.

The Model of determinants of infant and child mortality is based on the following functional relationships of variables. The probability of dying (hj) for a child i in the age group j can be expressed as

$$hij = f(zij\ bij\ ,eij,\ sij)$$

Where;

The **'z'** variable represents biological factors which include

- Mother's age at birth
- Sex of the child,
- Previous birth interval,
- Multiple birth and
- Birth Order

These variables are often defined in the demographic literature as the endogenous causes of death to be distinguished from exogenous causes of death (Pressat, 1972, and Preston, 2001).Endogenous causes of death are

those factors that determine the congenital and constitutional characteristics of the child at birth and exert their influences on the infant during the first year of life and particularly during the first month.

Exogenous causes of death are modeled through sets *b*, *e* and *s*.

The ***'b'*** variable represents behavioral factors that influence infant and child mortality. It represents the ability (or willingness) of the households to prevent these infections from occurring or to mitigate/eliminate their effects once they have occurred.

Prenatal care like;

- Tetanus immunisation
- Antenatal medical visits
- Brest feeding

The environmental variable denoted by ***'e'*** includes

- Access to safe water
- Sanitation facilities
- Exposure to clean fuel

The socio economic factors ***'s'*** include

- Mother's employment status
- Mother's education and

- Wealth Index

NFHS 3 asked two questions to elicit the employment status of women. All eligible women were first asked “Aside from your housework, are you currently working?” Women who said ‘no’ were asked “as you know some women take up jobs for which they are paid in cash or kind. Others sell things, have a small business or work on the family farm or in the family business. Are you currently doing any of these things? Women who answered ‘no’ to both questions were counted as not employed; women who answered ‘yes’ to either the first or the second question were then asked details about the work they did including their occupation, where the work was done, and whether they earned cash for it or not. These data provide information on women’s employment status and if they work, the type of works that they do. In the light of both conceptual and empirical considerations, the present study categorised women’s employment into two types:

Employed

Not employed

Some caveats about the data need to be noted .The data on employment are based on self reported - employment, which generally underestimates the true extent of women’s employment. Thus the relationships found in this

model are really between employment that women themselves perceive as employment and mortality of infants and children.

6.2 Estimated Models

The estimated results of the Cox regression model are given in Table 6.2 and 6.3.Separate models are constructed for each state in south India and summarised in two tables. Since some of the determinants of infant and child mortality are different, two different models are fitted with two dependent variables viz.infant mortality and child mortality. In this Cox Regression model, most of the variables are dummy in nature. The details of the variables used in the construction of the model are given in the Table 6.1.

Table 6.1

Variables Used in the Hazard Models

Variables	Representation in the Model
Infant Mortality	One Dummy variable
Child mortality	One Dummy variable
Mother's Employment	One Dummy variable
Mothers Educational status	Three dummy variables indicating the categories of no education, primary and secondary
Wealth Quintiles	Quantitative variable based on wealth index
Access to Water	One Dummy variable
Sanitation	One Dummy variable
Fuel	One Dummy variable
Multiple Birth	One Dummy variable
Mothers Age at birth of child	Quantitative variable(age in completed years)
Birth interval	Quantitative variable(interval in completed months)
Birth Order	Quantitative variable according to birth order
Sex of child	One Dummy variable(Male:Female)
No. of tetanus injections	One dummy variable(less than two injections; two or more injections)
Antenatal Visits	Quantitative Variable
Breastfeeding	One dummy variable

Table 6.2

Cox Regression for Infant Mortality in South India

Explanatory Variables	Infant Mortality*(Dependent Variable)*			
	Andhra Pradesh	**Karnataka**	**Kerala**	**Tamil Nadu**
SOCIO ECONOMIC FACTORS				
Mother's Employment				
Not employed	rc	rc	rc	rc
Employed	1.06**	1.04**	1.01**	1.05**
Mothers Educational Status				
Has no education	rc	rc	rc	rc
Has primary education	0.77*	0.67*	0.79**	0.86*
Has secondary education	0.65**	0.87**	0.75*	0.76**
Economic Status				
Wealth Quintiles third or higher	rc	rc	rc	rc
Wealth Quintiles Second or Low	1.06	1.08	1.05	1.04

Explanatory Variables	Infant Mortality*(Dependent Variable)*			
	Andhra Pradesh	**Karnataka**	**Kerala**	**Tamil Nadu**
ENVIRONMENTAL FACTORS				
Unsafe Water	0.62	0.78	0.99	0.98
Unsafe Sanitation	0.65	1.01	0.79	0.88
Unsafe Fuel	0.87	0.67	0.87	0.65
BIOLOGICAL FACTORS				
Multiple Birth	5.37*	5.11*	4.19*	4.88*
Mothers Age at birth of child				
< 20 years	rc	rc	rc	rc
20-34 years	078	0.66	0.79	0.71
35 or more	0.66**	0.98**	0.77**	0.84**
Birth interval				
24 or more months	rc	rc	Rc	rc
< 24 months	1.93*	1.57*	1.66*	1.76*
Birth Order and presence of same sex siblings at birth				
Birth order 1	1.70**	1.69**	1.45*	1.32**
Birth order 2 or 3 with no same sex siblings	rc	rc	Rc	rc

Continued . . .

Explanatory Variables	Infant Mortality*(Dependent Variable)*			
	Andhra Pradesh	**Karnataka**	**Kerala**	**Tamil Nadu**
Birth order 2 or 3 with same sex siblings	0.97	0.78	0.86	0.84
Birth order 4 or higher with no same sex siblings	1.05	1.08	1.00	1.76
Birth order 4 or higher with same sex siblings	1.49**	1.07**	1.02**	1.22**
Sex of child				
Male	rc	rc	rc	rc
Female	0.78	0.77	0.88	0.76
BEHAVIOURAL FACTORS				
Two or more tetanus injections	0.67**	0.75**	0.69*	0.64**
No antenatal visits	rc	rc	rc	rc
Antenatal Visits	0.87*	0.85**	0.90*	0.83**
Never Breastfed	1.67*	1.65**	1.66*	1.97**
Wald Chi square	144.24	145.0	143.9	143.1

* Significance at 5% level
** Significance at 10% level
rc- reference category

Table 6.3

Cox Regression for Child Mortality in South India

Explanatory Variables	Child Mortality*(Dependent Variable)*			
	Andhra Pradesh	**Karnataka**	**Kerala**	**Tamil Nadu**
SOCIO ECONOMIC FACTORS				
Mother's Employment				
Not employed	rc	rc	rc	rc
Employed	1.42**	1.40**	1.31**	1.45**
Mothers Educational Status				
Has no education	rc	rc	rc	rc
Has primary education	0.58***	0.67***	0.66***	0.88***
Has secondary education	0.55**	0.67**	0.45**	0.66***
Economic status				
Wealth Quintiles third or higher				
Wealth Quintiles Second or Low	1.04	1.11	1.43	1.05
ENVIRONMENTAL FACTORS				
Unsafe Water	0.66	0.76	0.99	0.98
Unsafe sanitation	0.75	1.21	0.75	0.91
Unsafe Fuel	1.18**	1.21**	1.76*	1.54*

Continued . . .

Explanatory Variables	Child Mortality*(Dependent Variable)*			
	Andhra Pradesh	**Karnataka**	**Kerala**	**Tamil Nadu**
BIOLOGICAL FACTORS				
Mothers Age at birth of child				
< 20 years	rc	rc	rc	rc
20-34 years	078	0.66	0.79	0.71
35 or more	1.33*	1.23**	1.01*	1.87*
Birth Order and presence of same sex siblings at birth				
Birth order 2 or 3 with no same sex siblings	rc	rc	rc	rc
Birth order 2 or 3 with same sex siblings	0.97	0.78	0.86	0.84
Birth order 4 or higher with no same sex siblings	1.05	1.08	1.00	1.76
Birth order 4 or higher with same sex siblings	1.89**	1.34**	1.23**	1.43**
Sex of the child				
Male	rc	rc	rc	rc
Female	1.97**	1.76**	1.02	1.21**

Continued . . .

Explanatory Variables	Child Mortality*(Dependent Variable)*			
	Andhra Pradesh	**Karnataka**	**Kerala**	**Tamil Nadu**
BEHAVIOURAL FACTORS				
No antenatal visits	rc	rc	rc	rc
Antenatal Visits	0.67*	0.85**	0.93*	0.86**
Lack of knowledge of ORS	1.42**	1.33**	1.54**	1.44**
Never Breastfed	1.75*	1.71**	1.56	1.51**
Wald Chi square	142.11	144.0	142.8	143.4

* Significance at 5% level
** Significance at 10% level
rc-reference category

6.2 Results and Interpretation

The determinants of infant and child mortality in south India are estimated and depicted in the Table 6.2 and 6.3.These models include a selection of biological, behavioural, socio economic and environmental factors. The results are not expressed as coefficient estimates, but in the form of derived hazard ratios, which are shown in the table together with an indication of their significance. The interpretations of the hazard ratio are as follows. In the case of dummy variables, the hazard ratio is the ratio of the mortality risk of an infant/child with given characteristics in respect to an infant without those characteristics. In the case of quantitative variables, the hazard ratio is calculated in respect to the baseline hazard function, which is considered as the reference category. The ratio of less than one indicates a reduced risk associated with that factor. The detailed interpretations of the models are given in the following discussions.

i) Socio Economic Factors

The socio economic factors included in the model are mother's employment, education and economic status. The economic status of women is assessed based on the wealth index. Since the main focus of the study is to assess the economic roles of women and its impact on child survival, the first section is devoted to explaining the influence of these

variables on the survival of children. All variables coming under this category are found significant except the Wealth Index in the model. The hazard ratio of infants according to mother's employment status do not differ much from one. Which indicate that infant mortality is not highly dependant on mother's employment. At the same time the child mortality among working mothers is nearly 40% higher than non working mothers in all South Indian states. As expected, the hazard ratio of infants and children of educated mothers are less than one in all the south Indian states. This shows that if mother is educated, the mortality of their infants and children are low. The asset ownership index and environmental variables are not proved to be significant in all the models.

ii) Biological Factors

In the regression model, most of the biological factors have significant influence on infant and child mortality. The highest hazard ratio is found for infants from multiple births for all the states. The hazard ratio for infants born as multiple birth is nearly five times higher than that of a normal birth. The hazard ratio of higher birth order infants and children are also very high in the model. The higher birth order with same sex siblings shows a higher hazard than that of low birth order children. Mother's age at birth also proved to be significant with expected sign and hazard. The

sex of the child also proved to be significant determinants of child mortality. At the same time it is not significant for infant mortality. That explains the gender differences in the child survival. The hazard ratio of female children in Andhra Pradesh, Karnataka and Tamil Nadu is higher than that of Kerala. This shows the discrimination according to the sex of the child in South India. This is expected to be the outcome of emerging son preferences in these states.

iii) Behavioural Factors

The behavioural factors included in the model are tetanus immunization, prenatal checkups and breastfeeding and knowledge of ORS. Tetanus immunization and prenatal checkups are proved to be important in the reduction of infant mortality in all south Indian states. Tetanus is one of the most important causes of neonatal death in India (IIPS, 2000).Infants can be infected at the moment of delivery when unsterilized instruments are used to cut the umbilical cord. This infection is particularly common among infants delivered in unhygienic environments. When the mother is vaccinated, the immunity is transferred to the foetus through the placenta .Government of India launched a program of tetanus immunization for expectant women, yet full coverage had still not been achieved (Edoardo Masset and Howard White, 2004).According to the

National Immunization Schedule, a pregnant woman should receive two doses of tetanus toxoid injection and a third re-inoculation is recommended every three years. The results from our model reveal that the hazard ratio of infants born to mothers who received two or more tetanus vaccinations are less than one for all South Indian States. The antenatal visits also show significant influences on the reduction of mortality in all South Indian states. The hazard ratios of never breastfed also show significant effects on infant mortality. The statistics show that the never breastfed cases are very minimum and most of the researchers are of the opinion that this variable does not explain much change in the infant mortality. The hazard ratio of never breastfed variable is highest in Andhra Pradesh with 1.75 and lowest in Tamil Nadu with 1.51 in the models of child mortality.

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CHAPTER VII

SUMMARY AND FINDINGS

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Development progress in any country is now widely measured with reference to the Millennium Development Goals organized by the United Nations in the year 2000.Reduction in infant and child mortality is one of the MDGs.In the present study, different indicators are identified as the determinants of infant and child mortality along with the economic roles of women. This chapter explains the summary of findings and conclusion.

The dual role of women as the care provider to her child and participant in economic activities are examined in this research. The first part is devoted to explaining the determinants of infant and child mortality and the remaining for identifying the causation between women's economic roles and its impact on child survival. Infant and child mortality are moderately high in south India, varying widely from state to state. The southern state of Kerala has already achieved the targeted Millennium Development Goals in terms of infant and child mortality. This state is still considered as a model for other states in south India in terms of demography and health indicators. The poor performance of Andhra Pradesh in terms of these indicators need further attention. The infant and child mortality in Andhra

Pradesh are 53.5 and 21.0 respectively during 2005-06. These figures are far higher than that of Kerala. Only one child out of 1000 live births dies in Kerala. In other south Indian states it varies from 5.3 in Tamil Nadu to 12.1 in Karnataka.

The first part of the research investigated the world trend in Infant Mortality on the basis of high, middle and low income countries. A comparison is also made with India. India's reduction in Infant Mortality since 1960 is not satisfactory compared with high income countries. The rate of reduction is slightly higher than low income countries but it is too far from high and middle income economies. This is due to the high mortality rates in some of the Indian states.

The state wise infant and child mortality trend also gives a dismal picture. All Indian states except Himachal Pradesh could reduce infant mortality during the period 1999 to 2006.In Himachal Pradesh, Infant Mortality increased from 34.4 in 1999 to 36.1 in 2006, which shows a 4.94%increase.At the same time Himachal Pradesh could reduce the child mortality by 32.53% during this period. Child mortality of Orissa, Mizoram and Nagaland during NFHS 2 and NFHS 3 increased with 8.24%, 5.98% and 21.15% respectively. All south Indian states could reduce infant and child mortality during NFHS 2 and NFHS 3 survey

period. But still Andhra Pradesh and Karnataka stand with sad figures. Neonatal and post neonatal mortality are also examined in the present study. The notable thing in the case of post neonatal mortality is the increase in post neonatal mortality in Kerala between NFHS 2 and NFHS 3. This may be due to the reduction in vaccination coverage in Kerala.

The socio-economic status of women are assessed with some selected indicators in the study. The major women empowerment tools like Employment, Education, Possession of wealth and Power of decision making are considered for the analysis. Since NFHS data do not provide category wise employment status, the researcher considered only two situations viz. whether the mother is employed or not, 12 months preceding the survey. The employment status of women in all south Indian states are not satisfactory. On an average nearly 50% of women are unemployed in south India. In Kerala 69.7% of women are not engaged in any economic activity. Different from other indicators, Andhra Pradesh performed well in the case of employment status of women compared with other south Indian states. Nearly 52% of women in Andhra Pradesh are engaged in some sort of economic activities. At the same time, out of the employed, only 83.6% of women are earning cash out of their employment in Andhra Pradesh. Among the employed women in Kerala, 91.3% are earning cash out of their employment.

Educational status of mother is the other proximate determinant of infant and child mortality. Being a tool of women empowerment, women education has received considerable attention from the part of policy makers. Educational status of women in south India shows a dismal picture with an exemption of Kerala. In Kerala 93% of women are literate. In Andhra Pradesh it is only 49.6% and that is below the Indian average. This poor performance in education needs greater attention.

The economic status of women in south India is assessed using asset ownership index. The researcher used the DHS Wealth Index for this purpose. Based on the Wealth Index, total households are divided into five quintiles from the lowest to the highest. The distribution of households based on wealth quintiles are almost similar in south India except Kerala. In Kerala 44.8% of households belong to the highest wealth quintiles. Other south Indian states coming under the highest wealth quintiles are only less than 20%.

Women's decision making power is also examined in the present investigation. Decision making power of women and control over their income are considered as a powerful tool of women empowerment, which in turn have some positive impact on child survival. NFHS mainly focused four important issues about decision making power of women viz.their

own health care, making large household purchase, making daily household purchase and visit to their family. As far as decision making power of women is concerned Tamil Nadu stood first with 91.8% of women are participating in the decision making process along with their husbands. In Karnataka 26.9% of women not participating in any one of the stated decisions.

Women's access and control over income also examined to assess the socio economic status of women. In Karnataka 60.3% of women have their own money and that they themselves can decide how to use. But in Kerala only 20.7% of women have this power.

After reviewing the existing literature, the researcher has identified the determinants of infant and child mortality. Mainly biological, behavioural, environmental and socio economic factors are assessed in the study. All biological factors viz. birth interval, birth order, mother's age at birth and birth weight are found to be the major determinants of mortality. Average birth interval of south Indian states are between 30.3 months in Karnataka to 41.2 in Kerala. The birth weights of nearly 80% of babies in South India belong to the recommended weight of above 2.5 kg.

Children's vaccination coverage, maternal care and breast feeding are the major determinants coming under the behavioural factors, of which

antenatal, post natal checkups and place of delivery are found to be the major cause of mortality of infants and young children. The targeted goal of 100% doctor assisted delivery is still a distant dream of most of the Indian states. Even though the Indian average is 50.2% in doctor assisted delivery, south Indian states are in a sound position. More than 80% deliveries in south India are under the supervision of a doctor. Kerala is approaching to the targeted goal of 100% doctor assisted delivery. At present 98.1% of deliveries in Kerala are doctor assisted. Breast feeding practices are also considered as a major determinant of infant and child mortality. The statistics on breast feeding practices in south shows a satisfactory picture. More than 95% of infants in south India are properly breastfed.

The estimated models helped to assess the link between women's economic roles and child survival in south India. All major determinants of child survival are assessed in the model along with mother's economic roles. The employment status of women is proved to be a significant determinant of child mortality. Children of employed mothers are more vulnerable to mortality than non employed mothers. The derived hazard ratio shows that the mortality of children of employed mothers are nearly 40% higher than non employed mothers. The educational status of women also showed a significant impact on the survival of their infants and

children. The mortality of children of educated mothers are lower than that of non educated mothers in all south Indian states. The wealth index used in the model as a representation of the economic status of women proved to be insignificant in the determinants of infant and child mortality. The biological and behavioural factors also proved a significant determinant of infant and child mortality in South India.

Suggestion for Further Research

The researcher recommends the following research questions for further research.

- The determinants of gender difference in child survival in South India.
- The supply side barriers of maternal care in South India.
- Mother's workforce participation and its impact on the survival of their children
- Women's access and control over income and its influence on child care.

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