

Mughal, Mazhar; Javed, Rashid

Working Paper

Perturbed Nuptiality, Delayed Fertility: Childbirth Effects of Covid19

GLO Discussion Paper, No. 824

Provided in Cooperation with:
Global Labor Organization (GLO)

Suggested Citation: Mughal, Mazhar; Javed, Rashid (2021) : Perturbed Nuptiality, Delayed Fertility: Childbirth Effects of Covid19, GLO Discussion Paper, No. 824, Global Labor Organization (GLO), Essen

This Version is available at:
<http://hdl.handle.net/10419/233079>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Perturbed Nuptiality, Delayed Fertility: Childbirth Effects of Covid19

Mazhar Mughal * Rashid Javed[†]

Abstract

An aspect of the Covid-19 pandemic that merits attention is its effects on marriage and childbirth. Although the direct fertility effects of people getting the virus may be minor, the impact of delayed marriages due to the first preventive lockdown, such as that imposed in Pakistan from March 14 to May 8 2020, and the closure of marriage halls that lasted till September 14 may be non-negligible. These demographic consequences are of particular import to developing countries such as Pakistan where birth rates remain high, marriage is nearly universal, and almost all child-bearing takes place within marriage. Based on historic marriage patterns, we estimate that the delay in nuptiality during the first phase of coronavirus outbreak may affect about half of the marriages that were to take place during the year. In Pakistan, childbearing begins soon after marriage, and about 37% of Pakistani married women give birth to their first child within twelve months of marriage. A sizeable number out of these around 400,000 annual births that occur within twelve months of the marriage may consequently be delayed. Postponement of marriages due to the accompanying difficult economic situation and employment precariousness should accentuate this fertility effect. The net fertility impact of the Covid-19 outbreak would ultimately depend not only on the delay in marriages but also on the reproductive behavior of existing couples.

Key words: COVID-19; coronavirus; lockdown; marriage; childbirth; fertility; Pakistan.

JEL codes: I10; I18; J10; J12; J13.

*Pau Business School, France. E-mail: mazhar.mughal@esc-pau.fr

[†]Westminster International University in Tashkent (WIUT), Uzbekistan, TREE, University of Pau, France and Global Labor Organization (GLO), Germany. E-mail: rachid-javed@gmail.com

Résumé

Un aspect de la pandémie de Covid-19 qui mérite une attention particulière concerne ses effets sur le mariage et la naissance des enfants. Les conséquences démographiques sont particulièrement importantes pour les pays en développement tels que le Pakistan. Dans ce pays, le taux de natalité est élevé, le mariage est presque universel et la procréation se fait exclusivement dans le cadre du mariage. Bien que les effets directs du virus sur la fertilité des personnes infectées puissent être moins importants, l'impact des mariages retardés en raison des mesures de confinement telles que celles qui avaient cours au Pakistan du 14 mars au 8 mai 2020, et de la fermeture des salles de mariage qui a duré jusqu'au 14 septembre peut être sérieux. Sur la base des modèles de mariage historiques, nous estimons que le retard de la nuptialité pendant la première vague de la pandémie de coronavirus pourrait affecter environ la moitié des mariages qui devaient avoir lieu pendant l'année. Au Pakistan, la reproduction commence peu après le mariage et environ 37 % des femmes mariées pakistanaises donnent naissance à leur premier enfant dans les douze mois suivant leur mariage. Un nombre non négligeable des 400 000 naissances annuelles qui surviennent dans les douze mois suivant le mariage pourrait donc être retardé. Le report des mariages en raison d'une situation économique difficile et de la précarité de l'emploi devrait accentuer cet effet sur la fécondité. En fin, l'impact net de l'épidémie de Covid-19 sur la fécondité dépendrait en fin de compte non seulement du report des mariages, mais aussi du comportement des couples existants en matière de reproduction.

Mots clés: COVID-19; coronavirus; confinement; mariage; accouchement; la fertilité; Pakistan.

JEL codes: I10; I18; J10; J12; J13

1 Introduction

A century after the Spanish Influenza, dubbed “Mother of all pandemics” (Taubenberger and Morens, 2006) wreaked havoc across the planet, the Covid-19 pandemic is ravaging human population. Millions have perished and tens of millions have been infected. These numbers, though tragically big, have so far been a fraction of the fatalities seen in the Spanish flu outbreak. Estimates of Spanish flu fatalities range from 17 million to 100 million, or 1 - 6% of the world population at that time, with around 5% of British India’s population perishing in the pandemic (Chandra and Christensen, 2019; Johnson and Mueller, 2002; Patterson and Pyle, 1991; Spreeuwenberg et al., 2018). However, the economic losses of the Covid-19 pandemic are such not seen during peace-time for generations. Governments imposed preventive lockdowns and large parts of the global economy came to a halt. Demand for goods and services fell sharply, supply chains broke down as transportation and human mobility were seriously curtailed. As a result of the Great Lockdown caused by the pandemic, budget deficits and unemployment numbers have soared to unprecedented levels and the specter of recession loomed in countries across the world (Atkeson, 2020; IMF, 2020; McKibbin and Fernando, 2020).

Another dimension of the pandemic that merits attention is its effects on marriage and childbirth. The coital frequency in the affected population may fall below average during the outbreak, either as a result of the illness’s debilitating biological effects or for fear of contagion among the social survivors. The demographic consequences are of particular import to developing countries such as Pakistan where birth rates remain high, marriage is almost universal, and child-bearing exclusively takes place within marriage¹. The country has a Total

¹According to the data from pooled sample of four rounds of the Pakistan Demographic

Fertility Rate (TFR) of 3.6 and a population growth rate of 2.1% ([World Bank, 2019](#)).

A year since the Covid19 pandemic began spreading in Pakistan and other countries of South Asia, the region's infection-related mortality rates, at less than one death per thousand population, are lower than those seen in the worst-hit regions such as Latin America and Europe ([Johns Hopkins University & Medicine, 2021](#)). Pakistan, a country with a population of 216 million ([World Bank, 2019](#)), has suffered 16,094 reported deaths due to novel coronavirus by 17th April 2021, corresponding to one death per 13,456 individuals. Likewise, the numbers of persons affected by the virus remained below one in hundred, with 750,158 persons (about 0.35% of the country's population) testing positive to the coronavirus test².

Given this relatively low infection rate during the first year of the pandemic, the direct impact on fertility from the persons getting the virus may be minor. The fact that an overwhelming majority of those who have died due to coronavirus have been the elderly, often those with one or more co-morbidities, and that relatively-few young adults have died should also limit any direct effect on fertility. However, the impact on nuptiality and fertility arising from the preventive lockdown may well prove to be substantial. In this study, we discuss the delay in marriage caused by the ban on public gatherings and the closure of wedding halls during the first lockdown imposed by the Government of Pakistan. During the preventive lockdown that began from 13 March 2020, all educational institutions and places of public gathering including marriage halls and sport stadia were closed and public events were cancelled. Though some restrictions

and Health Survey (PDHS 1990-91, 2006-07, 2012-13 and 2017-18), 313 women out of a total of 39,786 with at least one child reported giving birth prior to marriage. This corresponds to 0.79% of firstborn births.

²The lower numbers may, in part, also owe to lower testing of the population.

were relaxed starting from May 9 2020, public gatherings remain prohibited until 14th September. The closure of marriage halls, banquets and marquees during this six month period (13 March – 14 September 2020) led to postponement or cancellation of ceremonies during the prime wedding season. We analyze possible fertility impact of the resulting delay in marriages and report some preliminary findings in light of the developing scenario.

The paper is organized as follows. Section 2 details the Covid-19 situation in Pakistan. Section 3 briefly describes the data. Sections 4 present the seasonality of nuptial arrangements. Sections 5 present the discussion of study.

2 Covid-19 situation in Pakistan

On 26 February 2020, Pakistan confirmed its first two cases of the novel coronavirus. The country announced the first phase of comprehensive nation-wide lockdown on March 13 2020. At that time, there were 33 confirmed coronavirus cases but no reported death in the country. Within one month of the virus' arrival, the number of total confirmed cases (COVID-19 Positive) in the country reached 1,057 (Figure 1). All of the Initial confirmed cases had recent travel history from Europe or Iran. The country reported its first death from coronavirus on March 20 2020 (Figure 2). During the second month (March 26 - April 26), the number of confirmed cases jumped to 12,723, with 269 reported fatalities ([Government of Pakistan, 2020a](#)). A large religious congregation that took place near Lahore, the country's second largest city, prior to the lockdown played a

major role in spreading the virus³. Within three months of the first reported case (May 26 2020), the number of COVID-19 positive cases reached 57,705 with 1,197 reported deaths.

A new spike was observed around the festival of Eid-al-fitr (May 24). On the 18th of May, Supreme Court of Pakistan ordered the federal and provincial governments to open all malls and shopping centres in order to allow shopping for the festival. Mass violations of standard operating procedures (SOP) devised by the government were observed during the period leading to exponential growth in infections. By mid-June, a peak was reached with 6,825 new cases reported on 15th June 2020, after which a steady decline was observed. On 2nd July, recoveries from the infection exceeded active cases for the first time. Six months since the first reported case (August 26 2020), the total number of positive cases had reached 294,193 with 8,987 active cases and 6,267 reported deaths. By September 2020, Pakistan had managed to control the outbreak; new cases during the month were consistently below 1,000 and daily death count was in the single figures. By the end of the month, the total number of deaths stood at 6,484.

The marriage halls were allowed to open from 14th September 2020, and large number of delayed marriages took place during the subsequent weeks⁴. However, mass violations of coronavirus SOPs turned large weddings into virus super-spreaders⁵. In mid-October, the government limited the timings of marriage halls and the number of guests amidst fears of a second wave of the coronavirus pandemic. By late October 2020, the country was in the grip of the second wave.

³According to news reports, 27% of Pakistan's Covid-19 cases can be traced to this congregation. Source: <https://tribune.com.pk/story/2203599/9-27-pakistans-covid-19-cases-linked-raiwind-ijtima-report/>

⁴Source: <https://images.dawn.com/news/1186901/till-death-do-us-party-theres-no-stopping-wedding-season-in-pandemic-stricken-pakistan>

⁵Source: <https://www.telegraph.co.uk/global-health/science-and-disease/restaurants-marriage-halls-emerge-coronavirus-hot-spots-pakistan/>

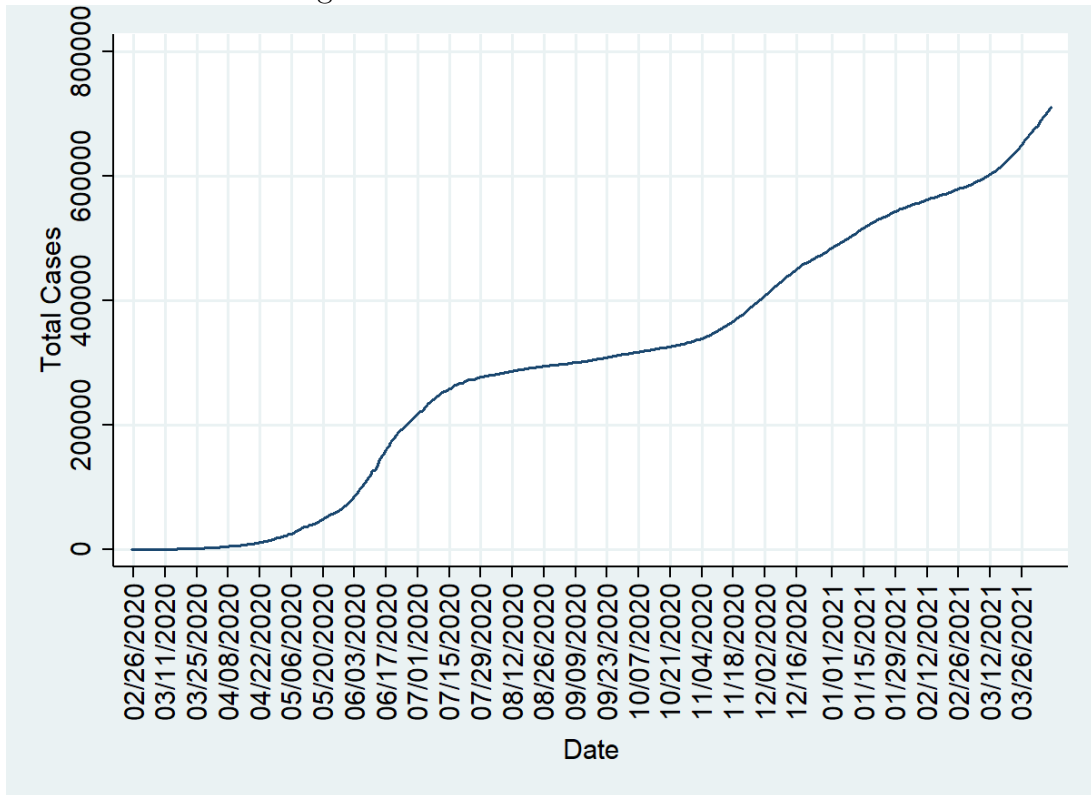
In response, the government closed down schools and universities, reduced the timings of markets, restaurants and marriage halls, and enforced smart lockdowns in worst-affected areas. In mid-November, new daily cases touched the two thousand mark. The peak of this wave, which proved to be milder than the first one, was reached on 6th December 2020, when 3,795 new daily cases were recorded. On 26th February 2021, exactly 1 year since the first coronavirus case was reported in Pakistan, the number of Covid-19 positive cases had reached 578,797 with 12,837 reported deaths.

After the relatively-calm months of January and February 2021, coronavirus cases again began to increase rapidly in March. Punjab, the most populous province, banned indoor weddings from 15th March 2021. From 5th April 2021, wedding ceremonies were banned in all the districts of the country where the test positivity rate was above 8%⁶. Besides, all educational institutions were closed down in the 18 high-risk districts. By 17th April 2021, the number of daily positive cases had reached 4,976 with 112 deaths recorded in the past 24 hours. In this wave, that is proving more virulent and deadly than the previous two, even the country's top leadership has been affected with both the President and the Prime Minister getting infected.

Overall, the outbreak has affected the population across the country. The highest numbers of infections are reported in the two more populous provinces of Sindh and Punjab with 269,840 and 255,571 confirmed cases respectively.

⁶Source: <https://tribune.com.pk/story/2291921/indoor-outdoor-gatherings-banned-with-immediate-effect-ncoc>)

Figure 1: COVID-19 cases in Pakistan

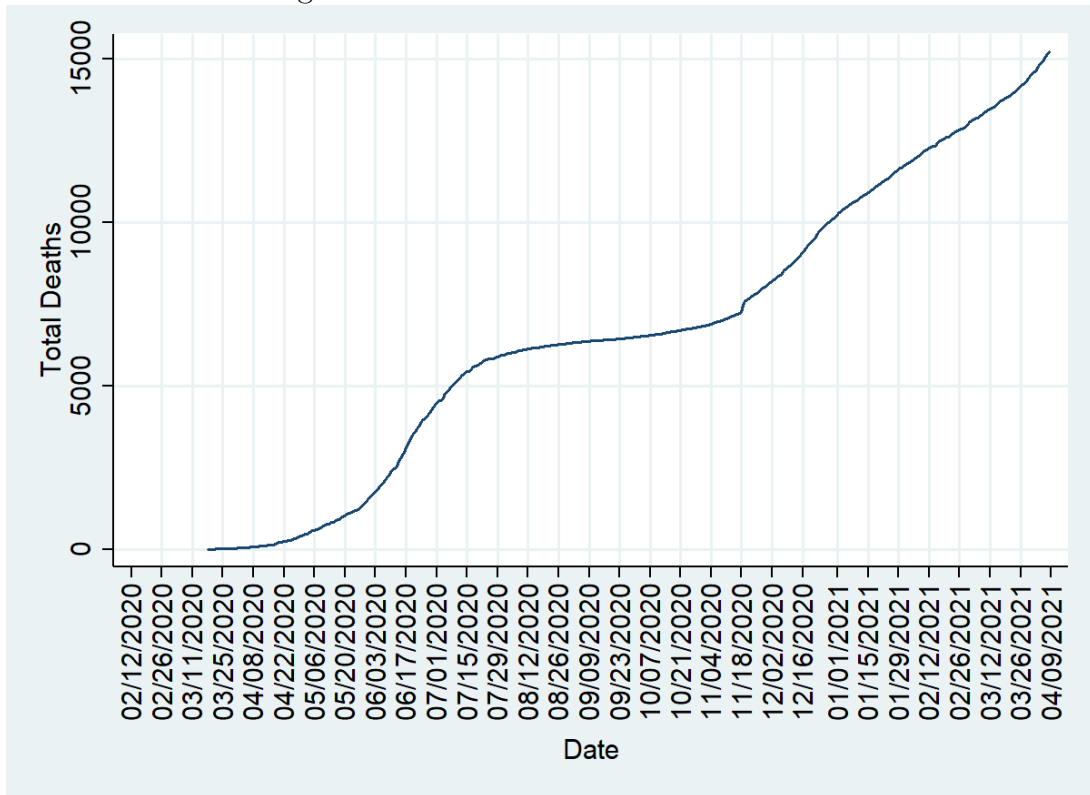


Source: Authors' calculations using [Roser et al. \(2020\)](#).

3 Data

The data used in this paper come from the Pakistan Demographic and Health Survey (PDHS), a nation-wide representative survey which contains comprehensive information on child and woman health, birth histories, birth durations, family planning, gender preference, use of contraceptives, domestic violence, employment and other demographic and socio-economic characteristics of the women, their husbands and their households. The PDHS surveys are based on a two-stage stratified strategy, and are carried out by the National Institute of Population Studies (NIPS), Islamabad with technical and financial assistance from US Agency for International Development (USAID). We employ the fourth and latest round of PDHS, i.e. PDHS 2017-2018. The sample of this survey

Figure 2: Coronavirus deaths in Pakistan



Source: Authors' calculations using [Roser et al. \(2020\)](#).

is representative at the national level as well as for urban and rural areas, the four provinces (Punjab, Sindh, Khyber Pakhtunkhwa, and Balochistan), Azad Jammu and Kashmir (AJK), Gilgit Baltistan (GB), the Islamabad Capital Territory (ICT) and the erstwhile Federally Administered Tribal Areas (FATA). For this round, the country was divided into 580 Primary Sampling Units (PSU), 285 in urban areas and 295 in rural areas. 15,068 women from 14,540 households were covered with a total of 50,495 corresponding children. This nation-wide survey of substantial size carried out in 2017-18 provides us latest available demographic data as well as the recent marriage and fertility patterns which can be used to understand possible changes taking place during the Covid19 pandemic.

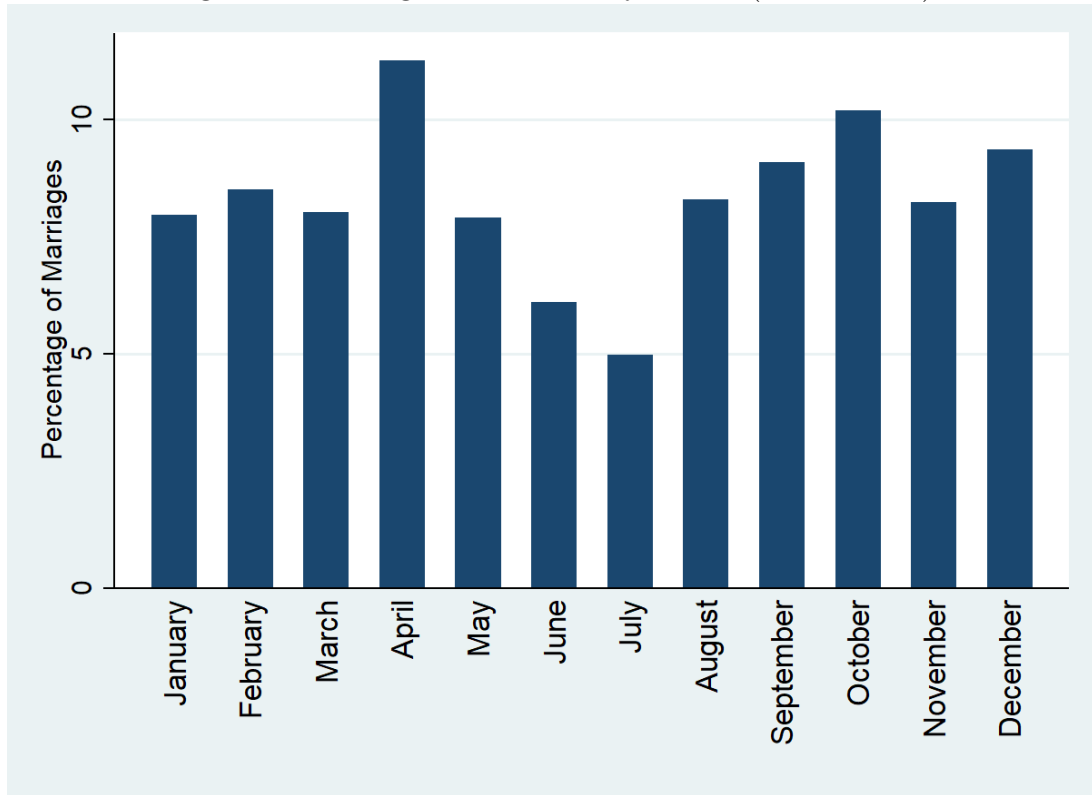
4 Seasonality of nuptial arrangements

In the Pakistani culture, the marriage contract (called Nikah) can take place at home (or even online or by telephone) in the presence of a handful of participants from the two sides. However, marriage is generally not consummated without a formal public ceremony called Rukhsati. Weddings are an elaborate set of ceremonies that last several days and are attended by hundreds (or occasionally thousands) of guests⁷. Spring has historically been the preferred season for marriages (Suleman, 1985). The weather at that time of year is pleasant, schools are closed after annual examinations, and the harvest of wheat, the country's principal winter crop, begins. Relatively few wedding ceremonies are carried out during summer months. In the month of June, the hottest month in the country, temperatures in the plains of Indus valley regularly rise to 40°C (104°F) or even higher. The months of July and August are hot and humid as the country receives frequent, occasionally heavy Monsoon rains. Nevertheless, households whose family members have migrated abroad tend to arrange weddings during the summer vacations in order to accommodate the migrant participants. Figure 3 shows the distribution by months of marriage for 3,311 women who married between 2013 and 2017 as reported in the 2017-18 Pakistan Demographic and Health Survey (PDHS). April, October and December are reported to be the three months in which the highest share of marriages traditionally takes place.

Along with seasonal variations, Pakistan's marriage calendar shows changing trends due to the shifting of the Hijri calendar. Pakistan's majority Muslim population usually does not celebrate marriages during the months of Muharram,

⁷In one large wedding that took place in southern Punjab, 'at least 3,000 VVIP guests participated every night for seven nights to devour not less than twenty dishes. More than 5,000 other guests were offered three to seven dishes.'. source: <https://dunyanews.tv/en/Pakistan/314104-Brother-goes-all-out-for-siblings-wedding-in-Chis>

Figure 3: Marriage distribution by month (2013 – 2017)



Source: Authors' calculations using PDHS 2017-18. Observations pertaining to incomplete survey year (2018 respectively) has been excluded.

the first month, and Ramadhan (also pronounced Ramzan), the ninth month⁸. The Islamic calendar is based on lunar observations and is about eleven days shorter than the solar calendar due to which events based on the lunar calendar drift through the seasons. For instance, in 2013, the month of Ramadhan started on July 11. In 2017, it began on May 27, some 44 days earlier.

⁸This cultural practice is more prevalent among the Muslims of the Indian Subcontinent and has little religious basis (Suleman, 1985).

5 Discussion

Our calculations based on the monthly mean of marriages from 2013 to 2017 show that the closure of marriage halls during the 14 March – 14 September period concerns nearly half (47.45%) of the marriages that were to take place during the year. This involuntary delay in nuptiality, which may range from a few days at the minimum to six months or more, is bound to have non-negligible impact on the subsequent fertility. In Pakistan, childbearing begins soon after marriage, and about 37 percent of Pakistani married women give birth to their first child within twelve months of marriage (Figure 4). The number of babies born within the first year of marriage corresponds to about 6.6% of the total births⁹. A sizeable number out of these around 400,000 births may get delayed due to the Covid19-related marriage delays¹⁰.

This impact may however prove to be temporary as these delayed births can be ‘recuperated’ in the second year of marriage. This would result in a minor baby bump in the later half of 2021 as the newly-wed couples move to make up for the lost time. There is also some anecdotal evidence suggesting that some weddings did take place during summer with limited guests. This owes to the fact that many families consider it undesirable to postpone wedding once the match has been made.

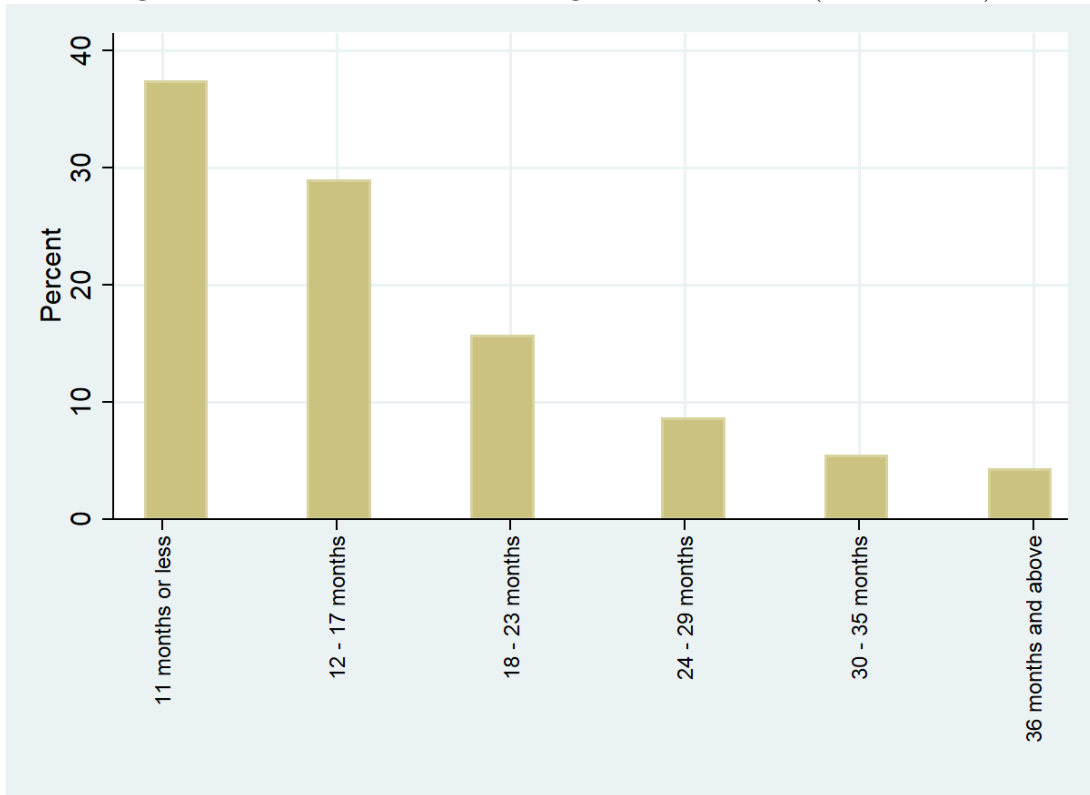
However, there are other reasons to suggest that the Covid19 pandemic and the corresponding lockdowns may have affected new marriages and fertility:

Inordinate delays, postponement of wedding arrangements and an atmosphere of stress and fear can exacerbate tensions which could ultimately cause the engagements to break down. The economic hardship caused due to the lockdowns

⁹833 out of 12,644 live births reported for the 2013 - 2017 period (PDHS, 2018).

¹⁰based on a Crude Birth Rate (CBR) of 28.25 per 1000 population for the year and a population estimated at 212,215,030 (World Bank, 2018).

Figure 4: Interval between marriage and first birth (2013 – 2017)



Source: Authors' calculations using PDHS 2017-18.

may force many people to postpone marriages even when restrictions on public gatherings are lifted. Nearly two months of economic closure during the preventive lockdown has hit the economic activity particularly hard. Pakistan's growth rate this year may get into negative territory for the first time since 1952¹¹. Barring the agriculture sector (which was allowed to remain open so as not to interrupt wheat harvest), most of the economy shut down during the first lockdown. Labourers, daily wage workers, street vendors and small shopkeepers went for weeks without work. Though the government provided relief to 12 million poor households (about a third of the population) through the Ehsas Emergency Cash programme ([Government of Pakistan, 2020b](#)). The cash assistance was

¹¹The country recorded a growth of -1.8% in the financial year 1952 ([Pakistan Bureau of Statistics, 2020](#))

later extended to cover 16.9 million households, or about half of the country's population¹². However, the financial assistance of Rs. 12,000 (approx. USD75) could only be enough to get the poor households through a few weeks of the lockdown. In addition to the extreme poor, a large proportion of middle-income households are engaged in work in the informal sector and have to rely upon their savings to cover their needs. A substantial number of Pakistani households also receive remittances from overseas. These remittances help the household accumulate assets (Ahmed et al., 2018) and save for dowry and wedding expenses. This source of income for many households is in jeopardy as tens of thousands of Pakistani workers based in the Gulf countries have lost their jobs and are returning home. A plausible consequence of these financial difficulties is that marriages may be postponed for some months while household finances get rebuild.

Slow economic activity will also decrease employment generation, which in turn, will affect the marriage prospects of the about 1.4 million persons of working age who enter the labour market each year (Najam and Bari, 2017). In Pakistan, delay in marriage timing is coincidental to young people's greater job precariousness (Sultan et al., 2020). Matches are not made or wedding ceremonies arranged as long as one or both of the future partners do not achieve job security¹³. Greater focus on higher education and economic pressures are increasingly leading to late marriages. The ongoing economic slowdown may accentuate this trend.

Another reason for postponement of marriages, especially those involving participants from the overseas, might be the travel difficulties that the guests or even

¹²Source: <https://www.dawn.com/news/1569458>

¹³This argument is in line with the conclusion of Sobotka et al. (2011) who report that the most important reason why economic recession is likely to exert downward pressure on fertility in the developed countries is the rise in unemployment and in job instability, which particularly affects young adults. Low-educated men with precarious work position face more difficulties finding a partner with whom to start a family.

the marrying couple faced during the spring and summer of 2020. The pandemic was hitting hard the states of Persian Gulf, North America and Western Europe, and travel to Pakistan from these major destinations of Pakistani migrants was far below average. Consequently, many marriages had to be put off.

The a cumulative effect of delayed marriages for all these reasons would be a significant delay in childbirth. This impact may however be dampened by the modifications in the fertility behavior of the existing couples. The lockdown can lead to higher frequency of sexual intercourse as a result of couples being cloistered together¹⁴. This, along with the fact that less than one in two couples in Pakistan use contraceptives¹⁵, can imply a mini corona-baby boom in late 2020 and 2021. Similarly, the desire to replace the deceased (replacement fertility) may not prove to be an overwhelming factor given low fatalities relative to the population. The lockdown may even act negatively on existing couples' fertility intentions as couples may choose to postpone their fertility plans in the environment of uncertainty and negative perceptions about the future (Menken et al., 1981). The existing couple's sexual activity and reproductive behavior may also suffer from increased risk of intimate partner violence and conflict (Sarkar, 2008). The presence of these divergent directions which the fertility behaviour of existing couples may take as well as the aforementioned birth effects of delayed marriages will ultimately determine the net fertility impact of the Covid-19 outbreak. A nation-wide demographic survey in the coming months may shed light on the various ways in which the Covid19 pandemic affected the marital and birth patterns of Pakistani households.

¹⁴A survey from Italy found no support for this assertion as 81.9% of people surveyed in a study do not plan to conceive during the COVID-19 crisis (Micelli et al., 2020).

¹⁵According to the 2017-18 DHS, the countrys Contraceptive Prevalence Rate (CPR) is 34%.

References

- Junaid Ahmed, Mazhar Mughal, and Stephan Klasen. Great Expectations? Remittances and Asset Accumulation in Pakistan. *Journal of International Development*, 30(03):507–532, 2018. ISSN 01902946. doi: <https://doi.org/10.1002/jid.3202>.
- Andrew Atkeson. What Will Be the Economic Impact of COVID-19 in the US? Rough Estimates of Disease Scenarios. 2020.
- Siddharth Chandra and Julia Christensen. RE: âReassessing the Global Mortality Burden of the 1918 Influenza Pandemicâ. *American Journal of Epidemiology*, 199(07):1404–06, 2019.
- Government of Pakistan. Coronavirus tracker, 2020a. URL <http://covid.gov.pk/>.
- Government of Pakistan. Ehsas programme, Poverty Alleviation and Social Safety Division, 2020b. URL <https://www.pass.gov.pk/Detailf90ce1f7-083a-4d85-b3e8-60f75ba0d788>.
- IMF. The Great Lockdown: Worst Economic Downturn Since the Great Depression, IMF Blog by Gita Gopinath, 2020. URL <https://blogs.imf.org/2020/04/14/the-great-lockdown-worst-economic-downturn-since-the-great-depression/>.
- Johns Hopkins University & Medicine. Mortality Analyses, 2021.
- Niall P.A.S. Johnson and Juergen Mueller. Updating the accounts: global mortality of the 1918-1920 "Spanish" influenza pandemic. *Bulletin of the history of medicine*, 76(1):105–115, 2002. ISSN 00075140. doi: 10.1353/bhm.2002.0022.
- Warwick J. McKibbin and Roshen Fernando. The Global Macroeconomic Impacts of COVID-19: Seven Scenarios. 2020.
- Jane Menken, James Trussell, and Susan Watkins. The Nutrition Fertility Link : An Evaluation of the Evidence A link between nutrition and fertility has. *Human Fertility*, 11(3):425–441, 1981.
- Elisabetta Micelli, Gianmartin Cito, Andrea Cocci, Gaia Polloni, Giorgio Ivan Russo, Andrea Minervini, Marco Carini, Alessandro Natali, and Maria Elisabetta Coccia. Desire for parenthood at the time of COVID-19 pandemic: an insight into the Italian situation. *Journal of psychosomatic obstetrics and gynaecology*, 0(0):1–8, 2020. ISSN 1743-8942. doi: 10.1080/0167482X.2020.1759545. URL <http://www.ncbi.nlm.nih.gov/pubmed/32379999>.

- Adil Najam and Faisal Bari. *Pakistan - National Human Development Report 2017*. 2017. ISBN 9789698736194.
- Pakistan Bureau of Statistics. Macro Economic Indicators, 2020. URL <http://www.pbs.gov.pk/sites/default/files//tables/Table-1{ }0.pdf>.
- K David Patterson and Gerald F Pyle. The geography and mortality of the 1918 influenza pandemic. *Bulletin of the History of Medicine*, 65(1):4–21, 1991.
- PDHS. NIPS. Pakistan Demographic and Health Survey 2017-18, 2018.
- Max Roser, Hannah Ritchie, Esteban Ortiz-Ospina, and Joe Hasell. Coronavirus disease (COVID-19) Statistics and research. *Our World in data*, 2020.
- N. N. Sarkar. The impact of intimate partner violence on women’s reproductive health and pregnancy outcome. *Journal of Obstetrics and Gynaecology*, 28(3): 266–271, 2008. ISSN 01443615. doi: 10.1080/01443610802042415.
- Tomáš Sobotka, Vegard Skirbekk, and Dimiter Philipov. Economic recession and fertility in the developed world. *Population and Development Review*, 37(2): 267–306, 2011. ISSN 00987921. doi: 10.1111/j.1728-4457.2011.00411.x.
- Peter Spreeuwenberg, Madelon Kroneman, and John Paget. Reassessing the global mortality burden of the 1918 influenza pandemic. *American Journal of Epidemiology*, 187(12):2561–2567, 2018. ISSN 14766256. doi: 10.1093/aje/kwy191.
- Mohammad Suleman. *MicrOfilms International Epidemiology of malaria in Punjab, Pakistan: a case study in a rural community near Lahore (Doctoral dissertation)*. PhD thesis, 1985.
- Tipu Sultan, Saeed Ahmad, and Ayesha Ayub. At Risk of Leftover Singles: Dimensions and Sociopsychological Repercussions of Delayed Marriageability Among Educated Females in Pakistan. *The Family Journal*, 2020. ISSN 15523950. doi: 10.1177/1066480720902454.
- Jeffery K. Taubenberger and David M. Morens. 1918 Influenza: the Mother of All Pandemics. *Emerging Infectious Diseases*, 12(1):15–22, 2006. ISSN 1080-6040. doi: 10.3201/eid1209.050979.
- World Bank. World Development Indicators (WDI), 2018. URL <https://data.worldbank.org/country/pakistan>.
- World Bank. World Development Indicators (WDI), 2019. URL <https://data.worldbank.org/country/pakistan>.