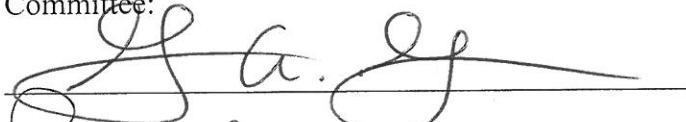UNDERSTANDING THE RELATIONSHIP BETWEEN MATERNAL EDUCATION
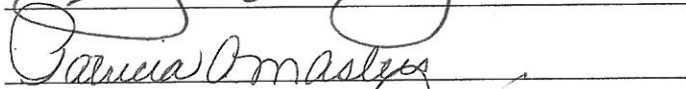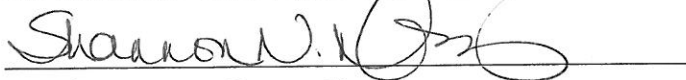AND INFANT/UNDER FIVE CHILD MORTALITY IN INDIA

by

Meenakshi Trichur Ramasubramanian
A Thesis
Submitted to the
Graduate Faculty
of
George Mason University
in Partial Fulfillment of
The Requirements for the Degree
of
Master of Arts
Sociology

Committee:

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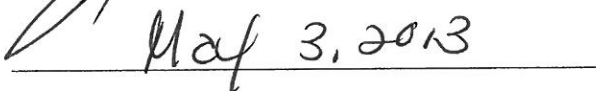
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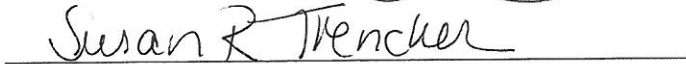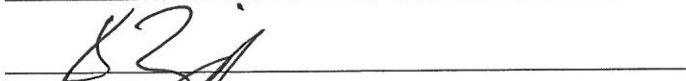   and Social Sciences

Date: _____   Spring Semester 2013
                                  George Mason University
                                  Fairfax, VA

Understanding the Relationship Between Maternal Education and Infant/Under Five
Child Mortality in India

A Thesis submitted in partial fulfillment of the requirements for the degree of Master of
Arts at George Mason University

By

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DEDICATION

This is dedicated to my husband Venkatesh, my parents Ramasubramanian and Rama Mani, and my daughter Advika.

ACKNOWLEDGEMENTS

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ABSTRACT

RELATIONSHIP BETWEEN MATERNAL EDUCATION AND INFANT/CHILD MORTALITY IN INDIA

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Women's education lowers child mortality rate in developing countries. My research question is '*What are the intervening variables involved in the process that lead to a relationship between maternal education and infant/under five child mortality in India?*' The dependent variable is infant/under five child mortality and the independent variables are maternal education, women's empowerment indicators, women's autonomy indicators, knowledge acquisition measure and decision-making regarding reproductive behavior and child care measure

I argue that the causal link between maternal education to child survival is due to impact of education on women's empowerment and autonomy (both in absolute and relative terms). Women's social status (empowerment and autonomy) improves with education, which has an impact on their ability to acquire knowledge and make decisions regarding their reproductive behavior and child care.

INTRODUCTION

United Nations interagency group 2011 reports that 7.6 million children under the age of five die annually. United Nations Children's Fund (UNICEF) finds that, of this, 70% of the deaths are preventable if access to vaccination, safe drinking water, improved family care and other low-tech measures are made available. In addition, lack of utilization of available resources, unawareness of its availability and lack of understanding of its benefits also leads to preventable deaths (UNICEF, 2011).

There is growing evidence that educating the mother contributes to saving children from dying young (Caldwell 1979, Van Ginneken and Cleland 1988; Bicego and ties Boerma 1993, Rosling et al. 2007, Gakidou, Cowling, Lozano and Murray, 2010). This establishes a causal relationship between maternal education and child health, and multiple pathways are being studied to address the issue of infant/under five child mortality.

The focus of my research paper is to understand the relationship by exploring the research question '*What are the intervening variables involved in the process that lead to a relationship between maternal education and infant/under five child mortality in India?*'

MATERNAL EDUCATION AND INFANT MORTALITY RATE

Women play the traditional role of caretakers of the family in many parts of developing countries. The knowledge women possess and the power relations within the family and in the community determine women's decision-making capacity. Increase in women's education averted 4.2million infant deaths according to Infant mortality data from 175 countries between 1970 and 2009 (Gakidou, Cowling, Lozano, and Murray 2010). Rosling et al find a negative correlation between the level of maternal education attainment and infant mortality rate in a study conducted among 152 low, middle and high income countries (Rosling et al. 2007). Female illiteracy rate is identified as a major contributor to infant mortality rate (IMR), and as the strongest predictor of infant mortality rate in low income countries. This relationship is found to be statistically significant and next only to Gross National Income and IMR. In middle income countries, the female illiteracy rate is the strongest univariate predictor of IMR.

Caldwell pioneered the unraveling of the relationship between IMR and maternal education in 1979. His research advocates that maternal education is the single most significant predictor of marked differences in child mortality rate. Therefore maternal education should not be considered a proxy to indicate the socio-economic changes but be examined as an independent contributor. This finding is reflected in recent research studies that demonstrate a causal mechanism between education and infant mortality, identifying education as resulting in better decision-making ability regarding reproductive behavior and child care, which in turn adds to improved chances of child survival (Caldwell and McDonald, 1982; Hobcraft, 1993). I would like to advance this

argument and propose that social status of educated women act as intervening factors that link infant/under five child mortality and maternal education. I will use the Demographics and Health Survey (DHS) to provide empirical evidence to investigate the process.

SIGNIFICANCE OF REPRODUCTIVE HEALTH DISCUSSION AS PART OF WOMEN'S EMPOWERMENT AND AUTONOMY IN DEVELOPING COUNTRIES

Social status of women can be broken down into two components namely women's empowerment and women's autonomy. Women's autonomy and empowerment manifests its use and effects in many fields such as economic well-being, job market, leadership, business, governance and politics. However, in developing countries, woman's autonomy and empowerment is predominantly linked to women's rights to reproductive health and behavior. Ironically, women belonging to lower socio-economic class lack economic, social and political standing and well being, which are conditions necessary to exercise reproductive health rights. In addition, population and population growth are increasingly linked to many social, economic and environmental problems such as poverty, pollution, unemployment, war, conflict which have significance from local to global levels. Therefore population control efforts also target women's reproductive and sexual behavior (Rao and Sexton, 2010).

Empowerment and autonomy of women involves reproductive health and rights that would liberate women and give them the sole rights to their own bodies. Population control policy, which is designed at the national and international level, decides good reproductive health for women depending on the needs and resources available to provide

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for the people. It promotes the idea of reproductive and sexual health and rights of women in order to benefit the community and nation at large. There is a vague demarcation between where woman's decision-making ends and where the population control policy implementer's decision-making starts.

Women's empowerment

Women's empowerment is a culmination of ideas put forth by third world feminists and various women's movements that took place around the world (Batliwala, 1994). Batliwala defines the term empowerment to refer to 'a range of activities from individual self-assertion to collective resistance, protest and mobilization that challenge basic power relations. For individuals and groups where class, caste, and gender determine their access to resources and power, their empowerment begins when they not only recognize the systemic forces that oppress them, but act to change existing power relationships. Empowerment therefore is a process aimed at changing the nature and direction of systemic forces which marginalize women and other disadvantaged sections in a given context (130).' Cleland (1990) identifies instrumentality, social identification and confidence as components of women's empowerment that enable women to provide improved child and health care thus lowering infant and child mortality. 'Instrumentality is the ability to manipulate and feel control over the outside world. Social identification is concerned with engagement with modern institutions and bureaucracies. Greater confidence permits the interaction with such officials and bureaucracies' (Hobcraft, 1993, 161).

Women's autonomy:

Women's autonomy is also closely related to the power relations as equality of autonomy between men and women is defined as equal decision-making ability with regard to personal affairs (Dyson and Moore, 1983). Autonomy is defined in the realm of private life or private sphere and not public sphere or in public life.

Reproductive rights:

An understanding of reproductive rights and family planning will aid in guiding the discussion around the areas that empowerment and autonomy in reproductive health extend to, as well as why both private and public sphere need to be considered. Family planning is the right of women to regulate her fertility safely and effectively; to understand and enjoy her own sexuality; to remain free of disease, disability or death associated with sexuality and reproduction and to bear and rear healthy children (Dixon-Mueller, 1993).

Reproductive right is commonly thought of as a western thought, however Correa and Petchesky (1993) argue that both, feminists from the western world and from the developing countries in Asia, North Africa and Latin America supported the same principles of equality, personhood and bodily integrity. 'They held the common premise that in order for women to achieve equal status with men in society, they must be respected as full moral agents with projects and ends of their own; hence they alone must determine the uses – sexual, reproductive, or other – to which their bodies are put (109).'

The descriptions of reproductive rights and empowerment suggest that both are closely interconnected as rights cannot be enjoyed unless women are empowered to both

recognize and mobilize movements for repositioning their status at home and in the community. Correa and Petchesky (1993) describe women's empowerment as an enabling condition to exercise women's reproductive rights.

Reproductive health:

The following is the description of reproductive health that was decided upon by ICPD participants who represented diverse fields such as population development, family planning, women's rights group and religious groups from western and third world countries. As we will see in the following section, the term 'reproductive health' was intended to appeal to a diverse group in order to legitimize the term and its usage in programs and policies. Reproductive health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, in all matters relating to the reproductive system and its processes. Reproductive health therefore implies that people are able to have a satisfying and safe sex life and they have the capability to reproduce and the freedom to decide if, when and how often to do so. Implicit in this last condition are the right of men and women to be informed and to have access to safe, effective, affordable and acceptable methods of family planning of their choice, as well as other methods of their choice for the regulation of fertility which are not against the law, and the right of access to appropriate health care services that enable women to go safely through pregnancy and child-birth and provide couples with the best chance of having a healthy infant… (Sen and Batliwala, 2000, 16).'

The definitions above pertaining to empowerment, autonomy, reproductive rights, and reproductive health recognize that women will be in a position to make informed

decisions only when provided with appropriate resources. The resources such as knowledge, access to safe and affordable products and services coupled with socio-economic standing and autonomy empower women to make informed decisions.

Boehmer and Williamson (1995) argue that the change in the status of women, both economically and socially has an impact on infant mortality rate in developing countries according to a cross-national analysis conducted to study the relationship between woman's status and infant mortality rate

PATHWAYS INVOLVED IN MATERNAL EDUCATION HAVING AN EFFECT ON CHILD MORTALITY RATE

Education is associated with women's decision making regarding her reproductive behavior and child care, which leads to lowering the occurrence of child death. Women's education has positive association with maternal and child health care in many studies (Gakidou et al 2010, Niraula 1994 and Rosling et al. 2007). The causal link between maternal education to child survival and child development is due to impact of education on the age of marriage, age at which first child is born, family size, the gap between having children, access to and use of health services and child care. These are indirect pathways to reducing child mortality. Changes in women's empowerment and autonomy (both in absolute and relative terms) that comes with education are the direct pathways leading to lowering child mortality rate (Boehmer and Williamson 1995 and Handy and Kassam 2004).

Direct pathways

Woman's status and education: Many studies fail to understand the influence of a woman's status on her role and ability to acquire knowledge as well as make decisions regarding reproductive behavior and child care. There is no empirical measure to understand what leads to women experiencing greater autonomy and empowerment with education and how that enables them to make decisions regarding reproductive behavior and child care. The study conducted in Nepal which involved an anthropological survey, observed that women with education could take prompt action to address illness and not depend on their spouse to visit the health care center (Niroula 1994) which is in line with Caldwell's explanation on how women's education reduces the child mortality rate. Caldwell discusses pathways that include an increased capability to manipulate the modern world, interact with professional health care / medical personnel and also be taken seriously in the family and in the community. In other words, a change in power structures within the family where women has a say to take charge of her child's health and nutrition (Caldwell, 1979).

An anthropological survey conducted in Karnataka, India found that in some villages where mother was illiterate, the child mortality rate was 130 (per thousand) and among mothers who had secondary education, the child mortality rate was 70 (per thousand). The study finds that women are ceded decision making rights by parents-in-law and are more likely to attend to child's health issues immediately and follow through the end of prescribed treatment. Priority or equal sharing of food among children and

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adults is another change in attitude among educated women (Caldwell J, Reddy and Caldwell P 1983).

Boehmer and Williamson (1995) measure the impact of woman's social status that comes with education to predict the lowering of infant mortality rate and find that education status and women's autonomy are predictors of infant and child mortality. They use the gender stratification theory to understand the differences in power and privileges in the society and the relative status of women to men along with the absolute status of women. For this purpose they measure female literacy using data on primary, secondary and post-secondary school enrollment, and measure women's autonomy using five indicators: namely age of marriage, contraceptive prevalence, fertility and crude child birth rate, as well as women's equality taking in to consideration legal equality and equality within the family. These indicators measure the decisions themselves but not social status or autonomy and empowerment as perceived by men and women in the society.

In order to address the social status of woman directly, my research uses a different set of measures. Woman's work status and decision making on money earned by women captures the economic dimension of woman's empowerment. It also adds another dimension regarding social status of women beyond family level (Desai and Jain, 1994). Woman's employment has been cited as one of the key measures of empowerment, reducing inequality between men and women as well as means to improve child health as there is an increase in family income (Duflo, 2012). Domestic violence is 'supported or reinforced by gender norms and values that put women in a subordinate position to men'

(Garcia´ -Moreno C. 2002, 127). Gender based violence is used as a measure of woman's

empowerment because in most cases, girls and women being the weaker sex experience

gender based violence more than boys and men.

Wife beating is considered a common and accepted form of intimate partner

violence by both men and women in many patriarchal societies in developing countries

(Hindin, 2003). Attitude towards wife beating is used as a measure to understand

woman's absolute and relative status in a community/society. Using this measure would

provide an insight on the social context, gender relationships and what woman perceives

as empowerment.

Gender based violence is a common intimate partner violence, which is found to

be a cause of infant or fetal death when violence is experienced by woman during

pregnancy (Janssen, Heise, Watts and Garcia-Moreno 2008). Woman's experience with

gender based violence has both short term and long term effects to women, families and

communities. In developing countries, gender based violence hinders with girls receiving

education (Burton, Duvvury and Varia, 2000). Since maternal education is recognized as

a significant determinant of infant/under five child mortality as explained in detail in the

above section, girls not receiving education due to gender based violence has a long term

effect on IMR.

Woman's empowerment and autonomy is supported by their exposure to

knowledge and resources and freedom of movement is one of the means to access

knowledge and resources. Freedom of movement increases woman's exposure, awareness

about social issues and provides opportunities to interact with and change social

institutions (Hussain and Smith, 1999). Physical autonomy is found to be a key indicator of status of women in developing countries (Balk, 1994). Physical autonomy is also found to increase use of health center facilities and contraception methods among women in developing countries (Chowdhury, Amin and Ahmed, 1994).

Indirect Pathways

Number of children that a family has reduces with an increase in education attainment by girls/women. Boehmer and Williamson in their research across 96 developing and underdeveloped countries argue that education provides women with greater autonomy on the use of contraception and other reproductive behavior (Boehmer and Williamson 1995). They measure fertility and the crude birth rate to measure lack of control in reproductive behavior assuming regions with low prevalence of contraceptive use will experience high fertility and crude birth rate. They find that female education has significant effects on both fertility and a high crude birth rate and it is the strongest with crude birth rate (Boehmer and Williamson 1995).

Relationship between women's knowledge acquisition and exposure, and infant/under five child mortality

Knowledge acquisition and use of acquired knowledge to make decisions is a combination of both, level of education attainment and power to make decisions (Rosling, et al. 2007). Niraula (1994) suggests that the use of health facilities in Central Nepal regions depended on the education level among women and men. Therefore, measuring the hurdles faced in accessing health facilities will indicate how women acquire knowledge when faced with access difficulties. Many studies fail to account for

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the influence of a woman's education and social status on her ability to acquire knowledge as well as make decisions regarding reproductive behavior and child care. There is no empirical measure to understand what leads to women experiencing greater autonomy and empowerment with education and how that enables them to make decisions regarding reproductive behavior and child care.

Education enables women to comprehend health messages communicated through print and audio-visual media. There are many efforts taken by local, national and international organizations to communicate to women and families, ways to provide better health care and improve the chances of child survival in developing countries. However, such messages are effective only if the care takers are able to comprehend the messages and take appropriate actions, which depends on reading and language proficiency skills. Rowe, et al. (2005) find a strong correlation between literacy and media exposure among women in a study conducted in Nepal to understand schooling influence on maternal health practices. They find that 'maternal schooling is a significant predictor of health knowledge and behavior (529).' 'Media exposure (print and broadcast) were also higher among literate women and were found to have advanced health knowledge and health behavior(530).' Media exposure and knowledge acquisition capabilities are critical because that is an avenue to understand if messages regarding the promotional and developmental activities undertaken in the region reaches the target audience or not.

Relationship among maternal education, use of health services and infant/under five child mortality

Education of women and knowledge of health services determine the use of services available according to many studies in rural and urban areas in developing countries. Educated women are more likely to utilize health services than uneducated women. Niraula (1994) studied the use of health services in hill villages in Central Nepal and found schooling of women to be a significant predictor of the use of health services because education aids in accruing more knowledge which enables the use of facilities available. Education also facilitates women to enter the workforce where they interact with others and gain knowledge by way of word of mouth. Desai and Johnson (2005) use DHS data to study woman's empowerment as an independent variable against dependent variables such as child vaccination between 13-60 months, children's height for age and child mortality. They find that when women have decision making authority, child health improved and this relationship was statistically significant. Simkhada et al finds in a systematic review of literature that maternal education, husband's education, and women's employment are factors affecting the utilization of antenatal care in developing countries (Simkhada, Teijlingen, Porter and Simkhada 2007). Underutilization of modern health care services is one of the major reasons for maternal death due to complications during pregnancy in developing countries (Amin et al 1989). Financial constrain is one of the main barriers to the utilization of antenatal care. Education is the determining factor for employability that facilitates an increase in family income. Woman who are civil servants or hold white-collar jobs utilize services more than those unemployed and/or

housewives (Simkhada, Teijlingen, Porter and Simkhada 2007). On similar lines, the authors find that women married to men who are unemployed did not use antenatal services as much.

An important child survival strategy adopted by UNICEF in many developing countries such as India, is prevention of death of child from Diarrhea (Anand, et al. 1992). One of the determinants of mothers treating diarrhea is her knowledge regarding causes and treatment of diarrhea (Olango and Aboud, 1990). Home treatment using salt and sugar solution is commonly advocated in developing countries for lack of availability of oral rehydration salt (ORS) (Bhattacharya, Kaur and Reddy, 1988). Simple home remedies which does not require visits to health centers could save millions of children's lives in developing countries. It requires woman's ability to gauge the seriousness of the problem, understand and apply home remedies which could prevent children from dying.

Thus the hypothesis is that with an increase in maternal education, and the intervening variables - woman's empowerment, autonomy, knowledge acquisition capability and, decision making regarding woman's reproductive behavior and child care, there is a decrease in infant/under five child mortality in India.

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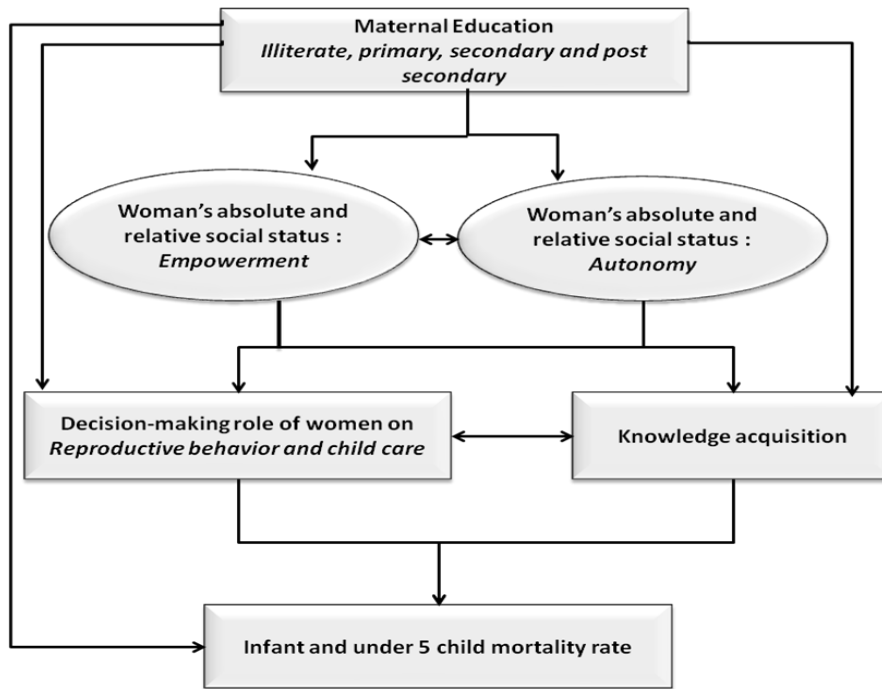
Figure 1: Conceptual model: Maternal Education and infant/under five child mortality

In order to better understand each of the indicators, the first five models consider the potential of individual indicators (education, woman's empowerment, woman's autonomy, knowledge acquisition capability and decision-making regarding reproductive behavior and child care) to predict on infant/child mortality.

Data and Methodology:

The data used for this study are from 2005-2006 Demographic and Health Survey (DHS) for India. The DHS survey is based on the third National Family Health Survey (NFHS - 3) data for India and covers 29 states, comprising information from a nationally representative sample of 124385 women in the age group of 15-49, 109041 households and 74369 men in the age group of 15-54. For the purposes of this study, only individual

level data of women who are married and living with spouse are utilized. My study incorporates independent variables which include education, autonomy and empowerment, exposure to media, knowledge about contraception use and diarrhea treatment, and decision-making regarding reproductive behavior and child care to predict on infant and under five child mortality in India.

Dependent Variable:

Infant and under five child mortality

Infant and under five child mortality (IM) variable is created as a binary variable using birth history index number and age at death of child. The birth history index number is measured as the actual number of children born. Age at death of child is measured in months as provided by respondents.

Using age at death of child alone was not sufficient to gauge the extent of infant and under five child mortality issue. Therefore, my study also incorporates the birth history index number in addition to compute IM variable. Thus, IM is calculated as the proportion of children who have died by dividing the total number of children dead (age at death of child) divided by the total number of children born. Missing age at death of child data was assumed to be a child that survived and was coded as a '0'. Child death between 0 and 60 months (IU5D) is coded '1'. According to the DHS manual, 'for ages of death that are not specified, an age at death is imputed by using the same age at death of the last child of the same birth order in the data file' (16). Thus, the birth history index variable incorporates both the total number of births and number of children who survived for more than sixty months from the day of birth.

Independent Variables

Maternal education:

Maternal education is measured as the highest degree level attained. The response is coded under the categories of no education, primary, secondary or higher. In the analysis that follows, dummy variables were created for each degree level with "no education" providing the reference category.

Empowerment indicators:

Woman's empowerment is a complex concept with multiple dimensions. Numerous questions in the survey assess empowerment, but only the economic, attitudinal and experiential dimensions will be used in the analysis presented here. The first indicator, 'woman's work status' represents the economic dimension linked to woman's empowerment. The second indicator, 'experience with gender based violence' provides a perspective on gender and family based relations. The third indicator 'opinion on wife beating' captures the attitudinal dimension of women on woman's empowerment.

The DHS has a question pertaining to whether the respondent has worked in the last 12 months. The response is coded as 'not working', 'worked in the last 12 months', 'currently working' and 'currently working but on leave for the last seven days'. For the purposes of the present analysis, the variable was recoded as a binary measure with a '0' indicating 'not working and a '1' incorporating the other working categories.

Woman's experience with gender based violence (GBV) measure is developed from four variables that provide information on a respondent's experience with any emotional violence, physical violence, and sexual violence. For the purposes of this

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study, GBV was constructed as a binary variable coded as a '1' if there was experience of any type of violence and a '0' if there was no experience.

Attitude towards wife beating (WB) is a measure developed from five questions that asks the respondents whether wife beating is justified under the following five scenarios: if wife goes out without telling husband, neglects children, argues with husband, refuses to have sex with husband or burns food. The new variable 'WB' was coded as '1' if the response was either 'yes' or 'don't know' to at least one of the five questions and '0' if the response was 'no' to all the five questions.

Autonomy indicators:

In addition to decision making capacity within the household, woman's autonomy in the area of her reproductive behavior and freedom of movement outside the household are included in this study.

Decision making capacity regarding household activities is developed using five questions on who has a final say on - respondent's own health care, making large household purchases, regular household purchases, visits to family or relatives and what to do with the money earned by husband. Respondent alone, respondent and husband/partner or respondent and other responses is recoded as 'woman'. And all other responses are recoded as 'other'. A new measure WDM is computed as a binary variable . If the recode is 'woman' for three or more of the above five questions then WDM is coded '1' (woman) and for the rest WDM is coded '0' (other).

A measure on woman's attitude towards 'refusing sex to husband' is computed using questions that asks 'if woman can refuse sex to husband' under three scenarios. The

first scenario is if husband has sexually transmitted disease (STI), second, if husband has relationships with other women and third, if wife is tired or not in the mood. A new binary variable WRS is coded '1' when the response to all three questions is 'yes' and coded '0' otherwise.

Measure on woman's freedom of movement is developed using three questions namely, if woman is allowed to go (i) to the market, (ii) to a health facility and (iii) outside the village/community. A binary variable FOM is coded as '1' if woman is allowed to go to all three places alone and coded '0' otherwise.

Knowledge acquisition indicators:

Media exposure measure is computed to understand the exposure to print, radio and television media. For each medium, exposure to media is coded as 'poor exposure to media' if the response is 'not at all', or 'less than once a week', or 'at least once a week' and coded 'reasonable exposure to media' if the response is 'almost every day'. A new measure media_exp is developed which is the sum of the recoded print, radio and television variables. Dummy variables of media exposure created for regression analysis are 'poormedia', 'lowmedia' and 'highmedia' keeping 'no exposure' as the reference category. A frequency distribution of media consumption indicated that print and radio media were not consumed by most and even television media was consumed only by about 40% of the sample. In order to understand the impact of knowledge acquisition with small changes in media consumption, it seemed imperative to create dummy variables to compare with no exposure to media.

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Knowledge of contraception methods is a direct question to record if the respondent is unaware of any methods, or knows only folkloric, or knows traditional method or knows modern method. According to the DHS coding manual, if a respondent knows both a traditional method and a modern method then the modern method takes priority and response is coded as knowing a modern method. Similarly, if a woman knows a traditional method and a folkloric method, the traditional method takes priority A new binary variable Contrcptn_kn is created where 'no' indicates that no methods are known to the respondent and 'yes' indicates at least one method is known to the respondent.

Knowledge regarding diarrhea treatment is measured using the question on knowledge of oral rehydration method. A new variable Diarrhea_trmt_kn is created with categories 'unaware' if the response is coded 'never heard of' oral rehydration method and 'some awareness' if the response is coded as either 'heard of' or 'used' oral rehydration method for treating diarrhea. *Decision making regarding reproductive health and child care indicators:*

Two measures are developed in order to understand decision making by women regarding reproductive behavior and child health care. Decision making regarding contraception is used for getting a perspective on reproductive behavior. A new binary variable 'contraceptiondecisn' is computed as 'woman' when response is 'mainly respondent' or 'joint decision' and coded as 'other' when the response is 'mainly husband/partner' or 'other'.

Vaccination for children is crucial in addressing the problem of child mortality. According to the DHS manual, the health card of a child contains all the information on vaccination and can be availed by all. However, not all respondents have a health card for all of their children. Therefore, a question, asked only to those respondents who could not produce a health card, pertaining to whether the respondent's child/children ever received any vaccination, is included in creating a new variable. The new binary variable 'Vacn' is computed using the above two questions. 'Vacn' is coded '1' if respondent has a health card for at least one child or the respondent provided vaccination to at least one child, else is coded '0'.

Methods

In my analysis, I empirically test the conceptual model to understand the relationship between maternal education and infant/under five child mortality in India. I analyze the relationship between infant/child mortality and maternal education by introducing four intervening factors - women's - empowerment, autonomy, knowledge acquisition ability and, decision making regarding reproductive behavior and child care. I first conduct a correlation analysis among the independent variables that encompass women's empowerment and autonomy to understand if the variables chosen represent different dimensions of the concept. I then test for an association or correlation between maternal education and infant/under five child mortality taking in to account all of the above mentioned intervening factors. In order to investigate this relationship, I use bi-variate logistic regression analysis using SPSS. I also test for an association between each of the intervening factors and infant/under five child mortality individually. Overall there

are six models that predict infant/under five child mortality. The determinant analyzed in model one is Maternal education, model two is women's empowerment indicators, model three is women's autonomy indicators, model four is knowledge acquisition capability, model five is decision-making regarding reproductive behavior and child care and model six is maternal education and the four intervening factors.

Results

The research question is '*What are the intervening variables involved in the process that lead to a relationship between maternal education and infant/under five child mortality in India?*' The dependent variable is infant/under five child mortality and the independent variables are maternal education, women's empowerment indicators, women's autonomy indicators, knowledge acquisition measure and decision-making regarding reproductive behavior and child care measure

Descriptives:

Education status:

The first independent variable discussed is education status of married women. The data indicates that a majority of married women, 47.2% are illiterate. Only about 15% have completed primary education and about 31.5% of married women have secondary education. Though education is found to be an important predictor of infant/under five child mortality rate, almost half of the sample are illiterate in India.

Social status of women:

Social status of women encompasses both women's empowerment and autonomy. As discussed earlier, the demarcation between empowerment and autonomy is unclear. A

correlation analysis was conducted among the selected variables that represent concepts of women's empowerment and autonomy. Variables were either selected, or grouped together as indicators, or dropped based on the finding from correlation analysis (table 2).

Women's empowerment:

The variables selected to represent the different dimensions of women's empowerment are women's employment status, decision making power regarding the money earned by women, experience with gender based violence and attitude towards wife beating.

Research suggests that women who are working have economic empowerment. In order to capture the economic dimension of empowerment, decision making on money earned is also chosen for analysis. About 36% of sample are currently working, of them, only about 25.5% make decisions on how to use the money they earn.

WB, the new measure created for women's perception of whether wife beating is justified or not, almost half (51.8%) think that wife beating is justified and the other half think that wife beating is not justified (N=90084). For each of the individual circumstance, more than 60% perceive that wife beating is not justified.

15.2% have experienced emotional violence, 35.1% have experienced less severe physical violence, 11% have experienced severe physical violence and 9.7% have experienced sexual violence. GBV, the new measure created combining the four types of violence experienced by women, about 40% of married women in the sample have experienced one or more kinds of gender based violence (N=68690).

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Women's autonomy:

Women's participation in household decision making, opinion on if women can refuse sex to husband under specific conditions, and women's freedom of movement encompass women's autonomy indicator. It is found that more than 60% of women in India participate in many types of household decision making. Only 52.9% of women take part in making decisions regarding large household purchases where as about 68% have a say in the way money earned by husband is used. About 40% of women do not participate in decisions regarding visits to family and friends and household purchases for daily needs. WDM index calculated has 52.5% of the sample as 'woman' decision makers and 37.5% of the sample saying that 'others' are the decision makers.

Over 18% of women think that women cannot refuse sex if the husband has a sexually transmitted disease or has a sexual relationship with other women. 20% of women feel that women cannot refuse sex to husband if women is feeling tired or is not in the mood. WRS, new measure created combining the above three scenarios, about 76% of the sample are of the opinion that women can refuse sex to husband. Overall, a majority of women perceive that a women can refuse sex to her husband under the above three circumstances (N=85791).

With regard to women's freedom of movement, 47.2% of women in India do not have the freedom to go to the market alone, almost 50% do not have permission to go to the health facility alone and 60.7% do not have permission to go outside the village or community alone. The new measure created for freedom of movement combining the

above three situations, about 65% of married women in India are not free to move out of their house alone (N=93056).

Knowledge acquisition:

Exposure to print and radio media is very low, 69.5% do not read newspaper and 58.2% do not listen to radio. Exposure to television media is greater than print and audio, about 40% watch television almost every day. At the same time almost 38% do not watch television at all. (N=92977). 52.6% do not have exposure to any type of media, which is more than half the sample size, 31.9% are exposed to one medium, 12.5% are exposed to two media and only 3% are exposed to all media almost every day (N=92938).

Diarrhea is one of the common problems faced by children under the age of five in India. 27.5% have never heard of oral rehydration treatment (ORS) and though 70.6% have heard of ORS, only 1.9% have used it for their child/children (N=92861).

Almost all are aware of at least one contraception method (99.3%), 34% have never used any type of contraception ever and about 10% have used contraception either since last birth or before last birth of their child (N=93089).

Decision making regarding reproductive behavior and child care:

Of the total sample, only 35716 have provided vaccination to their child at least once in the past. Among those who currently use contraception (54% of the sample), about 93.3% decide on contraception use.

Regression Analysis

A bi-variate logistic regression (model 6) of maternal education and all intervening factors along were used to predict on infant/under five child mortality (Table

1). In this case, primary, secondary and higher education were found to be significant predictors of infant/under five child mortality. Education and infant/under five child mortality are inversely related, that is with a unit increase in primary, secondary and higher education there is a decrease in the odds of infant/under five child mortality respectively.

Working status of women is found to be statistically significant, but women working is a negative predictor of infant/under five child mortality. With every unit increase in 'woman not working', there is an increase in the odds of child survival. Experience with gender based violence is a significant predictor of infant/under five child mortality. The odds of lowering infant/under five child mortality increases with decrease in experience with gender based violence. Interestingly, attitude towards wife beating is not a significant predictor of infant/under five child mortality.None of women's autonomy indicators (Household decision making by women (WDM), attitude towards women refusing sex to husband (WRS) and freedom of movement (FOM)) are statistically significant. 		Poor and low media exposure are found to be significant predictors of infant/under five child mortality, while high media exposure does not make any significant difference on the dependent variable. There is an increase in odds of child survival with every unit increase in poor media exposure and low media exposure keeping no media exposure as the reference category.

Vaccination is found to be statistically significant in predicting on infant/under five child mortality and shares an inverse relation with the dependent variable. That is,

with every unit increase in vaccination, there is a decrease in chances of infant/under five child mortality (at **p<.05).

A bi-variate logistic regression analysis between maternal education and infant/under five child mortality (model 1) found that primary, secondary and higher education share an inverse relationship with infant/under five child mortality and are statistically significant. A negative odds ratio indicates that, with every unit increase in level of education from illiteracy to primary education, the odds of infant/under five child mortality decreases. The same holds true for secondary and higher education attainment when compared to no education attained category.

A correlation analysis of all variables that are used under women's empowerment and autonomy in my conceptual model reveals that women's work status and decision regarding the use of money earned by her are highly correlated (.813). Many other variables are correlated and found to be statistically significant, but the Pearson correlation value is small taking in to account the large sample size (Table 2).

The above four empowerment indicators, women's work status, women's decision making power on money earned, attitude towards wife beating and experience with gender based violence are used to measure women's empowerment. A negative sign for experience with gender based violence (model 2) indicates an inverse relationship between empowerment and infant/under five child mortality. With decrease in experience with gender based violence, there is an increase in the chances of child survival. However, it is intriguing to find that, with every unit increase in women's working status, there is an increase in chances of infant/under five child mortality. This finding is

contrary to the proposed concept, that there is an inverse relationship between women's work status and child mortality. Also, attitude towards wife beating is not found to be statistically significant. Household decision making by women (WDM), attitude towards women refusing sex to husband (WRS) and freedom of movement (FOM) comprise autonomy indicators and none are found to be statistically significant (model 3).

Exposure to different types of media, knowledge about diarrhea treatment and knowledge about contraception methods (model 4) are used as knowledge acquisition indicators. A bi-variate logistic regression using dummy variables for media exposure find knowledge acquisition to be statistically significant in predicting infant/under five child mortality Poor media exposure (.488*), low media exposure (.302*), moderate to high media exposure (.223*) and diarrhea treatment knowledge (.782*) are all significant predictors where as knowledge about contraception method is not (at *p<.001)[1].

A bi-variate logistic regression between decision making regarding reproductive behavior and child care and infant/under five child mortality (model 5) is found to be significant (at *p<.001). For every unit increase in vaccination variable, there is an increased chance of lowering infant/under five child mortality. Decision making by women regarding contraception use is not found to be statistically significant predictor on infant/under five child mortality.

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[1] Knowledge about contraception methods variable is excluded from further analysis as there is no variation in the variable (99.3% of the sample are aware of one contraception method at least).

Discussion and Conclusion

The results of the bi-variate logistic regression analysis fails to reject the null hypothesis to support the conceptual model proposed to answer my research question 'what are the intervening variables involved in the process that lead to a relationship between maternal education and infant/under five child mortality in India?' Based on my analysis, maternal education, primary, secondary and higher is found to be a significant predictor of infant/under five child mortality. Among women's empowerment indicators, inverse correlation between experience with gender based violence and infant/under five child mortality is consistent with the proposed conceptual model. Though women's autonomy indicators are progressive in nature, it is not found to be statistically significant predictor of child mortality and hence there is no association between autonomy indicators and child mortality. Women experience freedom of movement, however, according to my analysis restricted freedom of movement improves the chances of child survival. This is contrary to my proposed conceptual model. Child care practices and exposure to media are found to be significant determinants of infant/under five child mortality as proposed in the model. One of the 'decision making by women indicators', 'vaccination', is found to be a significant determinant, however decision making by women regarding contraception use is not.

Previous research proposes a link between education and women's work status, but it is strange to find that working status of women, the economic dimension of women's empowerment, is not in favor of lowering child death. Poor health care of working woman and lack of access to child care facilities could be factors that may have

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an adverse effect on reducing infant/under five child mortality. An analysis on maternal health of working women, quality of child care, and child care support available to a working mother could provide additional input on the reasons for the above finding that woman currently working increase the odds of child death compared to woman currently not working. Research suggests that education facilitates improvement in woman's role as a decision-maker at home, however that characteristic is not found to be beneficial in improving the chances of child survival. This could be a function of age of woman making the decisions. Research suggests that women during their child bearing age are young in India and this could also have an effect on their household decision-making capacity (Das Gupta, 1990). Education may have an effect on better decision-making regarding child-care compared to decision-making on other issues (Das Gupta, 1990). She suggests that mother's education is related to better child care practices and that is one of the main pathways of association between maternal education and child mortality. Further analysis to understand the interaction between education and women's autonomy controlling for age and age at marriage, age at first child could throw some insight in to the above finding.

Providing vaccination to child improves child survival, but freedom of movement to health center has an inverse relationship. One reason could be lack of understanding of how safe the community is for women to practice freedom of movement. Gender based violence seems to be prevalent and women are faced with many physical and sexual abuse in many parts of India. Another reason could be attributed to the problem of female infanticide prevalent in India. Selective use of medical facilities in a patriarchal society,

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where both men and women favor a boy child could be a cause of concern which requires further research.

Communication of health messages is critical in ensuring that the health resources available are being utilized. Though literacy is an issue, television is viewed by over 40% of the sample which could compensate for illiteracy to some extent by communicating to the illiterate audience in vernacular language. However, that does not guarantee comprehension of all messages as intended.

It is important to note here that this analysis has a few limitations. Vaccination, which is a measure developed from two variables - whether the respondent has a health card for the child and if not, whether the child was vaccinated at least once, is found to be a significant determinant of infant/under five child mortality. These two are important child care decision-making measures and both have substantial missing data. This suggests that either quality of data collected on these variables have to be looked in to or these variables need to be refined and recoded.

Additional study is required to understand the relationship between maternal education and infant/under five child mortality, both in India and across other developing countries. Improvement in women's social status is promoted extensively for better child survival results, but social status of women alone does not seem to contribute as much to lowering infant/under five child mortality. Women's empowerment and autonomy could be studied beyond its implication on reproductive behavior and child care, empowerment and autonomy of women for the sake of women themselves. For future research on lowering infant/under five child mortality rate, one may consider factors such as health

facilities, role of father in child care, quality of maternal health care and access to child care facilities? Child mortality is still a compelling issue in many developing countries and a comprehensive understanding of what factors work together to reduce child mortality is critical in future efforts.

Table 1: Infant/under five child mortality logistically regressed on level of education, woman's empowerment indicators, woman's autonomy indicators, knowledge acquisition capability indicators and decision-making regarding reproductive behavior and child care

	Model1: Level of Education		Model 2: Women's Empowerment		Model 3: Women's autonomy		Model 4: Women's ability to acquire knowledge		Model 5: Decision making- reproductive behavior and child care		Model 6: Final model	
	Exp(B)	SE	Exp(B)	SE	Exp(B)	SE	Exp(B)	SE	Exp(B)	SE	Exp(B)	SE
Constant	0.397*	0.032	0.233*	0.048	0.058*	0.223	0.369*	0.051	0.452*	0.131	0.521*	0.15
Maternal Education												
No education	--	--									--	--
Primaryeducation	.523*	0.07									.595*	0.071
Secondoryeducation	.238*	0.061									.319*	0.068
Highereducation	.082*	0.168									.124*	0.185
Woman's Empowerment												
Work status of woman (wmnwrkstat)												
Not working			--	--							--	--
Working			1.652*	0.049							1.256*	0.052
Attitude towards wife beating (WB)												
WB Justified			--	--							--	--
WB not justified			0.912	0.048							1.041	0.051
Gender based violence (GBV)												
Experienced GBV			--	--							--	--
Not experienced GBV			.625*	0.048							.867*	0.051
Woman's Autonomy												
Household decision making by women (WDM)												
Others					--	--					--	--
Woman					0.993	0.05					1.096	0.052
Woman refuse sex to husband (WRS)												
Cannot Refuse					--	--					--	--
Can Refuse					0.947	0.056					1.051	0.058
Woman's Freedom of movement (FOM)												
No FOM					--	--					--	--
Yes FOM					0.868	0.052					1.078	0.055
Woman's ability to acquire knowledge (Knowledge of Diarrrhea treatment (Diarrhea_trmt_kn)												
Unaware							--	--			--	--
Aware							.823*	0.059			0.996	0.061
Media Exposure												
No Exposure							--	--			--	--
poormedia							.427*	0.057			.662*	0.061
lowmedia							.230*	0.102			.537*	0.111
medhighmedia							.209*	0.214			0.745	0.23
Decision making- reproductive behavior and child care												
Contraceptiondecision												
Other									--	--	--	--
Woman									0.844	0.091	0.908	0.095
Provided Vaccination for child at least once (Vacc)												
No									--	--	--	--
Yes									0.510*	0.104	0.76**	0.108
Chi-square	898.662*		223.671*		9.083*		525.320*		41.486*		1014.46*	
Number of observations	12417		12417		12417		12417		12417		12417	
Cox & Snell R2	0.069		0.018		0.001		0.041		0.003		0.077	
Nagelkerke R2	0.115		0.029		0.001		0.068		0.005		0.129	

Source: DHS, India (2005-2006)

*p<.001, **p<.05

-- Reference category

Table 2: Correlation analysis of women's empowerment and women's autonomy indicators

Correlations		workstatus	mnydecisn	WB	GBV	WDM	WRS	FOM
Workstatus	Pearson Correlation	1	.813**	-.088**	-.081**	.054**	-.009*	.047**
	Sig.(2-tailed)		.000	.000	.000	.000	.012	.000
	N	93076	81143	90260	68686	90998	85786	93050
Mnydecisn	Pearson Correlation	.813**	1	-.055**	-.077**	.184**	.000	.058**
	Sig.(2-tailed)	0.000		.000	.000	.000	.983	.000
	N	81143	81143	78678	60269	79301	74892	81123
WB	Pearson Correlation	-.088**	-.055**	1	.118**	.053**	.098**	.029**
	Sig.(2-tailed)	0.000	.000		.000	.000	.000	.000
	N	90260	78678	90266	66593	88248	84044	90245
GBV	Pearson Correlation	-.081**	-.077**	.118**	1	.030**	.007	.010**
	Sig.(2-tailed)	.000	.000	.000		.000	.075	.000
	N	68686	60269	66593	68690	67399	63224	68670
WDM	Pearson Correlation	.054**	.184**	.053**	.030**	1	.017**	.083**
	Sig.(2-tailed)	.000	.000	.000	.000		.000	.000
	N	90998	79301	88248	67399	91001	83873	90982
WRS	Pearson Correlation	-.009*	.000	.098**	.007	.017**	1	.076**
	Sig.(2-tailed)	.012	.983	.000	.075	.000		.000
	N	85786	74892	84044	63224	83873	85791	85772
FOM	Pearson Correlation	.047**	.058**	.029**	.010**	.083**	.076**	1
	Sig.(2-tailed)	.000	.000	.000	.007	.000	.000	
	N	93050	81123	90245	68670	90982	85772	93050

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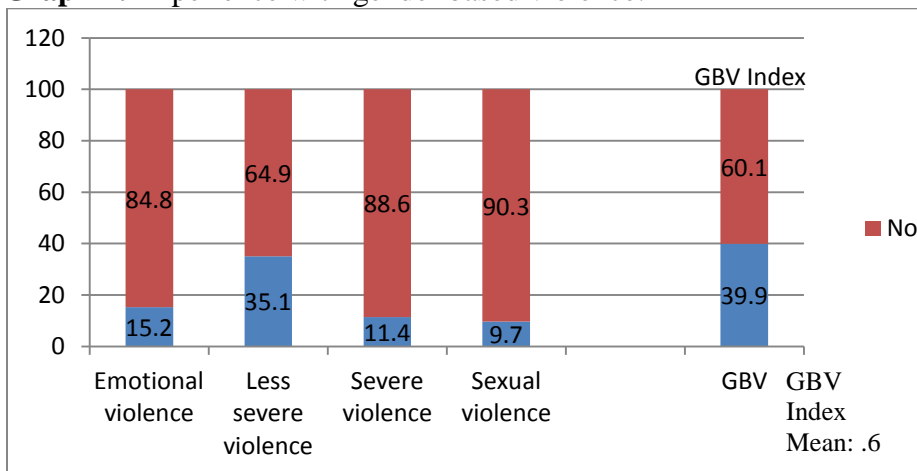
Women's empowerment indicators:
Graph 1: Attitude towards wife beating:
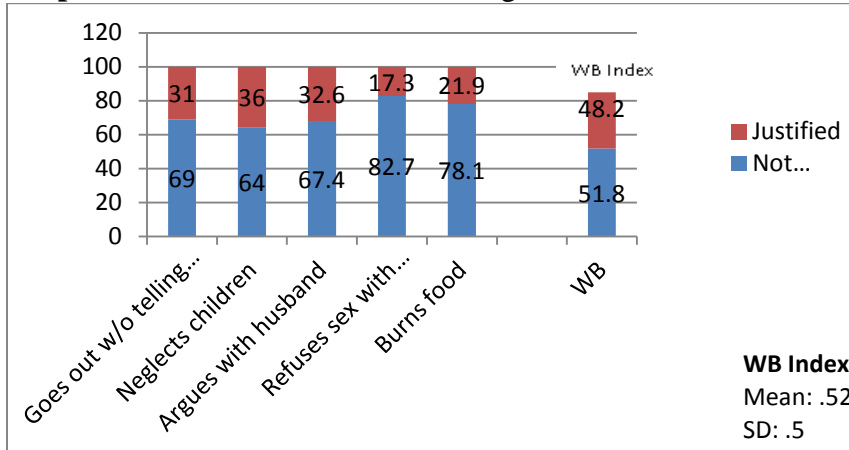
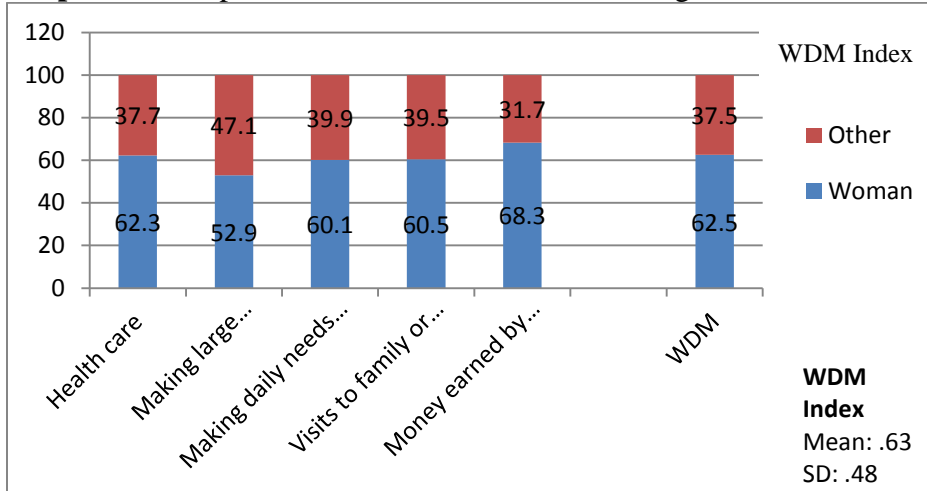Source: DHS, India (2005-2006)

Graph 2: Experience with gender based violence:
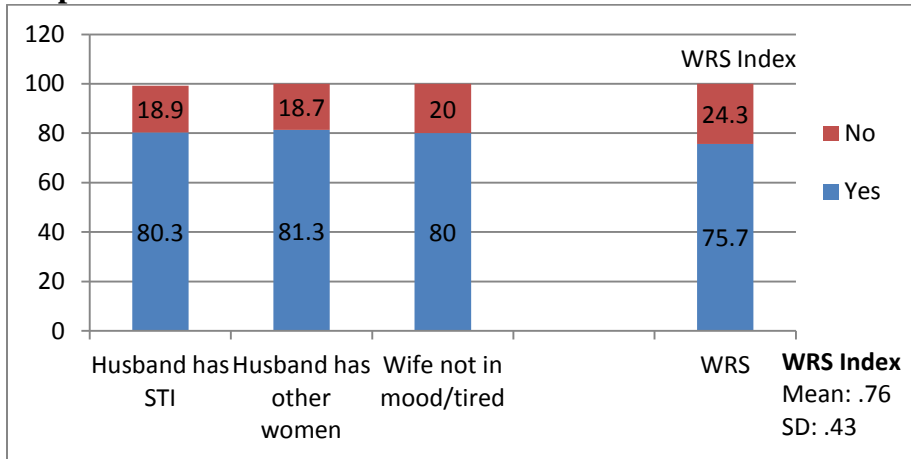

Source: DHS, India (2005-2006)

Women's autonomy indicators

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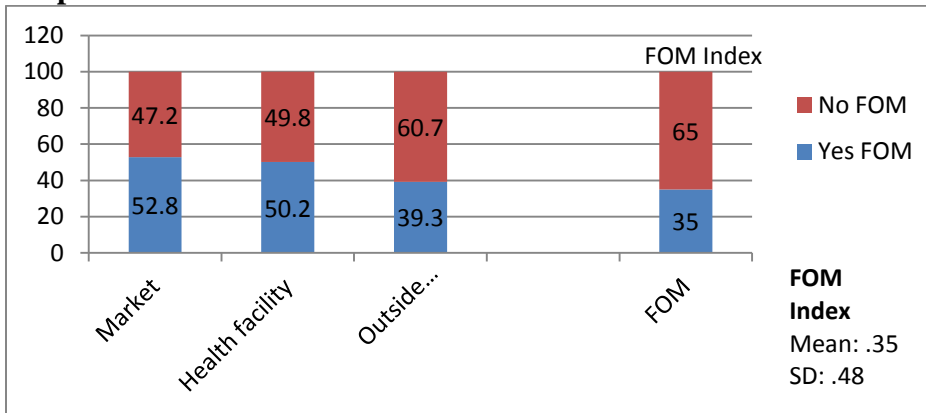**Graph 3:** Participation in household decision making:

Source: DHS, India (2005-2006)

Graph 4: Refuse sex to husband:

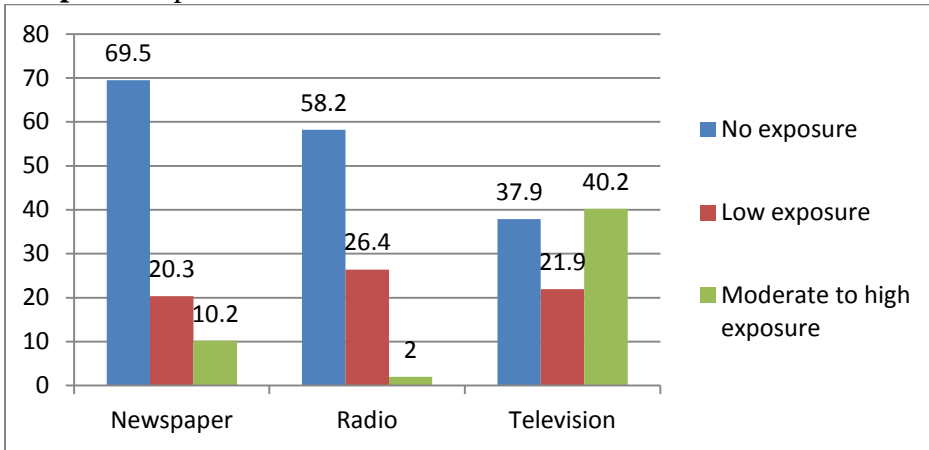Source: DHS, India (2005-2006)

Graph 5: Freedom of movement:

Source: DHS, India (2005-2006)

Knowledge acquisition indicator

Graph 6: Exposure to media:

Source: DHS, India (2005-2006)

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CURRICULUM VITAE

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