Patterns and Determinants of Gap between Fertility Intentions and Fertility Outcomes in Egypt

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Abstract:

This paper describes the current fertility behavior and fertility intentions in Egypt. Moreover, the current paper used Logistic regression model to reveal the factors determining gap between fertility intentions and fertility behavior in Egypt. According to data from Egypt Demographic and Health Survey (EDHS) in 2014, the mean ideal number of children is 3.01 and the mean number of children ever born is 2.69. The results indicate that the higher values of mean ideal number of children and mean number of CEB are demonstrated among uneducated women and families who have child mortality. The findings reveal that wealth index, women's age and women's education decrease the gap between fertility intentions and fertility behavior, while child mortality increases the probability of having a gap between fertility intentions and fertility behavior.

Keywords: Fertility - Fertility intentions – Fertility behavior – Ideal number of children – Gap- Logistic regression model – Egypt

Introduction

Fertility is among the most important components of population growth and age structure change [UN, 2020]. Investigation of current fertility is essential in monitoring the progress in any country. Additionally, it is necessary to evaluate the fertility desires in a population for predicting future fertility and to determine the potential unmet need for family planning [Ministry of Health and Population 2015]. Fertility has witnessed a major decline in the world for the past few decades. Globally, fertility rate in 1990 compared to 2019 declined from 3.2 to 2.5 live births per woman. Over the same period, total fertility in sub-Saharan Africa decreased from 6.3 to 4.6 births per woman [UN, 2020]. Moreover, fertility levels declined in Egypt from 4.58 births per woman in 1990 to 3.28 in 2019 [Knoema 2020].

Across 22 European countries, for every 100 births intended, about 60 births on average occur. Most couples have fewer children than they intended to have, resulting in a gap between fertility behavior and fertility intentions (desired family size) (Harknett and Hartnett 2014). Fertility behavior is the actual number of children for women. Fertility intentions is defined as the number of children couples would have if there were no subjective or economic problems involved in regulating fertility (McClelland 1983).

While much has been written on the determinants of actual and desired fertility in the worldwide (Bhuyan 1996; Choudhury et al.1976; Dinc et al. 2007; Ghaffar and Bhuyan 2000; McNamee 2009, Uddin et al 2011) and in Egypt (Abdel-Hakim 1990; Casterline et al. 2004; Ibrahim 2014), comparatively little is known about the determinants of the gap between actual and desired fertility in the worldwide (Channon and Harper 2019; Forero and Gamboa 2009; Yong and Wei 2019). Therefore, this paper tries to give an overview of the present status of fertility behavior compared to fertility intentions in Egypt. Additionally, the current paper aims to explore if the

gap between actual and desired fertility varies by characteristics of women in Egypt. Finally, our review of these research studies demonstrated that the determinants of gap between actual and desired fertility have not been examined in Egypt. To fill this gap, this current paper intends to explore the determinants of gap between actual and desired fertility in Egypt.

Data Source

The current paper used data from 2014 Egypt Demographic and Health Survey (EDHS) which the most recent dataset available in Egypt. This cross-sectional survey was made under authority of El-Zanaty and the Ministry of Health. It consisted of 21,762 ever married women aged 15 – 49. Our present study included 20,884 women who mentioned their ideal number of children and number of children ever born. Table (1) presents the definition and measurement of the variables used in our study.

Table (1): Definition and Measurement of the Dependent and Independent Variables

Variable	Definition	Measurement
Gap in fertility	Binary variable. It is calculated by finding the difference between ideal number of children and number of children ever born. If the two numbers are equal, there is no gap.	0: No gap between fertility intentions and fertility behavior 1: Gap between fertility intentions and fertility behavior
Place of residence	Dummy variable shows the type of place of residence whether urban or rural area	0: Urban 1: Rural
Wealth index	It is a proxy variable for economic status	1: Poorest 2: Poorer 3: Middle 4: Richer 5: Richest

Women's age	Age of woman in 5-year groups. We recode it to 3 categories.	1:15-24 2:25-39 3:40-49
Woman's education	Categorical variable: the highest level of education of woman	0: No education 1: Incomplete primary 2: Complete primary 3: Incomplete secondary 4: Complete secondary 5: Higher
Husband's education	Categorical variable: the highest level of education of husband.	0: No education 1: Incomplete primary 2: Complete primary 3: Incomplete secondary 4: Complete secondary 5: Higher
Listening	Dummy variable: listening to Radio is one of means to know exposure to the media for women	0: No 1: Yes
Watching	Dummy variable: watching Television is one of means to know exposure to the media for women	0: No 1: Yes
Reading	Dummy variable: reading Newspapers is one of means to know exposure to the media for women	0: No 1: Yes
Terminated pregnancy	Dummy variable: Ever woman had a terminated pregnancy	0: No 1: Yes
Gender structure of children	Categorical variable is calculated by compare two variables: number of sons at home and	0: Girls equal boys 1: Girls less than boys 2: Girls more than boys 3: Only girls

	number of daughters at home	4: Only boys
Contraceptive use	Dummy variable: whether woman use any contraceptive method	0: No 1: Yes
Woman's work	Dummy variable: whether woman works for cash or not	0: No 1: Yes
Parents' desire for children	Categorical variable shows the desire of the husband and her wife for children	1: Both want same 2: Husband wants more 3: Husband wants fewer
Surviving child status	Dummy variable: whether woman has any child mortality or not.	0: Not all survived 1: All survived

Methodology

This study aims to test the following statistical hypothesis: H_o: There is not gap between fertility intentions and fertility behavior. H_1: There is a gap between fertility intentions and fertility behavior

This paper measures the gap between fertility intentions and fertility behavior by calculating the difference between ideal number of children and number of children ever born (CEB). The differences are dichotomized into: "no gap between fertility intentions and fertility behavior" and "gap between fertility intentions and fertility behavior". The gap means that ideal number of children does not equal number of children ever born.

Two types of indicators are used in the descriptive statistics. The first is comparing the average ideal number of children and the actual number of births of women with different characteristics. The second is testing the statistical significance

association of the distribution of the difference between ideal number of children and number of CEB across explanatory variables by using Chi-square test.

Since the dependent variable, gap between fertility intentions and fertility behavior, is measured as a binary outcome variable, the Logistic regression model is used. The determinants potentially affecting on gap between actual and desired fertility that were included in our study were women's age, contraceptive use, place of residence (urban and rural), having a terminated pregnancy, husband's desire for children, wealth index, status of surviving children, region, gender structure of childbearing children, work status and education of wife and husband.

Logistic regression analysis (LRA) expands the techniques of multiple regression analysis to explore circumstances in which the dependent variable is binary (Dayton 1992).

For a binary response variable Y and a single independent variable X, recall that $\pi(x)$ denotes the "success" probability at value x [i.e. the probability that the event Y occurs, P(Y=1)]. The logistic regression model has linear form for the logit of this probability,

$$Logit[\pi(x)] = Log\left(\frac{\pi(x)}{1-\pi(x)}\right) = \alpha + \beta x$$

Using the exponential function $\exp(\alpha+\beta x) = e^{\alpha+\beta x}$, the logistic regression implies the following formula for the probability $\pi(x)$,

$$\pi(x) = \frac{\exp(\alpha + \beta x)}{1 + \exp(\alpha + \beta x)}$$

In the case of the general logistic regression model with k predictors, the model for the log odds is:

$$Logit[P(Y = 1)] = \alpha + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k$$

The parameter β_i denotes to the effect of X_i on the log odds that Y =1, controlling the other Xs. For example, $\exp(\beta_i)$ is the multiplicative effect on the odds of a 1-unit increase in X_i, at fixed levels of the other Xs (Agresti 2007).

Results

Table (2) summarizes the average ideal number of children and the actual number of children ever born (CEB) for women with different characteristics. One can observe that the average ideal number of children is 3.01 and the average number of CEB is 2.69

The descriptive analysis indicates that the higher values of mean ideal number of children (3.58) and mean number of CEB (3.05) are observed among women live in rural areas especially in rural upper Egypt. Moreover, both average ideal number of children and average number of CEB are higher in upper Egypt than lower Egypt.

The findings demonstrate that there is a decrease in both mean ideal number of children and average number of CEB with increase in level of wealth index. Data from Table (2) shows that average ideal number of children and average number of CEB for mothers from the poorest quintile was 3.42 and 3.36 respectively, while these two means for women from the richest quintile decreased to 2.76 and 2.27 respectively. Moreover, one can notice that the mean ideal number of children is greater than the mean number of CEB for all quintiles of wealth index.

The results show that the higher values of average ideal number of children (3.66) and average number of CEB (3.11) are observed among families whose wife's desire for children is more

than husband's desire. Governmental policies should target wives not husbands to decrease fertility.

As shown in Table (2), there is an increase in both average ideal number of children and mean number of CEB with increase in women's age. Moreover, average ideal number of children (2.82) is higher than average number of CEB (1.16) for younger mothers, while the opposite is observed for older women.

Regarding gender structure of children, Table (2) indicates that the higher values of average number of CEB are observed among families who have girls more than boys. On the other hand, mean number of CEB is greater among mothers who use contraceptive methods (3.07) than those who do not use (2.12).

The findings indicate that the mean ideal number of children and average number of CEB are higher among families who have child mortality than those who do not have. Data from Table (2) shows that average ideal number of children and average number of CEB for families who have child mortality was 3.53 and 4.72 respectively, while these two means for families who do not have child mortality decreased to 2.96 and 2.48 respectively.

Regarding women's education, one can observe that the average ideal number of children of women with illiteracy and incomplete primary is less than the mean number of CEB; meanwhile, the mean ideal number of children starts to be greater than mean number of CEB from women with complete primary.

Table (2): Average ideal number of children and average number of children ever born with different characteristics for women

characteristics		Average ideal number of children	Average number of children ever born
Women's age	15-24	2.82	1.16
	25-39	2.96	2.70
	40-49	3.29	3.84
Place of residence			
Rural		3.09	2.76
Urban		2.87	2.51
Region			
Urban governorates		2.75	2.34
Urban Lower Egypt		2.73	2.46
Rural Lower Egypt		2.75	2.57
Urban Upper Egypt		3.12	2.75
Rural Upper Egypt		3.58	3.05
Frontier governorates		3.46	2.64
Education of women			
No education		3.34	3.52
Incomplete primary		3.23	3.32
Complete primary		3	2.83
Incomplete secondary		3	2.41
Complete secondary		2.86	2.40
Higher		2.84	2.05
Woman's work	No	3.03	2.67
	Yes	2.9	2.72
Terminated pregnancy	No	2.97	2.57
	Yes	3.17	3.07
Contraceptive use	No	3.10	2.12
	Yes	2.95	3.07
Wealth index	Poorest	3.42	3.36
	Poorer	3.21	2.98
	Middle	2.92	2.51
	Richer	2.83	2.39
	Richest	2.76	2.27

Listening	No	3.05	2.71
	Yes	2.89	2.56
Watching	No	3.21	2.89
	Yes	3.01	2.67
Reading	No	3.04	2.71
	Yes	2.85	2.44
Husband's education			
No education		3.27	3.37
Incomplete primary		3.13	3.20
Complete primary		3	2.85
Incomplete secondary		2.96	2.65
Complete secondary		2.95	2.44
Higher		2.91	2.29
Parents' desire for children			
Both want same		2.94	2.67
Husband wants more		3.05	2.67
Husband wants fewer		3.66	3.11
Gender structure of children			
Girls equal boys		2.89	1.98
Girls less than boys		3.37	3.89
Girls more than boys		3.31	3.99
Only girls		2.83	2.05
Only boys		2.85	2.28
Surviving child status			
Not all survived		3.53	4.72
All survived		2.96	2.48
Mean		3.01	2.69

Table (3) introduced percentage distribution of gap between actual and desired fertility among women with different characteristics with Chi-square test. The results show that wealth index significantly decreases the gap in fertility (gap between fertility intentions and fertility behavior). About 73 percent of mothers who are in the poorest quintile had a gap in fertility, while this percentage declined to about 61 percent among mothers who are in the richest quintile.

The results demonstrate that there is a significant association between having a gap in fertility and women's age. About 86 percent among women aged 15-24 had a gap in fertility, while this percentage declined to 64 percent among mothers aged 40-49.

With respect to gender structure of children, Table (3) shows that about 66 percent of families who have the same number of boys and girls had a gap in fertility, while this percentage expanded to about 77 percent among families who have only girls. On the other hand, as indicated in Table (3), about 65 percent of parents who have the same desire for children had a gap in fertility, while this percentage expanded to about 79 percent among families whose husband's desire for children is less than the wife.

Regarding education, there is a significant association between education of women and having a gap in fertility. Table (3) shows that about 70 percent of mothers who have never gone school had a gap in fertility, while this percentage decreased to about 67 percent among mothers with university education or higher. On the other hand, women's work significantly decreases the gap in fertility. The findings demonstrate that 69 percent of mothers who do not work had a gap in fertility, while this percentage declined to 65 percent among mothers who work.

With respect to status of surviving children, Table (3) demonstrates that about 81 percent among women who have child mortality had a gap in fertility, while this percentage declined to 67 percent among mothers who do not have child mortality.

One can observe that exposure to the media significantly decreases gap in fertility. The findings demonstrate that 76 percent of mothers who do not watch Television had a gap in fertility, while this percentage declined to 68 percent among mothers who watch Television. Moreover, as can be seen from

Table (3), about 61 percent among women who use contraceptive method had a gap in fertility, while this percentage expanded to about 78 percent among mothers who do not use contraceptive method.

According to Table (3), a significant association between place of residence and having a gap in fertility is observed. About 63 percent of women live in urban areas had a gap in fertility compared about 71 percent among women live in rural areas. At the same time, there is a significant association between region and having a gap in fertility. The results show that the highest percentage of having a gap in fertility is observed among families who live in rural upper Egypt (76 percent), while the lowest percentage is in urban governorate (61 percent).

Table 3: Percentage distribution of gap between fertility intentions and fertility behavior among women with different characteristics

Characteristics		No gap in fertility	Gap in fertility	N
Women's age	15-24	13.9	86.1	3722
	25-39	35.6	64.4	11926
	40-49	35.8	64.2	5235
*Place of residence**	Rural	29.1	70.9	13565
	Urban	36.8	63.2	7319
*Region**				
Urban governorates		39.5	60.5	2655
Urban Lower Egypt		37	63	2235
Rural Lower Egypt		32.7	67.3	8147
Urban Upper Egypt		34	66	2333
Rural Upper Egypt		23.6	76.4	5348
Frontier governorates		27.3	72.7	165
*Woman's education**				
No education		30.3	69.7	4866
Incomplete primary		31.8	68.2	1251

Complete primary		33.6	66.4	866
Incomplete secondary		28.4	71.6	2798
Complete secondary		33.1	66.9	8167
Higher		33.3	66.7	2936
*Woman's work**	No	31.2	68.8	17892
	Yes	35.1	64.9	2992
*Terminated pregnancy**		32.1	67.9	16589
No		30.7	69.3	4295
Yes				
*Contraceptive use**		22.4	77.6	9352
No		39.4	60.6	11531
Yes				
*Wealth index**	Poorest	27.3	72.7	3616
	Poorer	30	70	4115
	Middle	30.4	69.6	4689
	Richer	31.9	68.1	4397
	Richest	39.1	60.9	4066
*Listening***	No	31.4	68.6	16259
	Yes	33.1	66.9	4624
*Watching**	No	23.8	76.2	311
	Yes	31.9	68.1	20572
*Reading**	No	31.4	68.6	17883
	Yes	34.3	65.7	3000
*Education of Husband**				
No education		33.2	66.8	3517
Incomplete primary		31	69	1771
Complete primary		34.5	65.5	1187
Incomplete secondary		30	70	2480
Complete secondary		31	69	8516
Higher		33.1	66.9	3410
*Parents' desire for children**				
Both want same		35.3	64.7	13043
Husband wants more		25.6	74.4	4599

Husband wants fewer	21.4	78.6	1012
Gender structure of children*			
Girls equal boys	33.6	66.4	6080
Girls less than boys	36.1	63.9	3457
Girls more than boys	31.9	68.1	2997
Only girls	23.5	76.5	3266
Only boys	32	68	5083
Surviving child status*			
Not all survived	19.2	80.8	1889
All survived	33	67	18994

*Sig. < 1%   **Sig.< 5%

Table (4) presents the results of goodness of fit of the logistic regression model to explore the determinants of gap between actual and desired fertility. One can observe that the final model can predict correctly about 70 percent of the cases. Additionally, chi-square is highly significant, so our model is significantly better.

Table (4): Goodness of fit for logistic regression for exploring the determinants of gap between fertility intentions and fertility behavior

Classification Table		Predicted		Percentage
		No gap	Gap	Correct
Observed	No gap	1381	4812	22.3
	Gap	992	12223	92.5
Overall Percentage				70.1
Chi-Square		1973.549		
Sig.		0.000		
Cox & Snell R Square		0.097		
Nagelkerke R Square		0.135		

Table (5) presents the significant variables of the logistic regression model to explore the determinants of gap between actual and desired fertility. The results of Table (5) demonstrate that women's education significantly decreases the likelihood of having a gap in fertility (gap between fertility intentions and fertility behavior). As indicated in Table (5), mothers who have achieved secondary are less likely to have a gap in fertility compared with mothers who have never attended school by about 17 percent (0.827 – 1 = - 0.173).

The analysis indicates that child mortality significantly increases the probability of having a gap in fertility. Table (5) shows that families who have child mortality are two times more likely to have a gap in fertility than those who do not have child mortality.

It is possible to observe that women from urban upper Egypt are more likely to have a gap in fertility than women from urban governorates by about 16 percent (1.163 – 1 = 0.163). Moreover, women from frontier governorates are more likely to have a gap in fertility than women from urban governorates by about 55 percent (1.546 – 1 = 0.546).

The findings reveal that the higher level of wealth index, the less likely the woman has a gap in fertility. According to Table (5), women from the poorer quintile are less likely to have a gap in fertility than women from the poorest quintile by about 9 percent. Moreover, women from the richest quintile are less likely to have a gap in fertility than women from the poorest quintile by about 17 percent.

One can observe that age of mother has a negative impact on the probability of having a gap in fertility. Data from Table (5) shows that women aged 25-39 and 40-49 years are less likely to have a gap in fertility than women aged 15-24 years by about 68

percent and 70 percent, respectively. Moreover, another predictor for having a gap in fertility was contraceptive use. Table (5) reveals that women who use contraceptive method are less likely to have a gap in fertility than women who do not use contraceptive method by about 55 percent.

As shown in Table (5), families whose husband's desire for children is less than the wife are two times more likely to have a gap in fertility than parents who have the same desire for children. Moreover, families whose husband's desire for children is more than the wife are more likely to have a gap in fertility than parents who have the same desire for children by about 41 percent.

Regarding gender structure of children, families who have only girls are more likely to have a gap in fertility than families who have same number of boys and girls by about 79 percent. Moreover, families who have only boys are more likely to have a gap in fertility than families who have same number of boys and girls by about 24 percent. Additionally, families who have girls less than boys are more likely to have a gap in fertility than families who have same number of boys and girls by about 30 percent. Also, families who have girls more than boys are more likely to have a gap in fertility than families who have same number of boys and girls by about 56 percent.

Table (5): Results of logistic regression for exploring the determinants of gap between fertility intentions and fertility behavior

characteristics	Odds Ratio (OR)	S.E.	Wald
Age of mother 15-24 (ref.)			
25-39	0.322*	0.056	416.50
40-49	0.300*	0.064	353.70
Region			
Urban governorates(ref.)			
Urban Lower Egypt	1.033	0.065	0.254
Rural Lower Egypt	1.180	0.360	0.211
Urban Upper Egypt	1.163**	0.066	5.28
Rural Upper Egypt	1.536	0.361	1.41
Frontier governorates	1.546***	0.240	3.30
Woman's education			
No education (ref.)			
Incomplete primary	0.853**	0.078	4.13
Complete primary	0.878	0.089	2.12
Incomplete secondary	0.829*	0.062	9.09
Complete secondary	0.827*	0.054	12.35
Higher	0.911	0.079	1.38
Contraceptive use No(ref.)			
Yes	0.454*	0.036	487.87
Wealth index Poorest (ref.)			
Poorer	0.907***	0.055	3.09
Middle	0.975	0.056	0.203
Richer	1.009	0.067	0.018
Richest	0.834**	0.085	4.52
Education of Husband			
No education(ref.)			
Incomplete primary	1.234*	0.070	8.98
Complete primary	1.087	0.080	1.09
Incomplete secondary	1.252*	0.065	11.88
	1.211*	0.056	11.66

Complete secondary Higher	1.259*	0.073	9.81
Parents' desire for children Both want same(ref.)			
Husband wants more	1.405*	0.041	70.48
Husband wants fewer	2.119*	0.081	85.69
Gender structure of children Girls equal boys(ref.)			
Girls less than boys	1.297*	0.050	27.05
Girls more than boys	1.562*	0.053	72.05
Only girls	1.787*	0.054	113.50
Only boys	1.244*	0.045	23.76
Surviving child status All survived (ref.)			
Not all survived	2.200*	0.066	143.24

*Sig. < 1%   **Sig.< 5%   ***Sig. < 10%

Discussion

One can observe that the average desired family size in Egypt is reasonable. The findings demonstrate that the average ideal number of children in Egypt is 3.01 as compared to 5 in sub-Saharan Africa (Channon and Harper 2019), 1.82 in China (Yong and Wei 2019) and 2.9 in other low and middle income countries (Channon and Harper 2019).

The results indicate that the higher values of average ideal number of children and average number of CEB are demonstrated among families who have child mortality. Moreover, child mortality increases the probability of having a gap in fertility. The findings of other studies also reflect that child mortality had a positive impact on level of fertility (Bhuyan 1996; Choudhury et al.1976. Ghaffar and Bhuyan 2000; Uddin et al 2011).

Consistent with previous findings (Yong and Wei 2019), actual number of births is higher than the desired number of children among women aged 40-49 who basically completed

childbirth. The findings show that age of mother has a negative impact on the probability of having a gap in fertility where older mothers are less likely to have a gap in fertility than younger mothers.

The analytical results reveal that with the increase in level of wealth index, decline in average of ideal number of children and CEB are demonstrated. The findings indicate that the lower values of average ideal number of children and average number of CEB are observed among women from the richest quintile. Moreover, wealth index decreases gap in fertility. This is also demonstrated in many studies (Bhuyan 1996; Uddin et al 2011).

It can be concluded that there is a negative relationship between education of women and having a gap in fertility where women's education decreases the likelihood of having a gap in fertility. Moreover, the high ideal number of children is noticed among highly educated women. This is also found in many countries worldwide (Beaujouan and Berghammer 2019; Channon and Harper 2019).

It can be noticed that mothers who utilize contraceptive methods are less likely to have a gap in fertility than women who do not use contraceptive methods. Moreover, mean number of CEB is higher among women who use contraceptive methods than those who do not use. This result is supported by a study in Bangladesh. This finding may be because of uneducated couples may utilize contraceptive methods without care which may lead them to unwanted pregnancy (Uddin et al 2011).

Consistent with previous findings (Yong and Wei 2019), gender structure of children is one of the predictor variables determining the gap between actual and desired fertility. The results indicate that families who have different number of boys and girls are more likely to have a gap in fertility than families who have same number of boys and girls. Moreover, families who

have only boys or girls are more likely to have a gap in fertility than families who have same number of boys and girls.

Concluding remarks

This paper tried to describe the current fertility behavior and fertility intentions in Egypt using data from EDHS in 2014. Additionally, Logistic regression model is utilized to explore the determinants of gap between fertility intentions and fertility behavior in Egypt. It can be concluded that there is no recent research on this variable in Egypt and this is the main contribution of our study.

The findings reveal that women's education decreases the probability of having a gap between actual and desired fertility. Therefore, governmental strategy should concentrate on those out of the formal educational system by giving more information about consequences of reproductive behavior.

Our paper did not be care whether fertility behavior is more or less than fertility intentions, but it aims to know whether there is a gap or not. Therefore, future research may explore determinants of underachieving, equaling, and overachieving fertility intentions in Egypt.

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