# Fertility in Saudi Arabia: levels and determinants

By

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Abstract:

The purpose of this study is to present the fertility levels in Saudi Arabia and determine the most important determinants of fertility behavior of Saudi women. It utilizes a sub-sample of a demographic survey that covers all geographic areas of the Country, which was conducted by Ministry of Planning in 1999. It contains information about nearly 10000 families, from which 6472 are Saudi families.

Using some statistical techniques such as one-way analysis of variance and correlation coefficients, important relationships between fertility and several demographic, socio-economic, and spatial variables, were explored. These include some wife and husband's characteristics, and some family's attributes.

In an attempt to understand fertility behavior of Saudi women, a regression analysis was utilized. It is found that age at marriage and woman's education are apparently the most important determinants of fertility behavior. It is also found that some variables, specifically "children death", "son preference", and the geographic region, are significant determinants of fertility. Opposite to the expectation, the analysis shows that living within an extended family setting is associated with low fertility levels. Also surprisingly, woman's participation in the labor force and husband's educational attainment were not among the significant fertility determinants in Saudi Arabia. Finally, the study was able to present few suggestions and recommendations.

## 1. Introduction

Fertility is an important component of population change. It has gained more and more attention since the rapid decline in mortality in most developing countries during the second half of the last century has not been followed (or accompanied) by similar reduction in fertility rates. Several efforts have been put forward in order to understand the determinants of fertility and attempt to formulate appropriate theories and models that explain reproduction behaviors such as Davis and Blake (1956); Becker (1960); Bongaarts (1978, 1983); Easterlin (1975); Caldwell (1976; 1982). Most of these theories and frameworks attempt to explain fertility based on economic, social, or anthropological grounds. Since data has been increasingly available to researchers in most developing countries, many of these theoretical frameworks were tested in different part of the World. Unfortunately, the different methods of sampling and data collection used in each study have undoubted affected the accuracy and consistency of research findings, leading to some contradictions. In addition, studies used different sets of explanatory variables and scales of measurements.

Few studies, however, has been conducted in Saudi Arabia and neighboring countries. Two of these studies were done in Riyadh have shown some inconsistency in their findings (Al-Otaiby, 1994; Al-Obaidi, 1995). Some other studies have been done as part of the Child Health Survey in most Arab Gulf States such as Al-Mazrou et. al. (1993) and Salman et al. (1995). .

Despite these efforts and other important empirical studies, contradictions have been apparent in some results and conclusions in different parts of the world. For instance, one study that was conducted in Riyadh in 1995 has found positive relationship between fertility and husband's education (Al-Obaidi, 1995), indicating that an increase in husband's education leads to a rise in fertility. These results are not consistent with findings of another study that was conducted in the same city (al-Otaiby, 1994). In Dammam in the Eastern Province in Saudi Arabia, Al-Isawi (1992) concluded that fertility tend to be higher for families with better economic conditions, while Abu-Subha (1989) states that there was no clear and stable relationship between fertility and income in Jordan. Mueller and Short (1987) emphasize the lack of consensus among research findings regarding income-fertility relationship. Another instance of contradiction is what Al-Obaidi (1995) finds about the relationship between fertility and the type of family (nuclear-extended families). His analysis shows that extended family promotes higher fertility, while findings of other studies indicate the opposite (e.g. Cain , 1982; Ohadike, 1994).

Fertility studies in Saudi Arabia are limited in number and geographic scope. For example, most of them are concentrated in the main cities, especially the capital, Riyadh. This is probably due to the lack of fertility data. Now, some data has become more available from demographic national surveys. Therefore, it is possible to explore fertility and further our understanding of this important issue, despite the existence of some limitations in the available data, which are drawn mostly from multi-purpose surveys.

This paper focuses on the levels of fertility in Saudi Arabia and attempt to determine the most important factors affecting reproduction behavior. Specifically, objectives of this research are: a) to present the levels of fertility and contraceptive

use in Saudi Arabia; and b) to determine the most important variables that explain the fertility behavior.

## 2. Hypotheses

Several hypotheses are formulated and tested in this study. These are as follows:

1 – Fertility behavior of married Saudi woman is affected significantly by age at first marriage.

2 –Fertility is significantly influenced by woman's educational attainment.

3 – Husband's education affects fertility behavior of Saudi woman.

4 – Child deaths significantly affect fertility behavior.

5 – Fertility behavior is significantly affected by the use of contraceptives; leading to reduction of children-ever- born.

6 – Woman's participation in the labor force affects fertility behaviors.

7 – Fertility is significantly affected by place of residence (rural – urban residence).

8 – Fertility behaviors vary geographically among major areas or regions in Saudi Arabia.

9 – Fertility behavior is significantly influenced by the type of family (nuclear or extended).

10 – Fertility behavior is influenced by son preference (i.e. proportion of male children).

11 – Fertility behavior is significantly influenced by family's level of living.

## 3. Methodology

### 3.1. Data

This study utilizes a sample of the National Demographic Survey that was conducted in 1999 by the Ministry of Planning. The survey covered all the thirteen administrative areas in the country. About 23000 families were interviewed around the country. Despite its nature as a multi-purpose survey, the questionnaire included several important fertility questions such as 'children ever born', 'children died', 'date of marriage', 'work status', and use of contraceptives. From all cases contained in this survey, about half of them were extracted (or selected) randomly for the purpose of this study. The total size of the sub-sample becomes nearly 10000 families, from which 6472 are Saudi families. Due to the nature of this study, only married Saudi women in their reproductive ages (15-49) are included in the analysis. Based on this criterion, the size of the sample of Saudi women is reduced to about 5388.

### 3.2. Method of Analysis

In order to accomplish the objectives of this paper and test research hypotheses, some statistical methods are used in this study such as analysis of variance, Pearson Correlation coefficient, and Regression Analysis Method. Several demographic, socioeconomic, and geographic variables are used for this purpose (Table 1). Theses variables represent some personal characteristics such as age, age at first marriage, and work status, in addition to familial attributes such as type of family and homeownership. Some of them are nominal in nature and included in the regression equations as dummy variables, while others are measured in an interval scale and used as such, or classified into groups.

**Table 1**
**Variables and Their Operational Definitions**

| Variable | Operational Definitions |
|---|---|
| Age at first marriage | Years |
| Length of marriage life | Years |
| Wife's Education | 1= illiterate |
| | 2 = read and write |
| | 3 = elementary |
| | 4 = secondary |
| | 5 = secondary |
| | 6 = university or higher |
| Work status | 1 = working |
| | 2 = not working |
| Son preference | Proportion of male children of the total children-ever-born that a woman has |
| Type of residence | 1 = rural |
| | 2 = urban |
| Home ownership | 1 = own |
| | 2 = rent |
| | 3 = otherwise |
| Type of house | 1 = traditional |
| | 2 = villa |
| | 3 = apartment |
| | 4 = otherwise |
| Current use of contraceptives | 1 = yes |
| | 2 = no |
| Child deaths | Number of children died |
| Type of family | 1 = extended |
| | 2 = nuclear |
| Migration | 1 = migrant (place of birth was different from current place of residence) |
| | 2 = non-migrant |
| Family's level of living | Composite measure of many variables such as type of house, home ownership, index of crowding, availability of house maids or servants in the family etc. |

## 4. Analysis

Based on the survey data, total fertility rate (TFR) is found to be 4.53, which is much lower than it was expected. At the same time, TFR in Saudi Arabia is estimated to be 5.7 based on one source (PRB, 2001), and 6.4 by the other (Committee of Western Asia, 2000).

Despite the inconsistency and differences among data sources, it is very evident that fertility in Saudi Arabia has taken a declining trend during recent years and fertility transition is clearly under way in the country (Table 2). This pattern is apparent by age-specific fertility rates for different years (Fig. 2). One can easily notice this declining trend by comparing the levels of age-specific fertility rates in 1985 or 1986 with their levels in 1999. The latest survey shows that there has been a delay in reproduction to relatively older ages (Fig. 1). The size of the shift in the age-specific fertility curve to middle ages seems unusual, and thus explanation is needed.

While it might be true that there has been some delay of both marriage and reproduction, it is difficult to accept the relatively large delay shown in Fig. (1). It is noteworthy that age-specific fertility rates in 1999 were depicted twice in Fig. (1). One is based on the tabulated results of the aforementioned survey and the other was computed using the raw data based on the sub-sample that was obtained by the researcher (i.e., the curve labeled 1999a). Even though, the relatively huge number of women in their early reproductive ages might contribute to the reduction of TFR.

**Figure 1  Patterns of Age-specific Fertility rates in Saudi Arabia (1987-1999)**
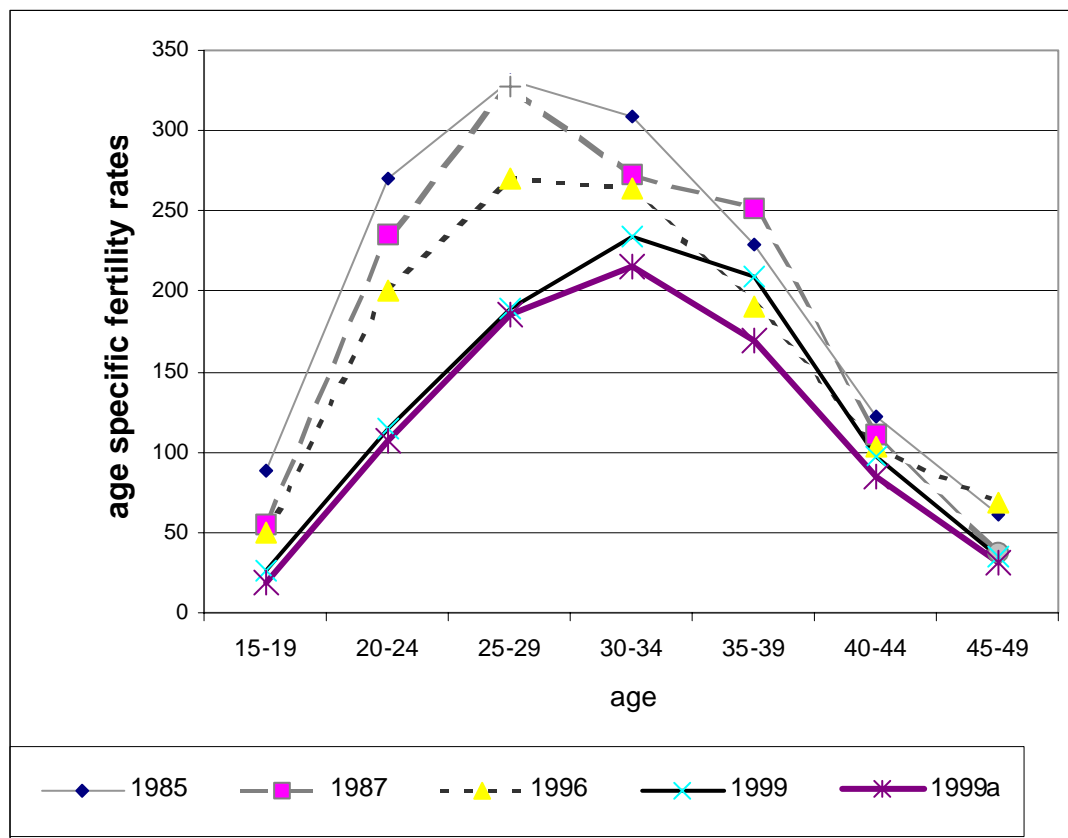


## 4.1: Levels of fertility by spatial, demographic, and socio-economic characteristics

It is very useful to present fertility levels by important woman's characteristics, familial attributes, and geographic regions of the country.

First of all, the data clearly show that there is strong relationship between average number of children and age at first marriage (Table 2). As age at first marriage increases, average number of children decreases in both rural and urban areas. The correlation coefficient between fertility and age at first marriage was found to be (-0.31). Based on the results of the analysis of variance (ANOVA) shown in Table (2), the relationship between these two variables is statistically significant at 0.001.

Moreover, it is not a surprise to find out that strong relationship between fertility and duration of marriage, especially in a relatively conservative society like that of Saudi Arabia. That is, the longer the duration of marriage is, the higher the chances for parents to bear more children. Our data show that women who stay in marriage for 25 years have, an average of more than 8 children, compared to those who stay only 10 years in marriage. The results of both ANOVA and Pearson correlation coefficient emphasized this expectation (Table 2 and Appendix A).

Similarly, education is found to be strongly related to fertility. Illiterate women tend to have larger number of children than those with higher level of education. As shown in Table 2, an illiterate woman was found to have a little more than six children on average, while a woman who obtained a university degree had less than three children. At the same token, the higher the level of husband's education is, the smaller the number of children a woman has. Based on both the analysis of variance (ANOVA) and Pearson correlation coefficients, it seems that wife's education is more strongly related to fertility than husband's educational attainment. The importance of each of these two explanatory variables and their contribution in explaining fertility behavior will be examined in the next section.

Results indicate that number of children-ever-born varies on the basis of work status (i.e., whether or not a woman participates in the labor force). While a working-woman has about three children on average, a non-working mother has nearly five kids. These differences become larger when a comparison is made between rural and urban areas.

As expected, there seems to be some differences in fertility levels between the rural and urban areas. The average number of children is higher in the rural areas compared to the levels in urban areas. Specifically, the average number of children reaches 5.25 and 4.16 in these areas respectively.

Child death is also found to be strongly related to fertility among Saudi women. Those who experience death of one child or more tend to have larger number of births in both rural and urban areas. For instance, the average number of live births is about four for women who have not experienced death of any of their children, but women who lost any of their children have about 9 children on average. The correlation coefficient between child-ever-born and number of child deaths is positive and statistically significant at 0.05. This finding is largely supported by most macro and micro fertility studies in different countries.

Opposite to findings of most empirical research in developing countries, our data show no relationship between children-ever-born on one hand, and the use of contraceptives on the other. The differences in the levels of fertility between women who use contraceptives and those who do not, are statistically insignificant, regardless of whether they live in urban or rural areas. This is probably due to many reasons such as the irregular use of contraceptives, use of inefficient methods, or the use of planning methods for prolonging the periods between pregnancies, especially after having a relatively large number of children. The latter explanation is especially relevant since the data reflect the current use of contraceptives. In addition, knowing

the sensitivity of asking about family matters in general and about use of contraceptives in particular in Saudi society, it is easy to believe that there are some couples who would feel shy of admitting the use of contraceptives. It is noteworthy to note that Salman et al. (1995) found direct relationship between fertility and the use of contraceptives.

**Table 2**
**Average number of children-ever-born by demographic, social, economic, and geographic characteristics: ANOVA Results**

| Variable | Fertility level (average children-ever-born) | | |
|---|---|---|---|
| | Total Sample | Urban Areas | Rural Areas |
| Area (F-Test)# | (3.65)*** | (1.98)* | (1.64)* |
| Riyadh | 4.59 | 4.53 | 5.17 |
| Makkah | 4.66 | 4.45 | 5.27 |
| Jazan | 5.46 | 4.89 | 5.62 |
| Eastern Province | 4.60 | 4.64 | 4.13 |
| Assir | 4.87 | 4.58 | 5.02 |
| Qaseem | 4.56 | 4.41 | 4.74 |
| Hail | 5.08 | 5.04 | 5.62 |
| Madinah | 4.90 | 4.78 | 5.24 |
| Al-baha | 5.13 | 4.46 | 5.19 |
| Northern Borders | 5.24 | 5.12 | 5.95 |
| Tabouk | 4.70 | 4.55 | 5.35 |
| Najran | 5.28 | 4.58 | 5.90 |
| Al-Jouf | 5.36 | 5.28 | 5.89 |
| Age at first marriage | (259)*** | (214.21)*** | (48.19)*** |
| Less than 18 | 5.94 | 5.87 | 6.07 |
| 18-24 | 4.28 | 4.09 | 4.75 |
| 25 + | 3.21 | 3.07 | 3.65 |
| Length of Marriage | (1835.19)*** | (1355.26)*** | (496.24)*** |
| Less than 1 year | 0.93 | 0.95 | 0.87 |
| 5 – 9 | 2.89 | 2.79 | 3.20 |
| 10 – 14 | 4.63 | 4.51 | 4.88 |
| 15 – 19 | 6.27 | 6.13 | 6.59 |
| 20 – 24 | 7.66 | 7.50 | 7.93 |
| 25 + | 8.51 | 8.50 | 8.53 |
| Woman Education | (257.82)*** | (201.12)*** | (65.83)*** |
| 1- illiterate | 6.52 | 6.83 | 6.25 |
| 2 – read or write | 5.48 | 5.63 | 5.11 |
| 3 – elementary | 4.41 | 4.57 | 3.79 |
| 4 – secondary | 3.47 | 3.68 | 2.41 |
| 5 – high school | 2.64 | 2.75 | 2.04 |
| 6 – diploma | 3.27 | 3.52 | 2.13 |
| 7 – University or higher | 2.68 | 2.96 | 2.15 |
| Husband's Education | (100.05)*** | (65.08)*** | (29.87)*** |
| 1- illiterate | 6.62 | 6.75 | 6.52 |
| 2 – read or write | 5.93 | 6.15 | 5.62 |
| 3 – elementary | 5.01 | 4.96 | 5.14 |
| 4 – secondary | 4.22 | 4.18 | 4.36 |
| 5 – high school | 3.81 | 3.81 | 3.81 |
| 6 – diploma | 4.56 | 4.44 | 4.83 |
| 7 – University or higher | 3.63 | 3.63 | 3.62 |
| Family Type | (57.71)*** | (22.93)** | (57.11)*** |

| | | | |
|---|---|---|---|
| Extended | 4.39 | 4.30 | 4.54 |
| Nuclear | 5.08 | 4.82 | 5.79 |
| Work status | (157.96)*** | (112.68)*** | (32.71)*** |
| Working | 3.29 | 3.32 | 3.06 |
| Not working | 5.03 | 4.87 | 5.27 |
| Migration | (0.82) | (1.97) | (2.22) |
| Migrant | 4.77 | 4.76 | 4.78 |
| Non – migrant | 4.86 | 4.61 | 5.29 |
| Use of contraceptives | (1.09) | (0.003) | (0.19) |
| Use | 4.74 | 4.65 | 5.15 |
| Don't use | 4.86 | 4.66 | 5.27 |
| Type of House | (68.81)*** | (52.82)*** | (5.41)* |
| Traditional House | 5.32 | 5.23 | 5.37 |
| Villa | 5.03 | 5.00 | 5.16 |
| Apartment | 3.69 | 3.70 | 3.48 |
| Others | 5.18 | 5.17 | 5.19 |
| | | | |
| Place of Residence | (39.80)*** | | |
| Rural | 5.25 | | |
| Urban | 4.16 | | |
| Home ownership | (116.96)*** | (96.63)** | (5.94)* |
| Own | 5.28 | 5.24 | 5.33 |
| Rent | 3.83 | 3.81 | 4.11 |
| Others | 4.85 | 4.90 | 4.67 |
| Child Deaths | (387.66)*** | (249.25)*** | (132.42)*** |
| No deaths | 4.45 | 4.31 | 4.79 |
| One child | 7.43 | 7.51 | 7.29 |
| Two or more | 9.25 | 8.75 | 9.94 |
| Major Regions | (7.59)** | (3.62)** | (2.25) |
| Central | 4.58 | 4.51 | 4.94 |
| Southern | 5.14 | 4.63 | 5.35 |
| Northern | 5.10 | 5.01 | 5.44 |
| Eastern | 4.60 | 4.64 | 4.13 |
| Western | 4.72 | 5.52 | 5.26 |
| Family's level of living | (101.51)*** | (79.25)*** | (17.93)** |
| Low | 5.62 | 5.89 | 5.45 |
| Middle | 4.68 | 4.55 | 5.30 |
| High | 4.04 | 4.08 | 3.73 |

(*) Significant at 0.05, (**) significant at 0.01, (***) significant at 0.001

# Values in parenthesis are results of ANOVA (i.e., F-Test).

It is noteworthy that the survey data show that family planning is not wide spread in the country. Only fifth of married women in their reproductive ages reported the use of contraceptives. Other sources estimated the proportion to be a little higher, ranging between 25 and 35 percent (e.g., PRB, 2001). In any case, the use of contraceptives is relatively low compared to other developing countries.

Like most Arab societies, the Saudi society is often characterized by strong family ties. But recent social change and concomitant shits in the family structure have led to a transition from large extended families to relatively smaller nuclear families. This is strongly supported by the data at hand. About 65% of women in the sample lived in nuclear families. Furthermore, our data show that there are differences in the number of children-ever-born between women living in extend families and those living in nuclear families. The average number of children is significantly smaller for women living in extended families, compared to those living in nuclear families. This rather surprising finding can be explained on basis of the

fact that the extended family in its traditional sense has shrunk and its existence is probably limited to small rural areas. The extended families observed nowadays are rather different from the traditional extended families in economic, and social functions and attributes. The statistically classified "extended families" are comprised of various forms of families that were mostly in transitional stage. One form, for example, is a family in which newly married son is living with his parents for a short time. Another form is a family in which an aging mother or father is living with her/his son or daughter. Although, this finding support Cain's (1982) idea regarding the relationship between fertility and the type of family, it is conceptually different.

In an attempt to explore the relationship between fertility and migration, average children-ever-born was compared for migrants and non-migrant (i.e., women whom place of birth was different from their current place of residence on one hand, and those whom places of residence were the same as their places of birth). As shown in Table 2, the differences are very small and insignificant on the other. But when fertility levels of migrant and non-migrants were compared in both rural and urban areas separately, little differences were observed, but they are still insignificant. This kind of finding might be related to the definition of the migration variable, which excludes geographic movements within each administrative area.

On the other hand, some studies showed that there were a relationship between fertility and the type of housing (Al-Obaidi, 1995). Supporting such findings, our data showed that fertility levels differed among women living in different type of houses. Women living in traditional Arab houses tend to have higher levels of fertility than those living in an apartment type of housing. This has probably reflected families level of living, since those who live in these house are relatively poor compared to people living in villas.

The level of fertility seems also to be also related to homeownership. Homeowners have larger number of children than renters. This relationship is statistically significant at 0.05. But this could be related to the fact that homeowners tend to be older than renters, thus reflecting the effect of age and duration of marriage.

The data clearly show that there are spatial variations in the levels of fertility (Table 2). While levels are high in the southern and northern administrative areas, they are relatively low in Riyadh, Makkah, Madinah, Tabuk, and Qaseem. These spatial variations are related to the regional differences in the level of socio-economic development.

Since income related questions have not included in the survey, a composite measure of level of living was constructed and found to be related to fertility behavior. Women who live in families with high level of living have few children than women belong to relatively poor family.


**4.2. Some determinants of reproductive behavior**

Despite the importance of descriptive analysis in previous section, it is very important to determine the variables that explain fertility behavior in Saudi Arabia. Utilizing multivariate analysis in which all independent variables are taken into consideration, our hypotheses can be tested. The results of multiple regression analysis show that most of the independent variables have significant effect on fertility. Few regression coefficients of some variables such as rural-urban residence,

husband education, work status, and use of contraceptives, are not statistically significant. Age of woman is introduced as control variable.

In order to test the consistency of our results two regression models were estimated; one with all independent variables (Model 1), and the other with only the significant ones (Model 2).

Among the significant variables, the results show that age at first marriage is one of most important variables that explain fertility behavior. This is not surprising; especially in Islamic country that forbids any sexual activities before marriage.

A women level of education is the second most important variable. As education level increases, fertility decreases significantly. It is noteworthy that results have not changed, when education is introduced in the regression model as dummy variables (results not included here). On the other hand, husband's education has been found not to have significant effect on fertility. This is probably due to its interrelationship with wife's education. Based on regression analysis of the determinants of fertility in the city of Riyadh, Al-Obaidi (1995) reported that husband's education directly affected fertility of Saudi women in that city.

It is also found that infant death affect fertility positively. The infant deaths shorten the period before next pregnancy and consequently lead to more births. This result is expected since most, if not all, fertility studies found similar results in different parts of the world. It is worthy to note that infant mortality rate (IMR) has sharply declined in Saudi Arabia during the last decade, which might suggest further decline in fertility.

Opposite to our expectation, regression results show that fertility is lower for women living in extended family settings, compared to those living in nuclear families. The regression coefficient is statistically significant. While it is difficult to give only one concrete explanation for this result, several explanations or rather speculations can be advanced. One explanation is that some newly wedded couples tend to live for few years in their parent's extended families. That is, some sons stay with their families for few years after marriage, then they move out when they have children, or their families grow larger. Second, some aging parents move-in with their sons or daughters when they loose one partner. They also do so when they are unable to support themselves, or feel that family caring is becoming necessary. In most of these cases, families are relatively smaller than those of older sons or daughters who live with their own children, mostly after their parents died.

Although the regression coefficient of this variables supports Cain's (1982) idea that extended family provides security in old age and offers some assistance for child care, it is difficult to accept this explanation, because the nature and dynamics of extended families are changing. The extended family forms are not constant, but rather changing from time to time.

In addition, son preference seems to be one of the variables that significantly affect fertility. The coefficient is statistically significant, thus supporting Hypothesis no. 9. Therefore, fertility is lower for women who have large proportion of male children and visa versa. That means that women with fewer or no sons tend to continue bearing children until they achieve the desired number of sons. This finding is consistent with findings of other fertility studies in developing countries such as Syria, Iraq, and Jordan.

**Table 3**
**Some Determinants of Fertility Behavior: The Results of Regression Analysis**

| Independent Variables | Model (1) | | Model (2) | |
|---|---|---|---|---|
| | Regression Coefficients | T-Values | Regression Coefficients | T-Values |
| Intercept | 2.233 | 11.76*** | 2.271 | 12.41*** |
| Age | 0.261 | 68.68*** | 0.261 | 69.22*** |
| Age at First Marriage | -0.263 | -38.04*** | -263 | -38.18*** |
| Woman's education | -0.225 | -9.64*** | 0.215 | 10.87*** |
| Child Deaths | 0.746 | 14.73*** | 0.742 | 14.70*** |
| Son Preference | -0.00018 | -5.25*** | -0.00018 | -5.21*** |
| Type of family (Extended) | -0.186 | -3.24*** | -0.191 | -3.34*** |
| Place of Residence (Urban) | 0.022 | 0.32 | | |
| Use of Contraceptives (Yes) | 0.066 | 0.958 | | |
| Work status (working) | -0.544 | -1.52 | | |
| Husband's education | 0.0009 | 0.45 | | |
| Interaction (work status X Woman's Education) | 0.128 | 2.11* | | |
| Geographic Regions: | | | | |
| West | -0.574 | -7.08*** | -0.572 | -7.09*** |
| Central | -0.360 | -4.40*** | -0.347 | -4.19*** |
| Southern Area | -0.270 | -3.01** | -0.277 | -3.28*** |
| Eastern | -0.419 | -4.33*** | -0.407 | -4.24*** |
| F-Test | 661.79*** | | 827.70*** | |
| Cases | 5387 | | 5387 | |
| Adjusted $R^2$ | 0.648 | | 0.648 | |

(*) Significant at 0.05, (**) significant at 0.01, (***) significant at 0.001

The geographic variables are significant in explaining the variations of fertility. Introducing some dummy variables to represent major geographic regions in Saudi Arabia, it is found that a women living in Western region have smaller number of children than those in the Northern region (base category). In fact, fertility levels are lower in all regions compared to the Northern region (base category). It seems that geographic variables captures the effects of some variables that are not in the model.

On the contrary to most research findings, regression results do not support our forth hypothesis regarding the effect of woman's participations in the labor force, (work status) upon fertility behavior. The regression coefficient is not statistically significant at 0.05. This is probably due to the fact that workingwomen in Saudi Arabia are given a motherhood leave, when they have birth. This leave consists of a two month vacation with paid salaries. For women working as teachers, this could be a rather incentive for bearing children since they would have little to do for the rest of a semester after having the first two months off. Noor's (1986) in Jordan finds no effect of work status on fertility. Zurayk (1987) believes that weak relationship between work status and fertility in some developing countries is due to availability of child care through the help of relatives. In addition, Easterlin (1985) believes that it

is not necessary for participation in the labor force to always lead to reduction of number of children, because of the competition between bearing children and work for the time of mother and father. As the value of children becomes high, the effect of women participation in the labor force weakens.

In Saudi Arabia, there is relatively strong relationship between education level and woman's participation in the labor force, because most of the workingwomen are graduates of teaching colleges or universities. For this reason, an interaction term between education and work status was introduced into the regression model. It is found that this term is statistically significant, indicating that the effect of education varies based on work status. The effect of education is a little less for working woman compared to non-working woman (-0.225 + 0.128 = -0.108). This result emphasizes the weak impact of "work" upon fertility behavior.

In addition, results show no statistical evidence of an effect of the urban residence and use of contraceptives. On the one hand, the inclusion of many variables that represent the differences between women living in rural and urban areas such as education, age at first marriage, probably captured the effect of the type of residence, and consequently weakened the effect of urban residence in the regression model. In addition, the relatively high fertility of rural-urban migrants lessens the gap between rural and urban areas. Al-Mazrou's et al. (1993) analysis of current fertility showed a significant effect of the type of residence

On the other hand, the use of contraceptives is not wide spread in Saudi Arabia, and its use is mainly for spacing rather than desire to limit family size. This finding is not surprising, since Salman and El-Khorazaty (1995) have found direct (positive) relationship between fertility and the use of contraceptives in their regression analysis of the determinants of fertility in Qatar.

The overall explanatory power of the regression model is satisfactory ($R^2$ = 0.65). This indicates that the model was able to explain 65% of the variations in the dependent variable (fertility behavior). In sum, it was shown that age at first marriage is one of the most important variables in the model. This means that fertility is Saudi Arabia is influenced by age at marriage and duration of marriage, rather than the impact of the use of contraceptives. This is especially important since sexual activities are only allowed through marriage. In addition, some other variables are found to affect fertility such as child deaths, education, and son's preferences.

## 4.3. Fertility in Rural and Urban Areas

As shown earlier, average number of children-ever-born is larger in rural areas compared to levels in the urban areas. While the average reaches a little over five children in rural areas, it is around four in the urban areas.

In an attempt to closely understand the determinants of fertility behavior of Saudi women in both rural and urban areas, two regression equations were estimated separately for each environment. The rural regression model has fewer independent variables than its counterpart for the urban areas. Despite the reduction of number of variables, it has kept the same or a little better explanatory power compared to the model of fertility in urban areas. Unlike the urban model (Model 3), geographic variables are not statistically significant in explaining fertility behavior of rural women (Model 4). This is probably due to the fact that there are little socio-economic differences between the rural areas in all administrative areas in the country. In other words, rural areas are more homogenous compared to salient differences among cities and urban areas.

**Table 4**
**Some Determinants of Fertility Behavior in Urban Areas: The Results of Regression Analysis**

| Independent Variables | Model (3) | | Model (4) | |
|---|---|---|---|---|
| | Regression Coefficients | T-Values | Regression Coefficients | T-Values |
| Intercept | 2.210 | 10.46*** | 2.090 | 10.88*** |
| Age | 0.264 | 61.65*** | 0.266 | 63.39*** |
| Age at First Marriage | -0.265 | -33.96*** | -0.263 | -33.99*** |
| Woman's education | -0.229 | -9.21*** | -0.186 | -10.78*** |
| Child Deaths | 0.712 | 11.39*** | 0.709 | 11.38*** |
| Son Preference | -0.00016 | -4.09*** | -0.00016 | -4.09*** |
| Type of family (Extended) | -0.170 | -2.58 | -0.176 | -2.67** |
| Use of Contraceptives (Yes) | 0.059 | 0.81 | | |
| Work status (working) | -0.430 | -1.02 | | |
| Husband's education | 0.017 | 0.69 | | |
| Interaction (work status X Woman's Education) | 0.113 | 1.62 | | |
| Geographic Regions: | | | | |
| West | -0.671 | -7.66*** | -0.681 | -7.81*** |
| Central | -0.443 | -4.95*** | -0.431 | -5.01*** |
| Southern Area | -0.314 | -2.69*** | -0.299 | -2.56** |
| Eastern | -0.473 | -4.76*** | -0.468 | -4.86*** |
| F-Test | 557.08*** | | 778.22*** | |
| Cases | 3760 | | 3760 | |
| Adjusted $R^2$ | 0.674 | | 0.674 | |

(*) Significant at 0.05, (**) significant at 0.01, (***) significant at 0.001

**Table 5**
**Some Determinants of Fertility Behavior in Rural Areas: The Results of Regression Analysis**

| Independent Variables | Model (5) | | Model (6) | |
|---|---|---|---|---|
| | Regression Coefficients | T-Values | Regression Coefficients | T-Values |
| Intercept | 2.088 | 5.22*** | 1.963 | 5.71*** |
| Age | 0.257 | 32.31*** | 0.257 | 33.32*** |
| Age at First Marriage | -0.259 | -18.25*** | -0.260 | -18.31*** |
| Woman's education | -0.188 | -3.20** | -0.186 | -4.22*** |
| Child Deaths | 0.804 | 9.06*** | 0.797 | 8.99*** |
| Son Preference | -0.00024 | -3.28*** | -0.00024 | -3.26*** |
| Type of family (Extended) | -0.235 | -2.07* | -0.218 | -1.95* |
| Use of Contraceptives (Yes) | 0.104 | 0.59 | | |
| Work status (working) | -0.705 | -1.03 | | |
| Husband's education | -0.037 | -0.08 | | |
| Interaction (work status X Woman's Education) | 0.113 | 0.82 | | |
| Geographic Regions: West | -0.257 | -1.36 | | |
| Central | -0.068 | -0.31 | | |
| Southern Area | -0.057 | -0.35 | | |
| Eastern | -0.339 | -0.98 | | |

| | | |
|---|---|---|
| F-Test | 164.26*** | 283.39*** |
| Cases | 1626 | 1626 |
| Adjusted $R^2$ | 0.584 | 0.585 |

(*) Significant at 0.05, (**) significant at 0.01, (***) significant at 0.001

Finally despite little differences in explanatory powers, results show large similarities between the urban on hand, and the model estimated for the total sample or for the whole country (model 1).    Variables that were included in the overall model (Model 1 or 2) are about the same as those in the urban model (Model 3).  This similarity is due to the fact that most of the Saudi populations live in urban areas (i.e., 75%).

## 4.3. Fertility and the level of living

Since the survey data used in this study has not included information about income, and because of the critical importance of economic dimension in the study of reproduction, the composite index of level of living is regressed against fertility along with other variables that were found significant in previous models (Models, 1, 2, 3, 4).    When keeping those independent variables into the regression equation, results show that fertility behavior is inversely influenced by the family's level of living. This means that as the level of living increases, fertility tend to decline.  Fortunately, the direction and strength of other regression estimates in the model have not changed, indicating stable and consistent estimates.    Moreover, the explanatory power of the regression model has not changed compared to Model 1.

**Table 6**
**Some Determinants of Fertility Behavior: The effect of level of living**

| Independent Variables | Model (7) | |
|---|---|---|
| | Regression Coefficients | T-Values |
| Intercept | 2.405 | 13.98*** |
| Age | 0.268 | 72.40*** |
| Age at First Marriage | -0.263 | -38.72*** |
| Woman's education | -0.091 | -5.44*** |
| Child Deaths | 0.725 | 14.49*** |
| Son Preference | -0.00018 | -5.13*** |
| Type of family (Extended) | -0.242 | -4.29*** |
| Geographic Regions: | | |
| West | -0.732 | -9.03*** |
| Central | -0.225 | -2.70** |
| Southern Area | -0.402 | -4.86*** |
| Eastern | -0.404 | -4.21*** |
| Level of Living | -0.195 | -11.28*** |
| F-Test | 933.87*** | |
| Cases | 5387 | |
| Adjusted $R^2$ | 0.656 | |

(*) Significant at 0.05, (**) significant at 0.01, (***) significant at 0.001

## 5. The Conclusion

In an attempt to further our understanding of levels of fertility in Saudi Arabia in general, and to determine the major factor affecting reproduction behavior in particular, the data of a recently conducted national demographic survey were utilized and some statistical methods were used.   The main findings can be summarized as follows:

1 – Fertility transition is clearly under way in the country.  Total fertility rate (TFR) is estimated to be a little less than 5.  The analysis of age-specific fertility rate reveals a large delay of child bearing, probably as a consequence of a marriage delay for both male and female and the remarkable shift in educational attainment of both sexes.

2 – Several woman's characteristics and familial attributes were found to be related to fertility levels.   More importantly, age at first marriage, duration of marriage, and woman's educational attainment are found to be strongly related to fertility.  Type of housing, homeownership, child death, and urban residence are also found to be significantly related to fertility.  That is, fertility levels vary on the basis of these characteristics significantly.

3 – There are significant spatial variations in fertility levels.   Fertility levels (average number of children-ever-born) are higher in the southern and northern administrative areas such as Jazan Najran, Hail, and Al-Jouf, while they are relatively lower in the central parts of the country  (i.e., Riyadh, Eastern Province, Makkah) in addition to Tabouk administrative area.

4 – Opposite to our expectations, the use of contraceptives were found to be not related to fertility.   It is probably because of the use of inefficient contraceptives and the tendency to use them for child spacing rather than limiting fertility, especially after having certain number of children.   This might indicate that contraceptive methods have not gained wide acceptance among younger cohorts.

5 – Regression analysis revealed that age at first marriage, women educational attainment are the most important variables in explaining fertility behavior in Saudi Arabia.   Other variables were also found to be significant determinants of fertility such as son preference, child deaths, and type of family.  The geographic variables are also significant in the regression equation.   On the other hand, woman's participation in the labor force, husband's level of  education, and the use of contraceptives are found not to have significant influence in explaining the variations in the children-ever- born.

6 – It is obvious that the use of contraceptives is not an influential factor in determining the fertility behavior of married Saudi women.   This is probably due to one or all of the following explanations:  (a) some people prefer not to report the use of contraceptives, and consequently they could be classified as "shy users" as it was found in Pakistan (Hashimi, 1998); (b) most people use contraceptives for the purpose of child spacing rather than for limiting fertility, and as result they tend to use contraceptives after they achieved a number of kids that is very close to the desired number; (c) some people could be using inefficient methods or practicing family planning irregularly.   Despite this finding, we believe that the use of contraceptives

will play an important role in controlling fertility in the country in the future as the levels of desired fertility decline.

7 - On contrary to previous research findings, the regression analysis shows no significant effect of woman 's participation in the labor force upon fertility, due firstly to the limited female's participation in the labor force; and secondly, to the privileges given to working women, especially to those women who are working in the public sector, which actually absorbs most of these women.   Examples of these privileges are two months motherhood leave with paid salaries, in addition to comfortable working hours, and the flexibility in giving short leaves when necessary.

8 – Although descriptive analysis shows some differences in the average of child-ever-born between rural and urban areas, regression models reveal no significant effect of rural – urban residence upon fertility levels.   One possible explanation is that the model includes some variables that accounted for the rural – urban differences. Secondly, the large size of recent rural – urban migration may offset difference between rural and urban areas because of similar reproduction behaviors of rural natives and rural-urban migrants.

9 – In light of social changes that the Saudi society is experiencing as a result of remarkable expansion in female's education and recent encouragement to wider participation of females in the labor force in particular, and involvement in development and societal matters in general, one would expect a further rise in the age at first marriage which could be accompanied by a decline in the desired family size.   In addition, there have been efforts to encourage breast-feeding.   Also the comprehensive Seventh National Development Plan has emphasizes the importance of the population dimension and its interrelationship with the development and environment in the country.  All these interrelated factors or matters would eventually lead to further reduction in fertility levels in Saudi Arabia.

Moreover, the findings of this study has important policy implications, especially in formulating national population policy and useful when addressing female's participation in the labor force.

Finally, it is very clear that there are urgent needs for future studies in order to further the understanding of reproduction behavior in Saudi Arabia and explore the prevalence of family planning practices and determinants of contraceptive use.  Needs for data on desired family size, and un-wanted births are also obvious.


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**Appendix (A) Pearson Correlation Coefficient between fertility and some independent variables**

| Independent variable | Correlation coefficient |
|---|---|
| Age | 0.678* |
| Age at first marriage | -0.313* |
| Woman's education | -0.445* |
| Child deaths | 0.336* |
| Son preference | -0.143* |
| Husband's education | -0.307* |
| Length of marriage life | 0.788* |

| | |
|---|---|
| Level of living | -0.219 |