A Comparative Study of Income Disparities and Fertility Trends in Egypt

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Abstract: This research paper presents a comprehensive literature review of the relation between income and fertility all over the world and a comparative analysis of income disparities and fertility trends in Egypt, utilizing data from Health survey for the Egyptian households and Central Agency for Public Mobilization and Statistics. The study investigates the individual and socio-contextual determinants of low fertility rates and decomposes wealth-based inequality to identify points of intervention for policy development, using the last 14 years from 2008 up to December 2022 via Egypt Demographic Health Survey (EDHS). It's clear that the fertility rates go down with a rapidly rates over all the Governorates at the same time with low households' income. As a result, the Arab Republic of Egypt lies in the fourth stage with regards to the relation between income and fertility which stated that (after a decreasing from the stage number two) low income is correlated with high fertility in the last 14 years.

Key words: Income, Fertility, Egypt DHS, Cash Earnings, Procreate, Development, Contraceptive, CAMPAS

1. Introduction

Income and fertility refer to the relationship between cash earnings on one hand and the inclination to procreate on the other hand [1], [2]. There is generally an inverse relationship between income and the total fertility rate within and among countries. [3]

As the level of education and the share of individuals of the population or subpopulation or social class in the gross domestic product increases, the number of children born in any advanced country decreases **[4]**. At the United Nations Population Conference in 1974 in Bucharest, Karan Singh, former Minister of Population in India, explained this trend by saying, "Development is the best contraceptive**."[5]**

The relationship between income and fertility has been a subject of significant interest in social science research and public policy discussions. Understanding the dynamics between income levels and fertility rates is crucial for comprehending demographic trends, economic development, and

societal transformations. The intricate interplay between income and fertility encompasses a spectrum of factors, including socioeconomic status, cultural norms, access to education and healthcare, and individual preferences. This relationship has far-reaching implications for social welfare, labor markets, and the overall well-being of populations. By exploring the multifaceted connections between income and fertility, we can gain valuable insights into demographic behavior, family dynamics, and the broader socioeconomic landscape.

2. The Effect of Income Distribution on Fertility

Birg, Herwig described the inverse relationship between income and fertility as an "economic demographic paradox." Evolutionary biology predicts that successful individuals (and similar countries) should seek to develop optimal conditions for their lives and reproduction. However, in the latter half of the twentieth century, it became clear that the economic success of advanced countries was met with demographic failure, and fertility below replacement levels could be destructive to their future economies and societies**. [6]**

In the years following the 1989 revolutions in Russia, it seems that individuals who were most affected by labor market crises were more likely to have another child compared to those who were less affected**. [7]**

The historical dynamics between fertility and income disparities in Egypt have been influenced by a multitude of interconnected factors, including socioeconomic status, cultural norms, access to education and healthcare, and individual preferences. This complex relationship has significant implications for social welfare, labor markets, and the overall well-being of the population. A comprehensive historical overview sheds light on the evolving demographic behavior and family dynamics in Egypt.

One of the important linkages between socioeconomic variables and fertility is the hypothesis that a more equitable distribution of income contributes to the reduction of fertility and may even be a precondition for such a reduction. It is argued that, in developing countries, fertility is generally negatively associated with income and that the relation is nonlinear in such a way that a small increase in the income of a poor couple reduces fertility more than does a small increase in the income of a rich couple; thus, a redistribution of income from the rich to the poor reduces the average level of fertility. This hypothesis has important policy implications. It implies that countries should

consider a redistribution of incomes as a way to reduce fertility (in addition to other effects it might have). Kocher (1984) suggests the following policy guidelines in order to increase the full income accruing to the low income majority; he argues that the overall fertility decline effects from these income redistribution policies will be greater than would occur if these development resources were directed to other areas: (a) major commitment of public resources to basic schooling (especially up to secondary level, and especially for girls), technical training, health care, and family planning services; (b) adoption of development strategies which give strong emphasis to policies and investments which stimulate labor-intensive sectors; and (c) technology development, promotion, and adoption strategies that favor technologies that complement rather than displace labor, in both the urban and rural sectors.

Repetto (1973, 1978, 1979), Kocher (1973), and Rich (1973) performed the empirical testing of these hypothesized linkages between income distribution and fertility and concluded that equalizing the distribution of income reduces fertility. Particularly, Repetto employs a three-equation model of interrelationships among fertility, infant mortality, and income distribution to test the hypothesis using cross-country data; this shows that the coefficient for the Gini Coefficient of income distribution variable in the fertility equation is positive and statistically significant.

Repetto also performed a micro-level analysis using household data from Puerto Rico ·and Korea. He tested that the relationship between household income and fertility was nonlinear with the expectation of a negative linear term and a positive quadratic term. The principal test consisted of regressions of children-ever-born on an income-per-household member (YPC) , income per household member squared (YPC2), age of the wife, wife's education, and other variables expected to influence fertility. He found that in all regressions for both Puerto Rican and Korean data, the coefficient for YPC was negative and the coefficient for YPC2 was positive, and both coefficients were statistically significant. Based on this evidence, he· asserts that equalization of income levels among households results in lower aggregate fertility for the entire population. For example, he argues that redistribution of income between households at one-half the average Korean income level and households at five times the average income level would reduce the overall fertility level of Korea by about 12 percent or approximately half of a birth in terms of mean numbers of children ever born per household (Repetto 1979).

The analyses and conclusions of Repetto have recently been criticized by various researchers including Birdsall (1977a, 1977b), and Boulier (1982) (see also Repetto (1977. 1982) for his responses to criticisms by Birdsall and Boulier). Birdsall points out that when the Eastern European countries of Bulgaria. ·Czechoslovakia. Hungary. Poland, and Yugoslavia - all extreme observations with the lowest fertility and the most equitable distribution of income - are excluded from Repetto's 64 nation sample, the coefficient for the income-distribution variable is no longer significant at the conventional 5 percent level. When the regression sample is limited to 41 less developed countries excluding 27 developed countries, the coefficient on the income distribution variable is also not significant. Birdsall argues that since the regression results are so sensitive to the exclusion of different sets of countries, our understanding of the true underlying relationship between income distribution and fertility is far from complete for Repetto's model to be useful in drawing policy conclusions. Birdsall further argues that the Repetto's use of such highly aggregated cross-country results to predict the pattern of a relationship between income distribution and fertility for a nation over time is highly questionable.

Boulier (1982) criticizes the micro-level analysis of Repetto, arguing that by regressing fertility on per capita (household member) income variables rather than per household income variables, Repetto introduces a spurious non-linearity. This occurs because the per capita income variable is obtained by deflating the total household income by· the number of family members which is highly correlated with the dependent variable, children ever born. Because of this statistical problem, Boulier feels that Repetto's regressions relating fertility to the per capita income measures cannot be used to test hypotheses relating fertility change to income distribution.

Both Birdsall and Boulier emphasize that the income distribution data in developing countries are often of poor quality and that measures of income inequality are often not comparable among nations because of differences in the definitions of income and households, and difference in the distributions of individuals among households. They suggest that recognition of the limitations of using faulty measures and poor quality data for income distribution dictates caution in the interpretation of Repetto's quantitative results.

There are recent empirical studies which contradict the conclusions of Repetto (Resenzweig and Evenson 1977; Boulier 1982). In their analysis of the determinants of fertility among Indian rural women, Rosenzweig and 'Evenson (1977) found that land size, which was assumed to be complementary with child labor, had a positive and statistically significant influence on fertility, and that a measure of land concentration had a negative influence on fertility. Based on the latter evidence, they conclude that a land redistribution program aimed at promoting equality, unaccompanied by other changes, would increase fertility in rural India. This finding contradicts Repetto's contention that the effects of land redistribution on fertility are negative.

Boulier (1982) analyzed the socioeconomic determinants of the number of children-ever-born to Filipino women aged 25 to 50. When he used the per household income variable (YH) and income squared (YH2), rather than the per capita income measures, the coefficient for YH is positive and that for YH2 is negative and both coefficients are statistically significant. The nonlinear relation between income and fertility resembles an inverted U such that a transfer of income from a couple with higher income to a couple with low.er income raises fertility. When he adopted the Repetto-like specification which uses the per capita income variables (YPC and YPC2) rather than the per household income variables in the fertility regressions, he obtained very similar results to Repetto's, revealing that the relationship between income and fertility is V-shaped. Boulier concluded that this outcome provided further evidence that Repetto's estimates of the effect of income distribution on fertility were deficient because the latter misspecified his model by using the per capita income measures rather than the per household income variables. From his analysis of Philippine data, Boulier also generated another important finding: the nature of the nonlinear relation between fertility and female education is such that a redistribution of a fixed stock of years of schooling from better-educated women to women with fewer years of schooling in- creases the average level of fertility. For example, he shows that if a woman with 11 years of schooling had attained only 10 years of schooling and this additional year of schooling were given to a woman with 1 year of schooling, the number of births would increase by .07.

It is generally accepted that the dispersion of adult educational attainment and the concentration of land ownership are the major determinants of in- come distributions in developing countries (see Repetto 1979). The empirical evidence generated by Rosenzweig and Evenson (1977) and Boulier (1982), indicating that more equal distributions of land holdings and schooling years increase rather than decrease fertility in developing nations, undoubtedly justify many skeptical views of Repetto's works on the income distribution fertility relationship.

The observed trend of declining fertility rates in many countries, attributing it to factors such as increasing life expectancy, declining child mortality, improved literacy and independence among females, and urbanization resulting from increased per capita GDP, in line with the demographic transition model. Additionally, discuss the specific case of Eastern Europe after 1990, highlighting the association between the increase in GDP and the postponement of childbearing and sharp decline in fertility.

The observed trend of declining fertility rates in many countries, attributing it to factors such as increasing life expectancy, declining child mortality, improved literacy and independence among females, and urbanization resulting from increased per capita GDP [8], in line with the demographic transition model. Additionally, discuss the specific case of Eastern Europe after 1990, highlighting the association between the increase in GDP and the postponement of childbearing and sharp decline in fertility [9].

In developed countries where contraception is widely used, there is a consistent trend of higher income being correlated with lower fertility rates. This inverse relationship between income and fertility has been studied extensively, and various theories have been proposed to explain this phenomenon:

- People who earn more have a higher opportunity cost if they focus on childbirth and parenting rather than their continued career [9]
- Women who are able to support themselves economically have less incentive to marry. [9]
- High-income parents value quality over quantity, so they spend their resources on fewer children. [9]

Religion sometimes modifies the effect: for example, higher income is associated with slightly increased fertility among Catholic couples but slightly decreased fertility among Protestant couples.[10]

In general, the fertility rate in a developed country is lower while the fertility rate is higher in less economically developed countries. For example, the total fertility rate in Japan, a more developed country, with a GDP per capita of US$32,600 in 2009, was 1.22 children per woman. But the total fertility rate in Ethiopia, with a per capita GDP of $900 in 2009, was 6.17 children born per woman.[11]

Ansley J. Coale's, stated that the three Preconditions for Declining Fertility asserts that increases in a society's income may increase its fertility, but only if three preconditions are met, summarized as “ready, willing, and able.” People will respond to economic and social opportunities that make it beneficial to reduce fertility, taking into account economic and psychosocial costs such as the cost of birth control or abortion.[12]

3. Obstacles

In all countries, there is a strong negative relationship between GDP and fertility, and finally there is a strong negative relationship between household income and fertility.

Decreased fertility can lead to population aging, which can lead to a variety of problems. See for example the demographics of Japan.

High birth rates tend to place a greater burden of raising and educating children on populations already suffering from poverty. Thus, economic inequality reduces average education and hinders economic growth.[13] Also, in countries with a heavy burden of this kind, low fertility can hamper economic growth as well as vice versa.[14] Rich countries have a lower fertility rate than poor countries, and high-income families have fewer children than low-income families.[15]

4. Contradictory Results

- The United Nations report in 2002 concluded that sharp declines in fertility rates in India, Nigeria, and Mexico occurred despite low levels of economic development. This indicates that there can be variations in the relationship between income and fertility across different countries, and in some cases, declining fertility rates can

occur independent of economic development. Additionally, it's noted that associations between income and fertility, which were traditionally positive in developing countries, have become negative due to increased education levels. This shift has led to declines in fertility even during economic recessions, with increased unemployment generally associated with lower fertility.**[16]**

- Each country can differ in its own relationship between income and fertility. Some countries demonstrate a positive correlation between income and fertility, where higher income levels are associated with higher fertility rates. On the other hand, other countries exhibit a negative correlation, where higher income levels are associated with lower fertility rates**.[17]**
- Based on a study conducted in France, it has been found that increased unemployment is generally linked to a decrease in fertility rates. The study specifically concluded that job instability has a significant and long-lasting negative impact on the overall number of children for both men and women. Furthermore, it was observed that job instability also contributes to delayed fertility among men. Additionally, the study revealed that job instability negatively affects fertility among individuals who hold more egalitarian views regarding the division of labor. However, interestingly, it was noted that job instability has a positive effect on women with more traditional views on gender roles. Keeping these findings in mind, please provide an analysis of the relationship between job instability, unemployment, and fertility, taking into account the impact on different gender perspectives and societal attitudes towards the division of labor, but still has a positive effect on women with more traditional views**.[18]**
- A decline in fertility rates was observed during the economic recession. This phenomenon is attributed to the postponement of pregnancy, particularly for first-time births. It is important to note that this effect may only be temporary and is often counterbalanced during subsequent economic upturns.[19]
- Based on two recent studies conducted in the United States, it has been suggested that there are instances where families with higher income levels tend to have a higher number of children**.[20]**

Fertility curve on the "J" curve

Some scientists doubted in the assumption that economic development and fertility are related in a simple negative way. A study published in the journal Nature in 2009 found that when the Human Development Index is used instead of GDP as a measure of economic development, fertility follows a J-shaped curve with increasing economic development Fertility rates actually decline initially but then begin to rise again as the level of social and economic development rises while still falling below the total fertility rate**.[21][22]**

In an article published in Nature, by researcher Myrskylä ،Mikko et al. He noted that "unprecedented increases" in social and economic development in the twentieth century had been accompanied by significant declines in population growth rates and fertility. This negative association between human fertility and socioeconomic development has been "one of the most well-established and generally accepted empirical systems in the social sciences**."[22]**

The researchers used cross-sectional and longitudinal analyzes to examine the relationship between total fertility rate and the Human Development Index.

The main finding of the study was that in highly developed countries with a Human Development Index of more than 0.9, low fertility rates stop falling with additional development. This means reversing the previous negative relationship between development and fertility; The graph becomes J-shaped (Myrskylä ،Mikko et al.). It asserts that there has been "a fundamental change in the entrenched negative relationship between fertility and development as the world's population enters the twenty-first century**."[22]**

Some researchers doubt the J-curve relationship between fertility and socioeconomic development (Luci*,* and Thvenon, 2010**;[23]**

Furuka, 2009). For example, Fumitaka Furuka (2009) used hyperbolic regression analysis to study the relationship between TFR and the Human Development Index, but found no empirical evidence to support the proposal that progress in development can reverse declining fertility rates

Exactly, it has been found that in countries with a low HDI, higher levels of the HDI tend to be associated with lower fertility rates. Likewise, in countries with a high HDI, higher levels of the HDI are associated with lower fertility rates, although the relationship is weaker. Furuka's findings support the "common rule" that high development is consistently associated with lower total fertility rates**.[24]**

5. Numerical Data Analysis in relation between Income and Fertility in Nile Basin countries especially in Egypt

Access to safe, voluntary family planning is a human right. Family planning is central to gender equality and women's empowerment, and it is a key factor in reducing poverty. Yet, globally at least 222 million women who want to use safe and effective family planning methods are unable to do so because they lack access to information, services, commodities or the support of their partners or communities. Most of the women with an unmet need for family planning live in 69 of the poorest countries on earth.

UNFPA works to support family planning by: advocating for evidence and human rights-based family planning policies; ensuring a steady, reliable supply of high quality contraceptives; strengthening national health systems; gathering data and funding research to support this work. UNFPA also provides global leadership in advocating for improved access to family planning, by convening partners – including governments – to develop evidence and policies, and by offering programmatic, technical and financial assistance to low and middle-income countries.

Egypt is the most populous country in the Middle East and the third most populous country in Africa. The 2018 fertility rate is at 3.1, according to a study prepared by UNFPA, with data collected from the birth and mortality registration system implemented in collaboration between with the Ministry of Planning, Monitoring and Administrative Reform and the Ministry of Health and Population.

Fertility levels are the main determinant of population growth. Since 2006, fertility levels in Egypt were on an upward trend, reaching its highest level in 2014 at 3.5. Fertility levels decreased at a slow pace in 2017 (3.4) compared to 2014, but saw a sharp decrease in 2018, reaching 3.1.

According to the Egypt Demographic and Health Survey (EDHS) from 2014, 16 percent of births in the five-year period prior to the survey were not wanted at the time of conception. This percentage is slightly higher than the percentage of women who reported an unwanted birth in the 2008 EDHS (14 percent). Among the births not wanted at the time of conception, just over half (8 percent of all births) were not wanted at all.

Egypt's government-led national family planning programme has succeeded in raising the Contraceptive Prevalence Rate, from 48 percent in 1991 to 59 percent in 2014 according to the preliminary results from the DHS. Furthermore, the Total Fertility Rate has been slowly declining from 4.4 live born children per woman in 1988 to 3 in 2008 and then risen again in 2014. The government has attributed the high rate of contraceptive use to efforts to inform women about health services. Yet, the 2014 DHS found that one in eight married women was in need of family planning at the time of the survey. According to 2014 data, the unmet need for family planning in Egypt is 12.6 percent.

According to the same survey, only 30 percent of women were counseled on postnatal birth control methods. The lack of information can place women at risk of unwanted pregnancy soon after a previous birth, which may carry health risks and cause complications and death during pregnancy. Child spacing continues to be a challenge especially among young mothers, overall, about 20 percent births occur within 24 months of the previous one.

The overall level of adolescent pregnancy (aged 15-19) has been on a slow but steady upward trend, from 9 percent in 2005 to 10 percent in 2008 and finally 11 percent in 2014. Seven percent of adolescents are already mothers, and 4 percent are pregnant with their first child, according to the EDHS 2014.

The 2014 EDHS indicates that around 59 percent of currently married women in Egypt are using contraception. The most widely used methods are the IUD, the pill, and injectable, and three percent of these women cited that they use traditional methods. Thereby, 41 percent of married women were, as of 2014, not utilizing any family planning method.

The extents to which women utilize modern methods vary across regions. Urban women were more likely to be using modern contraceptives than rural women, and the lowest modern contraceptive use is among women residing in rural Upper Egypt.

The extents to which women utilize contraceptive methods also vary within age groups, whereby only 21 percent of married women aged 15-19 use contraception, compared to 73 percent among married women aged 35-39. Only two percent of ever-married women aged 15-49 regard use of family planning before a woman's first pregnancy as appropriate.

Egypt's Situation:

The 2014 DHS indicates that fertility rate significantly has increased after more than 20 years of decline. Between 1980 and 2008, Fertility dropped from 5.3 children per woman to 3.0 children per woman. But since2008, fertility has risen (by half a child) to 3.5 births after experiencing a plateau of 3 births for years (3.8 in rural areas, 2.9 in urban areas).

- 11% of women (15-49) years are pregnant or have had a live birth.
- One fifth of non-first births were born within 24 months of a prior birth interval.
- Contraceptive prevalence rate is 59% and desired fertility among ever-married women 15-49 is still at three children.
- According to 2014 data, the unmet need for family planning is approximately 13%
- There is a slight shift in family planning methods mix from long to short term contraceptives.
- There are misconceptions around fertility and family planning, in addition to concerns about side effects of contraceptives.

6. United Nations Team Numerical Data Analysis from 2015-2020 AD:

Low income countries often high fertility and high-income countries often have low fertility. When their income increases, parents tend to pay more attention to the quality of their children's lives more than paying attention to their number, which ultimately reduces the fertility rate.

Table (1): Fertility distribution according to income levels in Nile Basin countries in the period 2015-2020AD

Statement	Low--income Countries	The lower segment of lower middle countries	The upper segment of lower middle countries
Burundi	5.45		
Congo		5.96	
Egypt			3.33
Eritrea		4.10	
Ethiopia		4.30	
Kenya			3.52
Rwanda		4.10	
Sudan			4.43
South Soudan		4.74	
Tanzania		4.92	
Uganda		5.01	
Average	5.45	4.53	3.76

Based on data from Table9&Table 13&the new classification of countries according to income levels: 2018-2019, by the World Bank Data Team.

https://blogs.worldbank.org/ar/opendata/new-country-classifications-income-level-2018-2019 (Accessed 22/6/2020)

By examining Table (1), it is clear that the fertility is high in the category of low-income countries (less than $996)m as in Brundi, and in the lower segment of middle-income countries(from $996 to$3895), as in the countries of Congo, Eritrea, Ethiopia, Rwanda, and South Africa, Sudan, Tanzania, and Uganda. While the fertility rate in the upper middle-income countries fell from $3896 to $12055, as in Egypt, Kenya, and Sudan. This is what indicates the inverse relation between income and fertility.

Table (2): Population Correlation coefficients between income and fertility in basin countries

Statement	Correlation coefficient	Correlation Degree
Burundi	0.678	Strong positive correlation
Congo	-0.0629	Strong negative correlation
Egypt	-0.484	Medium negative correlation
Eritrea	-0.785	Strong negative correlation
Ethiopia	-0.955	Very Strong negative correlation
Kenya	-0.964	Very Strong negative correlation
Rwanda	-0.965	Very Strong negative correlation
Sudan	-0.978	Very Strong negative correlation
South Soudan	0.904	Very Strong positive correlation
Tanzania	-0.980	Very Strong negative correlation
Uganda	-0.958	Very Strong negative correlation
World	-0.935	Very Strong negative correlation

SPSS Calculations: Statistical Package for the Social Science

- Statistical analysis of the relation between fertility rates and level of income

By studying table (2), it is clear that there is a strong direct relationship (0.678) in Brundi, and a very strong relation (0.904) in South Sudan, between fertility and income. That is, the more income trends toward decline and the poverty rate increases, the more fertility rates tend towards the decline in the period 2015-2020 AD.

While in the rest of the countries of basin, an inverse relation appeared between fertility rates and income. The higher the income level or the higher the income rates the fertility rates is declining.

From the previous presentation, it is clear that there are different trends shown by the study in the relation between income and fertility. One of them confirms the existence of an inverse relationship between the two, which is the distributional picture that is mostly in the Nile Basin countries, and another sees the existence of a positive relationship. It has been shown in some countries that high fertility is the main cause of poverty, underdevelopment, and low income levels, while it appeared in some countries that backwardness, poverty, and low income levels resulted from

high fertility rates, while in some countries it appears that the relationship between the two is dialectical relationship with mutual influence in which it is difficult to extract a direct relationship between them. By studying table (2) which expresses the relationship between income and fertility in the Nile Basin Countries in the period 2015-2020 AD. This appeared the next different 4 relationships:

The First: A relatively high average income and a high fertility rate

This category appeared in the state of Sudan, which confirms the dialectic of the relationship between income and fertility, and its connection to the three stages of economic development, where the first stage is the early stage of development, in which the level of income rises and the conditions and quality of life improve with the continued rise in fertility rates, which is what Sudan expresses.

As for the second stage, it is characterized by passing the early development stage and the relationship between income and fertility becomes inverse. In the third stage, this is reaching an advanced stage of development, the income level rises and fertility level decreases, but at lower rates than what was recorded in the second stage.

The Second: Low average income and high fertility rate

Low income and poverty may push in more than one direction, as it may push towards increase childbearing with the aim of pushing these children into the labour market to help the sole breadwinner of the family, who will be in this case will be father, as the mother devote herself to childbearing and caring for children until certain age. Poverty, on the other hand, may cause the wife to work with her husband to meet their basic needs, so the woman will go out to the labour market, which reduces the chances of her childbearing in the long term, and gains her some economic independence and social statues through her productive activities, which translates into power only if the man allows it, even if the woman's productive contribution equal to that of the man or greater (Wolf, A.P., Ying-Chang., 1994.P.429).

This category appeared in Brundi, Congo, Ethiopia, South Sudan, Tanzania, and Uganda, but these countries are rural, meaning that the main activity of the population in agriculture, which has a clear impact on human fertility through two main characteristics:

1) The 1st is the possession of agriculture land, its size, and the duration of the farmer's work on it, and whether the land is pure property or otherwise. As the first characteristic, which is called 9 what the land requires in terms of labour, especially in large areas that need workers, and in this case the workers will be children, and the demand will increase0 there for human fertility will increase.
2) The 2nd characteristic, which is the land security, which cause a negative relationship between land ownership and fertility, it is the result of the land replacing children as wealth. (Thomas 1991, P.381).

Perhaps the 1st characteristic is the closest to reality because under the conditions of poverty the children's must be worked as a kind of insurance against the unknown future, which is one of the main reasons for high fertility, especially in a low-income family. (Robinson, W.C., 1986, P.289).

The Third: A relatively high average income and low fertility rate.

The optimal case for any society, as a high income may lead to improve healthcare, and reduce death rates, and on the other hand, it may reducing the fertility rates and leads to changes in age composition (AL-Omary 2009,P/4) . This category appeared in two countries of Egypt and Kenya, as these two countries can be considered to express the second stage of economic development which characterized by transcending the early development stage and the relation between income and fertility becoming negative.

The Fourth: Low average income and low fertility

Which can be called rational fertility, which resulted from two basic factors: Poverty and relatively high awareness, which translates into low fertility rates, as low fertility rates may occur when there is a real desire to reduce family size, which comes in response to economic and social changes or the population environment that affects the living costs and cost of raising children (Okun, B.S., 1994, P.1993) this appeared in Eretria and Rwanda.

7. Egypt's Situation According to the Final Two DHS Data and Graphs Issued by CAPMAS in December 2022AD (2015-2022) and EDHS 2014 AD (2008-2014):

7.1 Age and Sex Composition

Figure 1 presents the population pyramid for Egypt based on EFHS-2021 data, which was constructed using the sex and age distribution of household population. Data indicated a decline in fertility during the past five years preceding the survey, which is evident by the decline in the percentage of population under the age of 5 years. This indicates an expected further decline in fertility levels in the future.

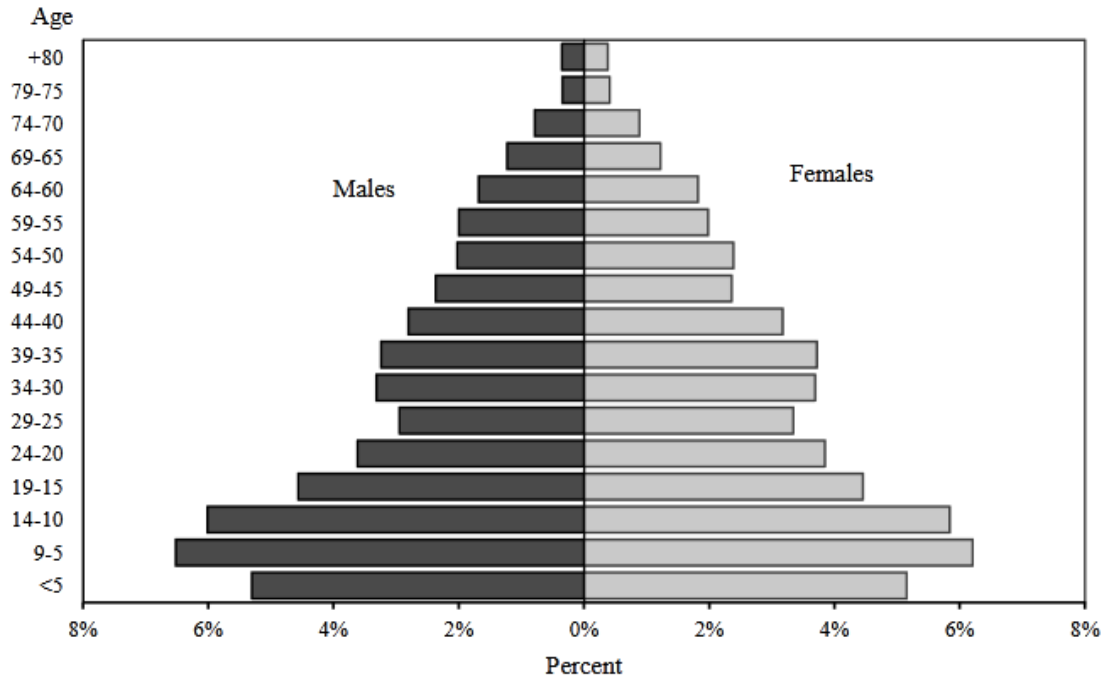

Figure 1: Population Pyramid, Egypt 2021

The next population pyramid shown was constructed using the sex and age distribution of the 2014 EDHS household population. The pyramid has a wide base. This pattern is typical of countries that have experienced relatively high fertility in the recent past. This indicates an expected further increase in fertility levels in the future.

Figure 2: Population Pyramid, Egypt 2014

7.2 Current Fertility by Residence 2021 &2014

The level of current fertility is one of the most important topics in this report because of its direct relevance to population policies and programs.

The next figure shows that there is decline in TFR in EFHS-2021 compared with the reported rate in the2014-EDHS by around 0.65 births (around 19% decline). Also, it is clear from the figure that the highest decline in TFR was observed between 2014 and 2021 in rural Lower Egypt (from 3.6 to 2.75 births per woman, respectively), while the least decline was in Urban Governorates (from 2.5 to 2.18 births per woman, respectively).

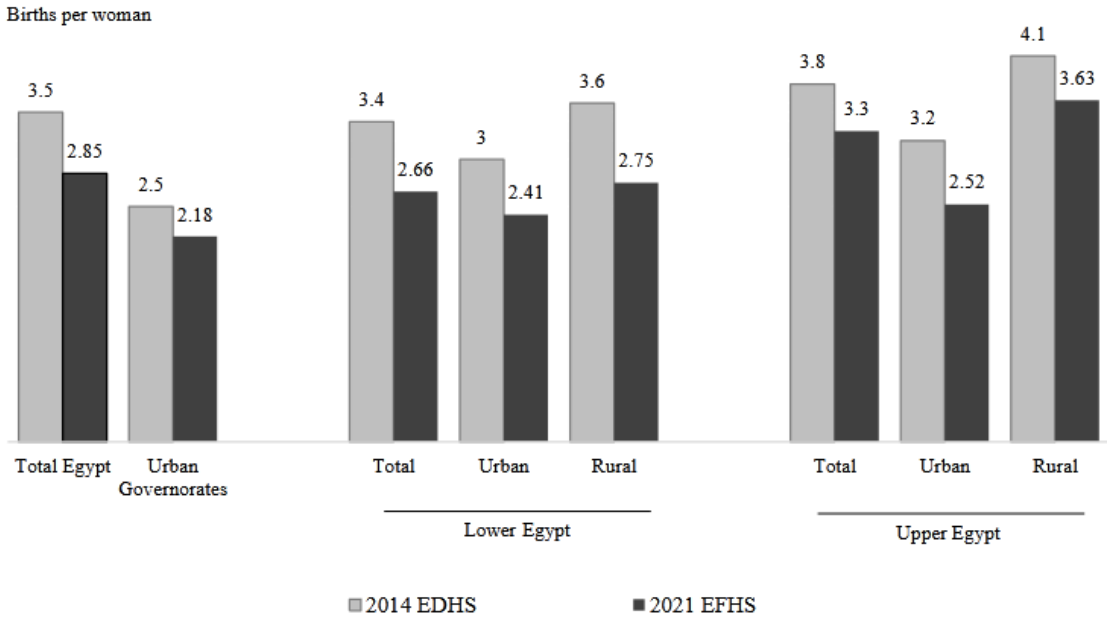

Figure 3: Age specific fertility rates by place of residence

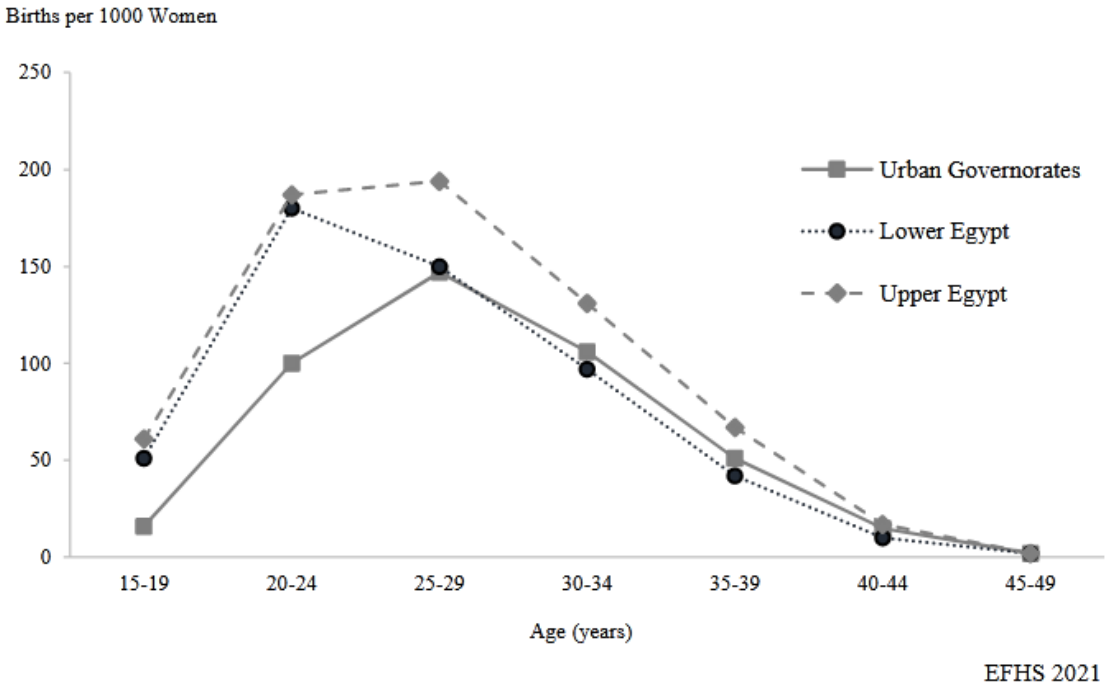

Figure **4: Trends in fertility by residence, Egypt 2014-2021**

Figure 5 shows that all areas shared in the rise in fertility that occurred between the 2008 and 2014 EDHS surveys except the Urban Governorates where the TFR decreased slightly from 2.6 births in 2008 to 2.5 births in 2014. The largest absolute increases in the TFR were observed in the three surveyed Frontier Governorates and rural Lower Egypt.

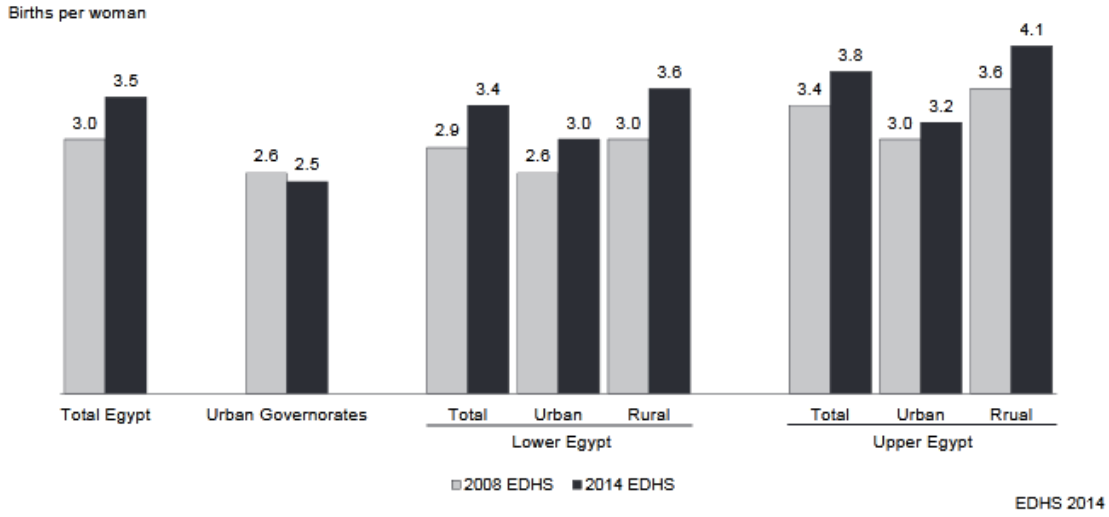

Figure 5: Trends in fertility by residence, Egypt 2008-2014

7.3 Fertility Trends 2021&2014

- **Retrospective Data 2021**

The next table 3 uses information from the retrospective birth histories obtained from EFHS-2021 respondents to examine trends in age-specific fertility rates for successive five-year periods before the survey. Births were classified according to the period of time in which the birth occurred and the mother's age at the time of birth. Because women 50 years and over were not interviewed in the EFHS-2021, the rates for older age groups become progressively more truncated for periods more distant from the survey date. For example, rates cannot be calculated for women aged 45-49 for the periods 5-9 years and more prior to the survey, because these women were 50 years or older at the time of the EFHS-2021 and, thus, were not interviewed in the survey.

Table 3: Trends in age-specific fertility rates

Age-specific fertility rates for five-year periods preceding the survey, by mother's age at the time of the birth, Egypt 2021

	Number of years preceding survey			
Mother's age at birth	0-4	5-9	10-14	15-19
15-19	56	74	69	54
20-24	183	231	214	190
25-29	177	211	203	198
30-34	116	145	139	[143]
35-39	57	74	[84]	-
40-44	15	[24]	-	-
45-49	[3]	-	-	-

Note: Age-specific fertility rates are per 1,000 women. Estimates in brackets are truncated. Rates exclude the month of interview.

Overall, the results in Table 3 document a marked decline in age-specific fertility between different age groups. However, the decline was relatively faster in the age group 15-19 years during the 5-9 years prior to the survey. Generally, age-specific fertility rate in the age 15-29 decreased from 2.6 births per woman during the 5-9 years preceding the survey to 2.08 per woman during the five years preceding the survey.

- **Retrospective Data 2014**

The next table 4 uses information from the retrospective birth histories obtained from EDHS respondents to examine trends in age-specific fertility rates for successive five-year periods before the survey. To calculate these rates, births were classified according to the period of time in which the birth occurred and the mother's age at the time of birth. Because women 50 years and over were not interviewed in the 2014 EDHS, the rates for older age groups become progressively more truncated for periods more distant from the survey date. For example, rates cannot be calculated for women age45-49 for the periods 5-9 years and more prior to the survey, because these women were 50 years or older at the time of the EDHS and, thus, were not interviewed in the survey.

Table 4: Trends in age-specific fertility rates

Age-specific fertility rates for five-year periods preceding the survey, by mother's age at the time of the birth, Egypt 2014

	Number of years preceding survey			
Mother's age at birth	0-4	5-9	10-14	15-19
15-19	57	58	59	69
20-24	204	201	201	206
25-29	198	197	206	224
30-34	130	131	141	[163]
35-39	66	68	[88]	-
40-44	17	[26]	-	-
45-49	[3]	-	-	-

Note: Age-specific fertility rates are per 1,000 women. Estimates in brackets are truncated. Rates exclude the month of interview.

Comparison with Previous Surveys 2021 & 2014

The next table 5 shows TFR estimates from a series of surveys conducted in Egypt during the period from2000 through 2021. In general, the rates calculated for three-year are subject to less sampling variability than one-year rates, where data was collected for the five years preceding the survey, then the TFR calculated using three years to avoid non-sampling errors. The size of the sample covered in a specific survey is another factor related to sampling variability. In general, rates from surveys with comparatively large samples are subject to less sampling variability than rates from surveys with smaller samples.

As results show in the next table, fertility levels declined during the two decades, from 3.5 births per woman at the time of the 2000 EDHS to 3.0 births per woman during2008-EDHS, then rose again in 2014- EDHS to the level observed in 2000, before falling again to reach 2.85 births per woman in EFHS-2021. The decline in fertility was rapid especially during the period 2000 and 2008 (14.3%). On the contrary, the TFR declined during the period between the EDHS-2008 and EFHS-2021 by only 0.15 births per woman representing a 5% decline only.

Results presented in the next table highlights that all age groups contributed to the recent decline in fertility rates. However, decline was more rapid among women in the 20-34 age groups than younger or older women. Age specific fertility rates decreased among women 30-34 years by around 25% between the 2000 EDHS and the EFHS-2021. On the other hand, TFR declined between women in the age less than 30 years by around11% during same period. As a result of the difference in fertility changes for different age-groups, TFR is more concentrated among women less than 30 years old. Currently, a woman will have on average around two children (2.27 births) by her 30th birthday. It is clear also from the next figure that decline is obvious for the age 20-39, however, it was clearer in the age group 20-24 and 25-29 and this is the same pattern observed in countries similar to Egypt where fertility levels decline.

Table 5: Trends in fertility

Age-specific fertility rates (per 1,000 women) and total fertility rates, Egypt 2000-2021.

	2000* EDHS	2005* EDHS	2008* EDHS	2014* EDHS	2021 EFHS
Age	1997-2000	2002-2005*	2005-2008	2011-2014	2019-2021
15-19	51	48	50	56	50
20-24	196	175	169	213	170
25-29	208	194	185	200	169
30-34	147	125	122	134	112
35-39	75	63	59	69	53
40-44	24	19	17	17	13
45-49	4	2	2	4	2
TFR 15-49	3.5	3.1	3.0	3.5	2.85

Note: Rates for the age group 45-49 may be slightly biased due to truncation.
* Source: MOHP and El-Zanaty & Associates.

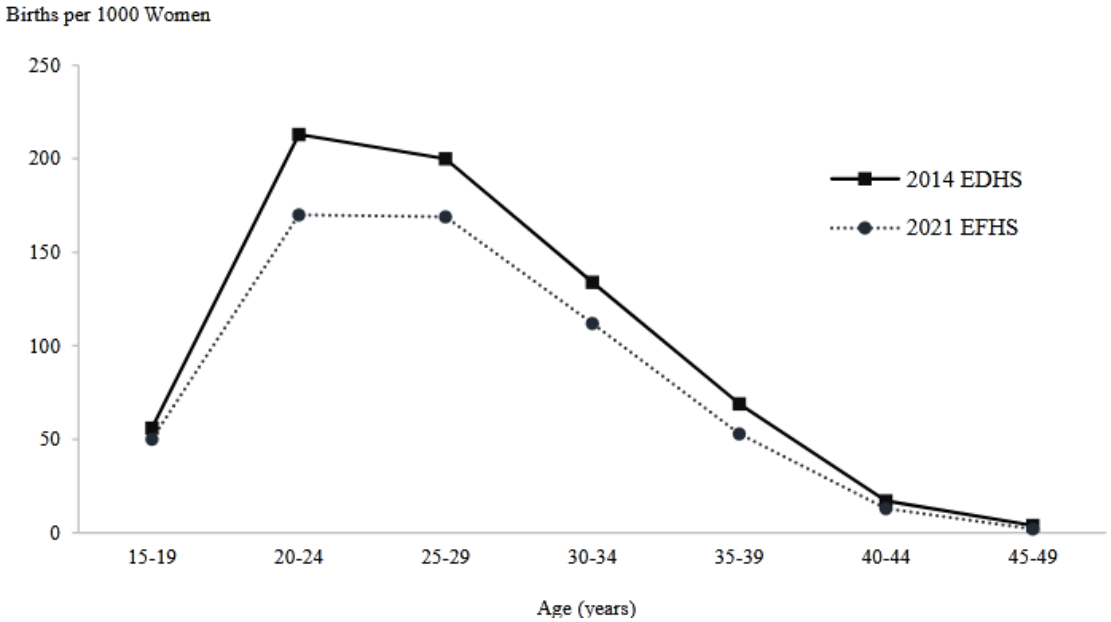

Figure 6: Trends in age-specific fertility, Egypt 2014-2021

The next Table shows TFR estimates from a series of surveys conducted in Egypt during the period 1979 through 2014. The surveys vary in the timeframes for which the TFR estimates are available. For example, the rates from the EFS, ECPS and the EMCHS are based on births in a one-year period before the survey, while the rates for the DHS surveys are based on a three-year period before the interview date. In general, three-year rates are subject to less sampling variability than one-year rates. The size of the sample covered in a specific survey is another factor related to sampling variability. In general, rates from surveys with comparatively large samples are subject to less sampling variability than rates from surveys with smaller samples. Thus, the TFR for the 2003 Interim DHS has a somewhat greater margin of error than the full scale DHS surveys (i.e., the surveys conducted in 1988, 1992, 1995, 2000, 2005, 2008 and 2014).

As next table 6 shows, the results from the various surveys indicate that fertility levels declined almost continuously in Egypt between the 1980 EFS and the 2008 EDHS. The decline in fertility was especially rapid during the period between the mid-1980s and the mid-1990s. During the period between the 1995 and 2008 EDHS surveys, the downward trend in the TFR continued but at a much slower pace, especially in the period between the 2003 and 2008 EDHS surveys. Reversing the long- term pattern of declining fertility, the TFR rose substantially during the six-year period between the2008 and 2014 surveys, from a level of 3.0 births per woman to 3.5 births per woman.

Table 6: Trends in fertility

Age-specific fertility rates (per 1,000 women) and total fertility rates, Egypt 1980-2014

Age	EFS 1979-1980[1]	ECPS 1983-1984[1]	1988 EDHS 1986-1988[2]	1991 EMCHS 1990-1991[1]	1992 EDHS 1990-1992[2]	1995 EDHS 1993-1995[2]	2000 EDHS 1997-2000[2]	2003 Interim EDHS 2000-2003[2]	2005 EDHS 2002-2005[2]	2008 EDHS 2005-2008[2]	2014 EDHS 2011-2014[2]
15-19	78	73	72	73	63	61	51	47	48	50	56
20-24	256	205	220	207	208	200	196	185	175	169	213
25-29	280	265	243	235	222	210	208	190	194	185	200
30-34	239	223	182	158	155	140	147	128	125	122	134
35-39	139	151	118	97	89	81	75	62	63	59	69
40-44	53	42	41	41	43	27	24	19	19	17	17
45-49	12	13	6	14	6	7	4	6	2	2	4
TFR 15-49	5.3	4.9	4.4	4.1	3.9	3.6	3.5	3.2	3.1	3.0	3.5

Note: Rates for the age group 45-49 may be slightly biased due to truncation.
Source: El-Zanaty and Way, 2009, Table 4.4
[1] Rates are for the 12-month period preceding the survey.
[2] Rates are for the 36-month period preceding the survey.

The next figure 7 highlights that all age groups shared in the recent rise in fertility rates except women age 40-49 years. The increase was highest among women in the 20-24 age group; fertility rose by 26 percent in this age group between the 2008 EDHS and the 2014 EDHS. As a result of the differences in the pace of fertility change across various age groups, childbearing has become somewhat more concentrated among women under age 30. Currently, a woman will have an average of 2.3 births by her 30th birthday, roughly two-thirds of her lifetime births.

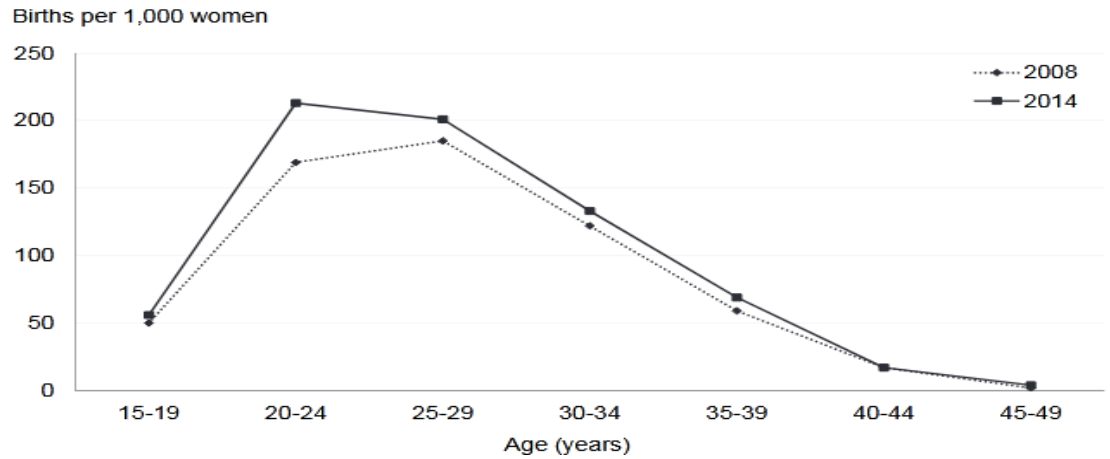

Figure 7: Trends in age-specific fertility, Egypt 2008-2014

Key Findings 2021:

A) The total fertility rate for the three years prior to the EFHS-2021 is 2.85 births per woman, around 0.7 births decline than the level observed in 2014.

B) The total fertility rate is 3.16 births per woman in rural areas, around 33% higher than the rate in urban areas (2.37 births).

C) Total fertility rates differ clearly by region, where TFR declines significantly in Urban Governorates to reach the lowest level of 2.18 births per woman, while the TFR reaches the highest level in rural Upper Egypt (3.63 births per woman) and Frontier Governorates (3.41 births per woman).

D) Total fertility rate has significantly dropped in rural Lower Egypt to reach 2.75 births per woman, around 0.8 births less than the level in 2014.

E) One-fifth of non-first births were born within 24 months of a prior birth, an interval which has been shown to place a child at higher risk of mortality.

F) Childbearing begins early for many Egyptian women; more than one-quarter of women in the age 25-49 years had their first birth by age 20, and 45% gave birth by age 22.

G) 5% of adolescents are already mothers, and around 1% is pregnant with their first child.

Key Findings 2014:

A) The total fertility rate for the three years prior to the 2014 EDHS is3.5 births.

B) In rural areas, the total fertility rate is 3.8 births per woman, around 30 percent higher than the rate in urban areas (2.9 births).

C) Reversing a more than 25-year pattern of declining fertility, the total fertility rate rose substantially during the six-year period between the2008 and 2014 surveys, from a level of 3.0 births per woman to 3.5 births per woman.

D) All geographic areas shared in the rise in fertility that occurred between the 2008 and 2014 EDHS surveys except the Urban Governorates where the rate dropped from 2.6 births in 2008 to 2.5 births in 2014.

E) One-fifth of non-first births were born within 24 months of a prior birth, an interval which has been shown to place a child at higher risk of mortality.

F) Childbearing begins early for many Egyptian women; more than one- quarter of women age 25-49 had their first birth by age 20, and 45 percent gave birth by age 22.

G) Seven percent of adolescents are already mothers, and 4 percent are pregnant with their first child.

8. Desire for More Children 2021&2014

During the EFHS-2021, information was obtained on fertility preference by asking non-sterilized currently married women the question: "Would you like to have (a /another) child, or would you prefer not to have any (more) children?" For pregnant women, the question was prefaced by the wording, "After the child you are expecting. . ..". Women who wanted more children were then asked how long they would like to wait before the birth of their next child. Sterilized women were considered for the purposes of the fertility preference tabulations presented in this chapter, as wanting no more children.

The next figure shows the reproductive intentions of currently married women interviewed in the EFHS-2021. Data indicated that the majority of married women did not want any more children (66%) or were sterilized (2%). Almost all the remaining women (28.5%) wanted another child or undecided. Among those wanting another child, data indicated that 13% of all currently married women— wanted a child soon (within two years), and 11% wanted to wait two years or more to have the next birth or were unsure of when they wanted another child. It was observed that the fertility preferences of the EFHS-2021 respondents are not very different from the preferences expressed at the time of the 2014 EDHS when 59% of currently married women did not want another child or were sterilized, 11 % wanted to delay the next birth and 13 wanted another child soon.

During 2014 EDHS obtained information on fertility preference by asking non-sterilized currently married women the question: "Would you like to have (a/another) child, or would you prefer not to have any (more) children?" For pregnant women, the question was prefaced by the wording, "After the child you are expecting. . . ." Women who wanted more children were then asked how long they would like to wait before the birth of their next child. Sterilized women were considered to want no more children for the purposes of the fertility preference tabulations presented in this paper.

The next figure shows the reproductive intentions of currently married women interviewed in the 2014 EDHS. The majority of married women did not want any more children (59 percent) or were sterilized (1 percent). Almost all of the remaining women (33 percent) wanted another child. Among those wanting another child, the majority—18 percent of all currently married women—either wanted to wait two years or more to have the next birth or were unsure of when they wanted another child. Less than half of the women who wanted another child—15 percent of all currently married women—wanted a child soon (within two years). The fertility preferences of the2014 EDHS respondents are not very different from the preferences expressed at the time of the 2008 EDHS when 62 percent of currently married women did not want another child or were sterilized, 17 percent wanted to delay the next birth, and 14 wanted another child soon.

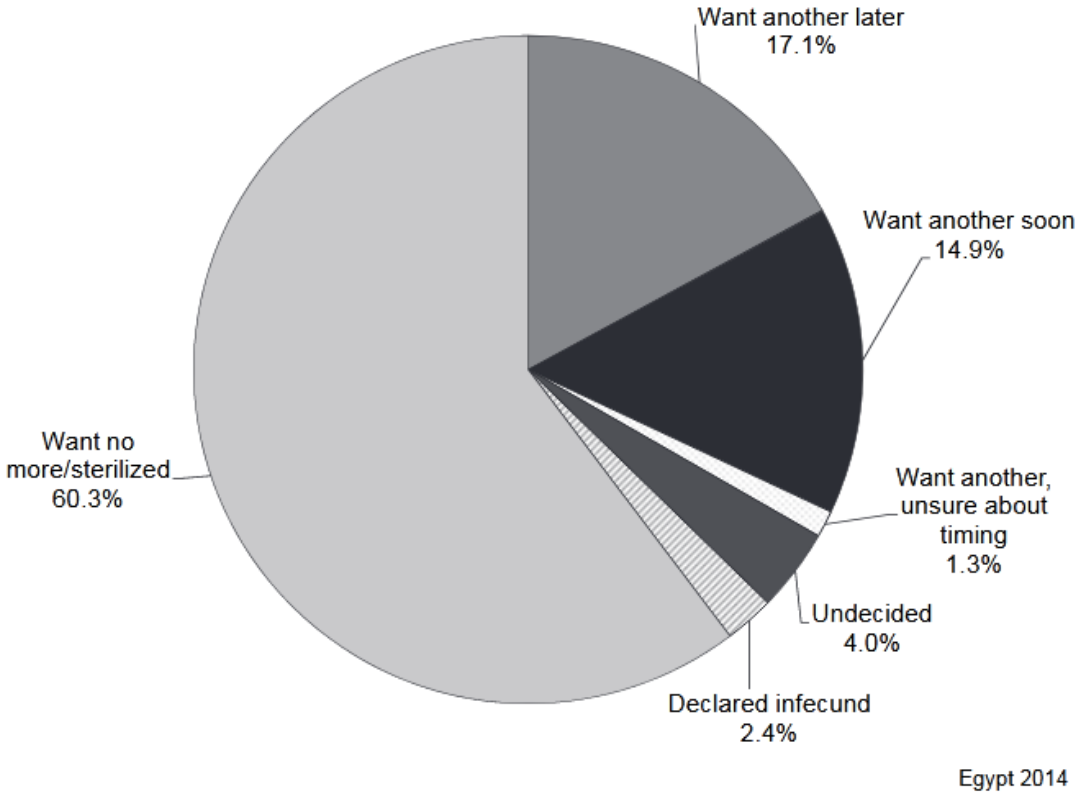

Figure 8: Desire for more children among currently married women

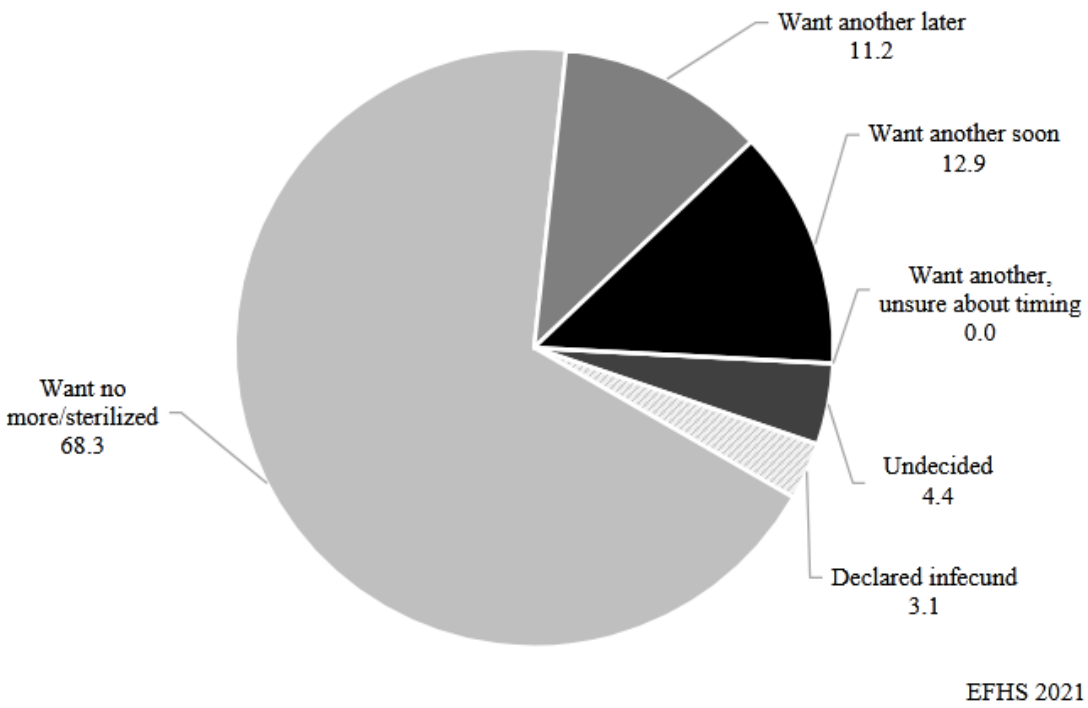

Figure 9: Desire for more children among currently married women

Key Findings 2021&2014:

A) Around seven in ten currently married women do not want another birth or are sterilized, and 11 % would like to delay the next birth for at least two years.

B) The total wanted fertility rate (2.14 births per woman) is less by around 0.7 birth than the current TFR (2.85 births per woman) and less than the wanted fertility observed in EDHS-2014 (2.4 births per woman) which indicates more decline in TFR in the future if women achieve their fertility preferences.

Key Findings:

A) Six in ten currently married women do not want another birth or are sterilized, and 17 percent would like to delay the next birth for at least two years.

B) The total wanted fertility (2.8 births per woman) is lower than the current TFR (3.5 births per woman) but higher than the wanted fertility rate at the time of the 2008 EDHS (2.4 births per woman).

Table 7: A comparison Table of Fertility Rates Trends During 1979-2021

TREND	Year	Value	Up or Down
TFR 15-49	1979-1980	5.3	Starting Period
TFR 15-49	1983-1984	4.9	0.4 Down
TFR 15-49	1986-1988	4.4	0.5 Down
TFR 15-49	1990-1191	4.1	0.3 Down
TFR 15-49	1990-1992	3.9	0.2 Down
TFR 15-49	1993-1995	3.6	0.3 Down
TFR 15-49	1997-2000	3.5	0.1 Down
TFR 15-49	2000-2003	3.2	0.3 Down
TFR 15-49	2002-2005	3.1	0.1 Down
TFR 15-49	2005-2008	3.0	0.1 Down
TFR 15-49	2011-2014	3.5	0.5 Sharp Increase
TFR 15-49	2019-2021	2.85	0.65 Sharp Down

Researcher ordering related to total fertility rates trends in EDHS during 1979-2021

A low individual's income is a basic hypothesis

9. Conclusions and Contributions

The decreasing relationship between the two variables demonstrates the connection between fertility choices and economic and social considerations. In general, the poor countries tend to have higher levels of fertility than rich countries.

In particular, women tend to give birth to no fewer than three children in countries where GDP per capita is below $1,000 per year. In countries where GDP per capita is above $10,000 per year, women tend to give birth to no more than two children.

This decreasing relationship between fertility and income is well known to economists and demographers alike. In addition, it holds true over time: Rich countries, such as the U.S., have experienced a remarkable decline in their fertility rate as they became rich. Also, the relationship holds at the individual level, as rich families tend to have fewer children than poor families.

Ddeveloping countries with low income tend to have higher fertility rates, leading to them being referred to as "young societies." Contrast this with developed countries with high income, where fertility rates are typically lower and immigration plays a significant role in sustaining population growth.

The total fertility rates in Arab Republic of Egypt stayed in the fourth stage which mentioned in this paper which related to low income and low fertility rates for past 20 years and then transformed from stage number four to stage number two which related to low income and high fertility and from 2015-2021 EDHS the total fertility rates transformed directly to the fourth stage again as low income and low fertility.

Why is fertility so much higher in poor countries? There are several possible reasons:

- Time is relatively cheap in poor countries, so spending time away from work to take care of a child is not as costly as in a rich country. If this effect is strong enough, it can (and probably does) offset the fact that it is difficult to afford a child on a low income.
- A child may require more education to be successful in a rich country. Thus, a child may be more costly there, so families may opt to have fewer, more educated children.
- Infant mortality can play a role. More births might be needed to achieve a desired number of surviving children when infant mortality is high, as it tends to be in poor countries.
- Children can take care of their parents when they are old. However, this is not necessary in rich countries with a well-developed social security system and functioning financial markets.
- Long staying in homes in Corona period.

Egypt situation now lies in Low average income and low fertility rates which can be called a rational fertility, which resulted from two basic factors: Poverty and relatively high awareness, which translates into low fertility rates, as low fertility rates may occur when there is a real desire to reduce family size, which comes in response to economic and social changes or the population environment that affects the living costs and cost of raising children as shown in Egypt DHS 2014 and DHS 2022 and age and sex composition in 2015. This is a result of the decline in income Egypt in general and the rise in the living costs, especially after the ongoing flotation policies since mid-2016. And it is appeared very clearly in the World Bank team's Data for the years 2015-2020, which resulted in a decline in the value of the Egyptian pound to 75% of its value and also an increase in healthcare, school costs, and other requirements for procreation and life requirements in general.

These previous research efforts have contributed to a better understanding of wealth-based disparities in fertility, the spatial distribution of fertility behaviors in Arab Republic of Egypt.

10. Recommendations for Further Research

1. **In-Depth Socioeconomic Analysis**: Conduct in-depth qualitative and quantitative research to explore the specific socioeconomic and cultural factors influencing fertility decisions across different income groups in Egypt. This would provide a more comprehensive understanding of the unique dynamics at play within each stratum.
2. **Longitudinal Studies**: Undertake longitudinal studies to track changes in fertility behaviors and economic circumstances over time, allowing for a more nuanced understanding of the evolving relationship between income and fertility in Egypt.
3. **Policy Impact Assessment**: Evaluate the impact of existing policies related to education, healthcare, and family planning on fertility rates in Egypt to inform the design of future interventions.
4. **Comparative Studies**: Conduct comparative studies with other countries that have undergone similar demographic transitions to gain insights into effective strategies for managing fertility rates amidst economic development.
5. **Qualitative Research**: Employ qualitative research methods such as focus group discussions and in-depth interviews to capture the lived experiences and perspectives of individuals regarding fertility decisions and economic considerations.
6. **Interdisciplinary Approaches**: Foster interdisciplinary research collaborations integrating economics, demography, sociology, and public health to comprehensively examine the multifaceted determinants of fertility in Egypt.
7. **Policy Evaluation**: Assess the effectiveness of policy measures targeted at addressing fertility rates and economic development, providing valuable insights for evidence-based policy formulation.

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