

Fertility, Income and Household Poverty in Ghana*

Vijay K. Bhasin**, Camara Obeng***
and Isaac Bentum-Ennin****

The study has used the Ghana Living Standards Survey data for 1998-1999 and control function approach to identify the significant determinants of fertility (captured by number of children alive in a household) and incomes of households by specifying fertility-consumption expenditure model and income-fertility model, and by using household level data. The determinants of fertility that are considered in the first model are the use of contraceptives by the mother and father, hours spent by the mother in taking care of children and personal characteristics of household members, such as the age of the mother, age square of the mother and education of the mother; age of the father, age square of the father and education of the father; consumption expenditure per adult, and the variables that correct for endogeneity and heteroscedasticity such as the fitted residuals for the logarithm of consumption expenditure per adult, and the interaction term between the fitted residuals and the logarithm of consumption per adult. In addition to these determinants, the study also looks at five categories of households, e.g. Agricultural Households, Public sector employees, Private sector employees, Non-farm self employed and Non-working that are included as control variables in the first model. The determinants of incomes of households that are considered in the second model are the personal characteristics of household members, such as the age of the mother, age square of the mother and education of the mother; age of the father, age square of the father and education of the father; fertility, and the variables that correct for endogeneity and heteroscedasticity such as the fitted residuals for fertility, and the interaction term between the fitted residuals and fertility. The Observed-Predicted Income and FGT poverty measures methods have indicated that the health intervention being considered in the study is poverty alleviating.

* **Prof. Vijay K. Bhasin (Team Leader)**, Department of Economics,
University of Cape Coast, Cape Coast, Ghana.
Phone: 00233-42-31349 (Office), Mobile: 00233-244-364881
Fax: 00233-42-37018, Email: vbhasin96@yahoo.com

** **Mr. Camara Obeng**, Department of Economics,
University of Cape Coast, Cape Coast, Ghana

*** **Mr. Isaac Bentum-Ennin**, Department of Economics,
University of Cape Coast, Cape Coast, Ghana.

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In order to complement the quantitative analysis, the qualitative survey was conducted to collect qualitative data on reproductive health behaviors and attitudes from several geographical and socio-economic regions of Ghana, namely, the north and south, and from the ethnic and religious groups to see how the fertility is affected by age, marital status, education, occupation, employment type, ethnicity, religion, and area of residence. It was observed from the Qualitative survey that fertility was affected by background characteristics – place of residence, religion and ethnicity. Differences were found in the responses on the use the additional time gained by households with respect to place of residence, whether rural/urban. Socio-cultural factors that contribute to poor maternal and child health must be addressed at all levels. Poverty was the major cause of the poor maternal and child health in Ghana. The attitude of health care service providers toward clients has direct impact on service utilization. Education and economic empowerment of community members was indicated as important for improving of maternal and child health in Ghana.

JEL classifications: I11, I31, D81, D82, O15.

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Background

The relationship between fertility and mortality can be explained by the theory of demographic transition. This theory claims that pre-modern societies experience simultaneously high levels of mortality and fertility, which jointly produce a relatively stable population size with low average age. A mortality transition then occurs, coincident with modernization and improvements in public health and nutrition, through which mortality rates decline, especially among children, causing rapid population growth. With a time lag, the mortality transition thereafter causes the emergence of a fertility transition, which occurs as fertility decreases in response to mortality reductions. These reductions create a baby boom generation whose movement through the population age structure has excited development theorists for their potential to facilitate economic growth. After both mortality and fertility transitions have taken place, population dynamics restabilize at low fertility and mortality rates, and older populations.

The targeting of mortality and fertility is critical for development. Mortality decline is an intrinsic good and should be a central goal of policy alongside other goals like income growth, literacy promotion, or poverty reduction. Fertility decline, which is not an intrinsic goal of policy, is often believed to be a necessary condition for socio-economic development, and persistently high fertility is believed by many as one of the most important obstacles to African

development. Moreover, these two transitions which jointly constitute the demographic transition create dynamic changes in the size and age structure of populations which pose challenges and opportunities for development that need to be understood by policymakers. The demographic transition creates a baby boom generation that winds its way through a population's age distribution. When this baby boom generation is young, it raises the youth dependency burden of a population, which may depress savings and therefore economic growth (Coale and Hoover, 1958), and poses challenges associated with investing in the health and education of the young. When this baby boom generation reaches working age, it creates special opportunities for growth—called the demographic dividend—in the form of extra labor supply, higher savings, and higher human capital (Bloom, Canning, and Sevilla, 2002). On the other hand, when this baby boom generation ages, it creates special challenges in the form of greater social security, health, and pension demands.

The world is expected to fulfill the promise of the Millennium Declaration and the Millennium Development Goals by 2015. These Goals provide a blueprint for human progress on the most important issues of our time – including hunger and poverty, child and maternal health and survival, education, gender equality, combating deadly diseases and protecting the environment. Children are at the heart of the Millennium Development Goals, for they are the most vulnerable in society and their needs are often the greatest. Achieving the Goals will mean a better future for children and a more secure world in which they will live.

Africa had experienced high mortality rates because of the combined effects of the AIDS epidemic, political instability and violence, and other infectious diseases. Africa must learn from what we know about how to reduce mortality, and pursue mortality reduction strategies with the utmost urgency. Two thirds of sub-Saharan Africa's population still has a fertility above 5, and has therefore had no or only incipient fertility transition. Unless this fertility rate declines, the sub-Saharan African continent will be unable to enjoy the demographic dividend. The key components of reproductive health care include family planning, safe delivery services, prenatal and postnatal care, and treatment of placental malaria, nutrient supplements during pregnancy and behaviors that promote fetal growth. The postnatal care of the children is very important for the creation of human capital, labor market and poverty reduction.

Four definitions of fertility rate are generally used in Ghana. First, age-specific fertility rates are expressed as the number of births per thousand women in the age group and represent a valuable measure for assessing the current age pattern of childbearing. They are defined in terms of the number of live births during a specified period to women in the particular age group divided by the number of woman-years lived in that age group during the specified period. Second, total fertility rate is defined as the total number of births a woman would have by the end of her childbearing period if she were to pass through those years bearing children at the currently observed rates of age-specific fertility. The

total fertility rate is obtained by summing the age-specific fertility rates and multiplying by five. Third, general fertility rate is the number of live births occurring during a specified period per 1,000 women age 15-44. Fourth, crude birth rate is the number of births per 1,000 populations during a specified period. In the present study, fertility is captured by the number of children alive in a household. It is important to identify the determinants of the number of children alive in a household for policy purposes. The determinants of fertility that are considered in this study are the pre-natal and post-natal care of children and the characteristics of the parents.

The population of Ghana increased from 12.2 million in 1984 to 18.9 million in the year 2000, growing at the average annual growth rate of 2.7 per cent. The proportion of working population (15-64 years of age) to the total population has increased from 51.0% in 1984 to 53.4% in 2000. The total fertility rate fell from 6.4 in 1988 to 5.2 in 1993 and then to 4.4 in 1998 and remained at 4.4 in 2003. Examination of the other fertility indices suggest that the 2000 census gave a general fertility rate of 130 births per 1000 women aged 15-49 years and a crude birth rate of 31.1 births per 1000 population compared to 142 births per women and 32.8 births per 1000 population computed from the 1998 data set. The general fertility rate was 146 in 2003. According to Ghana Statistical Service (2005), the direct estimate of infant mortality rate computed from the 1998 DHS for the period 1994-1998 was 57 deaths per 1000 while the application of the indirect technique yielded a value of 73 deaths per 1000 live births. On the other hand, the direct estimate of child mortality rate computed from the 1998 DHS for the period 1994-1998 was 54 deaths per 1000 while the application of the indirect technique yielded a value of 51 deaths per 1000 live births. The level of mortality (North model) based on $q(5)$ estimates was 16.8 for the period 1994-98. The average life expectancy was 56.1 for male and 59.8 for female and 57.9 for both sexes during 1994-98.

Population policies usually seek to reduce fertility by helping couples avoid “unwanted births” by promoting the diffusion of new more effective family planning methods. In Ghana, the family planning methods are divided into two categories, i.e. modern method and traditional method. Modern method comprises the use of pill, condom, IUD, injection, douche, female sterilization, male sterilization, and other sterilization. On the other hand, the traditional method comprises rhythm, withdrawal, abstinence and other. The exogenous improvement in birth control technology is expected to benefit different parents to different degrees. For parents who want relatively few children the provision of more effective birth control will be a greater benefit to them than other parents, given they have access to the same price and choice of birth control technology and other things being equal. According to Ghana Statistical Service (2000), Ghana Living Standards Survey 4 revealed that contraceptive use is very low among Ghanaian households; only about 15% of women reported that they or their partners were using a contraceptive method. The use of contraceptives was most common among women aged 25-39 years, but even among this group less

than 30% were using any form of contraception. Of the modern methods, the pill was the one most often used (5.4%), followed by injectable (2.5%) and condom (1.9%). Of the traditional methods, the rhythm method (2.5%) and abstinence (1%) were the ones mentioned to be used most often. According to Ghana Statistical Service (2004), the use of family planning methods among married women showed an increase from 13% in 1988, 20% in 1993, and 22% in 1998, to 25% in 2003. There has been a steady increase in the use of modern methods from 5% in 1988, 10% in 1993, and 13% in 1998 to 19% in 2003. However, there was an increase in the use of traditional methods from 8% in 1988 to 10% in 1993, use of these methods have since decreased to 9% in 1998 and 7% in 2003. Uses of male condoms, pills, injectables, and implants have increased markedly. For example, pill use more than doubled, use of injectables increased from less than 1% to 5%, and male condom use increased from less than 1% to 3%, between 1988 and 2003.

Although the total fertility rate in Ghana is below 5, it will be interesting for the policy makers to know which ones are the significant determinants of fertility out of those that include the use of contraceptives by the mother and father, hours spent by the mother in taking care of children and personal characteristics of household members, such as the age of the mother, age square of the mother and education of the mother; age of the father, age square of the father and education of the father; and consumption expenditure per adult. It is important to know the type of relationship that exists among these determinants and fertility and their magnitude of impact.

In Ghana, the structure, composition and size of households differ among the various ethnic groups based on the prevailing kinship, and the two broad descent and inheritance systems, i.e., the patrilineal and matrilineal. In the patrilineal system, inheritance and descent are traced from the father's line and household heads are mostly men. In the matrilineal systems which trace descent from the mother's line, a large proportion of household heads are women. Household heads are employed as Agricultural Households, Public sector employees, Private sector employees, Non-farm self employed and Non-working. In addition to the above mentioned determinants of fertility, it will be interesting to look at how the effects of these occupations on fertility levels differ across these different categories of occupations.

Institutional Context

Agriculture has been and continues to be the dominant sector as far as contribution to Ghana's GDP is concerned (see Table 1 below). There has been little structural change in the Ghanaian economy and as a result, agriculture remains the dominant sector in terms of income, jobs and output. Agriculture is seen as vital for leading the growth process by providing the necessary inputs for a vibrant, agro-processing industrial sector in the medium term in Ghana.

The economic activities and labor force participation of women are important indicators of women's status, autonomy and empowerment. But the economic importance of women extends far beyond its value as an index of women's empowerment or autonomy. Women's economic contribution is vital for national development or progress at the aggregate level and crucial for the household or family's sustainability. This is especially important in a country such as Ghana where women have traditionally played a dominant role in certain areas of the economy such as agriculture and trade. According to Ghana Statistical Service (2000), 17.1% of women were employed in the agriculture and 48.6% of women were engaged in trading in urban areas in 1998; whereas 66.9% of women were employed in the agriculture and 17.5% of women were engaged in trading in the rural areas in 1998. As such, there has been increasing concern about the marginalized participation of women in the formal labor market. This concern needs to be seriously addressed because it has implications not only for the status of women, but also for the eradication of poverty and, ultimately, national development.

Table 1: GDP by Sector at 1993 Constant Prices, 2000 – 2006 (% of GDP)

Item(Sector)	2000	2001	2002	2003	2004	2005	2006
Agriculture	36		35.9	35.9	36.1	36.7	37.0
Industry	25.2	24.9	24.9	24.9	24.7	24.7	25.4
Services	29.7	29.9	30.0	29.8	29.5	24.9	30.0
Sub Total	90.9	90.7	90.7	90.9	90.9	91.0	91.2
Indirect Taxes	9.2	9.3	9.3	9.1	9.1	9.0	8.8

Source: ISSER 2006

According to Ghana Statistical Service (2000), 31.8% of all adults had never been to school. A further 25.1% went to school but did not obtain any qualifications. About 32.8% had the Middle School/ Junior Secondary School certificate as their highest qualification, while the remaining 10.4% had secondary or higher-level qualifications. There was a marked contrast between females and males in levels of educational attainment. For instance, more than twice as many females as males had never been to school; in contrast, only half as many females as males had secondary or higher qualifications. There is a need to pay more attention to the education of women to improve their status and eradicate poverty.

The improvement in the health of the women is expected to impact positively on economic growth of the country. Improvement in health of women will lead to more participation in economic activities and therefore improvement in the well being of the women. Growth in the average standard of living will reduce poverty other things being equal, but where it is accompanied by an increase in inequality, the reduction in poverty will be reduced. The effectiveness of growth in

poverty reduction is increased where that growth is pro-poor, in other words, when it is accompanied by falling inequality.

About a third (34%) of the 3.7 million households in Ghana is headed by females (GSS, 2005). This situation gives cause for concern, since the sex of the household head is an important factor in determining the welfare of household members. Female household heads have to take on more roles in addition to their traditional roles sometimes at great cost to their mental and physical health. They work within and outside the home, doing many different things including mothering, nurturing children and cooking. In general, women hold their households and families together, managing available household resources. Their ability to do this effectively depends to a large extent, on their position within the family set-up and on their access to productive resources. Studies have shown that women in the traditional society have limited access to lineage land. This situation of gender inequality regulates women's access to resources in such a way that women are always dependent on men, with most women depending on husbands or kin for access to land for farming and other productive activities. The consequence of this on female heads of households is that they and their household members become more dependent on other men and relatives for productive resources and other male related assistance. The status of an uneducated, unemployed and pregnant female head is one of the worst in the country. Her status can be enhanced only with improvement in her educational and employment status and decrease in fertility.

The ability of female household heads to earn some income relieves her household from untold hardship particularly when it is a single parent household with many dependants. For the large proportion of female heads that are currently in no union, working in the formal sectors would enable them to earn higher incomes than working in the informal sector which is characterized by low incomes and high levels of insecurity. These female heads, however, are like other females, likely to be engaged in farming, trading, or small scale food manufacturing. For them to earn high incomes, the female heads need resources in the form of capital and land. Yet, women have limited access to these resources because of the traditional set up which precludes women from inheriting property.

Examining the poverty level in Ghana according to the gender of household head, it is shown that female-headed households are on average less poor than male headed households. Incidence of poverty among women household heads has declined consistently from 43% in 1991/92, 35% in 1998/99 to 19% in 2005/2006 as against 55% in 1991/92, 41% in 1998/99 to 31% in 2005/2006 for the male counterparts (GSS, 2007). This consistent decline in poverty incidence among women is attributed to the several public and civil society initiatives to improve women's access to economic and social services and opportunities. This shows that any significant improvement in reproductive health of women will go a very long way to speed up poverty reduction among women.

Objectives of the Study

The study looks at the determinants of fertility (captured by the number of children alive in a household), examines the relationship among income, fertility, and poverty in Ghana by using the control function approach and Ghana Living Standards Survey 4 data for 1998-1999. The study also supplements this information by qualitative survey which uses techniques such as individual interviews, focus group discussions (FGDs), in-depth interviews and a number of ethnographic methods, including narratives, life stories and observations.

Literature Review

The low fertility associated with demographic transition allows households to have fewer children, thereby allowing them to invest intensively in each child to produce the needed human capital for growth and development (Becker and Lewis, 1973). Demographic transition affects poverty through the economic growth (Adams, 2003). It endangers and the fact that the accompanying reduction in fertility associated with demographic transition allows smaller households to finance larger amounts of human capital investments in health and education in their children. These demographic dividends will accrue to a country on condition that health policies that focus on lowering infant and child mortality and promote child health care are implemented.

Schultz and Mwabu (2003) using Kenyan data for the years 1994 and 1997 have shown that the consequences of economic development on fertility depends on the composition as well as level of family economic resources. Family income from returns on physical capital such as land holdings increase family consumption and raise fertility, whereas family income from returns on women's human capital increase family consumption and lower fertility.

Economic theory says that fertility should be negatively related to income. The basic idea is that the price of children is largely time, and because of this, children are more expensive for parents with higher wages. Another argument is that higher-wage people have a higher demand for child quality, making quantity more costly, and hence those parents want fewer children. The other strand of literature attacks the question from an empirical point of view, arguing that the negative relationship is mainly a statistical fluke—due to a missing variables problem. This literature focuses on identifying those crucial missing variables, such as female earnings potential. Once those missing variables are controlled for, fertility and income are actually positively related (Hotz, Klerman, and Willis, 1993).

Borg (1989) examines the relationship between income and completed family size in empirical fertility models by considering Korean data. The relationship, which is hypothesized to be positive, often is negative in empirical studies. This

perverse result is thought to occur because of the many correlations between income and other factors that affect fertility. In this research, these other factors--such as the net price of a child, the opportunity cost of the wife's time, and supply factors--are statistically controlled, and the income effect is positive and significant. When the net price of a child is not controlled, however, the income effect becomes negative and significant.

Andres (2004) analyzes the impact of women's economic activity, earnings and take-up of child home care allowance on childbearing, using a ten percent sample from a longitudinal register data set that covers the entire female population of reproductive age in Finland in 1988-2000. Results show that a woman's economic activity and income were positively correlated with entry into motherhood and to a lesser extent with having a second child.

Dreze and Murthi (2000) have observed that there has been a significant decline in fertility in many parts of India since the early 1980s. They reexamine the determinants of fertility levels and fertility decline, using panel data on Indian districts for 1981 and 1991. They found that women's education is the most important factor explaining fertility differences across the country and over time. Low levels of child mortality and son preference also contribute to lower fertility. By contrast, general indicators of modernization and development such as urbanization, poverty reduction and male literacy bear no significant association with fertility.

Some studies have also found correlations between high fertility and poverty, both at the national and household level. A classical example is Eastwood and Lipton (2001) who found in a sample of 45 developing countries that high fertility is associated with higher levels of absolute poverty, and that a 5 per thousand reductions in the average country's birthrate would have reduced the incidence of poverty from 18.9 percent in the mid-80s to 12.6 percent in the early 90s.

Ravallion (2005) has argued that recent literature and new data help determine plausible bounds to some key demographic differences between the poor and non-poor in the developing world. The author estimates that selective mortality--whereby poorer people tend to have higher death rates--accounts for 10-30 percent of the developing world's trend rate of "\$1 a day" poverty reduction in the 1990s. However, in a neighborhood of plausible estimates, differential fertility--whereby poorer people tend also to have higher birth rates--has had a more than offsetting poverty-increasing effect. The net impact of differential natural population growth represents 10-50 percent of the trend rate of poverty reduction.

Arnstein et al (2006) have used simultaneous random effect models as a means to analyze causality issues related to poverty and fertility in Ethiopia, a country which is plagued by high and persistent poverty and very high fertility rates in rural areas. Using longitudinal data from both urban and rural areas of Ethiopia,

they analyze the relationship between childbearing and poverty. In addition to identifying state dependence in poverty and fertility, they investigate to what extent fertility act as a feedback mechanism leading to higher poverty and vice versa. They find that poverty itself has little effect on fertility, whereas there is evidence of state dependence in poverty and important feedback from fertility on future poverty. Not unexpected, they find substantial differences between rural and urban areas.

Arnstein et al (2005) have argued that just as poverty analysis has a central part in Development Economics, studies of fertility behavior have an equally important standing in the Demography literature. Poverty and fertility are two important aspects of welfare that are closely related. In this paper they use unique longitudinal data sources to study the relationship between poverty and fertility at household level over a two to five year period. In particular they compare the relationship between fertility and poverty in four countries: Albania, Ethiopia, Indonesia and Vietnam. These countries differ greatly in their history, average income, social structure, economic institutions and demographic features. They find that there is a substantial difference in the relative importance of the determinants of poverty dynamics and fertility; the persistence of high levels of fertility and poverty in Ethiopia is driven by lack of economic growth and poor access to family planning; education and health provision are crucial elements in reducing poverty and fertility, as is clear from Vietnam, Indonesia and Albania.

Singh (1994) using cross-country data, evaluated the effects of women's education, labor force participation, contraceptive-use and the availability and use of health services to mothers at births on fertility and mortality variations in LDCs. Following basically an extended version of the Schultz-Becker framework, a regression model was formulated, and the coefficients on the variables were estimated using the ordinary least squares. The empirical results revealed that the women's human capital variable measured by literacy, school enrollments and/or the completed school years had a deterrent effect on both the fertility and mortality rates in LDCs. Similarly, the effect of the contraceptive-use was to significantly reduce fertility rates, as was the effect of the supply of health services to mothers at birth on child mortality. Countries with the higher participation of women in wage-paid jobs experienced significantly lower fertility and mortality rates.

Bhargava and Saxena (1986), on the basis of data collected in Bombay, India, noted that the inverse relationship between work and fertility was more pronounced in the case of women engaged in white-collar jobs. The authors attributed the decrease in fertility to maternal role incompatibility. Their model is based on the hypothesis stating that if her two roles-as mother and as worker-are not compatible, an inverse relationship exists between work participation and fertility. However, if the two roles are compatible, work may have little effect on fertility.

Adamchak and Mbitvo (1994) assess the impact of husbands and wife's education and occupation on family size in Zimbabwe. Results from the 1988 Male Fertility Survey indicate that husband's education had a strong negative effect, and wife's education had a moderate negative effect on the number of children ever born. Contrary to the literature, wives who were not employed had significantly fewer children than those who work in agriculture, and fewer, but not significantly, than those in non-agricultural occupations. Findings show the importance of husband's education and the changing dynamics of wife's occupation in fertility decline.

Hoem et al. (2006) find that ultimate fertility decreases somewhat with an increasing educational level, but its dependence on the field of education is much more impressive. In particular, women educated for the teaching or health-care professions have less childlessness and a higher ultimate fertility than others. Conversely, women with an education for esthetic or (non-teacher) humanist occupations have unusually high fractions childless and low ultimate fertility. Women with religious educations stand out by having very high fractions childless but quite ordinary mean ultimate fertility nevertheless; such women have very little childbearing outside of marriage. Women with research degrees have remarkably ordinary childbearing behavior; they do not forego motherhood to the extent that some theories would predict.

Ajakaiye and Mwabu(2007) in their study on the demand for reproductive health services, review a unified model of demand for health care inputs and health production, first proposed by Rosenzweig and Schultz(1982) and show how the model can be applied to design and implement policies to improve reproductive health of the population. The demand for reproductive health services together with the associated health production technology is first analyzed in the context of a unitary model of the household, before positioning the analysis in a more general collective model. In one of the several illustrations presented, the control function approach is used on Kenyan data to estimate the effect of tetanus immunization on birth weight in a unitary household setting. Vaccinating mothers against tetanus during pregnancy is found to increase birth weight but indirectly through complementary behaviors and health care consumption patterns that are induced by vaccination. The effects of unobserved variables on birth weight such as the knowledge gaps among mothers about health care are also found to be substantial. They argue that if mothers do not possess information about essential health care during pregnancy, tetanus vaccination may never induce them to invest in activities that improve birth weight in line with the complementarity hypothesis. More generally, the study identifies the need to implement what the author's term immunization plus interventions to empower women to use reproductive health services effectively.

Models, Data and Methodology

Following Schultz and Mwabu (2003) and Ajakaiye and Mwabu (2007), we specify the the fertility- consumption expenditure model as follows to correct for the endogeneity in consumption:

$$NCH = w_1 \delta_s + \beta \text{Log } C + \varepsilon_1 \quad (1)$$

$$\text{Log } C = w \delta_c + \varepsilon_2 \quad (2)$$

Where NCH is the number of children alive in a household for women age more than 15 years old (nchild) and C is the Consumption expenditure per adult (texpad). Since child fostering is very common in Ghana, the number of children alive may include the children of relatives. The endogeneity of household consumption could result from two offsetting effects. First, added children could productively contribute to family income before reaching the age of 15 years and thus raise consumption per adult. Secondly, added children could occupy the time of their mother or other child care-givers and thereby lower the household's consumption per adult.

w_1 = a vector of exogenous covariates which include the provision of health pre-natal and post-natal care inputs for children to capture the complementary effect (use of contraceptives by the mother and father (conu), and hours spent by the mother in taking care of children (cchs)) and personal characteristics of household members, such as the age of the mother (agem1), age square of the mother (agem22) and education of the mother (medu) measured in years; age of the father (agey), age square of the father (agey22) and education of the father measured in years (fedu).

w = exogenous variables, consisting of w_1 covariates that belong in the number of children observed equation and a vector of instrumental variables w_2 (Rental Income (rentin)), that affect the consumption expenditure per adult,

δ , β , ε = vectors of parameters to be estimated, and disturbance term, respectively.

According to Schultz and Mwabu (2003) the lifetime expected income is the relevant welfare variable around which one would like to construct fertility comparisons, and this is commonly approximated by analyzing total household consumption. This total consumption is then divided by the number of adults in the household who share the consumption, to arrive at a measure of average consumption opportunities. Since we want to examine the relationship between fertility and economic welfare, it could be misleading to measure welfare as the household's per capita consumption, which essentially deflates consumption of the household by the number of children parents have. Measuring parent consumption opportunities in per capita terms therefore introduces parent's

reproductive choices into the measurement of household welfare. If our goal is to estimate the behavioral relationship between parent's economic opportunities and their fertility, deflating consumption opportunities by the numbers of children they chose to have, adds a negative partial correlation into the measured relationship, which could be due to heterogeneous preferences for fertility or simply errors in measuring fertility. As a result of these explanations, household welfare is measured by consumption expenditure per adult.

It is expected that the consumption expenditure per adult is inversely related with the number of children alive in a household. The use of family planning methods is expected to be inversely related to the number of children alive in a household provided the method used is successful; otherwise they may be positively related. The number of hours spent by the mother in taking care of children is expected to be directly related to the number of children in a household. Education of mother and father is expected to be inversely related with the fertility. The age of mother and father is expected to be directly related with the number of children; whereas the age of mother and father square is expected to be inversely related with the number of children.

The study uses the Ghana Living Standards Survey 4 data for the year 1998-99. The sample size consists of 5998 households. The effective sample size for this study is 5970 households. We estimate the reduced form equation (2) to get the predicted log consumption expenditure per adult and then take the difference between actual and predicted to get the residuals for ϵ_2 . We introduce Control Function variables such as Residuals for ϵ_2 (v) and interaction term of Residuals for ϵ_2 with log consumption expenditure per adult (vc) in the number of children observed equation to capture the effect of unobservable variables as follows:

$$NCH = \alpha_0 + w_1 \delta_s + \beta \text{Log } C + \alpha_1 v + \lambda (vc) + u \quad (3)$$

Where v is the fitted residual of $\text{Log } C$ derived from equation (2) and vc is the interaction of the fitted residual of $\text{Log } C$ with the actual value of the $\text{Log } C$; whereas u is a composite error term comprising ϵ_1 and v with the assumption that $E(\epsilon_1) = 0$; and α_0 , vector w_1 , β , α_1 , and λ are parameters to be estimated. We use the Ordinary Least Squares (OLS) method to estimate the structural equation (1) and the reduced form for equation (2). We use the instrument variable two stages least squares (IV2SLS) estimation method to estimate the equation (3). The IV estimates of the parameters of equation (3) are unbiased and consistent only when one or the other of the following conditions holds (a) the expected value of the interaction between logarithmic value of consumption expenditure per adult and its fitted residual is zero; (b) the expectation of the interaction between the logarithmic value of consumption expenditure per adult and its fitted residual is linear (see Wooldridge, 1997). The residuals and its interaction with the consumption per adult may be positively or negatively related with the number of children in a household.

Again, we specify the income- fertility model as follows to correct for the endogeneity in fertility:

$$\mathbf{LOG(INC)} = \mathbf{w}_3 \delta_i + \gamma \mathbf{NCH} + \varepsilon_3 \quad (4)$$

$$\mathbf{NCH} = \mathbf{w}_4 \delta_n + \varepsilon_4 \quad (5)$$

Where NCH is the number of children alive in a household for women age more than 15 years old (nchild) and INC is the total income of the household (income). The endogeneity of number of children alive could result from two offsetting effects. First, the price of children is largely time, and because of this, children are more expensive for parents with higher wages. Moreover, higher-wage people have a higher demand for child quality, making quantity more costly, and hence those parents want fewer children. Secondly, when the net price of a child, the opportunity cost of the wife's time, and supply factors are statistically controlled then parents with higher wages would prefer to have more children.

\mathbf{w}_3 = a vector of exogenous covariates which include personal characteristics of household members, such as the age of the mother (agem1), age square of the mother (agem22) and education of the mother (medu) measured in years; age of the father (agey), age square of the father (agey22) and education of the father measured in years (fedu).

\mathbf{w}_4 = exogenous variables, consisting of \mathbf{w}_3 covariates that belong in the income equation and a vector of instrumental variables \mathbf{w}_2 (Hours spent fetching water (hfwater)), that affect the number of children alive in a household,

δ , γ , ε = vectors of parameters to be estimated, and disturbance term, respectively.

It is expected that the number of children alive may be positively or negatively related with the income of a household. Education of mother and father is expected to be positively related with the income. The age of mother and father is expected to be inversely related with the income; whereas the age of mother and father square is expected to be positively related with the income.

We estimate the reduced form equation (5) to get the predicted number of children alive and then take the difference between actual and predicted to get the residuals for ε_4 . We introduce Control Function variables such as Residuals for ε_4 (z) and interaction term of Residuals for ε_4 with number of children alive in a household (znc) in the income equation to capture the effect of unobservable variables as follows:

$$\mathbf{LOG(INC)} = \theta_0 + \mathbf{w}_3 \delta_i + \gamma \mathbf{NCH} + \theta_1 z + \mu (znc) + \xi \quad (6)$$

Where z is the fitted residual of NCH derived from equation (5) and znc is the interaction of the fitted residual of NCH with the actual value of the NCH;

whereas ξ is a composite error term comprising ε_3 and z with the assumption that $E(\varepsilon_3) = 0$; and θ_0 , vector w_3 , γ , θ_1 , and μ are parameters to be estimated. We use the Ordinary Least Squares (OLS) method to estimate the structural equation (4) and the reduced form for equation (5). We use the instrument variable two stages least squares (IV2SLS) estimation method to estimate the equation (6). The IV estimates of the parameters of equation (6) are unbiased and consistent only when one or the other of the following conditions holds (a) the expected value of the interaction between number of children alive in a household and its fitted residual is zero; (b) the expectation of the interaction between the number of children alive in a household and its fitted residual is linear (see Wooldridge, 1997). The residuals and its interaction with the number of children alive in a household may be positively or negatively related with the income of a household.

The study uses two methods, i.e. Observed-Predicted Income method and Foster, Greer and Thorbecke (FGT) poverty measures method, to elicit the effects of health intervention on poverty of households. In the first method, we find the predicted values of the logarithmic income from equation (6) and then take the exponential values of the logarithmic income to get the predicted values of incomes. We calculate the difference between the actual and predicted values of incomes. We identify the number of households whose incomes have increased and the range of increase in incomes. We assume that 10% of these households are very poor and identify the range of increase in incomes of these households. We divide the number of very poor households by the censored sample size (5979) and multiply by 100 to find out the percentage of households that are taken out of poverty because of the health intervention. Since we know that one in every three households in Ghana has a female as the head of the household, we find the number of female headed households that are taken out of poverty because of health intervention.

In the second method, we use the DAD software to evaluate the poverty measures. The pre-intervention and post-intervention poverty levels are obtained using FGT poverty measures

$$POV_k = \int_0^z [(z - y)/z]^k f(y) dy, \quad k = 0, 1, 2$$

where y is the actual income of household before the health intervention or the predicted income of the household after the health intervention, k is a poverty-aversion parameter, z is the poverty line. The incidence of poverty is indicated by $k=0$. The depth of poverty is indicated by $k=1$, and the severity of poverty is indicated by $k=2$.

In the present study, the monetary poverty line of Cedis 665,300 per annum is used and it was obtained from the consumption basket of the bottom 20% of the distribution of individuals by their standard of living, which provided 2900

kilocalories per equivalent adult per day. The commodities that were included in this consumption basket were about 120 that belong to agricultural, industrial and services sectors.

Empirical Results

The OLS estimates for the coefficients of the determinants of structural fertility equation (1) are presented in Table 2. The relationship between the logarithm of the consumption expenditure per adult and the fertility is negative and statistically significant. When consumption expenditure per adult is viewed as exogenous, the OLS estimated effect of a 0.1 log (about 10 percent) increase in consumption expenditure per adult is to decrease fertility by 0.50. This effect is much higher in Ghana as compared to Kenya that was observed by Schultz and Mwabu (2003) to be 0.10 in 1997. The estimated coefficients for the quadratic functions in age of the women and her husband are of correct signs and are statistically significant at less than 1% level of significance. The pattern of coefficients on the age of women and her husband have inverted U-shape which shows that younger women and younger husbands are most likely to have fewer children than older women and older husbands.

Increase in the father's age by one year is associated with an increase in fertility by 0.19 in Ghana (0.15 for Kenya) and whereas increase in the mother's age by one year is associated with an increase in fertility by 0.14 in Ghana (0.66 for Kenya). The coefficients of the mother's and father's schooling are of correct sign and statistically significant at less than 1% level of significance. Increase in the father's education by one year is associated with a reduction in fertility by 0.027 and whereas increase in the mother's education by one year is associated with a reduction in fertility by 0.043 in Ghana (0.032 for Kenya). The estimated coefficient for the number of hours spent by the women in taking care of children is of correct sign and statistically significant at less than 1% level of significance. A one hour increase in the time of women devoted to children is associated with an increase in fertility by 0.017. Since the coefficient of the contraceptive use variable is statistically significant, it implies that an additional use of contraceptive method will increase fertility by 0.80 which means that the contraceptive methods were not used successfully. The F-value of 202.31 which is statistically significant at less than 1% indicates that the equation (1) that is fitted to household level data is a good fit.

The OLS estimates for the coefficients of the determinants of reduced form equation (2) for the logarithmic of consumption expenditure per adult are presented in Table 3. These first-stage estimates indicate that rental income, father and mother education are each individually significant in positively affecting consumption expenditure per adult. The F-value of 96.91 which is statistically significant at less than 1% indicates that the equation (2) that is fitted to household level data is a good fit.

When consumption expenditure per adult is treated as endogenous, the IV2SLS estimates for the coefficients of the determinants of the fertility equation (3) are presented in Table 4. The relationship between the logarithm of the consumption expenditure per adult and fertility is positive and statistically significant. When consumption expenditure per adult is viewed as endogenous, the IV2SLS estimated effect of a 0.1 log (about 10 percent) increase in consumption expenditure per adult is to increase fertility by 3.65. This effect is much higher in Ghana as compared to Kenya that was observed by Schultz and Mwabu (2003) to be 1.72 in 1997 (2SLS). The estimated coefficients for the quadratic functions in age of the women and her husband are of correct signs and are statistically significant at less than 1% level of significance.

The pattern of coefficients on the age of women and her husband have inverted U-shape which shows that younger women and younger husbands are most likely to have fewer children than older women and older husbands. Increase in the father's age by one year is associated with an increase in fertility by 0.19 in Ghana (0.13 for Kenya) and whereas increase in the mother's age by one year is associated with an increase in fertility by 0.19 in Ghana (0.51 for Kenya). The coefficients of the mother's and father's schooling are of correct sign and statistically significant at less than 1% level of significance. Increase in the father's education by one year is associated with a reduction in fertility by 0.14 in Ghana (0.02 for Kenya) and whereas increase in the mother's education by one year is associated with a reduction in fertility by 0.18 in Ghana (0.12 for Kenya). The estimated co-efficient for the number of hours spent by the women in taking care of children is of correct sign and statistically significant at less than 1% level of significance. A one hour increase in the time of women devoted to children is associated with an increase in fertility by 0.018. Since the coefficient of the contraceptive use variable is statistically significant, it implies that an additional use of contraceptive method will increase fertility by 0.61 which means that the contraceptive methods were not used successfully.

The coefficient of the fitted residuals for the logarithm of consumption expenditure per adult, with the controls for non-linear interactions between the logarithm of consumption expenditure per adult and unobservable variables, is negative and statistically significant at less than 5% level of significance indicating that logarithm of consumption expenditure per adult is endogenous to fertility. Since the coefficient of the interaction term between the fitted residuals and the logarithm of consumption per adult is negative and statistically significant at less than 5% level of significance, it shows that the estimates of parameters in equation (3) for households have been absolved of any effects of heterogeneity that arises from non-linear interaction of logarithm of consumption expenditure per adult with unobserved determinants of fertility in a household. The F-value of 167.87 which is statistically significant at less than 1% indicates that the equation (3) that is fitted to household level data is a good fit.

The OLS estimates for the coefficients of the determinants of structural fertility equation (1) with occupations as controls are presented in Table 5. There is no change in the signs and significance of the variables that were examined without the occupations as controls. The effects of agricultural households on fertility are negative and statistically significant at less than 1% level of significance. The F-value of 143.05 which is statistically significant at less than 1% indicates that the equation (1) with occupations as controls that is fitted to household level data is a good fit.

The OLS estimates for the coefficients of the determinants of reduced form equation (2) for the logarithmic of consumption expenditure per adult with occupations as controls are presented in Table 6. These first-stage estimates indicate that rental income, father and mother education, contraceptive use, and agricultural households are each individually significant in positively affecting consumption expenditure per adult. The F-value of 87.44 which is statistically significant at less than 1% indicates that the equation (2) with occupations as controls that is fitted to household level data is a good fit.

When consumption expenditure per adult is treated as endogenous, the IV2SLS estimates for the coefficients of the determinants of the fertility equation (3) with occupations as controls are presented in Table 7. There is no change in the signs and significance of the variables that were examined without the occupations as controls. The effects of agricultural households and non-farm self employed on fertility are negative and statistically significant at less than 1% level of significance. The F-value of 125.85 which is statistically significant at less than 1% indicates that the equation (3) with occupations as controls that is fitted to household level data is a good fit.

The OLS estimates for the coefficients of the determinants of structural income equation (4) are presented in Table 8. The relationship between the fertility and the logarithmic value of income is positive and statistically significant. When fertility is viewed as exogenous, the OLS estimated effect of an increase in fertility by one child is to increase income by 1.07%. The estimated coefficients for the quadratic functions in age of the women are of correct signs but are statistically insignificant; whereas the estimated coefficients for the quadratic functions in age of the women's husband are of incorrect signs but are statistically significant at less than 2% level of significance. The coefficients of the mother's and father's schooling are of correct sign and statistically significant at less than 1% level of significance. Increase in the father's education by one year is associated with an increase in income by 1.02% and whereas increase in the mother's education by one year is associated with an increase in income by 1.03%. The F-value of 66.11 which is statistically significant at less than 1% indicates that the equation (4) that is fitted to household level data is a good fit.

The OLS estimates for the coefficients of the determinants of reduced form equation (5) for fertility are presented in Table 9. These first-stage estimates

indicate that the coefficient of hours spent to fetch water is of correct sign and statistically significant at less than 1% level of significance. The estimated coefficients for the quadratic functions in age of the women and her husband are of correct signs and are statistically significant at less than 3% level of significance. The pattern of coefficients on the age of women and her husband have inverted U-shape which shows that younger women and younger husbands are most likely to have fewer children than older women and older husbands. The coefficients of the mother's and father's schooling are of correct sign and statistically significant at less than 1% level of significance. The F-value of 168.73 which is statistically significant at less than 1% indicates that the equation (5) that is fitted to household level data is a good fit.

When fertility is treated as endogenous, the IV2SLS estimates for the coefficients of the determinants of the income equation (6) are presented in Table 10. The relationship between the fertility and logarithmic value of income is positive and statistically significant. When fertility is viewed as endogenous, the IV2SLS estimated effect of an increase in fertility by one child is to increase income by 1.8%. The estimated coefficients for the quadratic functions in age of the women and her husband are of correct signs and are statistically significant at less than 2% level of significance. The patterns of coefficients on the age of women and her husband have U-shape which shows that younger women and younger husbands are most likely to have higher income than older women and older husbands. Increase in the father's age by one year is associated with a decrease in income by 1.09% and whereas increase in the mother's age by one year is associated with a decrease in income by 1.05%. The coefficients of the mother's and father's schooling are of correct sign and statistically significant at less than 1% level of significance. Increase in the father's education by one year is associated with an increase in income by 1.04% and whereas increase in the mother's education by one year is associated with an increase in income by 1.06%.

The coefficient of the fitted residuals for the fertility, with the controls for non-linear interactions between fertility and unobservable variables, is negative and statistically significant at less than 1% level of significance indicating that fertility is endogenous to income. Since the coefficient of the interaction term between the fitted residuals and fertility is negative and statistically significant at less than 1% level of significance, it shows that the estimates of parameters in equation (6) for households have been absolved of any effects of heterogeneity that arises from non-linear interaction of fertility with unobserved determinants of income in a household. The F-value of 68.16 which is statistically significant at less than 1% indicates that the equation (6) that is fitted to household level data is a good fit.

The numbers of households whose incomes have increased due to the health intervention were 2886 and their incomes increased from Cedis 601 to Cedis 2,805,642. The 288 very poor households were identified and their incomes

increased from Cedis 601 to Cedis 157,904. The percentage of very poor households that were taken out of poverty because of the health intervention was 4.82%. However, it was noticed that there were 96 female headed households that were taken out of poverty because of the health intervention.

Table 11: Poverty Measures for the Households

Households	
Incidence of Poverty (alpha=0)	
Observed Income	19.31%
Predicted Income after Health Intervention	0.78%
	(-18.53%)
<hr/>	
Depth of Poverty (alpha=1)	
Observed Income	7.97%
Predicted Income after Health Intervention	0.10%
	(-7.87%)
<hr/>	
Severity of Poverty (alpha=2)	
Observed Income	4.59%
Predicted Income after Health Intervention	0.02%
	(-4.57%)
<hr/>	
-----Poverty Line	(Cedis)
	665,300
<hr/>	

The poverty measures for the households are shown in Table 11. The incidence, depth and severity of poverty measures are calculated for the observed income and predicted income after the health intervention. The health intervention reduces the incidence of poverty by 18.53%, the depth of poverty by 7.87% and the severity of poverty by 4.57%.

Thus the results of FGT poverty measures are in conformity with the other methodology considered in this study to elicit the effects of health intervention on poverty.

Qualitative Survey Findings

The objective of the qualitative survey was to collect qualitative data on reproductive health behaviors and attitudes from several geographical and socio-economic regions of Ghana, namely, the north and south, and from the ethnic and religious groups to see how the fertility is affected by age, marital status, education, occupation, employment type, ethnicity, religion, and area of residence. In addition, the study identified the causes of poor maternal and child

health and suggestions to improve health delivery, maternal and child health. Moreover, the study identified the causes of poverty, loss of labor productivity, and how the additional time made available through improvements in reproductive health could be used to reduce poverty and increase economic growth.

The qualitative research techniques employed for the survey included individual interviews, focus group discussions (FGDs), in-depth interviews and a number of ethnographic methods, including narratives, life stories and observations. The in-depth interviews were conducted to tap into not only the individual biography and experiences of the respondents on the subject matter but also to have in-depth understanding from the point of view of policy makers and community opinion leaders. Individual views on the relationship among reproductive health, poverty and economic growth in the country is key to understanding interplay of the phenomena.

Spatially, the studies involved the northern and southern sectors of the country and spanned the three ecological zones (coastal savanna, forest and northern savanna) of the country were covered. For the southern sector, Greater Accra and Eastern regions were selected, whereas the Upper West Region represented the northern sector. Two areas, the Accra-Tema Municipality and the Wa Municipality were selected to represent the southern and northern sectors respectively. Piisi and Kambal were respectively the rural and urban communities in which the study was conducted in the northern sector. On the other hand, Oyibi and Tema were selected to respectively the rural urban areas in the southern sector.

Oyibi is a predominately rural community but with diverse socio-economic characteristics due to its proximity to the national capital, Accra, a distance of about 30 kilometers. Tema is a cosmopolitan harbour city in the Greater Accra Region. An in-depth interview each in Oyibi and Tema were conducted. The representative communities were carefully selected in the various regions to ensure that the four major ethnic groupings of Ghana were adequately represented. They are the Akan, Ga-Adangbe, Ewe and Mole-Dagbon. The individuals selected to participate in the FGDs also included women and men of diverse educational, occupational, income, religious and other socioeconomic backgrounds.

The survey was conducted between December 19 2008 and January 9, 2009. A total of eight (8) FGDs were organized, four each in southern and northern sectors of Ghana. In each sector, two FGDs were held in urban centres and two in rural settings. The participants for the in-depth interview in the northern sector comprised two expert interviews: a Senior Nurse at the Regional Health administration and an official of the National Commission for Civic Education (NCCE) for the Northern sector. Additionally, in the northern sector, four other in-

depth interviews with community members, two in each community were conducted.

A total of ten (10) in-depth interviews were done in the three regions. The interviewees were of two categories: 1) Six individuals within the communities, and 2) Four key policymakers in the health sector. The policy-makers included the directors of the Upper West Regional Health Administration and the National Commission for Civic Education (NCCE) of the Upper west Region and the Executive Director of the National Population Council.

The survey was delayed by the 2008 Ghana Presidential and Parliamentary Elections that were held on December 7 and 28, 2008 and January 2, 2009. Uncertainties surrounded some key government positions and interview with policy-makers was not possible until the results were declared on January 3, 2009.

A thematic analysis technique was employed in analyzing the data gathered from the four focus group discussions conducted. All the four focus group discussions were conducted in the rural settings. This was done to gain understanding of the different representations of the link between reproductive health, poverty and economic growth in Ghana at the group level of analysis. Focus Groups are considered as a miniature representation of the larger society. In this regard, ideas, comments and discussions at the group level may reflect the general views of the larger society. The size of the groups ranges from a minimum of six persons to a maximum of 8 persons.

The transcripts from the four focus groups were first of all verbatim transcribed. A thematic coding frame was developed after each transcript was read at different times to ensure inter-coding reliability and validity. Based on the coding frame developed, each transcript was then analyzed to reveal absence or consensus of various themes. A number of themes were expected to emerge but room was made for any unexpected themes that could emerge, which then becomes a "local surprise". The information collected from the four rural focus group discussions were triangulated with other information from the urban areas and also from expert interviews in the field to show the different versions of competing reality which then sustained a robust analysis of the data collected.

The data gathered from the in-depth interviews were also analyzed by thematic technique. The verbatim transcribed transcripts from the individual interviews were coded based on thematic coding frame. The themes for the analysis were also based on the research questions and the theories. To ensure inter-coder and intra-coder reliability and validity, each individual transcript was read and coded by two different individuals.

It was observed from the Qualitative survey that fertility was affected by background characteristics – place of residence, religion and ethnicity. Results of

the FGDs presented in Table 12 show a clear distinction between the north and the south in terms of fertility as measured by mean number of Children Ever Born (CEB). The fertility of the northern sector is almost twice that of the south which is clearly a result of the development dichotomy between the south and the north, the south being relatively more developed than the north. Furthermore, Muslims reported mean CEB which is more than two times that for Christians and Traditional Religion worshippers. This is consistent with the north-south divide as the northern half of Ghana is largely constituted by Muslims. In terms of ethnicity, the Wala, interviewed in the northern sector, reported the highest mean CEB, slightly above five. The Dagao, also in the north but included in the in the urban FGDs recorded the lowest mean CEB of less than two children. This indicates that beyond ethnicity, place of residence is a predictor of fertility in Ghana. Indeed, the results of the various Ghana Demographic and Health Surveys (GDHS) show that fertility levels are higher in the rural than urban areas.

There was a general view that the extra time saved when households do not have to take care of a sick mother and child can be invested in economic activities that can generate income and reduce poverty. The discussants, however, pointed out that saving time for economic activity is not the main economic problem facing them. It is rather lack of resources that could assist them use the time that is saved for economic activities when they have healthy mothers and children. They have time but cannot undertake economic ventures because of poverty or lack of money to invest in economic ventures. Even if they have healthy mothers and infants they will still remain poor.

Table 12 : Region, Religion, Ethnicity and Fertility

Background Characteristics	Mean CEB
Region	
North	4.1
South	2.3
Religion	
Christians	2.3
Muslims	5.2
Traditionalist	2.0
Ethnicity	
Akan	1.9
Ga/Krobo	2.7
Wala	5.3
Dagao	1.6
Others	4.8

The responses on how the additional time saved by households through healthy maternal and child health outcomes can be utilized varied among the various categories of FGDs and interviewees. As was deduced from the discussants, there is a clear distinction between what households in the South utilized and will

use the time gained for compared to their counterparts in the north. Similarly, differences were found in the responses on the use the additional time gained by households with respect to place of residence, whether rural/urban.

Among the southern discussants in the rural area, the relatively high poverty was seen as what impedes their ability to effectively utilize the time gained. Thus, they have time but are unable to put it into any productive activity due to lack of economic resources, particularly money and employable skills. The following are some of this view stated by the FGD members:

“One of the ways time saved can be used to increase economic growth is to provide women with working capital to allow them to engage in economic activities that would empower them”.

“I think I will call for a range of skills acquisition training Programme for women. This I believe would equip women with employable skills and in the process provide them with income”.

Some of the women who are able to translate the time gained into productive activity engage in trading and other household activities. Participants from rural settings in the south accentuated the presence of poverty in their communities in addition to the low education and employable skills among the women as the major barriers that limit their ability to utilize the time gained. This reasoning is captured in the responses below:

“In many cases the time saved is used to trade in consumer items or as small scale food vendors. The rest of the time saved is spent on household chores.

“...as we have said already, many women are unable to do that because of poverty and lack of money”.

“We are unable to generate any income because most of us are without any skill”.

In contrast to the North, southern urban participants were unanimous in reporting that the additional time gained is utilized in more productive activities. This can be attributed in part to the motivation of urban women with their higher socio-economic status that make them able to engage in economic activities. The socio-economic characteristics of the urban southern urban participants reveal that they are all employed. This has significant influence on how the time gained is utilized as their discussions indicated:

They [the women] go back to their work [after they give birth to children] and some people also engage in extra jobs.

They [the women] are all doing that [engaging in economic activities] and take advantage of every little opportunity to try and sell something in their houses.

Most of the women here also have stores in front of their houses selling all kinds of goods.

Yes, in my case, when I gave birth it was operation and my mother had to come and stay with me to care for the children. I am also due to start work but I haven't started. If I have to pay someone to do all that for me it would have cost me a lot of money and if I am very well I will do all that for myself and will not pay anyone and would also have started work.

Those who have their own work start working as soon as they are well so they start earning their income shortly after giving birth.

In the northern sector, among rural participants, the additional time gained through the improved maternal and child health is used mainly for income generating work activities in the informal sector. On the other hand, the discussants said that the utilization of time gained by good reproductive health outcomes depends on the age of the woman. As one discussant said:

Yes, it happens only when the woman is still in her youthful age. They help in some income generating activities, for example, quarrying, but this is very limited because of the children.

This observation shows that the discussants implied that when women have children, large numbers, their engagement in economic activities can be hampered by their maternal roles that they have to play. Other income-generating activities reported included fetch firewood for sale, selling food and trading. With their low levels of education and lack of diverse economic activities rural women in the north engage in these economic activities and indicate that time save from taking care of sick mothers and children can be used for these activities.

The FGDs in the northern urban centres also indicated a number of economic activities that women engage in when time gained is utilized. Three different types of economic activities were cited:

*Yes, women used to save time to burn charcoal and to sell firewood
We go down south to engage in kayayei to earn income.
We help each other in shea butter extraction.*

Charcoal burning is a major economic activity in the northern savanna ecological zone of Ghana. So also is cultivation of sheanut. Processing of the nuts into shea butter has been a prerogative of women. *Kayayei* are female head porters. They are mostly found in large urban centres. Most of them migrate from the north to Accra and Kumasi where demand for them is high.

The main policy statement was that there is the need to have a paradigm shift in reproductive health policy and delivery to improve access to them and their utilization. It was observed that emphasis has been laid on societal benefits of

family planning and reproductive health service. The implication is that, if households recognize and appreciate the benefits of reproduction health services to them, they will readily take advantage of the services being provided.

Furthermore, if the time saved is to be invested it must be accompanied by empowerment of women to use the time saved for income generating activities. Education of the girl-child is critical in this regard. But education is long-term. Governments must also be patient to see the long-term benefits of the reproductive health services and how they promote economic growth. Socio-cultural factors that contribute to poor maternal and child health must be addressed at all levels. Communities and males in particular, must be part of the policies and programmes that aim at improving economic growth through reproductive health or investing the time saved for economic activities at the household level. They should be involved in the policy adoption, implementation and evaluation. The community leaders should be made to see that the communities own the programmes that aim achieving economic growth through improved reproductive health delivery, use and outcomes.

There was consensus among all participants irrespective of geographical location that poverty is the major cause of the poor maternal and child health in Ghana. This was common in all the discussions as is conveyed by the following responses from some of the participants in the FGDs:

“My view point on this issue is that poverty is largely responsible for poor maternal and child health in Ghana”.

“Poverty, because many of the people have low or lower incomes and so they cannot take care of their children, etc”.

“Poverty is another factor that prohibits rural women and their children from assessing maternal and child health care services because of their inability to pay for the services”.

Other related factors such as education, attitude of health care service providers, (i.e. client-provider interactions) and access to health care facilities, were mentioned as factors that also account for the current maternal and child health status in Ghana. Education is multifaceted in explaining poor maternal and child health in Ghana. First, it impact on the utilization of maternal and child health services among the populace. This was pointed out by a participant captured in the statement presented below:

“Lack of education – with low education, people don’t see the importance of attending antenatal or postnatal care which has direct impact or influence on maternal and child health”.

Education also has the potential to guarantee employment and income security which influence accessibility to maternal and child health care services. With low

education and its related employment and income, affordability and accessibility to relevant maternal and child health care services is significantly inhibited.

The attitude of health care service providers toward clients has direct impact on service utilization. Client-provider interaction dominated participants' views on the causes of poor maternal and child health in Ghana. This phenomenon is not peculiar to any geographical area or type of place of residence (i.e. rural or urban). Most of the issues border on personal attitude rather than performance of duties as captured in the following quotes:

“Mothers and children who attend clinics and hospitals most often are not treated well by the nurses. They are either insulted or blamed for their predicament especially the illiterate rural women. When this happens they shy away from the hospitals and place their fate in their own hands”.

“Despite the introduction of the National Health Insurance Scheme (NHIS), mothers still shy away from health centres due to the humiliation they are often subjected to by health personnel such as midwives, nurses and other para- medical staff”.

Another prominent issue pointed out by discussants as the cause of the current condition of the maternal and child health in Ghana was access to health care facilities. Accessibility of health care facilities relates to both affordability and proximity. The differential distribution of health care facilities across the country especially between the north and south divide as well as the rural – urban places of residence, is key to understanding maternal and child health in the country.

The relatively long distance travelled to health facilities and the cost of service limit the utilization of health care services especially maternal and child health services. Distance and cost from the point of view of the discussants are the causes of the poor maternal and child health in the country captured in the following responses from the FGD participants:

“Lack of health facility is another factor responsible for this. Unavailability of health care facilities has affect maternal and child health”.

“Most of the health facilities are located so far away that there is difficulty accessing these facilities. The illiterate rural women are the worse hit in terms of ability to move to health centres”.

Labor force participation does not only depend on the skills endowment of the individual but also the availability of the individual to participate in labor force activities. Unhealthy status of an individual or household member prohibits the participation of the individual household member and other household members who take care of him/her in undertaking economically productive activity. There is loss of man working hours and a resultant loss of income leading to a strain on household resources. This relationship between poor maternal and child health

and loss of labor for productivity was observed by the discussants as captured in the following responses from some of the discussants:

The time that people use to care for such people (sick mothers and children) prevents them from working resulting in loss of income.

Of course it takes away time which in turn affects the amount of income generated because you spend most part of your time caring for a sick mother and or a child.

Sometimes it can be very distressing because a lot of resources is taken away by the incidence of illness.

According to the discussants poor maternal and child health has significant influence on the ability of the household to generate income through its participation in any active economic activity. Not only does poor maternal and child health directly takes away productive time and resources but also has psychological stress on household members. This is more pronounced when it involves maternal and child health. This is supported by the following statements from the in-depth discussions:

“A sick child would mean either the father or the mother or both would not go to the farm or work. Even if you force and go what effective work will you do when you know that you have a sick child”.

“Yes if during the pregnancy the mother does not protect herself well she will give birth and fall sick together with the baby and thus spend all her time on health care without engaging in productive work. You have to travel from one village to another, visiting herbalists and other health centres looking for cure”.

“Again, imagine if a mother is to send a malnourished child to a rehabilitation centre for say up to three months, productivity would be negatively affected”.

“Even if I was employed my sitting at home would have negatively affected my employers’ output. Good health is therefore very necessary for productivity”.

There is also the effect of poor maternal and child health on employment and availability of labour for economic productivity. In the words of participants:

“This does limit them not only from working, losing income, but also becomes temporary unemployed since they cannot engage in any economic activity”.

“Those who are currently not working but economically active cannot go and look for work or become unavailable for employment”.

“The husband and other relatives cannot also go to work especially if she is admitted to the hospital”.

“Yes , whenever I am well together with my children I am able to make a lot of sales compared to when I am sick or when anyone of them is sick”.

All participants in the study acknowledged that the current status of maternal and child health in the country could be improved appreciably if certain measures were taken, both at the community and the national level in terms of interventions. One of the major interventions recommended was the provision and expansion of health facilities especially in rural remote areas of the country. As the following quotations show, there was unanimity among the participants that improvements could be achieved in maternal and child health in Ghana:

“Hard to reach areas in the country should be provided with health post or the Community-Based Health Planning Services (CHIPS) zone. This is because often time it is the distance that limits the utilisation of maternal and child health services.

“Existing health facilities also need expansion since mothers spend almost all day in the facility due to congestion in the facilities.”

“There is also the need to revamp some of the existing facilities or resources for effective and efficient delivery and use of health services to mothers in the country.

Education and economic empowerment of community members was indicated as important for improving of maternal and child health in Ghana. The rationale is that education is a major determinant of health care service utilisation. Therefore, education, especially for females, as pointed out by the participants, is central in enhancing reproductive health among women. They indicated, for example that:

“Educate the community members on the importance of antenatal and postnatal care.”

So, what is very necessary now is for the health workers to try to discourage the use of traditional medicine as a better alternative to modern medicine and medical services.”

Economic empowerment of women increases their ability to access the health care services for themselves and their children. Financial independence through economic empowerment has the potential to remove the obstacle that limits the ability of women to access reproductive health care services. This is evidently captured in the response of a participant that:

“Women should be empowered economically to remove financial barriers that confront them.”

These views were shared by the policy makers too.

This is tied into the issue of cost of service delivery identified as a barrier to the utilization of reproductive health care services which influence maternal and child health. Pregnant women have since July 2008 enjoyed free delivery services in public health facilities throughout Ghana. Other maternal and child health

services, however, attract some fees. Some participants especially those in rural settings called for a downward review in the fees of maternal and child health care services. Some of the interviewee articulated their views as follows:

“Maternal and child care services should be absolutely free without a quota attached to the number of times one attend hospital.”

“The fees and charges at the hospital should be reduced considerably to allow many women to be able to purchase the services.”

“To move maternal and child health forward there is the need to maintain and improve on the National Health Insurance Scheme.”

The role of service providers in reproductive health service delivery also came up for scrutiny. Most of the participants argued that the nature of interaction that would exist between service providers and their clients would determine the attitude of clients toward service utilization. This view is articulated in the following observations:

“Service delivery should be improved since clients-provider interaction goes a long way to influence health care utilisation which also affects the health of the population.”

There were others who were of the opinion that the negative client-provider interactions were isolated cases based often on people’s perceptions. As some of them put it:

“It is very common to hear things like:

*When I went to hospital or clinic, the nurse(s) screamed at me. Or
When I went to deliver, the nurse beat me when she asked me to
push and I couldn’t.”*

In the words of a participant, more accommodating service providers with positive attitude toward service delivery and client interaction would help improve maternal and child health care provision in the country.

“Nurses and other health workers should be more welcoming and refrain from intimidating and insulting mothers who attend health care centres”.

The policy makers noted that the health of an individual translates into a healthy nation which promotes economic growth and development. With healthy mothers and children, time and economic resources allocated for the treatment and management of maternal and child related illnesses, can be used for economic productivity. Improved health for the mother and child has the potential to generate more income for the household. As stated by the Executive Director of the National Population Council:

This can generate more or additional income which will help improve the living condition of the household. Good health also has the potential to

increase the capacity of the labor force for economic productivity. Less time and money spent at the health facilities will mean saving time and money. This can be channeled into economic productivities activities.

These observations on the linkages among reproductive health, economic growth and poverty reduction suggest that improvement in maternal and child health in Ghana has multiple effects on the economy. The financial allocation by government for the health sector and the strain on economic resources could be reduced when there is relatively less demand on the health infrastructure and services as households have healthier mothers and children. As pointed out by the Upper West Regional Director of Health

Limited investment made in the health sector would be adequate since fewer numbers of clients would be using the health facilities the results will be better health. The better health will translate into economic growth.

It was also stated that time gained from ensuring that healthy mothers and children are healthy can be put into productive economic activities if women are empowered economically. This, many participants recommended can be achieved through the provision of economic capital and skill training for women. This would give them opportunity and economic empowerment to be more productive and earn more income to cater for their wellbeing. According to some of the women interviewed:

“One of the ways time saved can be used to increase economic growth is to provide women with working capital to allow them to engage in economic activities that would empower them.”

“I think I will call for a range of skills acquisition training programmes for women. This I believe would equip women with employable skills and in the process provide them with income”.

The various discussions in the FGDs indicate that there is a link between reproductive health and economic growth and poverty. There was a general view that the extra time saved when households do not have to take care of a sick mother and child can be invested in economic activities that can generate income and reduce poverty. The discussants, however, pointed out that saving time for economic activity is not the main economic problem facing them. It is rather lack of resources that can help them use the time that is saved for economic activities. They have time but cannot undertake economic ventures because of poverty or lack of money. Even if they have healthy mothers and infants they will still remain poor.

The in-depth interviews revealed that there is the need to have a paradigm shift in Reproductive Health Services to improve their rate of use. It was observed that emphasis has been on societal benefits from Family Planning and Reproductive Health Services. If households see the benefits of Reproduction Health Services

to them they will readily take advantage of the services being provided. Furthermore, if the time saved is to be invested, it must be accompanied by empowerment of women to use the time saved for income generating activities. Education of girl-child is critical in this regard. But education is long-term. Governments must also be patient to see the long-term benefits of the Reproductive Health Services and how they promote economic growth. Socio-cultural factors that contribute to poor maternal and child health must be addressed at all levels. Communities and males in particular must be part of the policies and programs that aim at improving economic growth through reproductive health services or investing the time saved for economic activities at the household level.

Conclusions and Policy Implications

The study uses the Ghana Living Standards Survey data for 1998-1999 and control function approach to examine the significant determinants of fertility and incomes of households by considering the household level data. Moreover, the study examines the impact of five categories of households, e.g. Agricultural Households, Public sector employees, Private sector employees, Non-farm self employed and Non-working on the fertility when they are incorporated as control variables in the regression equations. In addition, the study examines the relationship among fertility, income and poverty of households.

In the fertility-consumption expenditure model, when consumption expenditure per adult is treated as endogenous, the significant determinants of fertility are the logarithmic of consumption expenditure per adult, the quadratic functions in age of the women and her husband, mother's and father's schooling, the number of hours spent by the women in taking care of children, contraceptive use, fitted residuals for the logarithm of consumption expenditure per adult, and interaction term between the fitted residuals and the logarithm of consumption expenditure per adult. On the other hand, when occupations are included as controls in the equations, there is no change in the signs and significance of the variables that were examined without the occupations as controls. However, it is observed that the effects of agricultural households and non-farm self employed on fertility are negative and statistically significant.

In the income-fertility model, when fertility is treated as endogenous, the significant determinants of incomes of households are fertility, the quadratic functions in age of the women and her husband, mother's and father's schooling, fitted residuals for the fertility, and interaction term between the fitted residuals and the fertility. The Observed-Predicted Income method and FGT poverty measures method indicate that the health intervention being considered in the study is poverty alleviating.

Since the number of hours spent by the women in taking care of children is a significant determinant of fertility in the fertility-consumption expenditure model,

Ministry of Employment and Social Welfare, Government of Ghana should increase the period of maternity leave from three months to six months so that women can take very good care of the children and their life expectancy increases. The use of contraceptive methods is also a positively related significant determinant of fertility in the fertility-consumption expenditure model, which shows that the contraceptive methods are not properly used. The Ministry of Health, Government of Ghana should educate the public about the proper use of contraceptive methods through media. So far as the effects of occupations on fertility are concerned, it is advisable that the agricultural households and non-farm self employed should be targeted for health intervention in Ghana.

It was observed from the Qualitative survey that fertility was affected by background characteristics – place of residence, religion and ethnicity. There was a general view that the extra time saved when households do not have to take care of a sick mother and child can be invested in economic activities that can generate income and reduce poverty. However, differences were found in the responses on the use the additional time gained by households with respect to place of residence, whether rural/urban. The main policy statement was that there is the need to have a paradigm shift in reproductive health policy and delivery to improve access to them and their utilization. Socio-cultural factors that contribute to poor maternal and child health must be addressed at all levels. There was consensus among all participants irrespective of geographical location that poverty is the major cause of the poor maternal and child health in Ghana. The attitude of health care service providers toward clients has direct impact on service utilization. Education and economic empowerment of community members was indicated as important for improving of maternal and child health in Ghana. The National Development Planning Commission, Government of Ghana should implement poverty alleviating programmes to improve maternal and child health in Ghana. The Ministry of Health, Government of Ghana should provide training to the staff of health care service providers to improve their attitude towards clients.

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Appendix 1: Descriptive Statistics of Variables

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Hours fetching water	5997	.00	35.00	.8311	2.3093
Income (Cedis)	5998	7665.00	44073696.78	2567993.3028069	6679
Hours spent by mother in taking care of children	5997	.00	321.01	19.1677	33.3031
Age of Father (Years)	5997	15.00	99.00	46.8296	15.5665
Fathers education level (Years)	5992	.00	15.00	3.1642	5.3216
Mothers education level (Years)	5985	.00	15.00	.7983	2.4017
Total number of children born alive	5997	.00	15.00	3.1664	2.6757
Rental income (Cedis)	5997	.00	8905819.99	43483.406189419	2419
Age of mother (Years)	5997	15.00	97.00	43.6435	15.3193
Contraceptive method used Dummy	5997	.00	1.00	.1362	.3431
Agricultural Households Dummy	5998	.00	1.00	.4925	.5000
Non-farm Self-Employed Dummy	5998	.00	1.00	.2563	.4366
Non-working Dummy	5998	.00	1.00	7.869E-02	.2693
Private Households Dummy	5998	.00	1.00	7.919E-02	.2701
Public Households Dummy	5998	.00	1.00	9.320E-02	.2907
Age of Mother	5997	.23	9.41	2.1394	1.5007

Squared (x 10²)
 Age of Mother 5997 .23 9.80 2.4353 1.6111
 Squared (x10²)
 Valid N 5979
 (listwise)

Appendix 2: Tables for Fertility and Income of Households

Table 2: Determinants of the Number of Children Alive for Women age 15 years and above, OLS.

regress nchild ltxepad agey agey22 fedu agem1 agem22 medu cchs conu

OLS Estimates for the Structural Equation

Source	SS	df	MS	Number of obs =
				5970
Model	10028.5489	9	1114.28322	F(9, 5960) = 202.31
				Prob > F =
				0.0000
Residual	32826.6117	5960	5.50782075	R-squared =
				0.2340
				Adj R-squared =
				0.2329
Total	42855.1606	5969	7.17962148	Root MSE =
				2.3469

nchild	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]
ltxepad	-.4997109	.0435556	-11.47	0.000	-.5850956 -.4143262
agey	.1948562	.0359958	5.41	0.000	.1242913 .2654211
agey22	-1.346556	.3869018	-3.48	0.001	-2.105024 -.5880883
fedu	-.027058	.0066238	-4.08	0.000	-.0400431 -.014073
agem1	.1401714	.0342617	4.09	0.000	.0730061 .2073367
agem22	-1.931686	.3912278	-4.94	0.000	-2.698634 -1.164738
medu	-.0425133	.0143554	-2.96	0.003	-.070655 -.0143716
cchs	.016698	.0009246	18.06	0.000	.0148855 .0185105
conu	.7962101	.0903157	8.82	0.000	.6191586 .9732615
_cons	2.134613	.6931822	3.08	0.002	.7757246 3.493501

Table 3: Determinants of the Logarithmic of Consumption Expenditure per Adult regress ltxepad rentin agey agey22 fedu agem1 agem22 medu cchs conu

OLS Estimates of the Reduced Form Equation

Source	SS	df	MS	Number of obs =			
				5970			
Model	424.21666	9	47.1351845	F(9, 5960) = 96.91			
Residual	2898.68894	5960	.486357205	Prob > F =			
				R-squared =			
				Adj R-squared =			
Total	3322.9056	5969	.556693852	Root MSE = .69739			
ltxepad	Coef.	Std. Err.	t	P>t	[95%	Conf.	
Interval]							
rentin	1.48e-07	4.79e-08	3.08	0.002	5.37e-08	2.42e-07	
agey	.0020177	.0106964	0.19	0.850	-.0189511		
agey22	-.0964118	.1149678	-0.84	0.402	-.3217902		
fedu	.0282268	.0019342	14.59	0.000	.024435	.0320186	
agem1	-.0124876	.0101799	-1.23	0.220	-.0324438		
agem22	.1246079	.1162456	1.07	0.284	-.1032755		
medu	.0325584	.0042451	7.67	0.000	.0242365		
cchs	-.0002732	.0002748	-0.99	0.320	-.0008119		
conu	.0430831	.0268331	1.61	0.108	-.0095194		
_cons	14.5123	.0845189	171.70	0.000	14.34661	14.67799	

Table 4: Determinants of the Number of Children Alive for Women age 15 years and above, IV2SLS

regress nchild agey agey22 fedu agem1 agem22 medu cchs conu v vc

Instrumental variables (2SLS) regression

Source	SS	df	MS	Number of obs = 5970
Model	10139.8062	11	921.800562	F(11, 5958) = 167.87
Residual	32715.3545	5958	5.49099605	Prob > F = 0.0000
				R-squared = 0.2366
				Adj R-squared = 0.2352
Total	42855.1606	5969	7.17962148	Root MSE =
	2.3433			

nchild	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
ltexpad	3.650211	1.09087	3.35	0.001	1.511712	5.788711
agey	.1853156	.0360121	5.15	0.000	.1147189	.2559123
agey22	-.950936	.3996197	-2.38	0.017	-1.734335	-.1675367
fedu	-.1448819	.0314347	-4.61	0.000	-.2065053	-.0832584
agem1	.1935338	.036834	5.25	0.000	.1213259	.2657417
agem22	-2.457652	.4134199	-5.94	0.000	-3.268105	-1.647199
medu	-.1774561	.0382102	-4.64	0.000	-.252362	-.1025501
cchs	.0177239	.0009636	18.39	0.000	.0158349	.0196129
conu	.6064834	.1020843	5.94	0.000	.4063612	.8066055
v	-2.760329	1.241934	-2.22	0.026	-5.19497	-.3256887
vc	-.0988605	.0415155	-2.38	0.017	-.180246	-.017475
_cons	-58.04597	15.83502	-3.67	0.000	-89.08835	-27.0036

Table 5: Determinants of the Number of Children Alive for Women age 15 years and above with Occupations as controls included, OLS.

regress nchild ltxepad agey agey22 fedu agem1 agem22 medu cchs conu agrhou nfarhou nowhou prhou pubhou
 OLS Estimates for the Structural Equation

Source	SS	df	MS	Number of obs		
= 5970						
Model	10196.7145	13	784.362658	F(13, 5956)	=	143.05
Residual	32658.4461	5956	5.48328511	Prob > F	=	0.0000
				R-squared	=	0.2379
				Adj R-squared	=	0.2363
Total	42855.1606	5969	7.17962148	Root MSE	=	2.3416

nchild	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
ltxepad	-.4588429	.0442941	-10.36	0.000	-.5456753	-.3720104
agey	.2125849	.0444698	4.78	0.000	.1254079	.2997618
agey22	-1.533639	.4532412	-3.38	0.001	-2.422156	-.645122
fedu	-.0245322	.0066278	-3.70	0.000	-.037525	-.0115394
agem1	.1254541	.0430326	2.92	0.004	.0410947	.2098136
agem22	-1.755753	.4635739	-3.79	0.000	-2.664526	-.8469803
medu	-.0400451	.0143343	-2.79	0.005	-.0681455	-.0119447
cchs	.016691	.0009225	18.09	0.000	.0148825	.0184995
conu	.7773205	.0901693	8.62	0.000	.600556	.9540849
agrhou	-.3871202	.1174474	-3.30	0.001	-.6173597	-.1568807
nfarhou	-.185795	.1236246	-1.50	0.133	-.4281439	.056554
nowhou	(dropped)					
prhou	-.1397244	.1528332	-0.91	0.361	-.4393329	.159884
pubhou	.1508244	.1468825	1.03	0.305	-.1371185	.4387673
_cons	1.672703	.7065814	2.37	0.018	.2875474	3.057859

Table 6: Determinants of the Logarithmic of Consumption Expenditure per Adult with Occupations as Controls included
 regress ltxepad rentin agey agey22 fedu agem1 agem22 medu cchs conu agrhou nfarhou nowhou prhou pubhou

OLS Estimates of the Reduced Form Equation

Source	SS	df	MS	Number of obs =		
5970				F(13, 5956) = 87.44		
Model	532.552158	13	40.9655506	Prob > F = 0.0000		
Residual	2790.49541	5956	.46851837	R-squared = 0.1603		
				Adj R-squared = 0.1584		
Total	3323.04757	5969	.556717636	Root MSE = .68448		

ltxepad	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
rentin	1.42e-07	4.70e-08	3.03	0.002	5.03e-08	2.35e-07
agey	.0076037	.0129986	0.58	0.559	-.0178783	.0330857
agey22	-.1659543	.1324713	-1.25	0.210	-.425646	.0937374
fedu	.0250601	.0019101	13.12	0.000	.0213156	.0288046
agem1	-.0179505	.0125767	-1.43	0.154	-.0426054	.0067044
agem22	.1934164	.1354839	1.43	0.153	-.0721811	.4590138
medu	.0294474	.0041728	7.06	0.000	.0212672	.0376276
cchs	-.0002733	.0002697	-1.01	0.311	-.0008021	.0002554
conu	.0538217	.0263489	2.04	0.041	.0021683	.105475
agrhou	.2804655	.0341397	8.22	0.000	.2135394	.3473916
nfarhou	.0498686	.0361328	1.38	0.168	-.0209648	.1207021
nowhou	(dropped)					
prhou	-.07117	.044668	-1.59	0.111	-.1587356	.0163955
pubhou	.0059343	.0429354	0.14	0.890	-.0782346	.0901031
_cons	14.37678	.0894471	160.73	0.000	14.20143	14.55213

Table 7: Determinants of the Number of Children Alive for Women age 15 years and above with Occupations as Controls included, IV2SLS.

regress nchild agey agey22 fedu agem1 agem22 medu cchs conu agrhou
nfarhou nowhou prhou pubhou v1 v1c

Instrumental variables (2SLS) regression

Source	SS	df	MS	Number of obs = 5970		
Model	10316.8341	15	687.78894	F(15, 5954) = 125.85		
Residual	32538.3265	5954	5.46495239	Prob > F = 0.0000		
Total	42855.1606	5969	7.17962148	R-squared = 0.2407		
				Adj R-squared = 0.2388		
				Root MSE = 2.3377		

nchild	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
ltexpad	3.798842	1.127618	3.37	0.001	1.588301	6.009383
agey	.1784546	.0452333	3.95	0.000	.0897809	.2671283
agey22	-.825495	.4887589	-1.69	0.091	-1.78364	.1326497
fedu	-.1317657	.0289608	-4.55	0.000	-.1885394	-.074992
agem1	.2040674	.0475286	4.29	0.000	.1108942	.2972405
agem22	-2.594897	.5116102	-5.07	0.000	-3.597838	-1.591955
medu	-.1651285	.0360662	-4.58	0.000	-.2358312	-.0944257
cchs	.0177548	.0009644	18.41	0.000	.0158641	.0196454
conu	.5353485	.1090266	4.91	0.000	.3216169	.7490801
agrhou	-1.758677	.4144677	-4.24	0.000	-2.571184	-.9461705
nfarhou	-.560741	.184324	-3.04	0.002	-.9220827	-.1993992
nowhou	-.1641836	.1732706	-0.95	0.343	-.5038569	.1754897
prhou (dropped)						
pubhou	-.0442749	.1710281	-0.26	0.796	-.379552	.2910022
v1	-2.606293	1.282003	-2.03	0.042	-5.119484	-.093101
v1c	-.117195	.042556	-2.75	0.006	-.2006201	-.0337699
_cons	-59.31826	16.13446	-3.68	0.000	-90.94765	-27.68886

Table 8: Determinants of the Logarithm of Incomes of Households, OLS.
 regress lnincome nchild agey agey22 fedu agem1agem22 medu

OLS Estimates for the Structural Equation

Source	SS	df	MS	Number of obs = 5980		
Model	469.889294	7	67.127042	F(7, 5972)	= 66.11	
Residual	6064.32896	5972	1.01546031	Prob > F	= 0.0000	
				R-squared	= 0.0719	
				Adj R-squared	= 0.0708	
Total	6534.21825	5979	1.09286139	Root MSE	= 1.0077	

lincome	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
nchild	.0677159	.005313	12.75	0.000	.0573005	.0781314
agey	.0459202	.0191353	2.40	0.016	.0084081	.0834323
agey22	-.5084363	.1948417	-2.61	0.009	-.8903964	-.1264763
fedu	.0192067	.0027955	6.87	0.000	.0137265	.0246869
agem1	-.0090299	.0184838	-0.49	0.625	-.0452648	.027205
agem22	.1064052	.199271	0.53	0.593	-.284238	.4970485
medu	.0297049	.006138	4.84	0.000	.0176722	.0417376
_cons	13.22085	.1265169	104.500	0.000	12.97284	13.46887

Table 9: Determinants of the Number of Children Alive for Women age 15 years and above

regress nchild hfwater agey agey22 fedu agem1agem22 medu						
OLS Estimates of the Reduced Form Equation						
Source	SS	df	MS		Number of obs	
=	5979				F(7, 5971)	= 168.73
Model	7079.64937	7	1011.37848		Prob > F	= 0.0000
Residual	35791.0996	5971	5.99415501		R-squared	= 0.1651
					Adj R-squared	= 0.1642
Total	42870.749	5978	7.17142003		Root MSE	= 2.4483
nchild	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
hfwater	-.0759507	.0138517	-5.48	0.000	-.1031051	-.0487963
agey	.249054	.0463881	5.37	0.000	.1581166	.3399914
agey22	-1.980016	.4727233	-4.19	0.000	-2.906725	-1.053308
fedu	-.0395247	.006774	-5.83	0.000	-.0528042	-.0262452
agem1	.0988935	.0448917	2.20	0.028	.0108896	.1868973
agem22	-1.433464	.483804	-2.96	0.003	-2.381895	-.4850334
medu	-.0660875	.0148886	-4.44	0.000	-.0952745	-.0369006
_cons	-4.681068	.3033073	-15.43	0.000	-5.27566	-4.086476

Table 10: Determinants of the Logarithm of Incomes of Households, IV2SLS.
 regress income agey agey22 fedu agem1 agem22 medu z znc
 Instrumental variables (2SLS) regression

Source	SS	df	MS	Number of obs = 5979		
Model	608.980357	9	67.6644841	F(9, 5969)	= 68.16	
Residual	5925.17278	5969	.992657528	Prob > F	= 0.0000	
Total	6534.15314	5978	1.09303331	R-squared	= 0.0932	
				Adj R-squared	= 0.0918	
				Root MSE	= .99632	

lincome	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
nchild	.5929855	.0742185	7.99	0.000	.4474904	.7384807
agey	-.0888531	.0267406	-3.32	0.001	-.1412745	-.0364318
agey22	.5953233	.2438995	2.44	0.015	.117192	1.073455
fedu	.0384406	.0040033	9.60	0.000	.0305928	.0462885
agem1	-.049984	.0196755	-2.54	0.011	-.0885551	-.011413
agem22	.7235938	.2238737	3.23	0.001	.2847204	1.162467
medu	.0625428	.0077905	8.03	0.000	.0472707	.077815
z	-.4511144	.0748857	-6.02	0.000	-.5979173	-.3043114
znc	-.0146214	.0015482	-9.44	0.000	-.0176563	-.0115864
_cons	15.64747	.3836229	40.79	0.000	14.89543	16.39951

