Chapter II

Infant Mortality Rate: A Literature Review
CHAPTER – II

INFANT MORTALITY RATE: A LITERATURE REVIEW

“IMRs are more than just a measure of infant deaths. They capture many vital dimensions of human development... To that extent, the IMR is a surrogate measure of human development”

- UNICEF, (September, 2000)

2.1. Introduction

The Infant Mortality Rate (IMR) is a public health indicator of a complex societal problem numerous frameworks have been used to help understand the multiple determinants of infant mortality in a society and to identify interventions to reduce infant mortality. While the root social causes of infant mortality persistent poverty, pervasive and subtle racism, and the chronic stresses associated with them may not be easy to address, it is still possible to understand the risks of infant death by examining the biological pathways through which these societal forces act.

2.2. Geographical Variations in Infant and Child Mortality

Much attention has been given to the causes of child mortality in the developing world, and several individual, socioeconomic, demographic and environmental factors have been examined. The understanding is that improvement in healthcare services alone might not result in the well-being of children as most illnesses are discreetly influenced by lifestyle (Babalola
and Fatusi 2009; Foggin et al. 2001), socioeconomic and environmental factors (Foggin et al. 2001; Folasade 2000), cultural attributes (Gesler 1992; Kandala et al. 2006) and level of utilization of healthcare services (Atari and Mkandawire 2014; Gayawan 2014b). Studies by Kazembe and Namangale (2007), Kandala et al. (2006), Kandala et al. (2007) and Gayawan et al. (2014) identified the risk factors of childhood morbidity especially fever, cough, diarrhoea and pneumonia to include age, use of bed nets for sleeping, type of household roofing materials, feeding practices and, notably, the geographical location of a child. These studies reaffirmed the views of Kalipeni (1993) that the district in which a child is born sets the context for risk factors of child morbidity and mortality.

Policymakers are often interested in knowing the distribution of health outcomes according to geographical regions or the association with environmental and socioeconomic factors and how these factors exert influence at different locations. In this regard, mapping the spatial variations in child mortality becomes a critical tool. The need for adopting a geographical approach in analysing child mortality is vital as it would assist in identifying specific areas with high or low risks, thereby assisting in health planning and allocation of scarce resources. The majority of previous studies on infant and child mortality have largely depended on classical correlation and regression analyses. Statistical outcomes produced by these procedures are aggregates and can be misleading if generalized for all local
areas. Some authors have examined spatial inequality in childhood morbidity and mortality in West African countries. Analysing data from Nigeria, Adebayo and Fahrmeir (2005) and Adebayo et al. (2004) found significant variations in infant and child mortality based on geographical settings.

Yohannes Mehretie Adinew, Senafikish Amsalu Feleke, Zelalem Birhanu Mengesha, and Shimelash Bitew Workie (2017) Ethiopia has achieved the MDG goal set for child survival. U5M has dropped from 216 to 59, with 5% annual rate of reduction. The health extension program and the expansion of health facilities have played a significant part. Age, marital and educational status of mother, birth order, preceding birth interval, and family income were the dominant and the most significant determinants of childhood mortality. Other factors include nutritional factors like breastfeeding and healthcare factors like immunization, antenatal care, and delivery care. On the aspects of the environmental and sanitary factors, adequate ventilation, type of floor and roof of the house, availability of latrine facility, and habit of soap using for hand washing are associated with mortality. Regarding diseases, according to EDHS and WHO reports, the leading causes of this age group death are malaria, diarrhea, and pneumonia. Hence, it is worthwhile to address the appalling inequalities in the distribution and access to health services with a focus on service quality and improved sanitation to effectively mitigate childhood death and disease burden.
Gayawan and Turra (2015) mapped the geographical variations in risk factors of child mortality in Nigeria. On their part, Balk et al. (2004) found that in West Africa, spatial variables explained a good deal of the country-specific variations in mortality and that they are associated with household characteristics. However, there is the need to look beyond specific country and scrutinize detailed geographical variations among the West African countries in a manner that transcends frontiers. This would broaden our knowledge of the variability and assist in the allocation of scarce resources.

In the article reports the analyses involving data from 10 West African countries with the aim of elucidating geographical differences in infant and child mortality among regions of the countries. They particularly concentrate on whether there are significant regional variations in infant and child mortality among the countries and if there are, what category of variables can explain such variations. The study adopts Bayesian and geo-statistical techniques to the data from Demographic and Health Surveys to unravel the geographical inequality. They rely on spatial extension of the discrete-time survival model (Fahrmeir and Tutz 2001). Discreet-time model allows for analysing time as a discreet phenomenon and is therefore considered appropriate in this case because survival times of children are given in months only.
The predictors include non-parametric effects of time scale and continuous covariates, spatial components and a linear part in additive form in order to fully understand how the risk factors exert influence on mortality among the children and across space in West Africa. They categorize the variables into three: demographic variables that are inherent to the mother and child, variables that are related to mother’s status and those related to amenities available to households where the child belongs. Contextual factors, which measured unobserved or unmeasured risk factors, are introduced as random effects. It was anticipated that infant deaths might be more related to endogenous factors such as low birth weight and hereditary diseases (Balk et al. 2004; Kembo and Van Ginneken 2009) while mortality among older children would come from preventable diseases and malnutrition, which are often caused by socioeconomic and culture-related factors (Cleland and van Ginneken 1988; Kembo and Van Ginneken 2009). Therefore, they first run the analyses for all children under five and then repeated the same for infants, those below age 1 year.

Infant and child survival depend on a host of socioeconomic, environmental, and contextual factors. Determining the contribution of each of these factors provides useful feedback to the programs related to maternal and child health. The distribution of infant and child mortality and their determinants vary across genders, socioeconomic groups, and geographical regions. Mapping of the variation in infant mortality can help in improving programs
in terms of the allocation of limited resources to those regions with high unmet needs of healthcare. It is also widely accepted that infant mortality is an indicator of both economic and social wellbeing and represents multiple social determinants of health (Rodwin and Neuberg, 2005).

2.3. Empirical Studies on Infant Mortality Rate (IMR)

In India, approximately 1.72 million children die each year before reaching their first birthday. Infant mortality has declined significantly in India from 129 in 1970 to 68 in the year 2000. Though, the infant mortality rate is decreasing at an annual rate of 2.11 percent from the early seventies, the decadal rate (compounded annually) is decreasing at a slower rate when compared between 1981-91 and 1991-2001. The slow pace of education in the IMR is a major worry for the country’s development. To that extent its performance when compared to other Southeast and East Asian countries is poor. While the expected fall in infant mortality rate is at 47 based on the current rate, it is still above the millennium development goal of 28 per 1000 live births by 2015.

The country has observed a continuous decline in IMR. It stood at 192 during 1971, 114 in the year 1980 and 58 in 2005. The decline in IMR has been noticed both for the male and female child during the period. However, the rate of decline is more pronounced in the case of male as compared to female. On account of child health interventions, the infant mortality rate in
the country has gone down from 114 in 1980 to 58 in 2005. While looking at the infant mortality rate of the country, it is observed that there is a continuous decline both in rural as well as in urban areas although urban areas of the country are observing rapid decline in infant mortality rate as compared to rural areas attributing this change to better health care facilities easily accessible in urban areas.

Gangadharan K & Rajula Helan K.P. (2010) in their study discussed that Motherhood is the supreme fulfilment in women’s life. Many women die in the process of childbirth especially in developing countries. Complications of pregnancy and childbirth are often the major causes of morbidity and mortality among women in child bearing ages. Primary health care in the states in India by taking into account such indicates such as infant mortality rate, male and female mortality, percentage of assisted births, percentage of home with tap water, sex ratio, health spending etc. The study reveals that kerala has been able to establish its lead as a better health status states in india for the last five decades, tamilnadu, a state which has been for lagging in health care development is now gaining momentum in healthcare segment especially in maternal and child health. If the present trend continues in the immediate near future tamilnadu will super cede kerala and will be in the forefront with better health care indices of mothers and children. Radhakrishnan N (2012) in his study analysed that Women’s poor reproductive health in india is affected by a variety of socio-cultural factors.
Underling poor reproductive health among Indian women is their poor overall status on the one hand and inadequate delivery system to cater to the needs of secluded, shy devalued women on the other. The women’s health status in general and reproductive health in particular is determined in women’s power to make a choice in the quality of available health care services, lifestyle and women’s position in the society. It is thus important while aiming at improving the reproductive health standards of the women. Hullur M. H (2012) explained that health is a vital component of human capital and human resources. Hence development strategies and policies must focus on the physical and mental wellbeing of women along with their male counterparts. Status and wellbeing of women are indicated by maternal mortality and morbidity rates, infant mortality rates life expectancy, fertility rates, work participation rates age at marriage malnutrition etc. The study concludes that there is need for closer cooperation between the government, non-government organizations and the community for taking a holistic approach to women’s health and recognizing it as a basic human right. Such an approach must underline the critically of effective health service delivery for women.

2.3.1. Gender disparity and birth order

Much has been written about sex differentials in infant mortality in India. India is said to be one of the few countries in the world where females have a higher infant mortality rate than males. The NFHS-2 data do not show a
significant disparity in average male and female infant mortality rates, but this in itself is evidence of parental discrimination against female infants, as one would expect the infant mortality rate for males to be well above that for females in a non-discriminatory environment.

Further, the data show large gender differences in infant mortality for higher birth-order children. Girls of birth order 4 or more experience significantly higher rates of infant mortality than boys of similar birth order (84 versus 75), with this difference being larger in the non-poor states than in the poor states. Child mortality between the ages of one and five is also significantly greater for females than for males. A girl in India is 40 percent more likely to die between her first and fifth birth mortality would drop by 20 percent if girls had the same mortality rate as boys between the ages of 1 month and 5 years (Victora et al. 2003). Thus, child mortality would drop by 20 percent if girls had the same mortality rate as boys between the ages of 1 month and 5 years (Victora et al. 2003). The mortality rate for children by sex (from the NFHS-2 data), indicates that while the probability of death is greater for males than for females until age one, the reverse is true from ages one to five. Parental neglect toward girls symptomatic of the generally low social status of women is an important cause of the gender disparity in child mortality. Girls are less likely to receive adequate food allocations and medical treatment for their illnesses than boys (Das Gupta 1987; Filmer et al. 1998).
2.3.2. Disparity across social groups

In India, social groups, such as scheduled castes (SC), scheduled tribes (ST), and other backward castes (OBC), have been historically underprivileged, and tend to have poorer socioeconomic indicators than the general population. The NFHS-2 data indicate that these groups have higher infant mortality rates than the general population, although there are differences among these groups as well. Among the three groups, scheduled tribes have the highest infant mortality, followed by scheduled castes. Although SC/ST in the poor states have the highest absolute infant mortality rate of any group in the country, the relative position of SC/ST vis-à-vis the non-SC/ST/OBC groups is worse in the non-poor states relative to the poor states. For instance, in the poor states, ST have an infant mortality rate that is 54 percent greater than that of forward castes, but this differential is only about 37 percent in the non-poor states. As is widely observed in many countries (including India), mother's schooling is strongly associated with infant mortality.

Several indicators of childhood mortality are used to measure levels and trends, including the neonatal and post-neonatal mortality rates, the infant mortality rate, the child mortality rate, and the under-5 mortality rate. Over the 15-year period before the 1992-93 National Family Health Survey (NFHS), all measures of childhood mortality declined in India at rates slightly greater than the average for other low-income countries, excluding China. The decline of several childhood mortality indicators measured in the
National Family Health Survey. The decline in the less than 5 mortality rate in India was comparable with those rates of 20 other countries with Demographic and Health Surveys (DHS) data. Another source of infant mortality data is the Indian Sample Registration System (SRS), whose annual estimates are consistent with those of the National Family Health Survey. The Indian sample registration system was started in a few states in 1965, with coverage extended to all states in 1970, and it tracks births through the use of continuous enumeration and biannual surveys. Infant mortality rates and child deaths are published annually, but not child mortality rates. The continuous registration and survey results are matched and verified in the field to minimize duplication and omission. At the national level, the results are generally believed to be quite accurate. Improvements in the accuracy of the data are likely to have occurred in some states over time, which may underestimate the pace of decline; but this is not likely to affect the estimation of national trends. In 1980 survey omission of vital events found that death rates were underestimated by about 3 percent nationally; by 1985, this had improved to 2.5 percent. We have compared Indian Sample Registration System estimates of the annual infant mortality rate for the most recent five year period (1993-97) with retrospective data going back to 1981. Throughout this interval, the rate of decline in the infant mortality rate tended to stagnate for brief periods, and was often followed by a subsequent rapid decline. During the most recent
five year period, however, the marked reduction in the rate of decline has been sustained, and the observed estimates (with 95 percent confidence intervals) are now significantly above the 1981-93 trend line. Based on the longer term trend, the predicted value for the 1997 infant mortality rate was 63.5 per 1000 live births, whereas the observed rate was 71 per 1000 live births. In terms of numbers, this means that about 200000 more infants died in 1997 than would have been the case had the longer-term trend continued. As infant and child mortality rates fall, further gains become more difficult to achieve. However, childhood mortality rates in India are still at elevated levels, and the observed reduction in the decline is not readily explainable.

2.4. Empirical Studies on Child Health

Caldwell (1979) brought into focus the importance of women’s education for child health and survival. He pointed out that women's education is a crucial factor in determining child survival even after controlling for a number of other factors, such as education and occupation of the husband. As per Caldwell, there are several routes through which women’s education might enhance survival of a child, which are: Appropriate use of simple health knowledge, an increased interaction with medical personnel, and allowing the educated woman to take better and suitable health decisions for her children. Apart from this, the World Fertility Survey (WFS) program and a United Nations study conducted during 1980's, which used both survey and census data, showed that higher levels of women’s education
were linked with greater probability of child survival in a wide range of developing countries. Similarly studies done by Hobcraft et al. (1984), which covered 28 world fertility survey, and by Mensch et al. (1985), which covered 15 countries, also confirmed this association between education of women and child survival, keeping other socio-economic variables such as education and occupation of husband constant.

A number of studies such as (Hobcraft 1993, Boyle et al. 2006, Miller and Rodgers 2009), using data at household level, have found that female’s education is directly proportional to infant and child health and nutritional status. Yip et al. (1992) found that poor growth of children in Asia as measured by low birth weight, low height-for-age, and low weight for height was mostly due to poor nutritional status rather than genetic factors indicating that educating women in developing countries might help in reducing child mortality by improving their nutritional levels. According to Miller and Rodgers (2009), "Empirical work has also shown that education can serve as a means of adopting new health beliefs, gaining general knowledge, and applying specific knowledge about health and nutritional practices that promote child health (Glewwe 1999)". Another factor through which women education helps in improving child health is improved household income which comes with educated women working outside their homes thereby strengthening the financial ability of their households which in turn imply better nutritious food and health services for their children.
This shows that the socio-economic determinants such as income and household's wealth affect child health and nutritional status through some intermediary mechanisms that encompass household composition, dietary intake, medical treatment, and environmental contaminants (Miller and Rodgers, 2009).

Apart from socio-economic determinants there are demographic determinants of child health which constitutes the number of children in a household, female headed household and the age of woman at the time of first birth. Women who are less educated generally have more children on average and are younger at the time they first give birth. Specifically, greater the number of children in a household the greater is the competition for scarce resources, which could badly affect children’s dietary intake, reduce their access to medical treatment, and increase their chances of getting exposed to infectious diseases (Heaton et al. 2005).

2.5. Empirical Studies on Maternal Health Care

The fact that more than 100000 women in India are estimated to die every year from pregnancy and childbirth related causes reinforces the importance of ensuring that all pregnant women receive adequate antenatal care during pregnancy and that deliveries take place under the supervision of trained medical personnel in a hygienic environment International Institute of Population System (IIPS 1995). Antenatal care provides an opportunity for a
variety of preventive interventions during pregnancy, including tetanus toxoid injections, and educating women about nutrition, safe delivery, and postpartum care (Govindasamy et al. 1993). It also allows women who face a high risk pregnancy to be identified and monitored during pregnancy to ensure a safe delivery. Delivery care is an important aspect of maternal care. Most non-abortion maternal deaths occur around the time of labour and delivery or within a few days after birth (Fauveau et al. 1988). Access to obstetric services from qualified professionals is therefore essential to preventing maternal deaths. Educated mothers are more likely to recognize a problem, seek medical care, and report a problem.

Infant and child mortality rates are also greatly reduced if mothers received antenatal and delivery care from trained health professionals International Institute of Population Science (IIPS 1995). In India for example, infant mortality rates range from 97 per 1,000 for births with both neither antenatal nor delivery care, to 64 per 1,000 for births with either type of care, and 44 per 1,000 for births with both antenatal and delivery care. This pattern is constant for all the tatas under study. The findings are similar for institutional deliveries. Data from the NFHS show that infant mortality in India is 31 percent higher for births delivered at home than for births delivered in a public health facility and twice as high as for births delivered in a private facility.
2.6. **Empirical Studies on Child Health Care**

The most common contributors to post neonatal mortality and especially child mortality are respiratory ailments, gastrointestinal diseases, and six vaccine preventable diseases (namely, tuberculosis, diphtheria, whooping cough, tetanus, polio, and measles), often exacerbated by malnutrition (UNICEF 1990). The Universal Immunization Programme in India aims to reduce infant and child mortality due to the six vaccine preventable diseases by immunizing all children less than one year old. Through its Oral Rehydration Therapy Programme, the Government of India aims to increase awareness among women and in the community in general about the causes and treatment of diarrhoea. It also shows the percentage of children who suffered from diarrhoea and, among those children, the percentage that were taken to a health facility for treatment and the percentage that were treated with ORS and/or RHF. Finally, it shows the percentage of children age 12 to 23 months who are fully vaccinated, that is, who have received vaccinations against BCG and measles plus three doses of DPT and polio vaccines. The percentage of children suffering from symptoms of ARI varies from 3 percent in Karnataka to 10 percent in Kerala. In general, more children in the south than in the north experience symptoms of ARI. It is plausible that the more educated mothers in the south are more likely to recognize and report symptoms of ARI than the less educated mothers in the north. Southern mothers are also generally more likely to take their children to a
health facility than northern mothers. For example, four in five children with symptoms of ARI in Kerala were taken to a health facility or provider, compared with only about half of the children in Rajasthan. The pattern is somewhat similar when examining the incidence of diarrhoea. There is an obvious difference in treatment of diarrhoea between the north and south, with mothers in the south more likely to administer ORS and/or RHF when treating their children for diarrhoea. Children living in the four southern states are also more likely to be fully vaccinated than children living in the northern states, with the percentage fully vaccinated ranging from 45 percent to 65 percent in the south, compared with 11 percent to 29 percent in the north.

Health care versus economic determinants of infant and child mortality is one of the classical debates in the demography and history of health care, McKeown (1976) argued that medical advances played only a minor role in the mortality reductions that occurred in England since the 18th century. Social and economic transformations, rather than specific health interventions, would thus have been the primary driving forces behind the historical decline of mortality in England and, more generally, in Europe. Later work has diminished the relevance of this thesis, first, because mortality decline during the 20th century has undoubtedly been spurred to a major extent by specific developments in the health area, and second because even in the 18th and 19th centuries more public health measures
were implemented than recognises. Preston (1996a), for example, agrees that “specific therapeutic medical treatments have played a minor role in mortality reduction in Western countries”, but considers that: “Relatively little else of the thesis has survived. The weight of evidence suggests that public health measures, such as smallpox vaccination and the purification of milk, played an important role”.

More recently, however, the thesis that social and economic transformations, rather than interventions in the health area, are responsible for the current reduction of infant and child mortality has resurfaced in the work of World Bank economists like Ravallion (1997) and Filmer & Pritchett (1997). The latter argue that virtually all inter country variation in child mortality is explained by a set of development indicators, including GNP per capita. They also state that adding health expenditure to the model adds little explanatory power.

Hanmer, Lensink and White (1999) have contested this position by testing the robustness of the determinants of infant and child mortality. They estimated over 420,000 equations which show that, while income per capita is a robust determinant of infant and child mortality, so are indicators of health, education, and gender inequality. Some health spending, such as immunisation, is thus shown to be a cost effective way of saving lives. Their results are consistent with the view that much health spending in developing
countries may be poorly targeted or otherwise ineffective, but do not support the position that public health strategies should not be given too great a role in pursuing improvements in human welfare. Unfortunately, their analysis includes the percentage of deliveries attended by trained personnel as the only SRH variable. This variable is not consistently significant in the model specifications. No other SRH variables, such as the contraceptive prevalence rate, total fertility rate, adolescent fertility rate, or percentage of unwanted pregnancies were included, so it is not possible to know what their effect would be.

Alves and Belluzzo (2005), who used panel regression to analyse infant mortality trends and differentials in Brazil during a 40 year period, found that both per capita growth and the increase of education levels are important determinants. Their set of variables, however, is even more restricted than the one used by Hanmer, Lensink & White (2003) and includes no reproductive health variables. White (2004) notes that, as mortality rates fall, the bulk of less than 5 mortality is infant rather than child death and these deaths are more sensitive to health provision than general socioeconomic conditions. Countries or regions with low rates of antenatal care, attended delivery, and breastfeeding can expect substantial returns from changing parental behaviour. The well known analytical framework by Mosley and Chen (1984) incorporates both social and biomedical variables and integrates research methods employed by social
and medical scientists to clarify the understanding of the many factors involved in infant and child survival. It offers a scheme that treats socioeconomic factors (individual productivity of fathers and mothers, income/wealth, ecological setting, political economy, health system) as the independent variables that must act through five proximate variables to have their effects (maternal factors, such as age, parity, and birth interval, environmental contamination, nutrient deficiency, injury and personal illness) controlled. This research model makes the integrated analysis of the biological and social determinants of mortality feasible and suggests that a multidisciplinary approach to the study of child survival could provide guidance for health policy makers in the developing world.

UNICEF’s framework is frequently used in nutritional analysis (UNICEF, 1990). It is often called the triple an approach assessment, Analysis and action it offers conceptual guidance in studying the immediate, underlying, and basic causes of malnutrition in infants. The immediate causes include inadequate dietary intake and disease. The underlying causes are identified as the outcome conditions necessary for adequate nutrition, such as: adequate access to food, adequate care of children and women, adequate access to preventive and basic health services, together with a healthy environment. Finally, the basic causes are considered the historical processes in society related to the availability and control of human, economic, and organisational resources. Ecological/technical conditions of
production, Social conditions of production, Political and ideological factors, including habits, beliefs, cultural preferences, and all ideas that legitimise social actions. Charmarbagwala, Ranger, Waddington and White (2004) developed a Meta analysis, exploring the existing literature on both mortality and malnutrition. Their study indicates that income is a central variable in models of the determinants of child health and nutrition outcomes. Socio-economic conditions would be important for child survival, whereas that of infants depends on factors related to medical care and childbearing, which can be independent of household income. The authors also suggest that there is limited empirical evidence that the mother’s income is more important in the feeding of children, but so far not enough research has been done to subject this line of argument to a meta-analysis.

Availability of clean drinking water and sanitation, on the other hand, would be strongly associated to child health and nutrition outcomes, as well as to birth in a health facility, antenatal care, immunisation and reproductive patterns. Finally, the findings confirm that both growth and poverty reduction strategies, and the expansion of health services, must be balanced in country policies.

2.7. Empirical Studies on Reproductive Patterns and Child Mortality

The ICPD recognises reproductive patterns as closely linked to the health of children, “The Child survival is closely linked to the timing, spacing and
number of births and to the reproductive health of mothers. Early, late, numerous and closely spaced pregnancies are major contributors to high infant and child mortality and morbidity rates, especially where healthcare facilities are scarce.” In order to improve child health and survival, attention to SRS and health is required. The National Research Council (1989) summarises the interactions as follows: “Previous research suggests that the risk of mortality and poor health are higher for children who are born to mothers with particular reproductive histories. Results of bivariate studies usually show that infant and child mortality rates are higher for those who are: the firstborn, born to a young mother, or a combination; a higher order birth, born to an older mother, or a combination; born into a family with a large final number of children ever born; born before or after a short birth interval.”

The causal link between high fertility/short birth intervals and infant and child mortality A large number of studies from around the world, particularly using data from the World Fertility Survey (WFS) and Demographic Health Survey (DHS), has consistently demonstrated that infant and child mortality levels are related to births spaced too close to one another, to large families, and to high birth orders (Hobcraft et al., 1985; Palloni & Millman, 1986; Pebley & Millman, 1986; Curtis et al., 1993; Palloni et al., 1994; United Nations, 1994).
“When women can plan when and how many children to have, the number of ‘high risk’ pregnancies and births is reduced, and infant and child health and survival improve.” (Alan Guttmacher Institute, 1998) “High fertility reduces the provision of health care to children.” (UNFPA, 2002) Better timing and spacing of pregnancies improve child health outcomes and evidence from developing countries links improved child survival with smaller family size and well timed pregnancies (Alan Guttmacher Institute, 1998). Frequently, women with large families have had many pregnancies in rapid succession and the number of children has a negative impact on the attention given to each of them.

Desai (1995) examines the relation between family size and the welfare of individual members of the family, focusing particularly on the nutritional status of children aged between 6 and 36 months, based on data collected in DHS around 1986-90 in Bolivia, Northeast Brazil, Colombia, the Dominican Republic, Guatemala, Trinidad and Tobago, Egypt, Morocco, Sri Lanka, Thailand, Burundi, Ghana, Mali, Senegal, and Zimbabwe. The effect of family size on children’s height-for-age was examined by using multivariate regression, controlling for the education of the mother and her partner, urban residence, mother’s marital status and type of housing. The findings indicate that the number of children in the same age bracket has a negative effect on the nutritional status in 13 out of the 15 countries. The greatest competition is posed by children close in age; the impact of a
sibling aged more than 5 years is much weaker, and the presence of children aged 12 or older almost always seem to have a positive impact on the index child’s physical growth. However, the author suggests that in some societies, such as in Mali and Senegal, the link between sibling and kinship size and individual welfare is neutral or positive. Social organisations, like extended kin networks or child fostering, can alleviate some of the resource competition generated by a large number of siblings; similar effects are also related to governmental subsidies of some child related expenditures. It has long been known that babies born less than two years apart are much more likely to die than those born after longer intervals. Among other factors, this occurs because women who have closely spaced childbirths are more likely to discontinue breastfeeding too early, thereby increasing the risk of infant mortality. If all births occurring within less than two years of each other could be more widely spaced, one in four infant deaths in developing countries might be prevented (Alan Guttmacher Institute, 1998). The World Bank (1993) has estimated that family planning programmes could prevent 20-40 percent of all infant deaths by preventing mistimed and under spaced births. Victora and Barros (2001) suggest, more conservatively, that reducing by half the proportion of birth intervals that are under 24 months can prevent 9.5 percent of infant deaths in Brazil.

Pinto (1995) analysed reproductive patterns and child mortality in La Paz, Cochabamba, and Santa Cruz, based on data from the “Women’s Economic
Activity and Human Reproduction Survey”, carried out in 1986 by the National Population Council of Bolivia. The study applied multivariate statistical techniques for event history analysis to estimate the simultaneous effects of reproductive pattern variables as well as education and other controls on child survival. Unfortunately, it did not control per capita household income. In line with previous research, it found that increasing birth order, short preceding birth intervals, and short durations of breastfeeding increase the risk of death during the first two years of life and suggested that the adverse effects of short birth spacing are causally related to maternal depletion, sibling competition, and risk of cross infection (Pinto, 1995).

The causal link between very early or very late fertility and infant and child mortality Child mortality increases, to an important extent, with births to very young or to very old mothers. Several studies from a variety of countries, relating maternal age to various aspects of pregnancy and child development, suggest that maternal age is a central variable influencing pregnancy outcome (Nortman, 1974; Reynolds, Wong & Tucker, 2006).

Reynolds, Wong and Tucker (2006) used logistic regression analysis of DHS data for 15 developing countries and examined adolescents’ use of antenatal care, delivery care, and infant immunisation services compared with the use of these services by older women. In Latin America, controlling
for parity allowed differences between adolescents and older women to emerge. In the region, the proportion of teenage women who are mothers or currently pregnant is about 13 to 25 percent. Younger women may be less likely to use either antenatal care or delivery care, or to have their infants immunised. According to the authors, delay in seeking care, in reaching adequate health facilities, and in receiving appropriate care at facilities is a well known barrier to care for all women. This may be especially pronounced for young women, who may have little knowledge and experience in seeking care. Furthermore, women who are pregnant for the first time including most pregnant adolescents are more susceptible than women with higher-order pregnancies to malarial parasitic infection, which is associated with anaemia, abortion, stillbirth, premature birth and low birth weight.

2.7.1. Women’s roles and child health

In the LAC region, women are assigned the major responsibilities for the care of children. About 30 percent of the children born in Brazil have no formal recognition from their fathers, so that they do not even bear their names on the birth registration document. It is estimated that each year about 800,000 children are subject to this situation in the country (Thurler, 2004). As Neuhouser (1998) and Thurler (2004) observe, being a responsible father is an option for men, while for women, the qualification of being a “responsible” mother is generally redundant. Even when men are
committed to fatherhood, gender roles mainly assign household and childbearing responsibilities to women; female care thus has a direct influence over the child or infant health.

It is often stated that children whose mother dies right after giving birth are much more likely to die themselves, but actual evidence to this effect is remarkably scant. In 19th century Sweden showing that the death of a mother reduced her infant’s probability of surviving its first year of life from 0.97 to 0.50, and the chances of living to age 5 from 0.94 to 0.02. Though less dramatic, studies about the effects of adult deaths on the subsequent health and socioeconomic wellbeing of rural families in the Matlab area in Bangladesh also suggest that an adult death is associated with significantly higher child mortality risk during the next 5 years, that these risks are higher if an adult female died and if the child was a female and/or aged less than 5 years old at the time of the adult death (Koenig et al., 1988). These conclusions are also confirmed by a handful of studies in Sub-Saharan Africa, especially from areas with high HIV incidence. To some extent, this may be because infections (HIV, malaria, and anaemia) or ill-health may be transmitted from mother to child during pregnancy, and complications of delivery may endanger the infant as well as its mother, but the available evidence is too scant to draw any solid conclusions.
2.7.2. Women’s education

The effects associated with the mother’s education probably have a much greater impact on child survival than those resulting from maternal orphan hood. As Caldwell (1979) first suggested, education, in general, and female education, in particular, exert a great influence in children’s health and survival with regard to pregnancy, childbirth, immunisation, and management of childhood diseases. Children of educated mothers are less vulnerable to morbidity and mortality. Researcher found that educated women are more likely to be proactive mothers, taking initiatives in providing the best care for their children and willing to go against traditional norms to access modern health care facilities for children, increasing their rate of survival. Mosley and Chen (1984) also agree that the mother’s educational level increases her skills in health care practices related to disease treatment, preventive care, hygiene, and nutrition thus, improving chances for child survival. This relationship has area of residence been shown to hold up even after controlling for a wide range of indicators of income, social status, and access to health services (Ware, 1984; Cleland & Van Ginneken, 1988).

LeVine et al. (1994) and Castro Martín and Juárez (1995). The conclusion of Frost, Forste, and Haas is that the first and third effects explain most of the impact of female education, although there is a substantial portion that cannot be explained by any of the pathways. More recently, Rubalcava and
Teruel (2004) used data from the Mexican Family Life Survey, which contains information on cognitive abilities, to separate the effects of schooling, cognitive ability, and childhood background using children’s height for age scores as the long run health outcome. They found that maternal cognitive ability is an important factor in improving child health and that, unlike schooling, the impact of this characteristic seems to be relatively independent of childhood background.

Elo (1992) explored the positive correlation between formal education and the use of prenatal care and delivery assistance in Peru. The general outcome is that maternal education plays a crucial role in child and maternal survival, regardless of the mother’s childhood background, socioeconomic status, and access to health care services. Another study, by Haidar, Oliveira and Nascimento (2001) estimated associations between the level of maternal education and the obstetric marker for some risk factors for the mother and infant in the city of Guaratinguetá, Brazil, in 1998. Statistically significant associations were found between low maternal educational level and low birth weight, 3 or more live births, history of stillbirth, and prenatal care including up to 6 visits. No association was found between abortions and pre-term delivery, as described in other studies, perhaps due to insufficient information.
Kassouf and Senauer (1996) analysed the effects of parental education on malnutrition, among preschool children in Brazil, based on data from the 1989 Brazilian National Health and Nutrition Survey. Parental education had both a direct impact and indirect effects, via wages and full income, on child health, particularly, the mother’s education. Primary education of at least 4 but less than 8 years yielded the only significant direct effect; nevertheless, higher levels of education had an even greater impact by way of the indirect effects on wages and full income. Some 25 percent of preschool children with mothers who had less than 4 years of schooling suffered from severe or moderate stunning (direct impact); this would fall to 15 percent if these mothers had a primary education of at least 4 but less than 8 years, and only 3% if these mothers had at least 11 years of secondary schooling education. Handa (1999) found analogous effects of maternal education on child nutrition, measured by the height of the child, in Jamaica. Similarly, Thomas, Strauss and Henriques (1991), using data from the 1986 Brazilian DHS, also conclude that parental education has a significant positive impact on child health in both the rural and urban sectors of Northeast Brazil, particularly when considered together with the literacy information. Almost all of the impact of the mother’s education, according to the authors, can be explained by indicators of her access to information: newspapers, television, and the radio. This suggests that the availability and processing of information plays a critical role in the transmission of the
benefits of education. In an earlier article (Thomas, Strauss & Henriques, 1990), based on the analysis of the 1975 National Study on Family Expenditures, the same authors used parental heights and household income to control confounding background factors and concluded that, even with these controls, parental education maintained its importance for both child survival and children’s height. Although the effects of the mother’s education were generally greater than those of the father’s, they were not very different in the case of completed secondary education or more.

Investments in women’s education are important for lowering infant and child mortality and improving child health (World Bank, 1993). Maternal education alters some childcare patterns, leading, for instance, to the implementation of favourable behaviour and enhancing the use of modern health services (Caldwell & Caldwell, 1993).

2.7.3. Women’s employment

There is some controversy regarding the way in which the health of children is affected by the employment of their mothers. In theory, the relationship may go both ways because the mother’s employment means less time but more money available for child care. In a review of the literature, which is, unfortunately, the issue comprehensively. Evidence from around the world suggested little indication of negative effects of women’s employment on breastfeeding duration and infant feeding patterns. What it did show is that
there can be a positive effect on child nutrition status, if women have decent employment. There are two critical issues decent employment and/or alternative child caretakers in the home to substitute for the mother’s time when she is out working. Lamontagne, Engle, and Zeitline (1998) investigated the relationship among women’s employment, child care strategies, and the nutritional status of children 12-18 months of age. The study examines 80 Nicaraguan households sampled by randomised block design in 10 low income urban communities. Multiple regression analysis showed that the children of employed mothers 56 percent fared better in weight/height than those whose mothers were not employed, with and without controlling for socioeconomic status and maternal education, paternal financial support, child care adequacy, and sex and age of the child.

Even though maternal care time may decrease significantly when mothers work away from home, when the time of substitute caregivers is included in the total care time, no significant difference in total childcare time remains. Children with inadequate alternate child care (care by a pre-teen or care at the work place) had lower height for age. As the authors argue, the data are consistent with the hypothesis that women’s economic contribution, particularly when the economy is in crisis and there is little paternal support, can make a critical difference in their children’s growth. Similar results were obtained by Vial, Muchnik and Mardones (1989) in a study in Santiago, Chile. They found better weight gain in the infants of working
than non-working mothers and concluded that the negative effects of early
termination of breastfeeding were outweighed by the higher incomes earned
which allowed increased expenditures on food and better access to health
care. Engle (1993) found roughly the same results Johnson and Rogers
consequences of female empowerment for child wellbeing, also concluded
that the often presumed negative consequences of female employment for
child development do not hold. He did find, however, that there do seem to
be some negative consequences for children from partnership breakdown
and from extra partnership childbearing.

Johnson and Rogers (1993) analyse data from a Dominican Republic
national representative household survey of food consumption, income, and
expenditure in 1986. Out of 1440 families surveyed, 706 had children less
than 6 years of age. Anthropometric indicators of height and weight were
collected for all 1251 children in the sample in a follow up study conducted
from December 1986 to January 1987. It was concluded that at low income
levels, where there is a high risk of dietary inadequacy, children in female
headed households achieve superior nutritional status to those in male
headed households, in spite of lower per adult equivalent calorie availability
and higher incidence of some illnesses. Multivariate analysis indicated that
one possible explanation lies in the relative amount of household earnings
for women. At low income levels, the percentage of income earned by
women was a significant predictor of children’s nutritional status (height and weight by age) even when the mother’s education and total household income were controlled for. This suggests that when women control household resources, pre-school children in the household benefit.

2.7.4. Violence against women

In a study in Leon, Nicaragua, by Åsling-Monemi et al. (2003), it was found that children of women who experience physical or sexual violence whether before, during or after pregnancy are significantly more likely to die before age 5. The odds of losing a child, among women who had ever been physically or sexually abused, were 2-4 times as high as they were among women who had not been abused. The type and severity of the violence was probably more relevant to the risk than the timing, and violence may cause impact on child health through maternal stress or care giving behaviours, rather than through direct trauma itself.

The study also suggests that mothers exposed to physical or emotional stress are more likely than others to have low birth weight infants, who, in turn, have an increased risk of dying during childhood. Also, the capacity of women to raise a child may be diminished because of emotional issues associated with abuse, like depression, anxiety and post traumatic stress, and they may even be physically prevented from obtaining care for their children. A greater propensity towards low birth weight in children of
abused mothers was also found in a Mexican study by Valdez Santiago and Sanin-Aguirre (1996). Another study, conducted by Kishor and Johnson (2003), analyses DHS data to examine the prevalence and correlates of domestic violence and the health consequences of domestic violence for the health of their children, particularly the relation between the incidence of violence and routine child immunisation. Data from nine countries Cambodia (2000), Colombia (2000), the Dominican Republic (2002), Egypt (1995), Haiti (2000), India (1998-1999), Nicaragua (1998), Peru (2000), and Zambia (2001-2002) were investigated and evidence shows that, in most countries, children of mothers who have experienced violence are disadvantaged in their access to life saving routine immunisations. If the likelihood of receiving all of the required vaccinations is examined, in six of the nine countries, children of mothers who have experienced violence are less likely to be fully immunised. The proportion of fully vaccinated children age 12 to 35 months among mothers who have not experienced violence, compared with children of mothers who have experienced violence, is higher by at least 5 to 10 percent in Colombia, Egypt, Nicaragua, and Peru, and 49 percent in the Dominican Republic.

2.8. Empirical Studies on Migration and Child Mortality

Rural-urban and international migration may have either beneficial or harmful effects on infant and child health. Literature on Mexican immigrant families points to a diversity of outcomes, as the following studies illustrate.
According to Donato et al. (2003) the role played by migration on child mortality is mostly conditioned by the social and economic situation of the emigrant’s household.

In their recent study on the impact of migration on the health of Mexicans, where the households of migrants and non migrants were evaluated, the authors demonstrate that child mortality in Mexico suffers the influence of migration, and that the regions with the greatest reductions of child mortality influenced by migration were the more economically vulnerable ones. Moreover, the study demonstrates that the reduction depends on which spouses migrate. When the mother migrates, the risk of child mortality rises, whereas when both parents migrate, the risk tends to be reduced. Lastly, the impacts of migration on health are more related to better income levels than to any other explanatory factor.

Kanaiaupuni and Donato (1999) applied multi-level methods to data from 25 Mexican communities located in central Mexico and examined how village migration patterns affect infant survival outcomes in original communities. The study analyses data from the Mexican Migration Project, which surveyed the communities in the winters of 1987-1988 through 1992-1993. As the findings indicate, in its initial stages migration may be disruptive to communities and families; with time, however, it eases household survival as it becomes part of local institutions and community
life. Two factors diminish the disruptive effects of migration: migradollars (US remittances to communities), and the institutionalisation of migration over time. Mortality risks fall when remittances are high, and the change may be related to technological and structural advancements made gradually to facilitate incoming migradollars and their use and investment in local infrastructure. Infants in communities with 20 years of exposure to at least median migration intensity rates were nearly half as likely to die. Annual remittances of at least US$ 10,000 improved infant survival.

Hildebrandt and McKenzie (2005) also investigate the impact of international migration on child health outcomes in rural Mexico using data from the 1997 Encuesta Nacional de Dinámica Demográfica (ENADID). Children in migrant households are found to have lower rates of infant mortality and higher birth weights. Children born in households with a migrant member are estimated to be 3 to 4.5 percent less likely to die in their first year than children born in households without a migrant member. Controlling for state level health infrastructure, state historic infant mortality rates, and state GDP per capita reduces the estimated effect slightly to 3.7 percent. Being in a household with at least one migrant is estimated to raise birth weight by 364 grams, and 335 grams once state level controls are included. In addition, children in migrant households are significantly more likely to be delivered by a doctor. The study suggests that migration raises health knowledge in addition to the direct effect on wealth. Nevertheless,
preventive health care, such as breastfeeding and vaccinations, is less likely for children in migrant households. Internal migration effects are investigated by Brockerhoff (1994), who analysed the improved survival chances for children under 2 years of age who migrated with their mothers from rural to urban areas during the late 1970's and 1980's. The data, which was pooled by region, was obtained from DHS surveys conducted in 17 countries, between 1986 and 1990, in Sub-Saharan Africa, North Africa, Latin America (Bolivia, Ecuador, Guatemala, Mexico, and Peru), and Southeast Asia. Migrating children younger than 2 years experienced a decline in mortality from 110 deaths per 1,000 live births before migration to 82 deaths per 1,000 live births after migration. Survival improvement was found to be related to conditions in urban areas and also to the relative timing of births and migration. Children born during the two year period surrounding their mother’s migration had considerably higher mortality rates, but after this period the advantages of migration for child survival became gradually more evident.

Not all research has found positive effects though. Bender, Rivera and Madona (1993) found that children of urban women of rural origin in Bolivia were more likely to suffer from malnutrition than those of native urban women, a difference only partially explained by the lower educational level of the former. A UNICEF study on Ecuador, Mexico, and the Philippines (Cortés, 2006) suggests that children whose parents migrated
can suffer adverse psychologically effects. In another study by UNICEF (2005), on children and adolescents in the triple border region Argentina, Brazil, and Paraguay involving 62 municipalities of the three countries, the vulnerability of children in this transit area becomes evident. In transit area municipalities of Paraguay and Argentina, child mortality rates are higher than their national averages, whereas in Brazil, because of intense work by NGOs (especially Pastoral da Criança), child mortality was actually below the national average. Differences among the three countries also appear when other causes of death rates are analysed, including AIDS. These are indications that the potential advantages of the integration process and the Mercosul Treaty are not yet comprehensive for all the population, and there is a need for common policy implementation.

The migration of qualified health personnel from underserved areas to developed countries is a significant problem in several sectors of the health system. In the Caribbean sub-region, which is particularly affected, it is known as the “nursing crisis”. Child mortality is arguably the goal most sensitive to the lack of qualified health personnel. Basic orientation and counselling regarding lactation, child nutrition, and disease management are factors closely linked to the availability of health professionals.

Vijayavalli. R. & Rajarajan. S. (2015) find out that there is some evidence of reduction of social and economic inequalities over the past two-three
decades. Stagnation of early neonatal mortality in India and most of the states highlight the importance of improving quality of prenatal care for improving child survival. Tamilnadu reached the target of minimizing the Infant Mortality rate in recent years. Presence of several risk factors, which are significantly, associated with infant mortality retard the progress.

Prasad. M. G (2015) concludes that Alarming rise in infant deaths has emerged as a stark reality for the regions of Attappadi and Dharmapuri inviting the attention of the academicians and policymakers alike. These regions mark a digression from the phenomenon of low mortality rates of 12 and 22 observed for the states of Kerala and Tamilnadu respectively suggesting critical short falls in medical and health infrastructure in these pockets coupled with serious health deficiencies afflicting the inhabitants. To cite among a few health issues observed in these pockets are severe under nourishment and malnutrition amongst infants as well as pregnant and lactating women, lack of adequate medical infrastructure, inadequate access to medical aid and nutritious food etc., implying that the underlying issues are essentially the same in Attappadi and Dharmapuri. The case of Attappadi however differs from that of Dharmapuri as infant deaths in the former are largely confined to the tribal; while the occurrence is found across the socio economic communities in the latter. Sensing the gravity of the issue, urgent policy intervention is mandatory to address the peril
Several studies have been carried out on infant and child mortality using Census, Living Standards and Demographic Health Survey (DHS) data. The literature treats the phenomenon two fold; using cross sectional or panel household data on one hand and crosssectional time series or panel data on the other hand (Hanmer et al. 2003; Fayissa, 2001; Ranis et al. 2000; Waldmann, 1992). However, this study is based on cross sectional household data. The literature on the determinants of childhood mortality consistently identifies four broad categories of factors; household characteristics that have an indirect effect on mortality (e.g. maternal education, paternal education, region of residence, household income, and access to safe drinking water and sanitation); biological attributes at birth that have direct influence on health and nutrition (e.g. sex of the child, birth order, birth interval and mothers’ age); health inputs before, during and after delivery that directly affect mortality but can be influenced by parental behaviour (e.g. prenatal care, institutional delivery, immunization, postnatal care and breast feeding); supply side factors that indicate the availability of health infrastructure such as community health centre, primary health centre and private/public hospitals.

Desai and Alva (1998) investigated the effect of maternal education on three indicators of child health-infant mortality, children’s height for age and number of vaccinations received using Demographic and Health Survey data for 22 developing countries. The authors argued that maternal education
may be a proxy for the socio economic status of the household as well as for characteristics of the community of residence. Thus more educated women are more likely to have come from higher socio-economic strata and are likely to reside in areas with better health systems as well as water and sanitation systems.

Derose and Kulkarni (2005) using multi level logistic analysis found community HIV rates, women’s education and immunization as significant determinants of child mortality in Zambia. In Egypt, Aly and Grabowski (1990) used logit analysis to model child death probability using Egypt’s World Fertility Survey in 1980. They concluded that source of drinking water and sanitation was significantly and negatively related to child mortality. Woldemicael (1988) employed logistic regression to examine the effect of some environmental and socioeconomic factors that determine childhood diarrhoea in Eritrea using data from the 1995 Eritrea Demographic and Health Survey (EDHS). The results show that type of floor material, household economic status and place of residence are significant predictors of diarrhoea.

Gangadharan et al (2000) used probit analysis to model child mortality in Pakistan and found that girls have a significant lower probability of dying in age group 0-1 but have a significant higher probability of dying in the age group 1-5. Thus the higher mortality of girls in the age group 1-5 reflects
discrimination against girls in the form of lower health and other resource inputs. Additionally, they found mother’s education beyond a certain threshold and increased duration between births to significantly reduce child mortality. Boone and Zhan (2006) employed logistic regression for analyzing child mortality in a cross-section of countries. The study found mother’s and father’s education as significant determinants of child mortality in poor countries. Wang (2002) using cross-sectional demographic and health surveys concluded that at the national level, access to electricity, vaccination in the first year of life and public health expenditures can significantly reduce child mortality. In the urban areas, however, only access to electricity has a significant health impact while in rural areas, increasing vaccination coverage is important for reducing mortality.

In their study on Bangladesh, Bairagi et al (1999) using a duration model concluded that changes in mother’s education, birth interval and birth order had little effect on mortality decline. Duration modelling is assessing water and sanitation’s impact on child mortality in Egypt. The results show that access to municipal water decreases the risk of child mortality but sanitation is found to have a more significant impact on mortality than water. In Malawi, Baker (1999) and Espe (2002) used indirect methods to estimate levels and trends of mortality in Malawi. The main findings are that source of drinking water and sanitation facilities are strong predictors of infant mortality.
The hazard rate framework is utilized by Klaauw and Wang (2004), in which a flexible parametric framework for analyzing infant and child mortality is developed. Their model predicts that a significant number of under-five child deaths can be averted by providing electricity, improving the education of women, providing sanitation facilities and reducing indoor air pollution. Wang (2003), using data from the 2000 Ethiopia DHS examined the environmental determinants of child mortality by constructing three hazard models (the Weibull, the Piece wise and the Cox model) to examine three age-specific mortality rates: neonatal, infant and under-five mortality. He found a strong and positive statistical relationship between child mortality rates and poor environmental conditions.

In another study, Jacoby and Wang (2004) examined the linkages between child mortality and morbidity in rural China using a competing risks approach. The key findings are that access to safe water/sanitation and maternal education reduce child mortality risks while use of unclean cooking fuels (wood and coal) significantly reduces the neonatal survival probability in rural areas. Jacoby and Wang (2004) estimated a household demand for immunization and the effect of immunization coverage on the probability of child survival in rural India. The author argued that mothers with high risk of child mortality may engage in compensatory behaviour in the demand for health inputs and that those who are favourable to prenatal care might engage in complementary behaviour in the demand for postnatal care.
care (i.e. more likely to also obtain postnatal care). To address the problem of self-selection in the demand for health inputs, child mortality model was estimated jointly with the demand for immunization, demand for delivery care, and demand for prenatal care. Child mortality was specified as a proportional hazard model; while the demand for immunization was modelled as an ordered probit. Both the demand for prenatal care and delivery were specified as random effects probit models. The impact of parent’s education, health services and household standard of living measured by permanent income, on child survival in rural Sudan using household data consisting of 1400 rural residents. Child mortality was assumed to depend on the education levels of the mother and father, household’s income per adult, mother’s age, public programme variables related to health (such as availability of hospital beds per capita and services to improve sanitation and water-borne diseases) and rural dummies. It is argued that women’s allocation of time between market and home production (upbringing and care of children) might influence the health status of children. The two Stage Least Squares estimation technique was used with household assets used as identifiers in the regression.

Kravdal (2004) investigated the effects of the educational attainment of mothers and other women in the community on child mortality in India using the National Family Health Survey of 1998-1999. Child mortality was specified as a discrete time hazard model and some of the explanatory
variables considered were education of the mother, average education of women (capturing education of other women in the community) and women’s autonomy variables (economic, physical, decision making and emotional) which were incorporated as potentially mediating or confounding factors. Kravdal (2004) also estimated logistic models for (15) health and health care indicators (including vaccination of children, whether the woman received antenatal care, received tetanus vaccination and had moderate or severe anaemia). Average education of women, mother’s education, religion, wealth, urbanization, availability of health care facilities and the age of the child were some of the explanatory covariates used to model health and health care indicators. The results showed that higher mother’s education and average education of women in the community are significant in reducing child mortality. Also, physical, decision making and emotional indicators reduce the incidence of child mortality. In the case of health and health care indicators, mother’s education and average education of women also proved to be significant factors influencing their demand. The author recommended policies to enhance women’s autonomy at both the individual and community level since their autonomy is crucial in reducing child mortality.

Blunch (2005) examined the impact of maternal literacy and numeracy skills, formal education and adult literacy course participation on child health inputs (vaccinations and postnatal care) and child mortality in Ghana.
He adopted an Instrumental Variable (IV) based two stage least squares estimation technique to account for the potential endogeneity of maternal skills, schooling and adult literacy course participation. His preliminary results revealed that formal schooling, adult literacy course participation and literacy and numeracy skills have a positive impact on child health input demand and hence reduce child mortality. The author recommended improvement in child health knowledge through the inclusion of health topics in the curricula of adult literacy programmes. Maitra and Pal (2005) examined the relationship between early childbearing, parental use of health inputs and child mortality in Bangladesh. The authors argue that mother’s age at births well as hospital delivery and child vaccination are chosen by the couple (i.e. they are endogenous in the child mortality regression). Consequently, they attempted to address the potential bias resulting from endogeneity by jointly estimating child mortality, mother’s age at birth and the demand for health inputs allowing for cross correlations between the unobserved components of the residual terms in these equations.

Early child birth, institutional delivery, child vaccination and child mortality were all estimated as random effects probit models. The results revealed significant adverse selection in that women having early childbirth tended to use health inputs differently from all other women. Prior to accounting for self-selection in the choice of hospital delivery and child vaccination,
hospital delivery was significant but was seen as having a harmful effect on child health.

Wang (2003) investigated the determinants of child mortality in LDCs using Demographic and Health Surveys data from over 60 low income countries. The results show that at the national level access to electricity, incomes, vaccination and public health expenditure significantly reduce child mortality. For the rural sample, vaccination is the only significant predictor for child mortality while access to electricity is the only significant mortality determinant in the urban sample. Although pooled cross sectional data improves model performance because of the rich source of data, country specific effects are not captured.

Iram and Butt (2008) estimated the socio-economic determinants of child mortality in Pakistan using sequential probity model. The study posits that breastfeeding protects children from early exposure to diseases and ill health and that mother’s education is strongly related to neonatal mortality, infant mortality and child mortality through improved child caring practices. Proximate determinants such as prenatal care, income and environmental conditions were also found to be significantly related to child mortality.

Kovsted et al. (2002) investigated the impact of health knowledge on child health and mortality in Bissau, the capital of Guinea Bissau using duration modelling. Using the mothers’ knowledge of malaria as a proxy for health
knowledge and controlling for covariates, they concluded that the importance of maternal education in child health outcomes diminishes or disappears when health knowledge is introduced into the model.

However, it was established that health knowledge has significant effect on both child mortality and health when instrumented for to capture endogeneity. Earlier studies on childhood and under five mortality in Ghana have examined socioeconomic and bio-demographic factors without recourse to supply side variables such as availability of good roads and health personnel (Benefo and Schultz, 1996; Amankwah, 1996). On the determinants of fertility and child mortality in Ghana and Cote d’Ivoire, Benefo and Schultz (1996) used Instrumental Variable Estimation.

2.9. Empirical Studies on Infant and Child Mortality in Developing Countries

There is widespread agreement that development should be measured by variables other than GNP per capita. Health variables, such as infant or maternal mortality, and education indicators, such as literacy, should be used to indicate a country’s developmental status. The focus on non income dimension of development was promoted through the Basic Needs agenda in the 1970s, and the composite Physical Quality of Life Index. Since 1990, UNDP has strongly advocated a similar position in its Human Development Reports (HDRs), embodying the multi-dimensional view of development in the Human Development Index (HDI). The International Development
Targets, and the successor Millennium Development Goals (MDGs), explicitly adopt a range of social goals, including reductions of two-thirds in infant and under five mortality by 2015, as poverty reduction targets. But to agree that measures of development should incorporate non-economic variables is not the same as agreeing that achieving development requires looking beyond a growth-oriented development strategy. Even if the objective is to maximise welfare as measured by social indicators, this objective may arguably best be obtained by focussing on growth. Two broad positions may be identified in this debate. In addition to directing attention to non-economic welfare measures, the HDRs have typically pointed out that countries at comparable levels of income per capita can have considerable variation in their HDIs, suggesting that poor performers can raise welfare (i.e. improve social indicators) without waiting for growth to do so. The 1996 HDR (and subsequent work in that vein by Ramirez et al., 2000) went further to argue that, whilst investing in human capital can lay the basis for subsequent growth, countries which have focused exclusively on economic growth have, in the end, achieved neither sustained growth nor human development.

These views have been countered by Ravallion (1997) from the World Bank’s research department. Ravallion admits that the relationship between social indicators and income per capita is imperfect, but there is a relationship. Hence sustained improvements in welfare are best brought
about by increasing income the main issue is, he suggests, not whether growth is good or bad growth, but to get enough growth of any sort. A number of other pieces of work emanating from the World Bank also emphasise a growth led development strategy. The direct relevance to our paper is analysis by the World Bank’s research department (Filmer and Pritchett, 1997) on the determinants of infant and child mortality. Specifically they argue that virtually all inter-country variation in child mortality is explained by a set of development indicators including GNP per capita.

They seek to show that adding health expenditure to the model adds little explanatory power. They therefore warn against supporting expanding public health services as a means to improving welfare, thus implicitly supporting the view that growth is the answer. We are well aware that this debate is not a new one. McKeown (1976) sought to argue that medical advances had played little role in mortality reductions in England since the eighteenth century. The weight of the evidence suggests that public health measures, such as smallpox vaccination and the purification of milk, played an important role (Preston, 1996). Analysis of various developing countries also showed “the pivotal role played by government programmes in speeding mortality improvements” (Preston, 1996). The only real debate concerned the sources of low and declining mortality in Sri Lanka, with the
“best estimate” suggesting that close to half the reduction from 1930 to 1960 can be attributed to the anti-malaria programme (Preston, 1996: 533).

2.10. Theoretical Framework on Infant Mortality Rate

Child health outcomes, as measured by both mortality and morbidity, which mostly adopts something like the Mosley-Chen (1984). Myers (1994) analysed “combines social science and medical perspectives in a parsimonious way”. The insight of this approach is that underlying Socio-Economic Status (SES) manifests itself in (measurable) proximate determinants. The values of these variables influence the risk of disease, which link to the probability of death. The Mosley-Chen model motivates the idea that countries with the same income per capita will have differing mortality rates since the relationship is mediated in several ways. For example, analysis of household data shows a very strong relationship between mortality and both preceding and succeeding birth interval. Hence higher fertility, which implies a shorter birth interval, is associated with higher mortality. Fertility, in turn, is associated with income, but imperfectly so as both cultural factors and livelihood strategies (crucially the availability of alternative safety nets) play a role. So public policy to reduce fertility, either through promotion of reproductive health or through the provision of reliable safety nets, will bring down mortality.
Infant and child mortality spans medical studies of different interventions, anthropological studies of child rearing practices and regression analysis. Our attention here is restricted to the latter. Regression analysis of the determinants of under five mortality may take one of four approaches: (1) cross country regressions, in which mortality is defined at the level of the country as a whole; (2) cross country regressions for a single country with data for different administrative units (e.g. districts); (3) analysis of survey data, mortality being defined with reference to either a mother or individual child; and (4) time-series analysis for a single country, using the national mortality rate as the dependent variable. The second area of analysis became dominant with the availability of data first from the World Fertility Survey (WFS) and later the demographic health survey (DHS), both of which have taken place in many countries. These studies show fairly consistent patterns between demographic determinants and mortality (e.g. a child’s sex and birth spacing) and rather less consistency in socio-economic determinants. Early papers illustrating both these points using WFS data are by Hobcraft et al. (1984, 1985); Desai and Alva (1998) for a recent analysis arguing that mother’s education is a significant determinant of mortality only in some countries.

Cross country regressions typically combine income per capita with a range of other variables for both SES and proximate determinants. One of the earliest and most common of additional variables has been a measure of
female education, typically female literacy, which is often found to have a significant negative effect. This is consistent with the view strongly advanced by Caldwell (1986) that female education is an important mediating variable. Since there is a high correlation between the female literacy and total literacy then total literacy may work just as well. Many studies distinguish both male and female education, sometimes finding both to be significant. Alternatively other measures of women’s status may be used, which may indicate how much say mothers have over the allocation of resources. Boehmer and Williamson (1996) find that several measures of women’s status to have a significant impact.

The distribution of income, as well as its level, may be expected to matter. Accordingly, several studies have found a significant impact from inequality. Interestingly Waldmann (1992) finds that inequality still exerts an adverse impact on mortality even once the real income of the poor is also included in the regression though none of the hypothesis as to why this may be so is supported by the data. An important channel through which improving socio-economic status can operate on reducing mortality is through health and education. We have already mentioned that both female and male educations are often included. In addition a variety of health indicators have been used, such as contraceptive prevalence and the number of persons per physician, finding a significant impact from health provision on under five mortality. The exception is the study by Filmer and Pritchett
in which health expenditure is significant only at the 10 percent level.

Hobcraft, McDonald and Rutstein (1984), Cleland and Van Ginneken (1988) demonstrate that shifts in the reproductive pattern (as measured by birth interval, birth order and maternal age) cannot explain the relationship between education and child mortality. However, when Behrman (1988) uses data that permits controlling for the education of a woman’s siblings, the education effect nearly disappears. One interpretation of this finding is that the previously reported effects of maternal education may simply be the effect of unobserved familial abilities and motivation passed on from the mother.

Zerai (1996) examined socio-economic and demographic variables in a multi-level framework to determine conditions influencing infant survival in Zimbabwe. He employed Cox regression analysis to the 1988 Zimbabwe DHS data to study socioeconomic determinants of infant mortality. The unique finding was that women’s average educational level in their community exerts a greater influence on infant survival than the mother’s educational level. This result supports assertions that child survival is strongly impacted by mass education (Cleland and van Ginneken 1988). However, the author did not show the differential impact of the independent variables on infant and child mortality. The paper seeks to fill this gap in the
existing literature on childhood mortality, by analyzing how child and infant mortality are differently impacted by the aforementioned variables, particularly for Zimbabwe.

Bicego (1990) applied a three-step procedure using proportional hazards regression to estimate trends and determinants of childhood mortality in Haiti. He used the data from the 1987 Mortality, morbidity and services utilization survey in Haiti. Maternal education and low age at birth were found to have marked effects on neonatal survivorship but little effect thereafter. Indices that reflect community level access to child health services were shown to be important especially during childhood.

Manda (1999) used data from the 1992 DHS in Malawi to study the relationship between infant and child mortality and birth interval, maternal age at birth and, birth order, with and without controlling for other relevant explanatory variables. He also investigated the direct and indirect (through its relationship with birth intervals) effects of breastfeeding on childhood mortality. The study employed proportional hazards models.

The theoretical perspective highlights the postulate on epidemiological transition theory and Demographic transition theory. First, population goes through three stages in their transition to modern pattern, the second stage is the stage of transition where mortality and fertility is declining and is explained in terms of economic development and is majorly influenced by
urbanization and industrialization. Kenya features in this stage; it is experiencing increase in population this is due to population explosion resulting from decline in mortality due to decline in death rates. This is largely as a result of improvement in food supply and improvement in public health strategies which reduce mortality especially childhood. There is increased child survival which has resulted in growing population hence age structure of population is basically youthful.

It has been noted that Kenya is one of the countries having a massive decline in infant mortality this has resulted from improved public health initiatives. Second, account for the extraordinary advances in healthcare which were made in industrialized countries. He postulated that all countries experienced three stages in the process of modernization. Stage two comprises age of receding pandemic where life expectancy moves from under 30 to over 50. Kenya features in this stage its mortality pattern has reduced over the years be it adult and child mortality. Through agriculture, improved nutrition has been noted hence infant mortality has reduced especially in rural Kenya and at national level. Efficiencies in transport have helped in reversing infectious diseases making chronic diseases prevalent. However economic challenges restrict family size, while births and deaths have not reached equilibrium thus population has continued to increase.

Magoha, (2012), in his study of twelve countries on level of life expectancy, he noted that Kenya as of 2012, had a life expectancy of 64 and this
substantial improvement shows that Kenyans can expect to live longer. This further noted that factors leading to early deaths and reduced life expectancy included poor health which contributed majorly to infant mortality, poor living conditions and extreme poverty which affects quality of life. These two theories contribute greatly to the study of infant mortality in urban Kenya. Kenya is seen to be at the second stage in each theory and both stages are characterized by decline in mortality. Over the years mortality in Kenya has generally declined and this has been attributed to improvement in services and various targeted public health initiatives, improved maternal health and improved access to water and sanitation. Further uptake of services, reduction in stigmatization and uptake of preventive and curative services have reduced the impact of HIV/AIDS and increased life expectancy (Murage and Agwanda et al, 2012).

However mortality has been declining in rural areas and at national level, but it’s actually increasing in urban Kenya, this is unexpected since urban areas being centers of development are expected to have better healthcare and better sanitation especially compared to rural areas. Fotso (2011) noted that between 1998 and 2009, the number of people in urban areas in Kenya has increased, while local and national authorities have not been able to provide decent living and social conditions to measure up to the growing population. This growth in urban population has been accompanied by increased poverty and poor health outcomes. Several factors have attributed
to increase in infant and child mortality as child under nutrition due to poor feeding practices and lack of growth monitoring and promotion. Poor sanitation due to faecal contamination and poor hygiene has resulted in early infections among infants being one of main cause of deaths in urban Kenya.

Omran’s theory of epidemiological transition had one major shortcoming; it did not envisage a decline in manmade diseases due to policies that facilitated improved medication and further decline in other diseases as the Aids pandemic triggered, decrease in life expectancy. This theory is more favorable in explaining mortality at the continental level than at country and especially at a specific place as type of residence like urban areas, (Weisz and Jesse, 2009). Looking at demographic transition theory, Thompson failed to consider cultural variables and its hypothesized relationship between population growth and economic development. He assumed development of non western countries would follow that of western countries (Lee, 2003).

2.11. Research Gap

Mother’s Schooling, Social inequality, Sex, Socio-economic Factors, age and Gender disparity were found for the causes for Infant Mortality. The present study empirically examines the Psychological Discomfort is causes for the Infant Mortality Rate in the Study area.
2.12. Conclusion

This chapter has covered a review of relevant literature regarding the constructs of the proposed model. The chapter began with reviews of the Empirical Studies of women’s education, followed by child mortality and infant mortality. In the next chapter deals with research designing data, gathering procedures and development of Hypothesis Model etc,