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Socioeconomic and Proximate Determinants of High Fertility in Timor-Leste

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Abstract

The purpose of this study was to examine the role of socioeconomic and proximate determinants in high fertility in Timor-Leste. The data used came from the 2016 Timor-Leste Demographic and Health Survey. The unit of analysis was women in union aged 35–49 years. The explanatory variables were socioeconomic and proximate background characteristics. The response variable was the number of children ever born. A Poisson regression analysis was employed to investigate the association between socioeconomic and proximate determinants and fertility. Government should improve maternal and child health care to reduce infant mortality and promote smaller ideal family size and marriage postponement, reduce unmet need for contraception, increase access to a mobile phone, enhance education access and employment opportunity for women, and socialize family planning and enhancing reproductive health and family planning program and fostering female labor force participation to encourage women and men to prioritize education and career over childbearing.

Keywords: Socioeconomic Determinants, Proximate Determinants, High Fertility, Timor-Leste

1. Introduction

Timor-Leste is characterized by a low development achievement. The United Nations Development Programme (UNDP) reported that in term of human development achievement, in 2021, Timor-Leste ranked at tn he 140th position of 191 countries in the world (United Nations Development Programme (UNDP) 2022). Of 11 countries in Southeast Asia, Timor-Leste was on the ninth position before Cambodia (the 146th) and Myanmar (the 149th). In 2021, the human development index (HDI) was 0.732 globally, 0.607 in Timor-Leste, lowest in South Sudan (0.385) and highest in Switzerland (0.962). This indicates that human development achievement in Timor-Leste is lower than human development achievement of the world on average.

Low development achievement in Timor-Leste can be partly attributed to its high population growth rate. Although the population is small, estimated to be around 1,321 million people in 2021, the population of Timor-Leste was estimated to grow at 1.62% per annum during 2020–2021 (United Nations, 2022). It means that Timor-Leste people will double within 43 years. In addition, in 2021 the age dependency ratio in Timor-Leste was 55th highest globally (68 population age 0–14 and 65 years and over per 100 population age 15–64). This population dynamic

of the country will have many challenging development implications, including the fulfillment of increasing needs of the people, in particular health, education, employment, food, energy, water, sanitation, housing and transportation. With its limitation as a young country, Timor-Leste must manage its population dynamic in order to improve the welfare of its people.

Specifically, Timor-Leste has to deal with its relatively high fertility rate that has caused its high population growth rate, and age dependency ratio. In its Strategic Development Plan 2011–2030, the Government of Timor-Leste recognized that its fertility is among the highest in the world and that lower fertility is an important factor of better health quality in Timor-Leste (República Democrática de Timor-Leste (RDTL). 2011). The results of the 2010 Population and Housing Census showed that on average a Timor-Leste woman would have about six children at the end of her reproductive age (National Statistics Directorate (Timor-Leste), 2010). This figure had declined to about four children per woman according to the results of the 2016 Timor-Leste Demographic and Health Survey (Ministry of Finance (Timor-Leste), 2010). But, fertility is relatively high in Timor-Leste and highest in Southeast Asia region.

High fertility is defined as five or more births per woman at the end of her reproductive age (General Directorate of Statistics, Ministry of Health and ICF. 2018). High fertility has detrimental implications on the health of children and mothers, child education, economic growth, capitalization of demographic dividend and natural environment. The probability of infant and early childhood death is higher for higher-order births and closely-spaced births and when the mother is over age 40. The likelihood of death caused by pregnancy, delivery and post-delivery complications is higher among mothers who have many children and among younger and older mothers. Therefore, the lifetime risk of maternal mortality can be reduced by lowering the average number of pregnancies each woman experiences. The chance to attain higher level of education is lower for children from large families. In addition, consecutively larger birth cohorts – a characteristic of higher fertility societies – diminish the quality of education by reducing the expenditure per student.

High fertility causes high population growth. Population growth relates negatively with economic growth: fertility decline increases productive output in the long-run. Fertility decline also results in the favorable population age structure of "demographic dividend" of larger share of productive age population relative to non-productive age population that can be capitalized through supporting human resources investment policies that can increase per capita productivity. High fertility and the consequential high population growth is a direct and proximate determinant of alarming scarcities of fresh water in many countries and global warming. Fertility decline through family planning is one of the more cost-effective ways for limiting global warming. The negative consequences of high fertility imply the importance of the investigation of its determinants. A rich theoretical and empirical literature of the determinants of fertility in low-income and traditional societies has been produced since the 1950s (Timor-Leste Demographic and Health Survey 2016, 2018) World Bank (WB), 2010,
Davis, K. & J. Blake J.,1956, Easterlin, Richard A. 1975)

For example, (Timor-Leste Demographic and Health Survey 2016, 2018) proposed that the socioeconomic determinants can affect fertility through the proximate determinants. The proximate determinants are grouped into intercourse factors, such as the age of entry into sexual unions, conception factors, such as the use or non-use of contraception and gestation factors (unmet need), such as the fetal mortality from involuntary causes (child mortality experience).

Meanwhile, the World Bank (General Directorate of Statistics, Ministry of Health and ICF.,2018), employing the Easterlin Synthesis Framework, proposed that the determinants of high fertility include factors influencing (i) the supply of children, such as the age at first union; (ii) the motivation to regulate fertility, such as the child mortality; the demand for children, such as the ideal number of children, unmet need for family planning, and socioeconomic factors (education, type of place of residence, working status, and household wealth status); and (iv) the costs of fertility regulation, such as non-access obstacles to contraceptive use (e.g. cultural barriers, such as religion).

The age at entrance to first union heavily determines the age at first birth and the pace of childbearing (General Directorate of Statistics, Ministry of Health and ICF.,2018). The faster the pace, the higher the likelihood a woman

will at any particular period have a supply of children that fits or surpasses her demand for children. Early start of union exposes women to early start of childbearing and long motherhood period than in turn exposes them to having many children ever born (Davis, K. & Blake. J., 1956). In high fertility societies, women tend to start union and childbearing at a relatively young age, less than 20 averagely. The empirical researches show that delayed marriage was associated with smaller number of children ever born (Rosenzweig, M. R., & Schultz, T. P., 1985, Nisa U., 2007, Adhikari R., 2010, Mekonnen W. & Worku, A. 2011)

Motivation to regulate fertility is determined by child survival. In high fertility societies, child survival is relatively poor. The death of a child exposes a woman to the risk of conceiving again through the termination of breastfeeding and resumption of menses and ovulation. It also motivates couples to have additional children to replace a child death and to ensure that their fertility goals are achieved. The effect of child mortality on fertility have been richly studied (Nisa U., 2007, Adhikari R., 2010, Forty, J., Navaneetham, K. & Letamo, G., 2022, Cervellati, Matteo & Sunde, U., 2007, Shapiro D., 2007) These studies found that fertility is higher among women who ever experienced child mortality.

In high fertility societies, the ideal number of children is high as children are considered as source of satisfaction, labor, and old-age security (Asep, V., 2020) Therefore, the high ideal number of children will motivate couples to have many children in order to guarantee these sources. Empirical studies (Rosenzweig, M. R., & Schultz, T. P., 1985, Nisa U., 2007) confirm the positive effects of the ideal number of children on fertility. Study in Nepal (Nisa U., 2007) and in East Nusa Tenggara in Indonesia (Rosenzweig, M. R., & Schultz, T. P., 1985), a province in the same island with Timor-Leste, found that women who considered a higher number of children as ideal were more likely to have a higher number of children ever born.

Unmet need for family planning, the situation of desiring to prevent pregnancy, for spacing or limiting births, but not practicing contraception, is an important measure for evaluating the ability of women to achieve their reproductive goals (Schultz T.P., 2007). Thus, unmet need for family planning exposes women to the risk of unwanted conception and increases the likelihood of having a large number of children ever born. In many contemporary high-fertility societies, the levels of unmet need for family planning are moderate to high Estimation that satisfying the need for contraception lowered fertility by 35% in Latin America and the Caribbean, by around 20% in the Arab States and in the eastern and southern Africa and by approximately 15% in Asia and West Africa (MacQuarrie & Kerry L.D., 2014) Meanwhile, (Cleland J. et al. 2006) also found that the unmet need reduction was strongly correlated with fertility decline in Latin America, Asia, and South Africa.

Education is a strong determinant of fertility (Casterline & El-Zeini, 2014) and second strong factor after child mortality (Bryant, J., 2007). Increase in years of schooling among women will reduce the likelihood of early marriage and birth, will enhance access to more modern employment sector, and will improve their capacity to regulate their fertility. These all in turn will reduce the chance of having many children. In high fertility societies, women lack of schooling. Empirical studies have confirmed that the importance of education in fertility reduction

Income and household economic status lowers fertility through aspiration for better child investment. In high fertility countries, income is low. Studies have found the significant relationship between income and fertility. For example, (Asep, V., 2020, Billari et al., 2017) found that at country level, measures of income are negatively and strongly related to fertility. Meanwhile, (Mekonnen W. & Worku, A. 2011) in their study in Malawi found that women from poorer households had higher chance of having more children than women from wealthier households.

Work reduces fertility through time demand and inflexibility with motherhood and nurturing children. Studies found that working women had lower number of children ever born (Mekonnen & Worku, 2011, Shapiro, D. & Gebreselassie, T, 2007, Agadjanian , 2000)

In urban areas, demand for children is lower as children have lower participation in the labor force, living cost are more expensive, and access to family planning information and services are better than in rural areas. Odusina, et

al. (2020) in their study in the United States of America and Mekonnen W. & Worku, A. (2011) in their study in Malawi confirmed that urban women had lower fertility than rural women.

A recent study had shown that digital revolution, including mobile phone ownership, may also affect fertility (Angeles L., 2010, Daniels, K. et al. 2017, Trudeau J., 2016, Guldi M. & Herbst C.M., 2017). A study in Malawi show that mobile phone ownership was associated with lower fertility in high-fertility societies through information access, role modelling, and preference change mechanisms (Guldi M. & Herbst C.M., 2017). In term of information access, the cost of searching information can be reduced by mobile phones (Billari F.C. Rotondi V. & Trinitapoli J., 2020). This helps persons make informed choices on various matters including fertility and family planning (Guldi M. & Herbst C.M., 2017). In terms of role modelling, mobile phone ownership can increase access to social media sites that might influence the suitability and public appropriateness of specific behaviors, including the number of children and family planning (Guldi M. & Herbst C.M., 2017). In term of preference change, mobile phone ownership can increase access to financial inclusion and hence might lower the demand of children by basically self-protecting households, particularly the weakest, against unpredicted shocks (Guldi M. & Herbst C.M., 2017).

A characteristic of modernization is women's autonomy, including economic (Forty et al. 2022). It is proposed that women's autonomy is associated with fertility reduction through decision making power including in reproductive health areas. Studies found that women who had a financial autonomy, such as having a bank account, had lower fertility n(Aker, 2010, Cigno & Rosati, 1992, Filoso & Papagni, 2011,Agyeman, 2021, Singh, et al. 2019.

Non-access obstacles to contraception affect fertility by hindering family planning practice and hence exposing a woman to the risk of unwanted pregnancy and having large number of children. These obstacles include cultural barriers, such as the religion (WB 2010). Religions are differentiated by particular norms about fertility and therefore generating differences among religious groups. Bhupatiraju (2022) proposed that religion influences fertility by disseminating views about certain fertility-related behaviors, by requiring submission to these views, either through community pressure or through punishments, and by enforcing religious unity. In particular, during the Industrial Revolution, the European Catholics were categorized by the devotion to high fertility views and family-centered norms (McQuillan, K., 2004). A study by Lesthaeghe & Wilson (1986) in France, that still preserves its Catholic identity, confirmed that religious Catholic women had higher children ever born than other women.

A study of the determinants of fertility in Timor-Leste using the results of the 2003 Timor-Leste Population and Housing Census show that the age of women, marital status, still-birth experience, child death experience, education, work status, housing characteristics and mother tongue statistically affected fertility significantly in Timor-Leste (Shapiro D., 2007). However, some determinants were not included in the analysis since this information was not collected in the 2003 Census, in particular the age at first union, unmet for family planning, ideal number of children and non-use of contraception because of fear of health side-effects. This information is available from the 2016 TLDHS.

Studies on the association between socioeconomic and proximate determinants and fertility in Timor-Leste was limited. Therefore, in general the present study aimed to examine the impact of socioeconomic and proximate factors on fertility in Timor-Leste. The specific objectives were to (i) analyze the differences in fertility by socioeconomic factors (education, household wealth, place of residence, work status, husband or partner's education and work status, mobile phone and bank account ownership, and religion) and proximate determinants (age at first union, child death experience, ideal number of children, and unmet need for contraception) and (ii) to assess the effects of these socioeconomic and proximate determinants on fertility.

2. Methods

2.1. Data

Data used in the study come from the results of the 2016 Timor-Leste (Demographic and Health Survey Ministry of Finance (Timor-Leste), 2010). It is the second national level population and health survey carried out as part of the world Demographic and Health Surveys and implemented by the General Directorate of Statistics of the Ministry of Planning and Finance and the Ministry of Health, Education and Social Solidarity of Timor-Leste. The survey was carried out between September and December 2016.

The 2016 TLDHS utilized the sampling frame of the 2015 Timor-Leste Population and Housing Census (2015 TLPHC) supplied by the Timor-Leste General Directorate of Statistics. The sampling frame was a complete list of enumeration areas (EAs) produced for the 2015 TLPHC. On average, there were 89 households per EA. Information covered in the sampling frame included the administrative unit, type of residence, number of residential households, and male and female population in each of the EAs.

There are five geographic regions in Timor-Leste which are subdivided into 12 municipalities and special administrative region (SAR) of Oecussi. Therefore, the 2016 TLDHS sample was designed to produce reliable estimates of indicators for the country as a whole, for urban and rural areas, and for each of the 13 municipalities. A representative probability sample of about 12,000 households was drawn from which women were interviewed. The sample was stratified into urban and rural areas and the multistage sampling design was employed for choosing the respondents. At the first stage, 455 EAs were chosen with probability proportional to EA size from the 2015 TLPHC: 129 EAs in urban areas and 326 EAs in rural areas. At the second stage, 26 households were randomly selected within each of the 455 EAs.

There were 12,607 eligible women age 15–49 years successfully interviewed in the 2016 TL-DHS. Of these women, 61.1% (7,697) were women in union, either currently married or living with partner women. Further, of these women, 42.5% (3,272) were aged 35–49 years. The unit of analysis in this study was women in union age 35–49 years. This selection was done to obtain the values that approach the completed childbearing (Billari et al. 2020)

2.2. Variables

The dependent variable is the number of living children (CEB). The socioeconomic determinants were the highest educational level (WEduc), household wealth (Wealth), place of residence (Rural), work status (WWork), husband or partner's educational level (HEduc), husband or partner's work status (HWork), mobile phone ownership (MPhone), bank account ownership (Bank), and religion (Religion). WEduc was grouped into no education, primary, secondary, and higher and formed three dummy variables which were WNoEduc, WPrimary, and WSecondary. Wealth were classified into lowest, second, middle, fourth, and highest and had four dummy variables which were WealthLowest, WealthSecond, WealthMiddle, and WealthFourth. WWork was grouped into yes (WWork = 0) and no (WWork = 1). Rural was classified into urban (Rural = 0) and rural (Rural = 1). HEduc was grouped into no education, primary, secondary, and higher and formed three dummy variables which were WNoEduc, WPrimary, and WSecondary. HWork was grouped into "worked" (HWork = 0) and "did not work" (HWork = 1). MPhone was classified into yes (MPhone = 0) and no (MPhone = 1). Bank was classified into yes (Bank = 0) and no (Bank = 1). Religion was grouped into Other (Religion = 0) and "Catholic" (Religion = 1).

Meanwhile, the proximate determinants included the age at first union (Agemar), child death experience (DeathExp), ideal number of children (Ideal), and unmet need for contraception (Unmet). Agemar was categorized into before 20 (Agemar = 1) and 20–49 (Agemar = 0), DeathExp was grouped into ever (DeathExp = 1) and never (DeathExp = 0), Ideal was classified into four or less (Ideal = 0) and five or more or non-numeric (Ideal = 1), and Unmet was divided into met (Unmet = 0) and unmet (Unmet = 1).

2.3. Statistical Analysis

The Statistical Package for Social Sciences version 21 (Lesthaeghe, R.J. & Wilson, C., 1986) was employed to analyze the data. Univariate analysis was carried out to evaluate the percentage distribution of number of children ever born, socioeconomic factors (education, household wealth, place of residence, work status, husband or

partner's education and work status, mobile phone and bank account ownership, and religion), and proximate determinants (age at first union, child death experience, ideal number of children, and unmet need for contraception). Bivariate analysis was used to assess the differentials in number of children ever born by these socioeconomic and proximate determinants.

Since the number of children ever born is a count data, a Poisson regression was appropriate (Baudin, T., 2015, IBM Corp.,2012, Fagbamigbe & Adebowale, 2014, Pandey & Kaur, 2015, Dwivedi et al. 2016) to evaluate the association between socioeconomic and proximate determinants and fertility. The assumption of the equal variance was tested employing Akaike's Information Criterion (AIC) and Bayesian Information Criterion (BIC). However, since the variance of children ever born was greater than the mean, the Negative Binomial regression was considered to correct this over-dispersion problem (Forty, et al. 2022). Still, it was recommended to select the model with lower Akaike's Information Criterion (AIC) and Bayesian Information Criterion (BIC). In this study, lower AIC and BIC indices were obtained from the Poisson regression (14,087.5 and 14,215.8 respectively) compared to AIC and BIC indices from the Negative Binomial regression (18,000.7 and 18,129.0 respectively). Therefore, Poisson regression was chosen in this study.

Poisson regression model is derived from Poisson distribution by letting the parameter μ (mean) dependent on covariates or regressors. In Poisson regression, the dependent variable Y, that is the number of children, is assumed to follow Poisson distribution that is caused by a set of explanatory variables, X_1, X_2, ..., X_k as follows.

$$\Pr(Y = y) = \frac{e^{-\mu}\mu^y}{y!} \; ; \; \mu > 0, y = 0, 1, 2, \dots$$

Where $\ln(\mu)$ is a linear function of the independent variables

$$\ln(\mu) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + \varepsilon$$

and X_i is the independent variable, α is constant, and β_i is the Poisson regression coefficient of the ith independent variable. The model can be rewritten as follows.

$$\mu = e^{\alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + \varepsilon}$$

The regression coefficients were exponentiated to produce the incident rate ratio (IRR) for interpretation of the results. It measures how a change in an independent variable will influence the dependent variable. Therefore, the model in this study is as follows.

$$\begin{aligned}
\ln(\mu) = \beta_0 &+ \beta_1 Agemar + \beta_2 DeathExp + \beta_3 Ideal + \beta_4 Unmet + \beta_{51} WNoEduc \\
&+ \beta_{52} WPrimary + \beta_{53} WSecondary + \beta_{61} WealthLowest + \beta_{62} WealthSecond \\
&+ \beta_{63} WealthMiddle + \beta_{64} WealthFourth + \beta_7 Rural + \beta_8 WWork + \beta_{91} HNoEduc \\
&+ \beta_{92} HPrimary + \beta_{93} HSecondary + \beta_{10} HWork + \beta_{11} MPhone + \beta_{12} Bank \\
&+ \beta_{13} Religion + \varepsilon
\end{aligned}$$

The goodness-of-fit chi-squared test was used out to assess how well the model fits using the deviance statistic (D). The model fits reasonably well if the goodness-of-fit chi-squared test is not statitiscally significant (the p-value is greater than the significance level). Next, the likelihood ratio chi-square was used to evaluate the significance of the overall model. Further, the significance of each independent variable in the model was tested using the Wald chi-square at the significance level of 0.15.

2.4. Ethics Statement

The 2016 Timor-Leste Demographic and Health Survey follows the Standard DHS survey protocol under the Demographic and Health Surveys Program (DHS-7) that was approved by the Institutional Review Board of

International Classification of Functioning, Disability and Health and complied with the United States Department of Health and Human Services requirements for the "Protection of Human Subjects" (45 CFR 46).

3. Results

The results of univariate analysis are presented in Table 1. It can be seen that 61% of the women in the study had five or more children, 40% were married before age 20, 23% ever had a child mortality, 60% wanted to have five or more or non-numeric children, 20% experienced unmet need for contraception, 40% had no education, 19% came from lowest household wealth index quintile, 74% were rural dwellers, 51% were currently not working, 34% had husbands or partners with no education, 23% had jobless husbands or partners, 56% did not have a mobile phone, 85% did not have a bank account, and 98% were Catholic.

The percentage distribution of children ever born of women in union age 35–49 years by background characteristics were displayed in Table 2. It can be seen that the percentage of women in union age 35–49 years with five or more children differed by background characteristics. It was higher among those who were married during teenager, who experienced a child death, whose ideal number of children was five or more or non-numeric, whose contraceptive need was unmet, who had lower education, who came from lower household wealth index quintile, who lived in rural areas, who were currently not working, whose husbands or partners were low educated, whose husbands or partners did not work, who did not have a mobile phone, who did not have a bank account, and who were Catholic.

Table 1: Percentage distribution of women age 35–49 years by background characteristics, Demographic and Health Survey Timor-Leste 2016

Background characteristics	Number of observation	%
Number of children ever born		
0–4	1,272	38.9
5–15	2,001	61.1
Age at first union		
10–19	1,309	40.0
20–49	1,963	60.0
Child death experience		
Ever	744	22.7
Never	2,528	77.3
Ideal number of children		
0–4	1,324	40.4
5–15 or non-numeric	1,949	59.6
Unmet need for contraception		
Met	2,620	80.1
Unmet	652	19.9
Highest educational level		
No education	1,318	40.3
Primary	694	21.2
Secondary	1,052	32.1
Higher	209	6.4
Household wealth quintile		
Lowest	615	18.8
Second	640	19.6
Middle	649	19.8
Fourth	655	20.0
Highest	712	21.8
Place of residence		
Urban	865	26.4
Rural	2,407	73.6
Currently working		
Yes	1,595	48.7
No	1,677	51.3

Husband/partner's educational level		
No education	1,116	34.1
Primary	756	23.1
Secondary	1,049	32.1
Higher	350	10.7
Husband/partner's work status		
Worked	2,513	76.8
Did not work	759	23.2
Owns a mobile phone		
Yes	1,452	44,4
No	1,821	55,6
Has a bank account		
Yes	500	15.3
No	2,772	84.7
Religion		
Roman Catholic	3,215	98.3
Other	57	1.7
Total	3,272	100.0

Table 2: Percentage distribution of children ever born of women in union age 35–49 years by background characteristics, Demographic and Health Survey Timor-Leste 2016

Background characteristics	Number of children ever born				Total	
	Four or less		Five or more		Obs.	%
	Obs.	%	Obs.	%		
Age at first union						
10–19	275	21.0	1,034	79.0	1,309	100.0
20–49	997	50.8	966	49.2	1,963	100.0
Child death experience						
Ever	126	16.9	619	83.1	745	100.0
Never	1,146	45.3	1,382	54.7	2,528	100.0
Ideal number of children						
0–4	865	65.3	459	34.7	1,324	100.0
5–15 or non-numeric	407	20.9	1,542	79.1	1,949	100.0
Unmet need for contraception						
Met	1,084	41.4	1,536	58.6	2,620	100.0
Unmet	188	28.8	464	71.2	652	100.0
Highest educational level						
No education	476	36.1	842	63.9	1,318	100.0
Primary	209	30.1	485	69.9	694	100.0
Secondary	455	43.3	597	56.7	1,052	100.0
Higher	132	63.2	77	36.8	209	100.0
Household wealth quintile						
Lowest	220	35.8	395	64.2	615	100.0
Second	205	32.0	435	68.0	640	100.0
Middle	235	36.2	414	63.8	649	100.0
Fourth	266	40.6	389	59.4	655	100.0
Highest	346	48.6	366	51.4	712	100.0
Place of residence						
Urban	405	46.8	460	53.2	865	100.0
Rural	867	36.0	1,541	64.0	2,408	100.0
Currently working						
Yes	660	41.4	935	58.6	1,595	100.0
No	612	36.5	1,066	63.5	1,678	100.0
Husband/partner's educational level						
No education	397	35.5	721	64.5	1,118	100.0
Primary	250	33.1	506	66.9	756	100.0
Secondary	437	41.7	612	58.3	1,049	100.0

Higher	189	54.0	161	46.0	350	100.0
Husband/partner's work status						
Worked	987	39.3	1,527	60.7	2,514	100.0
Did not work	285	37.5	474	62.5	759	100.0
Owns a mobile phone						
Yes	804	44.2	1,017	55.8	1,821	100.0
No	468	32.2	984	67.8	1,452	100.0
Has a bank account						
Yes	233	46.6	267	53.4	500	100.0
No	1,039	37.5	1,733	62.5	2,772	100.0
Religion						
Roman Catholic	1,246	38.8	1,969	61.2	3,215	100.0
Other	25	43.9	32	56.1	57	100.0
Total	1,271	38.9	2,001	61.1	3,272	100.0

The results of the analyses for the full model show that the goodness-of-fit chi-squared test is not statitiscally significant. The deviance statistic D is 2,920.9, degrees of freedom is 3,300 and p-value is 0.99999. Therefore, the model fits reasonably well. Next, the likelihood ratio chi-square is 1,236.9 and p-value is less than 0.001. Hence, the model is statistically significant. Further, the significance of each independent variable in the model is tested using the Wald chi-square at the significance level of 0.15.

The incidence rate ratios (IRR) of having more children ever born by characteristics of women in Timor-Leste based on Poisson regression model were presented in Table 3. It can be seen that socioeconomic and proximate determinants were significantly associated with fertility statistically. Of socioeconomic determinants, education was significant at the 0.10 level, work status was significant at the 0.001 level, husband or partner's education was significant at the 0.10 level, husband or partner's working status was significant at the 0.05 level, and mobile phone ownership was significant at the less than 0.001 level. Meanwhile, all proximate determinants (age at first union, child death experience, ideal number of children, and unmet need for contraception) were significant at the less than 0.001 level. In addition, household wealth, place of residence, bank account ownership, and religion did not have significant association with fertility statistically at the 0.15 significance level.

Ideal number of children was the first main reason for high fertility in Timor-Leste. Women in union age 35–49 years whose ideal number of children was five or more or non-numeric had 1.37 times more children ever born than women age 35–49 years whose ideal number of children was four or less.

Age at first union was the second most important factor of high fertility in Timor-Leste. Women in union age 35–49 years who started a union before age 20 years had 1.274 times more children ever born than those whose age at first union was 20 or older.

Child death experience was the third significant cause of high fertility in Timor-Leste. Women in union age 35–49 years who ever experienced child death had 1.266 times more children ever born than those who did not ever experience a child death.

Unmet need for contraception was the fourth important factor of high fertility in Timor-Leste. Women in union age 35–49 years whose need for contraception was unmet had 1.13 times more children ever born than those whose need for contraception was met.

Mobile phone ownership was the fifth significant factor of high fertility in Timor-Leste. Women in union age 35–49 years who did not own a mobile phone had 1.08 times more children ever born than those who owned a mobile phone.

Work status was the sixth reason for high fertility in Timor-Leste. Women in union age 35–49 years who were not working had 1.05 times more children ever born than women age 35–49 years who were working.

Husband or partner's work status was the seventh important factor of high fertility in Timor-Leste. Women in union age 35–49 years whose husband or partner were not working had 0.95 times less children ever born than those whose husband or partner were working. Or, women in union age 35–49 years whose husband or partner were working had 1.05 times less children ever born than those whose husband or partner were not working.

Education was the eighth essential reason for high fertility in Timor-Leste. Women in union age 35–49 years who had primary education had 1.09 times more children ever born than those who had higher education.

Table 3: Incidence rate ratio (IRR) of the Poisson regression Demographic and Health Survey Timor-Leste 2016

Covariates	IRR [95 CI]	*p*-value
Age at first union (ref: 20-49)		
10–19	1.274 [1.23–1.31]	< 0.001
Child death experience (ref: Never)		
Ever	1.266 [1.22–1.31]	< 0.001
Ideal number of children (ref: 0-4)		
5–15 or non-numeric	1.37 [1.33–1.42]	< 0.001
Unmet need for contraception (ref: Met)		
Unmet	1.13 [1.09–1.17]	< 0.001
Highest educational level (ref: Higher)		
No education	1.05 [0.96–1.15]	0.305
Primary	1.09 [1.00–1.20]	0.059
Secondary	1.06 [0.98–1.16]	0.143
Household wealth quintile (ref: Highest)		
Lowest	1.01 [0.94–1.08]	0.808
Second	1.04 [0.97–1.11]	0.247
Middle	1.01 [0.95–1.07]	0.857
Fourth	0.99 [0.94–1.05]	0.718
Place of residence (ref: Urban)		
Rural	1.00 [0.96–1.05]	0.964
Currently working (ref: Yes)		
No	1.05 [1.02–1.09]	0.001
Husband/partner's educational level (ref: Higher)		
No education	0.94 [0.87–1.01]	0.090
Primary	0.99 [0.95–1.03]	0.633
Secondary	1.00 [0.96–1.04]	0.962
Husband/partner's work status (ref: Worked)		
Did not work	0.95 [0.92–0.99]	0.017
Owns a mobile phone (ref: Yes)		
No	1.08 [1.05–1.12]	< 0.001
Has a bank account (ref: Yes)		
No	0.98 [0.94–1.03]	0.511
Religion (ref: Other)		
Roman Catholic	1.08 [0.96–1.22]	0.208
Constant	8.47 [7.53–9.53]	< 0.001

Husband or partner's education was the ninth significant cause of high fertility in Timor-Leste. Women in union age 35–49 years whose husband or partner had no education had 0.94 times less children ever born than those whose husband or partner had higher education. Or, women in union age 35–49 years whose husband or partner had higher education had 1.06 times more children ever born than those whose husband or partner had no education.

4. Discussion

The present study indicated that socioeconomic and proximate determinants were associated with higher fertility in Timor-Leste as found in previous studies.

The present study show that higher ideal number of children was associated with higher number of children ever born. Higher ideal number of children motivated couples in Timor-Leste to have many children to ensure the source of life satisfaction, manpower, and old security, as well as the continuation of culture and tradition. This finding supports the empirical evidence that confirmed the positive effects of the ideal number of children on fertility (Rosenzweig, M. R., & Schultz, T. P., 1985, Nisa U., 2007)

It was found that women whose age at first union was during teenager had higher number of children ever born. Early age at first union exposed women in Timor-Leste to early age at first birth, faster pace of childbearing, and longer motherhood period that increased their likelihood at any particular period of having a supply of children that fit or surpassed their supply of children. This finding supports the theory and empirical results of inverse relationship between age at first union and fertility (Easterlin, 1975, Rosenzweig & Schultz, 1985, Nisa, 2007, Adhikari R., 2010, Dwivedi et al., 2016)

Child death experience was associated with higher fertility. This result supports the idea that in high fertility society such as Timor-Leste, couples tended to replace the dead children by having another child that has led to high fertility in the country (General Directorate of Statistics, Ministry of Health and ICF, 2018). This finding supports the previous studies that found higher fertility among women who experienced a child death

Unmet need for contraception was found to be associated with higher fertility confirming the results of the study by (Schultz, 2007, Cleland et al. 2006). Unmet need for contraception exposed women in Timor-Leste to unwanted pregnancies and births that can lead to higher number of children ever born.

The results of this study show that support findings from previous studies that mobile ownership is associated with lower fertility. Women in Timor-Leste who had a mobile phone might have better access to fertility and family planning information, to role model of desirable and socially acceptable number of children, and to financial inclusion that empowered them (Guldi & Herb, 2017, Schumacker R.E. & Lomax R.G., 2010) including in the area of reproductive health and goals that consequently reducing their demand for children. This result is consistent with the findings of study in Malawi (Guldi M. & Herbst C.M., 2017) that discovered that mobile phone ownership was negatively related with fertility (Rosenzweig & Schultz, 1985, Nisa, 2007, Adhikari, 2010, Mekonnen & Worku, 2011, Bryant, 2007, Angeles, 2010, Billari et al. 2017, Shapiro & Gebreselassie, 2007, Agadjanian, 2000).

Contrary to the expectation, the findings of the study showed that women with higher educated and working husband or partner had higher number of children ever born than women with lower educated and non-working husband or partner. It suggests that husbands or partners with better socioeconomic status in Timor-Leste still consider children as the welfare symbol.

The results of the study confirm the importance of socioeconomic and proximate determinants in high fertility in Timor-Leste. Higher number of children ever born was associated with teenage marriage, having a child death, larger or non-numeric ideal number of children, unmet need for contraception, lower education, not working, higher educated husband or partner, working husband or partner, and not having a mobile phone.

the effects of mobile phone ownership on fertility in Timor-Leste, even after controlling for supply for children, demand for children, motivation to regulate fertility, and costs of fertility regulation. Fertility was higher among women who did not own a mobile phone. In addition, a higher fertility was associated with early age at first marriage, larger ideal number of children, shorter years of education, poorer household wealth, having a child death, and non-use of contraception because of health concerns.

The results from the present study offer guidance essential for improving population management in Timor-Leste. For fertility reduction in Timor-Leste, the Government should improve maternal and child health care to reduce infant mortality and should promote smaller ideal family size and marriage postponement, reduce unmet need for contraception, increase access to a mobile phone, enhance education access and employment opportunity for women, and socialize family planning to working and higher educated husbands or partners through enhancing

reproductive health and family planning program and fostering female labour force participation to encourage women and men to prioritize education and career over childbearing.

5. Limitations

This study has some limitations. First, the independent variables were at the time of the survey, while the dependent variable was before the survey. So, it was assumed that the independent variables did not change much before the survey. Second, information used for mobile phone was limited to ownership, not the use and purposes. Third, the data was not recent as the latest Demographic and Health Survey in Timor-Leste was in 2016. Lastly, only one digital revolution variable was used in the study due to strong correlation between internet use and other socioeconomic characteristics, such as place of residence, education, and household wealth in the context high-fertility society like in Timor-Leste. However, these limitations should not importantly influence the results, and this study still gives a valuable contribution to the research in high fertility. Also, these limitations imply that the future Demographic and Health Survey should also collect retrospective history of socioeconomic information.

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