

Working Paper 284

**Infertility in India: Levels,
Trends, Determinants and
Consequences**

T S Syamala

ISBN 978-81-7791-140-4

© 2012, Copyright Reserved

The Institute for Social and Economic Change,
Bangalore

Institute for Social and Economic Change (ISEC) is engaged in interdisciplinary research in analytical and applied areas of the social sciences, encompassing diverse aspects of development. ISEC works with central, state and local governments as well as international agencies by undertaking systematic studies of resource potential, identifying factors influencing growth and examining measures for reducing poverty. The thrust areas of research include state and local economic policies, issues relating to sociological and demographic transition, environmental issues and fiscal, administrative and political decentralization and governance. It pursues fruitful contacts with other institutions and scholars devoted to social science research through collaborative research programmes, seminars, etc.

The Working Paper Series provides an opportunity for ISEC faculty, visiting fellows and PhD scholars to discuss their ideas and research work before publication and to get feedback from their peer group. Papers selected for publication in the series present empirical analyses and generally deal with wider issues of public policy at a sectoral, regional or national level. These working papers undergo review but typically do not present final research results, and constitute works in progress.

INFERTILITY IN INDIA: LEVELS, TRENDS, DETERMINANTS AND CONSEQUENCES

T S Syamala*

Abstract

This paper aims to understand the levels, trends, determinants and consequences of infertility in India using data from the Third National Family Health Survey. The study finds that 2.3 per cent of the women in India are infertile. The prevalence of infertility is highest in the southern region and lowest in the northern region. The variation across the states shows that the prevalence of infertility is highest in Goa followed by Andhra Pradesh. Infertility rates are also increasing in India. Biological and life style related factors, rather than the socio-economic factors, seem to determine the infertility levels. The impact of infertility on the woman's life is also substantial. Therefore, infertility can definitely be considered an important public health issue with wide social implications.

Introduction

In most of the developing countries and South-East-Asian countries in particular, infertility has been relatively neglected as a health problem and as a subject of social science research (Jeejeebhoy, 1998). The major focus of the programme in these countries is still on the implications of high fertility and its control rather than understanding the various dynamics of infertility. However, data from various countries show that infertility affects a large number of couples (WHO, 1994; Jeejeebhoy, 1998). Further, it is also presumed that the consequences of infertility will be greater in countries with pro-natal culture where motherhood is viewed as synonymous with womanhood (Inhorn, 2003). In these countries, motherhood is undeniably one of the most universally desired goals for a woman and most couples have life plans that include children. Traditionally, motherhood for women is seen as natural and in many societies, feminine identity was synonymous with motherhood. Therefore, at least in most of the developing countries, the desire for children is universal. However, not all couples who desire a child are successful in becoming parents. For many couples, the inability to bear children is a tragedy. The expectations of society, family, religion and culture nurture a sense of failure, loss and exclusion in infertile couples. Therefore, infertility is generally considered as a difficult condition for individuals and couples. Infertility has till now been a private matter to be resolved individually. However, the World Health Organisation (WHO) has recognised it as a public health issue worldwide.

Infertility is considered as an individual problem but the impact of infertility on women may vary from society to society depending up on the culture of the society. Studies from some of the African countries have established that marital instability, such as separation and divorce, are much higher among infertile couples (Gijssels, Mgalla and Wambura, 2001). Physical and emotional harassment of childless women by family members have also been documented by different studies (Darr and Mrali, 2001). In the present Indian socio-cultural context where motherhood is associated with a woman's identity and the desire for children is universal, the impact of infertility on women is considerable.

* Associate Professor, Population Research Centre, Institute for Social and Economic Change, Bangalore. Email: syamala@isec.ac.in

Treatment and prevention for infertility are integral components of the programme of action of the International Conference for Population and Development (ICPD). India's Reproductive and Child Health Programme, however, fails to focus on infertility. Studies around the world have shown that infertility is a growing problem that needs immediate attention. This issue becomes more important in view of the fact that the medical facilities available in many developing countries are inadequate to address the issue. Although a few recent studies have attempted to address this issue, the data on levels, trends and consequences of infertility are however very limited, especially in the Indian context. Given this background, the present study primarily addresses the issue of infertility and its consequences in India and across the states.

Prevalence of Infertility

Infertility affects 60 to 168 million people worldwide. Generally, one out of 10 people experience primary and secondary infertility. Majority of those who suffer infertility live in developing countries. On an average, infertility varies from 1 per cent to 12 per cent across countries (Vayena E, Rowe P, Peterson H, 2002; WHO, 1991 Fidler A, Bernstein J, 1991, van Balen F, Inhorn M, 2002; Vayena E Rowe P). The incidence of primary infertility generally varies from 1 to 8 per cent and secondary infertility is as high as 35 per cent. The world's highest infertility rates are reported from the South and Central Africa. In some other countries, infertility is widespread and it can have an enormous impact on healthcare resources. According to Census of India, 1981, infertility in India is around 4-6 per cent and NFHS 1 reports that the childlessness among the currently married above the age of 40 years is 2.4 per cent (Jeejeebhoy, 1998).

The causes of infertility are varied including biological and social factors. It has been generally agreed that around 3 to 5 per cent of the couples are infertile in any populations due to anatomical, genetic and immunological reasons. Infertility higher than this proportion is because of the preventable conditions such as sexually transmitted diseases, infections, healthcare practices and policies and also due to various environmental conditions.

Causes of Infertility

Infertility affects both men and women. However, it is the woman who is often accused of being infertile, especially in developing countries. The causes of infertility generally derive from 3 major sources: physiological dysfunctions, preventable factors and unexplained issues (Emily, 2004). Physiological causes of female infertility include tubal blockage, abnormal ovulation, congenital malformation and endometriosis (Daar, 2002). Male infertility factors include issues with sperm counts, motility and quality and ejaculatory dysfunctions. The most common preventable causes of infertility are sexually transmitted infections, especially chlamydia and gonorrhoea (Fidler A and J Bernstein 1999; Butler P, 2003; Datta B and Okopnofua F, 2002). Undiagnosed or inadequately treated chlamydia and gonorrhoea in women can lead to pelvic inflammatory diseases (PID), which can lead to infertility. It is estimated that 40 per cent of women in developed countries with inadequately treated chlamydia develop PID with 20 per cent of those becoming infertile due to tubal scarring. These rates could be higher in developing countries. Chlamydia and gonorrhoea are the most easily transmitted infections.

The other preventable causes of infertility can broadly be classified into physical, behavioural and socio-economic, biological and environmental and life-style related factors. Studies have shown that the physical environment in which a couple live, like frequent exposure to heat, noise etc., can affect the reproductive outcomes and increase the prevalence of infertility (Rachooitn and Oslen, 1983, lipscom et al., 1991). Occupational exposure to certain chemicals like, mercury, chloroform, organic solvents and certain metals like lead, steel etc., too can increase the prevalence of infertility among males and females (Dahl *et al* 1999; Lindohm *et al*, 1990; Valanis *et al*, 1999). Continuous exposure to pesticides has been reported to be a reason for the higher prevalence of infertility even among farmers and agricultural workers.

Life-style related factors such as diet and obesity too seem to have an adverse effect on the reproductive outcomes in general and infertility in particular (Pasquali *et al*. 2003). The general consensus is that there is a considerable reduction in fecundity among women with a body mass index that exceeds 25 kg/m² (Hassan and Killick, 2004). The behavioural factors such as excessive intake of caffeine, smoking and consumption of alcohol too are associated with reduced reproductive outcomes (Fenster *et al*, 1997); Tolstrup *et al*, 2003; Ness *et al*, 1999, Juhl *et al*, 2003; Eggert *et al* 2004). Further, excessive atmospheric pollution, water contamination and the chemicals used for water purification too contribute to the increased prevalence of infertility. Apart from this, various other biological and socio-economic factors also contribute to elevate the risk of infertility in human beings.

Another common cause of infertility in today's world is the advancing maternal age. As women delay childbearing to pursue education and employment opportunities, they face potentially increased difficulty in becoming pregnant due to diminishing egg quality and ovulatory function with increase in maternal age.

There has been significant economic development throughout the world, particularly in India, in recent decades that has resulted in changes in biological, cultural and environmental aspects, which in turn have an impact on fertility outcomes. Several clinical studies have pointed out that, over time, the prevalence of infertility in the world has increased, especially in the developing countries. Many factors such as lifestyle changes, environmental changes and the changing occupational patterns have contributed to increased prevalence of infertility in the developing countries. Moreover, the prevalence of infertility is reported to be higher in developing countries than in developed countries mainly because of the fact that the medical technologies in these countries are not adequate to address this issue.

In view of the epidemiological and nutritional transition that is taking place in the developing countries and the associated changes in dietary trends and physical activity levels, the proportion of increasing over-weight adults in these countries is a clear indication of the life-style changes that are taking place within a society. Further, with the social and economic development, several changes have been reported in these countries like, increased environmental pollution, changes in occupational structure, changes in dietary intake and the physical activity levels. All of this adversely affects the health of the individual in general and their reproductive outcomes in particular. Several clinical studies have pointed out to these changes as the main causes for the increased levels in infertility in recent years. However, due to lack of comparable data, it is difficult to come to any consensus on whether or not there is any increase in prevalence of infertility over the years. In the case of an increase, it is still

debatable how far these changes can be attributed to the changed life-style pattern. Therefore, an attempt has been made in this study to understand the levels and patterns of infertility in India and its regional dimensions. The study also explores the possible linkages of infertility in India with socio-economic and life style related factors.

Objectives

1. To study the prevalence of infertility in India and its regional dimensions
2. To address the socio-economic and life style determinants of infertility in India
3. To understand the impact of infertility on family dynamics, such as, marital disruption, extra-marital affairs, divorce, violence against women etc.

Measurement Issues of Infertility

There appears to be a lack of consensus on the definitions and concepts related to infertility and this has brought some confusion, particularly between clinicians, epidemiologists and demographers. Epidemiological and community-based surveys used different definitions and reference periods to define infertility. In English demographic terminology, primary infertility is defined as the inability to bear children due to either the inability to conceive or the inability to carry a pregnancy to a live birth. The inability to conceive after the exposure to conception for a period of one year is defined as infertility by clinicians. Inability to conceive within two years of exposure to conception is considered as infertility by epidemiologists. However, the World Health Organisation (WHO, 1975) modified the definition of infertility as the inability to conceive after exposure to conception between one and two years (WHO, 1975 and 2001). Since conception data is very difficult to procure, the ability to conceive is often replaced by the ability to produce a live birth (Leonard, 2002). However, for survey data, the two-year period is too short a time to declare a couple as infertile. Therefore, demographers have used longer duration of exposure, like 7 years in case of primary sterility and 5 years for secondary sterility (Larsen, U, 2000). Different studies have used different definitions and so the data on infertility is often not comparable.

For the purpose of the present study, primary infertility is defined as the inability to have a live birth among the currently married non-contracepting women after 7 years of marital exposure. To rule out the possibility of adolescent sterility, women who are less than 20 years are not included in the analysis. Age-specific marital infertility rates have been calculated for women in five-year age groups to understand the levels of infertility across different ages and general marital infertility rates have been calculated for women in the 20-49 years age group to compare the infertility rates across the States.

Data and Methods

The data for the present study are drawn from the Third National Family Health Survey (NFHS-3) conducted during 2005-06. The major objective of NFHS-3 was to provide state-level and national-level estimates on various demographic indicators such as fertility, family planning, infant and child mortality, reproductive and child health, nutrition of women and children, the quality of health and family welfare

services and socio economic conditions. The survey also collected information on the prevalence of HIV/AIDS among adult women and men at the national level. The International Institute for Population Science (IIPS) was the nodal agency for the survey at the national level. NFHS-3 collected information from a sample of 1,24,385 women aged 15–49 years, and 74,369 men aged 15-54 years which covers 99 per cent of India's population in 29 States. Bivariate analysis was carried out to understand the variations in infertility across different groups and the Logistic Regression analysis was carried out to understand the determinants of infertility.

Information on Infertility

The data for the present analysis is taken from the women's file. Currently married women in the aged 20-49 years with 7 or more years of marital duration were considered for the analysis. No direct question was asked in NFHS regarding infertility or childlessness. However, based on some control variables infertility was calculated.

Analysis and Discussion

Infertility in India: Regional Variations

Table 1 and Figure 1 provide the regional variations in infertility in India. Overall, 2.3 per cent of the women in India are infertile.

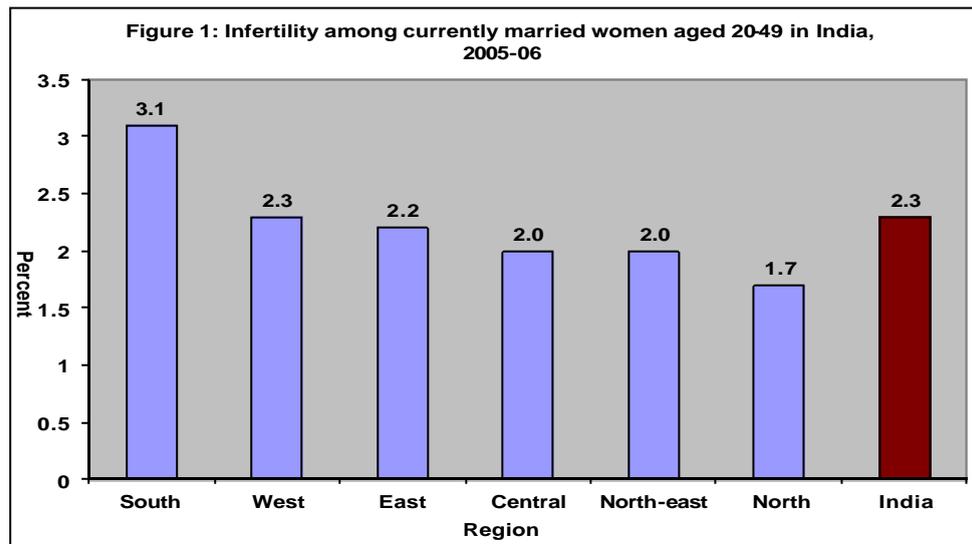


Table 1: Infertility among Currently-Married Women in India, Aged 20- 49

States	Percentage Infertile	Number
India	2.3	68,148
North	1.7	9,057
Delhi	2.1	780
Haryana	0.9	1,313
Himachal Pradesh	1.1	405
Jammu & Kashmir	1.8	567
Punjab	1.5	1,626
Rajasthan	2.0	3,847
Uttaranchal	1.3	521
Central	2.0	16,110
Chhattisgarh	3.6	1,485
Madhya Pradesh	1.9	4,274
Uttar Pradesh	1.8	10,350
East	2.2	15,436
Bihar	1.9	5,431
Jharkhand	3.3	1,764
Orissa	2.5	2,531
West Benga	2.0	5,710
North East	2.0	2,339
Arunachal Pradesh	0.8	61
Assam	2.2	1,654
Manipur	1.6	111
Meghalaya	1.9	129
Mizoram	1.4	44
Nagaland	1.6	70
Sikkim	1.7	35
Tripura	1.6	235
West	2.3	10,013
Goa	4.5	79
Gujarat	2.5	3,499
Maharashtra	2.1	6,438
South	3.1	15,194
Andhra Pradesh	3.6	5,557
Karnataka	2.2	3,905
Kerala	2.6	1,948
Tamil Nadu	2.3	3,783

The regional variations show that the infertility is highest in the Southern region followed by the Western region and lowest in the Northern region, followed by the North-eastern and Central regions.

The figures show that the highest proportion of infertile women are found in Goa (4.5 per cent) followed by Andhra Pradesh (3.6 per cent). In most of the Southern States, except Karnataka, the proportion of infertile women is above the national average. In Goa and Gujarat from the Western region, Orissa and Jharkhand from the Eastern region and Chhattisgarh from the Central region the infertility figures are above the national average. In all States from the Northern and North-Eastern regions the infertility figures are below the national average.

These figures show that the infertility in India is quite low and well within the range defined by WHO across populations. WHO considers infertility above 5 per cent as alarming. In India as a whole, it

is 2.3 per cent. However, in Goa, Andhra Pradesh and Chhattisgarh, infertility may become a problem eventually because the current levels are much above the national average.

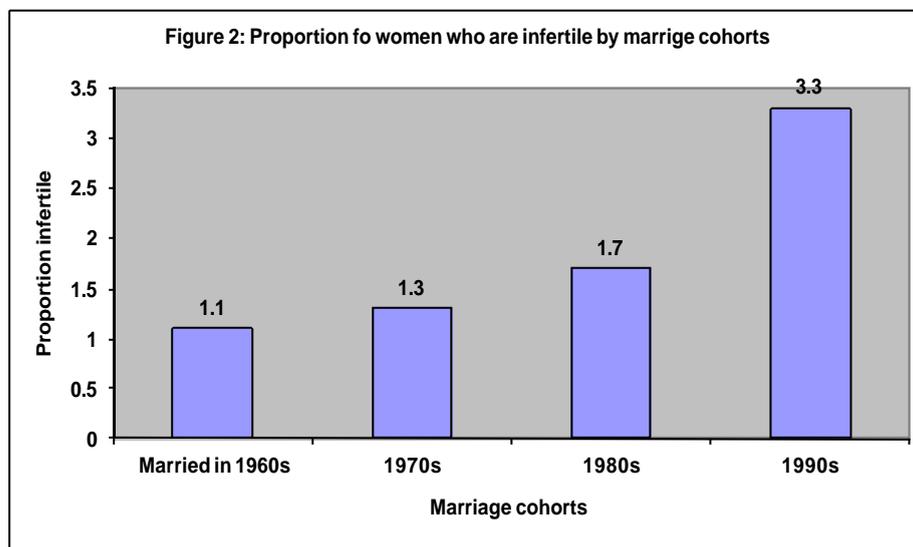
Trends in Infertility

Although the present level of infertility does not present an alarming picture as far as India as a whole is concerned, it will be of interest to see the trends in infertility in India. A number of clinical studies based on small samples often report that infertility is increasing in India. An attempt has therefore been made here to understand the trends in infertility across different periods in India. NFHS-3 alone can provide information on infertility in India during the last 50 years as it provides details of women who were married in different periods. Women in different marriage groups who got married in 1960s, 1970s, 1980s and 1990s were compared to study the trends in infertility. Table 2 and Figure 2 provide the data on infertility among women across different marriage groups. The comparison of women who got married in the 1960s 70s, 80s and 90s is given below:

Table 2: Proportion of Women who are Infertile across Marriage Cohorts

Marriage Cohorts	Proportion Infertile	Total Number of Women
Married in 1960s	1.1	377
Married in 1970s	1.3	13409
Married in 1980s	1.7	27387
Married in 1990s	3.3	26975

This table clearly shows that, although the levels of infertility are relatively low in India, it is slowly increasing. The proportion of women who were infertile among women who got married in the 1960s was only 1.1 per cent. This proportion increased steadily over the marriage groups. Thus, the proportion of infertile women has tripled from 1.1 per cent in the 1960s to 3.3 per cent in the 1990s.



The age-wise data also shows that there is an increase in the proportion of women who are infertile in India. The proportion of infertile women in the 20-24 years age group is nearly twice that of women in the 45-49 years age group, indicating the increasing trend of infertility in India. Overall, a higher proportion of younger rather than older women experienced infertility (Table 3).

Table 3: Proportion of Women in India who are Infertile according to Age

Age Group	Percentage Infertile	Number
20-24	4.0	4058
25-29	3.0	14106
30-34	2.2	15623
35-39	2.1	14341
40-44	1.6	11552
45-49	1.8	8468
20-49	2.3	68148

The data on the levels and trends in infertility show that the infertility levels are quite low in India. Overall, 2.3 per cent of the women in India are reported to be infertile. The geographic variation across India has shown that infertility is relatively higher in the Southern and Western regions. State-wise figures show that infertility is highest in Goa (4.5 per cent) followed by Andhra Pradesh (3.6 per cent). Further, the data do not support the general view that infertility in India is alarmingly high.

Determinants of Infertility

Infertility has a wide range of issues stemming from three general causes: physiological dysfunctions, preventable causes and unexplained issues. In addition to the core prevalence of infertility due to physiological conditions, additional conditions such as socio-economic, environmental and life-style related factors also determine infertility. The NFHS data do not provide the scope to study the physiological determinants of infertility, however, it provides data on some of the socio-economic, environmental and life-style related factors that can cause infertility. Hence, an attempt has been made here to look at the determinants of socio-economic, environmental and life-style related factors that cause infertility.

Socio-Economic Factors and Infertility

Considering the increasing trend of infertility and its association with the geographic, environmental and life-style related factors, it can be presumed that the prevalence of infertility is likely to vary with socio-economic background. There are two types of arguments in the literature regarding the variation with respect to socio-economic variables. One set of studies has shown that the infertility rates may be higher among couples from the high socio-economic strata mainly because people from these strata may have greater exposure to changing environmental conditions, thereby higher life style-related changes leading to higher infertility. Another set of studies has shown that the infertility levels may be high among the low socio-economic groups because their access to infertility treatment may be poor.

Further, considering the cultural dimensions of infertility, it will be interesting to see also whether infertility is different across different religions and caste groups.

Table 4: Percent Distribution of Infertile Currently-Married Women Aged 20- 49 years by Select Socio-Economic and Demographic Characteristics, India, 2005-2006

Background Characteristics	Percentage Infertile	Number of Women
Place of Residence		
Rural	2.2	47,102
Urban	2.5	21,047
Education of Women		
No Education	2.2	36,147
Literate, < Middle School Complete	2.4	10,535
Middle school complete	2.4	18,310
High School Complete And Above	3.0	3,153
Religion		
Hindu	2.3	55,554
Muslim	2.3	8,905
Christian	2.9	1,503
Others	1.9	2,108
Caste		
SC	2.0	12,589
ST	2.9	5,603
OBC	2.3	27,309
Others	2.4	20,701
Wealth Index		
Poorer	2.2	13,086
Poor	2.4	13,708
Middle	2.1	13,509
Richer	2.5	13,615
Richest	2.1	14,236

Table 4 presents data on the proportion of infertility across different socio-economic categories. The major socio-economic factors considered here are place of residence, education of women, economic status of the family measured in terms of the wealth index, religion and caste. The Table shows that, in general, infertility is significantly different across socio-economic categories. A higher proportion of urban women and better-educated women had slightly higher prevalence of infertility. This may be due to the fact that these women are more exposed to environmental and life style-related changes than their rural or less-educated counterparts. However, the relationship between wealth index and infertility does not show any definite pattern. The data on religious differentials in infertility shows that the prevalence of infertility is highest among Christians (2.9 percent) compared to women from other religions. Similarly, infertility is highest among Scheduled Tribes than other castes. Higher infertility among tribals is an accepted fact because historically also studies have shown that the infertility among tribals is much higher than the other groups. However, there is a need to control other

confounding life style and environmental related variables to draw meaningful conclusions on the relationship between socio-economic factors and infertility.

Biological, Environmental and Life-Style Related Factors

As mentioned earlier, infertility has a wide range of causes stemming from three general sources: physiological dysfunctions, preventable causes, and unexplained issues. The linkages between physiological dysfunctions leading to infertility come under the purview of clinical research and cannot be studied using NFHS data. Other causes such as increasing maternal age, life style factors etc. , can be studied to some extent using NFHS data because some information related to these aspects is collected by NFHS. The life style factors include diverse issues such as obesity, weight gain and loss, malnutrition, use of nicotine, alcohol or caffeine and contamination of water.

Although a detailed analysis on life style and environmental factors and its linkages with infertility is not possible with NFHS data, an attempt can be made to understand the relationship using a set of limited variables. NFHS-3 collected information on a few life style related health habits of both males and females like smoking, use of tobacco and drinking alcohol which has definite linkages with the prevalence of infertility. Further, the survey also collected anthropometric measurements of the respondents and using this information, body mass index (BMI) was calculated. This was used to understand the linkages between infertility and body weight. Further, the survey also collected information on the quality of drinking water used and the type of fuel used for cooking. These indicators can be used to study to some extent the environmental factors and its linkages with infertility. Advancing maternal age and its association with infertility was studied using the variable age at marriage. It was presumed that higher the age at marriage, higher the prevalence of infertility.

Age at Marriage and Infertility

In order to understand the relationship between advancing maternal age and prevalence of infertility, age at marriage is considered as a variable and its relationship with prevalence of infertility is analysed. Table 5 provides data on age of women at marriage and prevalence of infertility. The variable age at marriage has been classified into 4 categories, those who married below age 20, 20-24, 25-29 and 30 years and above. The data clearly show a positive relationship between age at marriage and prevalence of infertility. Higher the age at marriage greater is the prevalence of infertility. The prevalence of infertility is as low as 2 per cent among those who married before the age of 20 years and as high as 17 per cent among those who married after the age of 30 years indicating a link between maternal age and prevalence of infertility. As India is catching up with the final stages of demographic transition, the concomitant changes like increase in age at marriage, postponement of marriage and delay in child bearing are inevitable. If this trend goes unchecked, it is likely that infertility levels in India may increase in the future.

Table 5: Percentage Distribution of Infertile Currently Married Women Aged 20-49 years by Selected Demographic, Environmental and Life-Style related factors India, 2005-06

Background Characteristics	Percentage Infertile	Number of Women
Age at marriage*		
Below 20 Years	2.0	56568
20-24 Years	3.0	9809
25-29 Years	5.5	1556
30+	17.2	215
Environmental Variables		
Drinking Water Source*		
Piped	2.5	25814
Other	2.0	38779
Cooking Fuel*		
Safe	2.4	16627
Unsafe	2.2	49346
Drink or Smoke or Chew Tobacco or Partner Drink*		
Yes	2.5	42550
No	2.2	24035
Body Mass Index*		
Underweight	1.9	20538
Normal	2.4	34030
Overweight	2.6	8438
Obese	3.1	2646

Note: * p < .01;

Table 6: Age, Body Mass Index and Infertility

Age	Body Mass Index	% Infertile	No of Women
Below 30	Underweight	2.7	6607
	Normal	3.2	9532
	Overweight	4.8	1122
	Obese	7.7	260
30 and above	Underweight	1.5	13931
	Normal	2.2	24498
	Over weight	2.2	7316
	Obese	2.6	2386

Environmental Factors and Infertility

Human beings are continuously exposed to pollutants through air, food and water. In recent years, the adverse impact of exposure to pollutants on reproductive outcomes has received much attention. Exposure to environmental contaminants has been suggested to have adverse reproductive health effects including decreased semen quality, increased infertility and sub-fertility (Carlsen *et al*, 1992; Allen *et al*, 1997). The information on the major environmental factors such as exposure to chemicals, pollutants etc. , are not available through NFHS but the information on sources of drinking water and fuel used for cooking is and is analysed here to understand its linkages with the prevalence of infertility.

Studies have shown that the contaminated water used for drinking may adversely affect the reproductive health of the people. However, there are divergent views on the relationship between safe and unsafe water and reproductive health. One set of studies has shown an elevated risk of infertility among those who regularly consume unsafe drinking water whereas several other studies have shown that even the chemicals used in the developing countries for water purification, such as chlorine, contains by-products and continuous exposure to these chemicals may elevate the risk of infertility. Hence, it is difficult to hypothesise the relationship between safe drinking water and its impact on infertility. Similarly, clean cooking fuel is likely to reduce the infection rates among women and thereby affect their reproductive health.

Table 5 presents the data on the quality of drinking water and fuel used for cooking and its impact on the prevalence of infertility. The quality of drinking water is considered safe when it is piped to dwellings, yards, plots or when water is available from public taps or bore wells. The data show that the prevalence of infertility is relatively higher among those who use piped water than those who use other sources. Similarly, the prevalence of infertility is higher among those who use improved sources of cooking fuel such as gas, electricity or biogas than those who use kerosene, coal, firewood etc. Therefore, the households using piped water or improved cooking fuel may be mainly in urban areas and among the well-to-do groups. The effect of other confounding socio-economic variables may have to be controlled in order to draw any meaningful conclusion on the relationship between these variables and infertility.

Smoking, Drinking or Chewing Tobacco and its Impact on Infertility

The detrimental effect of smoking and drinking on reproductive health has been highlighted in a number of studies. An attempt has been made here to understand the linkages between smoking, consumption of alcohol or chewing tobacco and the prevalence of infertility. In NFHS-3, men and women were asked questions about their habit of smoking, drinking or chewing tobacco. In this analysis, only the information collected from women is used. NFHS also asked the women about their awareness of their husbands' drinking habits and this information is used to understand the alcohol consumption among men. Here, those who have adverse health habits are those women who smoke or chew tobacco or consume alcohol or their partner consumes alcohol. The data show that the prevalence of infertility is slightly higher among those who have any of the adverse health habits than among those who do not.

Body Mass Index and Infertility

Body Mass Index (BMI) can be used to assess both thinness and obesity. BMI is defined as the weight in kilograms divided by height in metres squared (kg/m^2). According to the World Health Organisation (WHO), BMI less than $18.5 \text{ kg}/\text{m}^2$ is considered as underweight, $18.5\text{-}24.9 \text{ kg}/\text{m}^2$ as normal, $25.0\text{-}29.9 \text{ kg}/\text{m}^2$ as overweight and more than or equal to $30 \text{ kg}/\text{m}^2$ is considered as obese. Table 6 shows the linkages between BMI and its relationship with infertility. Since infertility is linked to the age of women, the analysis has been carried out separately for women below and above 30 years of age. The table shows a clear positive relationship between BMI and level of infertility. The table shows that among those below 30 years, the proportion infertile women is more than double when the women is obese as against those who have normal BMI. Similar findings were observed among women above 30 years also. Higher the BMI higher the proportion of infertile women. This analysis clearly establishes a positive relationship between obesity and infertility.

Overall, this section brings out certain findings of interest — place of residence and education of women seem to affect infertility levels in India. Infertility levels are higher among women who stay in urban areas and have better education. However, the household economic status measured in terms of the wealth index does not seem to determine infertility. The biological factor such as the timing of child-bearing seems to be a very important factor in determining the prevalence of infertility. Those who started child-bearing after the age of 30 years clearly had an elevated level of infertility than those who had started earlier. Similarly, the BMI of women also had a positive relationship with levels of infertility. Overweight or obese women exhibited higher levels of infertility than those who had normal BMI.

Logistic Regression Analysis

In the previous section, it was observed that there are differentials in the proportion of infertility by various socio-economic, biological and life style related variables. These are gross differences without controlling for the effect of background variables. In order to quantify the net effect of the background variables on infertility, a logistic regression analysis is carried out. In the present analysis the dependent variable is dichotomous in nature (i.e. women infertile vs. fertile) so logistic regression would be an appropriate technique to establish the influence of explanatory variables on the dependent variables. The explanatory variables included are region (reference category being the northern region), education of the respondent (with illiterate being reference category), type of residence (with rural taken for reference category), wealth index (with poorest taken for reference category), religion (with Hindu as reference category) and caste (with scheduled caste as the reference category).

Table 7: Results of Logistic Regression Analysis on Selected Socio-Economic, Biological and Life-Style related Factors and Infertility

	Beta coefficient	Odd Ratios
Region		
North		
Central	.188	1.207
East*	.298	1.348
North East	-.154	0.857
West	.213	1.238
South*	.556	1.743
Place of Residence		
Rural		
Urban	.037	1.037
Education of women		
No education		
Literate, < middle school complete	-.004	0.996
Middle school complete	-.152	0.859
High school complete and above	-.176	0.839
Religion		
Hindu		
Muslim	.400	1.041
Christian	-.147	0.863
Others	-.041	0.960
Caste		
SC		
ST*	.432	1.541
OBC	.125	1.133
Others	.261	1.299
Wealth Index		
Poorer		
Poor	.022	1.022
Middle**	-.185	0.831
Richer**	-.222	0.801
Richest	-.938	0.528
Background Characteristics		
Age at Marriage*		
Below 20 years*		
20-24 years*	.373	1.451
25-29 years*	.916	2.498
30+*	2.141	8.504
Marriage cohort		
Married in 60s		
70s*	0.699	0.497
80s	-.479	0.619
90s	.101	1.106
Environmental Variables		
Source of drinking water*		
Piped*		
Other	-.179	.836
Cooking Fuel*		
Safe		
Unsafe	-.285	.750
Drink or Smoke or Chew Tobacco or Partner Drinks*		
No		
Yes	.156	1.169
Body Mass Index*		
Underweight*		
Normal*	.293	1.341
Overweight*	.470	1.600
Obese*	.560	1.974
Constant	-3.876	
-2 Log Likelihood	12908.196	

Note: * p < .01; **p < .05

Among the biological and life-style related variables considered were age at marriage (married below 20 years taken as the reference category), marriage cohort (married in 1960s taken for the reference category), source of drinking water (piped water is taken for reference category), source of cooking fuel (safe fuel is taken for reference category), habit of drinking, smoking or chewing tobacco (did not smoke, drink or chew tobacco is the reference category) and body mass index (underweight is taken as the reference category). The results of the logistic regression analysis are presented in Table 7.

The results show that after controlling the various background variables, it is the biological and life-style related variables that affect infertility significantly. Age at marriage, timing of marriage, drinking, smoking or chewing tobacco and body mass index seem to affect infertility significantly. The relationship between age at marriage and infertility is positive — higher the age at marriage higher the infertility. Similarly, women who married in the 1990s have higher infertility rates compared to women who married in the 1960s, indicating an increase in infertility over the years. Habit of drinking by self or the partner or smoking or chewing tobacco seems to have a positive effect on infertility. Similarly, after controlling all the background variables, overweight or obese women have much higher infertility levels than normal women. Since women in the Southern regions exhibit significantly higher infertility levels compared to Northern regions, regional variations in infertility also seem to be important. However, the socio-economic variables such as, place of residence, education, wealth index and religion do not seem to play any significant role in determining the levels of infertility in India.

Impact of Infertility on Women's life

Infertility interferes with human activities and presents major life challenges to those who desire to have children. Infertility can lead to decreased levels of personal wellbeing and for many individuals the consequences are significantly more severe (Fiddler, A 1999). The burden of infertility includes physiological, social and physical suffering (Emily, 2004). In several parts of the world, women's wellbeing rather than men's appears to be more seriously affected by infertility. The nature and severity of the consequences of infertility in developing countries differ from developed countries (Van Balen and Inhorn, 2002). The reason for greater consequences of infertility in developing countries is mainly due to the importance attached to children in the family. In the Western world, having children is widely viewed as a personal choice. In the case of developing countries, not having children is seldom viewed as an option. Adherence to social norms, desire and need for social security, power and perpetuity are often cited as reasons for having children in developing countries. In the absence of adequate social security measures, children are viewed as security in old age in these countries and old childless couples face severe economic hardship. Further, in societies where the status of women is defined by their reproductive capacity and where motherhood is often glorified, infertility can be the cause for unstable marriages, domestic violence, several stigmatisations and social repercussions of enormous proportions (Unisa, 19991; Mulgaonkar, 2001; Prakasamma, 1999).

Impact of Infertility on Marital Disruption

An attempt has been made here to understand some of the repercussions of infertility on women. Marital disruption, exposure to multiple partners, experience of domestic violence, women's involvement in household decision-making, freedom of movement and access to money etc., have been analysed here. Instead of currently-married women, ever-married women have been considered for this analysis. However, an aspect that needs to be noted here is that the timing of marital dissolution and reasons for separation and divorce have not been collected in NFHS. Therefore, it is not quite clear from this data whether or not divorce or separation has occurred after the incidence of infertility. In case one observes higher incidence of divorce and separation among infertile couples, considering the current social milieu, it may however be safe to attribute this to the incidence of infertility.

Table 8: Impact of Fertility on Marital Stability

	Infertile (%)	Not Infertile (%)
Marital Instability		
Divorced	4.7	0.2
Separated	10.9	1.3
More than one Partner	5.0	1.8

Table 8 gives the results of the impact of infertility on marital stability. If one looks at the data on the proportion of divorce and separation, it is clear that a higher proportion of childless women experienced either divorce or separation. Similarly, a higher proportion of the husbands of childless women had multiple sex partners than the women with children.

Infertility and its Impact on Female Autonomy

The ability of a woman to take decisions on her own, have access to resources and enjoy freedom of movement signifies an essential aspect of empowerment. In order to assess women's autonomy, NFHS-3 collected information on women's involvement in different types of household decisions regarding their own health care, making large household purchases, making household purchases for daily needs and visiting their family and relatives. In order to assess women's access to financial resources, an important element of women's empowerment, NFHS-3 had asked all women whether they have any money of their own which they alone decide how to spend and whether they hold a bank account. Further, to understand freedom of movement outside the home, women were asked whether they were allowed to go alone to the market, the health facility and to places outside the village or community. This information is used here to analyse women's autonomy vis-à-vis their fertility status. It is presumed that in a patriarchal setting like India, infertility may affect not only marital harmony but also women's autonomy.

Table 9 presents data on infertility and its impact on women's autonomy. The table clearly shows that infertile women are less involved in household decision-making than women who had children. The proportion of women who on their own take decisions on their health care, in major household purchases, purchases on daily household needs and decisions about visiting relatives/friends

was lower among infertile women compared to those who had children. Similarly, infertile women seem to have restricted freedom of movement because a lower proportion was allowed to go alone to the health facility, market and places outside the village or community. Further, when it comes to accessing money, fewer infertile women had access to money and held bank account compared to women who were not infertile. These findings clearly show that not only a higher proportion of infertile women had unstable marriage; they also enjoy lesser autonomy compared to women with children.

Table 9: Infertility and Women's Autonomy

	Infertile (%)	Not infertile (%)
Woman's Involvement in Household Decision Making		
Health care for self*	22.8	29.8
Major household purchases*	8.1	10.2
Purchase on daily household needs*	32.1	37.2
Decision about visiting family/relatives	12.2	12.5
Freedom of movement		
Allowed to go to health facility alone	56.1	60.7
Allowed to go to market facility alone	51.5	58.3
Allowed to go to places outside the village	56.1	60.7
Access to Money		
Has money for self-use	48.7	52.3
Has bank account	17.3	18.1

* p < .01

Infertility and Exposure to Domestic Violence

NFHS-3 also collected data on women's exposure to domestic violence. Information on emotional violence, physical violence and sexual violence information was collected in the survey. Questions such as whether at any time the husband tried to humiliate, insult or threatened the wife were included under emotional violence. Physical violence included slapping, pushing, kicking, punching and pulling hair. Sexual violence included forcing sex or unwanted sex. An attempt has been made in this paper to see the linkages between infertility and exposure to domestic violence.

Table 10: Impact of Infertility on Domestic Violence

	Infertile (%)	Not Infertile (%)
Acts of Emotional Violence		
Humiliated*	17.4	14.1
Threatened*	7.9	5.8
Insulted*	10.3	8.6
Acts of Physical violence		
Pushed	15.9	15.5
Slapped*	7.9	5.8
Punched*	10.3	8.6
Pulled hair	18.6	17.4
Sexual violence		
Forced Sex	9.6	9.6
Unwanted Sex	4.9	4.5
Health impacts		
Had bruises**	40.2	37.0
Had Injury/sprain/dislocation/burns*	12.2	9.0
Broken Bones/teeth*	10.1	6.7
Severe Burns	2.1	1.8

* p < .01

Table 10 clearly demonstrates the adverse consequences of infertility in women's life. The data show that infertile women are subjected to more emotional and physical violence compared to women who have children. Similarly, the consequences of domestic violence on women's health are also greater for childless women. A higher proportion of infertile women experienced bruises, injury, broken bones and severe burns because of violence compared to women who have had children.

This analysis clearly shows the impact of infertility on women's life. Infertility can lead to greater marital instability, divorce and extra-marital affairs by husbands. Further, it can also affect women adversely. Women's involvement in household decision-making, freedom of movement and access to resources was also restricted for infertile women. Infertile women experienced greater emotional and physical violence in the family and had more health problems associated with domestic violence. Therefore, it can be concluded that although the levels of infertility may be low in India the consequences of infertility on women are substantial. Thus, infertility cannot be treated as an individual problem. It has a wide range of social and health consequences and therefore infertility can definitely be considered an important public health issue with wider social implications.

Conclusion

The study aims to understand the levels, patterns and determinants of infertility in India using data from the National Family Health Survey-3. It also explores the impact of infertility on the woman's life in terms of marital disruption, autonomy and exposure to domestic violence. The data show that the levels of infertility in India are not alarmingly high. Overall, 2.3 per cent of the women can be classified

as infertile in India. WHO reports that in any population 2-3 per cent of the women will be infertile and populations with infertility levels above 5 per cent can be treated as high prevalent countries. Although the overall prevalence of infertility is 2.3 per cent, there are regional variations in infertility levels. The prevalence of infertility is highest in the Southern regions and lowest in Northern regions. The variation across the States shows that prevalence of infertility is highest in Goa followed by Andhra Pradesh.

The overall trends in infertility show that the prevalence of infertility is increasing in India. Women who got married in the 1990s had significantly higher levels of infertility than women who married in 1960s. Similarly, younger women had higher prevalence of infertility compared to older women.

The determinants of infertility with respect to various socio-economic, biological and life style related factors indicate that the socio-economic factors such as place of residence, education, wealth index, caste and religion do not have any significant role in determining the levels of infertility. However, biological factors such as age at marriage, life-style related factors like exposure to drinking alcohol, smoking and chewing tobacco and the BMI levels seem to affect infertility levels significantly. Infertility levels are higher among those who married late, had the worst health habits and were overweight or obese.

Although the levels of infertility are low, the impact of infertility on women's life seems to be substantial. Higher rates of marital disruption in terms of divorce and separation were observed among infertile women. Infertile women had lower autonomy in terms of their involvement in household decision-making, freedom of movement and access to resources than women with children. They also had greater exposure to emotional and physical violence. Therefore, infertility cannot be treated as an individual problem; it has a wide range of social and health repercussions. Therefore, infertility can definitely be considered an important public health issue with wider social implications.

References

- Allen B B, R Brat, J E Seidel and J F Jarrel (1997). Declining Sex Ratios in Canada. *Canadian Medical Association Journal*, 156 (1): 37-41.
- Butler P (2003). Assisted Reproduction in Developing Countries-facing up to the Issues. *Progress in Reproductive Health Research*, No 63, pp 1-8.
- Carlsen E Giwercman A, N Keiding and N E Skakkeback (1992). Evidence of Decreasing Quality of Semen during Last 50 years. *British Medical Journal*, 305 (6854): 609-13.
- Daar A Merali Z (2002). Infertility and Social Suffering: The Case of ART in Developing Countries. In Vayena E, Rowe P, Griffin D (eds), *Report of the Meeting on Medical, Ethical and Social Aspects of Assisted Reproduction*. Geneva: World Health Organisation. Pp 15-21.
- Datta B, F Okonofua (2002). What about us?. Bringing infertility into reproductive care. *Quality/Calidad/Qualité* No.13, pp.1-31.
- Dahl J E, J Sunbdy, A Hensten-Pettersen and N Jacobsen (1999). Dental Workplace Exposure and Effect on Fertility. *Scandinavian Journal of Work Environment and Health*, 25 (3): 285-90.
- Eggert J, H Theobald and P Engfeldt (2004). Effects of Alcohol Consumption on Female Fertility during an 18-year period. *Fertility and Sterility*, 2 (81): 379-83.

- Emily McDonald Evens (2004). A Global Perspective on Infertility: An Under Recognized Public Health Issue. *Carolina papers No 18*
- Fenster L, C Schaefer, A Mathur, R A Hiatt, C Pieper, A E Hubbard, J Von Behren and S H Swan (1995). Psychological Stress in the Workplace and Spontaneous Abortion. *American Journal of Epidemiology*, 142: 1176-83.
- Fenster L, A E Hubbard, S H Swan, G C Windham, K Waller, R A Hiatt and N Benowitz (1997). Caffeinated Beverages, Decaffeinated Coffee, and Spontaneous Abortion. *Epidemiology*, 8 (5): 515-23.
- Fidler A Bernstein J (1999). Infertility: from a personal to public health problem. *Public health reports*, 114 (6): 495-511.
- Gigsels M, Z Mgalla and L Wambura (2001). No child to send: context and consequences of female infertility in North-West Tanzania. In Boerma T and A Mgalla (eds), *Women and infertility in sub Saharan Africa*. Amsterdam: KIT Press. Pp 203-21.
- Inhorn M C (2003). The Worms are Weak Male Infertility and Patriarchal Paradoxes in Egypt. *Men and Masculinity*, 5 (3): 236-56.
- Juhl M, J Olsen, A-MN Andersen and M Gronbaek (2003). Intake of wine, beer and spirits and waiting time to pregnancy. *Human Reproduction*, 18 (9): 1967-71.
- Jeejeebhoy, S (1998). Infertility in India-levels, patterns and consequences: Priorities of social science research. *Journal of family welfare*, 44 (2): 15-24.
- Hassan M A M and S R Killick (2004). Negative lifestyle is associated with a significant reduction in fecundity. *Fertility and Sterility*, 81 (2): 384-92.
- Lindbohm M L, H Taskinen, M Sallmen and K Hemminki (1990). Spontaneous abortions among women exposed to organic solvents. *American Journal of Industrial Medicine*, 17 (4): 449-63.
- Larsen, U (2000). Primary and Secondary Infertility in Sub Saharan Africa. *International Journal of Epidemiology*, 29 (2): 285-91.
- Leonard, L (2002). Problematizing Fertility: "Scientific" Accounts of Chadian women's narration. In M Inhorn and F van Balen (eds), *Infertility around the Globe: New Thinking on Childlessness, Gender and Reproductive Technologies*. Berkley, USA: University of California Press. Pp 215-32.
- Lipscomb J A, L Fenster, M Wrensch, D Shusterman and S Swan (1991). Pregnancy outcomes in women potentially exposed to occupational solvents and women working in the electronics industry. *Journal of Occupational Medicine*, 33 (5): 597-604.
- Mulgaonkar V B (2001). *A Research and Intervention Programme on Women's Reproductive Health in Slums of Mumbai*. Mumbai: Sujeevan Trust, 2001.
- Ness R B, J A Grisso, N Hirschinger, N Markovic, L M Shaw, N L Day and J Kline (1999). Cocaine and tobacco use and the risk of spontaneous abortion. *New English Journal of Medicine*, 340 (5): 333-39.
- Pasquali R, C Pelusi, S Genghenini, M Cacciari and A Gambineri (2003). Obesity and reproductive disorders in women. *Human Reproduction Update*, 9 (4): 359-72.

- Prakasamma M (1999). Infertility: a social and gender perspective. Paper presented at the *National consultation on infertility prevention and management*. New Delhi: UNFPA.
- Rachootin P and J Olsen (1983). The risk of infertility and delayed conception associated with exposures in the Danish workplace. *Journal of Occupational Medicine*, 25 (5): 394-402.
- Tolstrup J S, S K Kjaer, C Munk, L B Madsen, B Ottesen, T Bergholt and M Gronbaek (2003). Does caffeine and alcohol intake before pregnancy predict the occurrence of spontaneous abortion? *Human Reproduction*, 18 (12): 2704-10.
- Unisa S (1999). Childlessness in Andhra Pradesh, India: treatment seeking and consequences. *Reproductive Health Matters*, 7 (13): 54-64.
- Vayena E, P Rowe, H Peterson (2002). Assisted reproductive technology in developing countries: why should we care?. *Fertility and Sterility*, 78 (1): 13-15.
- Vayena E, P Rowe, D Griffin, P Van Look, Turmen T Forward (2002). Current practices and controversies in assisted reproduction. In Vayena E, Rowe P, Griffin D (eds), *Report of a meeting on Medical, Ethical, and Social Aspects of Assisted Reproduction*. Geneva: World Health Organisation. Pp 15-21.
- Valanis B, W M Vollmer and P Steele (1999). Occupational exposure to antineoplastic agents: self-reported miscarriages and stillbirths among nurses and pharmacists. *Journal of occupational and Environmental medicine*, 41 (8): 632-38.
- Van Balen F and M Inhorn (2002). Interpreting infertility: a view from the social sciences. In Inhorn M and Van Balen F (eds), *Infertility around the globe: new thinking on childlessness, gender, and reproductive technologies* London: University of California Press. Pp 3-32.
- Vayena E, P Rowe, H Peterson (2002). Assisted reproductive technology in developing countries: why should we care?. *Fertility and Sterility*, 78 (1): 13-15.
- World Health Organisation (1975). The Epidemiology of Infertility: Report for the WHO scientific group. *Technical Report Series No.582*. Geneva.
- (1994). *Challenges in reproductive health research: Biennial report 1992-93*. Geneva: World Health Organisation.
- (1991). *Infertility: a tabulation of available data on prevalence of primary and secondary infertility*. WHO programme on maternal and child health and family planning division of family Health.

Recent Working Papers

- 223 **A Comparative Analysis of Efficiency and productivity of the Indian Pharmaceutical Firms: A Malmquist-Meta-Frontier Approach**
Mainak Mazumdar and Meenakshi Rajeev
- 224 **Local Governance, Patronage and Accountability in Karnataka and Kerala**
Anand Inbanathan
- 225 **Downward Dividends of Groundwater Irrigation in Hard Rock Areas of Southern Peninsular India**
Anantha K H
- 226 **Trends and Patterns of Private Investment in India**
Jagannath Mallick
- 227 **Environmental Efficiency of the Indian Cement Industry: An Interstate Analysis**
Sabuj Kumar Mandal and SMadheswaran
- 228 **Determinants of Living Arrangements of Elderly in Orissa: An Analysis**
Akshaya Kumar Panigrahi
- 229 **Fiscal Empowerment of Panchayats in India: Real or Rhetoric?**
M Devendra Babu
- 230 **Energy Use Efficiency in Indian Cement Industry: Application of Data Envelopment Analysis and Directional Distance Function**
Sabuj Kumar Mandal and SMadheswaran
- 231 **Ethnicity, Caste and Community in a Disaster Prone Area of Orissa**
Priya Gupta
- 232 **Koodankulam Anti-Nuclear Movement: A Struggle for Alternative Development?**
Patibandla Srikant
- 233 **History Revisited: Narratives on Political and Constitutional Changes in Kashmir (1947-1990)**
Khalid Wasim Hassan
- 234 **Spatial Heterogeneity and Population Mobility in India**
Jajati Keshari Parida and S Madheswaran
- 235 **Measuring Energy Use Efficiency in Presence of Undesirable Output: An Application of Data Envelopment Analysis (DEA) to Indian Cement Industry**
Sabuj Kumar Mandal and S Madheswaran
- 236 **Increasing trend in Caesarean Section Delivery in India: Role of Medicalisation of Maternal Health**
Sancheetha Ghosh
- 237 **Migration of Kashmiri Pandits: Kashmiriyat Challenged?**
Khalid Wasim Hassan
- 238 **Causality Between Energy Consumption and Output Growth in Indian Cement Industry: An Application of Panel Vector Error Correction Model**
Sabuj Kumar Mandal and SMadheswaran
- 239 **Conflict Over Worship: A Study of the Sri Guru Dattatreya Swami Bababudhan Dargah in South India**
Sudha Sitharaman
- 240 **Living Arrangement Preferences of the Elderly in Orissa, India**
Akshaya Kumar Panigrahi
- 241 **Challenges and Prospects in the Measurement of Trade in Services**
Krushna Mohan Pattanaik
- 242 **Dalit Movement and Emergence of the Bahujan Samaj Party in Uttar Pradesh: Politics and Priorities**
Shyam Singh
- 243 **Globalisation, Democratic Decentralisation and Social Security in India**
S N Sangita and T K Jyothi
- 244 **Health, Labour Supply and Wages: A Critical Review of Literature**
Amrita Ghatak
- 245 **Is Young Maternal Age A Risk Factor for Sexually Transmitted Diseases and Anemia in India? An Examination in Urban and Rural Areas**
Kavitha N
- 246 **Patterns and Determinants of Female Migration in India: Insights from Census**
Sandhya Rani Mahapatro
- 247 **Spillover Effects from Multinational Corporations: Evidence From West Bengal Engineering Industries**
Rajdeep Singha and K Gayithri
- 248 **Effectiveness of SEZs Over EPZs Structure: The Performance at Aggregate Level**
Malini L Tantri
- 249 **Income, Income Inequality and Mortality: An empirical investigation of the relationship in India, 1971-2003**
K S James and T S Syamala
- 250 **Institutions and their Interactions: An Economic Analysis of Irrigation Institutions in the Malaprabha Dam Project Area, Karnataka, India**
Durba Biswas and L Venkatachalam
- 251 **Performance of Indian SEZs: A Disaggregated Level Analysis**
Malini L Tantri
- 252 **Banking Sector Reforms and NPA: A study of Indian Commercial Banks**
Meenakshi Rajeev and H P Mahesh
- 253 **Government Policy and Performance: A Study of Indian Engineering Industry**
Rajdeep Singha and K Gayithri
- 254 **Reproduction of Institutions through People's Practices: Evidences from a Gram Panchayat in Kerala**
Rajesh K
- 255 **Survival and Resilience of Two Village Communities in Coastal Orissa: A Comparative Study of Coping with Disasters**
Priya Gupta
- 256 **Engineering Industry, Corporate Ownership and Development: Are Indian Firms Catching up with the Global Standard?**
Rajdeep Singha and K Gayithri

- 257 **Scheduled Castes, Legitimacy and Local Governance: Continuing Social Exclusion in Panchayats**
Anand Inbanathan and N Sivanna
- 258 **Plant-Biodiversity Conservation in Academic Institutions: An Efficient Approach for Conserving Biodiversity Across Ecological Regions in India**
Sunil Nautiyal
- 259 **WTO and Agricultural Policy in Karnataka**
Malini L Tantri and R S Deshpande
- 260 **Tibetans in Bylakuppe: Political and Legal Status and Settlement Experiences**
Tunga Tarodi
- 261 **Trajectories of China's Integration with the World Economy through SEZs: A Study on Shenzhen SEZ**
Malnil L Tantri
- 262 **Governance Reforms in Power Sector: Initiatives and Outcomes in Orissa**
Bikash Chandra Dash and S N Sangita
- 263 **Conflicting Truths and Contrasting Realities: Are Official Statistics on Agrarian Change Reliable?**
V Anil Kumar
- 264 **Food Security in Maharashtra: Regional Dimensions**
Nitin Tagade
- 265 **Total Factor Productivity Growth and Its Determinants in Karnataka Agriculture**
Elumalai Kannan
- 266 **Revisiting Home: Tibetan Refugees, Perceptions of Home (Land) and Politics of Return**
Tarodi Tunga
- 267 **Nature and Dimension of Farmers' Indebtedness in India and Karnataka**
Meenakshi Rajeev and B P Vani
- 268 **Civil Society Organisations and Elementary Education Delivery in Madhya Pradesh**
Reetika Syal
- 269 **Burden of Income Loss due to Ailment in India: Evidence from NSS Data**
Amrita Ghatak and S Madheswaran
- 270 **Progressive Lending as a Dynamic Incentive Mechanism in Microfinance Group Lending Programmes: Empirical Evidence from India**
Naveen Kumar K and Veerashkharappa
- 271 **Decentralisation and Interventions in Health Sector: A Critical Inquiry into the Experience of Local Self Governments in Kerala**
M Benson Thomas and K Rajesh
- 272 **Determinants of Migration and Remittance in India: Empirical Evidence**
Jajati Keshari Parida and S Madheswaran
- 273 **Repayment of Short Term Loans in the Formal Credit Market: The Role of Accessibility to Credit from Informal Sources**
Manojit Bhattacharjee and Meenkashi Rajeev
- 274 **Special Economic Zones in India: Are these Enclaves Efficient?**
Malini L Tantri
- 275 **An Investigation into the Pattern of Delayed Marriage in India**
Baishali Goswami
- 276 **Analysis of Trends in India's Agricultural Growth**
Elumalai Kannan and Sujata Sundaram
- 277 **Climate Change, Agriculture, Poverty and Livelihoods: A Status Report**
K N Ninan and Satyasiba Bedamatta
- 278 **District Level NRHM Funds Flow and Expenditure: Sub National Evidence from the State of Karnataka**
K Gayithri
- 279 **In-stream Water Flows: A Perspective from Downstream Environmental Requirements in Tungabhadra River Basin**
K Lenin Babu and B K Harish Kumara
- 280 **Food Insecurity in Tribal Regions of Maharashtra: Explaining Differentials between the Tribal and Non-Tribal Communities**
Nitin Tagade
- 281 **Higher Wages, Cost of Separation and Seasonal Migration in India**
Jajati Keshari Parida and S Madheswaran
- 282 **Pattern of Mortality Changes in Kerala: Are they Moving to the Advanced Stage?**
M Benson Thomas and K S James
- 283 **Civil Society and Policy Advocacy in India**
V Anil Kumar

Price: Rs. 30.00

ISBN 978-81-7791-140-4



INSTITUTE FOR SOCIAL AND ECONOMIC CHANGE

Dr V K R V Rao Road, Nagarabhavi P.O., Bangalore - 560 072, India
Phone: 0091-80-23215468, 23215519, 23215592; Fax: 0091-80-23217008
E-mail: lekha@isec.ac.in; Web: www.isec.ac.in