



THE IMPACT OF COVID-19 ON FERTILITY:

THE CASE OF SRI LANKA



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Executive Summary

The COVID-19 pandemic has significantly impacted developing countries with economic vulnerabilities, such as Sri Lanka, which recorded over 671,000 infections and 16,808 deaths by December 2022.

The pandemic has aggravated Sri Lanka's existing economic challenges, which have led to an ongoing crisis worsened by the decline of earnings from the tourism sector and disruptions in foreign remittances. Existing government debt has also contributed to a dire economic situation.

The pandemic has further exacerbated inequalities, potentially giving rise to a new segment of vulnerable people. In addition to pandemic-specific factors, Sri Lanka's economic uncertainty also stems from fiscal imbalances, high debt levels, and political turmoil. Investigating the intricate relationship between pandemic waves, economic instability, and fertility is essential for understanding demographic trends. This research analyses the potential impact of the pandemic on fertility and reproductive behaviours and examines how it hampered access to family planning, altered social norms, and limited healthcare services. Understanding these dynamics are crucial for predicting population changes and developing effective policies.

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Study Methodology

The study employed a mixed-method approach to comprehensively explore the impact of the COVID-19 pandemic on birth trends and reproductive behaviours. Birth registrations from 2018 to 2022 were examined to identify pandemic-related interruptions. Data collection encompassed a sample survey 360 women of reproductive age from urban, rural, and estate sectors.²

The methodology included structured questionnaires, six Focus Group Discussions (FGDs), and sixteen case studies for in-depth insights. This mixed-method approach integrated both quantitative and qualitative data, providing a holistic view.

Multivariate statistical techniques were utilized for quantitative analysis to control the interplay between variables and enhance the reliability of conclusions. Qualitative insights from FGDs and case studies further complemented the analysis. Key Informant Interviews were conducted with Public Health Midwives and were pivotal in understanding reproductive health issues on the ground during the pandemic.

The research aligns with the UNFPA's framework and captures the COVID-19 pandemic's downward impact on total fertility rates (TFR) due to fertility postponement triggered by economic uncertainty, recession, and altered work-life balance, both during the pandemic and its aftermath.

Findings

Our study found that amid the COVID-19 pandemic and economic crisis, over a quarter of Sri Lankan women postponed childbearing. The delay mainly affected younger women (15-35 years), with 76.3% remaining childless by end of 2022. The first and second births were most deferred, particularly by younger women. Older women considering a third birth had also postponed such plans. The rate of desired children decreased slightly from 2.30 to 2.24 due to the pandemic, particularly in higher birth orders due to economic uncertainty.

COVID-19 primarily affected timing of births, and disproportionately impacted younger women. Variations were observed among ethnic and religious groups. Indian Tamil women aligned with the general population's fertility norms.

[2] However, the study included a larger sample, incorporating 90 women who were not married but were of marriageable age, to conduct a separate study on the influence of the COVID-19 pandemic on marital union formation.

While COVID-19 influenced timing, economic concerns led to fewer anticipated children among Sri Lankan Tamil women. Strong religious networks buffered Muslim women from similar impacts. Health concerns led to a "baby bust," with 46.9% delaying pregnancies due to infection fears. COVID-19 infections during pregnancy and miscarriages impacted the health of 7.1% of newborns.

Movement restrictions affected family planning for 21.6% of women, predominantly for older women. Lockdowns increased domestic workloads and influenced childbearing decisions. Economic uncertainties disrupted social networks and affected childbearing choices, especially among younger women.

Assisted reproduction services faced interruptions, with 6% discontinuing due to travel restrictions. Child mortality impacted childbearing decisions, with around 22% experiencing child deaths, out of which 25% was linked to COVID-19. Irregular menstrual cycles post-vaccination affected daily life. Elevated miscarriage rates were observed, notably among estate and rural women. The Total Fertility Rate (TFR), which dropped temporarily, is expected to recover between 2023 and 2030 and stabilize thereafter.

The pandemic and the economic crisis have deeply influenced women's repro-

ductive choices and health in Sri Lanka, necessitating comprehensive support mechanisms.

Recommendations

For addressing the multifaceted challenges arising from the COVID-19 pandemic and the economic crisis on reproductive health and fertility include implementing measures to support fertility recovery through incentives and policies; focusing on healthcare system resilience to ensure maternal and reproductive health access; addressing concerns of women postponing childbearing by offering comprehensive support systems; tailoring interventions for different population groups; strengthening family planning services and accessibility; combating intimate partner violence; promoting work-life balance; ensuring continuity of assisted reproductive technologies services; enhancing reproductive healthcare and support; fostering a supportive environment for women's choices; and establishing a robust data collection system to monitor trends and policy effectiveness. Implementing these recommendations can empower individuals, promote reproductive health, and mitigate the pandemic's impacts on fertility decisions.

1. Introduction

COVID-19 is regarded as a public health emergency worldwide, including in Sri Lanka. By December 2022, approximately 671,000 infections and 16,808 deaths due to COVID-19 were recorded in Sri Lanka (Ministry of Health, 2023). The pandemic's adverse effects have been more pronounced in developing countries like Sri Lanka due to their weaker economic positions. The current economic crisis in Sri Lanka can be seen as a prolongation of the crisis exacerbated by the COVID-19 pandemic. Key economic sectors, particularly tourism and foreign remittances from migrant workers, were severely impacted during the pandemic, with effects lasting unpredictably long. Coupled with the country's debt obligations, this has led to an economic crisis that appears irreversible in the immediate term.

Prior to the COVID-19 pandemic, Sri Lanka had made significant progress in poverty alleviation. However, the pandemic has increased existing inequalities among vulnerable groups. A new segment of the population, now on the verge of poverty, has likely emerged and their situation may have deteriorated further due to the post-pandemic economic crisis.

Sri Lanka's economic position has become uncertain due to fiscal and external imbalances, including high levels of debt, debt servicing, fiscal deficit, and external instability. The country is facing its worst economic crisis, compounded by a political crisis, which has severely impacted the poor and vulnerable populations. This economic uncertainty is partly independent of the COVID-19 pandemic. Given the multiple waves of the pandemic in Sri Lanka, it is important to investigate how the pandemic and economic uncertainty has and will affect fertility in both the short and long term. Economic downturns, mobility restrictions, healthcare crises, and fears for the future seem to be disrupting social norms, including reproduction, in Sri Lanka. The effects on fertility are likely to vary based on the severity and duration of the epidemic, the subsequent economic crisis, the country's socio-economic level, and policy responses. Understanding the impact of the COVID-19 pandemic and economic uncertainty on fertility is critical for projecting future population levels and trends.

It has been found that uncertainty stemming from the 2008 global economic crisis reduced the intention to have children, especially in high-income countries, weakening fertility behaviour. The current crisis, which arose with the COVID-19 pandemic, is unique due to the lack of access to family planning.³ Unlike other crises, the COVID-19 pandemic limited people's mobility. Social distancing regulations and the government's lock-down controls can influence family relations and sexual activity,⁴ thus affecting fertility.

Preliminary studies in the Asia-Pacific region have shown that restricted access to family planning services, economic uncertainty and recession, reduced work-life balance and restricted access to assisted reproduction services can limit fertility choices at the individual level.⁵

There is also a higher likelihood that vulnerable groups such as the poor, marginalized communities, informal workers, and migrant workers could face the most significant challenges in achieving their desired family size and in exercising their reproductive rights.

This study hypothesizes that restricted access to family planning services, economic uncertainty and recession, reduced work-life balance, and restricted access to assisted reproduction services limit individual fertility choices. The study aims to identify vulnerable groups facing the greatest barriers to achieving their desired family size and the most significant constraints on their reproductive rights. It also seeks to identify relevant policies needed to address these barriers and inequalities, enabling fertility choices for all in the context of COVID-19 and beyond.

In this study, we evaluate the impact of the COVID pandemic on fertility intentions and behaviour in Sri Lanka. This is done using a specifically designed survey, Focus Groups Discussions (FGDs) and Key Informant Interviews (KIs) with Public Health Midwives (PHMs) and Medical Officers of Health (MoH).

[3] Emery T, Koops JC (2022) The impact of COVID-19 on fertility behaviour and intentions in a middle-income country. *PLoS ONE* 17(1): e0261509. <https://doi.org/10.1371/journal.pone.0261509>

[4] Settersten R, Bernardi L, Härrkönen J, Antonucci A, Dykstra P, Heckhausen J, et al. Understanding the effects of COVID-19 through a life course lens. *Advances in Life Course Research*. 2020; 45:1–11. <https://doi.org/10.1016/j.alcr.2020.100360>

[5] https://asiapacific.unfpa.org/sites/default/files/pub-pdf/210112_unfpa_impact_of_COVID19_on_human_fertility_sp.pdf

2. Data and Methods

Firstly, the study examined the number of births registered from 2018 to 2022 by month of birth to determine whether the COVID-19 pandemic interrupted birth trends. This analysis is expected to reveal fluctuations in birth trends during the presence and absence of the COVID-19 pandemic. The data for this examination were obtained from the Registrar General's Department. Secondly, data were collected from a sample survey, which included populations from urban, rural, and estate sectors. The sample consisted of women in the reproductive age span, representing both younger and older women. The total sample size was 360, with 120 women drawn from each sector. This sample size was calculated with a 95% confidence interval and a 5% margin of error, which is considered appropriate for a population of 5,406,032 women in the reproductive age span in 2022 (Dissanayake, 2016).⁶

The following approaches were used to collect data/information in the study:

- 1 **Structured Questionnaire**
- 2 **Six Focus Group Discussions**
- 3 **Sixteen case studies to get detailed information and Key informant interviews.**

The study adopted a Mixed Methods methodology, integrating the benefits of both quantitative and qualitative approaches to provide a more comprehensive understanding than a standalone study of either type. Mixed methods research is often used in the behavioural, health, and social sciences, particularly in multidisciplinary settings and complex situational or societal research.

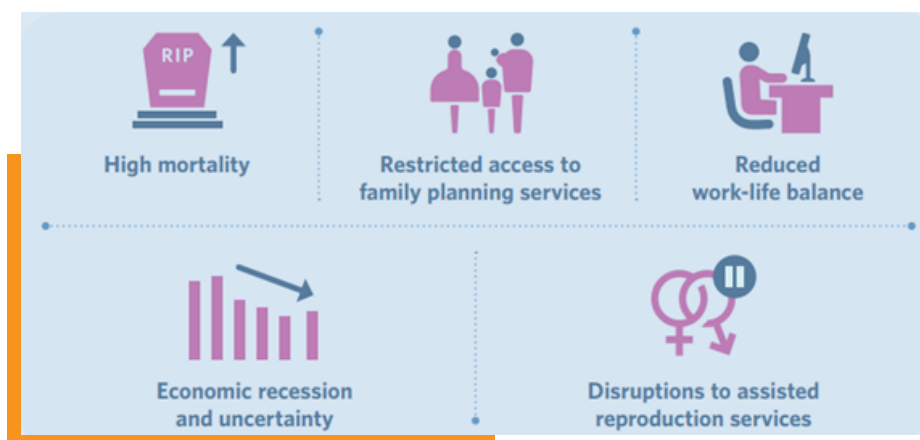
Multivariate statistical techniques were employed where necessary to analyse quantitative data. This approach helps control for confounding factors and other variables by considering multiple variables simultaneously and accounting for their interactions, thereby providing a more accurate understanding of the relationships between the variables of interest. It allows researchers to assess the individual effects of each variable while controlling for the influence of other potentially confounding factors, leading to more reliable and robust conclusions.

The analysis was supplemented with qualitative information collected from the FDGs and Case Studies, using a 'qualitatively informed' purposive sampling approach.

[6] Dissanayake, Lakshman (2016) Medium-Term Population Projection for Sri Lanka: 2012 to 2037. 2016. United Nations Population Fund, ISBN: 978-955-8375-13-6.

Purposive sampling better matches the sample to the research aims and objectives, enhancing the rigor and reliability of the study (Campbell et al., 2020).⁷ The study included sixteen Case Studies and 6 Focus Group Discussions, in addition to Key Informant Interviews primarily conducted with Public Health Midwives. The perceptions of Public Health Midwives are crucial for capturing the ground situation regarding reproductive health issues faced by women during the COVID-19 pandemic, as they are the main contact persons for these women.

Importantly, the study was placed within the framework developed by the UNFPA⁸ to capture the impact of COVID-19 on period Total Fertility Rate (TFR), at least in the short term. The framework consists of five dimensions of the COVID-19 pandemic that have the potential to impact fertility trends, patterns and choices:



[7] Campbell S, Greenwood M, Prior S, Shearer T, Walkem K, Young S, Bywaters D, Walker K. Purposive sampling: complex or simple? Research case examples. *J Res Nurs*. 2020 Dec;25(8):652-661. doi: 10.1177/1744987120927206. Epub 2020 Jun 18. PMID: 34394687; PMCID: PMC7932468.

[8] https://asiapacific.unfpa.org/sites/default/files/pub-pdf/210112_unfpa_impact_of_covid19_on_human_fertility_sp.pdf

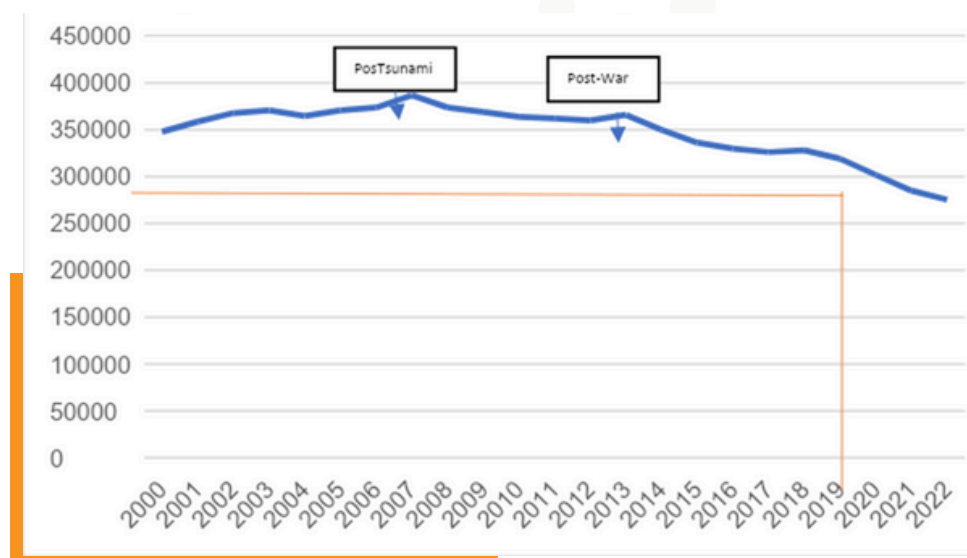
3. Findings

3.1 Decline in Fertility and Fertility Intentions

When analysing the annual number of births, we found a decline of 17,304 births from 2019 to 2020, while the drop from 2020 to 2021 was 16,859 births. The decline was much smaller from 2021 to 2022, indicating a stage of fertility recovery with the end of the pandemic. Figure 1 shows that up to 2020, the initial year of the pandemic, there were more than 31,000 births annually in Sri Lanka.

However, for the first time and more rapidly, the annual number of births fell below that level and reached about 27,000 in 2022. It is apparent that there will be a rebound in the fertility rate, as Sri Lanka has already observed two recoveries following past disasters: the Tsunami in December 2004 and the end of the 30-year long war in 2009. These recoveries are clearly visible in Figure 1.

Figure 1 : Distribution of Births by Year, 2000 - 2022

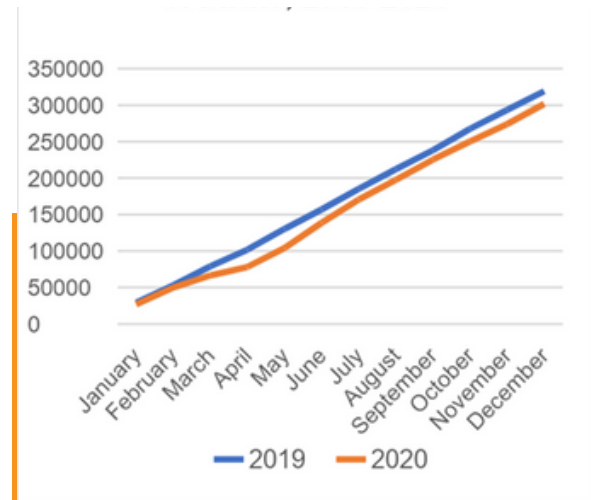


Source: Drawn from the data obtained from the Registrar General's Department

Evidence shows that Australia's fertility rate rebounded to pre-pandemic levels in 2020-21,⁹ indicating that Australian couples have adapted to the uncertainty of the pandemic and quickly caught-up on delayed childbearing plans. By looking at post-tsunami and post war fertility rebound scenarios, we can reasonably hypothesize that Sri Lanka's fertility will start rebounding from 2023

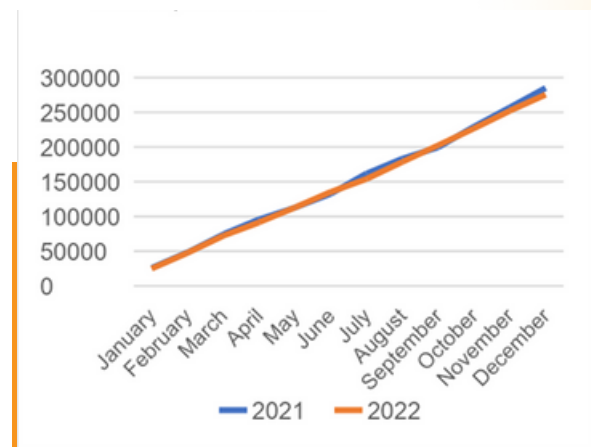
We also examined the cumulative number of births by month of occurrence to compare the impact of COVID-19 during the pre-pandemic and post-pandemic periods, as shown in Figure 2 and 3. Figure 2 clearly indicates a marked decline in the cumulative number of births in each month starting from the onset of the pandemic in March, coinciding with a major lock down experienced from April to June 2020. This decline was not evident in 2022, as there is no significant difference between 2021 and 2022 (Figure 3).

Figure 2 : Cumulative number of Births, 2019 - 2020



Source: Drawn from the data obtained from the Registrar General's Department

Figure 3 : Cumulative number of Births, 2021 - 2022



Source: Drawn from the data obtained from the Registrar General's Department

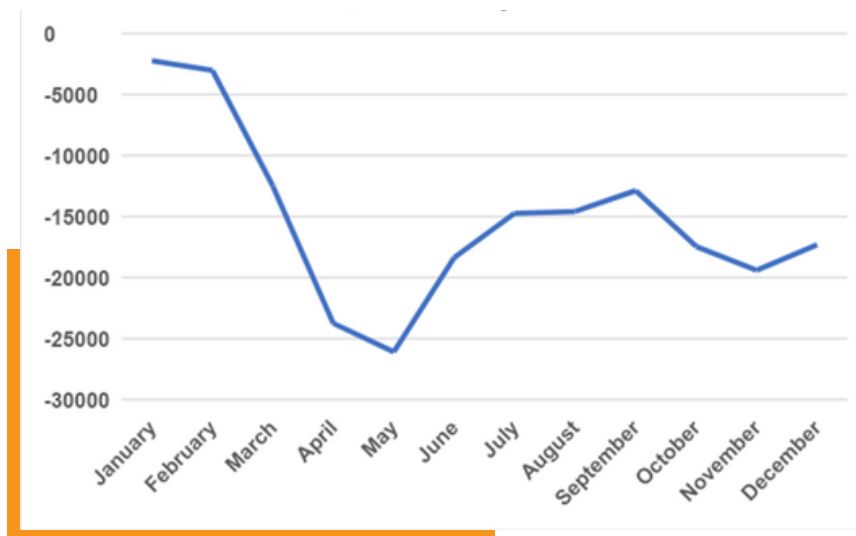
[9] <https://www.theguardian.com/australia-news/2023/jan/02/australias-fertility-rate-rebounds-to-pre-COVID-levels-but-jim-chalmers-issues-warning-on-ageing-population>

Figure 4 reveals that the lockdown imposed on 20 March 2020, had a significant impact on fertility decline. While the situation improved somewhat, it never returned to pre-pandemic levels throughout 2020. Lockdown measures during the COVID-19 pandemic led to concerns about the consequences for childbirth plans and decisions. For example, in Australia, the average effect was small, with fertility intentions estimated to fall by between 2.8 per cent and 4.3 per cent of the pre-pandemic mean (Mooi-Reci et al., 2023).¹⁰

In Sri Lanka, the per centage decline in the number of births from February to March was 30.3 per cent, indicating a substantial decline.

Our FGDs and KIs revealed that lockdowns imposed restrictions on people's social and intimate lives. Marriages were postponed, and there were fewer opportunities to plan for the future. Couples were preoccupied with coping with the numerous stressors associated with lockdowns and the pandemic.

Figure 4 : Distribution in cumulative number of births, 2019 - 2020 by months



Source: Drawn from the data obtained from the Registrar General's Department

[10] Mooi-Reci I, Trinh TA, Vera-Toscano E, Wooden M. The impact of lockdowns during the COVID-19 pandemic on fertility intentions. *Econ Hum Biol.* 2023 Jan;48:101214. doi: 10.1016/j.ehb.2022.101214. Epub 2022 Dec 19. PMID: 36565491; PMCID: PMC9762099.

Furthermore, the increased economic uncertainty caused by the COVID-19 pandemic, including job losses—especially in the informal sector—school closures, and reduced access to both formal and informal childcare, placed families under greater stress. For families with young children, lockdowns increased the amount of household labour and care work, with women typically bearing more of this burden.

Following are few case studies which show the delay in childbearing due to the COVID-19 pandemic:

Ramya, a 30 year old Sinhalese woman from Minuwangoda, shared that several women in her village who gave birth during the pandemic faced economic hardships. Consequently, Ramya and her husband decided to postpone having a child in 2020, despite their initial plans to start a family that year.

Fasna, a 34 year old Muslim woman with two young children, lives in Kalutara. Although she planned to have another child, she postponed this until 2022 due to difficulties during the pandemic, including limited access to health care, transportation, and food.

Lechchimi, a 29 year old Indian Tamil woman, lives in Nayabedda Estate in the Badulla district. She married in 2016 and by 2019, had three boys. The couple hoped to have a daughter and planned for another child before the pandemic. However, her husband didn't want Lechchimi to get pregnant during the COVID-19 pandemic, so they postponed having another child.

Sunethra, a 26 year old Sinhalese woman from Minuwangoda, faced a unique challenge when her husband was trapped in lockdown while working in Saudi Arabia. They wanted to have their first child in 2020 but couldn't because her husband was unable to return to Sri Lanka due to travel restrictions.

Malini, from Nivithigala, whose husband works as a laborer in a gem mine, postponed having their second child because of COVID-19. They had planned for a child in 2020, but mobility restrictions and the fear of contracting the virus led to a delay. The economic crisis, which severely impacted their livelihood, has caused them to further postpone having another child.

Our case studies and FGDs among Sinhalese women, where the fertility norm is around two children, show that they were more likely to state that COVID-19 impacted the timing of having children rather than the number of children they would have in the future. However, this is not the case among Tamil and Muslim women, whose fertility norm is around three children. Another observation from our case studies is that younger women were more likely than older women to report delaying having children and to consider having fewer children.

These case studies provide clear instances of individuals exercising control over their reproductive desires. This control is manifested in various ways, such as the deliberate timing of childbirth. By examining these cases, it becomes apparent that individuals have the capacity to make conscious decisions regarding when to have children, underscoring their autonomy and agency in managing their reproductive goals. This ability to influence the timing of childbirth showcases how people can navigate their personal circumstances and preferences to align with their reproductive aspirations. It is noteworthy that the outcomes derived from the FGDs were corroborated by the subsequent quantitative analysis conducted within this study.

Our FGD in Minuwangoda with Muslim women revealed that younger women have not postponed their first birth, but those who were at parity 1 and above postponed childbearing because of COVID-19 and the associated economic uncertainty.

According to the records of the Public Health Midwife in Minuwangoda Town, the fertility norm among Muslim women is four children, which is twice the size of the fertility norm of Sinhalese women in the same area. One important factor is that Muslim women marry very young, at the ages of 18 and 19, and they bear children immediately after due to socio-cultural obligations. This behavior persisted even during the COVID-19 pandemic.

Our FGD with Sinhalese women in Minuwangoda in the Gampaha district revealed that they were very fearful of contracting COVID-19 during pregnancy, which could affect both mother and unborn baby. Therefore, the majority deliberately postponed childbearing during the pandemic, unless it was unexpected. Additionally, government-imposed travel restrictions influenced these delays, as transportation and access to healthcare facilities were greatly restricted. Women also mentioned that the economic crisis following the pandemic made them prolong childbearing due to difficulties with their livelihood activities and the high cost of living.

In the Tamil community in Vavuniya, where the fertility norm is three children, both the COVID-19 pandemic and the economic crisis appear to have reduced that number to around two children.

Our FGD with Tamil women in Vavuniya revealed that on average, they would prefer to have two children as their completed family size, despite desiring an additional child. However, those without male children might attempt to have another child due to the son preference in Tamil Hindu culture. Some older women of reproductive age who wanted another child were prevented by COVID-19 and now feel they are too old to have more children. These women are now considering LRT to permanently terminate childbearing.

Our FGDs further showed that the COVID-19 pandemic has significantly damaged livelihood opportunities in every setting, whether urban or rural, although the estate sector was less affected due to its isolation. FGD participants mentioned their communities experienced job losses due to the casual nature of their jobs and suffered from financial difficulties. Those with formal employment managed to work from home while looking after and homeschooling their children. The majority of participants believe that the pandemic has reshaped their viewpoints about having their first or additional child, leaving an enduring mark on the future population of the nation.

Studies on fertility intentions during the COVID-19 pandemic are rare worldwide, and Sri Lanka is yet to conduct such a study. Therefore, this study can be viewed as pioneering work. Available literature suggests that research on the impact of the COVID-19 pandemic on fertility behaviour has mostly focused on high-income countries, particularly in Western Europe and North America (Emery and Koops).¹¹ For example, in Australia, over one in ten women reported that they and their partner had been trying for a first or additional child before the pandemic, but about 18 per cent of these women have stopped trying to conceive, at least partly due to the pandemic (Qu, 2021).¹² Chen et al. (2022)¹³ have shown that COVID-19 lowers the fertility intentions of women of childbearing age in China. A study in Kenya claimed that the COVID-19 pandemic has not led to widespread changes in fertility intentions in there, although the most vulnerable women may have accelerated their childbearing intentions (Zimmerman et al., 2022).¹⁴

[11] : Emery T, Koops JC (2022) The impact of COVID-19 on fertility behaviour and intentions in a middle-income country. *PLoS ONE* 17(1): e0261509. <https://doi.org/10.1371/journal.pone.0261509>

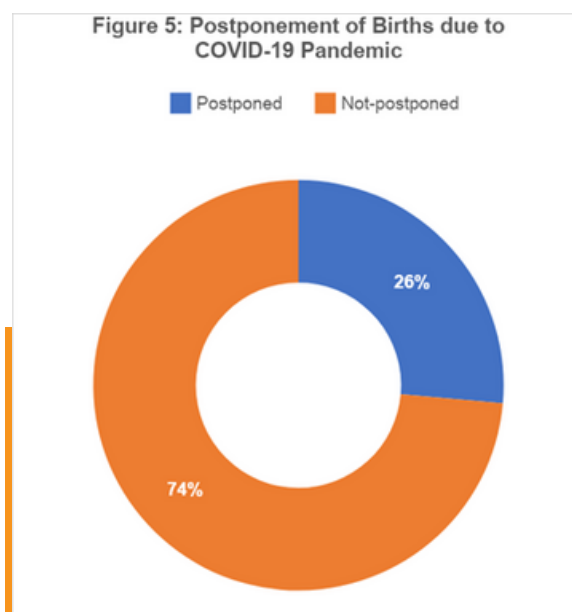
[12] Qu, Lixia (2021) Impact of COVID-19 on pregnancy and fertility intention, *Australian Institute of Family Studies*

[13] Chen, T.; Hou, P.; Wu, T.; Yang, J. The Impacts of the COVID-19 Pandemic on Fertility Intentions of Women with Childbearing Age in China. *Behav. Sci.* 2022, 12, 335. <https://doi.org/10.3390/bs12090335>

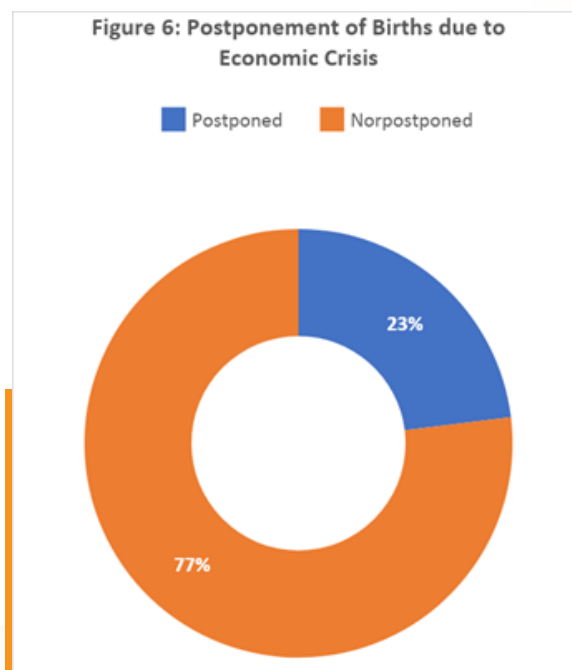
[14] Zimmerman LA, Karp C, Thiongo M, Gichangi P, Guiella G, Gemmill A, et al. (2022) Stability and change in fertility intentions in response to the COVID-19 pandemic in Kenya. *PLOS Glob Public Health* 2(3): e0000147. <https://doi.org/10.1371/journal.pgph.0000147>

Luppi, Arpino and Rosina (2020)¹⁵ found that fertility intentions had dropped in Spain, France, Italy, Germany and the UK but that changes varied by context. In Italy, drops in fertility intentions were among the highly educated under 30's, whereas in Germany the patterns were geographically focused in areas with the highest infection rates.

Findings from our survey (Figures 5 and 6) show that both COVID-19 pandemic and economic crisis have led more than 25 per cent of women to postpone childbearing. 21.3 per cent of women have opted to delay their childbearing due to both the COVID-19 pandemic and the economic crisis. This indicates that these events have a significant impact of delaying fertility in Sri Lanka, suggesting that future population projections must consider this effect. It is also important to adjust existing population projections to reflect the fertility changes observed after 2020 in Sri Lanka.



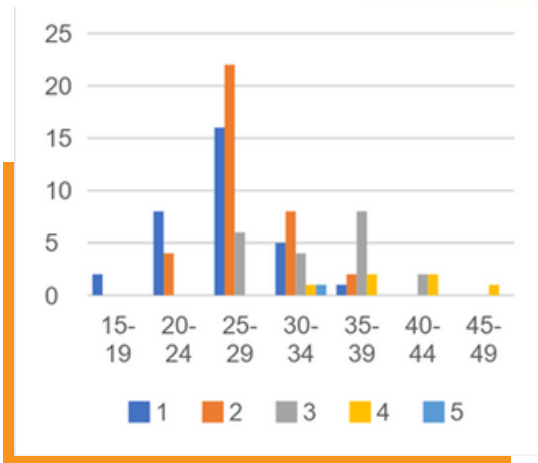
N=360; Source: COVID-19 Fertility Survey



N=360; Source: COVID-19 Fertility Survey

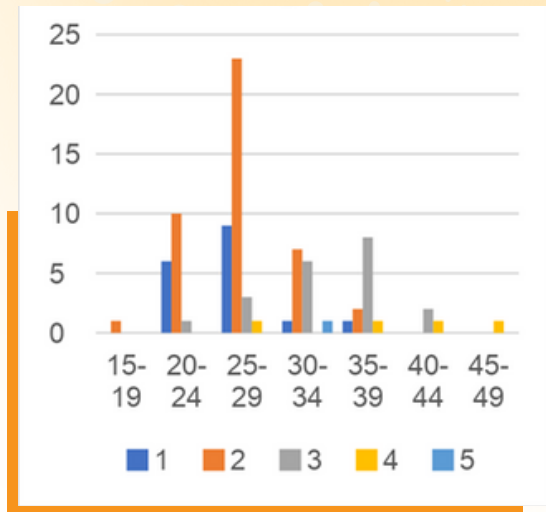
[15] Luppi F, Arpino B, Rosina A. The impact of COVID-19 on fertility plans in Italy, Germany, France, Spain, and the United Kingdom. *Demographic Research*. 2020; 43:1399–1412. <https://doi.org/10.4054/DemRes.2020.43.47>

Figure 7: Postponement of Births due COVID-19 Pandemic by Birth Order and Age of Mother



N=360; Source: COVID-19 Fertility Survey

Figure 8: Postponement of Births due Economic Crisis by Birth Order and Age of Mother

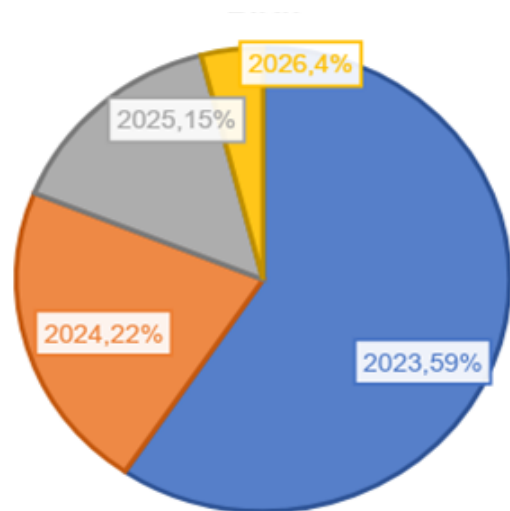


N=360; Source: COVID-19 Fertility Survey

Figures 7 and 8 reveal that the postponement of childbearing has mostly affected the first and second births, primarily among young women in the first half of childbearing period. However, a notable proportion of older women who intended to have their third child also deferred it between 2020 and 2022. Unlike the pandemic, the economic crisis has more significantly impacted younger women postponing their second child. Even by the end of 2022, 76.3 per cent of women who postponed childbearing during the pandemic had not yet given birth. The economic crisis further delayed childbearing, as 90 per cent of women who wanted children after the pandemic had not given birth by the end of 2022. Remarkably, about 59 per cent of these women planned to have their postponed birth in 2023

Figure 9 while about 37 per cent expected to have their intended birth in 2024 or 2025, largely due to the ongoing economic crisis.

Figure 9: Intended Year of Giving Birth to already Postponed Birth

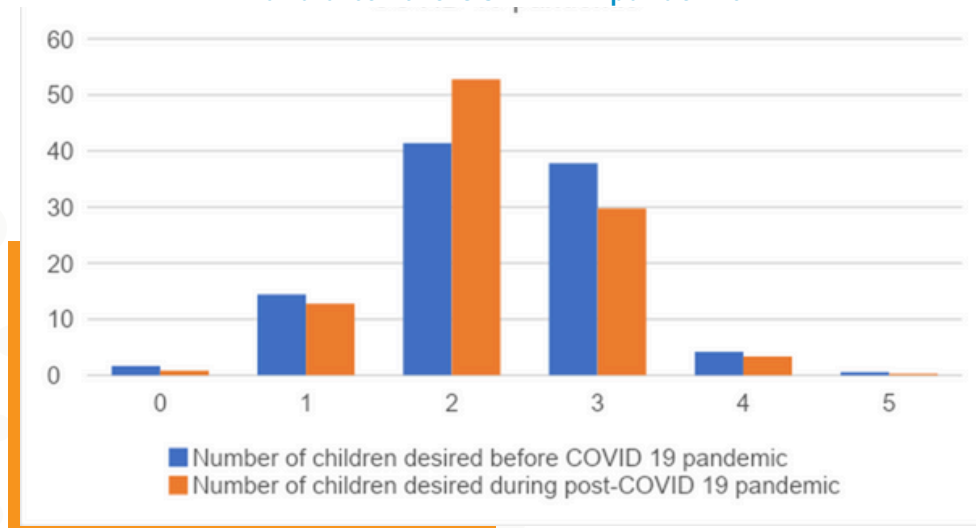


N=360; Source: COVID-19 Fertility Survey

When examining the number of children desired before and after the COVID-19 pandemic, there was a slight decrease in the mean number of children desired, from 2.30 to 2.24. Parity one women had a greater desire to have a second child after COVID-19 pandemic, but for all other birth orders, there was a declining trend, particularly due to prolonged economic uncertainty (Figure 10). Delayed fertility began to pick up by the end of 2022, with about 8 per cent of women becoming pregnant.

It appears that those who postponed childbearing resumed around July 2022, as the mean duration of pregnancy was about 4.87 months by the end of 2022. When combining the fertility intentions shown in Figure 5, it is likely that delayed fertility will pick up from mid-2023, resulting in a fertility upsurge from 2023 to 2026, after which fertility will return to pre-COVID-19 levels. This analysis indicates that Sri Lankan women were more likely to report that COVID-19 affected the timing of having children rather than the number of children they would have in the future.

Figure 10 : Number of children desired before and after the COVID-19 pandemic



N=360; Source: COVID-19 Fertility Survey

Our study further investigated whether the postponement of childbearing during COVID-19 and the economic uncertainty differed by major socio-economic differentials such as sector, educational level, employment status, and ethnicity. We performed a Chi-square test to determine if there was a significant difference between different categories of these variables. The Chi-square test assesses whether observed categorical data significantly deviate from expected frequencies, helping determine if there is an association between variables. In Table1, each socio-economic variable is evaluated in terms of its association with delaying childbearing due to COVID-19 and economic uncertainty. The Chi-Square value represents the test statistic,

which measures the extent of deviation from expected values. The Asymptotic Significance (2-sided) indicates the probability of observing such a deviation if the variables were not associated. Lower significance values (usually below 0.05) suggest a significant association.

Table1 shows that postponement of childbearing due to COVID-19 did not differ by income, sector, ethnicity, and educational level groupings but differed by employment status (whether employed or not). When analyzing postponement due to economic uncertainty, we found that employment status, ethnicity, and educational level showed significant differences but not income and sector.

Table 1: Chi-Square Test for Delaying Childbearing due to COVID-19 and Economic Uncertainty for Various Socio-economic Variables

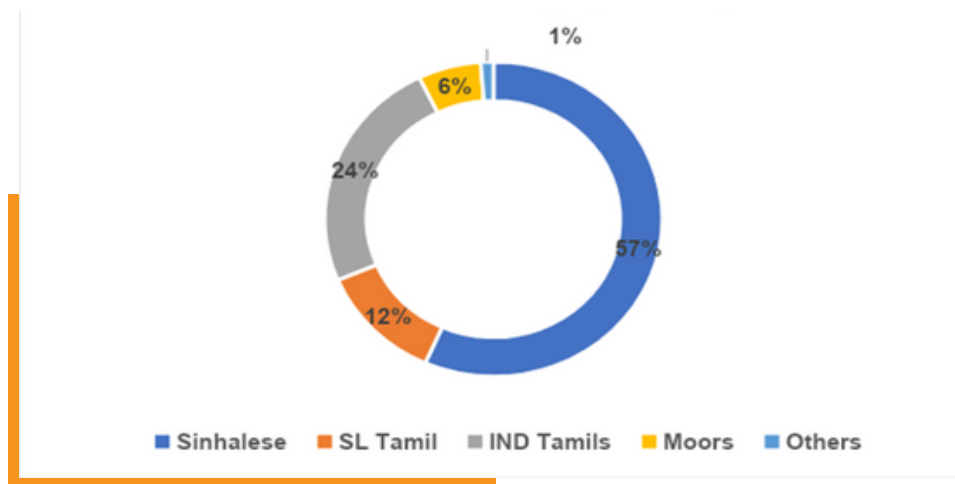
Chi-Square Tests				
Socio-economic Variables	Due to COVID-19		Due to Economic Uncertainty	
	Chi-Square Value	Asymptotic Significance (2-sided)	Chi-Square Value	Asymptotic Significance (2-sided)
Educational Level	7.199	.066	6.304	.098
Employment Status	6.42	.040	6.928	.031
Income Level	.393	.942	1.256	.740
Place of Residence	.200	.905	2.85	.241
Ethnicity	13.671	.008	5.109	.276
N of Valid Cases	360			

Source: Author's calculations

These results suggest that COVID-19 affected all educational levels, ethnic groups, place of residence categories (urban, rural, and estate), and income categories in terms of postponing childbearing.

However, economic uncertainty affected ethnicity, educational level, and employment status differently, with no significant influence from the place of residence.

Figure 11 : Delayed childbearing due to COVID-19 and Economic Uncertainty by Ethnicity



N=360; Source: COVID-19 Fertility Survey

Table 2 presents the results of a binary logistic regression model exploring the associations of sociodemographic characteristics with the postponement of childbearing during the pandemic and economic uncertainty. The dependent variables are (1) postponement of childbearing during the COVID-19 pandemic (yes/ no) and (2) postponement of childbearing due to economic crisis (yes/ no).

The selected independent variables are employment status (economically active/ economically inactive), sector (urban/ rural/ estate), ethnicity (Sinhalese / Sri Lankan Tamils/ Indian Tamils/ Muslims/ Other), educational level (less educated/ better educated), age group (15 to 34 years of age/ 35 to 49 years of age), and income (less than LKR 60,000/ LKR 60,000 and more).

Table 2: Results of logistic regression for effects of COVID-19 and economic uncertainty [Log Odds]

Dependent Variable	Postponement of childbearing during COVID-19 Pandemic		Postponement of childbearing during Economic Crisis	
	Independent Variables	p-value	Exp(B)	p-value
Employment Status Ref = Economically Inactive				
Employment Status (1)	0.52	0.743	.36	.625
Employment Status (2)	0.01	0.353	.02	.343
Sector Ref = Estate				
Sector (1)	0.60	1.481	.98	.979
Sector (2)	0.55	1.534	.51	1.609
Ethnicity Ref = Other				
Ethnic Group (1)	0.91	1.146	.84	1.283
Ethnic Group (2)	0.26	4.971	.37	3.586
Ethnic Group (3)	0.98	1.040	.86	1.294
Ethnic Group (4)	0.37	3.463	.50	2.526
Educational Level Ref = Tertiary Education				
Educational Level (1)	0.398	1.371	.899	1.057
Age Group Ref = Greater than 35 years				
Age Group (1)	0.003	0.399	.004	.396
Monthly Income Level Ref = LKR 60000 and more				
Monthly Income Level (1)	0.963	0.986	.632	.857

N=120; Source: COVID-19 Fertility Survey

Table 2 shows that, except for younger women and unemployed women, all other variables are not significant at the 0.05 level. Therefore, we can reliably say that COVID-19 and the economic crisis have affected all these sub-groups without any difference. In other words, various sub-groups of the population have positively contributed to postponing childbearing during the COVID-19 pandemic. However, there is a significant difference between younger and older women in postponing childbearing during the pandemic. When unemployed women are compared to economically inactive women (housewives and unpaid family workers etc.) there is a significant difference between the two groups in postponing childbearing during the COVID-19 period. We found that Women in urban and rural sectors were about 1.5 times more likely to postpone childbearing during the pandemic compared to their estate counterparts. Among ethnic groups, Indian Tamil and Muslim women were 4.9 and 3.5 times more likely to postpone childbearing compared to other ethnic category used as a reference group. When the impact of educational level on fertility intentions during the pandemic was examined, we found that less educated women were 1.4 times more likely to postpone childbearing during the pandemic.

Further investigation on ethnicity revealed that Indian Tamils, being a minority (4.2 per cent of the population), have postponed their procreation more than all other minority groups (Sri Lanka Tamils - 11.2%; Sri Lanka Moors - 9.2%). Our key informant interviews and FGDs conducted in the estate sector, where most of the Indian Tamils live, revealed that estate employment was not disrupted by the COVID-19 pandemic due to the isolated location of estates and limited outside social contacts. However, a significant level of delay in childbearing was observed compared to pre-pandemic period. Except for the fear of COVID-19 infections leading to untimely death, the COVID-19 pandemic has not affected the usual work of the estate people. Few women who got infected appear to have lost their babies or had spontaneous abortions which led to increased fear among childbearing-age women, contributing to postponement.

The 2012 census showed a Total Fertility Rate of 3.0 for the estate women. Our FGDs also suggest that the fertility norm in the estate sector is still 3¹⁶ but younger women desire not more than two children, indicating a convergence towards the general population's fertility level.

[16] <http://www.statistics.gov.lk/Health/StaticInformation/DemographicAndHealthSurveyReport-2016-Chapter4>

Younger women believe they cannot afford more than two children due to their socio-economic standing and are prepared to postpone childbearing during the economic crisis.

It is important to note that Sinhalese fertility norm is 2.¹⁷ In contrast, our FGD in Nivithigala in the Ratnapura district revealed that Sinhalese fertility intentions in this area, where men work in gem mines, differ from the general population. They are poor, less or uneducated. Our FGD as well as KIs carried out with three Public Health Midwives in the area suggested that their average fertility level is around 3, even among younger women. However, this is not their desired family norm but an achieved family size. Further investigation revealed low use of modern family planning methods and reliance on withdrawal methods, leading to accidental pregnancies. We found that withdrawal is a common method used by the couples in this area and is even publicly discussed while working in gem mines. This behaviour is an example of program failure among poor, marginalized, and illiterate groups where male dominance is prevalent in deciding sexual intercourse/ pregnancy/ reproductive health related matters. Such behaviours are not captured by the Demographic and Health Survey therefore, it is essential to carry out further studies among these illiterate poor engaged in low level jobs in the informal sector and devise appropriate programmes.

The FGD in Vavuniya district with married women aged 15 to 49 revealed a widespread fear that contracting COVID-19 during pregnancy would adversely affect both mother and fetus during pregnancy or even after the child is born. Some women got pregnant during the initial stage of the COVID-19 pandemic because they were unaware of the potential consequences.

However, they soon feared for their unborn children. Almost all the women who participated in the FGD expressed that women in the area were afraid to conceive, believing that COVID-19 would result in unhealthy children. As a result, many women chose to postpone pregnancy. According to a key informant interview with the Public Health Midwife in the area, an average of about seven pregnancies per month were registered prior to the pandemic, but this number dropped to just one per month during COVID-19. These pregnancies were primarily due to contraceptive failure and were often undesired.

In the estate sector, women postponed marriage and procreation. Marriage was postponed due to social distancing regulations and procreation was postponed due to the fear of COVID-19 infection leading to untimely death.

[17] <http://www.statistics.gov.lk/Health/StaticInformation/DemographicAndHealthSurveyReport-2016-Chapter4>

However, the increase in teenage pregnancies observed during the pandemic and the increase in the occurrence of spontaneous abortions seem to have cancelled-out the effect of delayed childbearing. Further, neglect of contraceptive use by the older women and the perception that they are less vulnerable to conceive led them to procreate even during the pandemic. However, this cancel-out effects will end due to the continued economic recession in the post pandemic period. Hence, delayed childbearing will be clearly visible especially between 2022 and 2023. Those women who will postpone their childbearing will be the women who have at least one child now. In other words, one can expect a clear decline in the parity progression ratio after parity 1. Further, the interval between the first marriage and the first birth as well as the last birth with the previous birth have narrowed with delayed marriage and resumed procreation after nine months of the termination of COVID-19 pandemic. As mentioned previously, as per 2012 census, the Total Fertility Rate (TFR) for the estate sector was 3.0 and our FDGs also suggest that the current norm of fertility is still 3, on average, but younger women seem to be satisfied with having only two children. Therefore, the estate TFR will be approaching the general level of TFR of the country in the future.

In the case of Muslim women, we found that they were well supported by their community during the COVID-19 period and the necessary family planning methods and other reproductive health advice were provided by the public health midwives when needed. Our Key Informant Interview with the Public Health Midwife in Minuwangoda area revealed that there was no decline in childbearing behaviour by Muslim women between pre-COVID-19 and COVID-19 pandemic period. This was confirmed by the Medical Officer of Health, who noted that the distribution of nutrition bags (worth Rs. 25,000) and free condoms helped Muslim women maintain their childbearing behaviour during the pandemic.

In summary, our FDGs with married women aged 15 to 49 indicated concerns about financial difficulties, employment prospects, and uncertainty about the future. The pandemic led to uncertainty and hopelessness about the gloomy future and raising children, with some women feeling they would have fewer children than preferred due to the lack of access to healthcare and health implications of COVID-19 for mothers and babies.

3.2 Sexual and Reproductive Health During the COVID-19 Pandemic

Global evidence indicates that COVID-19 and related social restrictions have raised concerns about access to family planning services (Dasgupta et al., 2020).¹⁸ In developing countries, the pandemic has disrupted supply chains and access to these services, increasing the risk of unintended pregnancies and unplanned births (UNFPA, 2021).¹⁹ For instance, the use of family planning services declined in 6 of 12 Eastern and Southern African countries, with the drop in visits for injectable contraceptives ranging from 10% in Tanzania to 87% in Angola (WHO - UNFPA - UNICEF, 2gether 4SRHR, 2020).²⁰

The WHO's 'national pulse survey offers critical insight from key informants about the impact of the COVID-19 pandemic on essential health services. It highlights the challenges health systems face in ensuring continuity of care and access to essential COVID-19 tools (including COVID-19 diagnostics, therapeutics, vaccines and personal protective equipment),

and how countries are responding to mitigate disruptions, recover services, and strengthen health service resilience over the long-term'.²¹

In Sri Lanka, the survey revealed that the disruption level for adolescent and youth friendly services, well-child visits (including growth and development monitoring and counselling) and fertility care/infertility services is between 26 to 50 per cent while the level for family planning and contraception, antenatal care, and potential care for women and newborns is between 5 to 25 per cent. It appears that health delivery within a COVID-19 environment, including lockdowns and fear of contracting the virus may have had serious implications for the use of contraception, and eventual births. Our study investigated this aspect in detail.

[18] Dasgupta A, Kantorova V, Ueffing P. The impact of the COVID-19 crisis on meeting needs for family planning: a global scenario by contraceptive methods used. *Gates Open Research*. 2020; 4(102):102.

<https://doi.org/10.12688/gatesopenres.13148.2> PMID: 33330836

[19] UNFPA (2021) How will COVID-19 impact fertility? Technical brief, United Nations Population Fund, New York.

[20] WHO-UNFPA-UNICEF, 2gether 4SRHR (2020) Data on Disruption of services (comparison between February and April 2019 and February to April 2020).

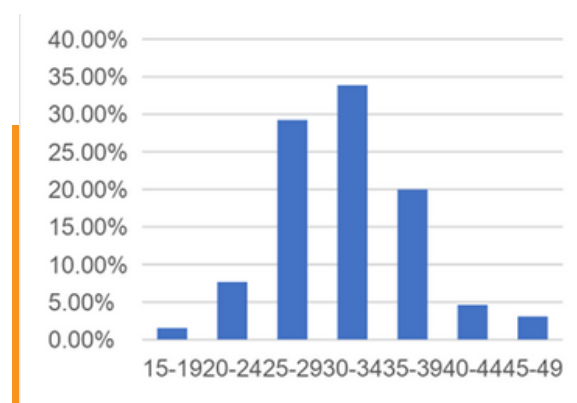
[21] <https://www.who.int/teams/integrated-health-services/monitoring-health-services/global-pulse-survey-on-continuity-of-essential-health-services-during-the-COVID-19-pandemic>

In our study, 21.4 per cent of women had abstained from having intercourse during the COVID-19 period. As Figure 12 suggests, more women in the first half of the childbearing and sexually active age span had abstained from having sexual intercourse during the COVID-19 pandemic. This trend will likely affect fertility during the COVID-19 period, potentially leading to a “baby bust.”

Further investigations showed that these women had avoided sexual relationships due to government imposed social distancing regulations (21.4%) and to minimize the risk of viral transmission to themselves and their babies if they became pregnant (78.6%). Among those who have postponed childbearing, 46.9 per cent did so because they feared the risk of infection on birth outcomes. This fear was greater among younger women in the reproductive age span, as shown in Figure 13. Notably, a significant proportion of women (18.1%) in the childbearing period have contracted COVID-19. Similarly, 38.8 per cent of the women were pregnant during this period, and among them, 13.3 per cent experienced a miscarriage. Figure 14 indicates that most miscarriages occurred among women in the peak childbearing ages. When we examined the distribution of women who became pregnant during the COVID-19 pandemic by age, we found that younger women have gone on to give birth to their first and second child, while the older women had given birth to their third child (Figure 15).

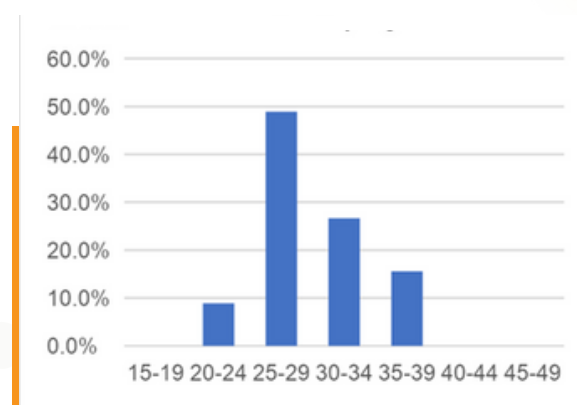
Among those who had a live birth, 7.1% reported that their newborn babies were not in good health. As a result, the majority of these women (69.2%) do not wish to have another child even immediately after the termination of COVID-19.

Figure 12: Per centage distribution of women who contracted COVID-19 by Age



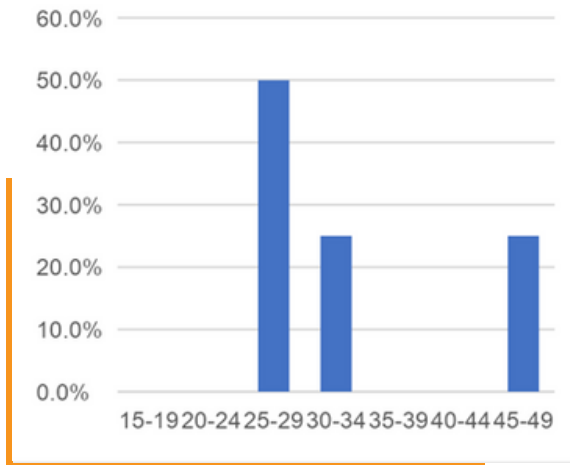
Source: Author's Calculations

Figure 13: Women postponing procreation due to fear of contracting COVID-19 by Age



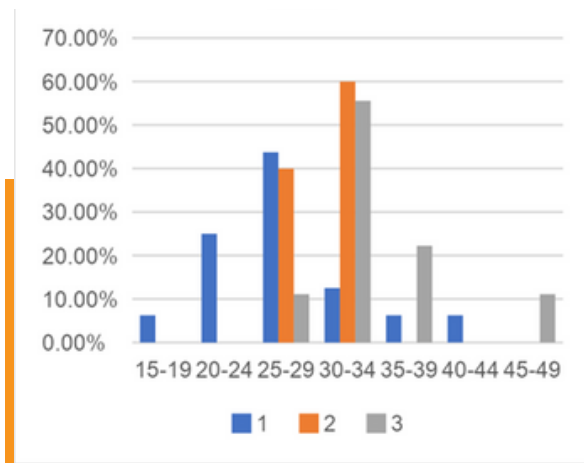
Source: Author's Calculations

Figure 14: Occurrence of miscarriages by Age during COVID-19 Pandemic



Source: Author's Calculations

Figure 15: Distribution of women who became Pregnant by Age and Birth Order



Source: Author's Calculations

Restricted Access to Family Planning Services:

Lockdowns and restrictions early in the COVID-19 pandemic disturbed contraceptive services and other sexual and reproductive health care worldwide.²² It has been reported that access to contraceptive diminished as countries prioritized pandemic response over sexual and reproductive health care (Mukherjee et al., 2021).²³ During the early phase of the COVID-19 pandemic, it was anticipated that the pandemic would result in a 10 per cent reduction in contraceptive use and a considerable rise in unintended pregnancies, especially in low and middle-income countries (Riley et al., 2020).²⁴ Measures such as social distancing, lockdown strategies and mobility restrictions, as well as fear of travelling to health facilities, increased concerns about the impact of COVID-19 on women's ability to continue using contraception.

[22] <https://www.prb.org/resources/pandemic-lockdowns-disrupted-family-planning-and-other-reproductive-health-care-worldwide/>

[23] Trena Mukherjee et al., "Reproductive Justice in the Time of COVID-19: A Systematic Review of the Indirect Impacts of COVID-19 on Sexual and Reproductive Health," *Reproductive Health* 18, no. 1 (2021): 252.

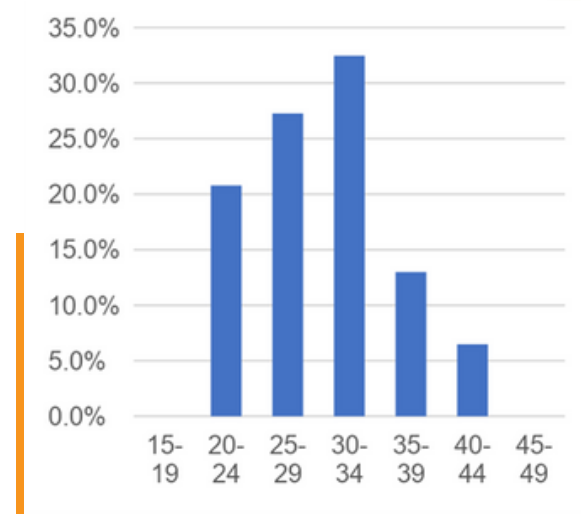
[24] Riley T, Sully E, Ahmed Z, et al. Estimates of the potential impact of the COVID-19 pandemic on sexual and reproductive health in low- and middle-income countries. *Int Perspect Sex Reprod Health*. 2020;16(46):73–6

The United Nations Population Fund (UNFPA) has estimated about 12 million women in low and middle-income countries to encounter barriers in accessing family planning services due to COVID-19, leading to an estimated 1.4 million unintended pregnancies (UNFPA, 2021).²⁵

In our sample, we found that 21.6% of women avoided visiting family planning clinics or outlets due to government-imposed movement restrictions during the COVID-19 pandemic. Figure 16 reveals that younger, sexually active women with low parity were more likely to avoid visiting family planning clinics or outlets because of COVID-19-related travel restrictions. Additionally, 37.2% of women who wanted to use contraception were unable to do so because they avoided visiting healthcare providers, especially Public Health Midwives, and pharmacies, fearing they would contract COVID-19. The majority of these women (68.6%) were in the first half of their childbearing years. A significant proportion of women at the terminal ages of childbearing also struggled to access family planning services (31.4%). The most affected group were women from the estate sector (40.3%), where a majority of Indian Tamils reside, while the least affected group were women from rural areas (20.1%).

Further investigation through FGDs and KIs revealed that older women in all settings tended to neglect contraception, believing they had a lower risk of pregnancy due to their age. Additionally, they did not want to appear sexually active to Public Health Midwives, especially if they had grown children. Another important finding is that family planning programs are mainly directed towards younger women, resulting in older women receiving less attention, despite still being sexually active.

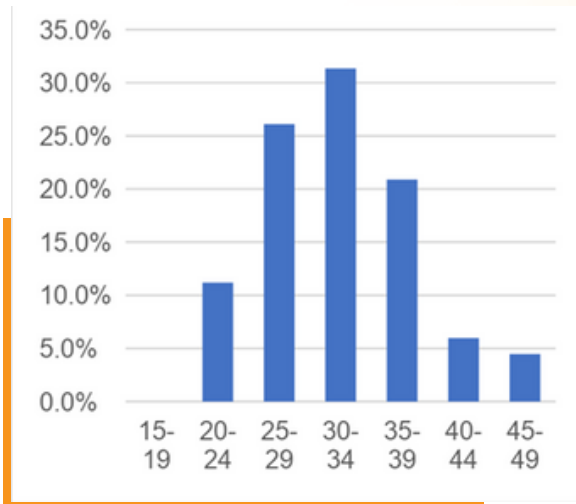
Figure 16: Avoiding FP clinics/outlets due to COVID-19 related restrictions



Source: Author's Calculations

[25] UNFPA. (2021) Impact of COVID-19 on Family Planning: What we know one year into the pandemic. UNFPA. https://www.unfpa.org/sites/default/files/resource-pdf/COVID_Impact_FP_V5.pdf

Figure 17: Avoiding visiting healthcare providers or pharmacies to obtain contraceptive methods due to fear of contracting COVID-19



Source: Author's Calculations

It was also observed that 10.6 per cent of women in our sample had avoided obtaining family planning services because they could not afford it during a time of livelihood issues. Among them, the most affected group was women in the estate sector (78.9%). When we asked the women in our sample, "Did you experience any intimate-partner violence, which may include sexual coercion and sexual assault, potentially increasing the need for emergency contraception?" we found that 5.3 per cent reported positively. Estate women were the most vulnerable category in this regard, accounting for 63.2 per cent of the women in the sample who experienced intimate partner violence during the COVID-19 pandemic.

Additionally, 36.8 per cent of women who experienced intimate partner violence had difficulties in obtaining emergency contraception due to COVID-19 related travel restrictions. Our FGDs suggest that women felt COVID-19 lockdown restrictions worsened existing factors related to poverty and gender inequity, such as intimate partner violence and power imbalances, which weakened women's ability to refuse sex with their husband and diminished their autonomy to use contraceptives. Although quarantine was necessary to reduce the community spread of the Coronavirus, it introduced a paradox, increasing intimate partner violence, especially by husbands after consuming illicit liquor. These cases are often unreported, but FGDs revealed that such incidents happen frequently in the estate sector, leading women to prefer long-term contraceptive methods such as Jadelle implants and LRT. As mentioned earlier, our FGD participants reported that COVID-19 lockdown restrictions worsened intimate partner violence. With men at home more often, women's ability to use contraceptives without their partner's knowledge was limited, resulting in more frequent sex without women being able to refuse. The risk of unintended pregnancy increased, with 10 per cent of women who experienced intimate partner violence unintentionally becoming pregnant.

Men being in control of family planning and intimate partner violence are known barriers to contraceptive use (Kriel et al., 2019),²⁶ which were likely intensified by lockdown orders and the social outcomes of COVID-19, such as economic pressure (Bradbury-Jones and Isham, 2020).²⁷

Reduced Work-Life Balance:

The COVID-19 pandemic caused difficulties for workers in managing their work and family responsibilities daily. Adjusting to measures like online work, on-site presence, and school closures added complexity to their daily schedules and working patterns. Work-life balance became especially challenging for many working mothers who care for children, elderly family members, or other dependents. For some workers, virtual working arrangements provided new opportunities to combine care and work. However, for others, especially parents with young children, enforced online work led to managerial stress, reduced productivity, and increased work-related stress.

School closures, reduced informal help from grandparents, and limited access to formal personal care and domestic workers further weakened work-life balance for many caregivers. As a result, women experienced a disproportionate increase in domestic work and diminished working opportunities.²⁸ Poor work-life balance can contribute to delayed parenting and declining fertility rates. Increased domestic workload burdens parents' time, and in settings where contraception is accessible, it can lead to the postponement of procreation, potentially causing a decline in period TFR, at least in the short term (UNFPA, 2022).²⁹

In our study, we found that 34.4 per cent of women faced increasing workloads in terms of housework and childcare due to lockdowns and school closures, as their children and husbands were at home. The most affected women were from the estate sector (37.1%), followed by those from the rural sector (33.9%), with the least affected in the urban sector (29%).

[26] Family Planning and contraceptive use: perspectives from community members and healthcare providers in KwaZulu-Natal, South Africa. *Reprod Health*. 2019;16(1):89. <https://doi.org/10.1186/s12978-019-0749-y>

[27] Bradbury-Jones C, Isham L. The pandemic paradox: the consequences of COVID-19 on domestic violence. *J Clin Nurs*. 2020;29(13-14):2047-9. <https://doi.org/10.1111/jocn.15296>

[28] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8892814/#CR11>

[29] https://asiapacific.unfpa.org/sites/default/files/pub-pdf/210112_unfpa_impact_of_COVID19_on_human_fertility_sp.pdf

Table 3 shows that difficulties faced by older relatives in providing informal childcare support significantly impacted women of childbearing age, who largely depend on this support. This shows that the majority of women depend on older parents' support for child caring. About 50 per cent of women in the childbearing ages seem to have postponed procreation due to the overwhelming workload during the COVID-19 pandemic. Additionally, 31 per cent of women had postponed childbearing because of challenges in achieving work-life balance.

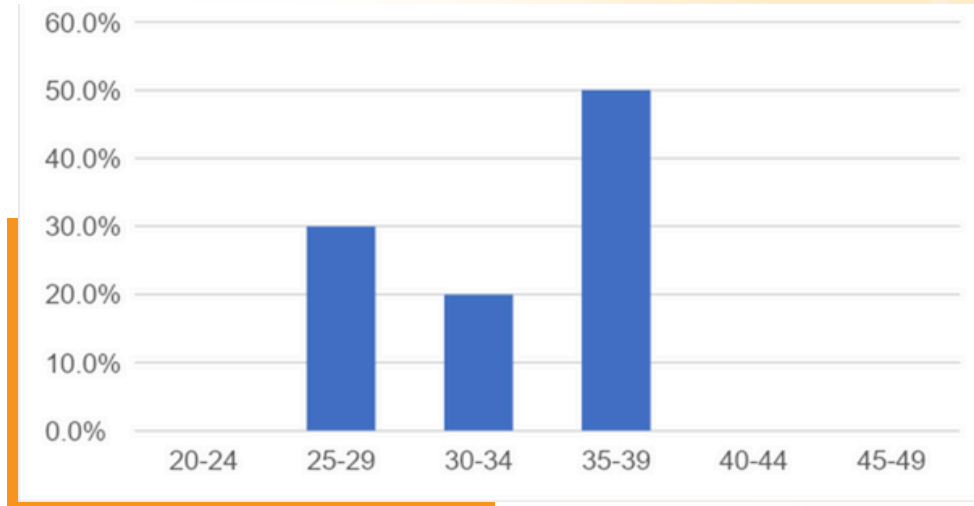
The difficulty in maintaining work-life balance has influenced women in the estate sector (80%) and urban sector (20%) to postpone childbearing as they are engaged in jobs in both the formal and informal sectors and face considerable challenges in finding caregivers, whether formal or informal.

Analysis revealed that the majority of women who postponed childbearing due to work-life balance issues were aged 25 to 39 years, with a significant portion in the 35 to 39 age group, suggesting higher parity (more than two children) and thus greater childcare burdens compared to younger age groups. On average, these women have 2.7 children.

Difficulties	Per Centage
Difficulty in finding formal childcare services during the COVID-19 period	42.4
Difficulty in finding informal childcare support by older relatives	84.8
The increased domestic workload places a burden on your time, in settings even when contraception is accessible	50.0

N=360: Source: COVID-19 Fertility Survey; Multiple responses

Figure 18 : Postponement of procreation because of difficulty in managing work-life balance by age

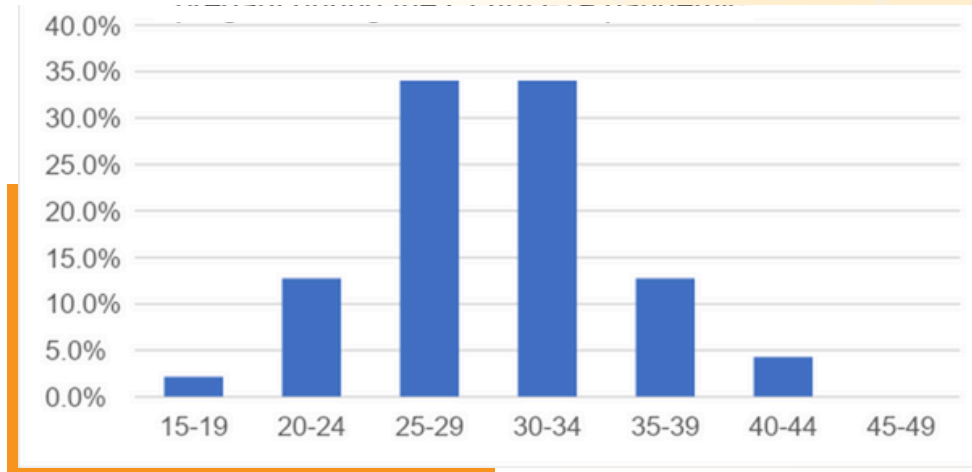


N=360: Source: COVID-19 Fertility Survey

Our study further revealed that husbands spent an average of 3.356 and 3.569 hours per day on domestic work and household care, respectively, compared to women who spent an average of 9.112 and 9.803 hours per day on these tasks during the COVID-19 pandemic. This disparity highlights the substantial burden placed on women of childbearing age during this period. Additionally, 24.7 per cent of women experienced an additional burden of household chores, child rearing, and caring for older relatives during the pandemic. Among them, 15.5 per cent stated they did not want to have a child during this time.

Moreover, 13.1 per cent of women feared losing employment and other opportunities if they had children. The majority of these concerns were voiced by women in the urban sector (40.4%), followed by the estate sector (31.9%), and the rural sector (27.7%). Analysis by age showed that a significant portion of these women were under 35 years old and had low parity levels, indicating their potential fertility was affected by the COVID-19 pandemic.

Figure 19 : Postponement that women will lose employment and other opportunities if they become pregnant during the COVID-19 pandemic



N=360: Source: COVID-19 Fertility Survey

Economic Recession and Uncertainty:

The current economic crisis in Sri Lanka can be seen as an extension of the crisis worsened by the COVID-19 pandemic. On one hand, everyone, including women of childbearing age, was severely affected by repeated lockdowns and isolation measures. On the other hand, the economy suffered significantly from these lockdowns, exacerbating an already serious economic crisis. The national economy was severely impacted during the pandemic, with effects lingering unpredictably. Coupled with existing debt issues, this led to an economic catastrophe.

Our study reveals that women of childbearing age became more vulnerable due to increased poverty, lack of social protection, and deteriorating health. Consequently, socioeconomic programs across all aspects of life were severely disrupted. The COVID-19 pandemic had a profound impact on Sri Lanka, particularly during lockdowns. While signs of economic decline began during the pandemic, the severity of the current situation was unexpected.

Economic uncertainty is a significant determinant of fertility changes, as fluctuations in consumption and income uncertainty tend to decrease fertility rates.

Research indicates that events like natural disasters or pandemics raise health concerns about having children (Gozgor et al., 2022³⁰; Chabé-Ferret et al., 2018).³¹ Globally, lockdowns and reduced economic activity due to COVID-19 led to a surge in unemployment rates. Individuals from all walks of life have been afflicted by the financial fluctuations and economic uncertainty during the outbreak, and the situation has led to economic recession and increased psychological stress (Ullah et al., 2020).³² Sri Lanka faced three major waves of COVID-19, which continued to impact the economy even after initial lockdowns during the first and second waves. The country experienced significant contractions in GDP (3.6 per cent), increase in poverty rates (4.1 per cent), rise in unemployment (5.2 per cent), and inflation (4.56 per cent) in 2020, all pointing towards a deepening economic crisis (Razeena and Marso, 2022).³³ As shown in Figure 19, unemployment rates clearly spiked during the pandemic, and while they began to decline in the first quarter of 2022,

a resurgence in the third quarter of 2022 mirrored levels seen during the initial pandemic period, indicating prolonged economic hardship.

Moreover, the economic contraction led to widespread job losses and reduced labour income. Between 2021 and 2022, an estimated half a million jobs were lost in industry and services.³⁴ The resulting vulnerability, compounded by shortcomings in the social safety net, failed to improve income levels, doubling poverty rates (measured by the World Bank's \$ 3.65 international poverty line in 2017 Purchasing Power Parity terms) from 13.1% in 2021 to 25.6% in 2022. This means that approximately 2.7 million additional people were falling into poverty within one year. This meant approximately 2.7 million additional people fell below the poverty line within a year. Urban poverty rates tripled to 15%, and over half the population in estate areas slipped into poverty.

[30] Gozgor G, Bilgin MH, Rangazas P. Economic uncertainty and fertility. *J Human Capital*. (2021) 15:373–99. doi: 10.1086/715020

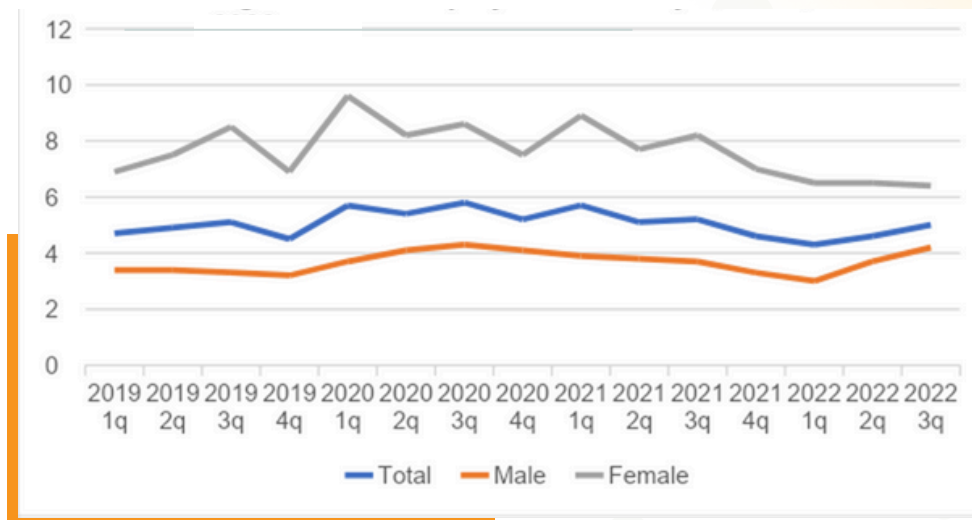
[31] Chabé-Ferret, Bastien, and Paula Gobbi. "Economic uncertainty and fertility cycles: The case of the post-WWII baby boom." (2018).

[32] Ullah MA, Moin AT, Araf Y, Bhuiyan AR, Griffiths MD and Gozal D (2020) Potential Effects of the COVID-19 Pandemic on Future Birth Rate. *Front. Public Health* 8:578438. doi: 10.3389/fpubh.2020.578438

[33] Razeena, A.R.F; Marso, N. (2022) Effects of Third Wave of COVID-19 in Sri Lanka: Response on Unemployment and Economic Cost, *Journal of Human Resource and Sustainability Studies* > Vol.10 No.3, September 2022

[34] <https://blogs.worldbank.org/endpovertyinsouthasia/resilience-sri-lankas-strength-navigate-uncertain-future>

Figure 19 : Unemployment Rate by Quarter, 2019 to 2022



N=360: Source: COVID-19 Fertility Survey

Our study explores how economic recession and economic uncertainty exacerbated by COVID-19, affected fertility in Sri Lanka. Historically, epidemics demonstrate a common pattern on their impact on population, which is surprisingly similar to natural disasters, where fertility initially declines sharply, gradually increases, and results in a baby boom. Sri Lanka had already experienced such a situation following the tsunami disaster (Dissanayake, 2016).³⁵

In our survey, we asked respondents if economic uncertainty delayed their marriage and childbearing. Figure 20 shows that 61.4% of women cited perception of uncertainty fuelled by negative media coverage of the economy, caused them to postpone childbearing during the pandemic. This trend was most pronounced among urban and estate women, though rural women were also affected to a lesser extent.

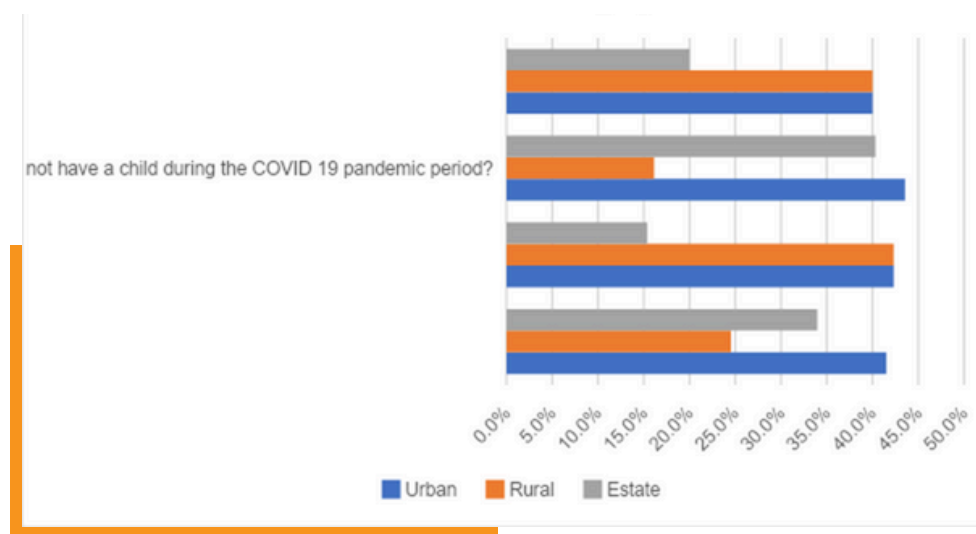
[35] Dissanayake, Lakshman (2016) Recent Fertility Dynamics in Sri Lanka, Sri Lankan Journal of Population Studies, Population Association of Sri Lanka

The second most cited reason was fear of rising unemployment and job insecurity due to economic uncertainty (52.5%). Pursuing further education due to high unemployment levels (25.7%) was the third reason, while marriage delays caused by economic recession were the least mentioned (14.9%). Negative media coverage of the economy, rising unemployment and job insecurity created uncertainty, led higher proportion of estate women to postpone their childbearing.

Overall, urban women were the most affected group to postpone their child-bearing due to all four reasons related to economic uncertainty.

International travel restrictions, mobility restrictions and stay-at-home requirements exhibit a relatively strong relationship with the decline in migratory movements. Human mobility is closely linked with the spread of infectious diseases (Wesolow et al., 2016).³⁶

Figure 20 : Effects of economic recession emerged with COVID-19 on childbearing by sector



N=360: Source: COVID-19 Fertility Survey

[36] Wesolowski A., Buckee CO, Engø-Monsen K., Metcalf CJE. Connecting mobility to infectious diseases: the promise and limits of mobile phone data. *The Journal of infectious diseases*. 2016;214(suppl_4): S414–S420. pmid:28830104

Evidence also shows that human mobility patterns have influenced the ways in which COVID-19 has spread within and between countries (Sirkeci and Yucesahin, 2020; Chagas et al., 2021; Cheshmehzangi et al., 2021).³⁷ At the onset of the pandemic, governments swiftly implemented mobility restrictions and border closures to curb the spread of COVID-19, leading to increased involuntary immobility. These measures have had substantial impacts on both the levels and patterns of international and internal migration. In our survey, 5.8% of women were identified as migrant workers. Among them, 40.9% postponed marriage due to economic uncertainty exacerbated by the pandemic. All of these women were in the prime childbearing ages (25 to 34 years). This indicates that the economic crisis triggered by the pandemic has temporarily delayed childbearing among younger women, with expectations that they will resume childbearing with the termination of pandemic.

Studies suggested that social support from individuals' networks can mitigate the impact of uncertainty on fertility choices (Philipov, 2003).³⁸

This implies that those with stronger social support systems may have more resilience against constraints affecting their decisions about having children. Our study found that 37.5 per cent of women reported that their social support networks faltered during the pandemic. Among these women, 20.4% stated that they postponed childbearing due to economic uncertainty exacerbated by disruptions in their social support networks. The majority of these women were in the first half of their childbearing years (82.1%). Notably, estate women were the most affected group (57.1%). Our FGDs suggested that women experienced social isolation, and/or social exclusion during the pandemic, often intertwined with the challenges of daily life and poorer health outcomes. They also reported increased instances of depression and domestic violence.

[37] Sirkeci I, Yucesahin MM. Coronavirus and Migration: Analysis of Human Mobility and Spread of COVID-19. *Migration Letters*. 2020;17(2): 379–398.; Chagas ETC, Barros PH, Cardoso-Pereira I, Ponte IV, Ximenes P, Figueiredo F, et al. Effects of population mobility on the COVID-19 spread in Brazil. *PLOS ONE*. 2021;16(12): e0260610. pmid:34874978; Cheshmehzangi A, Maycon S, Junhang R, Dezhou K, Yifan S, Sinan B, et al. The Effect of Mobility on the Spread of COVID-19 in Light of Regional Differences in the European Union. *Sustainability*. 2021;13(10): 5395.

[38] Philipov, D. (2003) 'Fertility in times of discontinuous societal change'. In: Irena Kotowska and Janina Jozwiak (eds.), *Population of Central and Eastern Europe: Challenges and Opportunities*. Warsaw: Statistical Publishing Establishment, pp. 665-689.

Disruptions to Assisted Reproduction Services:

The COVID-19 pandemic has seemingly caused a significant impact on medically assisted reproduction services (The ESHRE COVID-19 Working Group et al., 2020).³⁹

As the pandemic intensified, most Assisted Reproduction Technology (ART) centres worldwide had to suspend their routine operations to minimize infection risks and comply with governmental decisions on social distancing. For ART units attached to hospitals, equipment and staff were redirected to COVID-19 wards, leaving ART units unable to deliver full service to its clientele.

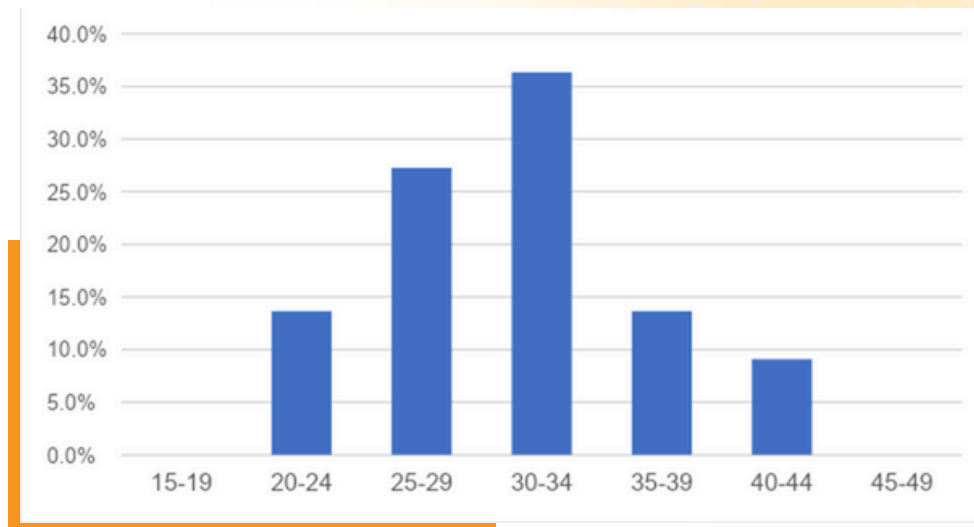
Additionally, travel restrictions prevented women from accessing ART clinics, compounding the challenges faced by those undergoing fertility treatments. Insights gathered from FGDs and KIIs with

Public Health Midwives and Medical Officers of Health underscored the significant impact of temporary social distancing measures and the closure of non-emergency health services on women seeking fertility treatments.

In Sri Lanka, there is no comprehensive health system record of women utilizing ART services, highlighting the importance of our study in assessing how the COVID-19 pandemic affected these services and its consequences. Our study found that 6.1 per cent of women surveyed were undergoing ART treatment at various ART service centres before the pandemic. Among them, 59.1 per cent discontinued their visits due to travel restrictions and the temporary closure of ART centres. Remarkably, 95.5% of these women expressed a preference to continue with their treatment and give birth, under-scoring their willingness to take risks after prolonged efforts to conceive.

[39] The ESHRE COVID-19 Working Group, Luca Gianaroli, Baris Ata, Kersti Lundin, Satu Rautakallio-Hokkanen, Juha S Tapanainen, Nathalie Vermeulen, Anna Veiga, Edgar Mocanu (2020) The calm after the storm: re-starting ART treatments safely in the wake of the COVID-19 pandemic, *Human Reproduction*, Vol.36, No.2, pp. 275–282, 2021 Advance Access Publication on November 30, 2020 doi:10.1093/humrep/deaa285

Figure 21: Percentage of women who were undergoing ART treatment by age



N=360: Source: COVID-19 Fertility Survey

Figure 21 shows that 77.3 per cent of those women are younger than 35 years of age, while 9.1 per cent women are between 40 and 44 years of age (nearing menopause) and the pandemic prevented them from obtaining necessary services in a timely manner. In our sample, we did not observe significant variations in the proportion of women affected (ranging from 31% to 34%) across urban, rural, and estate sectors. This suggests uniform demand for ART services across different sectors, emphasizing the need for equitable access to these services.

Our FGDs in the estate sector revealed a notable number of women facing infertility issues, with many seeking ART services.

The pandemic severely disrupted their treatment continuity, as these services are primarily available in urban centers. Lockdowns, curfews, and transport disruptions compounded these challenges, preventing many from accessing necessary treatments. Economic constraints and abstaining from employment further hindered travel, leading some women to abandon ART treatments altogether, while others persevered through significant difficulties to continue their treatments.

COVID-19 Child Mortality and Its Effects:

Infant and child mortality are linked to fertility in two aspects: First, reduction in child mortality is a key activator for fertility transition as it reduces the 'demand' for children by improving the chances of survival to adulthood; Second, high rates of infant and child mortality are significant barriers to fertility decline (Bongaarts 2008).⁴⁰ In this context, COVID-19-related child mortality becomes pertinent to a key policy parameter known as the replacement effect—how does child mortality influence total fertility?

The 'replacement hypothesis' assumes that couples, aiming for a certain number of surviving children, may increase births following the death of a child to offset the loss. This hypothesis predicts that those who experience one or more child deaths will tend to have one additional birth. Van Soest and Saha (2018),⁴¹

using panel data from Bangladesh, found an estimated replacement effect of infant mortality on total fertility of about 0.54 children for each infant death in the comparison area with standard health services.

Globally, approximately 0.4% of deaths occur among children and adolescents under 19 years of age due to COVID-19.⁴² In Sri Lanka, there were 43 deaths among children under 10 years old and 46 deaths among those aged 10 to 19 years due to COVID-19, accounting for 0.6% of all deaths. In our study sample, 22% of women reported experiencing child deaths during the pandemic, with 25% attributed to COVID-19. Thus, 75% of these instances of child mortality are expected to lead to an additional child as a replacement.

[40] Bongaarts, J. (2008) Fertility transitions in developing countries: Progress or stagnation? *Studies in family planning*, 39 (2), pp. 105-110.

[41] van Soest A, Saha UR (2018) Relationships between infant mortality, birth spacing and fertility in Matlab, Bangladesh. *PLoS ONE* 13(4): e0195940. <https://doi.org/10.1371/journal.pone.0195940>

[42] <https://data.unicef.org/topic/child-survival/COVID-19/>

3.3 Findings Which Need Further Investigation

3.3.1. Does COVID-19 Vaccination Cause Irregular Menstruation as well as Spontaneous Abortions?

The menstrual cycle is a critical indicator of women's overall health, as irregular and prolonged cycles have been linked to increased risk of premature mortality.⁴³ During the initial phases of the COVID-19 pandemic, concerns arose with widespread vaccination campaigns about potential effects on women's menstrual cycles. This concern gained traction when many women reported sudden changes in their menstrual cycles post-vaccination.⁴⁴ In Sri Lanka, our FGDs and KIs revealed a notable increase in irregular menstrual cycles among younger women following COVID-19 vaccination. Such irregularities can impact daily life and eventually impair a woman's quality of life.

KIs with MoH and PHMs indicated that women were less likely to seek medical advice for menstrual abnormalities post-vaccination, as their primary concern during the pandemic was avoiding COVID-19 infection. Therefore, we propose conducting prospective cohort studies to investigate the temporal relationship between menstrual cycle changes and COVID-19 vaccination. Additionally, understanding the impact of COVID-19 vaccination on female menstrual cycles would benefit from randomized controlled trials or longitudinal prospective studies involving genetically and socioeconomically diverse female populations.

Another significant finding from our study is the higher rate of spontaneous abortions observed, particularly among estate women and economically disadvantaged rural women. This observation emerged during discussions with Public Health Midwives of two FGDs conducted at estates in Nuwara Eliya and Bandarawela, as well as during an FGD held in Nivithigala.

[43] Wang Y.X., Arvizu M., Rich-Edwards J.W., Stuart J.J., Manson J.E., Missmer S.A., Pan A., Chavarro J.E. Menstrual cycle regularity and length across the reproductive lifespan and risk of premature mortality: prospective cohort study. *bmj*. 2020 Sep 30:371.

[44] Medicines and Healthcare Products Regulatory Agency Coronavirus vaccine—weekly summary of yellow card reporting. 2021.

Public Health Midwives in Nivithigala presented records showing an increase in spontaneous abortions, expressing uncertainty over the cause behind this recent rise. There is some evidence linking vaccine to miscarriages in other settings,⁴⁵ but this has been limited to cases where women were vaccinated during pregnancy. While there exists certain evidence, scientific confirmation regarding the increased risk of miscarriage due to COVID-19 vaccination has not yet been established. Our findings differ from this because miscarriages were reported among women who became pregnant a few months after the vaccination. Therefore, further investigation is crucial to explore this association through dedicated studies, which can inform local and international health policies regarding the administration of such vaccines in the context of women's reproductive health and rights.

3.3.2. Predicting Fertility by Incorporating the COVID-19 Pandemic and Economic Uncertainty

Our study clearly demonstrates that a significant number of younger women postponed marriage due to COVID-19. Additionally, married women of childbearing age began delaying childbirth during the economic crisis following the pandemic. As stated previously, analysis of births registered by the Registrar General's Department showed decline of 17,304 births from 2019 to 2020, followed by a decrease of 16,859 births from 2020 to 2021 (Figure 1). However, the decline lessened noticeably from 2021 to 2022, indicating a stage of fertility recovery post-pandemic. Before 2020, annual births averaged over 31,000, but dropped below this level for the first time in 2020, reaching approximately 27,000 births by 2022. This suggests a clear rebound in fertility rates. As mentioned previously, after the year 2000 Sri Lanka observed two recoveries of a similar nature with tsunami in December 2004 and the end of a 30-year long war in 2009.

[45] <https://academic.oup.com/humrep/advance-article/doi/10.1093/humrep/dead036/7043098>

By looking at post-tsunami and post war fertility rebound scenarios, we can hypothesize that Sri Lanka's fertility rate will rebound from 2023.

Historical evidence suggests that post-transitional fertility change is usually due to the adjustment of childbearing behaviour by couples to encounter some disasters, and tend to be temporary.⁴⁶ Changes in fertility behaviour during the post transitional fertility regime is due to adjustment behaviour of the couples which is also a temporary phenomenon.⁴⁷ Similar trends were observed after the tsunami in 2004 and the end of the 30-year civil war in 2009. Therefore, we anticipate that fertility adjustments made during the COVID-19 pandemic and economic uncertainty will also be temporary, returning to pre-pandemic levels once the pandemic concludes, albeit with potential prolongation due to economic factors.

In this study, we illustrate the increase in fertility following the tsunami and the 30-year-long war by correlating additional births with each death. Between 2005 and 2009, 27,491 extra births 21,862 deaths were recorded. This indicates an average of 1.26 additional births per reported death over those four years.

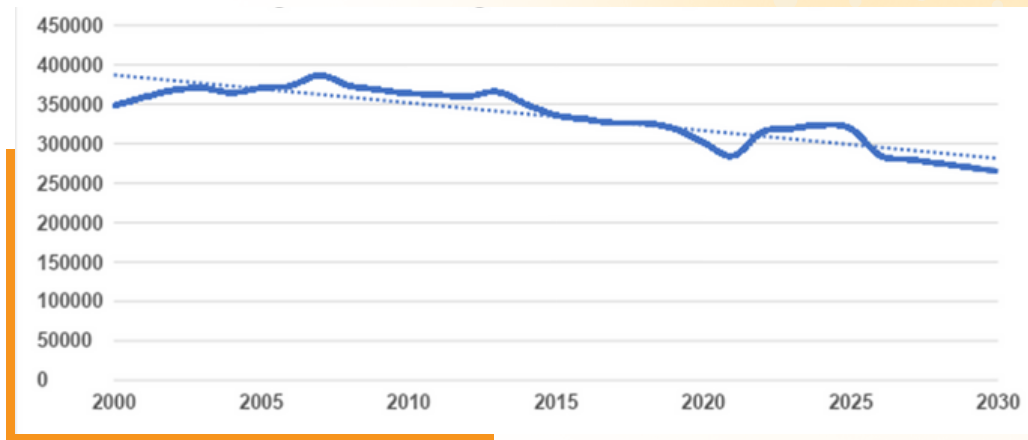
There were 16,808 deaths due to the COVID-19 pandemic by December 2022. With the threat of COVID-19 eliminated by that time, we expect 21,178 additional births over the next five years, from 2022 to 2027. This translates to an average of 4,236 extra births annually during this period. Our projections for annual births from 2021 to 2030 are illustrated in Figure 22. The figure indicates an increase in annual births from 2023 to 2025, followed by a return to pre-pandemic levels with a gradual decline thereafter. We used a second-order polynomial curve to model our predictions, achieving a close fit with an R-squared value of 0.8763.

We anticipate the prolongation of fertility decline due to economic crisis will remain until the end of 2024, given the current economic recovery facilitated by the IMF loan facility and debt restructuring with international partners and local investors. It is reasonable to hypothesize that people will gradually adjust to price hikes and other taxation issues, leading the country to return to normalcy by the end of 2024. Beyond 2024, there may be a temporary upsurge in fertility as postponed marriages and childbearing resume. Once the loss of time is compensated, the TFR is expected to reach the replacement level, possibly during the second half of the 2020s decade.

[46] Coale, A.J. 1973. The demographic transition reconsidered. In *IUSSP—Proceedings of the International Population Conference*. Liège, Belgium: Eds. Ordina.

[47] Dissanayake, Lakshman (2009) *Education and Fertility: Review of theoretical approaches to explaining the fertility transition: A new synthesis on mass education and the fertility transition*, Kumaran Book House, Colombo-Chennai

Figure 22: Predicting Number of Births, 2021-2030, Sri Lanka



Source: Author's calculations

Earlier predictions were that the Total Fertility Rate (TFR) will reach replacement level by 2022.⁴⁸ Sri Lanka may have already achieved replacement level fertility because of COVID-19, and may remain around the replacement level with fluctuations favouring lower value of TFR until the second half of 2023. Subsequently, a fertility upswing above replacement levels, possibly around 2.4, is anticipated due to:

- **More marriages and procreation by 'collateral survivors' which were postponed due to pandemic/economic.**

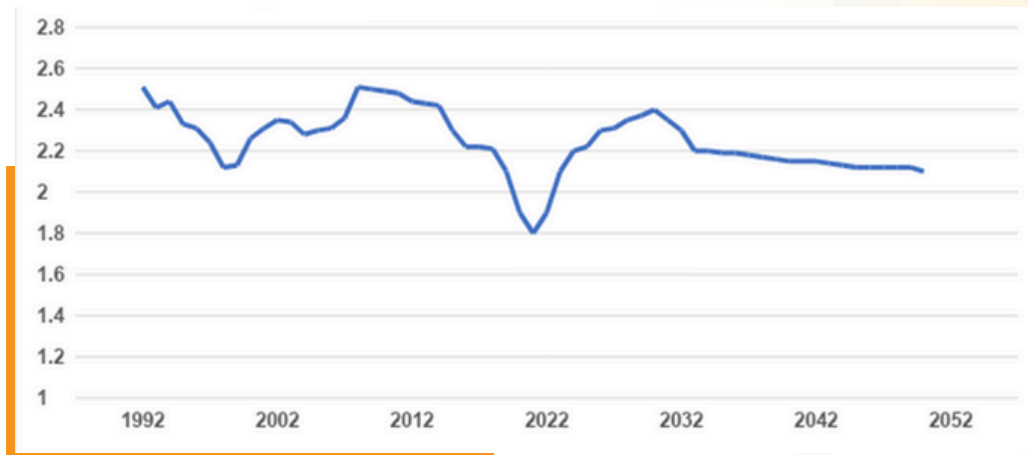
- **Resumption of delayed procreation by collateral survivors after the epidemic/economic crisis, resulting in accumulation of more births over a short period of time.**

Using the Trussell variant of the Brass P/F ratio technique,⁴⁹ we estimated and adjusted age-specific fertility rates (ASFR) and resultant TFR for Sri Lanka. Subsequently, TFR predictions were made until 2050 using logistic function, under the hypothesis that FR fell below replacement level in 2022, followed by recovery and surpassing replacement levels thereafter. The TFR predictions are depicted in Figure 23.

[48] Illogicality between contraceptive use and recent fertility dynamics in Sri Lanka, *Colombo Arts: Journal of Social Sciences and Humanities*, 2(1): 1-11

[49] <http://demographicestimation.iussp.org/content/overview-fertility-estimation-methods-based-pf-ratio>

Figure 22: Predicting TFR for Sri Lanka, 2022-2050



Source: Author's calculations

4. Conclusion and Recommendations

This study aimed to explore how the COVID-19 pandemic and the associated economic crisis have influenced fertility behaviour in Sri Lanka. Analysis of the annual number of births revealed a significant decline in births from 2019 to 2020, followed by a smaller decrease in births from 2020 to 2021, indicating a fertility recovery stage with the termination of the pandemic. There was also a marked decline in the monthly births coinciding with the onset of the pandemic and lockdown experienced from April to June 2020. The lockdown imposed from 20 March 2020 had a greater impact on fertility decline. Although subsequent easing occurred, birth rates did not return to pre-pandemic levels throughout 2020.

Our survey data align closely with these macro-level trends, highlighting that over 25% of women postponed childbearing due to the COVID-19 pandemic and economic crisis. Nearly 60 per cent aimed to resume postponed births by 2023, while about 40 per cent expected to have their intended birth during 2024 or 2025, especially because of the current economic crisis.

When examining the changes in desired number of children before and after the COVID-19 pandemic, we found a slight decline overall. Parity one women showed a higher desire to have their second child after COVID-19 pandemic but for all other birth orders there is a declining trend,

attributed largely to prolonged economic uncertainties associated with the pandemic and economic crisis. It is certain from our study that delayed fertility will pick up from mid-2023, which will show a fertility upsurge from 2023 to 2026 leading to a surge from 2023 to 2026, before stabilizing around pre-COVID-19 levels.

A detailed analysis with the use of the binary logistic regression model revealed that both the COVID-19 and the economic crisis affected all population sub-groups equally, with all showing a tendency to postpone childbearing during the COVID-19 period. However, significant differences were observed between younger and older women within the reproductive age span regarding their decisions to postpone childbearing. More younger women had postponed childbearing during the pandemic than older women.

Ethnicity based analysis highlighted that Indian Tamils, a minority group, postponed procreation more than other ethnic minorities. Despite a previous fertility norm around three children, economic realities have led many in the estate sector to reconsider as they can't afford to feed an additional child, converging their fertility behaviours with the general population. Regarding Sinhalese women, our findings indicate that COVID-19 affected the timing of having children more than the number of children they planned for the future. Sri Lankan Tamil women reported that they are likely to have fewer

children due to the fear of contracting the coronavirus which can harm both the mother and child. In contrast, Muslim women continued child-bearing without significant disruption during the COVID-19 pandemic, largely due to the strong social network of the Muslim community, which helped them achieve comfortable living standards.

The study showed that more sexually active women in the first half of the childbearing age abstained from sexual intercourse during the COVID-19 pandemic, creating a 'baby bust' effect. They avoided sexual relationships due to government-imposed social distancing regulations and to minimize the risk of viral transmission to themselves and their potential babies. Additionally, they feared the impact of infection on pregnancy outcomes, with younger women in the reproductive age span particularly concerned. It is important to note that a significant proportion of women in the childbearing period contracted COVID-19. Similarly, many women were pregnant during this period, and among them, some experienced miscarriages, predominantly occurring among those in their peak childbearing years.

It was also revealed that a significant proportion of women avoided visiting family planning clinics or outlets due to government-imposed movement restrictions during the COVID-19 pandemic.

This trend was particularly pronounced among women in the younger half of their childbearing age. However, what stands out most prominently is that a significant proportion of women who are at the terminal ages of childbearing have faced challenges in accessing family planning services. The most affected group of women are from the estate sector where the majority of Indian Tamils reside, while the least affected group of women are from rural areas. Across all settings, older women tend to neglect the use of contraception, often assuming they are at lower risk of pregnancy due to their age. Further, they do not want to show even the Public Health Midwives that they are sexually active as they have grown up children. Another significant finding is that family planning programs primarily target younger women, resulting in less attention given to older women who are still sexually active.

Intimate partner violence was more visible during the COVID-19 pandemic, with women in the estate sector being the most vulnerable. Those who experienced intimate partner violence faced difficulties in obtaining emergency contraception due to COVID-19 related travel restrictions. Women felt COVID-19 lockdown restrictions worsened existing contextual influencing factors related to poverty and gender inequity, such as intimate partner violence and power imbalances that weaken women's ability to refuse sex with their husband and their autonomy to use contraceptives. The quarantine measures

aimed at controlling the spread of COVID-19 created what is known as the quarantine paradox, where incidents of intimate partner violence surged, especially following alcohol consumption by husbands. Women's limited ability to use contraceptives without their partner's knowledge led to increased instances of unprotected sex and heightened the risk of unintended pregnancies.

Moreover, access to modern contraception, such as Depo-Provera, was limited among the lower socio-economic groups during the pandemic. As a result, many resorted to less effective methods like the withdrawal method, which contributed to unintended pregnancies.

A significant proportion of women faced increased workloads in terms of housework and childcare due to lockdowns and school closures, as their children and husbands were at home. Women have spent three times more hours on domestic work and household care work compared to their husbands. Women from the estate sector were the most affected, while those from the urban sector were the least affected. Difficulty in finding informal childcare support by the older relatives was a major factor affecting women in the childbearing ages, indicating a heavy reliance on older parents for childcare. About half of the women in childbearing age postponed having children due to the unbearable workload during the COVID-19 pandemic.

Another 30 per cent postponed childbearing because of difficulties in managing work-life balance. The majority of these women were aged 35 to 39, as they had more than two children and thus faced a greater childcare burden compared to younger groups. Additionally, negative media coverage of the economy, rising unemployment, and job insecurity during the pandemic created uncertainty, leading a higher proportion of women to postpone childbearing.

The COVID-19 pandemic significantly impacted medically assisted reproduction (ART) services. There is no proper record in the Sri Lankan health system regarding the number of women obtaining ART services. In the absence of such data, this study aims to highlight how the COVID-19 pandemic affected these services and their consequences. Our study found that about 6 per cent of women had been undergoing ART treatment at various centers before the pandemic. Among them, approximately 59 per cent discontinued their visits due to travel restrictions and the temporary closure of those centers. Interestingly, 95 per cent of these women expressed a preference to have given birth even during the pandemic. This is understandable, as many had been trying to conceive for a long time. Most of these women are young, below 35 years of age. Since ART treatments must be continued without disruption, the pandemic significantly affected their ability to receive these treatments. ART services are mainly available in urban centers; hence, lock-downs,

curfews, and transport disruptions prevented women from accessing them. Poverty, coupled with difficulty in traveling and abstaining from employment, were major obstacles to attending these clinics. Consequently, some women completely abandoned such treatments, and only a few have managed to obtain these services with great difficulty.

Infant and child mortality are linked to fertility in two ways: first, reductions in child mortality drive fertility transition by reducing the 'demand' for children as their chances of surviving to adulthood improve; second, high rates of infant and child mortality hinder fertility decline. In our sample, 22 per cent of women experienced child deaths during the COVID-19 pandemic. Of these deaths, 25 per cent were due to COVID-19. Consequently, 75 per cent of these women are expected to have an additional child as a replacement.

The menstrual cycle is regarded as a critical indicator of women's overall health because irregular and prolonged cycles have been linked to an increased risk of premature mortality. During the initial phases of COVID-19 mass vaccination campaigns, there were concerns that these vaccines could potentially affect the menstrual cycle in women. In our study sample, we found that younger women, in particular, experienced irregular menstrual cycles after receiving the COVID-19 vaccination. Such irregularities can impact daily behavior and eventually impair a woman's quality of life. Additionally, we found that women were less likely to seek

medical assistance for menstrual abnormalities after vaccination, as their priority during the pandemic was to avoid contracting COVID-19. Therefore, it is essential to carry out prospective cohort studies to identify the temporal link between menstrual cycle changes and COVID-19 vaccination. Further, the impact of COVID-19 vaccination on female menstrual cycles can be effectively understood through studies such as randomized control trials or longitudinal prospective population-based studies that enrol genetically and socioeconomically diverse female populations.

One of the important findings from our study is the higher rate of spontaneous abortions (or miscarriages) among estate women and poor rural women. Although existing evidence suggests an association between the vaccine and miscarriages in other contexts, scientific confirmation is lacking. Notably, such associations were observed in women who received the vaccine while pregnant. Our finding differs, as miscarriages were reported among women who became pregnant several months after vaccination. In this context, further investigation is necessary to explore this association with a dedicated study. This research will help local and international health sectors make informed decisions about administering vaccines concerning women's reproductive health rights.

With the knowledge gained from our field survey and by analyzing macro-level data, we predicted the Total Fertility Rate (TFR) up to 2050.

This prediction suggests that the TFR declined below the replacement level in 2022 but will recover and move above replacement after 2022. Our predictions indicate that the TFR will experience a rise from 2023 to 2030 and then decline, oscillating around the replacement level.

Recommendations for addressing the multifaceted challenges arising from the COVID-19 pandemic and the economic crisis on reproductive health and fertility include implementing measures to support fertility recovery through incentives and policies; focusing on healthcare system resilience to ensure maternal and reproductive health access; addressing concerns of women postponing child-bearing by offering comprehensive support systems; tailoring interventions for different population groups; strengthening family planning services and accessibility; combating intimate partner violence; promoting work-life balance; ensuring continuity of assisted reproductive technologies services; enhancing reproductive healthcare and support; fostering a supportive environment for women's choices; and establishing a robust data collection system to monitor trends and policy effectiveness. Implementing these recommendations can empower individuals, promote reproductive health, and mitigate the pandemic's impacts on fertility decisions.

Annex

METHODOLOGY, DATA COLLECTION TOOLS, TECHNIQUES, AND PLAN

Introduction

This note explains how the data collection methodology was devised and employed in this study. Data collection was through a sample survey of 450 respondents. This sample consisted of urban, rural and estate sector populations.

This 450 is the total sample size with 150 women drawn from each sector. The following section describes the data collection design for the study.

Sampling

The sample size for all categories of women (450) was derived with the use of 5 per cent margin of error, 50 per cent population proportion and 95 per cent confidence intervals. Urban areas in Colombo, Gampaha, Anuradhapura and Kurunegala districts were selected to draw the urban sample. Colombo and Gampaha identify as high urban areas whereas, Kandy and Anuradhapura are in an intermediate position with Kurunegala symbolizing the lowest urban status. According to 2012 census data, Colombo had 77.6 per cent of the urban population and Gampaha consisted of 15.6 per cent of urban dwellers.

Kandy and Anuradhapura had 12.4 per cent and 5.9 per cent of the urban population respectively while Kurunegala exhibited only 1.9 per cent of urban people living in that district. Such selection provides a unique opportunity for our sample to represent the urban sector in Sri Lanka.

Within those urban areas, following DS divisions were selected at random to draw appropriate number of cases within already drawn GN divisions:

Table 1: Urban Sample by District and DS Division

District	DS Division	Number of Respondents
Colombo	Kirillapone, Nugegoda, Wijerama, Maradana	44
Gampaha	Kelaniya, Jaela, Minuwangoda	55
Kandy	Geliyoa, Karamada	17
Anuradhapura	Anuradhapura	17
Kurunegala	Mahawa	17
Total		150

The sampling frame for the selection of respondents from those DS divisions were obtained from the Public Health Officer in each area and then corresponding samples were selected at random.

Rural sample was selected from Gampaha, Kalutara, Kandy, Anuradhapura and Vavuniya. The selection of Vavuniya was purposely done to accommodate Sri Lankan Tamil population.

More than 87 per cent of the population in these districts are rural populations. Therefore, the rural sample drawn for this study can be regarded as a sample which can be representative of the rural population in Sri Lanka. The number of respondents within those DS divisions were selected in consultation with the sampling frame available with Public Health Officers.

Table 2: Rural Sample by DS Division and District

District	DS Division	Number of Respondents
Gampaha	Minuwangoda	12
Kalutara	Mathugama, Beruwala	58
Kandy	Ampitiya	20
Anuradhapura	Nocchiyagama, Mudithagama	20
Kurunegala	Giribawa	20
Vavuniya	Vavuniya	20
Total		150

As Nuwara Eliya and Badulla districts consist of tea estates and the Kalutara and Rathnapura districts contain Rubber Estates, samples were drawn from these four districts to represent estate women in Sri Lanka. However, Nuwara Eliya and Badulla districts were given prominence as the two districts have a higher number of women working in tea estates.

The sample also consisted of main ethnic groups of the country as the respondents were selected from Sinhalese, Sri Lankan Tamils, Indian Tamils, and Muslims to represent the country's ethnic breakdown. Although it is not the intention of the study to analyse ethnic differentials of fertility, it is felt that ethnic differentials of fertility have some significant bearing on the country's overall fertility level.

Table 2: Estate Sample by DS Division and District

District	DS Division	Number of Respondents
Nuwara Eliya	Chapaltan, Kotiyagala	30
Badulla	Bandarawela, Goanmotawa Estate, Bandarawela	74
Kalutara	Agalawatta	16
Rathnapura	Rathnapura	30
Total		150

Step 1: Preparation of Structured Questionnaires

Two structured questionnaires were prepared for the following two categories of women:

- 1 Women who were in marriageable ages (i.e., less than 30 years of age) during the COVID 19 pandemic period.
- 2 Women who were in their reproductive life span (i.e., 15 to 49 years of age) during the COVID 19 pandemic period.

The category 2 is further subdivided as follows to detect two distinct fertility behaviour which can be observed with younger and older women in the reproductive age span:

- 1 Women who were in the first half of childbearing (i.e., 15 to 34 years of age)
- 2 Women who were in the second half of childbearing (i.e., 35 years to 49 years of age)

Field Investigators

Ten Field Investigators were drawn from the final year Demography Honours undergraduate students with thorough knowledge on survey methodology and field investigations.

A Field Coordinator was appointed to coordinate the field work. Field coordinator was also given the task of collecting information.

Conducting A Pilot Study

A pilot survey was conducted for two days (13 and 14 December 2022) in the locations specified in the Table below.

Table 3: Pilot Survey Description on Number of Questionnaires to be Completed

Investigator's Name	Urban			Rural			Estate			No. of Questionnaires
	1*	2*	3*	1*	2*	3*	1*	2*	3*	
Buddhi							1	3	1	5
Ishan							1	3	1	5
Thishula				1	3	1				5
Wasana							1	3	1	5
Thilini				1	3	1				5
Tharuka	1	3	1							5
Lahiru	1	3	1							5
Nilakshika	1	3	1							5
Thanuri				1	3	1				5
Maheshi				1	3	1				5
Ishara	1	3	1							5
No. of Questionnaires	4	12	4	4	12	4	3	9	3	55

Note*:

1. Single who are at marriageable ages (below 30 years of age)
2. Currently Married who are at the ages below 35 years of age
3. Currently Married who are at the ages 35 years and above

Field Work Period

Field Work for the study is divided into three activities: Pilot Survey, Field Survey, Case Studies, and the Focus Group Discussions.

Table 4: Field Work Plan

Activities	23 Nov to 10 Dec 2022	10 – 11 Dec 2022	13– 15 Dec 2022	16 Dec 2022 to 10 Feb 2023	10 Feb – 30 Sep 2023
Designing methodology, data collection tools, techniques, and plan					
Training of investigators on data collection					
Contacting relevant authorities at field level (MoH, PHI and FHOs)					
Conducting a pilot study to test the questionnaire					
Gathering required primary data from the sample survey in urban, rural and estate sectors					
Developing the case study template					
Collecting Information from 15 case Studies					
Developing FGD themes					
Conducting six FGDs					
Data cleaning, analysis and reporting					

Developing the Case Study Template

Sixteen case studies were conducted after identifying suitable cases during the survey period covering urban, rural, estate and ethnicity of the women. Again, the women were divided to three groups: (1) women who are at marriageable ages but were not married during the COVID-19 period, (2) women who were married and were in their first half of the childbearing period

and (3) women who were married and were in their second half of the childbearing period. Each category consisted of four case studies. Within those four in each category, there were at least four women for each urban, rural and estate sector. Furthermore, there were eight Sinhalese women, three Sri Lankan Tamil women, three Sri Lankan Muslim women and two Indian Tamil women among those 16 case studies.

Table 5: Case Study Template

Sector	Urban/Rural/Estate
Ethnicity	Sinhalese/SL Tamil/SL Muslim/Indian Tamil
Group of Women	<ol style="list-style-type: none"> 1. Women who are at marriageable ages but not married during the COVID 19 period/ 2. Women who were married and in their first half of childbearing period/ 3. Women who were married and in their second half of the childbearing period.
Locality	District/DS Division

Themes
General experience with COVID 19 pandemic
Specific experience with COVID 19 pandemic
Marriage (Delayed marriage and causes; expectation)
Childbearing (Postponement of childbearing and causes; expectation)
Economic hardships <ul style="list-style-type: none"> • Food security • Income security • Social protection
Access to goods and services
Access to healthcare
Access to family planning
Experience during lockdown periods
Work-Life Balance
Economic uncertainty
Government policies/actions
Gender-based violence
Disruption of childcare
Disruption of elderly care
Intergenerational solidarity during the pandemic and economic uncertainty
Disruption to social network

Case study areas were selected from the manner given in the table below to cover all the categories of women who are drawn to the sample.

Table 5: Case Study Template

District	Women in marriageable ages (less than 30 years)	Women in the first half of childbearing (less than 35 years)	Women in the second half of childbearing (35 years and above)
Colombo	1	1	1
Gampaha	1	1	1
Kalutara	1	1	1
Kandy	1	1	1
Nuwara Eliya	1	1	1
Badulla	1	1	1
Anuradhapura	1	1	1
Vavuniya	1	1	1
Kurunegala	1	1	1
Rathnapura	1	1	1
Total	10	10	10

Note: The best 16 case studies were selected from those 30 case studies carried out

Developing Focus Group Discussion (FGD) Themes

Six FGDs were carried out to understand how women adjusted their fertility behaviour during COVID 19 pandemic period and economic uncertainty.

The following themes were developed to conduct FGDs covering urban, rural and estate sectors by selecting two in each sector. For this, the Nuwara Eliya, Vavuniya and Kalutara districts were selected.

Table 7: FGD Themes

Sector	Urban/Rural/Estate
Ethnicity	Sinhalese/SL Tamil/SL Muslim/Indian Tamil
Group of Women	<ol style="list-style-type: none"> 1. Women who are at marriageable ages but not married during the COVID-19 period/ 2. Women who were married and in their first half of childbearing period/ 3. Women who were married and in their second half of the childbearing period.
Locality	District/DS Division

Themes
Covid-19 Experience (adjustment of marriage/fertility behaviour)
Economic Crisis Experience (adjustment of marriage/fertility behaviour)
Impact of Mortality on Childbearing Decisions
Restricted Access to Family Planning Services on Childbearing Decisions
Reduced Work-Life Balance and Childbearing Decisions
Food Security and Childbearing Decisions
Access to Healthcare and Childbearing Decisions
Disruption of Assisted Reproduction Services and Childbearing Decisions
Disruption of Transport Services/Increased Transport Cost
Gender-Based Violence
Intergenerational Solidarity
Broken Down Social Network and Childbearing Decisions

Note: Maximum 45 Minutes Discussion

We conducted FGDs to obtain the consensus view from two groups of women (those who are in the first half of childbearing and those who are in their second half of childbearing) on how they have adjusted their fertility behaviour during the COVID-19 pandemic and economic uncertainty.

The following table indicates the location of the FGDs which were held in consultation with the Family Health Workers. The FGDs were carried out during from 23 December 2022 to 10 February 2023 depending on the dates suitable for the Family Health Worker in the respective area.




Table 8: Location of FGDs

District	Women in the first half of childbearing (less than 35 years)	Women in the second half of childbearing (35 years and above)
Gampaha		1
Nuwara Eliya	1	1
Badulla		1
Vavuniya	1	
Kurunegala	1	
Total	3	3



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