Factors Affecting the Number of Live Children Per Woman in Egypt Using Poisson Regression Model

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Abstract: **The overall fertility rate in Egypt is to be decreased from 3.5% children per woman to 2.4% by 2030, which is one of the most significant sustainable development goals. Egypt's overall fertility rate began to increase in 2008, peaking at 3.5 births per woman in 2014. (Ministry of Health and Population et al). The study focuses on the demographic, social, and cultural aspects that are crucial in reducing the overall number of children born to each woman. In order to identify the background factors that can contribute to a decrease in the total number of children ever born for each woman, we used the Egypt Demographic and Health Survey 2014 data [EDHS-2014]. The study provides in-depth information on Egypt's demographic, socioeconomic variables as well as birth events. The data include 4,336 married women 15 to 49 years. The Poisson regression model is used in the paper's analysis of the data. According to the study, the most significant characteristics that contribute to a decrease in the number of children per woman include education level attained, exposure to family planning messages, place of residence, wealth index, female employment, and contraceptive use. One of the most recommendations for this study is that the government continues its support for investments in education and improve the standard of living programs. The results show that the government has to increase the number of family planning service locations and step up its efforts to target fertility control.**

I. INTRODUCTION

Recently fertility in Egypt increase in worrying change of direction, where population has doubled since the early 1980s to reach 84 million in 2014 Egypt. This study focuses on the Demographic, socioeconomic and cultural factors which are very important to decline the number of children ever born for every woman Demographic and Health Survey 2014 data [EDHS-2014]. After years of low fertility, fertility in Egypt has risen to its highest level in two decades, reaching 3.5 births per woman (Radovich et al., 2018). Changes in fertility levels, availability to and usage of contraception, and age at first marriage all have an impact on fertility rates (Rutayisire et al., 2014). Changes in women's traits and reproductive behaviour as a result of those changes lead to changes in fertility (El Misery,2020). According to research by Bongaarts (2003), at later points in the fertility transition, differences in fertility by education level tend to decline. Women's socio-economic factors, particularly as evaluated by education and wealth index, are one of the main determinants of fertility, according to several studies (Krafft, 2016; McDonald, 2000b). Socioeconomic and demographic factors can be viewed as both causes and effects of the sharp fluctuations in the fertility rates in Egypt (El-Zanaty, 2011). In our study, we focused on the role that social, economic, and demographic determinants for women have in changing fertility rates. In this work, we employed Egypt's Poisson regression model to analyse the change in fertility using the number of children ever born (CEB) as the measure of fertility.

II. STUDY OBJECTIVE

Each year, the population in Egypt still grows by approximately 1.5 million people. The objective of the current population strategy of Egypt aims to reduce the fertility rate to 2.4 births per woman by 2030. The aim of this study is to identify the determinants that can lead to a decline in fertility levels in Egypt. Fertility measures can be calculated by using many techniques. The number of children ever born is one of the important ways to study the fertility levels (Dribe et al., 2015). In this study, one tries to focus on the variables which affect the fertility decline in Egypt. The proximate variables are the only determinants through which the background factors can affect fertility (Bongaarts,1978, Zaky and Mostafa, 2006, El Misery and Mohamed, 2018). One determines Socioeconomic and demographic variables which of these variables has a high influence on the fertility decline (Zaky,2005, Moustafa et al., 2022). The aim of this study is to examine the background variables which are very important to decline the number of children ever born for every woman. We use Egypt Demographic and Health Survey 2014 data [EDHS-2014] using Poisson regression model.

III. DATA AND METHODS

3.1 Data

The 2014 round of the Egypt Demographic and Health Survey [EDHS-2014] provides detailed information about demographic and socioeconomic of Egyptian households. Socioeconomic variables that are included in this study are region of residence, respondent's education, female employment status, husband's education, and wealth index. Demographic variables which are included in this study are age at marriage, respondent's age (mother's age at birth), sex composition of children already born (sex of prior birth), survival of prior birth, and fertility desire. The proximate variables that are included in this study are contraceptive use, exposure to family planning messages. Data also include detailed information about the birth histories and the number of children ever born.

3.2 Methods

The response variable used in the study was the number of children ever born (CEB) The paper used the number of children ever born for every woman (CEB) to measure the

fertility level. The explanatory variables include; socioeconomic variables, demographic variables and the proximate variables Poisson regression model is a special case of Models of generalized linear. It is a standard model for count data. It is useful in studying the occurrence per unit time conditional on some covariates (Colin. and Pravin, 2013). Poisson regression model is derived from the Poisson distribution by allowing the intensity parameter μ to depend on covariates (regressors). The Poisson loglinear model with explanatory variable X is a Poisson regression is used to analyze the most important factors that affecting the CEB. The incident rate ratio (IRR) of the findings is exponentiated using the coefficients. The incident rate ratio demonstrates the impact of changes in X (an independent variable) on the rate at which Y (CEB) happens.

$$ln \: ln \: (\mu_i) \: = a + X_i\beta_i$$

where, μ_i is the expected number of children born to a respondent based on the respondent's demographic and socioeconomic variables; X_i are independent factors; α is a constant and β_i represent coefficients linked to the explanatory factors. the study focuses on the background variables which result fertility decline.

IV. RESULTS

Using data from [EDHS-2014], the model proposed in section 3.2 is fitted. The results are shown in Table 1. The results of Poisson regression are discussed. Concerning The rate ratio of CEB, the covariates used in the model are region of residence, respondent's education, female employment status, husband's education, and wealth index. Also, age at marriage, respondent's age (mother's age at birth), sex composition of children already born (sex of prior birth), survival of prior birth, and family size preference. The last group of variables are contraceptive use, exposure to family planning messages that can affect CEB.

From the following table, the model is significant. As for continuous variables, the results show that age at first marriage, and respondent's age are significant. As for categorical or dummy variables, we analyze each categorical variable by using the reference category and comparing the other categories to it. The results of the following table show that region of residence, respondent's education, female employment status, husband's education, and wealth index, sex composition of children already born, survival of prior birth, and Family size preference. Also, contraceptive use, exposure to family planning messages are significant variables.

As for region, the results indicate that it is important in determining the expected number of children born. In addition, the wealth index influences the expected number of children born. As for the characteristics of the birth the results show that survival of prior birth and sex of prior birth are both important in determining the expected number of children born. Concerning the additional wife's characteristics such as family

size preference, the results clearly indicate that it is important in determining the expected number of children born.

Concerning the husband's characteristics, the results clearly indicate that the husband's educational level is important in determining the expected number of children born.

Table 1: Summary results for Poisson regression model for Socio-economic and demographic factors associated with children ever-born, EDHS-2014

Variables		
Background variables	RR(exp^β)	Se
female employment status		
Not employed	(Reference)	
Employed	0.487	0.359**
Household wealth index		
Lowest quintile	(Reference)	
Second quintile	0. 869	0.120
Middle quintile	0.777	0.310
Fourth quintile	0.596	0.149***
Highest quintile	0.294	0.132***
Region of residence		
Greater Cairo	(Reference)	
Alexandria and the Suez Canal cities	0.468	0.0301
Urban Lower Egypt	1.231	0.0501**
Urban Upper Egypt	1.315	0.0542**
Rural Lower Egypt	1.423	0.0651**
Rural Upper Egypt	1.521	0.754**
respondent's education		
No education	(Reference)	
Primary	1.869	0.654
Secondary	0.828	0.141***
University degree	0.543	0.434**
husband's educational level		
No education	(Reference)	
Primary	0.183	0.048
Secondary	0.755	0.033**
University degree	0.486	0.127**
age at marriage,	1.48	0.764***
respondent's age	0.62	0.57***
sex composition of children already born		
Female	(Reference)	
Male	0.689	0.039***
survival of prior birth		
No	(Reference)	
Yes	0.70	0.67***
Family size preference		
0–2 Children	(Reference)	
3–4 Children	1.5	0.84***
5+ Children	2.01	0.91***
contraceptive use		
Not using	(Reference)	
Using	0.60	0.55***
exposure to family planning messages		
No	(Reference)	
Yes	0.57	0.50***

Significance: **=5%; ***=1%

As for region, the fitted model indicates that there is no significant difference between the mother who lives in Greater Cairo and Alexandria and the Suez Canal cities. However, the expected number of children born increases by 23 percent if the mother lives in urban lower Egypt compared to the one living in Greater Cairo. The expected number of children born increases by 32 percent if the mother lives in Egypt of urban upper compared to the one living in Greater Cairo. The expected number of children born increases by 42 percent, and by 52 percent if the mother lives in rural lower Egypt, and if the mother lives in rural upper Egypt compared to the one living in Greater Cairo.

As for female employment status, the fitted model indicates that the expected number of children born decreases by 51 percent if the mother employed compared to the one not employed.

For the education of woman, the results show that, having secondary education or higher is associated with lower expected number of children born compared to not educated women. The expected number of children born for respondents who have secondary education have almost 17% lower than those who have no education while the expected number of children born those with higher education have 56% lower than females who have no education.

As for wealth index, the results clearly indicate that there is no significant difference between the second quintile, the middle quintile, However, the expected number of children born for respondents decreases by 40 % if the household wealth was in the fourth quintile and by 71% if the household wealth was in the highest quintile compared to (lowest quintile).

V. CONCLUSION

This study investigates the effect of women's socioeconomic and demographic factors that may help in reducing the number of children per woman. The government should keep funding initiatives to raise the standard of living and invest in education, as this is one of the study's main suggestions. The results indicate that the government needs to increase the number of family planning service locations and intensify outreach programmes that concentrate on fertility control.

The paper tries to analyze how contraceptive use effects on fertility in the Egyptian. Also, it investigates the effect of female's participation in the workforce, and women's participation in decision-making on the expected number of children ever born. Results show females with low educated, low income, not employed have higher expected number of children ever born than those who have highly educated, highly income, and employed.

The government must continue to support media campaigns that promote family planning and fertility control since doing so will increase the use of contraceptives and modify people's views toward having large families.

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