India 2017

Demographic Dimensions of Sustainable Development

Selected Papers of
Bhopal Seminar 2017

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Editor

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Introduction

Aalok Ranjan Chaurasia

The present monograph includes selected research papers presented at the Bhopal Seminar 2017 which was organised by the MLC Foundation and Shyam Institute as part of the annual seminar series on contemporary issues in population and development in India. The theme of the Bhopal Seminar 2017 was demographic dimensions of sustainable development in India. During the Bhopal Seminar 2017, 40 research papers on different aspects of population and sustainable development were presented. Research papers included in the present monograph were selected through a two-step selection process. At the first step of selection, the chairperson of each technical session of the Bhopal Seminar 2017 selected two papers from the papers presented during the technical session. The research papers so selected were peer-reviewed by independent reviewers and, on the basis of the recommendation of reviewers, research papers were selected. The selected research papers were revised on the basis of the comments and suggestions of the reviewer. The modified research papers were then revised and finalised by the editor of the monograph. The papers included in the present monograph cover different aspects of sustainable development in the context of different dimensions of population growth, structure and distribution. These include impact of population growth on sustainable development, application of geographic information system in the mapping of health facilities at the local level, gender balance in the nutritional status, differentials in the level of morbidity and the extent of hospitalisation, gender dimensions of contraceptive use, treatment seeking behaviour of youths in the context of their reproductive health problems, health dimensions of the profession of street sweeping, urbanisation and factors associated with women's participation in household decision-making. The research papers included in the monograph highlight the importance of taking into consideration population related factors in all efforts directed towards promoting sustainable development. They also emphasise the need of developing policy and programme framework for integrating population factors with sustainable development efforts and activities.

The first paper of included in the present monograph analyses the historical perspective and future prospect of the impact of population growth on one of the three dimensions of sustainable development as defined by the 2030 Sustainable Development Agenda of the United Nations - the dimension of environmental protection - in terms of trends in primary energy use and resulting emission of greenhouse gases, particularly CO_2. The analysis suggests that the direct contribution of the population growth to the increase in the primary energy use and CO_2 emission in India has not been large in the past but the second order effects of population growth in conjunction with the change in the per capita gross domestic product or the change in affluence has been quite substantive. The analysis indicates that a substantial proportion of the effect of the increase in affluence on the increase in the primary energy use and emission of greenhouse gases including CO_2 can be compensated by accelerating the pace of population transition. This observation is important as increase in affluence is widely recognised as an indicator of development and improvement in the quality of life. The analysis also suggests that technology advancement had and is likely to have only a limited impact on the environmental concerns facing India. The decrease in the primary energy use and CO_2 emission as the result of improvements in the technology used in the social and economic production system has been found to be too small to compensate for the increase in the primary energy use and CO_2 emission as the result of population growth and the increase in affluence. The prospects of rapid advancement in technology in India appear to be remote because of the heavy cost associated with technological innovations and technological research. The need of an acceleration in the speed of population transition in the context of sustainable development in India, therefore, is even stronger.

The second paper of the monograph maps the availability of health care facilities in villages and towns of Uttar Pradesh - the most populous state of India - through the application of geographical information system (GIS) tools and techniques. Using the data available through the population census 2011, the paper highlights some important issues related to the availability of health care facilities at the grass roots level in the state despite some serious limitations of the data. It is well known that the availability of health care facilities is the first and perhaps the most important determinant of the access to health care services and hence in deciding the health status of the people. In this context, this paper highlights gross inadequacies in the availability of health care facilities in terms of both number of health care facilities and their distribution across villages in the rural areas and across towns in the urban areas of the state. The analysis also highlights the usefulness of using the GIS tools and methods in analysing the spatial distribution of health care facilities. The spatial accuracy of village points in the rural areas and town points in the urban areas confirms the soundness of the methodology which can be used in other contexts. The methodology adopted in the paper may be used to generate spatial data for advanced spatial epidemiological research and analysis which may help policy makers and health programme managers to understand the spatial mismatches between disease outbreaks and availability and access to health care facilities; planning new health care facilities; analysing the availability and utilisation of the existing health care facilities, etc.

The third paper of the monograph analyses the gender balance in the nutritional status of children and adults in Odisha, one of the poorly developed states of India. The paper is based on the data on clinical, anthropological and biochemical dimensions of the nutritional status available through the Annual Health Survey carried out in the state by the Registrar General and Census Commissioner of India in the year 2013 to provide district level estimates of nutritional status in children and adults. The analysis reveals that the problem of malnutrition is quite pervasive in the state and in its constituent districts and is not confined to children only but widely prevalent in the adult population also. The analysis also reveals that while children of the state face the challenge of under nutrition, the youth of the state, especially in the urban areas, face the challenge of obesity and over nutrition that needs to be effectively addressed through specific programme interventions. The paper, interestingly, observes that among unmarried persons, the prevalence of underweight is higher among females as compared to males but among married persons, the prevalence of under nutrition is found to be higher in males as compared to females. The paper also reveals that the prevalence of both under nutrition and over nutrition varies widely across the districts of the state as well as across different population groups.

Social and economic differentials in morbidity levels and hospitalisation in India is the focus of the fourth paper of this monograph. Morbidity and hospitalisation are two important indicators of the health status of the people. This paper is based on the data available through the National Sample Survey. The paper observes that both the level of morbidity and the rate of hospitalisation in India have increased over time. However, the rural-urban gap in the morbidity incidence has widened but the rural-urban gap in the hospitalisation rate has narrowed down over time. The paper also reveals wide variations in both morbidity level and hospitalisation rate across the states of the country. The paper suggests that the main diseases accounting for the morbidity in India remain infections followed by respiratory and cardiovascular diseases. On the other hand, main reason for hospitalisation is child birth followed by infections. The paper also observes that both morbidity incidence and rate of hospitalisation vary widely across the states of the country with both morbidity incidence and hospitalisation rate being the highest in Kerala whereas the morbidity incidence is found to be the lowest in Assam, but the hospitalisation rate has been found to be the lowest in Uttar Pradesh. Moreover, the paper also observes strong social and economic differentials in both morbidity incidence and the rate of hospitalisation at both national and state levels. The findings of the analysis may be useful to health planners, health policy makers and health managers in planning and programming the delivery of health care services so as to meet the health needs of the people of the country.

The fifth paper of the monograph analyses the gender dimension of contraceptive use in India. Using the data available through different rounds of the National Family Health Survey including the latest round 2015-16 which, for the first time, provides estimates of the contraceptive prevalence rate by methods for the 640 districts of the country in addition to national level and state specific estimates. The paper reveals wide variation in both prevalence of modern contraceptive methods and gender gap in the use

of modern contraceptive methods across the country, especially, across its 640 districts as they existed at the time of the 2011 population census. The analysis reveals that, although, in majority of the districts of the country, the gender balance in contraceptive use is highly biased towards female family planning methods, yet, there are more than 13 per cent districts where the gender balance in contraceptive use is very balanced. The paper also suggests that inter-district variation in the gender gap in contraceptive use is largely the result of the inter-district variation in the prevalence of two modern contraceptive methods - female sterilisation and condom which is a male contraceptive method and, in districts where the gender gap in contraceptive use is relatively more balanced, the prevalence of condom is very high. Moreover, there are distinct regional patterns in the gender balance in the use of modern family planning methods in the country. The paper concludes that variation in the use of modern family planning methods and regional clustering of districts in terms of gender balance in contraceptive use may be the result of factors endogenous and exogenous to the family planning services delivery system. The paper calls for analysing the relationship between the administrative capacity and organisation efficiency of the family planning services delivery system and the gender balance in contraceptive use and emphasises the need of a district-based decentralised approach of planning and programming for family planning services delivery to make sure of improving not only the effectiveness of family planning in the context of reduction in fertility and population stabilisation but also in terms of improving the health of women and children. In order to improve the effectiveness of family planning in the context of both maternal and child health and fertility reduction, the paper argues that the local context of family planning should be a priority in planning and programming for family planning services delivery.

The next paper of the monograph focusses on the reproductive health problems of the young population in India. The paper argues that reproductive health remains a neglected issue in the Indian society despite numerous programmes and schemes being implemented in the country and concerns related to meeting the health needs of the people remain challenging with a considerable gap in the reproductive health status of people living in the rural areas as compared to those living in the urban areas of the country. The paper observes that youth, especially, unmarried, has less interest to seek advice/treatment for their reproductive health related problems, especially, genital infections possibly due to a number of social and cultural barriers. Moreover, the value system for male and female youths in the society is different and these differences have been found to get reflected in the gender gap in advice/treatment seeking behaviour of male and female youths. The analysis also observes that the standard of living of the household has a considerable influence on the advice/treatment seeking behaviour of youths - married as well as unmarried. The paper also argues that the advice/treatment seeking behaviour in relation to the reproductive health problems faced by the youths is essentially a multidimensional issue which cannot be addressed by launching programmes or interventions of vertical nature. The paper emphasises the need to adopt an integrated approach that covers social, cultural, economic, psychological and services delivery related dimensions of reproductive health.

Health related consequences of street sweeping work is the subject of interest of the seventh paper of the monograph. The repetitive, rigorous nature of the street sweeping work increases the risk of musculoskeletal disorders and related disabilities among the street sweepers. The present study, based on the data collected from street sweepers in Greater Mumbai, the largest metropolitan city of the country, shows that the prevalence of musculoskeletal disorders and related disabilities is substantially higher in street sweepers as compared to other municipal workers with similar, social, economic and demographic profile. The paper also observes that factors like the number of years engaged in street sweeping, job satisfaction and location of work are important predictors of musculoskeletal disorders and related disabilities. The paper emphasises the need of designing and implementing specific programmes and activities for educating street sweepers about the health hazards associated with the street sweeping work and rehabilitation programme for those street sweepers who have developed musculoskeletal disorders and related disabilities so as to ensure proper rehabilitation of street sweepers with work related disabilities.

The next paper of the monograph analyses factors that affect contraceptive use in Bihar. The analysis is based on the data collected through a primary survey on the use of different family planning methods carried out in two districts of Bihar. Perhaps the most important finding of the analysis presented in this paper is that factors affecting the use of contraception are different in the two districts. This observation emphasises the need of adopting a decentralised district-based approach for planning and programming family planning services delivery in the state so as to integrate the local context of family planning use in the state. The paper also suggests that the contraceptive prevalence rate in the two districts which were covered under the present study is found to be radically different. The paper suggests that the existing highly centralised approach of planning for family welfare services delivery may not be the correct approach to integrate the local factors in family planning methods service delivery.

The last two papers included in the present monograph are related to Nepal but they focus on two important aspects of sustainable development - urbanisation and women's participation in household level decision-making. The first of the two papers discusses the dynamics of urbanisation in Nepal. Based on the data available through the latest population census in the country, the paper observes that there has been a very rapid increase in urbanisation in the country largely because of the reclassification of the rural areas into urban areas. The paper finds that the definition of urban has been changing over time in the country and political decision has primarily been the basis for the change in the definition of the urban areas in the country. Different definitions of an urban area depict different pictures of urbanisation in the country. Most of the urban population of the country, however, is concentrated in the Central Development Region of the country whereas the concentration of the urban population is the lowest in the Mid-western Development Region. The Government of Nepal, reclassified a number of rural areas as urban areas in 2016 which has resulted in a radical change in the urbanisation scenario of the country.

The last paper included in the present monograph focusses on the impact of women's empowerment activities in involvement of females in family decision-making in Nepal. The paper is based on a primary survey carried out in one of the cooperative societies located in western Nepal, the Sana Kisan Krishi Sahakari Sanstha (SKKSS). Cooperative societies are the backbone or the engines of growth of the economy and social change in Nepal. These grass roots level organisations mobilise people and allocate financial resources in a productive manner and work for creating employment opportunities and improving the skills of workers including creating opportunities for the participation of women in development activities. The paper observes that the efforts of SKKSS towards empowering women through their participation in productive activities have not resulted in any significant change in the involvement of females in household level decision-making processes which continue to be heavily male dominated.

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Population Growth and Sustainable Development in India

Aalok Ranjan Chaurasia

Introduction

The United Nations General Assembly adopted, in September 2015, the post-2015 development agenda named ' Transforming the World: The 2030 Agenda for Sustainable Development' as the plan of action for people, planet and prosperity (United Nations, 2015). The scope and the ambition of the Agenda are reflected in terms of its 17 Goals and 169 targets. Sustainable development may be defined as the development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. It is argued that it is crucial to harmonise three core elements - economic growth, social inclusion and environmental protection - to achieve sustainable development (United nations, 2015a). These elements are interconnected and all the three are crucial for the well–being of individuals and societies.

Surprisingly, the 2030 Agenda for Sustainable Development of the United Nations is silent about the fourth and the most important dimension of sustainable development - the population dimension. It is well known that pervasive poverty, environmental degradation and hazards, the use of natural resources, and economic and social development are closely linked to population growth, distribution and structure. It is also recognised that unsustainable patterns of consumption and production are depleting natural resources and causing environmental degradation, while reinforcing social inequity and poverty. The challenge of the sustainability of development processes is to meet the needs of the present generation and improve their quality of life in ways that do not compromise the ability of future generations to meet their own needs. It is therefore important to recognise the interrelationship between population, economic growth, social inclusion and environmental protection - the three dimensions of sustainable development. In the context of sustainable development, it is imperative that the population dimension is explicitly recognised in all strategies of economic growth, social inclusion and environmental protection. According to the latest medium variant of population

projections prepared by the United Nations Population Division, the world population is the most likely to increase from an estimated 7349 million in 2015 to 8501 million in 2030 or an increase of 1151 million during the 15 years (United Nations, 2015). More than 97 per cent of this increase (1119 million) will be confined to the so-called developing or less developed countries of the world, although there will be substantial variation in the rate of population growth across countries. Along with the increase in population, there will also be changes in the age structure of the population because of the transition in fertility and mortality and movement of the population. All these changes in the population stock will undoubtedly have implications to the demand for natural resource and the impact on the environment in terms of the wastes generated out of the natural resources use. They will also influence the economic growth processes and prospects of human development including poverty eradication, unequal distribution of resources across countries and within countries. These concerns were recognised at the International Conference on Population and Development at Cairo in 1994 which emphasised the need of integrating population factors in development planning and programming (United Nations, 1994). The Conference also recommended that population considerations should be explicitly taken into consideration in economic and development strategies - planning, decision-making and resource allocation at all levels and in all regions - and argued that integration of population factors in development planning will contribute to both sustainable development and poverty alleviation and will lead to slowing down the population growth and improving the quality of life. However, the population dimension has surprisingly been ignored in the 2030 Sustainable Development Agenda.

The population dimension of sustainable development is not just about the implications of population growth on economic growth, social inclusion and environmental protection. It is also about the implications of the changes in population age structure resulting in demographic dividend and population ageing and mobility - urbanisation and migration. These dimensions are central to any development process and, therefore, have direct bearings on the realisation of Sustainable Development Goals and associated targets as identified in the 2030 Sustainable Development Agenda.

It is in the above context, this paper analyses how population growth impacts upon sustainable development in India. The United Nations Population Division has estimated that India's population in 2015 was around 1311 million (United Nations, 2015b). According to the medium variant of the projections prepared by the United Nations Population Division, India's population is the most likely to increase to 1528 million in 2030 (United Nations, 2015b). This means that during the 15 years between 2015 and 2030, India's population is the most likely to increase by around 217 million. It is obvious that this increase in the size of the population of the country will have important implications to the social and economic development processes of the country and will have substantial environmental impact.

On the other hand, sustainable development is characterised in terms of the dimension of environmental protection and focus on two aspects - primary energy use and associated carbon dioxide (CO_2) emission. An understanding of the contribution of the

increase in the population to the increase in the primary energy use and the increase in CO_2 emission may be important to reflect the demographic dimensions of sustainable development in India.

The paper is organised as follows. The next section of the paper describes the methodology adopted for analysing the impact of population growth on sustainable development. The paper uses the widely used IPAT framework to analyse the contribution of the increase in population to the increase in primary energy use and CO_2 emission. The third section of the paper describes the data source. Results of the analysis are presented in section four of the paper while the fifth section discusses the policy implications of the findings of the analysis in the context of sustainable development. The last section summarises main conclusions of the analysis and emphasises the need of integrating demographic factors in sustainable development processes in India.

Methodology

The paper employs the well-known IPAT framework that assumes that the environmental impact is the combined effect of population, affluence and technology. This framework was first proposed in the early 1970s (Ehrlich, 1968; Commoner, 1972) but still used widely. The framework assumes that all anthropogenic changes in the environment are primarily due to (i) population, (ii) economic activity, (iii) technology, (iv) political and economic institutions, and (v) attitudes and beliefs (Stern, Yong and Druckman, 1992). The framework is simple, systematic, and robust. It is simple because it incorporates key anthropogenic driving forces with parsimony. It is systematic because it specifies the mathematical relationship between the driving forces and their impact. Moreover, it is robust because it is applicable to a wide variety of environmental impacts (Dietz and Rosa, 1997).

The IPAT framework requires measurement of the environmental impact and its three components - population, affluence and technology. In the present paper, we measure environmental impact in terms of primary use energy use and CO_2 emission. The primary energy use reflects the extent of the use of natural resources, whereas CO_2 emission reflects the technology involved in transforming natural resources into usable form. On the other hand, the most straightforward measure of population is the size of the population. Other things being equal, the larger the population, the larger the demand and use of natural resources and the larger is the waste generated out of the resource use, whereas affluence represents the average consumption of each person in the population - the higher is the average consumption, the larger is the use and hence the demand for natural resources and the larger is the waste generated out of resource use. A common proxy for measuring consumption is the GDP per capita. Finally, the technology component of the IPAT framework may be measured in terms of primary energy intensity of the gross domestic product which means the primary energy used in producing a unit gross domestic product. Many factors influence the energy intensity of the gross domestic product. These include, among others, general standards of living and weather conditions,

structure of the social and economic production system and the efficiency of primary energy use by the system. In the context of the efficiency of primary energy use in the social and economic production system, energy intensity of the gross domestic product reflects the state of technology. When the energy intensity of the gross domestic product is low then, other things being equal, the state of technology may be termed as advanced as compared to when the energy intensity of the gross domestic product is high. It may be noticed that the energy intensity also reflects the use of natural resources.

If *G* denotes the total gross domestic product or the total output of the social and economic production system and *P* denotes the size of the population then the IPAT framework may be represented in terms of the total primary energy use (*E*) in the following manner:

$$E = P * \frac{G}{P} * \frac{E}{G} = P * A * R \tag{1}$$

Here *A* is the gross domestic product per capita and *R* is the primary energy intensity of the gross domestic product. In this formulation, environmental impact is measured in terms of total primary energy use.

The equation (1) may be extended further in terms of total CO_2 emission (*C*) to what is known as the Kaya identity (1990):

$$C = P * \frac{G}{P} * \frac{E}{G} * \frac{C}{E} = P * A * R * W \tag{2}$$

Here *W* is the carbon intensity of energy use, which means CO_2 emitted in using one unit of primary energy. CO_2 is one of the greenhouse gases. Increased concentration of these gases in the atmosphere is attributed to disruptive changes in the climate, particularly, the increase in the atmospheric temperature. CO_2 is essentially a waste generated out of the primary energy use. The carbon intensity of the primary energy use also reflects the mix of the energy in the social and economic production system, in particular, the share of the energy from renewable or non-renewable sources, and - among the non-renewable sources - the share of highly carbon intensive sources such as coal and low carbon intensive sources such as natural gas (O'neill and Chen, 2002).

Following Kim and Strobino (1984), the change in the primary energy use (*E*) over a given period of time can be decomposed into the change in the size of the population, change in the gross domestic product per capita and the change in the energy intensity in the following manner:

$$\begin{aligned} E_2 - E_1 = {} & (P_2 - P_1) * A_1 * R_1 + (A_2 - A_1) * P_1 * R_1 + \\ & (R_2 - R_1) * P_1 * A_1 + (P_2 - P_1) * (A_2 - A_1) * R_1 + \\ & (P_2 - P_1) * A_1 * (R_2 - R_1) + P_1 * (A_2 - A_1) * (R_2 - R_1) + \\ & (P_2 - P_1) * (A_2 - A_1) * (R_2 - R_1) \\ = {} & P + A + T + PA + PT + AT + PAT \end{aligned} \tag{3}$$

The first three terms on the right-hand side of equation (3) represent the main effects, the next three terms represent the first order or two-way interactions while the last term represents the second order or three way interactions. For example, the first term on the right of equation (3) shows the contribution of the change in population size to the change in the primary energy use when the gross domestic product per capita and energy intensity of the gross domestic product are held constant at their initial values. Similarly, the fourth term on the right-hand side of the equation shows the contribution of the simultaneous change in the size of the population and the change in the gross domestic product per capita on the change in the primary energy use when the energy intensity of the gross domestic product is held constant at its initial value. Finally, the last term on the right-hand side of equation (3) represents the contribution of the simultaneous change in all the three components that ultimately determine the change in the total primary energy use - population size, gross domestic product per capita and energy intensity of the gross domestic product. Equation (3) thus helps in understanding the relative role of the change in population, affluence and technology to the change in the primary energy use. The change in the primary energy use reflects the impact of the change in the use and the demand of the natural resources on the environment. An increase in the primary energy used because of either increase in population or because of the increase in per capita gross domestic product or because of the increase in the primary energy intensity of the gross domestic product may be assumed to reflect the increased impact on the environment.

Following the same argument, the change in the CO_2 emission over time may be decomposed in the following manner:

$$\begin{aligned} C_2 - C_1 = {} & (P_2 - P_1) * A_1 * R_1 * W_1 + (A_2 - A_1) * P_1 * R_1 * W_1 + \\ & (R_2 - R_1) * P_1 * A_1 * W_1 + (W_2 - W_1) * P_1 * A_1 * R_1 + \\ & (P_2 - P_1) * (A_2 - A_1) * R_1 * W_1 + (P_2 - P_1) * A_1 * (R_2 - R_1) * W_1 + \\ & (P_2 - P_1) * A_1 * R_1 * (W_2 - W_1) + P_1 * (A_2 - A_1) * (R_2 - R_1) * W_1 + \\ & P_1 * (A_2 - A_1) * R_1 * (W_2 - W_1) + P_1 * A_1 * (R_2 - R_1) * (W_2 - W_1) + \\ & (P_2 - P_1) * (A_2 - A_1) * (R_2 - R_1) * W_1 + \\ & (P_2 - P_1) * A_1 * (R_2 - R_1) * (W_2 - W_1) + \\ & P_1 * (A_2 - A_1) * (R_2 - R_1) * (W_2 - W_1) + \\ & (P_2 - P_1) * (A_2 - A_1) * (R_2 - R_1) * (W_2 - W_1) \\ = {} & P + A + R + W + PA + PR + PW + AR + AW + RW + PAR + PAW + ARW + PARW \end{aligned} \tag{4}$$

Application of equations (3) and (4) to India has been carried out for two time periods: 1990-2015 and 2015-2030. The period 1990-2015 is period of the Millennium Development Agenda of the United Nations (United Nations, 2000), while the period 2015-2030 is the period of the 2030 Sustainable Development Agenda also mooted by the United Nations (United Nations, 2015). The analysis for the period 1990-2015 reflects the historical perspective of the change in the size of the population, change in the per capita consumption or the change in the level of affluence and the change in the technology on the environment in terms of the change in the primary energy use and CO_2 emission.

The analysis for the period 2015-2030, on the other hand, projects the future perspective of the projected change in the population size, projected change in the per capita consumption or the projected change in the level of affluence and the projected advancement in technology on the projected change in primary energy use and CO_2 emission. In other words, the analysis for the period 1990-2015 tells what has happened in the country in the past, whereas the analysis for the period 2015-2030 tells what is likely to happen in the near future. Three scenarios have been built up for the period 2015-2030. The first is the Business as Usual Scenario. This scenario is based on forecasting the change in the primary energy use and CO_2 emission, change in the size of the population and the change in the per capita consumption on the basis of the trend during 1990-2015 through the time series modelling. In the time series modelling, the past provides a model for the future. The Expert Modeller of the Forecasting module of the SPSS software package was used for building the forecasting model (IBM, *no date*). The Expert Modeller attempts to automatically identify and estimate the best-fitting ARIMA or exponential smoothing model thereby eliminating a great deal of the trial and error in modelling the time series. The second scenario is the New Policies Scenario (International Energy Agency, 2015). This scenario takes into account a number of policy initiatives that have been taken by India to influence the primary energy use and associated CO_2 emission. Finally, the third scenario may be termed as the Indian Vision Case, which takes into consideration an accelerated realisation of key policy targets notably the Make-in-India campaign, which is directed towards putting industry at the heart of India's growth model (International Energy Agency, 2015).

Data

The analysis is based primarily on the data on primary energy use and carbon dioxide emission in the country available through EnerData, which is an independent research and consulting organisation on the global oil, gas, coal, power, renewable and carbon markets. The organisation provides consistent estimates of total primary energy used, primary energy used per capita, energy intensity of the gross domestic product and total carbon dioxide emission for 186 countries of the world including India for different years of the period 1990 through 2015. These estimates have been used in the present analysis. In addition, estimates of population size are derived from the latest population prospects prepared by the United Nations Population Division (United Nations, 2015). The population enumerated at different population censuses in the country has not been used in the present analysis because of two counts. First, there is some under counting of the population at all population censuses. For example, the post enumeration survey carried out after the latest 2011 population census in India suggests that there was a net omission of 23 persons for every 1000 enumerated persons in the country (Government of India, 2014). Second, estimates of population are not available from the population census are available at an interval of 10 years only. On the other hand, the official population projections based on the 2011 are not yet available and the population projection based on 2001 population census is limited up to the year 2026 only.

Historical Perspective

It is estimated that during the 25 years between 1990-2015, the total CO_2 emission in India increased by more than four times from 517 million tones (Mt) in 1990 to 2166 Mt in 2015 or an increase of 1649 Mt (Table 1). During the same period, total primary energy use increased by 307 million tones of oil equivalent (Mtoe) in 1990 to 882 Mtoe in 2015 or an increase of 575 Mtoe. The increase in CO_2 emission and primary energy use has been associated with an increase in per capita income from US$1579 at 2005 US$ purchasing power parity in 1990 to 5134 in 2015, whereas the population of the country increased from 871 million in 1990 to 1311 million in 2015. As the result, per capita primary energy use increased from 352 Kilogram of oil equivalent (Koe) in 1990 to 673 Koe in 2015, while the carbon intensity of the primary energy use increased from 1.685 to 2.456. The energy intensity of the gross domestic product, however, decreased from 0.223 in 1990 to 0.131 in 2015.

Table 2 decomposes the increase in CO_2 emission during 1990-2015 into the increase attributed to the increase in population, per capita gross domestic product, carbon intensity of primary energy use and the decrease in the energy intensity of the gross domestic product. Similarly, the decomposition of the increase in the primary energy use during the period 1990-2015 has been decomposed into the increase in population, per capita per capita gross domestic product and the decrease in the energy intensity of the gross domestic product. The primary contributor to the increase in the primary energy use and associated CO_2 emission during the period under reference has been the increase in the gross domestic product per capita or the increase in the affluence. However, the contribution of the increase in the population has also been quite significant. Moreover, the direct contribution of the decrease in the energy intensity of the gross domestic product to the increase in the primary energy use has been too small to compensate for the direct contribution of the increase in the gross domestic product per capita and the increase in population size. Similarly, the direct contribution of the decrease in the energy intensity of the gross domestic product to the increase in CO_2 emission has also been too small to compensate for the direct contribution of the increase in the per capita gross domestic product, population size and the carbon intensity of the primary energy use. This means that technological advancement in the country has not been large enough to compensate for the negative environmental effects of the increase in affluence and the increase in the size of the population.

One way to analyse the impact of population growth on primary energy use and CO_2 emission is to estimate the increase in the primary energy use and CO_2 emission under the condition that there is no population growth. If it is assumed that there had been no population growth in the country during the period 1990-2015, then, the table 2 suggests that the primary energy use would have increased by only 279 Mtoe, while the CO_2 emission would have increased by about 922 Mt. This means that population growth in India during 1990-2015 has been responsible for around 296 Mtoe of the increase in the primary energy use and 727 Mt of the increase in CO_2 emission during the 25 years between 1990 and 2015. The impact of population growth on the environment is obvious.

Future Prospects

Table 3 presents the future prospects of the increase in primary energy use and CO_2 emission and the components of the increase under three different scenarios as discussed above. Under the business as usual case, the primary energy use is forecasted to increase to 1665 Mtoe by 2030, whereas the CO_2 emission is forecasted to increase to 5138 Mt. In the New Policy Initiative case, the primary energy use is forecasted to increase to 3744 Mtoe, whereas the CO_2 emission is forecasted to increase to 3744 Mt. Finally, in the India Vision case, the primary energy use is forecasted to increase to 1482 Mtoe, whereas the CO_2 emission is forecasted to increase to 3865 Mt. On the other hand, the business as usual case suggests that the population of the country will increase to 1541 million by the year 2030 whereas the medium variant of population projection prepared by the United Nations Population Division suggests that India's population will increase to 1528 million by 2030. Finally, under the business as usual case, the gross domestic product of the country is likely to increase to US$ 13408 at 2005 purchasing power parity. This means that the energy intensity of the gross domestic product is likely to increase to 0.110 whereas the carbon intensity of the primary energy use is likely to increase to 3.1.

The decomposition of the increase in the primary energy use and CO_2 emission during the period 2015-2030 is presented in table 4. If it is assumed that there will be no increase in the population during the period 2015-2030 then the primary energy use will increase to 534 Mtoe, 354 Mtoe and 390 Mtoe respectively under the business as usual, New Policy Initiatives and India Vision scenario, while the CO_2 emission will increase to 2204 Mt, 1047 Mt and 1154 Mt respectively. This means that increase in population will account respectively for 249 Mtoe, 204 Mtoe and 210 Mtoe increase in the primary energy use and 768 Mt, 531 Mt and 548 Mt increase in the CO_2 emission in the country under the three scenarios.

Discussions and Conclusions

The analysis presented here highlights the impact of population growth on one of the three dimensions of sustainable development as defined by the United Nations in the 2030 Sustainable Development Agenda - the dimension of environmental protection - in India. The substantial impact of population growth on both the increase in primary energy use and the increase in CO_2 emission in the country in the past as well as the likely impact in the near future clearly emphasises the need of incorporating population concerns, while customising the 2030 Sustainable Development Agenda to the Indian context. The 2030 Sustainable Development Agenda is essentially a global development perspective which, as recommended by the United Nations, needs to be customised at the country level after incorporating development priorities and concerns specific to the country.

The analysis also suggests that although the direct contribution of the population growth to the increase in the primary energy use and CO_2 emission may not be large but the second order effects in conjunction with the change in the per capita gross domestic product or the change in the affluence is quite substantive. This means that a substantial

proportion of the contribution of the increase in affluence to the increase in primary energy use and emission of greenhouse gases including CO_2 can be compensated by accelerating population transition. This observation is important as increase in affluence measured in terms of gross domestic product per capita is widely recognised as an indicator of development and improvement in the quality of life.

Finally, the analysis shows that technology advancement had and is likely to have only a limited impact on the environmental concerns in India. The decrease in the primary energy use and CO_2 emission as the result of improvements in the technology used in the social and economic production system has been too small to compensate for the increase in the primary energy use and CO_2 emission as the result of population growth and the increase in affluence. The prospects of rapid advancement in technology in India appear to be remote because of the heavy cost associated with technological innovations and technological research. As such, the case of accelerating population transition in the context of sustainable development in India becomes even stronger.

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Table 1
CO_2 emission, primary energy use, gross domestic product and population during 2015-2030 in India

Particulars	1990	2000	2010	2015
Population (million)	871	1053	1231	1311
Gross domestic product (Billion 2005 US$ ppp)	1375	2360	4878	6731
Gross domestic product per capita (2005 US$ ppp)	1579	2240	3963	5134
Primary energy use (Mtoe)	307	441	693	1649
Energy intensity of the gross domestic product	0.223	0.187	0.142	0.131
CO_2 emission (Mt)	517	899	1576	2166
Carbon intensity of energy use (Mt)	1.69	2.04	2.28	2.46

Source: Population estimates are from United Nations (2015b). Estimates of gross domestic product, primary energy use and CO2 emission are from EnerData. Rest are author's calculations.

Table 2
Decomposition of the increase in the primary energy use and CO_2 emission in India during 1990-2015

Contribution to the increase in primary energy increase and CO_2 emission	Primary energy use (Mtoe)	CO_2 emission (Mt)
Total increase	575	1649
Direct contribution	719	1448
Population (*P*)	155	261
Gross domestic product per capita (*A*)	690	1163
Energy intensity of gross domestic product ®	-126	-213
Carbon intensity of primary energy use (*W*)		237
Second order contribution	0	555
P and *A*	349	588
P and *R*	-64	-108
P and *W*		120
A and *R*	-285	-480
A and *W*		533
R and *W*		-98
Third order contribution	-144	-243
P and *A* and *R*	-144	-243
P and *A* and *W*		269
P and *R* and *W*		-49
A and *R* and *W*		-220
Fourth order contribution		-111
P and *A* and *R* and *W*		-111

Source: Author's calculations.

Table 3
Forecast of CO_2 emission, primary energy use, gross domestic product and population during 2015-2030 in India.

Particulars	2015	2030		
		Business as usual	New policy initiatives	India vision
Population (million)	1311	1541	1528	1528
Gross domestic product (Billion 2005 US$ ppp)	6731	13408	13408	13408
Gross domestic product per capita (2005 US$ ppp)	5134	8699	8777	8777
Primary energy use (Mtoe)	1649	1665	1440	1482
Energy intensity of the gross domestic product	0.131	0.124	0.107	0.124
CO_2 emission (Mt)	2166	5138	3744	3865
Carbon intensity of energy use (Mt)	2.46	3.09	2.6	2.61

Source: Author's calculations.

Table 4
Decomposition of the increase in the primary energy use and CO_2 emission in India during the period 1990-2015

Contribution to the increase in primary energy increase and CO_2 emission	Primary energy use (Mtoe)			CO_2 emission (Mt)		
	Business as usual	New policy initiative	India vision	Business as usual	New policy initiative	India vision
Total increase	783	558	600	2972	1578	1699
Direct contribution	721	613	634	2326	1632	1691
Population (*P*)	155	146	146	380	358	358
Gross domestic product per capita (*A*)	612	626	626	1504	1537	1537
Energy intensity of gross domestic product ®	-46	-159	-138	-113	-390	-338
Carbon intensity of primary energy use (*W*)				555	127	134
Second order contribution	68	-36	-18	619	1	54
P and *A*	108	103	103	264	254	254
P and *R*	-8	-26	-23	-20	-64	-56
P and *W*				97	21	22
A and *R*	-32	-113	-98	-78	-277	-240
A and *W*				385	90	95
R and *W*				-29	-23	-21
Third order contribution	-6	-19	-16	29	-51	-42
P and *A* and *R*	-6	-19	-16	-14	-46	-40
P and *A* and *W*				68	15	16
P and *R* and *W*				-5	-4	-3
A and *R* and *W*				-20	-16	-15
Fourth order contribution						
P and *A* and *R* and *W*				-4	-3	-2

Source: Author's calculations.

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GIS-based Mapping of Health Facilities in Uttar Pradesh, India

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Introduction

Geographic Information System (GIS) and the accompanying methods and data are now being increasingly adopted in diverse health-related domains with the goal of improving the response to public health problems. GIS has been defined as "automated system for the capture, storage, retrieval, analysis, and display of spatial data" (Clarke et al, 1996). Spatial analysis and mapping have a historical association with epidemiology. However, until recently, their use in public health practice has been limited. Recent advances in geographical information and mapping technologies have created new opportunities for public health administrators to enhance planning, analysis and monitoring capabilities (WHO, 1999). Since 1993, Public Health Mapping and GIS Programme of WHO is leading a global partnership for the promotion and implementation of GIS to support decision making for a wide range of infection diseases and public health issues (WHO, 2000). GIS is highly relevant to meet the demand of outbreak investigation and response, where prompt location of cases, rapid communication of information and quick mapping of the epidemic dynamics are vital. Until recently, use of these tools in public health were largely limited due to major problems the prohibitive cost of hardware and the great complexity of GIS software. The situation has now changed and GIS is now being increasingly used in the detection of disease spatial resolutions (Oppong, 2007), tracking child immunizations, conducting health policy research and establishing service areas (Jones and Bentham, 1995).

The use of GIS for the measurement of physical accessibility of health facilities is well established (Wilkinson, 1999; Albert et al, 2000; Cromley and McLafferty, 2002). Location of health facilities, patient distribution and their characteristics are important for local level health care planning and the use of different GIS functions and models are very useful in this context (Abubakar et al, 2008). The application of GIS has risen to prominence in the past 5-10 years with the recognition that health surveillance practices

and health service allocation need to become more sensitive to the needs in local geographic areas (Gatrell and Loytonen, 1998).

Access to health care facilities is an important component of the health care services delivery system, which has a direct impact on the burden of diseases. Measuring accessibility to health care facilities, therefore, is imperative to widening the understanding about the performance of the health care delivery system and facilitates the development of evidence-based health care policies and programmes. In this context, creation of spatially referenced health care facilities database helps in showing the spatial distribution of health care facilities and information about the location and physical relations of these facilities. The advantage of using GIS in the analysis of the accessibility of health care facilities is that spatial referencing of health facilities provides an added dimension to data analysis, which helps in visualizing the complex patterns and relationships. Relationships among neighbouring areas are explicit in a map, which allows for the visualization of spatial patterns. The analysis of accessibility is important in the context of the performance of the health care delivery system as access to health care facilities is an important determinant of health outcomes. It is well known that unequal spatial distribution of health care facilities has an impact on health outcomes through unequal distribution in the access to these facilities. Unequal spatial distribution of health care facilities is also a factor in the inequality in the health status of the people across geopolitical regions.

It is in the above context that the present paper uses GIS tools and methods to analyse the availability of health care facilities in Uttar Pradesh at the grass roots level - villages in the rural areas and towns in the urban areas. Uttar Pradesh is the most populous state of India, but among the poorest states of the country as far as the health status of the people is concerned. The available evidence suggests that disparities in the distribution of health care facilities are especially pronounced in the state with many and varying causes. The paper explores the spatial distribution of health care facilities across the villages and towns of the state to examine the spatial inequality in the availability of health care facilities at the grass roots level.

Uttar Pradesh is situated between 23° 52'N and 31° 28 N latitudes and 77° 3' and 84° 39'E longitudes. It had an area of 2,40,928 sq km and a population of 199.81 million at the 2011 population census. The state is divided into 71 districts, 312 subdistrict, 821 development blocks, 1,06,775 villages and 915 towns. The population density of the state, at the 2011 population census, was 829 persons per sq km against the national average of 368 persons per sq km. During 2001 through 2011, state population increased by 20.2 per cent against an increase of 17.7 per cent for the country as a whole, which indicates that the population growth in the state has been more rapid than that in India. The 71 districts of the state vary widely in terms of population size with district Mahoba being the smallest district in the state with a population of 8,75,958 at the 2011 population census, while district Allahabad is the largest district with a population of 59,54,391. The geographical area of the districts of the state also varies widely. District Sant Ravidas Nagar (Bhadohi) of the state has the smallest geographical area of 1,015 sq kms, whereas the geographical area of district Allahabad is the highest in the state (7,680 sq kms).

Methodology

The first step in the spatial analysis of the availability of health care facilities at the village and town level is the creation of the geo-referenced database of health care facilities. This requires two types of data. The first is the digitised map showing the location of villages and towns, while the second is the information related to the availability of health care facilities in villages and towns. To create the geo-referenced database, the information available in the District Census Handbook (DCHB) was used. The DCHB comprises of three parts. The first part of the handbook contains development block level maps showing the location of villages and towns as points with unique identification code. The second part of the handbook comprises of village and town directory, which shows the availability of a range of infrastructure facilities available in villages and towns including education, medical, drinking water, communication and transport, post and telegraph, electricity and banking facilities. The third part of the handbook presents the primary census abstract for each village and town. For the purpose of the present analysis, the development block level maps contained in DCHB were digitised and geo-referenced using the ArcGIS 10.0 software package. All village/town points were digitized sequentially starting with the first development block in the district. This reduced the likelihood that any village/town point on the paper map was missed. Once the digitised map of villages/towns was completed in a district, it was compared with the village/town data available through the primary census abstract to check for duplication, erroneous village/town codes, and other a-spatial errors. Spatial accuracy checks were conducted using stratified random sampling technique and Google Earth imagery. Seven hundred random sample village points were extracted from the Google Earth imagery to identify likely sources of spatial errors. This exercise revealed that small villages and villages close to the boundaries were likely to show a higher number of spatial errors. Further analysis and better annotated satellite imagery can help make this test more robust. After checking and correcting all spatial errors, digital maps of different districts were combined to obtain the digitised map of the state showing location of villages and towns. The digitised map with the location of villages and towns so developed was then joined to village/town level data on the availability of different types of health care facilities using unique concatenated identification codes to create the village/town geo-referenced database of health care facilities in the state. This database presents a unique opportunity to spatially analyse the availability of health care facilities in the state.

In the 2011 population census, health care facilities available at the village/town level are first categorised as government or public health care facilities and non-government or private health care facilities. Further classification of the government health care facilities in the rural areas is different from the classification of the government health care facilities in the urban areas. In the rural areas, the government health care facilities are classified as Hospital-Allopathic (HA), Hospital-Alternative Medicine (HM), Community Health Centre (CHC), Primary Health Centre (PHC), Health Sub Centre (PHS), Maternity and Child Welfare Centre (MCW), Family Welfare Centre (FWC), Dispensary (DI), Tuberculosis Hospital/Clinic (TBC) and Mobile Health Clinic (MHC).

In the urban areas, the government health care facilities are classified as Hospital-Allopathic (HA), Hospital-Alternative Medicine (HM), Maternity and Child Welfare Centre (MCW), Family Welfare Centre (FWC), Dispensary (DI), Tuberculosis Hospital / Clinic (TBC), Mobile Health Clinic (MHC), Maternity Home (MH), Nursing Home (NH) and others (OT). The definition of different health care facilities adopted at the 2011 population census is given in the appendix for the reference. On the other hand, non-government health care facilities are classified on the basis of the type of services being provided by the health care delivery institution such as facilities providing only out-patient services (OP) and facilities providing both in-patient and out-patient services (IP). There is also a third category of charity health care institutions (CHA). In addition, the non-government or private health care services providers have been classified on the basis of their qualification - health care services providers having at least MBBS degree; health care services providers having a recognised medical qualification other than MBBS degree; and health care service provider having no recognised degree. In addition, information about the available traditional health care services providers and faith healers was also collected at the 2011 population census. Finally, the medical shop has also been included in the list of the provider of health care services in the non-government sector, although, a medical shop is not a health care services delivery facility in the true sense.

It may be pointed out here that the classification of the health care facilities adopted in the 2011 population census is different from the classification of public health care delivery institutions adopted by the Government of India, Ministry of Health and Family Welfare for the rural areas. According to the classification adopted by the Government of India, Ministry of Health and Family Welfare, all public health care institutions in the rural areas of the country have been classified into one of the three types of health care delivery institutions - Community Health Centre, Primary Health Centre and Health Sub-centre following the population-based norm. The Health Sub-centre is the lowest level public health care delivery institution in the country. The norm for establishing the Health Sub-centre is a population of 5,000 in plain area and 3,000 in hilly / tribal / difficult area (Government of India, 2012). The norm for the Primary health Centre, on the other hand, is 30,000 population in plain area and 20,000 population in hilly / tribal / difficult area. Finally, the norm for establishing the Community Health Centre is 1,20,000 in plain area and 80,000 population in hilly / tribal / difficult area. On the other hand, public health care delivery institutions in the urban areas are classified as district hospital and other hospital. District hospitals are those which are located at the district headquarters and designated by the government. All other hospitals are simply hospitals irrespective of their bed strength. In addition, there are also urban family welfare centres and urban health posts in the urban areas of the country but precise definition of public health care delivery institutions is largely missing. Similarly, there is no established classification for the non-government or private health care delivery institutions in either rural or urban areas. As such, the number and distribution of health care facilities in both rural and urban areas as revealed through the 2011 population census are not comparable to the number and distribution of health care delivery institutions adopted by the Government of India, Ministry of Health and Family Welfare.

Analytical Findings

According to DCHB, total number of villages in Uttar Pradesh was 106,775 at the time of the 2011 population census while there were 915 towns which include both statutory towns and census towns. In addition, there were 8961 villages, where there was no population at the time of 2011 population census so that the total number of inhabited villages in the state was 97814. The uninhabited villages have been excluded from the present analysis. The villages in the state vary widely in terms of the size of the population. Village Dasna Dehat in subdistrict Ghaziabad of district Ghaziabad was the largest village of the state at the time of 2011 population census with a population of 43,722. In addition, there were 3978 villages with a population of at least 5000 at the 2011 population census. On the other hand, there were 4344 very small villages in the state with a population of less than 100 at the time of 2011 population census. Similarly, there were 915 towns of varying population size. The Lucknow Municipal Corporation was the largest town of the state at the 2011 population census with a population of 2,817, 105. In addition, there were six more towns in the state with a population of more than 1,000,000. On the other hand, the census town Pavi Sadakpur in subdistrict Ghaziabad of district Ghaziabad was the smallest town at the 2011 population census with a population of 757. In all, there were 26 towns in the state with a population of less than 5,000 at the 2011 population census.

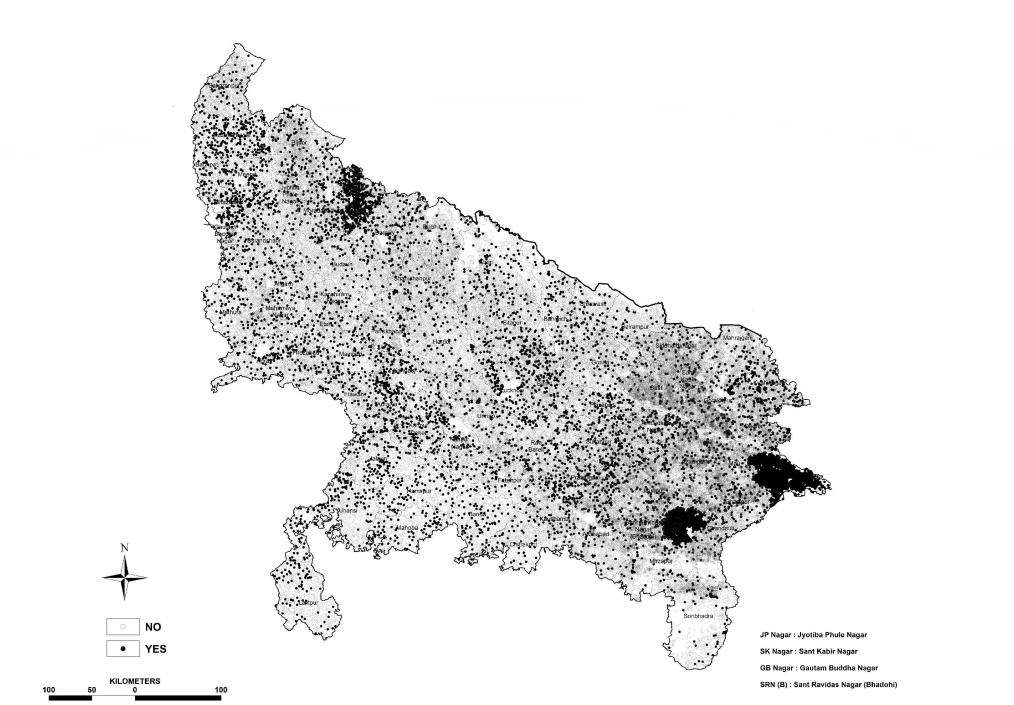
Availability of Health Facilities in Villages. Table 1 gives the number of different types of health care facilities in the villages of the state as enumerated at the time of the 2011 population census. It may be pointed out that the classification of health care facilities in the rural areas according to the Government of India, Ministry of Health and Family Welfare is different from that adopted by the Census Commissioner of India at the 2011 population census. According to the Ministry of Health and Family Welfare, there are only three categories of public health care institutions in the rural areas of the country - Community Health Centre (CHC), Primary Health Centre (PHC) and Health Sub-centre (PHS). The definition of CHC, PHC and PHS adopted by the Census Commissioner of India is in accordance with the population norms adopted by the Government of India, Ministry of Health and Family Welfare. However, the number of CHCs, PHCs and PHSs enumerated at the time of the 2011 population census does not tally with the number of CHCs, PHCs and PHSs reported by the Department of Health and Family Welfare. According to the Government of India, there were 773 CHCs, 3497 PHCs and 20521 PHSs or a total of 24791 public health care facilities in the rural areas of Uttar Pradesh in 2012 (Government of India, 2012). By contrast, 21729 health care facilities were enumerated in the villages of the state. One reason of this discrepancy is that some of the CHCs, PHCs and PHSs, reported by the Government of India, Ministry of Health and Family Welfare may be located in habitations which are classified as urban not rural at the time of the 2011 population census. Another reason of discrepancy may be the fact that the public health care facilities enumerated at the 2011 population census include public health care facilities of all systems of medicine - allopathy, Ayurveda, Unani, Homeopathy, etc. whereas the public health care facilities reported by the Government of India, Department of Health and Family Welfare are confined to the allopathic system of

medicine only. There may also be classification error in the sense that a public facility is reported as private facility and vice versa at the population census. In any case, there is a need of one-to-one mapping of the public health care facilities reported by the Government of India, Ministry of Health and Family Welfare and public health care facilities enumerated at the 2011 population census.

Table 1 also gives the number of villages, where these facilities were located. The number of different health care facilities in the villages of the state is different from the number of villages where these health care facilities are located, which means that there are many villages, where more than one of the same type of health care facilities were located according to the 2011 population census. For example, there were 731 Community Health Centres in the state, which were located in 730 villages. This means that there is one village in the state, where two Community Health Centres were located according to the 2011 population census. More specifically, there were 21,729 public health care facilities in the state according to the 2011 population census which were located in only 9714 villages of the state. This means that in 88199 (90.1 per cent) villages of the state, there was no public health care facility at the time of the 2011 population census. Similarly, there were 8309 non-government or private health care facilities in the state, which were located in 2053 villages so that in 95761 villages (97.9 per cent), there was no private health care facility. Combining the public and private health care facilities, total number of health care facilities in the state was 11,767 according to the 2011 population census which were located in 11,143 villages, which means that in 86,671 or almost (88.6) per cent villages, there was no health care facility, either public or private. The availability of the health care facility is the first requirement for accessibility to health care services. In this context, the data available through the 2011 population census indicate that non-availability of health care facilities in most of the villages is the primary reason for the poor accessibility of health care services in the state.

In terms of population coverage, one CHC in the state is estimated to serve a population of more than 212 thousand on average at the 2011 population census, whereas a PHC served a population of around 68 thousand. On the other hand, a PHS serves a population of around 88 thousand. However, if Health Sub-centre, Mother and Child Welfare centre, Dispensary and Family Welfare Centre are taken into account simultaneously, then the four institutions served a population of almost 10 thousand on average at the 2011 population census. It is however observed that the location of Health Sub-centre, Mother and Child Welfare Centre, Dispensary and Family Welfare Centre is not mutually exclusive. The total number of Health Sub-centre, Mother and Child Welfare Centre, Dispensary and Family Welfare Centre in the state, according to the 2011 population census, was 15880 but these health facilities were concentrated in only 8619 villages of the state meaning that there were many villages, where more than two of the four types of health care facilities were located, whereas in majority of the villages of the state, there was no public health care facility of any type. It is obvious from the foregoing discussions that the availability of public health services in the villages of the state is skewed in favour of a few villages.

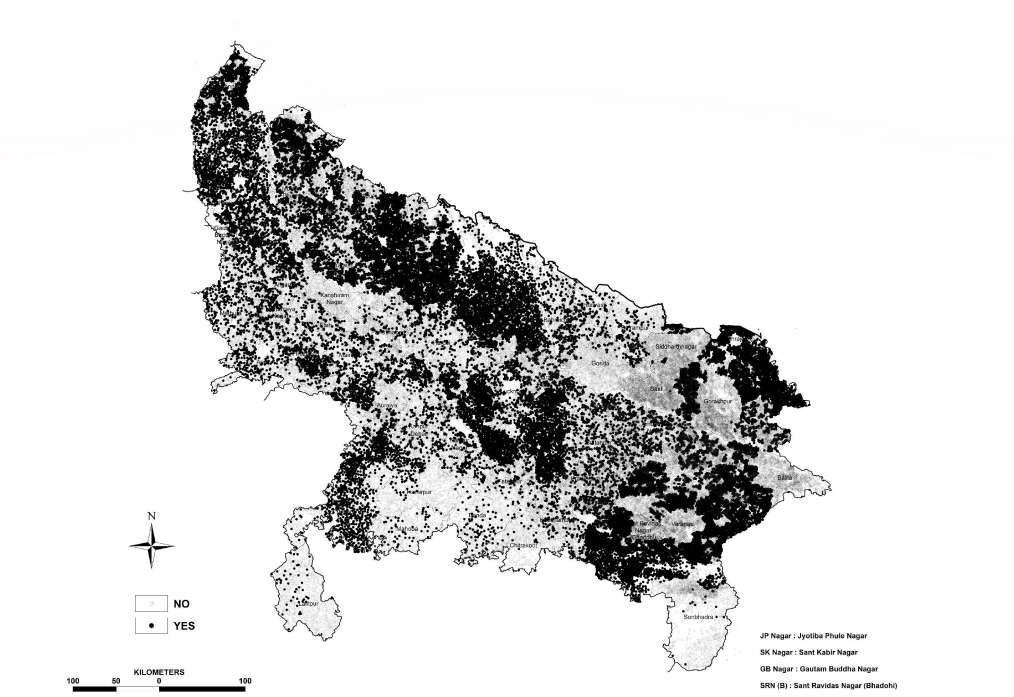
Figure 1
Public health facilities in villages of Uttar Pradesh, 2011



Availability of the private or non-government health care facilities in the villages of the state is even poorer. There were 6966 private out-patient facilities in the villages of the state, which were concentrated in only 1577 (1.6 per cent) villages. On the other hand, total number of private health care facilities providing both in-patient and out-patient care was 5269, which were concentrated in only 1181 villages. Lastly, there were 1716 charity health care facilities, but these facilities were located in only 79 villages. Obviously, villagers in the state were dependent primarily upon the public health care facilities for meeting their health care needs as the private health care facilities are concentrated in only a few villages according to the 2011 population census.

The 2011 population census also informs that there were 2478 private health care service providers with an MBBS degree, while there were 5831 private health care services providers, who were having a degree other than MBBS. These private practitioners were also concentrated in selected villages only as may be seen from table 1. In all, but few villages of the state, there was no public or private health care facility or no qualified health care service provider according to the 2011 population census. The poor availability of health care facilities - either public or private - in the villages of the state, it is logical that the access of the rural population living in the villages of the state to health care facilities remains extremely limited. What is more, even these very small number of health care facilities in the villages of the state are concentrated in only a select few villages making the availability of health care facilities in villages of the state even more unequal.

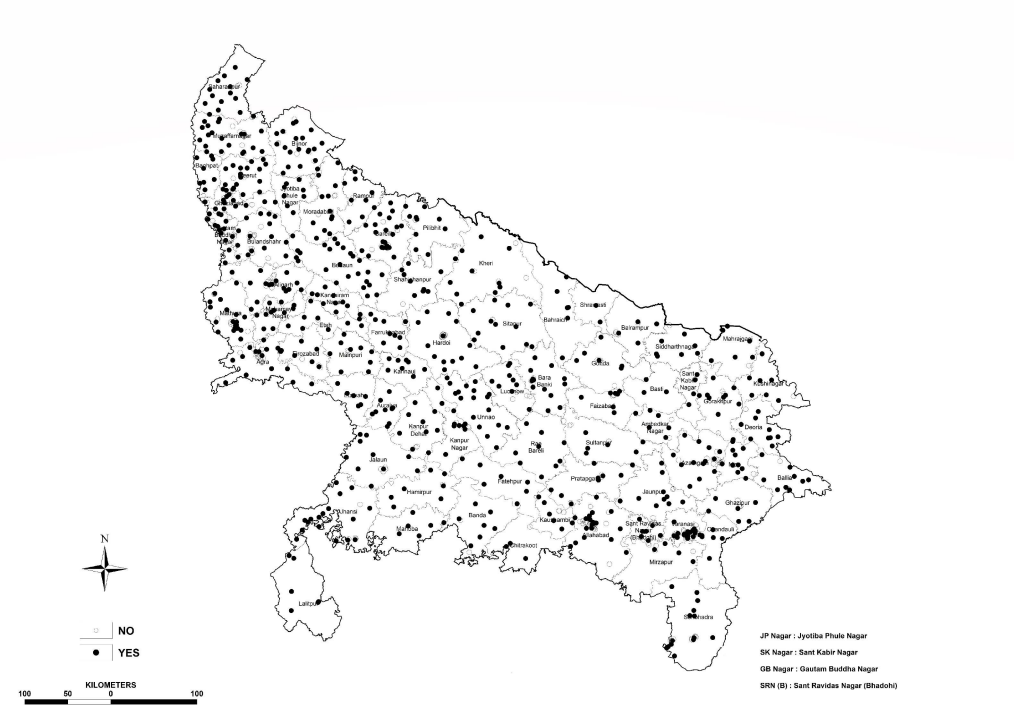
Figure 2
Private health care facilities in villages of Uttar Pradesh, 2011



The 2011 population census also indicates that are large number of unqualified health care service providers and traditional and faith healers in the villages of the state. This is expected simply because there is a serious paucity of public and private health care facilities and qualified health care services providers in the villages of the state. According to the 2011 population census, there were 21181 health care services providers in the villages of the state, who were not having any qualification which is necessary for the delivery of health care services. At the same time, there were 14602 traditional and faith healers identified in the villages of the state at the 2011 population census. In other words, the number of unqualified health care services providers (35783) in the villages of the state is more than four times the number of qualified health care services providers (8309). The availability of large number of unqualified health care services providers and traditional and faith healers in the villages of the state indicates that the villagers of the state are largely dependent upon unqualified health care services providers and traditional and faith healers in meeting their health needs.

Availability of Health Care Facilities in Towns. Availability of health care facilities in the towns of the state appears to be much better than the availability of health care facilities in villages. According to the 2011 population census, there were 5223 public health care facilities in the 915 towns of the state, whereas the number of private health care facilities was 76055 (Table 2). However, these health care facilities are also concentrated in a small number of towns so that in many towns of the state there was no

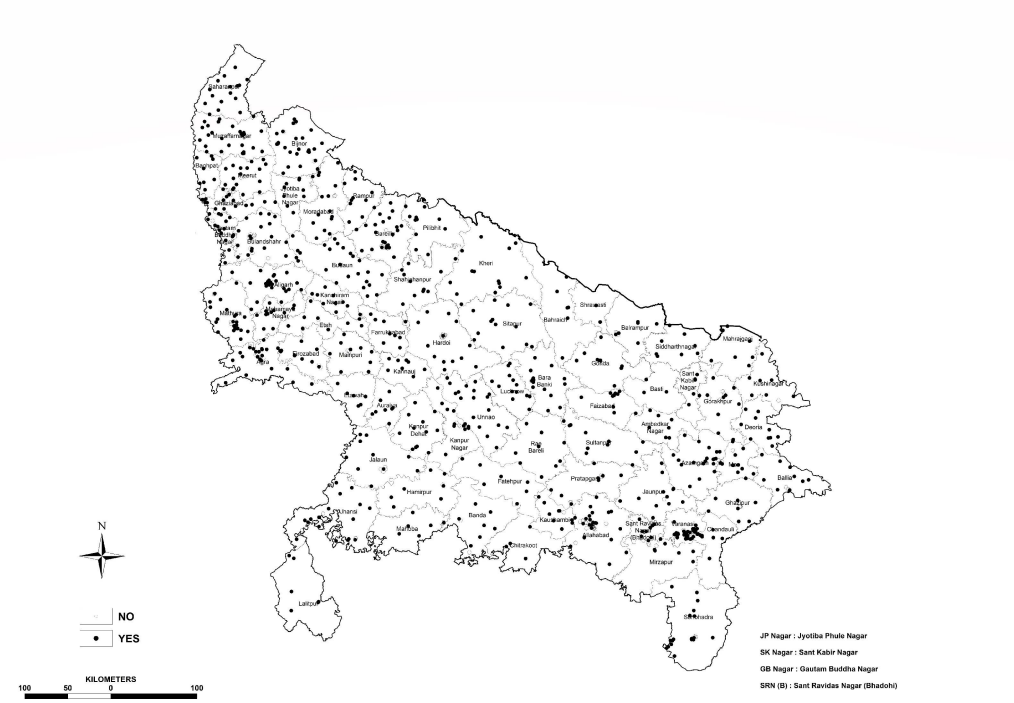
Figure 3
Public health facilities in towns of Uttar Pradesh, 2011



health care facility at the time of the 2011 population census. For example, there was no allopathic hospital in 428 towns of the state. Similarly, 1017 dispensaries enumerated at the 2011 population census were concentrated in only 394 towns of the state. In fact, there were 101 towns in the state, where there was neither any public health care facility nor any private health care facility according to the 2011 population census. On the other hand, there were 204 towns, where there was no public health care facility, whereas in 264 towns, there was no private health care facility.

In terms of population coverage, there was one public allopathic hospital for every about 47 thousand urban population in the state according to the 2011 population census, whereas there was one public hospital of alternative medicine for every about 199 thousand urban population. Similarly, there was one nursing home for every 41 thousand urban population and one dispensary for every about 44 thousand urban population, on average, in the state. By contrast, the availability of private health care facilities in the urban areas can be judged from the fact that there was one private out-patient facility for every about 0.8 thousand urban population and one private facility providing in-patient as well as out-patient facilities for every about 27 thousand urban population. These observations confirm that the availability of health care facilities in the urban population of the state is much better than that in the rural population of the state primarily because the private health care facilities are very heavily concentrated in the urban areas of the state. However, data available through the 2011 population census suggest that health care facilities in the urban areas also are not evenly distributed across all towns of the state and

Figure 4
Private health facilities in towns of Uttar Pradesh, 2011



residents living in a large number of towns in the state, especially, towns small in population size, remain devoid of even the basic health care simply because health care facilities, either public or private, are not available. The situation is particularly stark in case of the availability of private or non-government health care facilities. According to the 2011 population census, there were 57065 private health care facilities in the towns of the state, which were providing only the out-patient services, but these facilities were confined to only 539 towns. Similarly, there were 16504 private health care facilities providing both in-patient and out-patient services, but these facilities were concentrated in only 413 towns.

Conclusions

Notwithstanding many limitations of the data available through the 2011 population census, the present analysis has highlighted some key issues related to the availability of health care facilities in Uttar Pradesh. It is well known that the availability of the health care facilities at an affordable time and money cost is the first and perhaps the most important determinant of the access to health care services, which, in turn, is an important factor in deciding the health status of the people. In this context, the present paper highlights gross inadequacies in the availability of health care facilities in terms of both number of health care facilities and their distribution across villages in the rural areas and across towns in the urban areas of the state.

The analysis also highlights the usefulness of GIS tools in analysing the spatial distribution of health care facilities. The spatial accuracy of village points in rural areas and town points in urban areas confirm that the methodology is sound and reproducible. Further attempts may be made to use this methodology for research and analysis. The approach adopted in this paper to build GIS-based database of health care facilities may assist researchers in conducting advanced spatial epidemiological analysis, which may help policy makers and health officers to understand spatial mismatches between disease outbreaks and availability of health care facilities; planning new health care facilities; analysing the availability of health care facilities; and accessibility rather than just proximity of health care facilities taking into account terrain characteristics.

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Table 1
Number of different types of health care facilities in the rural areas of Uttar Pradesh along with number of villages with at least one health care facility and number of villages without any health care facility at the 2011 population census

Health care facility	Number available	Villages where the facility was available	Villages where the facility was not available	Population served per unit (000)
Government health care facilities	21729	9714	88199	7.1
Community Health Centre	731	730	97083	212.5
Primary Health Centre	2300	2300	95513	67.5
Primary Health Sub-centre	1773	1773	96040	87.6
Mother and Child Welfare Centre	6930	6918	90895	22.4
Tuberculosis Clinic	464	463	97350	334.7
Hospital - Allopathic	728	676	97137	213.3
Hospital - Alternative Medicine	923	704	97109	168.3
Mobile Health Clinic	703	609	97204	220.9
Family Welfare Centre	6171	6000	91813	251.7
Dispensary	1006	792	97021	154.4
Non-government health care facilities	13951	2053	95760	11.1
Out-patient services only	6966	1577	96236	22.3
Out- and in-patient services	5269	1181	96632	29.5
Charity institutions	1716	79	97022	90.5
Health care services providers	8309	3072	94741	8.3
With MBBS qualification	2478	1197	96616	62.7
With other qualifications	5831	2773	95040	26.6
Without any qualification	21181	12120	85693	7.3
Traditional and faith healers	14602	11991	85822	10.6
Medical shop	20258	15354	82459	7.7
Others	4321	3562	94251	35.9

Source: Government of India (2011).

Table 2
Number of different types of health care facilities in the urban areas of Uttar Pradesh along with number of towns with at least one health care facility and number of villages without any health care facility at the 2011 population census

Health care facility	Number available	Towns where the facility was available	Towns where the facility was not available	Population served per unit (000)
Government health care facilities				
Hospital - Allopathic	955	487	428	46.6
Hospital - Alternative Medicine	224	168	747	198.6
Dispensary	1017	394	521	43.8
Family Welfare Centre	631	347	568	70.5
Mother and Child Welfare Centre	347	308	607	128.2
Maternity home	691	325	590	64.4
Tuberculosis Clinic	168	158	757	264.9
Nursing home	1085	104	811	41
Mobile Health Clinic	54	41	874	824
Others	51	33	882	872
Non-government health care facilities				
Out-patient services only	57065	539	376	0.8
Out- and in-patient services	16504	409	506	2.7
Charity institutions	2486	286	629	17.9
Medical shop	22015	814	101	2

Source: Government of India (2011)

Appendix

Definition of Health Care Facilities adopted at the 2011 Population Census

1. *Hospital-Allopathic (HA) and Hospital-Alternative Medicine (HM).* A hospital is an institution, where sick or injured are given medical or surgical care. Bed strength differs from hospital to hospital ranging from 31 to 500 depending upon whether these are subdistrict, sub-divisional or district hospitals. If the hospital is providing facilities under different systems of medicines such as, Allopathy, Ayurveda, Unani and Homeopathy etc., these details are given separately.
   (a) *Allopathy*. The system of medical practice, which treats disease by the use of remedies which produce effects different from those produced by the disease under treatment.
   (b) *Ayurveda*. Ayurveda means 'Science of life'. The philosophy of Ayurveda is based on the theory of Pancha Mahabhootas (Five elements) of which all the objects and living bodies are composed of. The combination of these five elements is represented in the form of Tridosha: Vata, Pitta and Kapha. These three 'doshas' are physiological entities of living beings. Ayurveda developed into eight distinct specialities, i.e., Internal Medicine, Pediatrics, Psychiatry, Eye and ENT, Surgery, Toxicology, Geriatrics and Science of virility. Two types of treatments, Preventive and Curative, are given in Ayurveda.
   (c) *Unani*. Treatment of Unani consists of three components, namely, preventive, promotive and curative. Unani system of medicine has been found to be efficacious in conditions like Rheumatic Artharitis. Jaundice, Filarisis, Eczema, Sinusitis and Bronchial Asthma. For the prevention of the disease and promotion of health, the Unani System emphasizes six essentials: pure air, food and water, physical movement and rest, psychic movement and rest, sleep and wakefulness and retention of useful materials and evacuation of waste materials from the body.
   (d) *Homoeopathy*. Treatment in Homoeopathy, which is holistic in nature, focuses on an individual's response to a specific environment. Homoeopathic medicines are prepared mainly from natural substances such as plant products, minerals and animal sources. Homoeopathic medicines do not have any toxic, poisonous or side effects. Homoeopathic treatment is economical as well and has a very broad public acceptance.
2. *Community Health Centre (CHC).* A Community Health Centre is designed to provide referral health care for cases from PHC and those in need of specialist health care approaching the CHC directly. On average, 4 PHCs are covered under each CHC so that a CHC, on average, caters approximately 80,000 populations in tribal/hilly areas and 1, 20,000 populations in plain areas. The CHC is a 30- bedded hospital providing specialist care in Medicine, Obstetrics and Gynaecology, Surgery and Paediatrics.

3. *Primary Health Centre (PHC)*. A Primary Health Centre is the first contact point between a village community and the Government medical officer. A PHC covers a population of 20,000 in hilly, tribal or difficult areas and 30,000 populations in plain areas with 4-6 indoor/observation beds. It acts as a referral unit for 6 sub-centres. It has a medical officer and para medical staff.
4. *Primary Health Sub-centre (PHS)*. A Primary Health Sub-centre is the first contact point between the primary health care system and the community. As per the population norms, one PHS is established for every 5,000 population in plain areas and 3,000 population in hilly/ tribal/ desert areas. Each PHS has a sanctioned strength of one male and one female heath worker.
5. *Maternity and Child Welfare Centre (MCW)*. It provides pre-natal and post-natal services for both mother and child. The services include regular checkup of pregnant women, giving folic tablets, counselling, delivery, immunization of children with checkup etc.
6. *Tuberculosis Clinic (TBC)*. The diagnosis and treatment of Tuberculosis are functions of the general health services and hence it is a part and parcel of Primary Health Care. Specialised unit such as the District Tuberculosis Centre (DTC) act as referral centres. TB clinics are established by the Government of India under the National Tuberculosis Control Programme and implemented through a network of DTC. The DTC is the nodal point for TB control activities in the district and it also functions as a specialized referral centre. The functions of subdistrict level Tuberculosis Unit (TU) are implementation, monitoring and supervision of TB control activities in its designated geographical areas.
7. *Health Centre (HC)*. Clinic where medicine and medical supplies are dispensed. It has no in-patient facility. A clinic (or an outpatient clinic) is a small private or public health facility that is devoted to the care of outpatients, often in a community, in contrast to larger hospitals, which also treat inpatients.
8. *Dispensary (DI)*. Place where patients are treated and medicines provided but with no in-patient facility. Immunizations, MCH Services and sometimes pathological tests are carried out here. It may be of allopathic or any alternative medicine.
9. *Mobile Health Clinic (MHC)*. These are Mobile vans well equipped with a range of health services to villages located far away from the CHCs, PHCs or any public health sources. The vans visit villages on designated days to deliver the health care services. The services generally offered are OPD, antenatal and post-natal, B.P. examination, X-ray, ECG, Immunization, First Aid, etc.
10. *Family Welfare Centre (FWC)*. Checkup and counselling services are provided to the pregnant and married women regarding the small family norm and devices for having a small family. Temporary and permanent contraceptive devices are provided here.
11. *Nursing Home (NH)*. A nursing home is a long-term care facility licensed by the state government which offers 24-hour room, boarding and health care services including basic and skilled nursing care, rehabilitation and a full range of other therapies, treatments and programmes to the old and the sick. The difference between a hospital and a nursing home is that a nursing home gives importance to the convalescence from a disease while a hospital gives only medical treatment.

12. *Medicine Shop*. A shop which sells drugs and medicines of any system of medicine viz. allopathic, homeopathic, ayurvedic or unani medicines, is considered as a medicine shop. Sometimes some shops and Paan shops also keep ordinary medicines, like Crocin, Burnol etc. These shops are not taken as medicine shops.

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Gender Balance in Nutritional Status in Children and Adults of Odisha

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Introduction

India is the second most populous country of the world, next to China. Although, India occupies 4.2 per cent of land mass, yet, it constitutes around 16.2 per cent of the world population. As per 2011 Census, total population of the country is 1210.5 million, out of which 623.1 million are females. Entire population of the country can be divided into three subgroups namely the child, the adult and the old, on the basis of age. In the age group 0-14, male population is about 1 per cent more than the female population whereas, in the age group 60 years and above, the proportion of females is 0.7 percentage points more than that of males. In the 15-59 years age, females outnumber males marginally. Majority of female population lives in poverty, illiteracy and malnutrition.

Under nutrition is frequently part of a vicious circle that includes poverty and ill-health. These factors are interlinked in such a way that each reinforces the other. Under nutrition among children is the direct consequence of inadequate availability of food, improper dietary intake, insufficient breast feeding, prevalence of infectious and parasitic diseases, lack of vitamin-A supplementation, poor maternal care during and after pregnancy, unhygienic water intake and sanitation facilities, etc. Demographic characteristics like age, sex, birth order and birth weight of the child also affect the nutritional status of the child. Nutritional status is also influenced by various Socio-economic factors like poverty, illiteracy and ignorance of the mother and the family. Positive intervention in socio-economic-demographic and health sectors, therefore, can break the vicious cycle and improve the nutritional status.

Gender differentials in nutritional status and health are very often reported at the family level. During infancy, mothers adopt discriminatory attitude towards breastfeeding and supplementary feeding practices for the girl child. Female infant girls are breastfed not only less frequently but also for short duration. Women face nutritional discrimination within the family by taking food at the end of the family dinner. Religiously, it is believed

that female members should take food at the last and in the least quantity (at the time of insufficient food) as a pious activity. Although, no one compels females to adopt this practice, yet, it is still widely prevalent in most of the rural families. These family practices lead to anaemia and under nutrition in female children and adults.

There is now global consensus about the importance of intervening in the first 1000 days of life - from conception to the age of two years to improving the health and nutritional well-being of adolescent girls - to ensure good pre-conception nutritional status. According to the World Bank (2009), as far as the number of children suffering from under nutrition is considered, India ranks 2nd in the world. Most of the growth retardation occurs during the first two years of life and the damage is irreversible. In India the prevalence of underweight in the rural areas is 50 per cent as compared to 38 per cent in the urban areas and is higher among girls (48.9 per cent) than among boys (45.5 per cent).

At the present juncture, gender equality is the avowed objective of all development programmes and policies of the Government. It is a precondition for meeting the challenge of reducing poverty, promoting sustainable development and building good governance (Annan, 2002). However, gender differences in health, nutrition and health care are well documented in the literature (Payne, 2001). Arokiasamy and Pradhan (2005) have observed, on the basis of the data available through the National Family Health Survey 1998-99 that there exists gender inequality in the level of nutrition, immunisation, illness and treatment of diseases with regional differences in India and States. Mitra (2014), on the other hand, has found that there is a strong son preference and neglect of the girl child among the Indian society, even in the educated and affluent sections of the society. India exhibits wide variations in the degree of son preference. There is a stronger son preference found in northern India vis-à-vis the southern India (Dyson and Moore, 1983). Studies across India have found that boys are more likely than girls to be taken to a health facility when sick (Das Gupta, 1987; Govindasamy and Ramesh, 1996; Kishor, 1993). Boys have a higher immunisation coverage rate than girls in all states, except Goa and Karnataka. Girls are more likely to be under nourished than boys in both the northern and southern states (Arnold et al, 1992; Sen and Sen Gupta 1983; Pebley and Amin, 1991). Female infants are breastfed less frequently, for shorter duration, and over shorter periods than boys (Wyon and Gordon, 1971; Das Gupta, 1987). However, Mishra and others have observed on the basis the National Family Health Survey 2005-06 that the prevalence of under nutrition in girls and boys is nearly the same (Mishra et al, 1999).

In Odisha, there is a dearth of studies on the nutritional status of the people. There are many studies on sex bias and gender differences with respect to a number of parameters, such as level and pattern of immunisation, health care service utilisation, etc. carried out in other parts of the country, especially, in the north Indian states, particularly, Punjab and Haryana (Das Gupta, 1987), yet, very little is known about the situation that prevails in Odisha. It is in this context that the present study has been undertaken to analyse, in depth, the gender differentials in the nutritional status of the people of Odisha. Gender differentials in the nutritional status of the people of the state can best be

understood through a systematic analysis of the social, economic and health status of females - girls and women - of the state. This helps us to understand the background in which different forces interplay to influence, differentially, the nutritional status of females and males. Such an analysis also helps in developing the perspective plan of action to achieve the desired objective of gender equality in nutrition.

More specifically, the present study attempts to answer the following research questions:

- Is there any significant gender difference exists with respect to nutritional status of children and adults?
- Is there any linkage between the social class distribution of the population and the prevalence of under nutrition at the district level?
- Is there any relationship between the level of income and the prevalence of under nutrition?

To answer the above research questions, the study analyses the gender difference in the nutritional status of children and adults at the district level and examines the impact of different social, economic and demographic factors on the gender difference of in the nutritional status.

Status of Women in Odisha

The state of Odisha is located in the eastern part of India. With a population of about 42 million according to the 2011 population census, the state accounts for approximately 3.46 percent of India's population. Women constitute around 49.5 per cent of the state population. Among the women of the state, 20 per cent are adolescents (13-18 years of age), 54 per cent belong to the reproductive age group (15-49 years), 10 per cent belong to the age group 50-60 years and 8 per cent are at least 60 years of age. According to the sample registration system (SRS), the total fertility rate in the state was less than the replacement level in 2015 whereas the sex ratio at birth was 956 girls for every 1000 boys. On the other hand, the population sex ratio was 979 females for every 1000 males at the 2011 population census, which indicates strong son preference and gender biasedness in the State. The literacy rate in the state (72.9 per cent) is at par with the national average (73 per cent), but the female literacy rate (64 per cent) is substantially lower than the male literacy rate (81.6 per cent), although improvement in female literacy has been more rapid than that in male literacy. Inter-district variation in the literacy rate is also important. District Nabarangpur has the lowest literacy rate of 37.2 per cent, whereas the literacy rate in district Khurda is the highest (82.1 per cent) according to the 2011 population census.

Poverty and unemployment remain major development challenges for the state. It is estimated that 32.6 per cent of the state population was living below the poverty line in 2011-12, although the prevalence of poverty in the state has steadily declined from 57.2 per cent in 2004-05 to 32.6 per cent in 2011-12 (Government of Odisha, 2017).

Moreover, the unemployment rate in the state (8.1 per cent in rural and 6.3 per cent in urban) has always been higher than the national average (6.8 per cent in rural and 5.8 per cent in urban) according to the 66th round of the National Sample Survey 66.

Marriage, especially of girls, at an early age is quite common in Odisha. Approximately one out of every four currently married women aged 20-24 years is married before reaching 18 years of age and this proportion is more than 50 per cent in Koraput, Malkangiri and Nabarangapur districts, where there is a high concentration of Scheduled Tribes. Moreover, 44 per cent girls, aged 15-19 years, are found to be already the mother or pregnant. The maternal mortality ratio in the state is estimated to 235 maternal deaths per 100,000 live births in 2010-12 according to the sample registration system which is unacceptably high and reflects not just poor services at the critical stage of the life but also the neglect of females all stages of life including the prenatal stage, time of birth, infancy, childhood, adolescent, adulthood, motherhood and beyond. The female infant mortality rate (IMR) and the female under-five mortality rate (U5MR) for females have remained higher than those of males throughout the last two decades and are a cause of concern for the state. There seems to be a consensus that higher female mortality between age one and age five and high maternal mortality rate result in a deficit of females in the population.

Data and Methodology

The analysis is based on clinical, anthropometric and biochemical (CAB) data collected by the Registrar General and Census Commissioner of India as part of the Annual Health Survey (Government of India, *no date*). The survey provides district level information on magnitude of under and over nutrition, hypertension and high fasting glucose for all districts in the nine states covered under the Annual Health Survey - Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttarakhand, Uttar Pradesh and Assam. The CAB data were collected in 2014 in a sub-sample of 12 sample units per district on an average, in all the districts of Odisha. All eligible members of alternate households in the selected sample units were surveyed. The survey covered 477065 households and 1.99 million population in Odisha.

The nutritional status of the population aged five years and above was assessed through the Body Mass Index (BMI), which is defined as weight in Kilogram divided by the square of the height in metres (International Institute for Population Scieces, 2007). A person having a BMI of less than 18.5 is classified as under nourished. On the other hand, the nutritional status of children below five years of age was measured in terms of weight-for-age, weight-for-height and height-for-age. The nutritional status of the child is measured in terms of comparing the weight, the height and the weight-for-height of a child with those of the international reference population following the approach adopted by the World Health Organisation (WHO, 2006). The approach involves calculation of the 'z' score for each child. If the 'z' score of a child is less than -2 in terms of either weight or height or weight-for-height, then the child is classified as under nourished. Weight-for-

age, height-for-age and weight-for-height depict three different aspects of the nutritional status of the child. The height-for-age is a measure of linear growth. Low height-for-age or stunting reflects chronic under nutrition either due to inadequate food intake resulting from poor feeding practices or from lack of sufficient intake of food. The weight-for-height index is a measure of body mass in relation to body length and describes current nutritional status and reflects the acute under nutrition. Low weight-for-height or wasting reflects the failure to receive adequate nutrition in the period immediately preceding the survey and may be the result of the inadequate food intake or a recent episode of illness causing loss of weight and the onset of malnutrition. Weight-for-age, on the other hand, is a composite index of height-for-age and weight-for-height. Low weight-for-age or under-weight takes into the account both acute and chronic under nutrition.

Results and Discussion

Table 1 gives an overview of the gender difference in the nutritional status of children below five years of age in terms of the prevalence of stunting, wasting and under-weight in the districts of Odisha. The gender difference is expressed in percentages. A positive value depicts the female, while a negative value depicts the male disadvantage. At the state level four out of every ten female children are underweight and an equal number are also stunted whereas only two out of every ten are wasted. The gender difference in under weight is five percentage points, which implies that the prevalence of under-weight is higher in female than in male children. Likewise, the gender difference in stunting is 1.4 per cent but the gender difference in wasting is -3.5 per cent, which means that the prevalence of wasting is higher in male than in female children.

Among the districts of the state, the gender difference in under-weight is positive and the highest in the Sundargarh district followed by Dhenkanal and Balasore districts, whereas it is negative, but high in Khorda, Nayagarh and Cuttack districts indicating that the prevalence of under-weight in male is higher than that in female children in these districts. On the other hand, gender difference in stunting is positive and the highest in district Angul, but negative and the highest in district Puri. Finally, the gender difference in wasting is positive and the highest in district Nuapada followed by district Jajpur, but negative and the highest in district Ganjam followed by district Balasore.

Table 2 presents the gender difference in the nutritional status of the population aged 18-59 years and the population aged 60 years and above in terms of the Body Mass Index (BMI). The gender difference in BMI in the population aged 18-59 years is negative in only one district of the state - district Nayagarh. This indicates that in the remaining districts of the state, the prevalence of under nutrition in this population aged 18-59 years is higher in females than in males. On the other hand, there are five districts - Khorda, Ganjam, Nabarangpur, Baudh and Bolangir - where the gender difference in BMI in population aged 60 years and above is negative, which means that, in these districts, the prevalence of under nutrition as measured through BMI is higher in males than in females in population aged 60 years and above.

The gender difference in the prevalence of anaemia among adults is presented in table 3. Approximately eight out of every ten adults aged 18-59 years in Odisha are anaemic and this proportion is marginally higher in population aged 60 years and above. The gender difference is positive and the highest in district Jajpur followed by Angul and Sambalpur for adults aged 18-59 years. Among the population aged 60 years and above, the gender difference is positive and the highest in the Nuapada district followed by Sonapur and Jajapur districts.

The gender difference in the nutritional status by selected socio-demographic characteristics is presented in table 4. The table shows that as adolescents enter into adulthood, the problem of underweight decreaes, but the problem of overweight and obesity accentuates. However, the situation is juxtaposed in adults aged 50 years and above. Moreover, underweight is prevalent in the rural population and the overweight/obesity appears be prevalence in the urban population. Table 4 also suggests that the prevalence of under-weight is high in never married women and in ever married men. Finally, table 5 presents the prevalence of under-weight and over-weight by gender in the districts of the state to comprehend the nutritional adversity. The situation appears to be dismal in the Nabarangpur district, where the prevalence of under-weight is the highest, but the prevalence of over-weight is the lowest in both males and females.

Determinants of Gender Difference in Nutritional Status

In order to investigate the effect of a range of social, economic and demographic variables on the gender difference in the nutritional status of children and adults, we have used the technique of multiple regression analysis. Following regression model was fitted to the district level data to identify the factors responsible for the gender difference in nutritional status:

$$GNS = a_0 + a_1SCP + a_2STP + a_3PCI + a_4AANM + a_5BMI + a_6FLR + a_7WWPR + a_8CSR + a_9UP + a_{10}RD + e_i$$

where GNS is the gender difference in the nutritional status; SCP is the percentage of Schedule Castes in the district; STP is the percentage of Schedule Tribes in the district; PCI is the net state domestic product in rupees; AANM is the percentage of adult persons suffering from Anaemia; BMI is the percentage of adults having BMI less than 18.5; FLR is the female literacy rate; WWPR is the women's work participation rate in per cent; CSR is the child sex ratio defined as females divided by males; UP is the percentage of the urban population to the population of the district; and e_i is the error term which is normally distribution with mean 0 and standard deviation 1.

Results of multiple regression analysis are presented in table 6. The district level data from Odisha suggests that the gender difference in weight-for-height is statistically significantly influenced by the percentage of Schedule Castes population, percentage of Schedule Tribes population; net state domestic product in rupees, percentage of adult members suffering from Anaemia, percentage of adults having BMI less than 18.5 on the basis of the district level data in the state. The effect of other social, economic and

demographic variables included in the multivariate regression analysis on the gender difference in the nutritional status has however not been found to be statistically significant.

Conclusions

Main findings of the present analysis can be summarised as follows:

- At the state level, 40 per cent female children are under-weight and an equal proportion are stunted, whereas only 20 per cent are wasted.
- The gender difference in the prevalence of under-weight and stunting is against female. Gender difference also exists in the districts, but there is no clear trend.
- The gender difference in the nutritional status of adults is also against females with a few exceptions.
- More than 80 per cent of the people aged 60 years and above suffer from anaemia irrespective of the gender.
- The problem of overweight and obesity accentuates in young adults irrespective of the gender.
- Prevalence of underweight is high in the rural population but the prevalence of overweight / obesity appears to be a problem in the urban population.
- In the never married population, the problem of under-weight is quite common in females, but in the ever married population, the prevalence of under-weight is quite common in males.
- Among the districts, the prevalence of under-weight is the highest in the Nabarangpur district irrespective of gender.
- Gender difference in the prevalence of wasting influenced by the percentage of Scheduled Castes population, percentage of Scheduled Tribes population, per capita net state domestic product in rupees, Percentage of adult persons suffering from anaemia and percentage of adults having BMI less than 18.5.

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Table 1
Gender difference in under nutrition in children below five years of age in Odisha

State / District	Prevalence rate (Per cent)		Gender difference
	Male	Female	(Per cent)
		Wasting	
Odisha	20.5	19.8	-3.4
Baragarh	27.2	21.4	-21.3
Jharsuguda	22.4	16.7	-25.4
Sambalpur	28.5	22.5	-21.1
Debagarh	28.3	31.8	12.4
Sundargarh	12.9	15.7	21.7
Kendujhar	27.5	21.8	-20.7
Mayurbhanja	19.9	19.0	-4.5
Baleswar	18.2	24.2	33.0
Bhadrak	17.3	20.1	16.2
Kendrapara	14.7	19.4	32.0
Jagatsinghpur	18.8	20.4	8.5
Cuttack	15.0	12.1	-19.3
Jajapur	10.1	5.1	-49.5
Dhenkanal	8.8	11.1	26.1
Angul	17.3	13.0	-24.9
Nayagarh	19.3	12.8	-33.7
Khordha	22.8	20.7	-9.2
Puri	22.8	24.6	7.9
Ganjam	14.3	22.8	59.4
Gajapati	25.5	20.2	-20.8
Kandhamal	24.4	29.3	20.1
Baudh	28.6	28.7	0.4
Sonapur	19.2	17.7	-7.8
Balangiri	27.8	27.3	-1.8
Nuapada	26.1	9.3	-64.4
Kalahandi	29.7	23.9	-19.5
Rayagada	30.0	31.6	5.3
Nabarangapur	27.9	19.3	-30.8
Koraput	21.6	20.0	-7.4
Malkangiri	32.5	34.1	4.9
		Stunting	
Odisha	41.2	41.8	1.5
Baragarh	49.3	44.5	-9.7
Jharsuguda	38.7	37.8	-2.3
Sambalpur	45.9	46.4	1.1

State/District	Prevalence rate (Per cent)		Gender difference
	Male	Female	(Per cent)
Debagarh	39.0	35.8	-8.2
Sundargarh	47.2	49.0	3.8
Kendujhar	50.8	45.3	-10.8
Mayurbhanja	40.7	51.1	25.6
Baleswar	43.1	47.1	9.3
Bhadrak	36.3	36.4	0.3
Kendrapara	26.6	22.8	-14.3
Jagatsinghpur	21.8	20.7	-5.0
Cuttack	35.4	33.1	-6.5
Jajapur	34.4	43.2	25.6
Dhenkanal	33.5	35.6	6.3
Angul	42.8	28.3	-33.9
Nayagarh	27.0	36.1	33.7
Khordha	23.0	25.5	10.9
Puri	20.8	29.5	41.8
Ganjam	39.9	43.9	10.0
Gajapati	44.3	42.3	-4.5
Kandhamal	30.2	28.1	-7.0
Baudh	42.8	34.9	-18.5
Sonapur	43.7	44.6	2.1
Balangiri	51.1	51.3	0.4
Nuapada	48.9	42.4	-13.3
Kalahandi	43.4	45.9	5.8
Rayagada	51.3	44.3	-13.6
Nabarangapur	54.2	51.2	-5.5
Koraput	57.7	57.6	-0.2
Malkangiri	53.0	48.0	-9.4
		Under-weight	
Odisha	38.0	40.0	5.3
Baragarh	46.9	45.8	-2.3
Jharsuguda	31.3	34.7	10.9
Sambalpur	40.1	47.7	19.0
Debagarh	43.4	40.2	-7.4
Sundargarh	33.5	46.5	38.8
Kendujhar	47.9	47.4	-1.0
Mayurbhanja	37.6	43.9	16.8
Baleswar	39.1	48.3	23.5
Bhadrak	31.3	36.7	17.3
Kendrapara	20.2	22.1	9.4

State/District	Prevalence rate (Per cent)		Gender difference
	Male	Female	(Per cent)
Jagatsinghpur	13.5	14.8	9.6
Cuttack	25.0	21.8	-12.8
Jajapur	22.5	24.1	7.1
Dhenkanal	25.1	31.2	24.3
Angul	29.1	28.1	-3.4
Nayagarh	24.7	21.0	-15.0
Khordha	26.3	20.3	-22.8
Puri	31.7	35.3	11.4
Ganjam	45.4	48.5	6.8
Gajapati	43.2	40.0	-7.4
Kandhamal	22.1	24.1	9.1
Baudh	51.9	46.9	-9.6
Sonapur	41.1	44.5	8.3
Balangiri	45.3	46.6	2.9
Nuapada	51.5	47.9	-7.0
Kalahandi	55.6	49.7	-10.6
Rayagada	56.2	50.7	-9.8
Nabarangapur	54.3	51.1	-5.9
Koraput	50.6	54.8	8.3
Malkangiri	66.2	68.3	3.2

Source: Annual Health Survey 2012.

Table 2
Gender difference in the prevalence of under nutrition (BMI<18.5) in adults in Odisha

State/District	18-59 years			60 years and above		
	Male	Female	Gender difference (Per cent)	Male	Female	Gender difference (Per cent)
Odisha	23.3	30.3	23.1	34.8	40.6	14.3
Baragarh	24.1	28.6	15.7	33.5	45.8	26.9
Jharsuguda	22.7	27.4	17.2	28.3	38.9	27.2
Sambalpur	23.3	33.5	30.4	40.5	41.4	2.2
Debagarh	28.7	34.8	17.5	33.2	53.2	37.6
Sundargarh	22.4	30.7	27.0	30.9	38.6	19.9
Kendujhar	28.4	38.8	26.8	40.1	43.1	7.0
Mayurbhanja	26.1	34.7	24.8	39.2	47.9	18.2
Baleswar	19.8	25.9	23.6	29.1	39.3	26.0
Bhadrak	21.1	32.8	35.7	31.9	36.9	13.6
Kendrapara	18.4	25.9	29.0	25.6	34.9	26.6
Jagatsinghpur	10.2	14.8	31.1	19.7	26.7	26.2
Cuttack	14.8	20.3	27.1	28.3	34.8	18.7
Jajapur	21.4	24.4	12.3	33.4	36.1	7.5
Dhenkanal	26.2	30.1	13.0	36.3	39.4	7.9
Angul	21.9	25.2	13.1	36.7	39.8	7.8
Nayagarh	20.3	18.9	-7.4	31.3	32.5	3.7
Khordha	14.5	16.2	10.5	34.3	27.7	-23.8
Puri	10.7	17.7	39.5	24.4	30.0	18.7
Ganjam	21.0	24.8	15.3	30.4	27.4	-10.9
Gajapati	19.4	30.9	37.2	32.5	42.5	23.5
Kandhamal	20.1	28.3	29.0	35.5	45.9	22.7
Baudh	27.7	35.6	22.2	52.0	48.0	-8.3
Sonapur	27.7	38.3	27.7	42.9	50.4	14.9
Balangiri	31.0	45.5	31.9	46.9	59.0	20.5
Nuapada	27.9	28.2	1.1	48.2	44.9	-7.3
Kalahandi	40.9	44.4	7.9	56.2	59.7	5.9
Rayagada	18.9	28.1	32.7	32.5	42.1	22.8
Nabarangapur	41.5	48.5	14.4	56.6	51.1	-10.8
Koraput	29.4	43.9	33.0	49.6	53.6	7.5
Malkangiri	40.5	49.7	18.5	48.4	62.0	21.9

Source: Author's calculations.

Table 3
Prevalence of anaemia among adults aged 18 years and above in Odisha

District	18-59 years			60 years and above		
	Male	Female	Gender difference (Percent)	Male	Female	Gender difference (Percent)
Odisha	71.8	77.7	7.6	82.7	81.4	4.5
Baragarh	69.5	76.6	9.3	81.2	83.0	7.7
Jharsuguda	83.4	91.4	8.8	92.1	90.2	-1.3
Sambalpur	49.4	68.5	27.9	74.9	69.0	0.7
Debagarh	71.7	79.7	10.0	89.3	89.1	10.5
Sundargarh	86.2	83.7	-3.0	88.2	81.3	-3.0
Kendujhar	81.1	88.6	8.5	93.1	89.4	0.9
Mayurbhanja	78.5	75.9	-3.4	84.4	76.3	0.5
Baleswar	58.8	75.1	21.7	74.7	84.5	11.1
Bhadrak	70.7	79.5	11.1	85.8	79.8	0.4
Kendrapara	72.1	81.1	11.1	84.3	85.0	4.6
Jagatsinghpur	80.8	84.3	4.2	88.1	89.1	5.4
Cuttack	56.4	71.2	20.8	79.1	77.8	8.5
Jajapur	27.2	48.4	43.8	47.2	55.1	12.2
Dhenkanal	49.5	67.6	26.8	65.4	71.5	5.5
Angul	50.3	70.8	29.0	71.6	76.3	7.2
Nayagarh	62.8	75.1	16.4	85.4	83.4	10.0
Khordha	68.8	72.4	5.0	82.1	80.1	9.6
Puri	86.1	83.5	-3.1	89.2	85.7	2.6
Ganjam	64.6	73.6	12.2	77.0	79.9	7.9
Gajapati	85.0	86.2	1.4	93.8	86.8	0.7
Kandhamal	80.0	74.2	-7.8	90.8	84.0	11.7
Baudh	80.4	82.7	2.8	93.6	91.8	9.9
Sonapur	52.9	68.9	23.2	75.6	79.1	12.9
Balangiri	79.2	88.4	10.4	93.3	92.2	4.1
Nuapada	56.9	73.3	22.4	81.7	86.3	15.1
Kalahandi	64.6	76.6	15.7	83.3	84.3	9.1
Rayagada	95.3	89.9	-6.0	98.2	90.9	1.1
Nabarangapur	76.2	84.7	10.0	89.1	90.2	6.1
Koraput	85.1	79.4	-7.2	87.2	77.4	-2.6
Malkangiri	90.7	87.8	-3.3	94.7	89.7	2.1

Source: Annual Health Survey 2012.

Table 4
Nutritional status by selected social, economic and demographic characteristics in Odisha

Particular	Person			Males			Females		
	Under-weight	Over-weight	Obese	Under-weight	Over-weight	Obese	Under-weight	Over-weight	Obese
Age group									
10-19	66.4	2.0	0.6	71.0	2.0	0.6	61.8	2.0	0.5
20-49	26.0	12.0	2.7	22.1	11.9	2.4	29.0	12.0	3.0
>49	35.9	10.6	2.6	30.2	10.5	2.0	35.5	10.7	3.2
Place of Residence									
Rural	48.8	6.7	1.4	48.7	6.4	1.2	48.8	7.1	1.7
Urban	34.6	15.3	4.8	34.7	15.5	3.8	34.5	15.2	5.7
Marital Status									
Never Married	41.4	4.8	1.2	33.3	0.0	0.0	41.4	4.8	1.2
Ever Married	31.9	12.7	3.1	57.1	38.1	4.8	28.4	12.7	3.1

Source: Annual health Survey 2012.

Table 5
Gender difference in the nutritional status in districts of Odisha

District	Persons		Males		Females	
	Under-weight	Over-weight / Obese	Under-weight	Over-weight / Obese	Under-weight	Over-weight / Obese
Odisha	36.8	7.7	35.5	6.9	38.1	8.4
Baragarh	36.5	10.9	35.7	10.4	37.3	11.4
Jharsuguda	36.1	12.7	35.9	12.0	36.4	13.4
Sambalpur	39.4	10.6	37.3	9.7	41.4	11.5
Debagarh	38.0	6.9	36.3	6.7	39.7	7.0
Sundargarh	31.3	7.6	30.0	6.6	32.7	8.6
Kendujhar	40.2	6.3	37.3	6.1	42.9	6.4
Mayurbhanja	39.1	5.8	37.3	6.1	40.9	5.6
Baleswar	37.6	8.1	35.9	7.6	39.2	8.6
Bhadrak	34.9	6.5	32.5	6.0	37.1	7.0
Kendrapara	31.3	9.1	29.7	7.7	32.8	10.4
Jagatsinghpur	24.7	14.3	23.7	12.4	25.7	16.3
Cuttack	27.4	9.9	25.8	7.6	29.0	12.1
Jajapur	35.4	9.2	36.5	7.8	34.3	10.5
Dhenkanal	37.9	8.0	38.4	6.4	37.4	9.7
Angul	37.5	10.1	37.2	9.1	37.7	11.1
Nayagarh	28.0	10.2	29.1	8.4	26.9	12.2
Khordha	26.8	10.2	27.2	8.9	26.3	11.7
Puri	26.5	10.0	24.5	8.9	28.6	11.0
Ganjam	33.7	9.4	34.2	7.9	33.3	10.8
Gajapati	34.0	7.2	33.6	6.5	34.4	7.9
Kandhamal	30.9	8.3	28.8	7.9	32.9	8.7
Baudh	38.1	5.7	36.0	5.2	40.1	6.2
Sonapur	41.1	5.4	38.9	4.8	43.5	6.1
Balangiri	40.5	8.0	37.1	7.5	43.8	8.4
Nuapada	37.2	5.3	37.7	3.9	36.7	6.6
Kalahandi	48.1	3.4	46.1	3.4	50.1	3.5
Rayagada	34.4	5.5	33.5	5.6	35.4	5.3
Nabarangapur	51.5	2.8	50.6	2.6	52.3	2.9
Koraput	49.1	4.2	46.4	4.1	51.8	4.3
Malkangiri	45.6	3.2	42.9	3.4	48.3	3.1

Source: Author's calculations.

Table 6
Results of OLS regression of gender difference in nutritional status of children below five years of age on selected population characteristics

Covariates	Stunting		Under-weight		Wasting	
	β	't'	β	't'	β	't'
Schedule Castes	-0.34*	-1.13	-0.28	-0.89	-0.78***	-3.73
Schedule Tribes	0.15	0.36	0.19	0.41	-0.61**	-1.96
Net domestic product per capita	-1.4	-0.65	0.87	0.38	-2.68**	-1.8
Prevalence of anaemia in adults	-0.03	-0.98	0.8	0.32	0.67***	4.13
Adults with BMI<18.5	-0.15	-0.72	-0.26	-1.2	-0.48***	-3.32
Female literacy rate	0.44	0.86	0.85*	1.5	0.02	0.06
Women work participation rate	-0.21	-0.57	0.36	0.91	-0.21	0.4
Child sex ratio (F/M)	-0.01	-0.02	-0.1	-0.36	0.74	3.4
Urban population	0.40*	1.61	-0.43	-1.6	0.3	0.16
Region	0.09	0.48	0.41**	1.85	0.08	0.6
Constant	-0.47	-0.66	-0.93	-1.2	-1.35	0.19
Adjusted R^2	0.19		0.03		0.6	
R^2	0.47		0.36		0.74	

Remarks: *0<P<0.10, **0<P<0.05, ***0<P<0.001
Source: Author's calculations.

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Socio-economic Differentials in Morbidity and Hospitalisation in India

Binod Jena

Introduction

Morbidity and hospitalisation are important indicators of health status of the population. Analysis of different aspects of morbidity and hospitalisation, therefore, is of paramount importance from the point of view of formulation of health policies and programmes. Morbidity is defined as the illness or injury which means any deviation from the state of physical and mental well being. The level of morbidity and hospitalisation in India is increasing over the years. During 1995-96, the level of morbidity at national level was 55 per thousand of population, which increased to 91 in 2004 and 98 in 2014 according to the national sample survey (Government of India, 1998; 2006; 2016). Similarly, the rate of hospitalisation at the national level was 15 per thousand of population during 1995-96 which increased to 25 in 2004 and further 46 in 2014. There are studies that have analysed morbidity patterns and hospitalisation in India and in its different states (Dilip, 2002; Duraiswamy 1998; Ghosh and Arokiasamy, 2009; Nimisha, 2013; Prasad, 2012; Sekhar, 1997). In the present paper, data available through different rounds of the national sample survey have been used to estimate the prevalence of morbidity and hospitalisation in the constituent states of the country and in different socio-economic groups. The primary focus of the paper is on the analysis of the latest data on morbidity and hospitalisation in India available through the 71st round of the national sample survey which was carried out in the year 2014. In addition to analysing the trend in morbidity and hospitalisation in the country over the 20-year period between 1995-96 and 2014, the paper also analyses the inter-state variations in the level of morbidity and hospitalisation in India on the basis of the latest data available through the national sample survey. Moreover, using the latest data available, the paper makes an attempt to examine the socio-economic differentials in the morbidity and the hospitalisation in the country. Finally, the paper also analyses causes of morbidity and reasons of hospitalisation in the country.

Data Source and Methodology

This paper is based on the unit level data available through the 71st round of the national sample survey. The survey was carried out during January to June 2014 and information was collected from a sample of households regarding demographic particulars, particulars of medical treatment received as in-patient care during last 365 days and expenses incurred, particulars of spells of ailments of household members during the last 15 days and expenses incurred, health status of the aged persons and the status of maternal care utilisation. The sample size was 36480 households in the rural areas and 29452 households in the urban areas. Morbidity rate is calculated per thousand of population during 15-day reference period and the rate is termed as the proportion of ailing persons (PAP). Hospitalisation, on the other hand, means admission as in-patient to a medical institution for the treatment of some ailment or injury or for childbirth. The rate of hospitalisation is calculated per thousand of population with a reference period of the last 365 days. The rate of hospitalisation is calculated in two ways - one by taking all types of hospitalisation including hospitalisation for childbirth and two by excluding the cases of hospitalisation for childbirth. Bi-variate analysis has been carried out to analyse the gross differentials in the rate of morbidity and the rate of hospitalisation across socio-economic groups.

Findings

Levels, Trends and Differentials in the Level of Morbidity. Table 1 shows the proportion of ailing persons (PAP) over the last three rounds of the national sample survey - 1995-96, 2004 and 2014 - at the national level separately for rural and urban sectors. In 1995-96, the PAP at the national level was 55 per thousand of population and there was hardly any difference between urban and rural areas. In 2004, the PAP increased to 91 along with the increase in the rural-urban gap. In the latest round carried out in 2014, the PAP further increased to 98 and the rural-urban gap also increased substantially. This rising trend in PAP may be attributed to the increase in health consciousness and better reporting of morbidity in the latest round of the national sample survey. On the other hand, the increasing gap in the PAP in rural and urban areas may be attributed to the increasing concentration of health care facilities in the urban areas.

Inter-state Variation in the Proportion of Ailing Persons (PAP). Inter-state variation in PAP is presented in table 2 which shows that, among the major states of the country, Kerala has the highest proportion of ailing persons (PAP) for every 1000 population followed by Andhra Pradesh, West Bengal and Tamil Nadu and Punjab. On the other hand, Assam has the lowest PAP in the country. PAP has also been found to be very low in Chhattisgarh, Delhi, Bihar and Madhya Pradesh. Moreover, rural-urban differential in PAP is common in all states and Union Territories, although the magnitude of the difference varies from state to state.

Proportion of Ailing Persons (PAP) by Background Characteristics. Table 3 shows that PAP varies by the socio-economic and demographic characteristics of the respondents.

PAP was higher in urban population as compared to the rural population. On the other hand, PAP was the highest in other castes, but the lowest in Scheduled Tribes. Similarly, PAP was the highest in Christians, but the lowest in Muslim. Table 3 also suggests that PAP decreases with the increase in the level of education. However, PAP increases with the increase in the mean per capita consumption expenditure (MPCE). Other things being equal, PAP is found to be higher in females as compared to males and in young and old population as compared to middle-aged population. The PAP has also been found to be low in never married and currently married population, but high in widowed / divorced / separated population. The PAP also varies by access to safe drinking water and improved sanitation facilities. The PAP is found to be relatively higher in households having improved source of drinking water and having improved sanitation facilities as compared to households, which do not have these facilities.

Levels, Trends and Differentials in the Level of Hospitalisation. Table 4 shows how the level of hospitalisation in the country has increased substantially between 1995-96 and 2014 according to the national sample survey and the increase in hospitalisation has gained momentum after 2004. Moreover, although the level of hospitalisation continues to be higher in urban than in rural areas, yet, the gap has reduced during the period under reference. Inter-state variation in the level of hospitalisation is presented in table 5. The table shows two types of hospitalisation - including hospitalisation for childbirth (IC) and excluding hospitalisation for childbirth (EC). In case of IC, the level of hospitalisation has been found to be the highest in Kerala followed by Tamil Nadu and Andhra Pradesh, Himachal Pradesh, West Bengal and Gujarat. By contrast, the level of hospitalisation has been found to be the lowest in Jharkhand succeeded by Chhattisgarh, Bihar and Uttar Pradesh. The same pattern may also be observed in the rural and urban areas. Moreover, in majority of the states, the rate of hospitalisation is lower in rural areas as compared to urban areas. The same pattern can be observed in case of EC also.

Regional Variations in the Level of Hospitalisation. The rate of hospitalisation has been found to be the highest in the southern region of the country followed by north India and west India, whereas the rate of hospitalisation has been found to be the lowest in the northeast region succeeded by central region and the east region (Table 6). Similar variations may also be observed, when hospitalisation for childbirth is excluded from the analysis.

Hospitalisation by Background Characteristics. Table 7 shows the variation in hospitalisation rate by selected background characteristics. When hospitalisation rate is calculated on the basis of all hospital admissions including admissions for childbirth, the hospitalisation rate is found to be lower in rural than in urban areas. Among different social classes, hospitalisation rate is found to be the lowest in Scheduled Tribes, but the highest in other castes. Among different religions, hospitalisation rate is the highest in Christians. Education has a direct impact on hospitalisation. Hospitalisation rate is very high among currently married population widowed / divorced / separated population, but the lowest among never married population. The hospitalisation rate in females is two times the hospitalisation rate in males. However, this comparison is not valid as

hospitalisation for child birth is female-centric. When hospitalisation for child birth is excluded, there is little gender difference in hospitalisation rate. Hospitalisation rate increases with age as well as with the increase in the standard of living. Hospitalisation rate has been found to be inversely proportional to the size of the household. Household level basic amenities such as safe drinking water and improved sanitation facilities also have a direct impact on the hospitalisation rate. Lastly, the variation in the hospitalisation rate by selected background characteristics remains more or less the same when hospitalisation for childbirth is excluded from the analysis.

Relationship between Morbidity Rate and Hospitalisation Rate. Results of the correlation analysis carried out to explore the relationship between morbidity rate and hospitalisation rate are presented in table 8. There exists a positive relationship between morbidity rate and hospitalisation rate as the simple zero order correlation coefficient between PAP and the hospitalisation including hospitalisation for childbirth is estimated to be 0.79 and 0.81 when hospitalisation for childbirth is excluded from the analysis.

Causes of Morbidity and Hospitalisation. Table 9 and 10 show the causes of morbidity or ailments and the causes of hospitalisation. The leading causes of morbidity in India are infectious diseases followed by diseases of respiratory system, diseases of cardiovascular system, endocrine, metabolic and nutrition disorders and musculoskeletal diseases. On the other hand, the leading causes of hospitalisation are childbirth, infections, injuries, gastro-intestinal diseases and cardio vascular diseases.

Conclusions

Morbidity and hospitalisation are two important indicators of the health of the people. The analysis, based on the data available from different rounds of the national sample survey suggests that both morbidity incidence and hospitalisation rate have increased in India over the last three decades. The rural-urban gap in the morbidity rate has widened but the rural-urban gap in the hospitalisation rate has narrowed down. Both morbidity incidence and the hospitalisation rate vary widely across the states of the country and the inter-state variation in the morbidity incidence is almost the same as the inter-state variation in the hospitalisation rate, although, there exists a direct relationship between the morbidity rate and the hospitalisation rate. Moreover, data available through the national sample survey suggests that the causes of morbidity in India and in its constituent states and Union Territories are essentially different from the reasons for hospitalisation.

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Table 1
Ailing persons per 1000 population (PAP) in India 1995-2014

Period	Rural	Urban	India
1995-96	55	54	55
2004	88	99	91
2014	89	118	98

Source: Government of India (1998, 2006,2016).

Table 2
Inter-state variation in ailing persons per 1000 population (PAP), 2014

States/Union Territories	Rural	Urban	Total
Delhi	15	41	40
Jammu & Kashmir	64	41	59
Punjab	162	171	165
Haryana	56	75	63
Bihar	57	62	58
Jharkhand	52	96	62
Uttar Pradesh	68	91	73
Madhya Pradesh	53	71	58
Chhattisgarh	40	44	40
Assam	32	47	33
West Bengal	161	179	167
Orissa	103	97	102
Rajasthan	54	83	62
Gujarat	92	103	96
Maharashtra	81	70	76
Andhra Pradesh	155	204	170
Karnataka	94	104	98
Kerala	310	306	308
Tamil Nadu	146	184	165
Telengana	98	95	97
Himachal Pradesh	82	51	79
Uttarakhand	77	111	84
Sikkim	34	67	41
Arunachal Pradesh	95	49	88
Nagaland	31	19	28
Manipur	26	4	19
Mizoram	26	31	28
Tripura	35	51	39
Meghalaya	33	26	32
Goa	160	194	181
Chandigarh	109	135	134
Daman & Diu	39	186	165
Dadra Nagar Haveli	56	165	106
Lakshadweep	159	219	208
Puducherry	175	227	207
Andaman & Nicobar Islands	188	157	178
India	89	118	98

Source: Government of India (2016).

Table 3
Ailing persons per 1000 population (PAP) by background characteristics, 2014

Background characteristics	Category	PAP
Residence	Rural	89
	Urban	118
Social Group	ST	68
	SC	92
	OBC	98
	Others	111
Religion	Hindu	95
	Muslim	94
	Christian	166
	Others	126
Level of Education	Illiterate	123
	Primary	90
	Middle	87
	Secondary	86
	Higher Secondary	78
Source of Drinking Water	Improved source	137
	Unimproved source	94
Sanitation Facilities	Have latrine	98
	Don't have latrine	56
Energy for Cooking	Improved source	116
	Unimproved source	88
Household Size	≤4	126
	5-7	85
	≥8	68
MPCE-Quintiles	1st Quintile	67
	2nd Quintile	79
	3rd Quintile	89
	4th Quintile	112
	5th Quintile	147
Age group	0-4	106
	5-9	64
	10-14	48
	15-29	47
	30-44	84
	45-59	157
	60-69	286
	70+	315
Gender	Male	86
	Female	110
Marital Status	Never married	62
	Currently married	115
	Widowed / divorced / separated	252

Table 4
Hospitalisation rates in India 1995-2014

NSS rounds	Rural	Urban	Total
1995-96	13	20	15
2004	23	31	25
2014 (including hospitalisation for child birth)	44	49	46
2014 (excluding hospitalisation for child birth)	30	37	32

Source: Government of India (1998; 2006; 2016).

Table 5
Hospitalisation rates in states and Union Territories in India, 2014

States/UTs	Hospitalisation rate (IC)			Hospitalisation rate (EC)		
	Rural	Urban	Total	Rural	Urban	Total
Delhi	15	36	35	10	26	25
Jammu & Kashmir	39	37	39	26	25	26
Punjab	41	40	41	30	30	30
Haryana	42	50	45	27	38	31
Bihar	34	33	34	20	20	20
Jharkhand	32	35	32	14	22	16
Uttar Pradesh	34	40	35	21	29	22
Madhya Pradesh	40	44	41	24	31	26
Chhattisgarh	31	42	33	24	30	25
Assam	28	36	29	12	22	14
West Bengal	50	51	50	36	40	37
Orissa	45	51	46	30	38	31
Rajasthan	47	43	46	27	28	27
Gujarat	48	49	48	32	36	34
Maharashtra	53	47	50	38	35	37
Andhra Pradesh	59	55	58	46	44	46
Karnataka	52	49	51	37	37	37
Kerala	117	99	109	104	87	96
Tamil Nadu	57	59	58	46	48	47
Telangana	48	49	48	36	37	36
Himachal Pradesh	57	33	55	47	25	45
Uttarakhand	30	37	31	19	26	20
Sikkim	26	33	27	18	23	19
Arunachal Pradesh	34	41	35	30	34	31
Nagaland	17	22	19	13	15	14
Manipur	43	35	40	24	19	22
Mizoram	36	41	38	24	26	25
Tripura	55	57	55	44	44	44
Meghalaya	27	35	29	12	22	13
Goa	44	40	42	35	32	33
Chandigarh	28	35	35	16	22	22
Daman & Diu	55	53	53	43	44	44
Dadra & Nagar Haveli	49	54	51	37	43	39
Lakshadweep	47	76	71	32	65	59
Puducherry	58	63	61	47	50	49
Andaman & Nicobar Islands	52	61	55	38	50	42

Source: Government of India (1998; 2006; 2016).
Remarks: IC = Including childbirth; EC=Excluding childbirth

Table 6
Regional variation in hospitalisation rate in India, 2014

Region	Hospitalisation rate (IC)			Hospitalisation rate (EC)		
	Rural	Urban	Total	Rural	Urban	Total
North	44	41	43	28	29	28
Central	35	41	37	22	30	24
East	40	45	41	26	33	27
Northeast	31	38	32	16	24	17
West	51	48	50	36	35	36
South	63	61	62	50	49	49
Total	44	49	46	30	37	32

Source: Government of India (2016).
Remarks: IC= Including childbirth, EC= Excluding childbirth

Table 7
Hospitalisation rates by background characteristics of population, India, 2014

Background Characteristics	Category	Including childbirth	Excluding childbirth
Place of Residence	Rural	44	30
	Urban	49	37
Social Group	ST	37	23
	SC	47	32
	OBC	45	32
	Others	48	35
Religion	Hindu	45	32
	Muslim	47	31
	Christian	61	50
	Others	45	33
Level of Education	Non literate	46	36
	Primary	36	26
	middle	49	31
	Secondary	49	30
	Higher Secondary	49	28
Source of drinking water	Unimproved source	62	47
	Improved source	44	31
Sanitation Facilities	No latrine	41	27
	Latrine is present	49	36
Size of Household	≤4	49	39
	5-7	43	29
	≥8	46	24
MPCE-Quintile	1st Quintile	33	19
	2nd Quintile	42	27
	3rd Quintile	47	32
	4th Quintile	51	38
	5th Quintile	61	51
Gender	Male	31	31
	Female	61	33
Age Group	0-14	18	18
	15-29	63	23
	30-44	42	30
	45-59	49	49
	60+	89	89
Marital status	Never married	18	18
	Currently married	66	39
	Widowed/divorced/separated	66	65

Source: Government of India (2016).

Table 8
Causes of morbidity in India, 2014

Nature of Ailment	Frequency	Percent
Infection	31706220	26.5
Respiratory	16958670	14.2
Cardiovascular	15565222	13
Endocrine, Metabolic & Nutrition	13962025	11.7
Musculoskeletal	13229065	11.1
Gastro-intestinal	7713330	6.5
Psychiatric & Neurological	6156374	5.2
Skin	2834892	2.4
Others	2735636	2.3
Genito-urinary	2191953	1.8
Injuries	1993646	1.7
Eye	1706946	1.4
Blood diseases	1026129	0.9
Ear	760340	0.6
Cancers	452513	0.4
Obstetric & Neonatal	364060	0.3
Childbirth	146562	0.1

Source: Government of India (2016).

Table 9
Reasons for hospitalisation in India, 2014

Nature of Ailments	Including childbirth		Excluding childbirth	
	Estimated number	Percent	Estimated number	Percent
Childbirth	15617000	27.3	-	-
Infection	10381099	18.1	10381099	24.9
Injuries	4619876	8.1	4619876	11.1
Gastro-intestinal	4540520	7.9	4540520	10.9
Cardiovascular	3782374	6.6	3782374	9.1
Genito-urinary	2801133	4.9	2801133	6.7
Psychiatric & Neurological	2487836	4.3	2487836	6
Obstetric & Neonatal	2264628	4	2264628	5.4
Respiratory	2140762	3.7	2140762	5.1
Musculoskeletal	1966211	3.4	1966211	4.7
Eye	1894407	3.3	1894407	4.6
Others	1264858	2.2	1264858	3
Endocrine, Metabolic & Nutrition	1110097	1.9	1110097	2.7
Cancers	978764	1.7	978764	2.4
Blood diseases	810752	1.4	810752	1.9
Skin	380346	0.7	380346	0.9
Ear	188013	0.3	188013	0.5
Total	57228677	100	41611677	100

Source: Government of India (2016).

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Gender Gap in Contraceptive Use in India

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Introduction

According to the 2011 population census, India's population was enumerated to be 1210 million at 0.00 hours of 31st March, 2011. On the other hand, the 2017 revision of population estimates and projections prepared by the United Nations Population Division, India's population is estimated to have crossed 1340 million mark in July 2017 (United Nations, 2017). With the current population trend, India is slated to become the most populous country of the world, surpassing China in 2024. During the period 2010-15, the average annual population growth rate in India was estimated to be 1.23 per cent per year, which is well above the average annual population growth rate of 0.54 per cent per year in China. The National Population Policy 2000 had set a target of achieving the replacement fertility by the year 2010 and population stabilisation by 2040 (Government of India, 2000). However, estimates available from the sample registration system indicate that the total fertility rate is still well above the replacement level (Government of India, 2015) and the latest medium variant of the population projections prepared by the United Nations Population Division that India will not be able to achieve the replacement fertility before 2025. It is also projected that India's population will continue to increase till 2061 when it will reach almost 1680 million. This is so when India was the first country in the world to launch an official population policy and an official family planning programme way back in 1952. It appears that India's efforts to reduce the birth rate and control the growth of population have somewhere fallen short of expectations, which has implications for sustainable development - economic growth, social inclusion and environmental protection as outlined in the 2030 sustainable development agenda - Safe Guarding Our Future - adopted by the United Nations (United Nations 2015). Over the years, the use of family planning methods in the country has turned a prerogative of females only with male contraceptive users constituting an insignificant proportion of total contraceptive users (Government of India, 2016).

It is in the above context that the present paper analyses the gender gap in contraceptive use in India. The paper also explores the difference, if any, in the gender gap in selected northern states - Uttar Pradesh, Madhya Pradesh, Rajasthan - and selected southern states - Andhra Pradesh, Tamil Nadu, Karnataka, Kerala - as the contraceptive prevalence rate in the northern part is substantially lower than the in the southern part of the country. Finally, the paper also analyses underlying factors that influence the gender balance in contraceptive use.

Family planning in India has a history of several upheavals and controversies. In order to understand or analyse the gender gap in contraceptive use, the first need, therefore, is to have a look at the history of family planning efforts including the availability and affordability of contraceptive methods and the initiatives taken by the government towards promoting the use of family planning methods to achieve the small family norm, which is a precondition for achieving population stabilisation.

There are different types of contraceptive methods ranging from traditional family planning methods, which are the least invasive, to sterilization either male and female, which are the most invasive require doctor intervention. Different family planning methods are conventionally divided into traditional methods and modern methods. Modern contraceptive methods are further categorised as modern spacing methods and terminal methods and emergency contraceptive methods (WHO, 2011). Traditional methods are also known as natural methods, while terminal methods are also termed as irreversible methods. Some of the family planning methods, either traditional or modern spacing or terminal, are meant to be used by men, while others are meant to be pursued by females. For example, vasectomy is a terminal method that is used by men, whereas tubectomy is a terminal method that is used by women to prevent birth. All contraceptive methods have their own pros and cons and no method is fully effective in preventing a pregnancy (WHO, 2011; Trusell, 2011). If a woman gets pregnant even after using a particular contraceptive method or a combination of contraceptive methods, the only option to terminate the pregnancy is abortion.

The use or the practice of contraceptive method has two dimensions - the demand dimension and the supply dimension. The demand side factors are primarily related to the willingness of the couple to plan the family by regulating fertility and to stop child bearing when the desired family size is achieved. The supply side factors on the other hand are different for different family planning methods. In case of traditional methods, the supply side constraints are primarily related to the correct knowledge about how to practice the method so as to enhance its effectiveness. On the other hand, supply side factors are major determining factors of the use of modern spacing and emergency contraceptive methods. Availability of modern spacing methods at an affordable cost is a major challenge to the use of these methods. Finally, the use of terminal methods of contraception is entirely dependent upon the availability and access to health care facilities and the efficiency and quality of services available at these facilities. Use of terminal methods is an invasive process, which requires the availability of the services of a trained health professional as a precondition.

Review of Literature

Use of modern contraceptive methods has increased manifolds in India since the 1970, characterised by a predominance of female sterilisation. There are many studies that have analysed reasons behind women's choice of female sterilisation, but there are few studies from the male perspective (Char et al, 2009). The high prevalence of female sterilisation in India is in accordance with the global pattern, especially, among the developing countries (Zavier and Padmadas, 2000). It is argued that this procedure is welcomed by some women as a permanent barrier to pregnancy while others may be sterilised without the proper information about the procedure or complete understanding of after effects.

In India, male sterilisation was the main contraceptive method during the 1950s and 1960s. During the period of emergency (1976-77) men were offered compensation from the government for getting them vasectomised, often without fully informing them about the health risks and other consequences. Since then, vasectomies are extremely rare, and in a survey done in Uttar Pradesh, it was found that married men believe that female sterilisation is easier, less complicated, and has a shorter recovery time than male sterilisation (Mahmood, 1997).

Parental preference for son over daughter has been documented in many studies. In the desire to have a son, many couples continue to produce birth even after achieving their desired family size. Arnold (1987) found that the proportion of couples who did not want more children would increase on an average by 4.5 per cent in the absence of gender preference. Gulati et al (1996), in a study observed that preference for the male child over the female child is much higher in demographically backward states like Uttar Pradesh than in demographically advanced states of Kerala.

According to Kulkarni et al (1998), number and sex of living children have considerable influence on the practice of family planning. Sex preference is a major determinant of contraceptive use. Different studies show that the impressive decline in fertility has been accompanied by worrisome evidence of the emergence of son preference in the past decade, which is reflected in increasingly disproportional sex ratio at birth and at younger ages (Das Gupta and Bhat 1997, Basu 1999, Srinivasan 2005).

Men play a crucial role in the decision making process related to contraceptive use, especially, in a highly gender-stratified society. Many studies have examined men's attitude towards fertility and family planning and actual use of contraceptive methods. More research is however needed to examine whether men's attitude on gender equality is associated with contraceptive behaviour. Most of the research that has focussed on the decision making process related to contraceptive use has focussed on how women's lower autonomy and men's attitude about family planning have a strong influence on contraceptive use. It has been observed that gender sensitive decision making and equitable attitude show significant positive association while restrictions on wife's mobility have significant negative association with contraceptive use (Mishra, 2013). The majority of studies demonstrating an influence of husband's attitudes and preferences on women's

behaviour have focussed on women's perceptions of men's attitudes toward fertility and family planning and demonstrate the lack of communication and discussion between husband and wife on family planning.

Male involvement in regulating the family size has been a concern for the health policy makers for quite some time. The role of men in such matters is of great importance because the decision maker in the Indian families is generally the male. As such, their awareness and knowledge about family planning are essential prerequisites for taking correct decisions at the right time (Jayalakshmi et al, 2002). The National Health Policy 2017 calls for increasing the proportion of male sterilisation from the current less than 5 per cent to, at least, 30 per cent and, if possible, much higher (Government of India, 2017).

Use of Modern Contraceptive Methods in India

The proportion of couples using a modern contraceptive method (MCPR) in India is estimated to have increased from 40.6 per cent in 1992-93 to more than 56 per cent in 2005-06. However, the latest round of the National Family Health Survey (NFHS) 2015-16 indicates that this proportion in the country has decreased to less than 54 per cent in 2015. According to the third round of NFHS 2005-06, 13 states had an MCPR lower than the national average whereas according to the fourth round of NFHS 2015-16, 22 states and Union Territories had an MCPR lower than the national average (Table 1). The most noticeable decrease in MCPR has occurred in Manipur. MCPR increased in Chhattisgarh, Jharkhand, Punjab and Rajasthan only between 2005-06 and 2015-16.

Female sterilisation continues to be the most dominant family planning method in the country. According to the fourth round of NFHS, female sterilisation accounted for almost 68 per cent of the total family planning use in the country in 2015-16. In 2005-06, female sterilisations accounted for only about 66 per cent of the total family planning use. By contrast, the share of the three most common modern spacing methods of family planning - male condom, oral pill and intrauterine device (IUD)) has increased only marginally from around 14 per cent in 1992–93 to 18 per cent in 2005–06, but decreased to around 11 per cent in 2015-16 according to the different rounds of the National Family and Health Survey. Condom alone accounts for 6 per cent of the total family planning use in the country and, together with the rhythm method (9 per cent) - a traditional method - is the most popular temporary methods of contraception in the country.

The slower than expected increase in the prevalence of temporary methods of family planning is not trivial as the official efforts to promote family planning have historically placed the maximum emphasis on sterilisation to limit births (Stan, 1996). Coercive male sterilisation drive in the seventies led to the falling of the ruling government and thus stigmatised the method completely, placing the burden of the programme on female sterilisation. In the last decade or so, there have been attempts to shift the focus of the official family planning efforts on methods to delay and space births, but the dominance of female sterilisation continues.

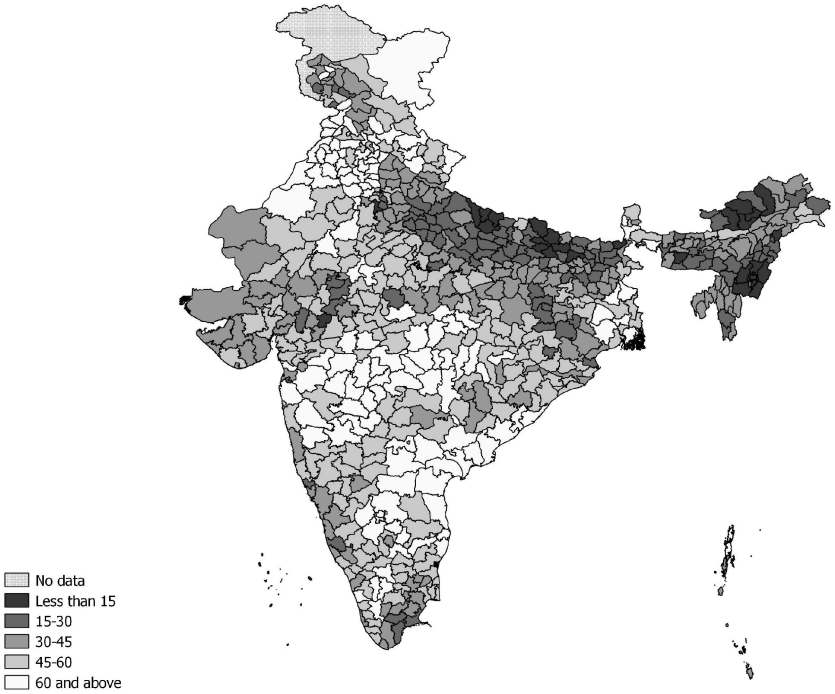
In general, Indian women who use temporary methods have a different socio-demographic profile than women who use permanent methods (either female or male sterilisation). Women using temporary methods are better educated and economically well off as compared to women who are sterilised. Similarly, the prevalence of spacing methods of contraception is higher in the urban areas whereas the prevalence of terminal methods is high in the rural areas. This profile reflects the effect of targeting poor, often rural, women through sterilisation campaigns, as well as advantages of living in urban areas where the access to family planning services and supplies is better especially for certain segments of the urban population. It is worth noting that the benefits of urban environments do not necessarily reach all segments of the population equitably, particularly, residents of slums, the poor, and other socially marginalised groups.

Unlike women who use a terminal method of contraception, women who use temporary methods are at risk of method failure and discontinuation while in need. As such, the chance of method failure and discontinuation is likely to increase with the increase in the use of terminal methods. Discontinuation while in need contributes to unmet need for family planning. The unmet need for family planning in the country was around 13 per cent in 2015-16 which is marginally lower than the unmet need in of 14 per cent in 2005-06. More than one in every five babies born in India are either mistimed (10 per cent) or unwanted (11 per cent), while one in every seven women has a pregnancy that ends in a still birth (e.g., spontaneous abortion, induced abortion, miscarriage, or stillbirth), although researchers argue that the proportion of unwanted births are under estimated. This is mainly because in after a birth, parents do a 'post-event rationalisation' as no parent would like to tell that their child is unwanted.

The discontinuation rate of different family planning methods in India is quite high ranging from 53 per cent for injectables, 49 per cent for oral pill and 45 per cent for condom. The discontinuation rate for different traditional methods is even higher. However, the overall discontinuation rate is lower because of a heavily skewed contraceptive method mix, which is dominated by female sterilisation. The use of temporary family planning method in India is mostly for birth spacing, while the most common reason for discontinuation is to become pregnant, followed by the concern over side effects and health.

Data available through the national family health survey also suggest that MCPR varies wide across the states and Union Territories of the country. The MCPR is estimated to be the highest in Himachal Pradesh, where almost three fourth of the women aged 15-49 years reported that either they or their husband was using a family planning method according to the fourth round of NFHS, 2015-16. By contrast, this proportion was the only about 34 per cent in Bihar, which is the lowest in the country and only around 36 per cent in Jharkhand. There are distinct regional patterns in MCPR in the country. In states located in the central, eastern and north-eastern part of the country, the MCPR is comparatively low with the exception of West Bengal and Tripura. By comparison, MCPR is relatively high in states and Union Territories located in the northern and southern parts of the country.

Figure 1
Prevalence of modern contraceptive methods (MCPR) in districts of India
2015-16



The National Family Health Survey 2015-16 also provides estimates of MCPR for the 640 districts of the country as they existed at the 2011 population census. These estimates suggest that the MCPR across the districts varies from a minimum of only 2.6 per cent in district Balrampur of Uttar Pradesh to 78.9 per cent in district Muktsar of Punjab. There are only 127 (19.8 per cent) districts where the MCPR is estimated to be at least 60 per cent around 2015-16 according to the National Family Health Survey (Table 2). This is so when the target of achieving an effective couple protection rate of 60 per cent by the year 2000 was set under the National Health Policy 1983 (Government of India, 1983). In more than 80 per cent districts of the country, the goal of protecting at least 60 per cent of the couples through the use of modern contraceptive methods could not be achieved even after 15 years the target date set under the National Health Policy 1983. Moreover, the regional pattern in MCPR is very much evident from figure 1. The MCPR is low to very low throughout the north-eastern part of the country as well as in most of the districts in Uttar Pradesh, Bihar and Jharkhand. In Gujarat and Odisha also, the prevalence of modern methods of contraception is estimated to be less than 60 per cent in almost all districts. On the other hand the prevalence of modern methods of contraception (MCPR) is estimated to be 60 per cent and higher in most of the districts in Andhra Pradesh and in majority of districts in Maharashtra, Punjab, Haryana and Uttarakhand.

Database and Methodology

The analysis is based on the data on contraceptive use available through the fourth (2015-16) round of the National Family and Health Survey (NFHS), which is a large-scale, multi round survey conducted in a representative sample of households (Government of India, 2016). The survey provides national and state level information on a range of population and health related issues including fertility, infant and child mortality, practice of family planning, maternal and child health, reproductive health, nutrition, anaemia, utilisation and quality of health and family planning services. Details of the survey are given elsewhere (IIPS and Macro International, 2007).

The gender gap in contraceptive use has been analysed in terms of the disparity in the prevalence of female family planning methods and the prevalence of male family planning methods, which is the sum of male sterilisation and condom. The National Family Health Survey, 2015-16 provides estimates of the prevalence female sterilisation, IUD, oral pill, male sterilisation and condom, which permit estimation of the prevalence of female and male family planning methods. Using these estimates, the gender gap index in contraceptive use has been measured in terms of Sopher's disparity index (Sopher, 1974), which is the logarithm of the odds ratio of the prevalence of female family planning methods to the prevalence of male family planning methods. If p denotes the proportion of family planning acceptors using female family planning methods and q denotes the proportion of family planning acceptors using male family planning methods, then the Sopher's disparity index D is defined as

$$D = Log\left(\frac{p*(1-q)}{q*(1-p)}\right)$$

Notice that D is equal to zero when $p=q$ in which case there is no gender gap in contraceptive use. On the other hand when $p>q$, D is positive but when $q>p$, D is negative. The larger is the deviation of D from the limiting value of zero, the larger is the gender disparity in contraceptive use.

It may also be noticed that, in the present context, $q=1-p$. Accordingly, the gender gap index in contraceptive use, G, based on the Sopher's disparity index is equal to

$$G = 2*Log\left(\frac{p}{1-p}\right) = 2*Log\left(\frac{1-q}{q}\right)$$

Obviously $G=0$ when $p=q=0.5$. When $G>0$, the gender gap in contraceptive use is positive; and when $G<0$, it is negative. A positive value of G indicates that the prevalence of female family planning methods is higher than the prevalence of male family planning methods. On the other hand, a negative value of G indicates that the prevalence of male family planning methods is higher than the prevalence of female family planning methods. The larger the deviation of G the larger gender disparity in contraceptive use.

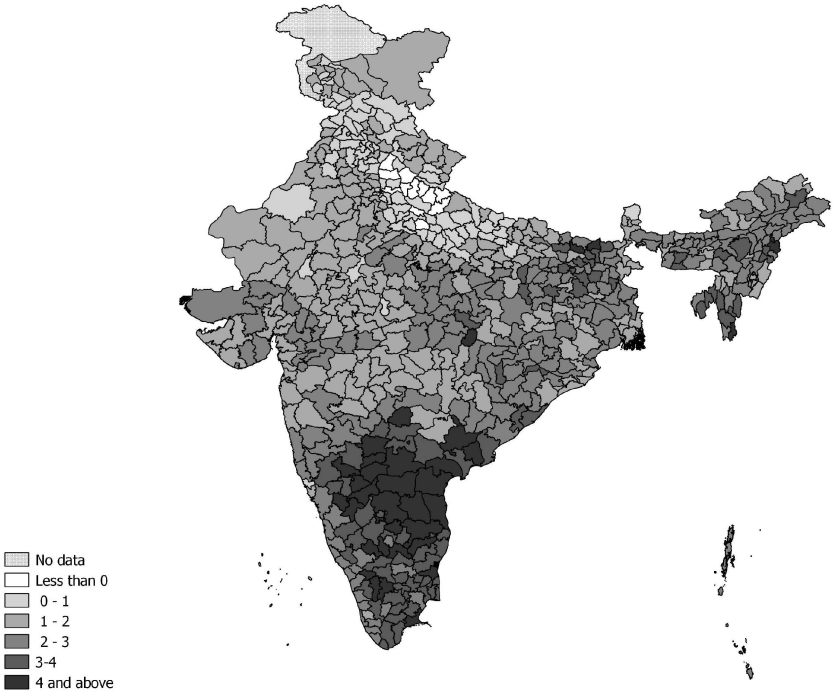
Gender Gap in Contraceptive Use

Estimates of the gender gap index in contraceptive use, *G*, for India, states and Union Territories are presented in table 3 for the period 2005-06 and 2015-16 as obtained from the data available from the National Family Health Survey. At the national level, the index, *G*, is positive and substantially different from zero, which indicates that the family planning use in India is substantially biased towards female family planning methods as compared to male family planning methods. Moreover, the index appears to have increased over time, which means that the biasedness towards female family planning methods in the contraceptive method mix of the country has increased, not decreased, in the recent past. According to the National Family health Survey 2015-16, 87.6 per cent of the family planning acceptors in the country were using a female family planning method - female sterilisation, IUD, oral pill - while only 12.4 per cent were using a male family planning method - male sterilisation and condom. Moreover, the index *G* is found to be substantially higher in the rural as compared to the urban areas of the country, where almost 91 per cent of the family planning users were using a female family planning method compared to less than 82 per cent in the urban areas. As a result, there exists a substantial difference in the index *G* in rural and urban areas of the country.

Among different states and Union territories of the country, the gender gap index of contraceptive use, *G*, varies widely ranging from just 0.034 in Chandigarh and 0.325 in Delhi to 3.947 in Andhra Pradesh and 3.712 in Puducherry (Table 3). There are only 12 states and Union Territories, where the index *G* is lower than the national average. Nine out of these 12 states and Union Territories are located in the northern part of the country. On the other hand, there are four states, where the index *G* is very high, which indicates a very strong gender biasedness in contraceptive use. All these four states are located in the southern part of the country. In general, north-south divide in the gender gap in contraceptive use is very much evident from table 3. In the southern part of the country, a very small proportion of the family planning acceptors are using a male family planning method according to the National Family Health Survey 2015-16 so that the contraceptive method mix is highly skewed towards female family planning methods. In the northern part of the country, however, the contraceptive method mix appears to relatively be more balanced as is reflected from low values of the index *G*. There is, however, no state or Union Territory in the country, where the index *G* is negative or the contraceptive method mix is biased towards males.

The variation in the index *G* across the districts of the country is even wider. Most interestingly, there are 14 districts in the country where the index *G* is negative which means that the prevalence of male family planning methods is higher than the prevalence of female family planning methods or the contraceptive method mix is biased towards male family planning methods. Twelve of these 14 districts are located in Uttar Pradesh while the other two are located in the National Capital Territory of Delhi (Table 3) and they constitute geographical continuity (Figure 2). On the other hand, there are 37 districts, where the index *G* is very high which means that the contraceptive methods mix in these districts is highly skewed in favour of female family planning methods. Thirty of

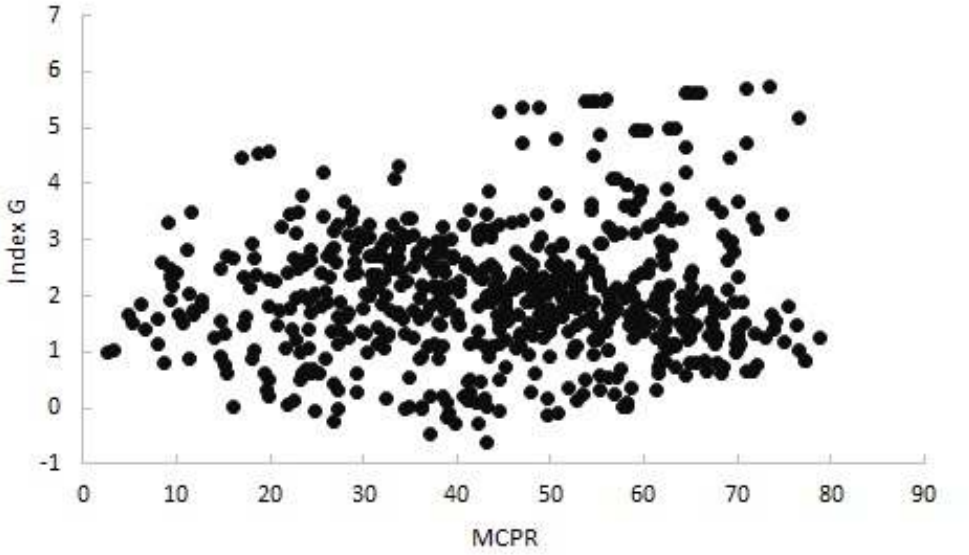
Figure 2
The gender gap index of contranceptive use (*G*) in districts of India
2015-16



these 37 districts are located in only four southern states - Andhra Pradesh, Karnataka, Tamil Nadu and Telangana - and they also constitute geographical continuity. In addition, there are only five states and Union Territories in the country where the index *G* is estimated to be more than 4 in at least one district indicating a very high degree of biasedness towards female family planning methods. These states are Bihar, Chhattisgarh, Mizoram, Nagaland and Puducherry. In more than two-third districts of the country, however, the index *G* ranges between 1 and 3, which confirms that the biasedness towards the use of female family planning methods is quite pervasive in the country and has persisted over time.

The gender gap in the contraceptive use, however, does not appear to be associated with the level of the prevalence of modern contraceptive methods (MCPR) on the basis of inter-district variation in the index *G* and inter-district variation in the prevalence of modern contraceptive methods as may be seen from figure 3. It is generally expected that with the increase in the use of contraception, the contraceptive method mix will get diversified, which, in turn, will lead to a decrease in the index *G*. However, the district level data provide little support to this conjecture. There is a substantial proportion of districts, where the index *G* is quite high despite the fact that the prevalence of the modern methods of contraception (MCPR) is also quite high. At the same time, there are districts, where the index *G* is low despite the fact that the prevalence of modern methods of contraception is also low in these districts. Figure 3, in fact, indicates that, in

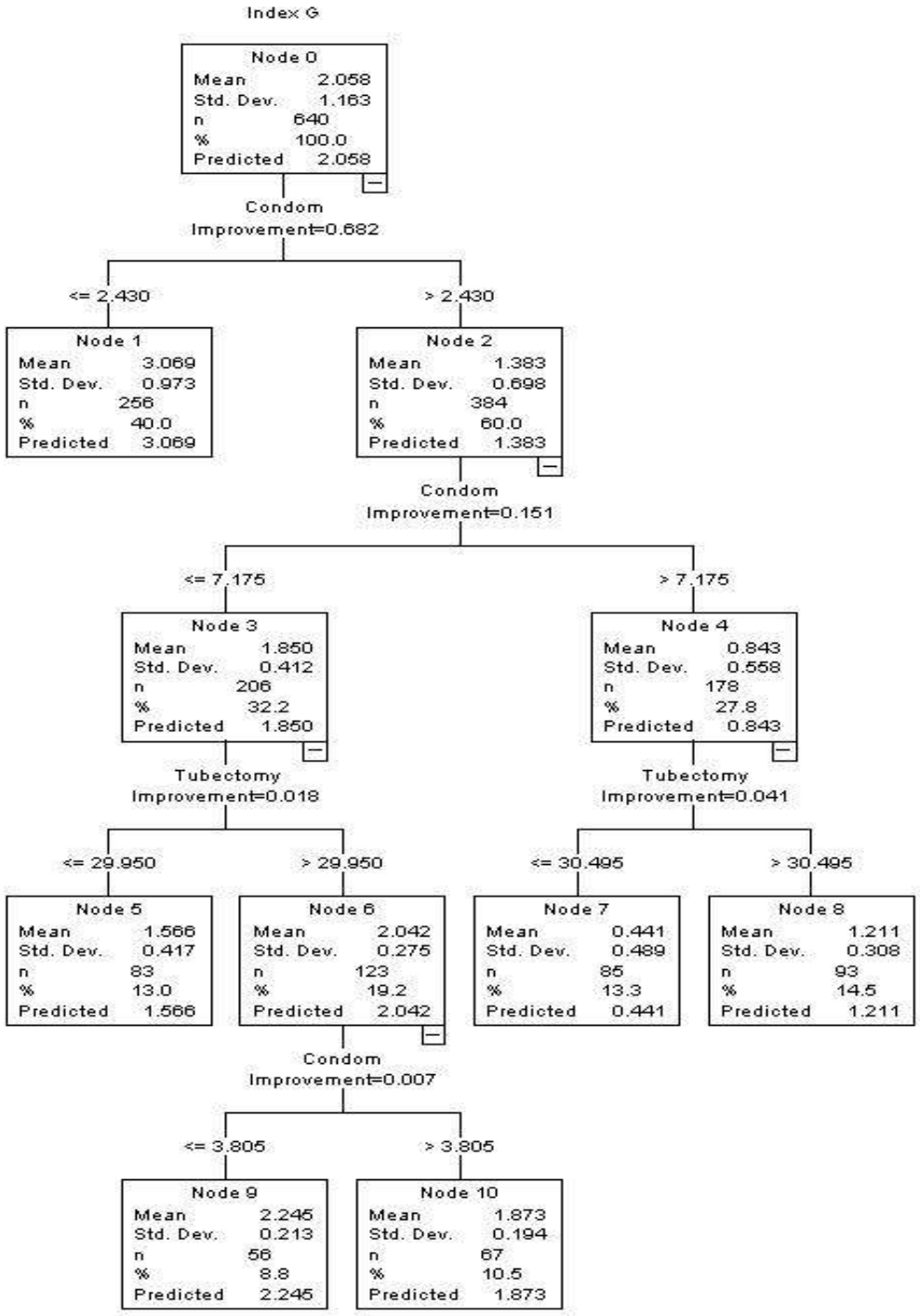
Figure 3
Gender gap in contraceptive use and level of contraceptive use
India, 2015-16



general, the prevalence of modern methods of contraception is largely dependent upon the prevalence of just one or two family planning methods so that the prevalence of a particular method of contraception largely determines both the level of the use and the gender gap in contraception. More specifically, the prevalence of the modern methods of contraception across the districts is largely contingent upon the prevalence of female sterilisation so that the prevalence of female sterilisation determines both the prevalence of modern methods of contraception as well as the gender gap in contraceptive use. On the basis of the district level data available from the National Family Health Survey 2015-16, the simple zero order correlation coefficient between the prevalence of modern methods of contraception and the prevalence of female sterilisation is estimated to be 0.835, which is statistically highly significant.

The data mining exercise using the classification and regression tree technique makes it possible to explore further the contribution of the prevalence of different family planning methods on the gender gap in contraceptive use as measured through the index *G*. Application of the classification and regression tree technique to the data on the prevalence of different family planning methods and the index *G* suggests that 640 districts of the country can be classified into six groups depending upon the prevalence of female sterilisation and the prevalence of condom and the gender gap in contraceptive use in the six groups of districts is essentially different. The data mining exercise also suggests that inter-district variation in the prevalence of IUD, oral pill and male sterilisation plays little role in the inter-district variation in the gender gap in contraceptive use as measured in terms of the index *G*. In other words, variation in the gender gap in contraceptive use across districts depends upon the prevalence of female sterilisation and condom only.

Figure 4
The classification tree



Results of the data mining exercise using classification and regression tree technique are presented in figure 4. At the first stage of classification, the 640 districts of the country are divided into two groups on the basis of the prevalence of condom - 256 (40 per cent) districts, where the prevalence of condom is less than or equal to 2.43 per cent and 384 (60 per cent) districts, where the prevalence of condom is more than 2.43 per cent. The average index *G* in the districts of the first group (3.07) is almost two times the average index *G* in the districts of the second group (1.38). This means that the districts, where the prevalence of condom is very low, the gender gap in contraceptive use is highly biased towards female family planning methods.

The districts belonging to the second group are further divided into five groups depending upon the prevalence of condom and the prevalence of female sterilisation. There are 56 (8.8 per cent) districts, where the average index *G* is the second highest (2.24). The prevalence of condom, in these districts, more than 2.43 but less than or equal to 3.81, while the prevalence of female sterilisation is more than 29.95 per cent. The average index *G* is the third highest in 67 (10.5 per cent) districts, where the prevalence of condom is more than 3.81 per cent, but less than 7.18 per cent, but the prevalence of female sterilisation is more than 29.95 per cent. There are 83 (13 per cent) districts, where the prevalence of condom is more than 2.43 per cent, but less than or equal to 7.18 per cent, whereas the prevalence of female sterilisation is less than or equal to 29.95 per cent. Similarly, there are 93 (14.5 per cent) districts where the prevalence of condom is more than 7.18 per cent and, at the same time, the prevalence of female sterilisation is more than 30.50 per cent. The gender gap in contraceptive use or the index *G*, in these districts is the second lowest, on average. Finally, there are 85 (13.3 per cent) districts, where the gender gap in contraceptive use is the lowest in the country. The prevalence of condom, in these districts is more than 7.18 per cent, but the prevalence of female sterilisation is less than or equal to 30.5 per cent. The data mining exercise also suggests that the role of inter-district variation in the prevalence of condom is the most important in deciding the inter-district variation in the index *G* or the gender gap in contraceptive use. The importance of the prevalence of oral pill and female sterilisation, on the other hand, is less than 50 per cent of the importance of the prevalence of condom, whereas the importance of the prevalence of male sterilisation and IUD is less than 20 per cent of the importance of condom.

The average prevalence of different modern family planning methods in the six groups of districts identified through the data mining exercise is presented in table 5. The average prevalence of condom in districts of group 5 and group 6 is very high compared to the average prevalence in districts of other groups. Similarly, the average prevalence of female sterilisation in districts of group 4 and group 6 is substantially lower than the average prevalence in districts of other groups identified through the data mining exercise. The prevalence of other family planning methods also varies widely across the six groups of districts. However, the variation in the average prevalence of these methods across different groups of districts is not as marked as the variation in the average prevalence of female sterilisation and condom.

Figure 5
Regional distribution of districts belonging to different categories identified through data mining exercise

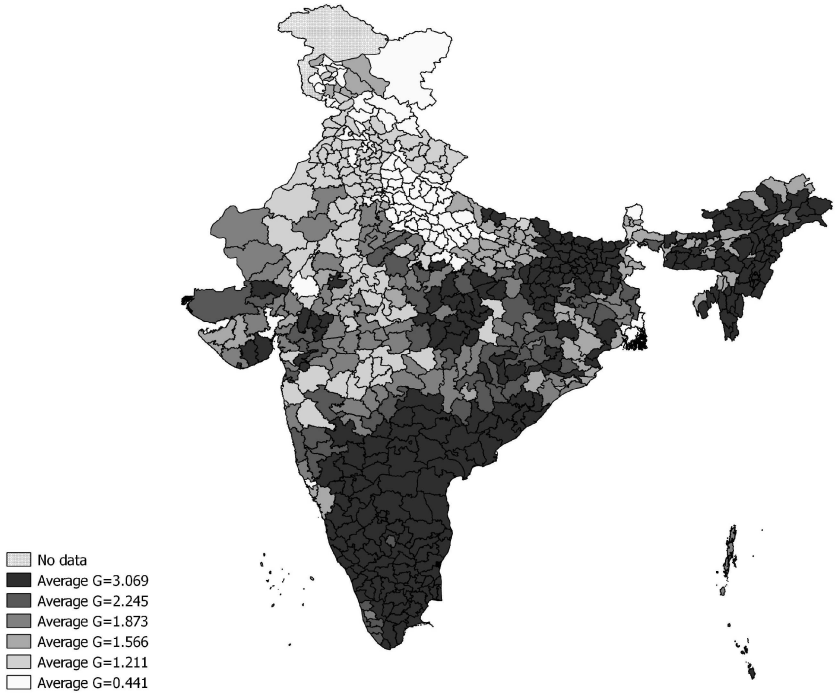


Figure 6 shows the distribution of districts in different states and Union Territories of the country according to the six groups of districts identified through the data mining exercise using the classification and regression tree technique. The regional pattern of the districts in terms of the gender gap in contraceptive use is very much obvious from the figure. Nearly all the districts belonging to group 1 - districts with the highest gender gap in contraceptive use (index *G*), on average - are located in the southern and north-eastern parts of the country. Some of the districts belonging to this category are also located in the central part of the country, especially in Jharkhand, Madhya Pradesh and Odisha. In Bihar also, all the 38 districts belong to this category. There is no district in the northern part of the country, which belongs to this category. On the other hand, 78 of the 85 districts belonging to group or category six - districts with the lowest gender gap in contraceptive use (index *G*), on average, - are located in the northern part of the country. In the National Capital Territory of Delhi, all the 9 districts belong to this group of districts. In Uttar Pradesh 37 of the 71 districts belong to this group of districts and all these 37 districts of the state are located in the north-western part of the state. It may also be seen from the table, that the gender balance in contraceptive use is comparatively more diverse in the central part of the country, especially, in states of Rajasthan, Gujarat, Madhya Pradesh and Maharashtra, as compared to its southern, northern and north-eastern parts.

Discussions and Conclusions

The present analysis, based on the latest data available through the National Family Health Survey 2015-16, highlights wide variation in both prevalence of modern contraceptive methods and gender gap in the use of modern contraceptive methods across the country, especially across the 640 districts as they existed at the time of 2011 population census. The analysis reveals that the gender gap in contraceptive use has some very distinctive regional pattern. Although, in majority of the districts, the gender balance in contraceptive use is highly biased towards female family planning methods, yet, there are more than 13 per cent districts in the country, where the gender balance in contraceptive use is very balanced. Moreover, the inter-district variation in the gender gap in contraceptive use is largely the result of the inter-district variation in the prevalence of female sterilisation and inter-district variation in the prevalence of condom. In districts, where the gender gap in contraceptive use is relatively more balanced, the prevalence of condom is very high. It is also obvious from the analysis that the country or even the state level aggregates in terms of either contraceptive prevalence rate, or contraceptive method mix or gender gap in contraceptive use do not reflect the wide variation in the level of the use of modern contraceptive methods and the gender gap in contraceptive use across the districts of the country.

Wide variation in the prevalence of modern family planning methods and in the gender balance in contraceptive use and the regional clustering of the districts in terms of the prevalence of and gender balance in contraceptive use may be the result of factors endogenous and factors exogenous to the family planning services delivery system. There is, however, very little investigation of the relationship between the administrative capacity and organisation efficiency of the family planning services delivery system and the prevalence of the modern methods of contraception as well as gender balance in the use of modern family planning methods. At the same time, there is very little understanding about the reasons for very high prevalence of condom in the northern part of the country. In any case, the analysis clearly emphasises the need of a district-based decentralised approach of planning and programming for family planning services delivery to make sure that so as to improve not only the effectiveness of family planning in the context of reduction in fertility and population stabilisation but also in terms of improving the health of women and children as laid down in the National Health Policy 2017. In the southern part of the country, the prevalence of modern methods of contraception is quite high but at the same time, the entire family planning use appears to be limited to female sterilisation only. Such a contraceptive method mix has important implications for the health of women and children as family planning is practised primarily for birth limitation and not for birth planning. On the other hand, a high prevalence of condom in the northern part of the country has implications for fertility reduction as the efficiency of condom in preventing pregnancy is substantially lower than that of sterilisation either female or male. In order to improve the effectiveness of family planning in the context of both maternal and child health and fertility reduction, it is imperative that the local context of family planning should be a priority in family planning services delivery.

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Table 1
Trends in the prevalence of modern methods of contraception in India

Period	Sterilisation		IUD	Oral Pill	Condom	Modern family planning methods
	Female	Male				
1992-93	27.3	3.5	5.3	5.1	7.1	48.3
1998-99	34.2	2.1	1.6	2.1	3.1	43.1
2005-06	37.3	1	1.7	3.1	5.2	48.3
2015-16	36	0.3	1.5	4.1	5.6	47.5

Source: National Family Health Survey (different rounds).

Table 2
Gender disparity index *G* in contrceptive use in India

Country / State	2005-06	2015-16		
	Total	Total	Rural	Urban
India	1.654	1.698	1.997	1.303
Aandaman & Nicobar Islands	na	2.048	1.930	2.300
Andhra Pradesh	na	3.947	4.597	3.226
Arunachal Pradesh	2.138	2.497	2.602	1.925
Assam	1.986	2.153	2.366	1.362
Bihar	1.902	2.692	2.847	2.191
Chandigarh	na	0.034	na	0.007
Chhattisgarh	1.679	2.069	2.378	1.478
Dadra and Nagar Haveli	na	1.933	2.644	1.324
Daman and Diu	na	2.261	2.280	2.251
Delhi	0.274	0.325	0.641	0.323
Goa	1.185	0.787	0.455	0.861
Gujarat	1.786	1.762	2.292	1.301
Haryana	1.126	1.134	1.295	0.892
Himachal Pradesh	0.949	0.775	0.811	0.426
Jammu & Kashmir	1.005	0.911	0.960	0.842
Jharkhand	1.905	2.320	2.650	1.799
Kerala	2.994	3.141	3.847	2.573
Karnataka	1.796	2.526	2.661	2.387
Lakshadweep	na	0.918	1.914	0.855
Madhya Pradesh	1.768	1.834	2.343	1.104
Maharashtra	1.662	1.721	2.094	1.392
Manipur	1.228	1.769	1.896	1.594
Meghalaya	1.637	2.386	2.702	1.762
Mizoram	3.238	2.848	2.941	2.788
Nagaland	1.731	2.341	2.542	2.114
Odisha	2.017	2.124	2.385	1.392
Puducherry	na	3.712	3.362	3.917
Punjab	0.742	0.763	0.923	0.538
Rajasthan	1.522	1.398	1.712	0.779
Sikkim	1.266	1.227	1.254	1.152
Tamil Nadu	2.647	3.565	4.069	3.275
Telangana	na	2.854	2.898	2.799
Tripura	2.084	2.673	3.052	2.119
Uttarakhand	0.730	0.552	0.832	0.004
Uttar Pradesh	0.671	0.567	0.875	0.067
West Bengal	1.890	1.843	2.288	1.162

Source: Author's calculations

Table 3
Gender gap in contraceptive use in districts of India, 2015-16

Country / State	Number of districts where index G is						Number
	<0	0-1	1-2	2-3	3-4	≥4	of districts
Andaman & Nicobar Islands	0	0	0	3	0	0	3
Andhra Pradesh	0	0	0	1	4	8	13
Arunachal Pradesh	0	0	5	10	1	0	16
Assam	0	0	6	20	1	0	27
Bihar	0	0	6	19	11	2	38
Chandigarh	0	1	0	0	0	0	1
Chhattisgarh	0	0	8	9	0	1	18
Dadara & Nagar Haveli	0	0	1	0	0	0	1
Daman and Dieu	0	0	0	2	0	0	2
Delhi	2	7	0	0	0	0	9
Goa	0	1	1	0	0	0	2
Gujarat	0	0	13	13	0	0	26
Haryana	0	7	14	0	0	0	21
Himachal Pradesh	0	7	5	0	0	0	12
Jammu & Kashmir	0	9	13	0	0	0	22
Jharkhand	0	0	7	13	4	0	24
Karnataka	0	0	0	6	13	11	30
Kerala	0	0	1	11	2	0	14
Lakshadweep	0	1	0	0	0	0	1
Madhya Pradesh	0	1	22	26	1	0	50
Maharashtra	0	0	23	12	0	0	35
Manipur	0	0	5	4	0	0	9
Meghalaya	0	0	2	3	2	0	7
Mizoram	0	0	0	3	4	1	8
Nagaland	0	0	1	6	2	2	11
Odisha	0	0	9	19	2	0	30
Puducherry	0	0	0	2	1	1	4
Punjab	0	14	6	0	0	0	20
Rajasthan	0	3	29	1	0	0	33
Sikkim	0	1	3	0	0	0	4
Telangana	0	0	2	1	3	4	10
Tamil Nadu	0	0	0	3	22	7	32
Tripura	0	0	0	1	3	0	4
Uttar Pradesh	12	31	25	3	0	0	71
Uttarakhand	0	5	8	0	0	0	13
West Bengal	0	1	8	10	0	0	19
India	14	89	223	201	76	37	640

Source: Author's calculations.

Table 4
Results of the data mining exercise

Category	Prevalence of		Index *G*		N
	Condom	Female sterilisation	Mean	SD	
1	≤2.430	All	3.069	0.973	256
2	>2.430 and ≤3.805	>29.950	2.245	0.213	56
3	>3.805 and ≤7.175	>29.950	1.873	0.194	87
4	>2.430 and ≤7.175	≤29.950	1.566	0.417	83
5	>7.175	>30.495	1.211	0.308	93
6	>7.175	≤30.495	0.441	0.489	85
All	All	All	2.058	1.163	640

Source: Author's calculations.

Table 5
Unweighted average prevalence of different contraceptive methods in different groups of districts identified through data mining exercise

Groups	Average prevalence of					
	Female sterilisation	Male sterilisation	IUD	Oral pill	Condom	All modern methods
1	32.88	0.23	1.64	3.92	1.07	39.24
2	41.19	0.35	1.14	3.93	3.18	49.79
3	45.16	0.48	1.3	2.88	5.32	55.16
4	17.45	0.24	2.24	6.64	4.33	32.97
5	43.33	0.53	3.33	2.4	12.28	62.21
6	18.3	0.88	2.78	3.91	14.47	40.34
All	36.01	0.27	1.53	4.05	5.62	47.48

Source: Author's calculations.

Table 6
Distribution of districts of different categories across states and Union Territories

Country / State	Gender gap in contraceptive use (Index *G*)						Total
	Very very high	Very high	Medium	Low	Very low	Very very low	
Jammu & Kashmir	0	0	0	7	4	11	22
Himachal Padesh	0	0	0	0	6	6	12
Punjab	0	0	0	0	14	6	20
Chandigarh	0	0	0	0	0	1	1
Uttarakhand	0	0	0	0	9	4	13
Haryana	0	0	0	2	16	3	21
Delhi	0	0	0	0	0	9	9
Rajasthan	0	0	14	2	16	1	33
Uttar Pradesh	3	3	2	22	4	37	71
Bihar	38	0	0	0	0	0	38
Sikkim	0	0	0	3	0	1	4
Arunachal Pradesh	13	0	0	3	0	0	16
Nagaland	10	0	0	1	0	0	11
Manipur	9	0	0	0	0	0	9
Mizoram	8	0	0	0	0	0	8
Tripura	3	0	0	1	0	0	4
Mieghalaya	6	0	0	1	0	0	7
Assam	14	1	0	12	0	0	27
West Bengal	1	5	3	5	1	4	19
Jharkhand	14	4	1	5	0	0	24
Odisha	12	7	4	7	0	0	30
Chhattisgarh	4	7	4	1	2	0	18
Madhya Pradesh	17	7	14	4	8	0	50
Gujarat	7	5	8	4	1	1	26
Daman & Diu	1	0	1	0	0	0	2
Dadra & Nagar Haveli	0	1	0	0	0	0	1
Maharashtra	1	9	13	0	12	0	35
Andhra Pradesh	23	0	0	0	0	0	23
Karnataka	28	1	0	1	0	0	30
Goa	0	0	0	1	0	1	2
Lakshadweep	0	0	0	1	0	0	1
Kerala	8	5	1	0	0	0	14
Tamil Nadu	32	0	0	0	0	0	32
Puducherry	3	1	0	0	0	0	4
Andaman & Nicobar Islands	1	0	2	0	0	0	3
India	256	56	67	83	93	85	640

Source: Author's calculations.

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Reproductive Health and Treatment Seeking Behaviour of Youths in India

Tushar Savarkar

Introduction

India has the largest youth population in the world. Youths in India are an asset for achieving social, economic and political goals. They can also play an important role in population stabilisation. The demographic dividend of India is not only large in size but heterogeneous (Savarkar, 2015). Indian youths, however, face problems like, illiteracy, limited employment opportunities and poverty (IIPS and Population Council, 2010). Despite been engulfed in many problems, the current generation of Indian youths is far better than the youths of previous generation as regards health, education and modernisation. As the youths move from adolescence to adulthood, they need sufficient knowledge and information related to sexual and reproductive health. However, a large section of Indian youths is less informed about sexual and reproductive matters of the life (Jejeebhoy and Sebastian, 2003). Youths, as a group, are also considered as the agents for social change. The increase in the age at marriage and concomitant decrease in the age of puberty has increased the chances of premarital sexual relations. As such, there is a need to empower youths through proper and adequate knowledge about reproductive health matters (Rachna, 2006). It may be argued that lack or incomplete knowledge may bias the treatment seeking behaviour of youths, especially, in the context of reproductive and sexual health problems.

It is in the above context that the present study attempts to analyse the treatment seeking behaviour of youths in India. The study has two objectives. The first objective is to analyse the treatment seeking behaviour of genital infections among youths in India. The second objective, on the other hand, is to identify social and economic determinants of treatment seeking behaviour related to reproductive health problems among youth in India. A youth, in the present study has been defined as a person in the age group 15-24 years. This definition is consistent with the definition of the youth adopted throughout the world.

Review of Literature

India is the second most populous country in the world and has a very large youth population. As such, providing information about reproductive health in general and family planing in particular to the youth population of the country is important to reduce fertility. Reproductive health awareness among youth is a challenging task in India because the discussion about issues related to sexual and reproductive health including use of family planning methods cannot be done freely in the Indian society because of a number of taboos engulfing the issue. It is well known that social, cultural and economic factors influence the awareness regarding reproductive health issues and concerns, although education is the most important intervention to increase the reproductive health awareness among youths (Vinitha et al, 2007).

According to Jejeebhoy (1997), more attention has been paid to physical infrastructure, personnel and equipment than on quality of care especially from the woman's (client's) perspective in the delivery of reproductive health services in India. Quality of care comprises several dimensions including availability of a wide range of contraceptive methods, maternal and child health services, access to complete and accurate information about contraceptive methods including their health risks and benefits, safe and affordable services along with high quality supplies, well-trained service providers with skills in inter-personal communication and counseling, effective follow-up and care and regular monitoring and evaluation of the performance incorporating the perspectives of clients and beneficiaries. While the poor quality of care can inhibit women from seeking health care, women's lack of autonomy in decision-making is also an important constraint on women's health seeking behaviour. Women are, by and large, taught self-denial and modesty from an early age and, therefore, are unlikely to acknowledge health problems, particularly a gynecological problems, unless it is very advanced (SEWA, 1994). In tribal and remote areas, people cannot afford to visit towns or cities for treatment of their health problems and, therefore, they rely upon traditional faith healers for the treatment of their ills. Although, examinations and consultations at public health institutions in India is largely free, yet, the cost of allopathic medicines prescribed by the doctors is a major deterrent by way of treatment for a long duration. Inaccessibility due to lack of transportation, unsympathetic attitude of the staff dispensing the health services and either shortage or non-availability of medicines locally further exacerbate the situation. In the rural areas, the quality of these services, especially, services available at public health institutions is very poor (Dreze and Sen, 1995; World Bank, 1995) which compels individuals, willy-nilly, to visit private health care facilities. Moreover, indirect costs like the time and money involved in travelling to a health care facility also serve as a deterrent for the rural population (Uplekar and George, 1994). According to Sharma (2003), knowledge about the source of treatment of reproductive health problems among adolescent women was found to be poor. Most women were unaware of the source of treatment for their reproductive health problems. In case of treatment of gynecological morbidity, majority of women sought treatment from private providers. According to

Nagda (2004), health seeking behaviour and health expenditure of the tribal households is influenced by their economic, demographic and household characteristics. Tribals have less faith in government allopathic treatment because of lack of timely availability of physical and human resources necessary for treatment. Ghosh (2004) has argued that there is significant impact of gender on treatment seeking behaviour, especially, treatment of reproductive health problems. The decision related to the tretment of the reproductive health problems of females is influenced by other members in the family. Health and health seeking behavior of youths is influenced by many factors such as age, gender, education, place of residence, caste and religion, etc. Every fifth person in India belongs to the age group 15-24 years. However, social, economic and cultural factors create obstacles in increasing the awareness as well as treatment of the reproductive health problems faced by the youth, especially, females. It is, therefore, necessary to understand the factors affecting the treatment seeking behavior of youth, especially, in the context of sexual and reproductive problems.

Data Source and Methodology

The study is based on the data available through a survey carried out by the International Institute for Population Sciences and Population Council about the situation and needs of the youth in India. This survey covered six states of India - Andhra Pradesh, Bihar, Jharkhand, Maharashtra, Rajasthan and Tamil Nadu - which accounted for 39 per cent of the population of the country at the 2011 population census. The survey collected data pertaining to key transitions experienced by married and unmarried youths in India related to education, work force participation, sexual activity, marriage, health, and civic participation. The study covered the population aged 15-24 years. However, data pertaining to married men were related to population aged 15-29 years. The survey covered 1,74,037 households in six states - 71,694 in urban areas and 1,02,343 in rural areas. During the survey, 50,848 youth were interviewed which included 8052 were married young men, 11,522 unmarried young men, 13,912 married young women and 17,363 were unmarried young women. The data available through the survey was cross-tabulation and binary logistic regression has been applied to analyse the data in the context of the objectives of the present study.

Findings and Discussion

Treatment Sought for Symptoms of Genital Infections. Table 1 shows the proportion of youths - male or female and married or unmarried - who sought treatment for their reproductive health problems by different background characteristics. The table indicates that both married males and females are more likely to seek advice/treatment for genital infections as compared to their unmarried counterparts. It is also evident from the table that married female youths with relatively higher level of education were more likely to seek advice/treatment for their genital infections as compared to unmarried female youths. The significant impact of education on the treatment seeking

behaviour is vey much evident from the table. The proportion seeking treatment of genital infections is almost two times more in married women having education up to higher secondary and above as compared to unmarried females. The rural-urban difference in the proportion of married men or women seeking treatment is however not substantial. On the other hand, living status of the household has a direct impact on treatment seeking behaviour of youths as the proportion seeking treatment for genital infections is, in general, found to be the highest in youths belonging to households in the highest income quintiles irresepctive of the gender and marital status of the youth. As regards the work status, the treatment seeking for genital infections is relatively higher in non-working females but in working males irrespective of the marital status. As regards social class, the treatment seeking appears to be the highest in SC/VJNT/ST. Similarly, slightly less than one fourth of the unmarried females of other religions sought advice/treatment for genital infection as comapred to 55 per cent unmarried females belonging to Muslim religion.

Factors Affecting Treatment Seeking of Genital Infections by Married Youths. In order to analyse how background social and economic characteristics influence the treatment seeking of genital infections in married youths, bivariate logistic regression analysis was carried out and the results are presented in table 2. Married youths in the age group 20-24 years are more likely to seek advice/treatment then married youths belonging to the age group 15-19 years. On the other hand, married youths living in the rural areas are more likely to seek advice/treatment for genital infections than married youths living in the urban areas. However, female married youths are less likely to seek advice/treatment for genital infections as compared to their male counterparts. Interestingly married youths with at least higher secondary education are less likely to seek advice/treatment for genital infections compared to illiterate married youths and married youths having below higher secondary level education. Similarly, mother's educational status has a very strong impact on seeking advice/treatment by married youth about their genital infections. Finally, the living standard of the household is directly related to seeking advace/treatment as may be seen from table 2. Married youths belonging to the richest households group is almost two times more likely to seek advace/treatment for genital infections compared to married youths belonging to poorest households. Simialrly, married youths belonging to other social classes are more likely to seek advice/treatment for genital infections as compared to married youths belonging to SC/VJNT/ST.

Factors Affecting Treatment Seeking of Genital Infections by Unmarried Youths. Table 3 presents results of the logistic regression analysis for unmarried youths. Interestingly, unmarried youths whose mothers are either illiterate or are educated up to primary level are more likely to seek advice/treatment for genital infections compared to unmarried youths whose mother's are educated at least up to the higher secondary level. Similarly, unmarried youths belonging to general social class (upper class) are less likely to seek advice/treatment for genital infections as compared to unmarried youths belonging to Scheduled Tribes and other social classes. However, the married

youths, advice/treatment seeking for genital infections is statistically significantly higher in youths belonging to the richest households. It is also clear from tables 2 and 3 that the influence of background characteristics on advice/treatment seeking behaviour related to genital infections is nearly the same in married and unmarried youths.

Factors Affecting Treatment Seeking of Anxiety/Swapndosh. Table 4 presents result of logistic regression analysis to show how background characteristics influence treatment seeking behaviour related to anxiety/swapnadosh in male youths. It may be seen from the table that male youths aged 20-25 years are more likely to seek advice/treatment than the male youths aged 15-19 years. On the other hand, unmarried male youths have 27 per cent higher probability of seeking advice/treatment of the problem of anxiety/swapndosh as compared to their married counterparts. Male youths belonging to the richest households have 75 per cent higher probability of seeking advice/treatment than the male youths belonging to poorest households. Similarly, male youths having primary level education have two times higher probability of seeking advice/treatment for problems related to anxiety/swapnadosh as compared to male youths without any education. On the other hand, there appears little influence of social class on the advice/treatment seeking behaviour of male youths in relation to the problem of anxiety/swapnadosh.

Factors Affecting Treatment Seeking of White Discharge Problem. Table 5 shows the result of logistic regression analysis in the context of advice/treatment seeking related to the problem of white discharge among female youths. Female youths aged 20-24 years are 75 per cent more likely to seek advice/treatment for white discharge problem than female youths aged 15-19 years. On the other hand, female youths living in the rural areas are about 10 per cent less likely to seek advice/treatment for white discharge than the female youths living in the urban areas. Similarly, unmarried female youths are 44 per cent less likely to seek advice/treatment for white discharge then their married counterparts. The difference in the probability of seeking advice/treatment for white discharge by the level of income, however, is not ery sharp but the strong influence of the level of education of the female youth is very much evident from the table. By contrast, the probability of seeking advice/treatment for white discharge is lower in female youths whose mother is educated at least up to higher secondary level as compared to female youths whose mother is illiterate. Similarly, female youths belonging to other social classes are less likely to seek advice/treatment for white discharge as compared to female youths belonging to SC/ST/VJNT.

Conclusions

In the Indian society, reproductive health remains a neglected issue. Even after numerous programmes and schemes, the issue remains unresolved. There is a considerable gap in the reproductive health status of people living in the rural areas as compared to those living in the urban areas. Youth, especially, unmarried youths have

less interest to seek advice/treatment for their genital infections such as white discharge and anxiety/ swapndosh. This may be due to a number of social and cultural barriers. Moreover, the value system for male and female youths in the society is different which gets reflected in the gender gap in advice/treatment seeking behaviour of male and female youths are revealed through the present analysis. The present analysis shows that the living status of the household has a considerable influence on the advice/treatment seeking behaviour of youths - married as well as unmarried. Advice/treatment seeking behaviour related to reproductive health problems of youths is essentially a multi-dimensional issue that cannot be be solved just by launching programmes or interventions of vertical nature. There is the need to adopt an integrated approach that covers social, cultural, economic, psychological and services delivery related dimensions of reproductive health.

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Table 1
Treatment sought for symptoms of genital infections by youth in India

Background characteristics	Married female	Unmarried female	Married Male	Unmarried Male
Age				
15-19	43.0	40.5	61.5	57.3
20-24	45.1	31.8	72.1	69.1
Education				
Illiterate	30.8	34.8	50.0	54.5
1-7 years of schooling	46.8	42.9	74.2	54.0
8-11 years of schooling	58.2	41.5	71.4	66.1
12 and more years of schooling	52.2	27.8	66.7	58.7
Place of Residence				
Urban	46.9	38.9	61.5	60.4
Rural	42.5	38.2	74.5	62.2
Wealth Quintile				
1st quintile	36.4	29.4	76.5	56.8
2nd quintile	34.9	50.0	56.0	43.6
3rd quintile	46.6	34.6	70.0	63.8
4th quintile	47.8	30.0	77.8	60.0
5th quintile	61.7	43.5	90.0	73.1
Work status				
Working	36.3	37.9	71.8	58.9
Not Working	49.3	39.1	33.3	64.6
Caste				
SC	40.3	37.8	57.9	62.8
ST/VJNT	36.4	29.6	88.2	55.6
OBC	46.1	41.5	74.4	64.3
General	50.9	39.2	33.3	57.4
Religion				
Hindu	43.6	37.9	71.0	63.7
Muslim	52.2	54.8	71.4	47.1
Others	40.7	23.1	60.0	43.8
Married Siblings				
None	61.4	45.8	66.7	64.7
At least one	41.3	36.2	70.8	60.3
Media Exposure				
No	54.5	0.0	70.0	100.0
Yes	45.5	38.9	0.0	62.0
N	13912	17363	8052	11552

Source: IIPS and Population Council (2010).

Table 2
Adjusted odds ratio for advise/treatment sought for genital infections by married male and married female

Background characteristics	Exp(B)
Age	
15-19 ®	
20-24	1.114*
Place of Residence	
Urban ®	
Rural	1.326**
Marital Status	
Married male ®	
Married female	.341***
Wealth Quintile	
1st quintile ®	
2nd quintile	.675**
3rd quintile	1.137*
4th quintile	1.174*
5th quintile	1.997***
Education	
Illiterate ®	
Primary education	1.895***
Secondary education	2.068***
Higher secondary and above	.928*
Mother's Education	
Illiterate ®	
Primary Education	1.604**
Secondary Education	1.811**
Higher secondary above above	5.342**
Caste	
SC/VJNT/ST ®	
Others	1.045*

*** p<0.01, ** p<0.05, ®= Reference category
Source: Author's calculations.

Table 3
Adjusted odds ratio for advise/treatment sought for genital infections by unmarried males and unmarried females

Background characteristics	Exp(B)
Age	
15-19 ®	
20-24	1.229**
Place of Residence	
Urban ®	
Rural	1.130*
Marital Status	
Married Male ®	
Married Female	0.387***
Wealth Quintile	
1st quintile ®	
2nd quintile	1.131*
3rd quintile	1.197*
4th quintile	1.212*
5th quintile	3.047***
Education	
Illiterate ®	
Primary education	1.082*
Secondary education	1.264*
Higher secondary and above	0.688**
Mother's Education	
lliterate ®	
Primary education	1.251**
Secondary education	0.405***
Higher secondary and above	0.395**
Caste	
SC/VJNT/ST ®	
Other	0.809**

*** p<0.01, ** p<0.05, ®= Reference category
Source: Author's calculations.

Table 4
Adjusted odds ratio for advise / treatment sought for anxiety / swapndosh by married and unmarried males

Background Characteristics	Exp(B)
Age	
15-19 ®	
20-24	1.193***
Place of Residence	
Urban ®	
Rural	1.156***
Marital Status	
Married male ®	
Unmarried male	1.270***
Wealth Quintile	
1st quintile ®	
2nd quintile	1.180**
3rd quintile	1.537***
4th quintile	1.537***
5th quintile	1.759***
Education	
Illiterate ®	
Primary Education	2.018***
Secondary Education	1.904***
Higher Secondary & Above	1.901***
Mother's Education	
Illiterate ®	
Primary education	1.026*
Secondary education	0.909**
Higher secondary & above	0.730**
Caste	
SC / VJNT / ST ®	
Others	0.809***

*** p<0.01, ** p<0.05, ®= Reference category
Source: Author's calculations.

Table 5
Adjusted odds ratio for advise/treatment sought for white discharge

Background characteristics	Exp(B)
Age	
15-19 ®	
20-24	1.758***
Place of Residence	
Urban ®	
Rural	0.897**
Marital Status	
Married female ®	
Unmarried male	0.560***
Wealth Quintile	
1st quintile ®	
2nd quintile	1.368***
3rd quintile	1.495***
4th quintile	1.417***
5th quintile	1.445***
Education	
Illiterate ®	
Primary education	1.728***
Secondary education	2.352***
Higher secondary & above	2.879***
Mother's Education	
Illiterate ®	
Primary education	1.003*
Secondary education	1.075*
Higher secondary & above	0.970*
Caste	
SC/ VJNT/ ST ®	
Other	0.781***

*** p<0.01, ** p<0.05, ®= Reference category
Source: Author's calculations.

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Street Sweeping Occupation and Potential Risk Factors for Developing Musculoskeletal Disorders and Related Disabilities: A Study in Mumbai

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Introduction

The occupation of sweeping is a vigorous task which involves sweeping of assigned areas such as roads, footpaths, parks, markets, and open settlements with the help of long-handle brooms and wheelbarrows. The waste collected in wheelbarrows is finally deposited in the nearby community dustbins. This whole process requires continuous physical activities such as manual sweeping in the standing posture for long durations, bending while collecting the swept waste, pushing and pulling of the wheelbarrow, and manual lifting of baskets to deposit waste. A similar process is followed in other cities in India and in other developing countries as well. The Municipal Corporation of Greater Mumbai (MCGM) has 9231 regular employees engaged in the street sweeping operation, and the corresponding figure is many times higher for India as a whole. Numerous studies have concluded that the occupational exposure of sweeping is associated with the development of chronic respiratory diseases, skin diseases, eye irritation, asthma, tuberculosis, and hypertension among workers (Anwar et al, 2013; Nku et al, 2005; Nagaraj et al, 2004; Sabde and Zodpey, 2008). The other non-fatal injuries identified are mostly musculoskeletal in nature. Musculoskeletal disorders are defined as pain, ache or discomfort in any of the anatomical areas of the body viz. neck, shoulders, upper back, lower back, elbows, wrists or hands, hips or thighs, knees, and ankles or feet (Mehrdad et al, 2008).

Past studies suggest solid waste collectors have a relatively higher probability of developing musculoskeletal disorders (MSDs) as compared to the general population (Mehrdad et al, 2008; Abou-El-Wafa, 2012; Dorevitch, 2001). Workers involved in repetitious physical activities of bending, lifting, pushing and pulling for long durations have been identified as facing the risk factors leading to the development of MSDs (Keyserling, 2000; Hoozemans, 2004; IJzelenberg, 2004). However, very few studies have been carried out focussing on street sweepers. Moreover, there is hardly any

study that has assessed the risk of musculoskeletal disorders thoroughly. Past studies among street sweepers in India have predominantly focused on eye, skin and respiratory morbidities (Sabde and Zodpey, 2008; Jayakrishnan, 2013; Smilee, 2013; Yogesh and Zodpey, 2008; Johncy, 2014) but there is hardly any research on musculoskeletal disorders (MSDs) faced by street sweepers in India. The present study, is directed towards assessing the effect of the occupational exposure of sweeping in the development of MSDs as well as disabilities among the street sweepers of Greater Mumbai. In addition, the present study also attempts to identify individual risk factors that contribute to the development of MSDs and disabilities among the street sweepers.

Material and Methods

The study is based on a survey of street sweepers carried out in Greater Mumbai, the largest metropolitan city of India. The study adopted a cross-sectional design to assess how the prevalence of musculoskeletal disorders and related disabilities among street sweepers of the Greater Mumbai Municipal Corporation to analyse how the prevalence of musculoskeletal disorders and associated disabilities in street sweepers differs from the prevalence of musculoskeletal disorders and related disabilities among municipal workers who are not exposed to street sweeping such as employees associated with fogging and pesticide spraying, and peons having similar socioeconomic conditions. The municipal workers not engaged in street sweeping are basically field workers of the MCGM who work continuously in the field, doing heavy physical work such as carrying necessary equipment/machines. However, their work load is more or less similar to that of the street sweepers. The survey collected data related to major morbidities, including MSDs, among the two groups of the employees of MCGM - the street sweepers and other field workers. The estimated sample size was 180 with a prevalence rate of 30 and a design effect of 1.25 (Jayakrishnan, 2013). The stratified systematic random sampling design was adopted for selecting the sample. The sampling frame for the study comprised of 24 municipal wards of MCGM having slum population according to the 2011 population census. The sample for the survey was selected in two stages. At the first stage of sample selection 24 municipal wards of Greater Mumbai 24 municipal wards were arranged in the ascending order of the proportion of slum population and were divided into three strata - municipal wards having low, moderate and high proportion of the slum population with respect to the population of the municipal ward. At the next stage, two municipal wards were selected from each stratum through simple random sampling procedure. Based on the list of employees provided by the Municipal Corporation, a representative sample of 60 employees from each ward (30 street sweepers and 30 other employees) was selected following the systematic random sampling approach. The sample selection process resulted in a sample of 180 street sweepers and 180 other employees that served as the comparison group. The sweeper and other employees selected in the sample were interviewed at their workplace during the period March to September 2015.

Measurements

A modified Standardized Nordic Questionnaire was adopted to assess the musculoskeletal disorders (Kuorinka, 1987). A diagram with labels and arrows clearly indicating the different musculoskeletal regions was used for the assessment of MSDs during the past 12 months and during the 7 days prior to survey. The interview schedule collected information on the MSDs along with the demographic, socio-economic, and occupational characteristics. Specifically, the interview schedule covered age, years of work, substance use, anthropometric measures, job satisfaction, caste and mental health. The outcome variable for the study was pain in 9 anatomical regions - neck, shoulders, elbows, wrists/hands, upper back, lower back, hips/thighs, knees, and ankles during the 7 days prior to the survey and during the last 12 months. Any person reporting pain in any of the 9 anatomical regions of the body was considered as morbid with MSDs. The respondents were prevented from doing normal day-to-day activities at home or away from home due to MSDs during the 12 months prior to the survey were classified and recoded as disabled. The collected data were converted into the electronic format using CSPro software package and were analysed using the STATA software package. Descriptive statistics were used to understand the socioeconomic and occupational characteristics of the respondents. The difference in the prevalence of MSDs and the related disabilities between street sweepers and other employees of MCGM was tested using the χ^2 test. The difference in the prevalence between groups was tested through the independent t-test. In order to assess the impact of street sweeping to the development of MSDs, the study adopted the nearest neighbourhood method of propensity score matching (PSM). The method allows assessment of the impact using the cross-sectional survey data. The propensity score was estimated by logistic regression with the dichotomous exposure variable. The respondents who were exposed to street sweeping were given a score of 1while respondents who were not exposed to street sweeping were given a score of 0. The associated demographic and occupational characteristics of the respondents served as the predictor variable. The principal assumption of the PSM is that the observable characteristics of the exposed and the comparison groups must have similar distributions. This assumption was tested using the 'p-score' command. The propensity score was calculated using the probability of exposure given pre-exposure characteristics. In order to calculate the impact of street sweeping on MSDs and related disabilities, average effects in both the groups were weighted by the proportion of respondents in the two groups. Further, to understand the individual risk factors for MSDs and disabilities among street sweepers, multiple logistic regression analysis was carried out. Since the study involved government employees, the permission to conduct the survey was taken from MCGM. Ethical clearance prior to data collection was also approved by the Student Research Ethics Committee of the International Institute for Population Sciences, Mumbai. The informed consent of the participants was obtained in the local language, and the respondents were assured that the information would be kept confidential and will be used for research purposes only.

Results

The socioeconomic and occupational characteristics of the respondents surveyed are presented in Table 1. There was a small difference in the mean age of the street sweepers (37 ± 9.12 years) as compared to that of the comparison group (38±7.39 years), although the variability in street sweepers' age is more than their counterparts in the sample. A similar pattern was observed while looking at the years of work experience of street sweepers (11±8.30 years) as compared to the comparison group (11±6.35 years). However, the prevalence of substance use, such as alcohol consumption, smoking, and chewing tobacco, etc. has been found to be higher among the street sweepers as compared to the comparison group. For instance, nearly 70 per cent of the street sweepers were using at least one type of substance including little less than one-third respondents who were using two or more types of substance. The corresponding proportion for the comparison group was only 19 per cent. Further, 17 per cent of the street sweepers reported that they were not satisfied with their occupation. This proportion was only 8 per cent in the comparison group.

The prevalence of MSDs and related disabilities during the 12 months prior to the survey is presented in table 2. It is clear from the table that street sweepers face a significantly higher risk of developing MSDs compared to the comparison group, specifically for the shoulders (32 per cent), wrists/hands (29 per cent), elbows (27 per cent), and neck (17 per cent). The corresponding proportions were 11, 19, 9, and 11 per cent respectively for the comparison group. Similarly, incidence of disabilities during the 12 months prior to the survey has been found to be statistically significantly higher in street sweepers than that in the comparison group. For instance, around 27 per cent of the street sweepers were disabled due to the pain in the lower back and upper back; 26 per cent due to the pain in wrists/hands, 24 per cent were due to pain in shoulders; 23 per cent due to pain in elbows and 17 per cent due to pain in hips/thighs. The corresponding proportions in the comparison group are 18, 19, 13, 9, 6 and 8 per cent respectively. In addition, the prevalence of MSDs during the period 7 days prior to the survey has also been found to be significantly higher among the street sweepers, particularly for the upper back (19 per cent), wrists/hands (17 per cent), hips/thighs (17 per cent), elbows (16 per cent), lower back (15 per cent), and shoulders (11 per cent).

In order to assess the effect of street sweeping on the development of MSDs, the propensity score matching (PSM) was carried out and the results are presented in table 3 in terms of the average exposure effects among exposed (AEEE) for the MSDs and disabilities during the previous 12 months. It is clear from the table that street sweeping raised the episodes of MSDs, particularly for shoulders (17 per cent), wrists/hands (14 per cent), elbows (13 per cent), upper back (12 per cent), neck (10 per cent), and hips/thighs (9 per cent). A similar pattern could be seen from the table for the MSDs led disabilities. Results of the propensity score matching exercise confirms that street sweeping significantly increased the risk of MSDs and associated disabilities.

The individual risk factors associated with the increased risk of MSDs among the street sweepers during the 12 months prior to the survey were identified after adjusting for age, body mass index (BMI) and caste of the respondent and the results are presented in table 4. The results exhibit that the number of work years is the most important factor in the development of MSDs. For instance, street sweepers working for at least 10 or more years were found to be having statistically significantly higher risk of MSDs in elbows (OR=10.79; $p<0.01$), shoulders (OR=6.40; $p<0.01$), wrists/hands (OR=6.08; $p<0.01$), upper back (OR=6.06; $p<0.01$), neck (OR=5.41; $p<0.01$), and hips/thighs (OR=4.49; $p<0.01$) as compared to the street sweepers working for less than 10 years. Job satisfaction among street sweepers has also found to be significantly correlated with the incidence of MSDs, as street sweepers who were not satisfied with their job were more likely to have suffered from the MSDs in the wrists/hands (OR=11.43; $p<0.01$), hips/thigh (OR=5.42; $p<0.01$), upper back (OR=4.52; $p<0.05$), and lower back (OR=3.91; $p<0.05$) as compared to the street sweepers who reported to be satisfied with their jobs. Similarly, the location of work has also been found to be a significant predictor of developing MSDs. Street sweepers working in the high slum concentrated areas were found to be having relatively higher risk of getting MSDs in hips/thighs (OR=10.64; $p<0.01$), lower back (OR=5.22; $p<0.01$), and elbows (OR=0.23; $p<0.01$) as compared to street sweepers working in the low slum concentrated areas.

Table 5 shows the association of individual factors with the risk of disabilities during the 12 months prior to the survey. Once again, the number of years of engagement in street sweeping is found to be directly related to the risk of MSDs related disabilities. More specifically, street sweepers working for at least 10 years are found to be statistically significantly more likely to suffer from disabilities in elbows (OR=8.12; $p<0.01$), hips/thighs (OR=6.27; $p<0.01$), wrists/hands (OR=4.98; $p<0.01$), upper back (OR=4.40; $p<0.01$) and lower back (OR=3.45; $p<0.01$) as compared to street sweepers working for less than 10 years. Job satisfaction and mental health have however not been found to be associated with the disabilities among the street sweepers. On the other hand, street sweepers working in the high slum concentrated areas have been found to be statistically significantly more likely to develop disabilities in hips/thigh (OR=16.17; $p<0.01$), lower back (OR=7.79; $p<0.01$), upper back (OR=3.20; $p<0.01$) and elbows (OR=0.22; $p<0.01$), as compared to street sweepers working in low slum concentrated areas.

Discussions and Conclusions

Street sweepers work for long duration in public places using long-handle brooms along with wheelbarrows. This repetitive, rigorous nature of work increases the risk of musculoskeletal disorders and related disabilities among the street sweepers as compared to those who are not engaged in street sweeping. The present study shows that the prevalence of MSDs among street sweepers is significantly higher for shoulders, wrists/hands and elbows as compared to those employees of the Greater

Mumbai Municipal Corporation who are not engaged in street sweeping. This may be because of the continuous sweeping with the long-handle broom and carrying of the collected waste in wheelbarrow to the community dustbins manually in an unvarying posture. The prevalence of MSDs has also been found to be higher among street sweepers for the lower back, wrists/hands, shoulders, elbows, and hips/thighs as compared to the prevalence in those employees who are not engaged in street sweeping task. The propensity score matching also suggests that average exposure effects among persons exposed to street sweeping significantly increases the risk of MSDs and MSDs associated disabilities. The study also shows that the number of years engaged in street sweeping, job satisfaction and location of work are important predictors of MSDs and MSDs associated disabilities even after adjusting for working age, BMI and caste.

The location of work emerged as a significant predictor of increased likelihood of MSDs and related disabilities among the street sweepers due to the higher quantum of work in the high slum concentrated areas. In the absence of any studies on MSDs among the street sweepers, the results of the present study are comparable with the other studies conducted among the solid waste workers except in the case of knee and ankle disorders (Nagaraj et al, 2004; Sabde and Zodpey, 2008; Jayakrishnan et al, 2013). This may be because the street sweepers are not engaged in lifting heavy loads continuously or for carrying them for long duration. They, therefore, do not put as much pressure on the knees and ankles as those engaged in solid waste collection. Other studies also have come out with the same conclusions (Mehrdad et al, 2008; Jayakrishnan et al, 2013). The present analysis suggests that specific programmes for educating street sweepers about the health hazards associated with street sweeping along with rehabilitation programme for street sweepers having MSDs related disabilities should be taken up by the Greater Mumbai Municipal Corporation.

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Table 1
Descriptive statistics of the study population

Background characteristics	Street Sweeper	Comparison group
Workers Age	(t= -0.952; p=0.3416)	
19-34 years	45.5	34.4
35 & above	54.4	65.5
Mean±SD	37.3 ± 9.1	38.1 ± 7.4
Years of Working	(t = -1.123; p= 0.261)	
Below 10	67.8	51.1
10 or more	32.2	48.9
Mean±SD	10.6 ± 8.3	11.4 ± 6.3
Substance use		
No Addiction	33.3	53.3
Any one	68.6	46.6
Two or more	32.2	19.4
Mental Health (GHQ-12)		
Good	47.2	35.6
Intermediate	21.7	28.9
Poor	31.1	35.6
Job Satisfaction		
Good	17.8	30.5
Average	65.0	61.1
Bad	17.2	8.3
BMI		
<25	65.6	51.7
>25	34.4	48.3
Mean±SD	23.6 ± 1.4	25.1 ± 3.3
Caste		
SC/ST	85.6	51.7
Others	14.4	48.3
N	180	180

Source: Primary data collected by the author.

Table 2
Prevalence and incidence of musculoskeletal disorder and disability in the surveyed population during 7 days and 12 months prior to the survey

Body regions	Street sweeper	Comparison group	χ^2
Neck			
Past 12 months	16.7	10.6	2.858; p = 0.091
Disabled in past 12 months	10.6	9.4	0.123; p = 0.725
7 days	6.7	4.4	0.847; p = 0.357
Shoulder			
Past 12 months	31.7	11.1	22.616; p = 0.000
Disabled in past 12 months	24.4	9.4	14.388; p = 0.000
7 days	10.6	4.4	4.844; p = 0.028
Elbow			
Past 12 months	26.7	8.9	19.459; p = 0.000
Disabled in past 12 months	23.3	5.6	23.017; p = 0.000
7 days	16.1	4.4	13.284; p = 0.000
Wrist / Hand			
Past 12 months	29.4	18.9	5.471; p = 0.019
Disabled in past 12 months	26.1	13.3	9.281; p = 0.002
7 days	16.7	2.8	19.780; p = 0.000
Upper Back			
Past 12 months	33.9	27.2	1.885; p = 0.170
Disabled in past 12 months	26.7	18.9	3.095; p = 0.079
7 days	18.9	3.9	20.065; p = 0.000
Low Back			
Past 12 months	33.3	29.4	0.632; p = 0.427
Disabled in past 12 months	26.7	17.8	4.114; p = 0.043
7 days	15.6	8.9	3.728; p = 0.053
Hip / Thigh			
Past 12 months	26.7	20	2.236; p = 0.135
Disabled in past 12 months	16.7	7.8	6.628; p = 0.010
7 days	17.2	6.7	9.534; p = 0.002
Knee			
Past 12 months	1.7	3.9	1.6457; p = 0.200
Disabled in past 12 months	0.6	3.3	3.6423; p= 0.056
7 days	1.7	0.6	1.0112; p = 0.315

Body regions	Street sweeper	Comparison group	χ^2
Ankles/Feet			
Past 12 months	3.9	2.2	0.8440; p = 0.358
Disabled in past 12 months	1.7	2.2	0.1457; p = 0.703
7 days	2.2	0.6	1.8254; p = 0.177
N	180	180	

Source: Primary data collected by the author.

Table 3
Average exposure effect among exposed (AEEE) to street sweeping occupation on developing MSDs and disability for various body regions during 12 months prior to the survey

Body regions	MSDs		Disability due to MSDs	
	Coefficient	Confidence interval 95%	Coefficient	Confidence interval 95%
Neck	0.10**	0.02 - 0.19	0.02	-0.05 to 0.09
Shoulder	0.17***	0.07 to 0.27	0.16***	0.07 to 0.24
Elbow	0.13***	0.05 to 0.21	0.13***	0.06 to 0.19
Wrist/hand	0.14***	0.06 to 0.22	0.14***	0.07 to 0.21
Upper back	0.12***	0.04 to 0.21	0.13***	0.05 to 0.22
Lower back	0.08*	-0.02 to 0.18	0.14***	0.05 to 0.23
Hip/thigh	0.09**	0.00 to 0.18	0.12***	0.05 to 0.18

**p<0.05, ***p<0.01, *p<0.1
Source: Author's calculations.

Table 4

Odds ratio showing individual risk factors for MSDs among street sweepers (past 12 months)

Predictor variable	Neck	Shoulder	Elbow	Wrist/hand	Upper back	Lower back	Hip/thigh
Years of working							
Below 10 years ®							
10 & more	5.41***	6.40***	10.79***	6.08***	6.06***	2.96***	4.49***
Job satisfaction							
High ®							
Medium	0.53	2.16	2.55	6.41**	5.13***	1.58	2.58
Low	2.19	1.89	2.38	11.43***	4.52**	3.91**	5.42***
Mental health							
Low ®							
Medium	0.22	0.24*	0.21*	0.30*	0.78	0.84	0.31
High	1.15	1.83	1.57	1.30	1.90*	1.28	1.70
Location of work based on proportion of slums							
Low®							
Moderate	0.43	0.93	0.96	1.06	2.04	2.18*	4.12***
High	0.40*	0.77	0.23***	0.44*	2.13*	5.22***	10.64***

® Reference category; ***p<0.01, **p<0.05, *<0.1; 95% confidence interval in parenthesis.

The full model is additionally adjusted for workers Age, BMI and Caste

Source: Primary data collected by the author.

Table 5

Odds ratio showing individual risk factors for disabilities due to MSDs among street sweepers (past 12 months)

	Neck	Shoulder	Elbow	Wrist/hand	Upper back	Lower back	Hip/thigh
Years of working							
Below 10 years ®							
10 & more	6.38**	3.13***	8.12***	4.98***	4.40***	3.45***	6.27***
Job Satisfaction							
High ®							
Medium	0.28*	1.30	1.85	4.78**	3.37**	1.33	1.75
Low	1.32	0.73	1.98	7.66**	2.93	4.08**	1.80
Mental health							
Low ®							
Medium	0.37	0.18	0.29	0.43	1.12	0.88	0.31
High	1.10	1.85	1.67	1.65	2.77**	1.05	1.49
Location of work based on proportion of slums							
Low®							
Moderate	0.03***	0.56	0.93	0.88	2.58*	2.45*	7.31***
High	0.25**	0.6	0.22***	0.37**	3.20***	7.79***	16.17***

® Reference category; ***p<0.01, **p<0.05, *<0.1; 95% confidence interval in parenthesis.

The full model is additionally adjusted for workers Age, BMI and Caste

Source: Primary data collected by the author.

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Factors Affecting Contraceptive Use in Munger and Kishanganj Districts of Bihar

Vidya Sagar Trigun

Introduction

Bihar has the dubious distinction of having the highest fertility in India. According to the sample registration system, the total fertility rate in Bihar was 3.2 in 2015 compared to 2.3 for the country as a whole (Government of India, *no date*). On the other hand, according to the fourth round of the National Family Health Survey 2015-16, the total fertility rate in the state was 3.4 (Government of India, *no date*). At the same time, the contraceptive prevalence rate in the state is also the lowest in the country. According to the National Family Health Survey 2015-16, only about 24 per cent of the currently married women aged 15-49 years in the state were using a family planning method. What is even more alarming is that this proportion has decreased rapidly by almost 10 percentage points from 31.4 per cent in 2005-06. Although, fertility is decreasing in the state, yet a decrease in the contraceptive prevalence rate is definitely a cause of concern not only in the context of fertility reduction and population stabilisation and requires in-depth analysis of the factors affecting the use of family planning methods in the state.

The present study has been carried out in the above context. It attempts to explore the factors that influence the use of family planning methods in two districts - Munger and Kishanganj - of the state. According to the National Family Health Survey 2015-16, the contraceptive prevalence rate in district Munger is estimated to be 33 per cent compared to only 11.8 per cent in district Kishanganj. A comparison of the factors affecting the use of family planning methods in the two districts is expected to help in understanding the differential dynamics of family planning use in the two districts, one having relatively high contraceptive prevalence rate and the other relatively low contraceptive prevalence rate. The study attempts to estimate the contraceptive prevalence rate in the two districts by different social, cultural, economic and demographic background characteristics of the population of the two districts and to

explore the determinants of the current use of contraception. The hypothesis is that social and cultural factors, especially religion and caste and the standard of living play important role in deciding the use of family planning methods and women empowerment and female autonomy can play a major role in improving the use of family planning methods in the state.

Data and Methodology

The study is based on a primary survey on family planning use carried out in the two districts Primary survey has been carried out for collecting the data from November 2011 to February 2012 in two districts of Bihar i.e. Munger and Kishanganj. These two districts have been selected on the basis of rural Crude Birth Rate (CBR), where Munger has lowest rural Crude Birth Rate (CBR) while Kishanganj has highest CBR. Rural CBR has been calculated through using Reverse Survival Method for all the districts of Bihar. Four Blocks (two from each district) have been selected by making composite index through taking some of the developmental indicators from census of India (2001) data. Eight villages (two from each block) have been selected on the basis of observation of literacy and socio-cultural composition of the households. Finally, sixty (60) households from each village have been selected, from where currently married women and their husbands have been taken as a respondent. Village's households have been selected on the basis of proportional to population size considering appropriate sampling for the study.

Quantitative methods have been applied for the analysis of data in terms of cross-tabulation for understanding the relationship between various dependent and independent variables and binary and multinomial logistic regression for analyzing the net effect of independent variables on dependent variables.

Findings

Current Use of Contraception. Table 1 shows that the contraceptive prevalence rate in the surveyed population was 51.5 per cent. The contraceptive prevalence was higher in Munger district compared to Kishanganj district. Among different contraceptive methods, female sterilisation was the most popular in both the districts. However, there was a big gap in the proportion of currently married women sterilised in district Munger and in district Kishanganj. By contrast, the prevalence of traditional methods, particularly, the rhythm method was substantially higher in district Kishanganj compared to district Munger. Interestingly, not a single woman surveyed in district Munger reported the use of condom as a family planning method.

District level estimates of contraceptive prevalence rate are also available through the latest round of the National Family Health Survey 2015-16 (Government of India, *no date*). According to these estimates, the contraceptive prevalence rate in district Munger was estimated to be 34.4 per cent whereas the contraceptive

prevalence rate in district Kishanganj was estimated to be only around 12.7 per cent. The present survey, however, reveals that the contraceptive prevalence rate in the two districts is significantly higher than that estimated on the basis of the National Family health Survey 2015-16. However, the Annual health Survey carried out in Bihar in 2012-13 suggests that the contraceptive rate in district Kishanganj was 39.5 per cent in 2012-13 whereas the same in district Munger was 42.6 per cent (Government of India, *no date*). In any case, the present survey as well as estimates based on the Annual Health Survey 2012-13 and the National Family Health Survey 2015-16 confirm that the prevalence of contraception in district Munger is higher than that in district Kishanganj.

The difference in the contraceptive prevalence rate in the two districts may be because of a number of factors. Among them, a important factor is the level of social and economic development. Similarly, the demographic situation may also be a factor in the use of family planning methods. It is well known that both level of social and economic development and the demographic situation in the two districts are essentially different. District Munger is comparatively more advanced than district Kishanganj in almost all aspects of social and economic development. Similarly, levels of fertility and mortality are also different in Munger district as compared to Kishanganj district. Another factor that may have an impact on the contraceptive prevalence rate is the social and cultural differences in the population of two districts. Similarly, difference in the administrative capacity and organisation efficiency of the family planning services delivery system may also influence the use of family planning methods. There is however very little information available about the administrative capacity and the organisational efficiency of the family planning services delivery system in the two districts.

A comparison of the development scenario and the demographic situation in the two districts is presented in table 2. It is evident from the table that the social, economic, demographic and socio-cultural environment in district Munger appears to be more favourable to family planning practice as compared to the environment that prevails in district Kishanganj. For example, district Kishanganj lags behind district Munger in terms of literacy rate in females and males which has implications for the attitude of the people regarding fertility goals. Moreover, the proportion of women having at least 10 years of schooling is more than two times in district Munger as compared to district Kishanganj according to the National Family Health Survey 2015-16. Hate (1970) in a study in Maharashtra has found that educated women had positive attitude towards family planning and, therefore, the prevalence of contraception was higher in educated females as compared to their illiterate counterparts.

Exposure to mass media also has its effect on the use of family planning methods. The prevalence of contraception in women having no exposure to mass media is estimated to 42.9 per cent compared to 67.7 per cent in women who had exposure to mass media (Table 3). The Pearson's chi-square is estimated to be 25.923 which is significant at 1 per cent level of significance. Similarly, the prevalence of contraception is estimated to be only 41.0 per cent in Scheduled Castes women

compared to 55.4 per cent in other backward classes women and 54.3 per cent in women belonging to others castes. The Pearson's chi-square value in case of the variation in the prevalence of contraception by castes has been estimated to be 6.395 which is also significant at 5 percent level of significance. However, the prevalence of contraception in working women (52.0 per cent) has not been found to be statistically significantly different from that in non-working women (51.0 per cent).

Demographic factors also appear to have an impact on the contraceptive prevalence rate. For example, contraceptive prevalence rate is found to be relatively low (47.4 per cent) in women who were married before reaching there 18th birthday compared to the contraceptive prevalence in women who were married after reaching their 18th birthday (55.6 per cent). The Pearson's chi-square value is estimated to be 3.119 which is significant at 10 per cent level of significance. Religion has also been found to have a strong impact on the use of family planning methods. The contraceptive prevalence rate in Hindu women is found to be statistically significantly higher (58.1 per cent) compared to the contraceptive prevalence rate in Muslim women (35.6 per cent). The Pearson's chi-square is estimated to be 19.450 which is significant at 1 percent level of significance. One reason for low contraceptive prevalence rate in Muslims is low educational status of Muslim women. Mandelbaum (1974) states that although some Muslims may state religious reasons for not controlling their fertility, yet, a significant cause of their higher fertility is their low levels of educational attainment.

Those women who have 'no living children' are currently not using any contraceptives, while 46.0 and 59.1 percent women who have 'up to 2 living children' and '3 and above living children' respectively are currently using them. The Pearson's chi-square value was found to be 36.023 and this was significant at 1 percent level of significance.

Another important factor influencing the use of family planning methods is the standard of living. According to Mandelbaum (1974a), women belonging to poor families have more children due to two reasons. First, many children die in their infancy and, therefore, uncertainty of child survival leads to more reproduction. Second, when the children die in infancy or during the period of lactation, the in-fecund period between births becomes shorter. In the present analysis, the standard of living of the households covered in the survey was measured in terms of the standard of living index (SLI) which has been found to be positively and directly related to the use of family planning methods. The contraceptive prevalence rate has been found to be relatively the lowest in women belonging to households with low standard of living index (45.5 per cent) but the highest in women belonging to households with high standard of living index (78.8 per cent) so that the Pearson's chi-square (21.821) is found to be statistically significant at 1 per cent level of significance.

A similar picture emerges in case of women's autonomy index - the increase in women's autonomy in the family and the society has been found to be associated with the increase in the use of family planning methods. The contraceptive prevalence rate is

estimated to be only 20 per cent in women with low autonomy index compared to a contraceptive prevalence rate of 50.9 per cent in women with medium autonomy index and 63.3 per cent in women with high autonomy index. The resulting Pearson's chi-square (22.358) is found to be statistically significant at 1 per cent level of significance. This means that the status of women in the family and the society has a strong impact on the use of family planning methods in the two district covered in the present study.

Determinants of Contraceptive Methods. Given the difference in the contraceptive prevalence rate in the two districts covered in the present study, it may be hypothesised that different social, economic and demographic variables differentially influence the contraceptive prevalence rate in the two district. In order to test the above hypothesis, binary logistic regression analysis was carried out for the two districts separately. The dependent variable in the analysis was a dichotomous variable having value 1 if the woman or her husband was using a family planning method at the time of the survey and 0 if the woman or her husband was not using any family planning method at the time of the survey. The independent variables, on the other hand included religion (Hindu and Muslim) and caste (Scheduled Castes, Other Backward Classes, and Other Castes), work status of the woman (working and non-working), level of education of the woman and her husband (illiterate, primary and middle, and high school and above), age at marriage (below 18 years and 18 years and above), number of living children (less than and equal to 2, 3, and 4 and more), standard of living index (low, medium and high), and women's autonomy index (low, medium and high).

Results of the bivariate logistic regression analysis are presented in table 5 separately for the two districts. Interestingly, the factors that influence the use of family planning methods in the two districts are found to be essentially different. In district Munger, the use of family planning methods is found to be statistically significantly related to the caste of the woman, her exposure to mass media, number of living children that the woman has and the level of autonomy that the woman exercises in the family and the society. Women belonging to Other Backward Classes and Other Castes are found to be more likely to use a family planning method than women belonging to Scheduled Castes. Similarly, women having exposure to mass media are more likely to use a family planning method then women who are not exposed to mass media. The use of family planning methods has also been found to be related with the number of living children the woman has - the likelihood of using a family planning method is statistically significantly more in women having 3 or more children compared to women having two and less than two children. Similarly, the use of family planning methods is found to be directly related to the autonomy of the women in the family and the society. The likelihood of using a family planning method is statistically significantly more in women with high and medium level of autonomy in the family and the society as compared to women having low level of autonomy. On the other hand, factors like the level of living, work status of the woman, level of education of the

woman and her husband, etc. have not been found to be statistically significantly influence the use of family planning methods in the district.

Factors that affect the use of family planning method in district Kishanganj are different from the factors in district Munger. In this district, religion of the woman has a strong impact on the likelihood of the use of family planning methods but the effect of the case is not statistically significant. The likelihood of using a family planning method is significantly lower in Muslim women compared to Hindu women. Similarly, the likelihood of using a family planning method is statistically significantly higher in working women as compared to non-working women of the district. The level of education of the husband also has a strong impact on the use of family planning methods in the district. The likelihood of using a family planning method by the woman or her husband increase with the increase in the level of education of the husband. However, the level of education of the woman does not have statistically significant effect on the use of family planning methods in the district. Another variable that has a statistically significant impact on the use of family planning methods in the district is the age of the woman at the time of her marriage. Women who were married after reaching the 18 years of age are more likely to use a family planning method than women who were married before reaching 18 years of age. Interestingly, the variables which were found to be statistically significant predictors of family planning use in district Munger were not found to be statistically significant predictors of family planning use in district Kishanganj. Similarly, variables that were statistically significant predictors of family planning use in district Kishanganj were not found to be statistically significant predictors of family planning use in district Munger.

Discussions and Conclusion

After analysing different dimensions of contraceptive use in Munger and Kishanganj districts, it can be said that Bihar will have to go a long way to achieve satisfactory contraceptive prevalence rate as well as, other associated characteristics of contraceptive use. The contraceptive use in the two districts is virtually confined to women. In both the districts, contraceptive use by men is at the best marginal. An important finding is that the factors that affect contraceptive use in the two districts covered in the present study are essentially different. This means that the policy and the strategy towards increasing the contraceptive prevalence rate in one district cannot be applied in the other district. Based on the findings of the present study, it can be argued that the factors affecting the contraceptive prevalence rate in different districts of the state are essentially different. This means that a district-based approach should be adopted to increase the contraceptive prevalence rate and to achieve the small family norm. This is however not the tradition at present as the planning, implementation and monitoring and evaluation of the family planning efforts and activities continue to be highly centralised in the country India. The present study, although based on a very small sample of currently married women in their reproductive ages, however, emphasises towards identifying local level social, economic, environmental and cultural

factors that impact upon the contraceptive prevalence rate and addressing these factors on a priority basis and integrating these factors in planning and programming for delivering family planning services to all couples at an affordable cost. There is however little initiative in this direction.

The analysis also highlights the fact that variation in the level of social and economic development appears to be a strong determinant of the variation in the contraceptive use across the districts of the state. It is therefore the need of the time to focus upon improving the level of social and economic development in any effort towards improving the use of family planning methods in the state. Such a strategy requires integrating population factors in the social and economic development planning and programming at the district level.

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Table 1
Family planning use in Munger and Kishanganj districts of Bihar, 2013

Particulars	Munger		Kishanganj	
	Number	Per cent	Number	Per cent
Number of women surveyed	232	100.0	230	100.0
Number of women using a family planning method	133	57.3	105	45.7
Female sterilisation	98	42.2	50	21.7
Male sterilisation	0	0.0	1	0.4
IUD	2	0.9	0	0.0
Oral pill	15	6.5	15	6.5
Condom	0	0.0	5	2.2
Other methods	18	7.8	36	15.7
Number of women not using any family planning method	99	42.7	125	54.3

Source: Primary data collected by the author.

Table 2
Development situation and demographic scenario in Munger and Kishanganj districts

Development and demography	Kishanganj	Munger
Population, 2011(Thousand)	1,690	1,368
Urban population, 2011(Per cent)	9.53	27.79
Decadal population growth, 2001-2011 (Per cent)	30.40	20.21
Area, 2011 (sq km)	1884	1419
Population density, 2011 (Persons per sq km)	897	964
Sex ratio, total, 2011 (Females per 1000 Males)	950	876
Sex ratio, rural, 2011 (Females per 1000 Males)	952	873
Sex ratio, urban, 2011 (Females per 1000 Males)	926	884
Literacy rate, 2011 (Per cent)	55.46	70.46
Literacy rate, male, 2011(Per cent)	63.66	77.74
Literates rate, female, 2011 (Per cent)	46.76	62.08
Scheduled Castes, 2011 (Per cent)	6.69	13.44
Scheduled Tribes, 2011 (Per cent)	3.8	1.56
Women (15-49 years) literate, 2015-16 (Per cent)	33.7	62.5
Men (15-49 years) literate, 2015-16 (Per cent)	46.8	86.7
Women (15-49 years) with at least 10 years of schooling, 2015-16 (Per cent)	12.1	29.3
Contraceptives prevalence rate, 2015-16	12.2	35.4
Institutional deliveries, 2015-16 (Per cent)	41.8	83.5
Total fertility rate, 2012-13	4.4	3.2
Muslim population, 2011 (Per cent)	67.98	8.07
Poverty incidence (Head count ratio)	31.38	37.5
Under-five mortality rate, 2012-13	84	57
Infant mortality rate, 2012-13	56	43

Source: Population census, National Family Health Survey, Annual Health Survey

Table 3
Socio-economic differentials in contraceptive prevalence rate in Munger and Kishanganj districts of Bihar

Background characteristics	χ^2	Using family planning method		
		Yes	No	Total
Women's educational level	17.883***			
Illiterate		43.5	56.5	269
Primary and middle		58.8	41.2	102
High school and above		67.0	33.0	91
Men(Husband)'s educational level	22.042***			
Illiterate		39.8	60.2	196
Primary and Middle		53.8	46.2	117
High school and above		65.1	34.9	149
Exposure to mass media	25.923***			
No exposure		42.9	57.1	301
Exposed		67.7	32.3	161
Caste	6.395**			
Scheduled Castes		41.4	58.6	116
Other backward classes		55.2	44.8	241
Others (General)		54.3	45.7	105
Work status of women	0.027			
Working		52.0	48.0	175
Not working		51.2	48.8	287
Age at marriage	3.119*			
Below 18 years		47.4	52.6	230
18 years and above		55.6	44.4	232
Religion	19.450***			
Hindu		58.1	41.9	327
Muslim		35.6	64.4	135
Number of living children	36.023***			
No living child		0.0	100.0	261
≤ 2		46.0	54.0	50
3 and more		59.1	40.9	286
Standard of living index (SLI)	21.821***			
Low		45.5	54.5	303
Medium		53.1	46.9	96
High		77.8	22.2	63
Autonomy index	22.358***			
Low		20.0	80.0	305
Medium		50.9	49.1	52
High		63.3	36.7	97

***p<0.001, **p<0.05,*p<0.01
Source: Author's calculations.

Table 4
Variation in contraceptive method mix by social and economic factors in Munger and Kishanganj districts, Bihar

Background characteristics	χ^2	Users by type of method			N
		Spacing	Limiting	Traditional	
Religion	19.622***				
Hindu		12.6	69.1	18.3	191
Muslim		26.5	34.7	38.8	49
Caste	6.289				
Scheduled Castes		12.2	69.4	18.4	49
Other backward classes		12.8	60.9	26.3	133
Others		24.1	58.6	17.2	58
Work status of women	13.615***				
Working		5.5	74.7	19.8	91
Not working		21.5	54.4	24.2	149
Exposure to mass media	2.471				
Not exposed		12.2	63.4	24.4	131
Exposed		19.3	60.6	20.2	109
Number of living children	20.474***				
≤2		24.3	40.0	35.7	70
3 and above		11.8	71.2	17.1	170
Women's education	2.667				
Illiterate		12.7	66.9	20.3	118
Primary and middle		18.0	55.7	26.2	61
High school and above		18.0	59.0	23.0	61
Men educational level	3.155				
Illiterate		16.7	62.8	20.5	78
Primary and middle		9.2	67.7	23.1	65
High school and above		18.6	57.7	23.7	97
Age at marriage	4.361				
Below 18 years		11.8	69.1	19.1	110
18 years and above		18.5	56.2	25.4	130
Standard of living index	5.444				
Low		12.9	64.7	22.3	139
Medium		13.5	57.7	28.8	52
High		24.5	59.2	16.3	49
Autonomy index	6.731				
Low		33.3	66.7	0.0	62
Medium		24.1	62.1	13.8	91
High		11.6	66.1	22.2	89

***p<0.001,**p<0.05,*p<0.01.
Source: Author's calculations.

Table 5
Results of the bivariate logistic regression analysis of the use of family planning methods on selected social, economic and demographic characteristics of the currently married women in their reproductive ages in Munger and Kishanganj districts of Bihar

Background characteristics	Munger			Kishanganj		
	B	'p'	Exp(B)	B	'p'	Exp(B)
Religion						
Hindu®						
Muslim				-1.261	0.030	0.283
Caste						
SC®						
OBC	0.927	0.053	2.526	0.968	0.162	2.632
Others(General)	1.692	0.028	5.432	0.980	0.222	2.663
Work status of women						
Working®						
Not working	0.498	0.262	1.646	-1.315	0.009	0.268
Exposure to mass media						
Not exposed®						
Exposed	1.122	0.041	3.072	0.837	0.244	2.308
Women educational level						
Illiterate®						
Primary and middle	0.338	0.535	1.403	-0.168	0.740	0.846
High school and above	0.649	0.262	1.914	-0.822	0.429	0.439
Men educational level						
Illiterate®						
Primary and middle	0.780	0.148	2.182	0.753	0.087	2.124
High school and above	0.222	0.675	1.248	1.757	0.029	5.794
Age at marriage						
Below 18 years®						
18 years and above	-0.229	0.550	0.796	1.159	0.002	3.186
Number of living children						
≤ 2®						
3	0.879	0.067	2.408	-0.851	0.165	0.427
≥4	1.824	0.000	6.195	-0.012	0.981	0.988
Standard of living index (SLI)						
Low®						
Medium	-0.876	0.148	0.417	-0.336	0.553	0.714
High	-0.061	0.942	0.941	1.230	0.347	3.422
Autonomy index						
Low®						
Medium	0.798	0.001	2.221	22.352	0.998	5.097
High	2.059	0.000	7.839	23.157	0.998	1.140

Background characteristics	Munger			Kishanganj		
	B	'p'	Exp(B)	B	'p'	Exp(B)
Constant	-3.584	0.000	0.028	-22.730	0.998	0.000
-2Log likelihood	195.1			196.1		
Nagelkerke R Square	0.347			0.387		
N	232			230		

Source: Author's calculations.

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Trends of Urban Growth and Urbanisation in Nepal

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Introduction

Urbanisation refers to the phenomenon of an increasingly large number of people living in small places and primarily engaged in non agricultural activities. Urbanisation is closely associated with industrialisation and development of infrastructure and facilities within cities, towns and their surrounding neighbourhoods. Urbanisation is widely considered as an index of modernisation (Singh, 1987).

Urbanisation, however, has different meaning in different contexts. Demographers, economists, statisticians and geographers consider urbanisation with specific views and tools. Demographers usually try to see urbanisation according to urban population *accretion* of population in urban areas as proportion of total population. Economists usually try to relate population growth, pattern of defined technology on the process of urbanisation. Statisticians try to relate production functions growth rates of urban population (Roy, 2013). Geographers consider urbanisation in relation to distribution of urban spaces and see proportions and growth of urban population at different spatial contexts (Basyal and Khanal, 2001).

In the broader sense, urbanisation is a vast process of development or increasing activities of people in areas known as urban reflecting the structural changes in physical, socio-economic, demographic and cultural factors of human life. Normally the level of development of a country has a direct relationship with the level of urbanisation. Urbanisation is a process by which rural population is transformed into an urban population or an increase in the proportion of the urban population. It includes pace of urbanisation and growth in the number of urban centers/places.

Urbanisation in Nepal is still in its infancy (Gurung, 2001). The rate of urban population growth in Nepal has picked up the pace in recent decades, although significant differences exist in the urban population growth rate, level of urbanisation

and the number of urban centres in the different parts of the country. The aim of this paper is to analyse the trend in the urban population growth in Nepal and to discuss the process of urbanisation in the country.

Nepal is a country in existence since ancient times. It is located in the lap of the Himalayas. It is a small country in between two big countries, India in the east, south and west and China in the north. Geographically, Nepal is situated between 26^0 $22^{'}$ North and $30^0 27^{'}$ North latitudes and 80^0 04' to $88^0 12^{'}$ East longitudes with average width ranging between 145 to 242 kms which gives the country a rectangular shape. Total geographical area of the country is 147188 sq kms which only about 0.03 per cent of the total land area of the earth. Nepal is land locked and its nearest point from sea is 760 kms. The altitude of the country varies widely from 60.22 m from the sea level in the south to 8848 m from the sea level in the north. Because of the very wide variation in the altitude within a very small area, the physiography of the country is unique in the world representing all land form features - plains, tars, hills, ridges, valleys, and mountains. From the ecological perspective, Nepal is divided into three regions - mountains in the north, Terai (plain) in the south and hills in between. Administratively, Nepal is divided into five development regions, 75 districts, 217 municipalities and 3151 village development committees.

Methods and Materials

The present analysis is based primarily on the data available from the population census of Nepal which has a history of more than 100 years. The first population census in Nepal was carried out in 1911. However, the population census carried out during 1952-54 is considered to be the first modern population census of Nepal introducing internationally comparable concepts, definitions and classifications. As such, the present analysis is based on the data available from the population census carried out in 1952-54 through 2011. Using the data so available, key indicators of urbanisation have been calculated including average annual urban population growth rate, and level, degree and pace of urbanisation in the country. The analysis has been carried out through the demographic perspective and not through an economic perspective. It may however be pointed out that the concept urban has been different in different population census carried out in the country since 1952-54. Table 1 gives a snapshot of the definition of an urban area adopted in different population census of the country since 1952-54. It is obvious from the table that the criteria adopted for treating a human settlement as an urban area has not been consistent across different population census since 1952-54. It may also be pointed out here that the definition of the urban area adopted at the population census has been different in different regions of the country. For example, according to the Local Self Governance Act, 1999 of Nepal, the minimum requirements for classifying a human settlement as an urban area are different in the hill and mountain regions of the country then those for the Terai region (Table 2). As such, comparison of the state of urbanisation across different regions of the country is problematic.

The problem of the definition in the study of urbanisation in Nepal is quite considerable. There has been a lack consistency in defining the urban areas in different population census of the country. In the 1952-54 population census, no definition of the urban area was adopted, although, data on ten "prominent" human settlements with a population of more than 5,000 were provided separately. The 1961 population census adopted, for the first time, the definition of an urban area. According to this definition, an urban area was an area with a population cluster of 5,000 and over and having an urban environment such as high school, college, judicial and administrative offices, bazaar, communication facilities, mills, factories etc. However, this definition was not strictly followed during the census. The Nagar Panchayat Act of 1962, however, adopted the nomenclature of Nagar as the local level urban administrative unit or a municipal area as distinct from a local level rural administrative unit. An urban area in this Act was interpreted not as a settlement unit but as a unit of local self-government. At the 1971 population census, the concept of localities was introduced for the first time but localities were not settlement units but Panchayat or Village Development Committee which included many, often far flung, settlement units. Moreover, the decision regarding classifying a settlement as urban or rural was made by the Ministry of Local Development. Since 1971, areas with municipal status have been ipso facto considered as urban. The fact that the population size criterion was not consistently followed in designating a settlement as Nagar Panchayat may be judged from the fact that at least four of the newly designated Nagar Panchayats in 1971 had a population of less than 10,000 whereas 12 other 'localities' which had a population of more than 10,000 were not classified as Nagar Panchayats. In 1976 the population size criteria for giving the municipal status to a settlement was reduced to 9,000. The Municipality Act of 1992, and the Local Self Governance Act of 1999 redefined and reclassified the municipal areas in the country and, for the first time, municipal areas were classified into different categories but the universally accepted criteria of population size, density, contiguity and occupational structure of population wee given scant attention. The 1999 Act laid down the population criteria for designating a settlement as municipal area which was different for the Tarai region and for the hill/mountain region of the country. In the Tarai region, the minimum population size for designating a settlement as municipal area was 20,000 while the same in the hill/mountain region was only 10,000. The double standard adopted in designating municipal area between the Tarai and the hill/moutain regions of the country remains incomprehensible even today. Most recently, the Government of Nepal, Ministry of Federal Affairs and Local Government declared 159 settlements as municipalities in 2015 which meant that these settlements are now treated as urban areas. This decision of the Government of Nepal radically changed the urban scenario in the country as will be highighted in the following pages. In general, the lack of a standadised approach in classifying a settlement as an urban area in the country makes it very difficult to analyse the urban population growth and urbanisation patterns in the country. Any analysis and discussion on urbanisation in the country should take into consideration the inherent inconsistency in classifying a settlement as urban as discussed above.

Urban Population Growth and Urbanisation in Nepal

Urbanisation is a relatively a new phenomenon in Nepal. The level of urbanisation in the country is low but the rate of urban population growth is faster than the rate of rural population growth. There has been an increase in the number of urban settlements and the proportion of the population living in the urban areas. At the time of 1952-54 population census, there were only 10 urban centers in the country which increased to 58 at the 2011 population census. However, according to the Ministry of Federal Affairs and Local Development of the Government of Nepal, there were 217 urban centres in the country in 2016 as 159 new municipalities were created in 2015 (Table 3). Similarly, the total population living in the urban areas increased from 23.827 thousand at the 1952-54 population census to 4523.820 thousand at the 2011 population census. If the population of the 159 new municipalities created in 159 is also taken into account, then the total urban population in the country at the 2011 population census shoots up to 11069.495 thousand.

The indicators of the degree of urbanisation in Nepal are presented in table 4. The proportion of the urban population to the total population of the country increased from around 3 per cent in 1952-54 to 17 per cent in 2011. However, if the 150 municipalities created in 2015 are also taken into consideration, then the urban population accounts for almost 42 per cent of the population of the country enumerated at the 2011 population census. As a result, the proportion of the rural population to the total population decreased from 97 per cent in 1952-54 to 83 per cent in 2011 and if the 159 municipalities are also taken into account then the proportion of the rural population reduces to 58 per cent of the total population of the country at the 2011 population census. The urban-rural ratio, therefore, increased from just around 3 per cent in 1952-54 to more than 20 per cent in 2011 and taking into considering the 159 municipalities created in 2015, the urban population was more than 71 per cent of the total population enumerated at the 2011 population census.

Table 5 presents the data pertaining to the tempo of urbanisation in Nepal which is measured in terms of urban-rural growth difference. The urban population growth rate in the country has always been faster than the rural population growth rate so that the tempo of urbanisation has always been positive. The temp of urbanisation in the country was at its peak during 1971-81 when the urban population of the country increased at an average annual rate of 7.6 per cent per year whereas the rural population increased at an average annual rate of 2.4 per cent per year. During the period, 2001-2011, however the tempo of urbanisation in the country has been quite low. It is well known that the growth of both urban and rural populations is influenced substantially by reclassification of rural areas into urban areas.

The spatial pattern of urbanisation in Nepal can be analysed in different ways. One way is to look into the urbanisation pattern across the three ecological regions of the country - mountains, hills and Terai. Similarly in the other way it can be analyzed through development regions. Nepal is made up of diverse landscape ranging from

plain, valleys and tars and hills and mountains. The pattern of population concentration varies by type of landscape. At the present time human settlement pattern in Nepal is largely governed by the availability of fertile land, which is normally available in the plains and in the valleys; the lowlands or plains are densely settled than the hills and mountains. (Subedi, 2014).

More than half of the urban population of the country is concentrated in the Terai ecological region of the country whereas there is little urbanisation in the mountain ecological region (Table 6). An interesting observation of table 6 is that the proportion of the urban population living in the hill ecological region has decreased consistently since 1952-54 whereas the proportion of the urban population licing in the Terai ecological region has consistently increased. In the mountain region, on the other hand, there was no urbanisation till 1991 and the pace of urbanisation in this ecological region of the country has been very slow. According to the 2011 population census, only 2 per cent of the urban population of the country lived in this region. The rapid urbanisation in the Terai ecological region appears to be due to the fact the east-west highway passes through this region so that urban centres have emereged in large numbers in this region. Moreover, this region is the nearest to the neighbouring India with which most of the trade takes place.

Nepal has also been divided into five development regions (Table 7). The central region of the country, urbanisation appears to be the most advanced. This is the region where the national capital of Kathmandu is located. This development region also has the largest number of urban settlements. On the other hand, the mid-western and far-western development regions of the country lag behind the other development regions as far as urbanisation is concerned.

Conclusions

Data available from different population censuses carried out in Nepal since 1952-54 show that urbanisation was low in the country till the last census in 2011. However, after the deceleration of new urban places in 2016, the scenario of urbanisation in the country has changed significantly. The urban population in Nepal increased from 2.9 per cent in 1952/54 to 17.1 per cent in 2011. However, the settlements declared as municipalities in 2015 are also treated as urban in 2011, then urban population in 2011 was 41.8 per cent of the total population enumerated in 2011 depicting the entirely different picture of urbanisation and urban population growth in the country. Obviously, political decision has always played the dominant role in defining the urban areas in the country rather than a standard approach.

The population of Nepal has recorded considerable increase during the last 60 years along with even more rapid increase in the urban population by all accounts. The increase in urban population in different inter-censal period has, however, not been uniform, although, the urban population growth in the country has always been more rapid than the rural population. Increase was highest between 1971 to 2001 period.

Urban population growth rate remained always higher than that of total and rural population growth rate. The growth of the urban population has particularly been very rapid during 1971-1981 whereas the rural population of the country increased very slowly during 2001-2011. It is however not very clear how much of the urban population growth has been the result of the reclassification of the rural settlements into urban settlements and how much of the urban population growth has been due to the increase in the existing urban settlements.

Among different regions of the country, the Hill region had a major share of the urban population from 1952/54 to 2001 but in 2011 the share of urban population in the Hill region has been less than that in the Terai region which suggests that the pace of urbanisation in the Terai region of the country has been faster than that in the Hill and in other regions of the country. The difference in urbanisation in different regions of the country reflects the difference in the level of social and economic development. In this context, the Central Development Region of the country appears to be the most developed whereas the Mid-western Development Region appears to be the least developed.

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Table 1
Changing definition of urban area in Nepal

Reference	Population size	Other criteria	Name of urban settlement
Population census 1952/54	> 5000	Prominent settlements	
Population census 1961	> 5000	Urban environment	Sahar
Nager Panchayat Act 1962	≥ 10000	Local urban administrative unit. Local government unit.	Nagar Panchayat
Amendment in Nagar Panchayat Act 1976	≥ 9000		Nagar Panchayat
Municipality Act 1992	≥ 9000		Nagerpalika
Municipality Act 1992	≥ 20000	Basic urban infrastructures. Minimum 1 million annual revenue. Semi-urban environment.	Nagerpalika
Local Self Governance Act 1999	Hills >10000 Terai >20000	Annual revenue Hills - at least NR 500 thousand Terai - at least NR 5 million Minimum urban facilities such as electricity, road, drinking water, communication and other similar facilities.	Nagerpalika Up-mahanagar Palika Mahanager Palika

Source: Government of Nepal (2011; 2014)

Table 2
Categorisation of designated urban areas by Local Self Governance Act 1999

Criteria	Nagerpalika	Upa-Mahanagerpalika	Mahanagerpalika
Population	In hills and mountain: more than 10000. In Terai more than 20000.	At least 100000	At least 300000
Revenue	NRs.5 million in annual revenue in Terai NRs.500000 in annual revenue in Mountain and Hill	Annual revenue at least NRs. 100 million	Annual revenue at least NRs. 400 million
Urban infrastructure	Minimum urban facilities	Urban facilities & urban environments	Urban facilities & urban environments
Other requirements		Infrastructures for national & international sports events, city hall, etc.	Infrastructures for international sports events, university, specialized services etc.
	Municipality	Sub-Metropolitan	Metropolitan

Source: Government of Nepal (2011; 2014)

Table 3
Population of Nepal by rsidence 1952-54 through 2011

Year	Total population	Urban ppopulation	Rural Population	Number of Urban agglomerations / Towns
1952/54	8256625	238275	8018350	10
1961	9412996	336222	9076774	16
1971	11555983	461938	11094045	16
1981	15022839	956721	14066118	23
1991	18491097	1695719	16795378	33
2001	23151423	3227879	19923544	58
2011	26494504	4523820	21970684	58

Source: Government of Nepal (2011; 2014)

Table 4
Degree and tempo of urbanisation in Nepal

Year	Urban-rural ratio Per cent	Urban population growth rate Per cent	Rural population growth rate Per cent	Urban-Rural growth difference
1952/54	2.98			
1961	3.73	4.53	1.56	2.97
1971	4.16	3.23	2.03	1.20
1981	6.83	7.55	2.40	5.15
1991	10.13	5.89	1.79	4.10
2001	16.14	6.43	1.70	4.73
2011	20.48	3.37	0.97	2.40

Source: Author's calculations.

Table 5
Urbanisation in ecological region of Nepal

Ecological region		1952-54	1961	1971	1981	1991	2001	2011
Mountain	Percentage of urban population						1.4	2.3
	Number of urban centres						2	8
Hills	Percentage of urban population	82.0	69.7	65.0	51.8	51.2	53.2	43.8
	Number of urban centres	5	8	7	9	13	27	52
Terai	Percentage of urban population	17.6	30.3	35.0	48.2	48.8	45.5	53.9
	Number of urban centres	5	8	9	14	20	29	70
Nepal	Percentage of urban population	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Number of urban centres	10	16	16	23	33	58	130

Source: Government of Nepal (2011; 2014)

Table 7
Urbanisation in Nepal by development regions

Development region	Total population	Urban Population	Proportion urban Per cent	Urban centres
Eastern	5811555	2149403	36.98	53
Central	9656985	4852643	50.25	71
Western	4926765	1959269	39.76	44
Mid-western	3546682	1049875	29.6	24
Far-western	2552517	1058305	41.46	25
Nepal	26494504	11069495	41.78	217

Source: Government of Nepal (2011; 2014)

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Women's Participation in Decision Making in Sana Kisan Krishi Sahakari Sanstha, Daijee, Nepal

Deepak Raj Joshi

Introduction

There is a large gap between haves and haves-not in Nepal. The cooperative organisations are contributing towards bridging this gap. The Sana Kisan Krishi Sahakari Sanstha (SKKSS) Daijee is one of the many member-based cooperative institutions in Nepal that works towards improving the quality of life of the poor in Nepal. An SKKSS is essentially a civil society organisation which pools its resources to meet the basic needs of its members and defends their interests. It is a three tier organisation comprising of 1) small farmers groups; 2) inter-groups council; and 3) a central committee. A typical small farmers group is involved in the management of group activities, conducting group meetings, supporting financial and community development programmes, collection of loan demand applications and forwarding them to the respective inter group, saving collection and mobilisation, etc. The inter-group council, on the other hand, acts as a coordinating agency for sharing resources and utilising them for collective benefits. It also serves as a mediator between groups and the central committee. Other activities of the inter-group council include mobilisation for economic, social and community development activities, collection of savings and monitoring and evaluating the programme prepared by the farmers groups and forwarding them with recommendation to the central committee. The central committee is responsible for the operation and management of SKKSS which includes, among others, making plan and policies, sanctioning loan, developing linkages with line agencies, providing leadership and building leadership capacity in addition to supervision and monitoring. The principles, values and norms of cooperatives are member-centred. Nepalese rural society is now very much familiar with SKKSS. Majority of the members of SKKSS are from the poor and the middle class households. SKKSS is designed primarily as a multi-service cooperative institution to deliver mainly financial services but it also delivers non-financial services to its members. The genesis

of SKKSS dates back to 1975 when the Small Farmer Development Programme (SFDP) was launched to alleviate poverty by the Agricultural Development Bank of Nepal. The movement has since grown up substantially and now covers the entire Nepal. Today there are more than 33 thousand primary cooperative organisations in the country working in different fields of development. Total membership of these institutions is more than 5 million and these organisations have provided direct employment to more than 60 thousand persons.

Empowering women through increasing their participation in the productive activities is one of the important activities of SKKSS. The present study is directed towards making an assessment of how far the women's empowerment activities being carried out by SKKSS have contributed towards improving the situation of women in the households. In this context, the study makes an assessment of the income level of women and the their role in making decisions related to food and non-food expenditure, expenditure on education and family planning as well as their contribution to family level savings and expenditure within the family. The study also reviews the skills development activities being organised by small farmers groups that constitute the basis of SKKSS and the impact of skills development on women's empowerment.

Materials and Methods

The study was carried out in SKKSS Daijee which is a village development committee in Kanchanpur District in the Mahakali Zone of south-western Nepal. According to the latest population census of Nepal, the population of Daijee was 27,481 according to the 2011 population census. For the purpose of the present study, 80 households were selected purposively. Both primary and secondary data were collected for the study. The primary data were collected through direct interview from one of the responsible members of the selected households on the basis of a structured questionnaire that was developed and pre-tested for the purpose while the secondary data were collected from different official records and articles, books, etc. The analysis of the collected data was limited to descriptive analysis only.

Findings

The basic characteristics of the respondents surveyed as part to the study are presented in tables 1 through 5. Out of the total 80 respondents, 41 were females and 39 were males. Majority of the respondents, either female or male, belonged to the age group 25-35 years. Moreover, none of the respondents surveyed were illiterate, although, there was no female respondent who was educated up to the masters' level whereas there were 3 males who were having master level education. Similarly, there appeared little difference in the family size of the female headed households as compared to the male headed households selected for the survey. On the other hand,

all but a few respondents surveyed belonged to the upper castes and the backward classes. Scheduled Castes households constituted an insignificant proportion of the sample of households surveyed in the present study.

In majority of the households surveyed, the average annual income per household ranged between NR 200 thousand to NR 400 thousand per year.There were only 3 households where the average per capita income of the household income was less than NR 200 thousand per year whereas there were only 14 households which had an average annual income of more than NR 400 thousand per year. Similarly, the land holding of the majority of the households surveyed was small - less than 2.5 acres. There were only 7 households which had a land holding of at least 4.8 acres at the time of the survey.

As regards the training received as part of being the member of SKKSS, only 41 respondents reported that they received a training after becoming the member of SKKSS (Table 6). The proportion of respondents who receivied training was comparatively higher in males than in female. Majority of the respondents, however, reported that they received training for less than 7 days. There were only 3 respondents - 1 female and 2 males - who reported that they received training for more than 14 days.

An important indicator of the empowerment of women is their involvement in the decision-making process at the household level. It is argued that the increase in the participation of women in income generating activities results in their increased involvement in the decision-making process within the household primarily in the context of decisions related to household expenditure. To examine this hypothesis, the respondents were questioned specifically in terms of who took decision regarding household level expenditure. The household level expenditure was divided into four categories for the purpose - expenditure on food and non-food items; expenditure on the education, especially, of children either female or male, expenditure on household savings and expenditure on health care of the members of the households. The respondents were specifically asked where the decision related to the household expenditure was taken only by male members of the households or by only the female members or by both male and female members jointly. In situations where the decision was taken by the male member alone, it was also asked from the respondents whether female members of the household were not involved in the decision-making process or not. Finally, it was also asked from the respondents whether some decisions at the household level were taken by female members alone.

Results of the enquiry are presented in table 7 in the context of household decision-making related to expenditure on food and non-food items. Only about one fourth of the respodents surveyed reported that women are involved in the household decision-making process regarding the expenditure on food and non-food items whereas around 55 per cent of the respondents reported that the decision-making related to the expenditure on food and non-food items was the sole prerogative of the male members of the household. However, around 20 per cent of the respondents

reported that household decision-making related to the expenditure on food and non-food was entirely the responsibility of the female members of the household. The survey also revealed that the income status or the standard of living of the household did not appear to have any impact on the involvement of females in the household decision making process related to the expenditure on food and non-food items in the household.

As regards involvement of women in household decision-making related to the expenditure on the education of children, the male dominance is very much evident from table 8. Out of the 80 respondents, 50 respondents reported that the decision related to the expenditure on the education of children was taken by only males in the household whereas only 10 respondents reported that the decision was taken by only females in the household. There were only 20 respondents who reported that the decision related to the expenditure on the education of children was taken by both female and male members of the household. In rich households, the household decision-making related to the expenditure on the education of children was found to be taken primarily by the male members of the household whereas involvement of females of the household in the decision making processes appeared to be generally confined to middle income group households only. In both low income and high income hourseholds, male members of the household, played a very dominant role in the household decision-making related to the expenditure on the education of the children in the household.

Household decision-making regarding the expenditure related to the health of the members of the household has also been found to be dominantly the prerogative of the male members of the household (Table 9) as more than three-fourth of the respondents surveyed in the present study reported that the household level decision related to the expenditure of the health of the members of the household was taken by the male members of the household only and the female members of the household were involved in the household level decision-making process. There were only 10 respondents who reported decision-making by only females of the household in matters related to the health of the members of the household. Similarly, only 10 respondents, out of the 80 surveyed, reported that decisions related to the expenditure on the health of the members of the household was taken jointly by male and female members of the family. The reason appears to be the fact that females in the surveyed households were nearly totally dependent upon male members of the household who also happened to be the main earning members in the household. As such the dominance of the male members of the household in making decisions related to the household expenditure was very much evident from the present study. Although, SKKSS might be instrumental in promoting the participating of females in the income generating activities, yet the household level environment remains male oriented so that household decision-making appears to largely remain the prerogative of the male members of the household. One reason may be the fact that there was a significant gap between the wages earned by females as compared to male members of the household.

Discussions and Conclusions

The present study shows that despite efforts by SKKSS towards empowering women by promoting their participation in productive activitiews, females in the households surveyed continute to be heavily dependent upon their male counterparts as far as the household decision-making related to expenditure on livelihood issues such as expenditure on food and non-food items, expenditure on education of children and expenditure on health of the members of the household is concerned. It appears that females in the study population are treated as subbordinates to males because of their participation in productive activities is poorer than males and they are nearly totally dependent upon males in the society and within the household. It appears that efforts to promote women's participation in producive activities as part of women's empowerment activities being organised by SKKSS Diajee have not been very effective in improving the involvement of females in the household level decision-making process. The analysis also reveals that majority of the females surveyed lacked the cooperative knowledge which appears to be a major inhibiting factor by way of their empowerment.

The study also suggests that reforming the Sana Kishan Krishi Sahakari Sanstha (SKKSS) can play a crucial role as far as improving the status of women in the country as a whole is concerned. Reforms play a crucial role in the economic growth of the country. It is obvious from the present analysis that a comprehensive review of women's empowerment activities being organised by SKKSS should be carried out so as to make these activities more effective in improving the participation of women in productive activities at the local level and sustaining the participation. Participation in productive activities can effectively reduce the gender inequalities in female and male average income is concerned. The household dynamics says that economic status of women is a major contributing factor in the involvement of females in the household level decision-making process.

Table 1
Age and sex composition of the respondents surveyed

Age group	Female		Male		Total	
	Number	Per cent	Number	Per cent	Number	Per cent
15-25	2	4.88	6	15.38	8	10.00
25-35	15	36.59	13	33.33	28	35.00
35-45	0	0.00	1	2.56	1	1.25
45-60	16	39.02	16	41.03	32	40.00
60-75	7	17.07	3	7.69	10	12.50
≥75	1	2.44	0	0.00	1	1.25
All	41	100.00	39	100.00	80	100.00

Source: Primary data collected by the author.

Table 2
Family characteristics of the respondents

Family size	Female headed households		Male headed households		Total	
	Number	Per cent	Number	Per cent	Number	Per cent
42738	10	24.39	13	33.33	23	28.75
42863	24	58.54	19	48.72	43	53.75
43021	6	14.63	5	12.82	11	13.75
15-19	1	2.44	2	5.13	3	3.75
All	41	100.00	39	100.00	80	100.00

Source: Primary data collected by the author.

Table 3
Education status of respondents surveyed

Level of education	Female		Male		Total	
	Number	Per cent	Number	Per cent	Number	Per cent
Uneducated	0	0.00	0	0.00	0	0.00
42739	7	17.07	7	17.95	14	17.50
42893	15	36.59	16	41.03	31	38.75
42987	6	14.63	6	15.38	12	15.00
43050	10	24.39	7	17.95	17	21.25
Graduate	3	7.32	3	7.69	6	7.50
All	41	100.00	39	100.00	80	100.00

Source: Primary data collected by the author.

Table 4
Annual income (1000 Nepali Rupees) of the respondents by social class

Annual income	Bramin	Kshritri	Backward	Scheduled Castes	Total	Per cent
100-200	0	2	1	0	3	3.75
200-300	8	16	10	2	36	45.00
300-400	9	5	13	0	27	33.75
400-500	1	3	2	0	6	7.50
500-600	1	1	1	0	3	3.75
≥600	1	1	3	0	5	6.25
Total	20	28	30	2	80	100.00
	25.00	35.00	37.50	2.50	100.00	

Source: Primary data collected by the author.

Table 5
Annual income (1000 Nepali Rupees) of the respondents by land holding

Annual income	Size of land holding (Acres)					
	< 1.2	1.2-2.4	2.4-4.8	≥4.8	Total	Per cent
100-200	2	1	0	0	3	3.75
200-300	23	7	5	1	36	45.00
300-400	9	10	6	2	27	33.75
400-500	2	0	2	2	6	7.50
500-600	1	1	1	0	3	3.75
≥600	2	0	1	2	5	6.25
Total	39	19	15	7	80	100.00
	48.75	23.75	18.75	8.75	100.00	

Source: Primary data collected by the author.

Table 6
Training received by the respondents surveyed

Duration of training	Female		Male		Total	
	Number	Per cent	Number	Per cent	Number	Per cent
No training	23	56.10	16	41.03	39	48.75
< 7 days	13	31.71	18	46.15	31	38.75
7-14 days	4	9.76	3	7.69	7	8.75
≥14 days	1	2.44	2	5.13	3	3.75
All	41	100.00	39	100.00	80	100.00

Source: Primary data collected by the author.

Table 7
Women's involvement in decision-making related to expenditure on food and non-food items

Annual income	Only female	Only male	Female and male	Total	Per cent
100-200	1	2	0	3	3.75
200-300	7	22	7	36	45.00
300-400	7	12	8	27	33.75
400-500	1	2	3	6	7.50
500-600	1	2	0	3	3.75
≥600	0	4	1	5	6.25
Total	17	44	19	80	100.00
	21.25	55.00	23.75	100.00	

Source: Primary data collected by the author.

Table 8
Women's involvement in decision-making related to expenditure on education of children

Annual income	Only female	Only male	Female and male	Total	Per cent
100-200	1	4	0	5	6.25
200-300	3	22	7	32	40.00
300-400	4	11	8	23	28.75
400-500	1	7	3	11	13.75
500-600	1	2	1	4	5.00
≥600	0	4	1	5	6.25
Total	10	50	20	80	100.00
	12.50	62.50	25.00	100.00	

Source: Primary data collected by the author.

Table 9
Women's involvement in decision-making related to expenditure on health

Annual income	Only female	Only male	Female and male	Total	Per cent
100-200	1	2	1	4	5.00
200-300	3	30	2	35	43.75
300-400	4	20	3	27	33.75
400-500	1	2	3	6	7.50
500-600	1	2	0	3	3.75
≥600	0	4	1	5	6.25
Total	10	60	20	80	100.00
	12.50	75.00	25.00	100.00	

Source: Primary data collected by the author.