

REGIONAL DISPARITY IN FERTILITY AND ITS DETERMINANTS IN SRI LANKA

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Introduction

Although Sri Lanka's national fertility levels are considerably low, there are several regional disparities of fertility that policy makers have to pay attention for improving the status of reproductive health and wellbeing of women, especially women who are in the reproductive ages. Most studies on fertility in Sri Lanka in the last decades (Abayaratne & Jayawardena, 1967, Fernando, 1972; 1974; 1975; 1976; Hanna & Nadarajah, 1976, Sandaratne, 1975, 1976, Siddhisena, 2000, Vamathevan, 1969, Wright, 1968, 1970, Yapa & Siddhisena, 1998) have focused and dealt mostly with the entire country and have not analysed the pattern and determinants of fertility by district/region. The main purpose of this paper is to fill that lacuna.

Sri Lanka consists of 14,022 Grama Niladhari Divisions (GN divisions) under 335 Divisional Secretary's Division (DS divisions), 25 administrative districts and 9 provinces with a plural society and differentiated ethnicity. Therefore, regional disparities in fertility display that the level of fertility in Sri Lanka is the net result of the compensating effects of differing levels of fertility among the above regions. However, due to unavailability of data related to status of fertility by GN or DS levels, this study focused on the district and provincial level to elaborate the regional disparities.

Fertility transition began far earlier in Sri Lanka than in other South Asian countries (Siddhisena, 2000; United Nations, 1986). In spite of lower economic development and thirty years of war, people in Sri Lanka benefited from free education and free health facilities for decades. As a result, Sri Lanka has achieved more favourable demographic levels with an advanced level in terms of fertility transition (Siddhisena, 2000; Sandaratne, 1998). The continuous declining trend in fertility from its onset of fertility transition succeeded in catching up to the replacement level by 1995 and further continued until it fell below replacement

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level. Once reaching its minimum point of 1.9 children per woman during 1995 to 2000, TFR showed a significant reversal with 2.2 children per women by 2016. The increasing trend in fertility was observed even in 2012. During the six-year period (1995-2000), fertility rates in almost all districts reflected some increase.

A refined measure of fertility, the Total Fertility Rate (TFR), which is the rate without the influence of age composition of the females, has also considerably declined from 5.0 in 1963 to 2.2 in 2016 (Department of Census and Statistics, 2016). Interpretation of this trend and its significance for the social and economic development of the country requires analysis of not just the national level pattern of fertility but also the regional variations within it. On the other hand, the study of regional disparities in fertility discloses a picture of which districts have extremes of fertility. This would help in assessing the impact of family planning or other socio-economic welfare programmes designed to further reduce the birth rate. Thus, the study of fertility variations by region/district is paramount not only for academics but also for policy makers to formulate vigorous programmes to reduce fertility and improve socio-economic and health promotions. Therefore, this study aimed to analyse the regional disparities since 1971 as these levels of fertility is what contributed to determine the national fertility levels.

The paper is organized as follows. The first section which is summarized in the above presents a background on the fertility trends and the importance of understanding this trend through regional variations of fertility. The second section presents the objectives, and the following section discusses the data and methods used in the study. The next two sections elaborate regional disparities in fertility for the last 5 decades demarcating separately single decades within the five decades and the factors that influenced regional fertility differentials. The regional disparity in fertility in terms of Total Fertility Rates (TFR) which is an unbiased measurement of age composition of female population and other related proximate determinants is explored in the next section. The final section summarizes and presents the conclusion of the paper.

Objectives

The study is an attempt to analyse the regional disparity in fertility in the 25 districts in Sri Lanka according to the following analytical framework.

- i) Regional disparities in the average level fertility
- ii) Regional disparities in fertility trends
- iii) Relationships between regional disparity in fertility and socio-demographic variables
- iv) Relationship between regional disparity in fertility patterns and proximate determinants of fertility

Data and methods

A comprehensive study has not been made so far on the regional disparities in fertility because of the lack of relevant data by DS or districts. In this study, the entire analysis is based upon data from the office of the Registrar General for the period of 1960-2022, the Sri Lanka Demographic and Health Surveys of 2006, 2012 and 2016 and the data on fertility published by the Department of Census and Statistics, Sri Lanka. The published vital statistics data on fertility are available only up to 2019, therefore estimated or provincial data published by the Registrar General are used with caution.

An exploratory data analysis is used for the entire analysis using GIS mapping strategy. The paper deals with the analysis of average crude birth rates in which average for 10-year periods are calculated based on geometric mean, since 1971 up to 2020 and Total Fertility Rates (TFR) which derived from SLDHS 2006, 2012 and 2016/17. Univariate analysis with descriptive statistics is used to explore the regional disparity in fertility and its trend by districts, whilst bivariate analysis using correlation techniques is used to examine the associated socio-demographic and proximate determinants which influence the regional disparity in fertility in Sri Lanka.

Analysis

Average level of fertility

Published crude birth rates indicates that there are vast regional variations in average levels of fertility in Sri Lanka during the five decades between 1971 and 2020 (Table 1). As Table 1 reveals, the average CBR have varied considerably by districts throughout the last five decades.

During 1971-1980 decade, the average crude birth rate was highest in Mullaitivu (40.04) whilst it was lowest in Gampaha (20.84). Moreover, in addition to the highest birth rate district, there are 11 districts - e.g. Vavuniya, Batticaloa, Moneragala, Anuradhapura etc. (Table 1) where average CBR was more than 30 for this period and it was considerably higher than the average birth rate for the country as a whole (28.51).

Thus 1971-80 decade discloses acute regional disparities in fertility in Sri Lanka. However, during the following decade of 1981-1990, while average CBR declined considerably in all districts, the regional variations in fertility were not much discerned, and the average CBR have varied around 21-26 per 1000 population except in Gampaha (16.24) and Kegalle (18.10).

As far as the changes of the regional disparity in fertility rates are concerned, the following two decades of 1991-2000 and 2001-2010, shows that while the average birth rates have declined in all districts except Matale, Galle, Hambantota, Jaffna, Trincomalee, Kurunegala, Anuradhapura, Polonnaruwa and Kurunegala, the district variation of crude birth rates in most districts have slightly varied except Nuwara Eliya, Jaffna Kilinochchi, Mullaitivu, Batticaloa and Puttalam (Table 1). In the decade of 1991-2000, the highest average birth rate was in Mullaitivu (32.12) whilst lowest was in Jaffna (11.41) though Mannar showed lowest average birth rate (9.29) which is relatively low, due to unsettled conditions.

Table 1: Average Crude Birth Rates* by districts, 1971-2020

District	Average Crude Birth Rate					Grand Average CBR 1971-2020
	1971- 1980	1981- 1990	1991- 2000	2001- 2010	2011- 2020	
Sri Lanka	28.51	23.60	18.87	18.07	15.94	21.00
Colombo	26.25	24.39	25.40	25.28	15.79	23.04
Gampaha	20.84	16.24	14.93	12.92	12.06	14.21
Kalutara	24.74	20.80	15.59	15.09	13.12	17.39
Kandy	28.55	25.55	20.97	22.11	17.64	22.65
Matale	30.98	25.57	18.96	20.40	17.14	22.08
Nuwara Eliya	27.43	25.01	20.60	14.96	15.19	20.02
Galle	24.60	21.80	18.56	18.97	16.32	19.85
Matara	28.46	25.87	19.13	18.17	14.27	20.53
Hambantota	29.36	23.96	14.44	14.82	17.65	19.27
Jaffna	29.38	21.46	11.43	16.59	15.11	17.84
Kilinochchi	NA	26.17**	29.87	21.31	20.69	23.96
Mannar	35.48	26.81	9.29***	15.38	16.50	18.63
Vavuniya	39.72	23.84	20.96	23.62	19.22	24.60
Mullaitivu	40.04	24.41	32.12	18.09	11.33	20.69
Batticaloa	38.46	29.75	24.05	21.44	18.00	25.42
Ampara	33.66	27.49	21.15	21.70	20.72	24.48
Trincomalee	38.52	25.16	21.50	22.58	21.14	25.09
Kurunegala	27.18	22.44	15.81	16.88	15.16	18.99
Puttalam	32.49	25.33	20.63	18.37	17.54	22.26
Anuradhapura	36.90	25.16	19.82	20.21	17.60	23.08
Polonnaruwa	32.07	24.20	18.42	18.99	17.18	21.56
Badulla	29.34	27.22	22.34	21.57	17.22	23.14
Moneragala	37.35	27.32	17.74	15.98	16.74	21.73
Ratnapura	31.18	27.21	17.72	18.26	16.33	21.39
Kegalle	22.46	18.10	12.45	13.06	13.53	15.50

Note: * Average Crude Birth rate was calculated based on Geometric Mean, **Average CBR of 5 years (1981-1990), *Mullaitivu and Gampaha average of 2 years 1979 and 1980 (1971-1980), Data for Kilinochchi district are not available in the data sheet (1971-1980), ***The reported figure is relatively low in Mannar due to unsettled conditions. (1991-2000)

Source: Department of Census & Statistics, Statistical Abstracts reported data based on Registrar Generals Office, vital statistics for the above various years.

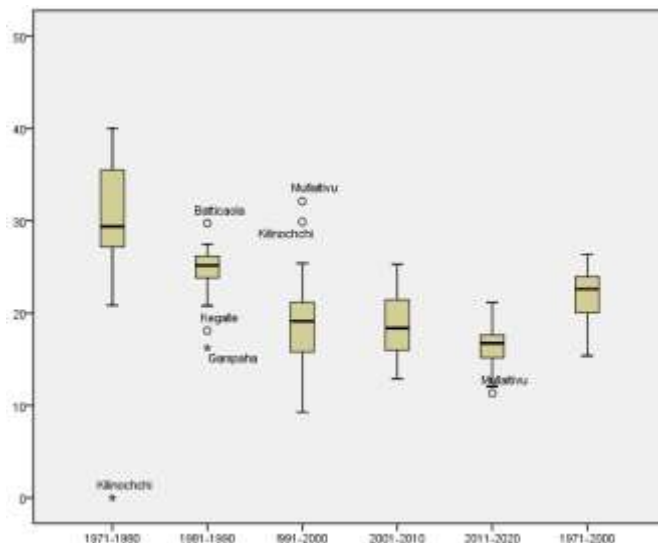
It is conspicuous that during the last decade (2011-2020) the average birth rate has shown a considerable decrease to around 15 per thousand population in most districts which was slightly higher or lower to the average birth rate at national level of 15.94 except Trincomalee (21.14), Ampara (20.72) and Kilinochchi (20.69).

As revealed from the last column of the Table 1, which depicts the district wise variations in fertility for the whole period of 1971-2020, there are apparent disparities in average birth rate among the 25 districts for five decades. Thus, for the corresponding period, the highest average crude birth rate is in Batticaloa district (26.31 per 1000 population) which is higher than the average birth rate for the country as a whole (21.00), whilst the lowest in Gampaha (15.39 per 1000 population).

In addition to the above discussion, the regional disparity and the decreasing trends in regional fertility during the last five decades from 1971-2020 is clearly displayed in the following box and whisker plots which is a useful graphical summary of a batch of data (Figure 1). The rectangle (or 'box') is drawn so that its lower and upper boundaries correspond to the first and third quartiles, and a line at the value in the interior of the box represents the median. The unusual values are plotted outside the lowest and highest values which is shown in a dashed line (or 'whiskers').

As revealed from Figure 1, the average birth rates of most districts for 1971-1980 are above the median of the birth rate (28.15 per 1000 population) which represents about 75 percent (upper quartile). Thus, the average birth rate for this decade has a skewed distribution. An unusual feature of the birth rate for this period is the relatively high value (40.04 per 1000 population) for Mullaitivu. For the period 1981-1990, the variations of the birth rate are insignificant, whilst there are more districts having a lower birth rate than the median value. The unusual two lowest average birth rate were reported for Gampaha (16.02) and Kegalle (18.06), whilst the highest value was reported in Batticaloa (29.75) (Figure 1). Further, as clear from the box and whisker plots, in the following decades from 1991, the average birth rates are declining, and more districts therefore belong to lower than its median except in 2001-2010. But for the overall period of 1971-2020 most districts represent lower than the median birth rate (Figure 1).

Figure 1: Regional disparity in fertility trends, 1971-2020



Source: The Box and Whisker plots drawn from the data in Table 1.

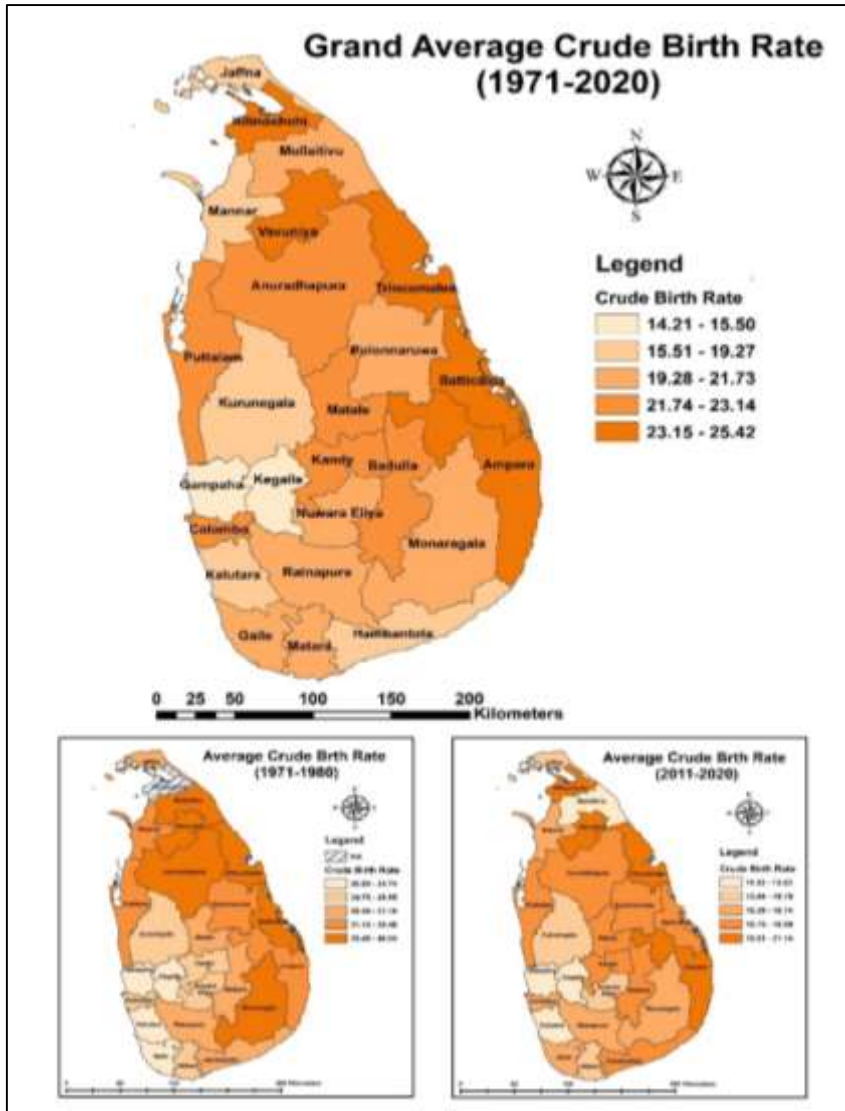
Agglomeration of regional disparity in fertility

In order to observe whether there is agglomeration of the disparity in fertility by region, the 25 districts have been grouped into three categories on the basis of average crude birth rates during the period of last 50 years from 1971 to 2020.

- (a) Low fertility areas – the average crud birth rate 14.0 to below 17.9 per thousand population
- (b) The Intermediate fertility areas – the average crude birth rate 18.0 to below 21.9 per thousand population
- (c) The high fertility areas – the average crude birth rate over 22 per thousand

(a) The low-fertility areas are located in the South-West lowlands (Gampaha, Kalutara), in the Central region (Kegalle) and in the Northern region (Jaffna). These 3 districts (excluding Jaffna district) are having geographical continuity and are in the wet zone (Table 2 & Figure 2). The demographic and socio-economic variables such as age at marriage, proportion of marriage, and education status of these districts have more or less equal conditions which certainly impact on the level of fertility in these areas. According to the data published in 2012 Census and the Sri Lanka Demographic and Health Surveys of 2006-07 and 2016, the singulate mean age at marriage for women and the median age at first marriage among women 25-49 are relatively high at an average of 25 years in these districts (Department of Statistics, 2012, 2016, vide Annexure Table 1).

Figure 2: Regional variations of fertility by district



Source: Department of Census and Statistics Statistical Abstracts and Registrar Generals Office (various years)

Moreover, these districts within the wet zone is influenced by the South-West monsoon except Jaffna (influenced by North-East monsoon), and is consequently very wet and receiving about 75 to 200 inches annual average rainfall. Therefore, these areas are highly cultivated, chiefly with coconut, some cinnamon and rubber (Kalutara) and there are arable land for paddy cultivation. Jaffna also cultivates paddy, pulses, and coconut in substantial levels whilst Palmyra

products are also a substantial source of income. Rice is produced during the Maha season under rain fed conditions, while vegetables are produced nearly all year around under rain fed irrigated conditions. High density, urban population and economic functions would be the factors determining the low crude birth rate compared with other areas.

(b) The intermediate fertility areas are scattered in several regions; Galle, Matara and Hambantota in the Southern, Ratnapura in South-Central, Nuwara Eliya in the Central, Mannar and Mullaitivu in the Northern, Kurunegala in the North-Western, Moneragala in the South–Eastern, and Polonnaruwa in the North-Central part of the country, which forms a band around the low fertility areas (Table 2 and Figure 2). Climatically, Polonnaruwa, Hambantota, Mannar and Kurunegala (especially Kurunegala north) belong to the Dry zone whilst the other areas are in the Wet zone. Moneragala is an intensively cultivated area and immigrant district. However, considering the density of population, Moneragala has a low density (82 persons per square kilometre in 2012). So, their higher fertility could be explained by the fact that the large agricultural holdings managed by family labour reduces the cost of bearing more children and enhances the labour benefits derived from the additional family (Sandaratne, 1975, p. 185). When the ethno-religious distribution of these regions are concerned, Central and Northern regions have relatively more Tamil population, and Southern, North-Central and South-Eastern have relatively more Sinhalese population. The different cultural practices and behaviour of fertility of the people and relatively less urbanization in these districts are the factors likely to be more important in determining the level of fertility in the intermediate fertility areas.

(c) The high fertility areas: are located in the North-Central, Northern, Eastern, South-eastern, Western, Central and North-West part of the country (Figure 2). Anuradhapura, Kilinochchi, Vavuniya, Batticaloa, Ampara, Trincomalee, Badulla, Colombo, Kandy, Matale, and Puttalam are the districts with high fertility. The districts in the North-Central (Anuradhapura), North-Eastern (Puttalam), Northern (Kilinochchi and Vavuniya), Eastern (Batticaloa, Ampara and Trincomalee) and South-West (Badulla) mostly belong to the dry zone, with the average annual rainfall ranging from 50-75 inches. Therefore, most of these areas are sparsely populated and consequently have a favourable man-land ratio (vide, Annexure Table 1). Further, most of these areas (e.g., Anuradhapura, Puttalam, Kilinochchi, Vavuniya, Batticaloa, and Ampara) were subject to the malaria epidemic during the first stage of the demographic transition. Sandaratne (1975, p,185) has pointed out that this experience supports the theory that there is a lag in the fertility responses to a cut in death rates owing to a continuing expectation of a low survival rate even after the death rate has in fact been curtailed. On the other hand, the districts in Eastern and North-Eastern part of the country which have relatively high average crude birth rates (Average birth rate over 24 per 1000

population) are areas consisting of a predominantly Moor population and have the lowest age at marriage (Vide, Annexure Table 1). Table 2 vividly displays the districts which represent the regional disparity in fertility for the last five decades from 1971-2020.

Table 2: Average crude birth rate by districts, 1971-2020

District	Average Crude Birth Rate
Category (a) – Low Fertility Area	
Jaffna	17.84
Kalutara	17.39
Kegalle	15.50
Gampaha	14.21
Category (b) – Intermediate Fertility Area	
Moneragala	21.73
Polonnaruwa	21.56
Ratnapura	21.39
Mullaitivu	20.69
Matara	20.53
Nuwara Eliya	20.02
Galle	19.85
Hambantota	19.27
Kurunegala	18.99
Mannar	18.63
Category (c) – High Fertility Area	
Batticaloa	25.42
Trincomalee	25.09
Vavuniya	24.60
Ampara	24.48
Kilinochchi	23.96
Badulla	23.14
Anuradhapura	23.08
Colombo	23.04
Kandy	22.65
Puttalam	22.26
Matale	22.08

Source: Derived from Table 1: Data from Dept. of Census & Statistics, Statistical Abstract and Registrar General's Office, Vital Statistics for 1971-2020.

Associated socio-demographic factors on regional disparity in fertility

Several studies in Sri Lanka have claimed that there is a relationship between the level of fertility and socioeconomic and demographic conditions in districts (Abayaratne & Jayawardena, 1967, Hanna & Nadarajah, 1976). As pointed by Abayaratne and Jayawardena (1967) “a low birth rate is associated with a high density of population, a high average age at marriage, a low fertility and a low proportion of the population married” (Abayaratne & Jayawardena, 1967, p 127).

Using the average birth rate data in 1971-2020, we examined the relationship between the Average CBR and socioeconomic variables. Furthermore, we prepared pooled data, including the average CBR and socioeconomic variables related to the 2010-2020 data which expose the influence on the fertility trend. We find that the relationships between average birth rate and the population of Moor and Sinhalese, the percentage of population with literacy, median age at marriage and percentage of married women in the districts are negative, and the coefficients are statistically significant at .05 or 01 level. This suggest that demographic factors such as nuptiality and cultural and social factors (ethnicity and literacy) have negative influence on fertility trends in the regional disparity in Sri Lanka (Table 3).

Table 3: The relationship between average CBR and socio-demographic variables (Pearson’s Correlation matrix)

Socio-demographic variables	Average CBR	Pop. density	% Moors	% Sinhalese	% Literacy	IMR	% Married	Median age at marriage
Average CBR	1							
Pop. density	-.269	1						
% Moors	-.426*	.098	1					
% Sinhalese	-.441*	.256	-.279	1				
% Literacy	-.705**	.563**	-.276	.226	.1			
IMR	.000	.466*	-.103	.079	.168	1		
% Married	-.445*	.786**	-.048	.529**	.550**	.511**	1	
Median Age at Marriage	-.694**	.608**	-.395	.305	.723**	.314	.583**	1

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Regional disparity in fertility in terms of Total Fertility Rates

In addition to aggregate fertility level (given by the crude birth rate) discussed above, the regional disparity in fertility could be expressed in terms of total fertility rates (TFR) which is not affected by the size of the female population or the population age structure. As shown in Table 4, all districts have significant variations in fertility by districts and also achieved a remarkable decline of fertility until 2006 though the pace of decline varies largely.

Table 4: Total Fertility Rate (TFR) by district, 1971- 2016

District	1971 ^a	1981 ^a	2001 ^b	2006 ^c	2012 ^d	2016 ^e	1971-1981 Change	1981-2001 Change	2001-2006 Change	2006-2012 Change	2012-2016 Change
Colombo	3.80 [#]	3.34	2.07	2.20	2.00	1.80	-0.50	-1.27	0.13	-0.20	-0.20
Gampaha		2.22	1.88	2.20	2.07	1.80	-1.60	-0.34	0.32	-0.13	-0.27
Kalutara	3.43	3.15	2.23	2.20	2.34	2.20	-0.28	-0.92	-0.03	0.14	-0.14
Kandy	4.15	3.84	2.53	2.40	2.47	2.60	-0.31	-1.31	-0.13	0.07	0.13
Matale	4.66	3.50	2.37	*	2.63	1.90	-1.16	-1.13	n.a	n.a	-0.73
Nuwara Eliya	3.98	2.93	2.47	2.60	2.83	2.20	-1.05	-0.47	0.13	0.23	-0.63
Galle	3.53	3.11	2.29	2.10	2.39	2.10	-0.42	-0.83	-0.19	0.29	-0.29
Matara	4.57	3.73	2.50	2.40	2.47	2.30	-0.84	-1.23	-0.10	0.07	-0.17
Hambantota	4.90	3.63	2.48	2.30	2.71	1.90	-1.27	-1.14	-0.18	0.41	-0.81
Jaffna	4.11	3.75	--	--	2.00	2.10	-0.36	n.a	n.a	n.a	0.10
Mannar	5.30	3.80	--	--	2.62	2.00	-1.50	n.a	n.a	n.a	-0.62
Vavuniya	5.91	3.22	--	--	2.51	2.00	-2.69	n.a	n.a	n.a	-0.51
Mullaitivu	--	--	--	--	2.53	2.00	n.a	n.a	n.a	n.a	-0.53
Kilinochchi	--	--	--	--	2.64	2.10	n.a	n.a	n.a	n.a	-0.54
Batticaloa	5.72	4.83	--	2.80	2.52	2.40	-0.89	n.a	n.a	-0.28	-0.12
Ampara	5.13	3.48	2.65	2.90	2.73	2.40	-1.64	-0.84	0.25	-0.17	-0.33
Trincomalee	5.39	4.94	--	2.90	3.02	2.30	-0.45	n.a	n.a	0.12	-0.72
Kurunegala	4.03	2.92	2.18	2.50	2.43	2.20	-1.11	-0.74	0.32	-0.07	-0.23
Puttalam	4.43	3.56	2.46	2.00	2.61	2.10	-0.87	-1.11	-0.46	0.61	-0.51
Anuradhapura	5.25	3.94	2.25	2.30	2.74	2.40	-1.30	-1.69	0.05	0.44	-0.34
Polonnaruwa	4.88	3.49	2.37	2.50	2.68	2.50	-1.39	-1.12	0.13	0.18	-0.18
Badulla	4.49	3.45	2.54	2.40	2.60	2.30	-1.04	-0.91	-0.14	0.20	-0.30
Moneragala	5.49	4.98	2.39	2.50	2.73	2.40	-0.51	-2.59	0.11	0.23	-0.33
Ratnapura	4.12	3.69	2.25	2.40	2.39	1.80	-0.42	-1.44	0.15	-0.01	-0.59
Kegalle	3.09	2.73	2.36	2.50	2.49	2.60	-0.36	-0.37	0.14	-0.01	0.11
Sri Lanka	4.13	3.38	2.26	2.30	2.40	2.20	-0.75	-1.12	0.04	0.10	-0.20

Notes: '--' indicates data not available, 'n.a' indicates not applicable, * indicates a TFR based on fewer than 500 unweighted women that has been suppressed

[#] Gampaha district was a part of Colombo district, until 1978 and therefore TFR of 1971 is presented together

Sources: ^a 1971 and 1981 TFRs were calculated by the author using Table 3 and 4 of the annexure in Gajanayake (1984).

^b TFRs for 2001 were calculated by the authors using data from the 2001 population census and vital statistics (birth registration) data of 2001.

^c Department of Census and Statistics, 2009

^d Department of Census and Statistics, 2015

^e Department of Census and Statistics, 2017

Reflecting a high variation of TFRs across districts, the standard deviation is as high as 0.80 and 0.66 during the years 1971 and 1981 respectively. However, the standard deviation declined to 0.24 in 2006 and the value remained constant even in 2016. Similarly, in 1971, the lowest TFR was 3.09 in Kegalle and the highest was 5.91 in Vavuniya. In contrast, the most recent figures of SLDHS 2016 show that TFRs in Sri Lanka are ranging from the lowest at 1.8 in Colombo, Gampaha and Ratnapura to the highest at 2.6 in Kandy and Kegalle. Accordingly, the gap between the highest and the lowest TFR went from about three children in 1971 to about one child in 2016. Hence, it is obvious that TFRs in districts of Sri Lanka currently lie within a narrow range as compared to the past, proving that fertility levels have been converging among districts. Surprisingly, Kegalle has reported the lowest TFR at the onset of fertility transition and the highest TFR later in the transition.

In 2006, TFR already reached lower levels such that no single district in Sri Lanka reported a TFR of above 3 children per women. By then, a slower fertility decline appears in all districts and there is no reduction of at least one childbirth in 2012 and 2016. The average number of live births per woman at the time she reaches the age of 50 was highest (5.9) in Vavuniya in 1971, where more than 80 percent of its population is comprised of Tamils. Subsequently, TFR reported a dramatic reduction of nearly 3 children (2.7) per woman by the next decade. Similarly, TFR in Moneragala also fell by half during the twenty-year period from 1981 to 2001. On the other hand, TFR in Gampaha has been comparably lower than other districts and the national average throughout the period while its TFR remained stable near the replacement level even in 1981.

The declining trend in TFR was unexpectedly changed to an upward trend after 2001. About ten districts represented a minor increase in TFR in 2006 for the first time in the transitional process. This increasing trend was demonstrated in 12 districts even in 2012, while Puttalam showed the highest increase in TFR from 2006 to 2012 at 30 percent. Overall, it is obvious that there is some increase of fertility in almost all districts between 2006 and 2012. This increase in district TFRs was clearly mirrored by the increase in national TFR in 2006 and 2012. However, in 2016, fertility levels again dropped throughout the country with the exceptions of Kandy, Jaffna and Kegalle.

The apparent regional disparity in fertility in terms of TFR are influenced not only by the social and cultural factors but also the demographic factors such as first marriage of women, first sexual inter course and age at first birth. Table 5 presents a comparison of women's median age at first marriage, first sexual intercourse and first birth at 2006/07 and 2016. The median age at first marriage for women is rising slightly except in Kalutara and Kegalle. This implies that those of younger generations get married later than their previous generations. The majority of women in Anuradhapura and Batticaloa got married as early as age 20 and 22, respectively. On the other hand, women in Colombo, Gampaha, Kalutara, Matara and Kegalle got married more than

one year later compared to other women in the country in 2006/07. This trend continues only in Colombo and Gampaha in 2016. Convincingly, women in war affected Jaffna have remained unmarried for more than 25 years and reported the highest mean age at marriage in Sri Lanka in 2016. Overall, it is obvious that the majority of women got married after passing their teenage years in each and every district of the country. This trend can be considered as evidence of the lower prevalence of teenage pregnancies in the country. As a whole, most women got married between the ages of 20 and 25 in 2006 and 22 to 25 in 2016. Thus, the lowest median age at marriage has significantly increased while the highest median age at marriage remained constant. Furthermore, the highest increase of age at marriage can be observed in Kandy, Hambantota, Anuradhapura and Ampara over the period.

The median age at first sexual intercourse is a summary measure of the average age at which women initiate sexual relationships. As shown in Table 5, the median age at first sexual intercourse is rising in most districts, with a few exceptions. The median age at first sexual intercourse often appears later than the median age at first marriage in the majority of districts in 2006. This reflects the fact that most of the legally married couples in Sri Lanka tend to postpone their first sexual intercourse until the traditional wedding ceremony takes place⁴. Thus, couples start living together sometime later than the legal marriage registration. However, in 2016, there is no gap between the age at first marriage and the age at first sexual intercourse in most districts as well as at the national level. Yet, there is evidence of pre-marital sexual relationships in a few districts such as Kandy, Mannar and Mullaitivu in 2016, where more than half of the respondents reported having their first sexual intercourse sometime before marriage.

The age at which mothers give birth to their first child is also highly determined by the socio-cultural, ethnic and religious background of a woman. The median age of mothers at first birth in Sri Lanka was reported as aged 25 in 2006 (Table 5). On average the age at first birth has slightly increased throughout the period except in Batticaloa, where ethnic minority groups (Tamil and Moor) are concentrated. Likewise, only three districts (Batticaloa, Matale and Anuradhapura) reported a gap of two or more years from marriage to first birth in 2006 while most districts do so in 2016. Thus, it is evident that the interval between marriages to first birth is on the increase and most couples tend to delay their first birth using effective contraceptive methods.

⁴ Most marriages in Sri Lanka take place at a registry and it became a legal marriage, once marriage registration is completed. Then it follows a traditional marriage ceremony often few months later than the legal marriage registration or on the same day.

Table 5: Median age at first marriage, first sexual intercourse and first birth among all women age 25-49 in 2006/07 and 2016

District	First Marriage			First Sexual Intercourse			First Birth		
	2006/07	2016	Difference	2006/07	2016	Difference	2006/07	2016	Difference
Colombo	24.8	24.9	0.1	a	24.9	n.a	A	a	n.a
Gampaha	24.5	24.9	0.4	24.7	24.9	0.2	A	a	n.a
Kalutara	24.6	24.4	-0.2	25.0	24.4	-0.6	A	a	n.a
Kandy	23.5	24.6	1.1	23.7	24.5	0.8	A	a	n.a
Matale	22.6	22.8	0.2	22.8	22.8	0.0	24.6	24.9	0.3
Nuwara Eliya	22.5	23.0	0.5	22.8	23.4	0.6	23.9	24.9	1.0
Galle	24.1	24.5	0.4	24.2	24.5	0.3	A	a	n.a
Matara	24.5	24.5	0.0	24.6	24.5	-0.1	A	a	n.a
Hambantota	23.2	24.3	1.1	23.3	24.4	1.1	24.9	a	n.a
Jaffna	--	25.0	n.a	--	25.0	n.a	--	a	n.a
Mannar	--	23.0	n.a	--	22.9	n.a	--	24.9	n.a
Vavuniya	--	23.0	n.a	--	23.4	n.a	--	24.7	n.a
Mullaitivu	--	21.7	n.a	--	21.6	n.a	--	23.1	n.a
Kilinochchi	--	22.5	n.a	--	22.5	n.a	--	23.9	n.a
Batticaloa	21.3	21.6	0.3	21.7	21.6	-0.1	23.8	23.6	-0.2
Ampara	21.2	22.2	1.0	21.4	22.3	0.9	22.9	24.2	1.3
Trincomalee	21.0	21.7	0.7	21.2	21.8	0.6	22.6	23.4	0.8
Kurunegala	22.6	23.5	0.9	22.9	23.5	0.6	24.6	a	n.a
Puttalam	21.3	21.9	0.6	21.7	22.0	0.3	23.0	24.0	0.0
Anuradhapura	20.4	21.7	1.3	20.7	21.7	1.0	22.4	23.9	1.5
Polonnaruwa	21.5	21.7	0.2	21.7	21.7	0.0	23.1	23.9	0.8
Badulla	22.5	22.8	0.3	23.0	22.8	-0.2	24.1	24.5	0.4
Moneragala	21.8	21.8	0.0	22.0	21.9	-0.1	23.6	24.1	0.5
Ratnapura	22.8	23.4	0.6	23.0	23.5	0.5	24.6	a	n.a
Kegalle	24.4	24.1	-0.3	24.5	24.1	-0.4	a	a	n.a
Sri Lanka	23.3	23.7	0.4	23.6	23.7	0.1	25.1	a	n.a

Notes: '--' indicates data not available, 'n.a' indicates not applicable

^a Less than 50 percent of the women had a birth before reaching the beginning of the age group and therefore were omitted.

Sources: Department of Census and Statistics, 2009 and 2017

Proximate determinants on regional disparity in fertility

Prevalence of contraceptive use

Contraceptive prevalence is subject to vary on socio-cultural, ethnic, religious, political, and various other individual factors, including level of education, access to facilities and concerns about contraceptive side-effects. As shown in Table 6, majority of districts reflect some decrease in contraceptive use from 2006/07 to 2016. The trend shows an increase of modern method users with a decrease of traditional method users. Available data proved that contraceptive prevalence in war affected Mannar is extremely low (18.4%) and with non-use of traditional methods. Only Batticaloa, where Tamil and Moor populations are concentrated, shows some increase (2.5%) in traditional methods during the period.

Contraceptive prevalence in Sri Lanka appears to be exceptional in that, less developed rural districts report higher contraceptive prevalence as compared to urban districts. In 2006/07, the highest proportion of any method users and traditional method users are reported from Ratnapura where more than 90 percent of its population live in rural or estate sectors (Table 6). As indicated in the 2012 population census report, Polonnaruwa remains within the four districts that have no urbanized characteristics in Sri Lanka (Department of Census and Statistics, 2015). Despite its lower level of urbanization, the highest number of any method users as well as modern method users is reported from Polonnaruwa in 2016. On the other hand, some districts in which war affected and ethnic minority groups (Tamil and Moor) were concentrated (Mannar and Vavuniya, Batticaloa, Ampara and Trincomalee) were reported to have particularly low levels of contraceptive use. This implies that ethnic-religious background and the influence of war seems to be more decisive than the urban rural factor regarding contraceptive use in Sri Lanka.

Table 6: Current use of contraception in 2006/07 and 2016

District	Any Method			Modern Method			Traditional Method		
	2006/07	2016	Difference	2006/07	2016	Difference	2006/07	2016	Difference
Colombo	65.2	60.5	-4.7	46.2	47.4	1.2	19.0	13.2	-5.8
Gampaha	67.3	67.3	0.0	46.4	52.0	5.6	21.0	15.3	-5.7
Kalutara	69.8	73.8	4.0	52.1	55.4	3.3	17.7	18.4	0.7
Kandy	69.1	61.8	-7.3	57.1	52.3	-4.8	12.0	9.5	-2.5
Matale	70.7	71.4	0.7	60.4	61.7	1.3	10.2	9.6	-0.6
Nuwara Eliya	69.5	66.6	-2.9	63.2	62.7	-0.5	6.3	3.9	-2.4
Galle	73.6	70.6	-3.0	48.9	53.8	4.9	24.1	16.8	-7.3
Matara	68.8	65.0	-3.8	49.0	52.9	3.9	19.8	12.0	-7.8
Hambantota	69.5	64.5	-5.0	47.0	54.0	4.0	22.4	10.5	-11.9
Jaffna	--	46.6	n.a	--	42.7	n.a	--	3.8	n.a
Mannar	--	18.4	n.a	--	18.4	n.a	--	0.0	n.a
Vavuniya	--	33.0	n.a	--	30.7	n.a	--	2.2	n.a
Mullaitivu	--	67.2	n.a	--	63.9	n.a	--	3.4	n.a
Kilinochchi	--	58.4	n.a	--	56.3	n.a	--	2.2	n.a
Batticaloa	34.5	31.5	-3.0	34.0	28.5	-5.5	0.5	3.0	2.5
Ampara	55.7	45.7	-10.0	49.9	40.6	-9.3	5.9	5.1	-0.8
Trincomalee	52.8	48.6	-4.2	49.7	45.4	-4.3	3.0	3.2	0.2
Kurunegala	75.5	69.5	-6.0	58.0	55.8	-2.2	17.6	13.7	-3.9
Puttalam	66.1	69.3	3.2	52.5	55.6	3.1	13.5	13.7	0.2
Anuradhapura	74.0	67.2	-6.8	62.6	62.5	-0.1	11.3	4.7	-6.6
Polonnaruwa	77.8	72.3	-5.5	68.3	67.0	-1.3	9.5	5.3	-4.2
Badulla	72.4	71.3	-1.1	62.0	64.7	2.7	10.4	6.6	-3.8
Moneragala	71.1	72.7	1.6	57.4	63.7	6.3	13.7	9.0	-4.7
Ratnapura	73.4	74.4	1.0	54.3	55.8	1.5	19.1	18.5	-0.6
Kegalle	70.9	66.9	-4.0	49.8	59.3	9.5	21.1	7.6	-13.5
Sri Lanka	68.4	64.6	-3.8	52.5	53.6	1.1	15.9	11.0	-4.9

Source: Department of Census and Statistics (2009 and 2017).

The desire to limit childbearing of women in Sri Lanka is particularly high, irrespective of residence. Women in Badulla and Nuwara Eliya had the highest (70%) desire to limit childbearing in 2006/07 (Table 7). The desire to limit childbearing further increased in most districts by 2016, except in Badulla, Nuwara Eliya, Batticaloa, Ampara and Ratnapura. The highest increase can be observed in Matara, from 53 percent in 2006/07 to 65 percent in 2016. Badulla was reported to have a considerable drop of desire to limit childbearing from 70 percent in 2006/07 to 62 percent.

The desire to limit childbearing of women with two children reflects the direction of replacement fertility in the area. More than 80 percent of married women who had their second child in Kurunegala and Badulla did not want to have more children in 2006/07. In contrast, the majority of women with two children in Trincomalee and Batticaloa, where Moors are concentrated, did not intend to limit childbearing, reflecting the desire for a higher number of births and deviation from the replacement level. More than 70 percent of women in 18 districts expressed in 2016, their desire to have no more children, while this was observed in only 11 districts in 2006/07 (Table 7). During the ten-year period, a dramatic increase of more than 22 percent in 2016 can be observed from women in Hambantota, which has the highest proportion of Sinhalese among all the districts. Women with two children in Kegalle report the highest desire to limit childbearing in 2016. However, unexpectedly, it is one of the two districts with the highest TFR in 2016. Furthermore, it is clear that the desire to limit childbearing of all women as well as women with two children is relatively low in war affected Mannar and Vavuniya together with ethnic minority concentrated Ampara, Trincomalee and Batticaloa. Overall, the percentage of women with two children, who desire to limit childbearing, is increasing in 2016 as compared to 2006/07.

Table 7: Percentage of currently married women who desire to limit child bearing in 2006/07 and 2016

District	Percentage of women who desire to limit child bearing			
	All currently married women		Women with two children	
	2006/07	2016	2006/07	2016
Colombo	59.2	60.0	79.9	79.4
Gampaha	61.5	64.7	77.8	80.8
Kalutara	61.8	62.3	78.3	80.1
Kandy	60.2	61.2	74.8	73.4
Matale	59.7	62.0	71.3	75.7
Nuwara Eliya	69.0	67.2	74.2	77.0
Galle	58.0	62.6	67.3	78.5
Matara	53.0	65.3	63.6	77.6
Hambantota	56.5	60.0	53.6	75.7
Jaffna	--	53.0	--	69.4
Mannar	--	33.7	--	40.3
Vavuniya	--	47.6	--	62.6
Mullaitivu	--	64.6	--	73.5
Kilinochchi	--	64.2	--	71.6
Batticaloa	56.5	55.9	49.6	66.6
Ampara	54.8	49.6	55.2	55.3
Trincomalee	43.4	50.0	40.2	51.8
Kurunegala	63.5	63.6	82.9	82.2
Puttalam	60.1	62.7	67.1	72.4
Anuradhapura	56.3	57.4	62.3	69.4
Polonnaruwa	61.3	64.0	77.7	72.1
Badulla	70.3	61.9	80.5	72.2
Moneragala	56.8	62.1	65.2	74.5
Ratnapura	62.8	60.7	79.4	78.7
Kegalle	60.9	68.9	78.6	88.2
Sri Lanka	60.2	61.1	73.5	75.9

Notes: '--' indicates data not available.

Source: Department of Census and Statistics, 2009 and 2017

Postpartum infecundability on regional disparity in fertility

Postpartum Infecundability is primarily related to breastfeeding, which inhibits ovulation. It is the time after a birth without regular ovulation and menstruation. Bongaarts stressed that the duration of postpartum infecundity is primarily a function of breastfeeding behaviour in the absence of modern contraception (Bongaarts, 1978; Bongaarts & Potter, 1983). In the current study, the median duration of breastfeeding has been utilized to determine the effect of postpartum infecundability. The median duration of any breast feeding in Sri Lanka is as long as 33 months (2.9 years) proving that the duration of breastfeeding is much longer (Table 8).

Table 8: Median duration of breastfeeding in 2006/07

District	Median duration (Months) of breastfeeding among children born in the past three years		
	Any breastfeeding	Exclusive breastfeeding	Predominant breastfeeding
Colombo	30.4	4.5	4.9
Gampaha	34.0	4.2	4.4
Kalutara	u	3.3	3.3
Kandy	u	5.6	5.7
Matale	32.4	5.4	5.5
Nuwara Eliya	29.4	3.1	3.4
Galle	u	3.4	3.4
Matara	u	3.4	4.0
Hambantota	31.8	4.3	5.1
Batticaloa	23.1	4.1	4.6
Ampara	28.9	1.3	2.0
Trincomalee	27.7	3.8	4.8
Kurunegala	u	4.6	4.8
Puttalam	31.8	5.3	5.6
Anuradhapura	u	5.2	5.6
Polonnaruwa	33.3	5.3	6.3
Badulla	u	5.0	5.3
Moneragala	u	5.1	5.9
Ratnapura	u	4.6	5.1
Kegalle	33.8	5.0	5.0
Sri Lanka	33.0	4.5	4.8

Notes: The estimates of median duration of breastfeeding are based on current status data, that is, the proportion of children in the three years preceding the survey who were being breastfed at the time of the survey.

u= Unavailable due to long duration of breastfeeding

The above table, the five districts in the Northern Province were dropped due to the security situation

Source: Department of Census and Statistics (2009)

The duration of exclusive breast feeding is considered as a proxy for the length of postpartum infecundability as it biologically extends the amenorrhea period. Table 8 shows that the duration of exclusive breast feeding is longest (5.6) in Kandy. Both exclusive and predominant breast feeding is shortest in Moor concentrated Ampara, proving that the majority of children are not breastfed even within the first three months of life. The duration of any breast feeding also seems to be relatively short in other Moor population concentrated Batticaloa and Trincomalee reflecting the fact that the Moor population are less likely to breast-feed their children than other ethnic groups. The lower prevalence of breastfeeding practices among Moors may contribute to increase their fertility as it caused a resumption of the ovulation process earlier than otherwise.

Discussion and conclusion

This paper analysed the regional disparity in fertility and fertility levels and trends in the 25 districts of Sri Lanka based on average crude birth rate and Total Fertility Rate derived from the Sri Lanka Demographic and Health Survey 2006/07, 2012 and 2016 (SLDHSs). The contribution of socio-demographic factors and proximate determinants of fertility on regional variations was also examined.

The analysis of average crude birth rate and TFR suggest that there have been immense regional variations in fertility in Sri Lanka during last five decades, and that these differences could have been determined by socio-demographic and proximate determinants. It has been clearly shown that the highest average crude birth rates are observable in the areas of the dry zone-which are the areas of low density of population. Further, the other socio-demographic variables are correlated with average birth rates by districts including higher percentage of married female population, median age at marriage, and percentage of Moors and Sinhalese and literacy rates of the districts. However, the Total Fertility Rates by districts are concerned demographic and proximate determinants including prevalence of contraceptive use, postpartum infecundability, median age at first birth, duration of breast feeding and desire to limit childbearing are also associated.

The current analysis revealed that, as theory predicts, the regional variations in fertility have been declining in recent decades, suggesting a convergence in fertility, occurring later in the transition. It proved that major driving forces of fertility transition in Sri Lanka have led to similar fertility outcomes in most regions, in spite of different socio-economic and demographic characteristics of districts. According to SLDHS 2006/07, no single district reported a TFR below 2.0 and the TFR ranges from 2.0 to 3.0. A similar pattern is reflected even in 2016 where TFR ranges from 1.8 to 2.6 in well urbanized cities as well as typical rural areas. This

may be due to the widespread access to modern contraceptives without any sectorial variation, the provision of knowledge and family planning services, the lower variation in infant mortality rates, and the overall development of child health in the country. Gampaha district shows the lowest fertility over time, while nearby Colombo, the capital of Sri Lanka also reflects a relatively low fertility rate. In contrast, Kandy and Kegalle have the highest fertility in 2016. Ethnic minority concentrated Ampara (2001 and 2006) and Trincomalee (1981, 2006 and 2012) also reported the highest fertility earlier.

Being married continues to be the most common marital status in Sri Lanka. However, most recent SLDHSs provided evidence of pre-marital sexual relationships from Kandy, Mannar and Mullaitivu. Typically, women who got married at an early age have a long period for childbearing, often leading to a larger number of children being born. The current study revealed that women's age at first marriage is slightly increasing in all districts except Kalutara and Kegalle. It is surprising to note that war affected Jaffna district reports the highest mean age at marriage by 2016. Even though the age at marriage is evident for the lower prevalence of teenage pregnancies in the country, it should be noted that the age at marriage is heavily dependent on the ethnic and religious background of the women.

The age at first marriage, first sexual intercourse and first birth are rising in most districts in Sri Lanka. Well educated women in more socially liberal countries have children later, while those who are less educated and in poorer countries tend to have children at an earlier age, as teenagers or even much earlier. Therefore, the age at first birth can be considered as an indicator of the social status of women. Reflecting a favourable status, women in Sri Lanka give birth to their first child at the age of 25. Remarkably, the largest span from marriage to first birth appears in the poorest district of Moneragala in 2006 and in Tamil and Moor concentrated Batticaloa in 2016. Despite the fact that the gap between marriage and first birth is increasing, marriage is still closely related to the first birth of a couple.

As a result of extended awareness programs for contraceptive methods, the knowledge of contraceptive methods remains extremely high at 100 percent in all districts in the country, irrespective of education levels or wealth quintiles (Department of Census and Statistics, 2017). Likewise, Sri Lanka has achieved the highest contraceptive prevalence rate since the 1980s. However, recent data shows that contraceptive prevalence in Sri Lanka is decreasing (from 70.6% in 2006/2007 to 65.6% in 2016) while modern contraceptive method users are steadily increasing (from 40.6% in 1987 to 54.1% in 2016). Even so, well educated women are less likely to use modern methods compared to less educated women. Alternatively, well educated women seem to prefer traditional

methods, especially the rhythm method (Department of Census and Statistics, 2017).

The current analysis suggests that Moor mothers have breastfed their children for a relatively shorter duration than other mothers in Sri Lanka. Policy guidelines for breastfeeding in Sri Lanka are in accordance with UNICEF and WHO recommendations wherein children be exclusively breastfed during the first six months of life and given solid or semisolid complementary food in addition to continued breastfeeding from 6 months until age 24 months or more, until the child is fully weaned (Department of Census and Statistics, 2009). Despite the above recommendations, the majority of children in Ampara have been breastfed a relatively shorter period of 1.3 months, implying there are health risks for such children.

To summarize, the analysis which is descriptive and exploratory in nature aimed to provide the reader with a better understanding of the characteristics of districts, and to explore the influence of proximate determinants of fertility in shaping district fertility levels in Sri Lanka. This descriptive analysis provides a concise summary of socio economic and demographic structure of the community with observed levels and trends of childbearing in recent decades.

Annexure

Table 1: Selected Demographic and Socio-Economic Characteristics by Districts, 2012 -2019

District	Population Density 2019	Percent of Moors 2012	Percent of Sinhalese 2012	Percent of Literacy (Both sexes) 2020	IMR per 1000 live births 2015	Married Percentage 2019	Median age at first Marriage-2016 25-49
Colombo	3604	10.7	76.5	96.2	13.4	10.44	24.9
Gampaha	1747	4.2	90.5	96.7	6.7	10.91	24.9
Kalutara	780	9.3	86.8	94.1	6.3	5.73	24.4
Kandy	767	13.9	74.4	93.7	12.5	6.57	24.6
Matale	254	9.2	80.8	91.7	7.5	2.36	22.8
Nuwara Eliya	440	2.5	39.6	93.4	7.5	3.60	23.0
Galle	701	3.6	94.4	93.3	7.9	4.98	24.5
Hambantota	253	1.1	97.1	90.8	3.9	3.14	24.3
Matara	659	3.1	94.3	92.5	5.3	3.77	24.5
Jaffna	632	0.4	0.4	96.3	13.6	3.18	25.0
Kilinochchi	78	0.6	1.2	91.1	4.9	0.66	22.5
Mannar	65	16.5	2.3	93.1	1.8	0.64	23.0
Vavuniya	59	6.8	10.0	88.4	6.8	0.93	23.0
Mullaitivu	72	2.0	9.7	91.0	1.8	0.63	21.7
Batticaloa	232	25.4	1.3	84.1	11.7	3.38	21.6
Ampara	164	43.4	38.9	89.7	3.5	3.78	22.2
Trincomalee	162	41.8	26.7	90.4	4.6	2.04	21.7
Kurunegala	350	7.1	91.4	93.8	11.0	7.73	23.5
Puttalam	267	19.4	73.6	91.4	6.7	4.61	21.9
Anuradhapura	130	8.2	91.0	93.0	7.9	4.35	21.7
Polonnaruwa	128	7.4	90.7	88.6	7.8	2.03	21.7
Badulla	306	5.5	73.0	88.1	7.8	3.87	22.8
Moneragala	86	2.1	94.9	87.7	6.7	2.38	21.8
Ratnapura	356	2.1	87.1	90.0	5.2	4.61	23.4
Kegalle	534	7.1	85.5	95.1	3.6	3.69	24.1

Source: DCS-Statistical Abstracts (various years); DCS (2017)

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