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Fertility and Natural Disasters: The Case of Tsunami Disaster in Sri Lanka

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Introduction

The main objective of this paper is to examine the fertility implications after the tsunami disaster in Sri Lanka with the use of one of the worst tsunami hit district in Sri Lanka. The study attempts to observe and examine changes in relation to fertility among tsunami affected population in the district by comparing the pre-tsunami situation. Although Sri Lanka has been experiencing gradual changes in mortality and fertility as predicted by the demographic transition theory, this natural disaster may have produced some imbalances with regard to both levels and patterns of fertility and mortality in the affected areas. It is quite clear that the environmental shocks and other forms of short-run instability affect fertility. Tsunami mortality can increase fertility rates as a result of significant number of children were affected by the tsunami disaster. Although mothers who lost their children but still in their childbearing age span may want to have some more children in order to replace the dead ones. However, fertility rates may decrease initially for a short time interval due to reasons like the lost of breadwinners of the family, economic instability of the family and mental stresses of the parents etc. There are few examples that we can draw from areas that have faced difficulties of disastrous situations in various ways. Their experiences can provide an excellent opportunity to direct the present study and see whether some of the hypotheses that we propose in this study are true.

Many people believe that human reproduction is highly sensitive to influences from the surrounding socio cultural milieu. Rodgers *et al.* (2005: 675) claim that after the terrorist attacks in New York City and Washington, DC, on September 11, 2001, birth patterns of the United States of America changed substantially. Conrad *et al.* (1996) have shown that birth rates declined dramatically (by about 60% between 1989 and 1994) in East Germany following the German reunification in 1989. This response was called "the most substantial fall in birth rates that has ever occurred in peacetime" (Conrad *et al.*, 1996: 331) and was interpreted as a 'demographic shock' caused by the difficulty of assimilation during the transitional period after reunification.

Cohan and Cole (2002) showed fluctuations in birth patterns following a natural disaster in relation to Hurricane Hugo. It was shown that following the hurricane in 1989, births increased in the 22 affected counties in South Carolina, compared with those that were not affected. Nakonezny *et al.* (2004) claimed there was a substantial reduction in the incidence of divorce following the Oklahoma City bombing. These suggest that one can observe significant changes in fertility following a natural disaster. Therefore, it is quite interesting to explore how the tsunami disaster has had any significant impact on the subsequent fertility in Sri Lanka. Furthermore, Lin (2004) has shown fertility experiences of Italy and Japan in terms of natural disaster by claiming that natural disasters have a significant negative effect on fertility in both countries, while short run economic volatility had a significant negative effect in Italy, but no effect in Japan. Thus, short-run instability, particularly those arising from the natural environment, appears to cause a decrease in fertility. This leads us to hypothesize that the tsunami disaster has a significant effect on subsequent fertility.

Hikkaduwa Divisional Secretariat (DS) division in Galle District is used as a case study in order to collect information from mothers who are still in the childbearing ages and lost at least one child due to tsunami disaster. Galle District is one of the worst tsunami hit district in Sri Lanka. Table 1 shows the number of deaths, number of injured people and number of missing persons in Galle District in a comparative perspective with other tsunami affected districts.

Table 1
Impact of Tsunami Disaster, 26th December 2004, Sri Lanka

District	No. of deaths	Number of Injured	Number of Missing
Jaffna	2,640	1,647	540
Mullaitivu	560	670	1
Kilinochchi	3,000	2,590	552
Trincomalee	1,078	n.a.	337
Batticaloa	2,840	2,375	1,033
Ampara	10,436	120	876
Hambantota	4,500	361	963
Matara	1,342	6,652	613
Galle	4,216	313	554
Kalutara	256	400	155
Colombo	79	64	12
Gampaha	6	3	5
Puttalam	4	1	3
	30,959	15,196	5,644

Source: *http://www.cenwor.lk/Tsunamistat.html*

Theoretical Underpinning

The demographic literature contains a wide-ranging treatment of how and why fertility changes. Several theories have been constructed to describe and explain the fertility transition. However, debate has been continuing for some time about the relative importance of the most significant causal factors such as contraception technology, communications, ideology, economics, mass education and changes in social structures (McDonald, 1993: 3). Concern over the social, economic and political consequences of the rapid population growth of the developing countries that resulted from declining mortality, occurring simultaneously with high fertility has lead to substantial interest both on the part of researchers and policy makers in the determinants of reproductive behaviour, especially those related to fertility decline. The analysis of post-transitional fertility differentials is of significance for population forecasting or demonstrating the different economic-demographic calculuses utilized in various social classes. Although the broad fertility theories have part relevance for understanding the possible effect of the tsunami disaster on fertility in Sri Lanka, Rodger *et al.* (2005) focused and specific theoretical formulations that can help in understanding fertility responses in tsunami-affected Sri Lanka, each of which draws in some key elements from these broader perspectives. We attempted to define theories that make specific and sharp distinctions between what might have happened in tsunami affected areas in Sri Lanka. In other words, we will try to organize our thinking about the ways in which the tsunami disaster in Sri Lanka might have influenced birth planning and birth patterns, in the context of those broad theoretical perspectives. Since the present analysis is focusing upon a single historical event (tsunami disaster in 2004), we primarily examine period effects on fertility. In this context, we consider whether women cohort which was exposed to tsunami disaster eventually attempt to have more children than they would have had otherwise or whether any additional babies born after the tsunami disaster reflected earlier childbearing. The community influence theory, replacement/insurance theory and terror management theory have been proven useful in explaining fertility effects arising from Oklahoma City bombing in 1995 (Rodgers *et al.*, 2005). These theories commonly agree in increase in births following a disaster.

In this study we hypothesize that potential couples who are just married may have changed their attitudes towards the number of children (different to the fertility norm which currently exists in the society) and have decided to increase the number of children by thinking of possible similar disasters in the future and also possible loss of children.

In addition, we hypothesize that those who are in the childbearing ages and lost their children have planned to have at least another child. This behavior can be seen as an adjustment to the lost children by replacing them by an additional birth. This was further studied by collecting information from women who lost children and replaced them by an additional birth. In addition, those who have not yet replaced children have been asked about their fertility decision.

It is also interesting to see how women who were in the childbearing ages but became widowed respond to their fertility desires in the subsequent marriage. In this regard, some few case studies were carried out in Hikkaduwa Divisional Secretariat Division in order to understand this phenomenon in great detail. One can expect the timing of births in the Galle district is occurring at a regular pace since Galle District is already in the fourth stage of the demographic transition. However, with the tsunami disaster we hypothesize that this regularity in the timing of births is disrupted.

Changes in Population Growth

It is quite interesting to see whether the tsunami mortality had any impact on the future population and its growth. This will indirectly force us to examine whether this decrease in

population growth will be compensated by an increase in fertility. Table 2 shows the population growth predicted in the absence and presence of tsunami deaths in the Galle district. It seems that the average annual growth rate of the Galle District population has decreased from .0074 per year between 2001 and 2011 in the absence of tsunami disaster to .0045 for the same period after applying tsunami deaths occurred in Galle District The decrease in the total population in 2011 due to tsunami disaster appears to be 30,500. It is a 2.9 percent decline of the total population and can be regarded as a substantial decline. However, it is important to note here that this decline may not be observed if those who have experienced child losses have intended to have additional birth in order to replace the loss ones.

Table 2
Population in 2011, in the Absence and Presence of Tsunami Deaths, Galle District

Average annual growth rate	In the absence of tsunami deaths	In the presence of tsunami deaths
2001-2011	.0074	.0045
Estimated population in 2011	1,067,115	1,036,613

Changes in the Total Number of Births

It will be quite exciting to examine whether there has been any change in the trend in the total births observed in the Galle District from the beginning of this century and during the post-tsunami period. This will surely provide a great opportunity to find out whether the intensity of fertility has changed significantly during this period. As we can see from the Figure 1, the total number of births has been increasing from the year 2001 up to 2004, latter being the tsunami year. In 2006, the total number of births has decreased even below the level observed in 2001. It is quite reasonable to argue here that the fertility decline is not necessarily reflected in the total number of births. This can arise due to the existence of large number of mothers in the childbearing ages. This can be observed when age structure of the childbearing ages of the Galle District is examined.

Figure 2 clearly shows that there has been a constant increase in the number of women in all ages during the period under study. This explains why the total number of births has increased from 2001 to 2004. As Coale (1975) pointed out, birth momentum has continued for some time even a significant fertility decline has been observed in the Galle District. Therefore, one needs to examine further whether this trend has continued even after the tsunami disaster in order to find reasons for a steady declining trend in the total number of births in the post-tsunami years.

Figure 3 shows that the number of females in the childbearing ages in 2006 has increased in all ages compared to that of the 2001. However, the relative increase in different ages shows that the intensity has been greater in the ages 35 and above in 2006. This suggests that most women who have produced children in their early years of childbearing ages have now been moving into higher ages where women usually commence stopping behaviour of fertility. Therefore, one can reasonably claim that the relative decline in the early years of childbearing may have had a significant impact on the decline of the total number of births. However, this alone may not be enough to explain the substantial decline observed in the total number of births in the post-tsunami years. Perhaps, women in the reproductive ages who have lost children may have decided to postpone their subsequent births during the immediate post-tsunami years. However, that does not

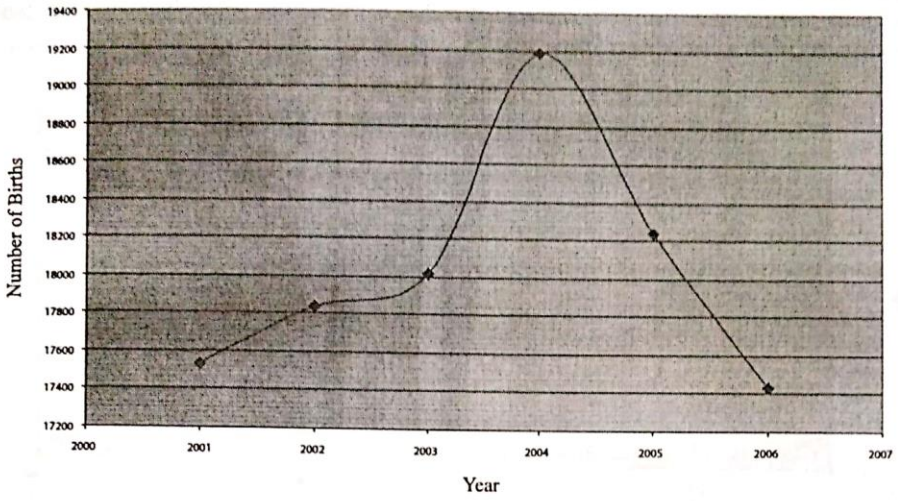

Figure 1. Trend in Total Number of Births, Galle District, 2001-2006

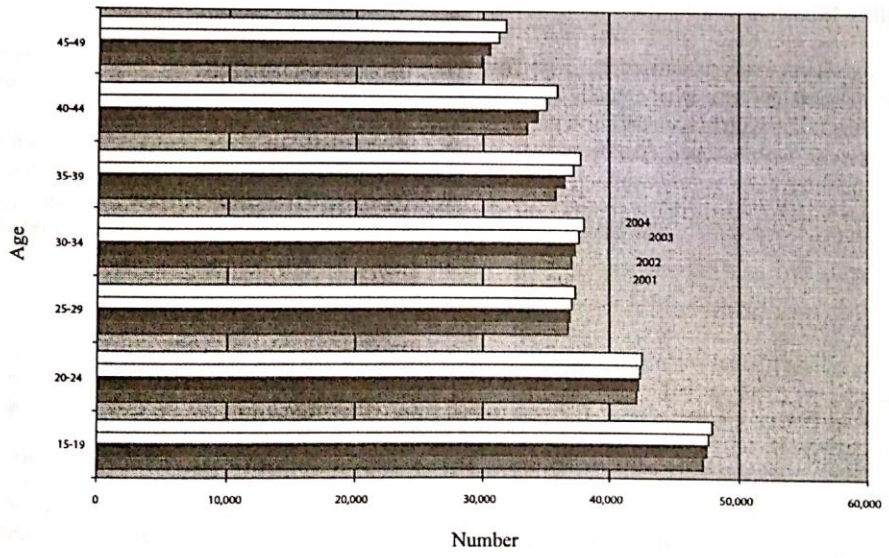

Figure 2. Age-specific Femle Population in the Childbearing Ages, 2001-2006

indicate whether they have decided to completely stop childbearing, but they may be expecting to have many more children than they expected after they have resettled themselves during the post-tsunami years, with a two or three years lapse.

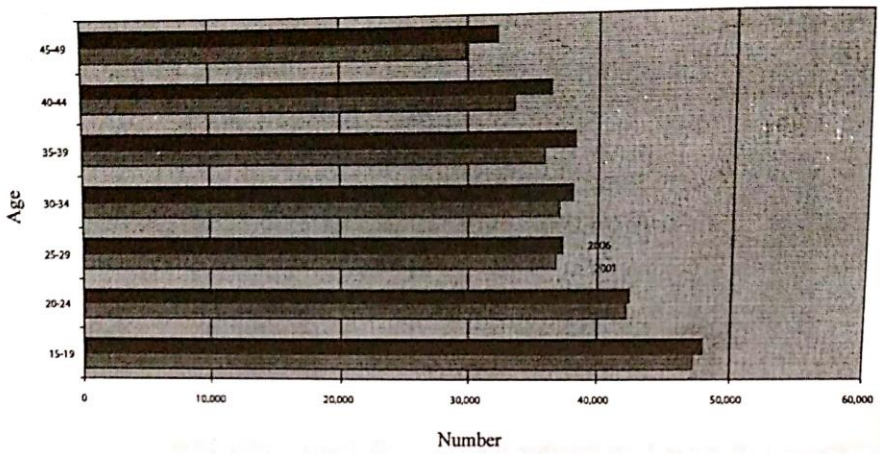

Figure 3. Age-specific Female Population in the Childbearing Ages, Galle District, 2001 & 2006

Fertility Intention

Micro-level analysis carried out with case studies at Hikkaduwa DS divisional level provides an obvious insight into what actually has caused to detect the decline in absolute number of births during the immediate post-tsunami years.

Although we observed decline of total number of births during the immediate post-tsunami years, families have started thinking of having more children after resettling in their new homes. The Case Study 1 shows that a couple who had four children and lost one child due to tsunami goes on having another child as a replacement. However, this family intended to have another child after their family economy became stable.

Case Study 1

31 years old Ruwani is a married woman, presently residing at Galagodawatta housing scheme after loosing her dwellings in the tsunami. She lost all she possessed, as well as a child due to tsunami tragedy. Ruwani is a Sinhala Buddhist who was educated up to year 10. She got married willingly at the very tender age of 13 and has given birth to five children so far. Four children were born prior to the tsunami and one in the post tsunami period. She was only 14 years old in the year 1991, when she delivered the first child. The second child was born in 1993 when she was 16 years old. She gave birth to the third child in 1995 when she was 18, fourth in 1998 when her age was 21 and at the age of 30 the fifth in 2007. Due to the tsunami tragedy they lost their house, household goods and their 6 years old son. Since she gave birth to their fourth child in 1998, they decided that they were content with their four children, two boys and two girls. Subsequently, when tsunami killed one of their sons, they decided that this should be compensated with another child in lieu of the lost. They did not implement this until their economy became stable and they got a house to live. Since then they proceeded to get a child. Their objective was fulfilled in the month of April in 2007. They have got a child and they are content with the family.

Following case study is a good example again to show how death of husband made women vulnerable and emphasizes the importance of economic recovery and the time needed for such recovery, which affect the fertility intentions.

Case Study 2

Niranjala who got widowed due to the loss of her husband from tsunami is 23 years old. She is a Sinhala Buddhist and was educated up to G.C.E ordinary level. She was just 18 years when she got married on a marriage proposal in the year 2003. She was 19 when she delivered her first baby on 16th August 2004. The baby was a male. Since the death of her husband from the tsunami, she and her child are living with her mother in law. Their family income depended on the salary her husband drawn from his occupation. However, this income source ceased with the demise of the husband. Therefore, not only the responsibility of the child but she has to bear the burden of feeding and caring for her mother in law. She is not willing for a remarriage or to send the mother in law to her dwelling, as the rightful owner of the house which her late husband claimed from his parents, she is responsible for their upkeep. Therefore, with the economic problems aroused with the tsunami her attention was focused on sewing. The donation of a sewing machine by an organization has become as a great asset for her. She is sewing night dresses on the basis of settling the credit for the material after marketing them. She has developed the enterprise to a certain extent. She is still 23 years old. Her parents and relatives are proposing marriages for her. Her intention is to develop the enterprise, and if a person could be found who would understand her situation and undertake the responsibility of maintaining the family, with her mother in law's consent to consider to such a marriage. In such a context she expects to bear children. Considering the situation that has arisen with the tsunami tragedy, she said having more children is a satisfaction. She said she was able to develop her life because of her child.

Following is a case study of a middle aged man who lost everything to the tsunami disaster. As he was married again and expects two children in the second marriage, it is quite clear that his fertility intention has changed completely with the tsunami disaster after loosing all two children.

Case Study 3

We could identify with Danasiri, (an employee of the 'Department of Health') as a person who is depressed due to his losses from the tsunami. He is 49 years old and is educated up to G.C.E ordinary level. They were contented with the two children they had prior to the tsunami and lived a happy family life. The tsunami tragedy snatched everything he possessed leaving him alone. He lost his wife, children and all the property. He was severely depressed due to this and the Department of Health services extended an excellent counseling service for him. He lived as a spinster and subsequent to the counseling he developed hopes of rearranging his life. The first move was getting married to an attendant serving in the Department of Health. She is 39 years old. Their intention is to give birth to two more children before they get old. At the inception in the first marriage they wanted only two children.

Changes in the Age-specific Fertility Rates

Examining the age-specific fertility rates between the period from 2001 to 2005 provides a unique opportunity to understand whether there has been a significant change in the fertility behaviour in Galle District with the tsunami disaster. This macro-level picture is further investigated by carrying out in-depth studies in Hikkaduwa DS division that are described later in this section.

Figure 4 exhibits the age-specific fertility rates calculated without considering tsunami disaster for the years 2004, 2005 and 2006. It shows that fertility decline has been substantial during the two-year period from 2004 to 2006, especially in the first half the childbearing period in all ages. This coincides with the intensity of the fertility decline, which can be observed in the initial period of the fourth sage of the fertility transition, where fertility begins to stabilize at relatively low level.

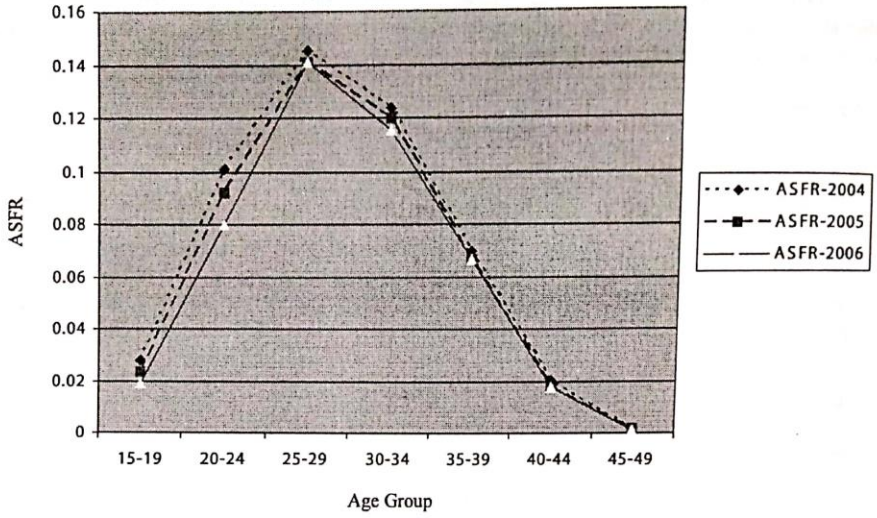

Figure 4. Age-specific Fertility Rates, Galle District, in the Absence of Tsunami Disaster, 2004, 2005, 2006

Figure 5 shows the changes in age-specific fertility rates of the Galle District incorporating the tsunami deaths to the population being studied. It indicates that the decline in the age-specific fertility rates have been in the first half of the childbearing. This is very similar to the pattern what we have observed even in the absence of the tsunami disaster as depicted in Figure 4.

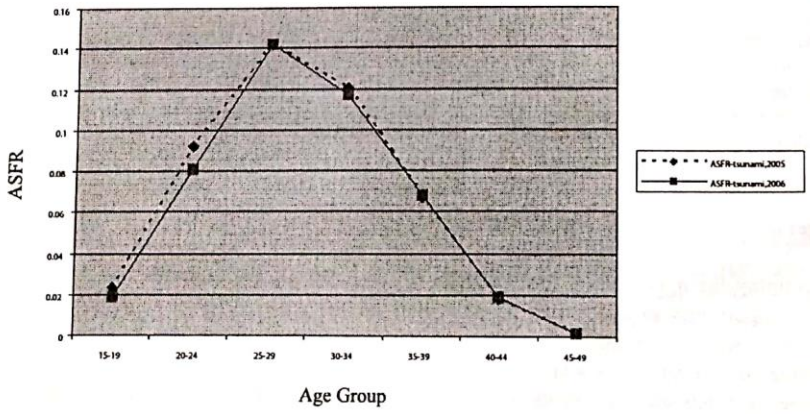

Figure 5. Age-specific Fertility Rates, Galle District (after incorporating tsunami deaths)

Although Figures 4 and 5 do not show much of a variation in terms of level and pattern of age-specific fertility rates, Figure 6 undoubtedly exhibits a considerable difference between level of fertility between 2001 and 2006, latter being a post-tsunami year.

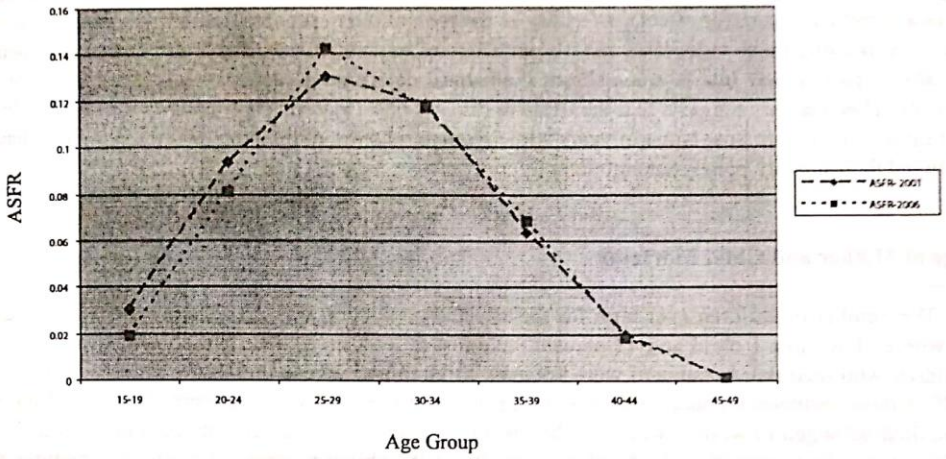

Figure 6. Age-specific Fertility Rates, Galle District, 2001 & 2006 (after incorporating tsunami deaths)

By examining the peak around the age group 25-29, one can claim that the most fecund women and also those who have just married may have decided to have more births during the post-tsunami years. Since the number of women who were severely affected by loosing children is not substantial, their impact may not be reflected in the occurrence of absolute number of births in 2006. However, when rates are calculated, the relative intensity is clearly seen as depicted in Figure 6. This can be further examined by using General Fertility Rate (GFR) of the Galle District from 2001 to 2006.

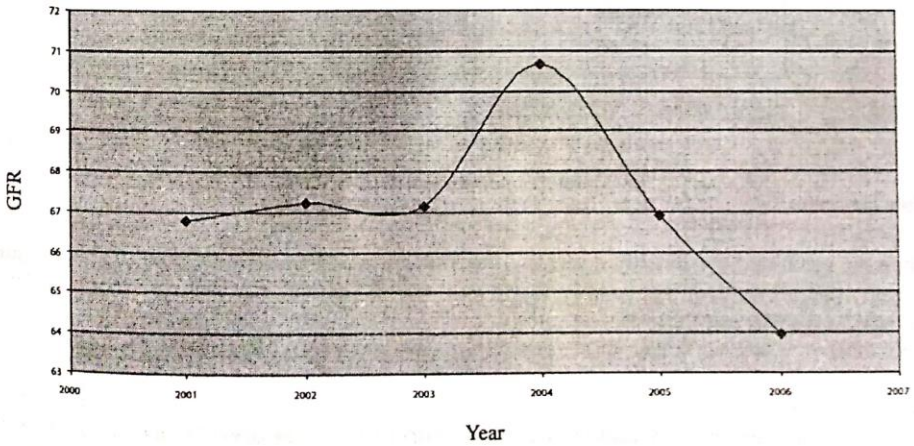

Figure 7. General Fertility Rate, Galle District, 2001 to 2006

Figure 7 is not very different to Figure 1, which exhibited the time trend of the absolute number of births that occurred in the Galle District. It appears that there is a clear decline in fertility during the immediate post-tsunami period. However, the present analysis is in a great position to highlight that an unusual pattern of change in the fertility behaviour of women has been observed, especially in the ages 25-29 years. This could be a result of short run economic volatility that can have a significant negative effect on fertility as the rehabilitation process took more than two years. Families became more vulnerable mainly with regard to shelter and livelihood. Hence, short-run instability particularly that is arising from the natural environment appears to cause a decrease in fertility. This analysis suggests that the tsunami disaster has a significant negative effect on fertility, during the immediate post-tsunami years while women who are in the most fecund age group have changed their fertility behaviour significantly in a positive manner.

Age of Mother and Child Mortality

The number of children ever born for the affected population was 2.1. Among them 59 percent of women have lost 1 child and 41 percent have lost at least more than two children. Majority of children who died due to tsunami were younger children and whose mothers were still in the first half of their childbearing age span. According to our survey[1] results 68.1 percent of the children who died belonged to women who were below 35 years of age at the time of tsunami disaster. It is quite interesting to note that the level of mortality of the children among the affected community before the tsunami disaster was zero as no children were reported dead.

Table 3
Number of Children Lost due to Tsunami by Age of Mother

Age group	Number
20-24	8
25-29	12
30-34	40
35-39	13
40-44	10
45-49	5

Source: Hikkaduwa Fertility Survey

Fertility Desires

When we examined the fertility desires of the mothers who lost their children, we found quite interestingly that all wanted to have at least one more child. The majority indicated that they desire to have at least 2 children (Table 4).

1. 80 women who lost children due to tsunami were identified with the help of the Grama Niladari (Village Headman) in Hikkaduwa DS Division and collected information on fertility from these women with the use of structured questionnaire and also by using in-depth studies.

Table 4
Number of Children Desired by Age of Mother Who Lost Children due to Tsunami

Age group	Number of children desired		
	1	2	3
20-24	–	4	4
25-29	–	8	4
30-34	20	12	–
35-39	8	4	4
40-44	4	4	–
45-49	4	4	4

Source: Hikkaduwa Fertility Survey

These desires were quite different to what they had before the tsunami disaster. It coincided with the fertility norm of the society which is 2 children per family. About 86 percent indicated their fertility desires were not the same before the tsunami disaster as depicted in Figure 8.

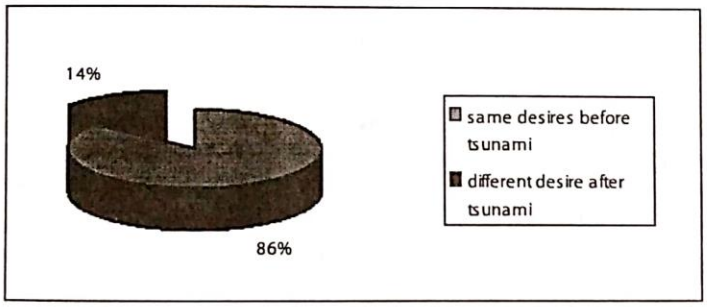

Figure 8. Fertility Desire Before and After Tsunami Disaster

It is quite interesting also to observe how the fertility desires have changed dramatically with the tsunami disaster for those who are still at fecund ages. Following case study is a good example of how tsunami changed fertility intention of mothers who lost children.

Case Study 4

In the pre tsunami era, Dilanthi and her family lived in Peraliya North GN Division with wealth and happiness. At present she is 34 years of age and has studied up to G.C.E advance levels. They got married subsequent to a love affair, with the blessings of their parents and were gifted with a son and a daughter. Even prior to their marriage they had planned to have only a son and a daughter. When this was fulfilled, they decided to limit their family. She lost many belongings due to tsunami, most importantly even her beloved children. Their life was shattered. Subsequent to the tragedy they got accustomed gradually for the life style. Though they wanted only two children in the pre tsunami era, they wished they could have three children in lieu of their lost children. They have arrived at this decision due to the loss of their children from the tsunami tragedy. At present they are once again

parents of a son and a daughter. Wife was 18 years old when she married, her first child was born in 1993 when she was 19 years old and the second child was born when she was 25 years old in 1999. In the post tsunami period the first child was born in 2006 when she was 32 years and the second child was born in April 2008 at her 34th year. She has given birth to four children during her life span. As she is 34 years old, she is expecting to deliver her next baby within two years.

It is also quite interesting to show that the age at widowhood due to tsunami was 36 years. About 43 percent have remarried and the average age at re-marriage was 36.57 years. About 95 percent of the respondent stated that they would like to replace the dead children by having some more children. This suggests that they were still in the fecund age and their desire is to have children in the new marriage as well. It seems as indicated earlier that the women who are still in their fecund ages would like to replace their dead one from a similar number and is very much evident in the following case study.

Case Study 5

30 year old Susila resides at the 'Tobacco' housing scheme at Galagodawatta after the tsunami. She is currently a mother of two children. She is a Sinhala Buddhist educated up to G.C.E ordinary level. When she was 18 years old she got married according to her wishes and has given birth to four children. She was a mother of three when tsunami struck. Her first child was born in 1997 when she was 19 years, the second in 2002 when she was 24 years and the third on 17th December 2004 when she was 26 years. She sacrifices her property as well as two of her children for the tsunami. Till then they were satisfied with their family consisting of two daughters and a son. But they lost their only son who was 7 years old then and seven days old infant daughter due to tsunami. They decided to have two more children due to this fact, resulting in the birth of another daughter in the year 2007. She was 29 years old then. She is still in a fine fertile age and also because they feel the lack of a son they intend giving birth to a child as early as possible. There was no such intention in the pre tsunami period. She said they decided on this due to the loss of children by tsunami.

It is quite interesting to note that tsunami disaster has changed older women attitudes towards childbearing as depicted by the following case study. This woman whose second marriage husband died due to tsunami expected only one child before the tsunami. However, the woman who is now 44 years of age intends to have another child at their earliest.

Case Study 6

Warusa is a 44 year old married woman. She is a Sinhala, Buddhist and is educated only up to primary level. In the year 1985, when she was 21 years old, she got married and the first child was born in 1986. The second child was born in 1996 when she was completing 32 years of age. At the time of marriage their intention was to have two children. Though this objective was fulfilled the disagreements which prevailed between them for a long period developed and they divorced. The custody of the children was assigned to the father. Now the elder daughter is married and the son is living with the father. Subsequent to the divorce, she lived a single life for some time and remarried, when she was 34 years old in the year 1998. As she had no children under her custody and due to remarrying she intended having only one child. When the tsunami struck on 26th of December 2004 she was pregnant for two months. But due to the unexpected shock she aborted and lost hopes of a child. Currently they have gradually developed their way of life which was affected by the losses due to tsunami. After the tragedy, the first child of the marriage was born in the year 2007. Till the economical difficulties gradually lessened, they have postponed having another child. Initially they expected only one child from the second marriage but due to the losses from the tragedy they decided that a solitary child is not sufficient. As she is already 44 years old, the intention is to have another child at their earliest.

It was found that the majority of the children who died due to tsunami were younger children and whose mothers were still in the early years of childbearing age span. It was also revealed that

the level of infant and child mortality during the pre-tsunami period in the affected community was zero as no child had been reported dead. Our analysis showed that the fertility desires of the affected who are still in the childbearing age span are quite different to their fertility desires before the tsunami. At present, they desire more children which is more than the fertility norm in that community. This is expected for not only to replace the dead children but also as an insurance measure to face a future disaster situation. This clearly shows those women who were affected by tsunami have decided to adjust their fertility behaviour accordingly. A relatively high incidence of re-marriage was also noticed among the women who lost their husbands due to tsunami. This has resulted in an increase in number of children in their new marriage.

It is also clear that some actually want more children, especially older women as a social security measure as well as an insurance measure as depicted in the following case study.

Case Study 7

Let's name her as Sarojni. At present she is 42 years old. She had two children at the time of tsunami. Those are an 11 years old son and a 9 years old daughter. She was 38 years of age then. She lost her 9 years old daughter due to tsunami. She and her husband could not bear this up. In the post tsunami period she lived in a temporary shelter with her husband and son. She was craving for another child due to the loss of her child. But they could not achieve this as they were both mentally depressed. Later they sought advice of the mid wife regarding having another child. They advised her not to bear another child due to her age. She got scared due to this factor, but she cannot bear up the loss of her child. She was 40 years old when she sought advice from the mid wife. She said that she and her husband are both depressed, and solution would be another child. They felt it was better if they referred them for medical advice. Mid wife has advised that if another child is born, the gap of the age difference would affect the children socially. She got more dejected on this advice. Both of them are disheartened due to the fact that they are not able to achieve their need. She further said her husband is not yet mentally stable. The only solution is another child, but they are helpless as they fear any repercussion. She said they should have had at least four children without limiting to two.

All these case studies clearly support the hypothesis that "fertility desires of the disaster affected community can be quite different to the fertility desire prior to the disaster". It was also evident that now couples desire more children than the fertility norm of that community. This is not only for replacing the dead ones due to the disaster but also as an insurance measure to face future fatal disasters like tsunami.

Conclusion

In this paper, we attempted achieve two specific objectives: to examine whether the tsunami situation can lead to increase fertility during the subsequent tsunami post-tsunami years and; to explore whether women in the childbearing ages change their fertility behaviour during the post-tsunami period. Our investigation suggested that there has been a clear decline in fertility during the immediate post-tsunami years. This was mainly due to short run economic volatility which had significant negative impact on fertility as rehabilitation process took place nearly more than two years. Therefore, affected families became more vulnerable with regard to shelter and livelihood. It was also found out that the fertility desires of the affected community are quite different after they have resettled and economically recovered. Subsequently, they desired more not only to replace the dead children but also as an insurance measure to face future disaster situations. This phenomenon was observed in almost all the possible types of family contexts that emerged due to the tsunami disaster.

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