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MEDIA AND POLICY: An Application of Cox Proportional Hazard Model to Evaluate Population Policy of Pakistan

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Abstract

In developing countries like Pakistan, the family planning program has been the principal instrument of a population policy to influence fertility behaviour and preferences. For effective implementation of such programmes, media plays a crucial role to bring awareness among people. Through information sharing, media helps restructure society's preferences to bring them in line with the set policy targets. This study undertakes the analysis in retrospect by evaluating the Population Policy of Pakistan 2002. The use of family planning methods was increased and incentivised through media coverage. The Cox proportional hazard model is applied to explore the extent to which the policy remained effective in influencing fertility behaviour by an increase in contraceptive use through a mass media campaign. The childbearing dynamics of women is analysed using data from Pakistan Demographic and Health Survey (PDHS) 2012-13. The women's age group included in the analysis is between 15 to 32 years. The data is segregated into 3-year calendar periods, divided into six groups, ranging over the time period from 1995 to 2012. The indicator of media coverage has been used to capture policy intervention while controlling for women's education, wealth quintile index, and rural urban divide. Results show that the policy of 2002 effectively increased the birth gaps only for a higher order of childbirth and mass media played an important role in bringing awareness about contraceptive usage.

Keywords: Demography, Fertility, Family Planning, Media.
JEL Classification: N3, J13, L82.

I. Introduction

The population dynamics and demography play an important role in the development of a country. High population growth rates have serious implications for the sustainability of resources and a high dependency ratio also poses a severe challenge for economic development by affecting the productive capacity of a country. Therefore, it is necessary to implement policies to curtail high population growth rates, which act as an income depressing force. For over half a century, family planning programmes have remained the main agenda item in the economic development of a

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country. In 2013, 66 countries of the world were classified as susceptible to high fertility rates i.e., per woman, childbirth was above five children. Around 90 per cent of these countries are having explicit population policies to reduce fertility rates [Bremner et al., (2010)]. However, beliefs about the importance of family planning in economic development are at times stronger than the evidence that supports them.

The developed countries have completed their demographic transition [Bongaarts (2002) and Van de Kaa (2010)], while the developing countries are still lagging. Before the onset of demographic transition, the high birth rates counterbalance the high death rate resulting in almost zero population growth. At the onset of demographic transition, the population growth rates rise due to a fall in death rates but rising birth rates observed in many developing countries. Developed countries which have completed the demographic transition observe almost zero population growth rates due to a fall in death and birth rates resulting from technological advancement, education and economic development. Pritchett (1994) points out that developing countries faced high and unprecedented population growth rates in the second half of the twentieth century. These countries have nevertheless experienced a declining trend in mortality, but the fertility rate is still found to be very high [Freedman (1979)]. The high rate of fertility translates into higher population growth rates that lead to a number of social problems like unemployment, poverty, illiteracy, environmental degradation and ill health, especially in the context of developing countries [Ali and Kiani (2003)]. The National Population Policy and Family Planning Programmes have been on the mainstream agenda in many developing countries to combat such issues by reducing the overall fertility rates [Robinson and Cleland (1992) and Schultz (2005)].

The high population growth rates remained one of the major policy concerns under the 3rd, 4th, 6th, 7th and 8th five-year plans of Pakistan [Khan (1996)]. The core objective of these plans was to reduce population growth rates through the adoption of traditional contraceptive measures. The population growth rates of Pakistan depict that from 1960 to mid-1980, it had an increasing trend and reached its highest peak to around 3.4 per cent during the mid-1980 [Sathar (2012)]. It was mainly attributed to the failure of 3rd and 4th five-year plans to control population growth rates. These plans were fully centralised, and the provinces were facing budgetary issues [Cleland and Sathar (1984) and Khan (1996)]. However, population control programmes introduced in the 7th and 8th five-year plans have been successful to some extent in targeting slower population growth rates after the mid-1980. The uniqueness of these two five-year plans was the increase in contraceptive prevalence from 12.9 per cent to 23.5 per cent aiming to reduce fertility rates from 5.9 to 5.4 children per woman.

The 6th National Population and Housing Census of Pakistan took place in 2017, after a gap of 19 years. It is an important source in determining the composition and distribution of population within a country. The results of the census indicate that the population growth of Pakistan has declined from 2.6 per cent in 1998 to 2.4 per cent in 2017. However, the total population of the country has increased by 57 per cent

during the same period [Government of Pakistan (2017a)]. The Population Welfare Department is providing support to the federal and provincial levels to implement Population Welfare Programmes at the provincial level. The total funds allocated to such programmes are estimated to be at Rs 8176.06 million for the year 2017-18 and have mainly been done through the Public Sector Development Program (PSDP). The core obligation of these programmes is to set up the service delivery centers, which include Family Welfare Centers, Reproductive Health Centers and Mobile Service Units. Table 1 provides the contraceptive usage in Pakistan, and the indicators show that Population Welfare Programmes are expected to curtail the future population growth rates in Pakistan.

After the 18th amendment, the health sector became a provincial subject and all of the provinces were given a mandate to design and implement their own population policies in order to reach an optimal population size. Unfortunately, ever since the devolution, none of the provinces rolled out their respective population policies except the Government of Punjab. The Punjab Population Policy 2017 targets to achieve the fertility of 3.3 births per woman by 2020 and a replacement level fertility to 2.1 children per woman by 2030 [Government of Punjab (2017)]. Interestingly, the strategies and policy instruments of the Punjab Population Policy 2017 are very much similar to that of the Population Policy of Pakistan 2002. Therefore, it is apparent that the Population Policy of Pakistan 2002 is virtually still intact for policymakers to undertake analysis and evaluate its impacts. There are numerous studies [Siddiqui, et al., (2001) and Sathar and Zaidi (2009)] which have theoretically discussed the overall objectives, policy instruments, response variables, and the importance of population policies in Pakistan. However, there is a lack of research on empirical evidence on the impact evaluation of the Population Policy of Pakistan 2002 i.e., whether the policy has been effective in reducing the fertility rates. For the effective implementation of such policies, information diffusion is very important and mass media is an important policy instrument in this regard. Media helps to fine-tune the behaviour of the masses through not only awareness but also playing a crucial role incentivizing the use of family planning. It restructures the social preferences in favour of policy targets set by the government. To undertake the impact evaluation of the 2002 Popu-

TABLE 1

Contraceptive Trends in Pakistan

	2017 (Current Estimates)	2020 (Projection)
Additional Users of Modern Contraception (Total No.)	2,921,000	4,768,000
Modern Contraceptive Prevalence Rate	21.2%	23.6%
Unmet Need for Modern Contraception	28.9%	28.0%
Demand Satisfied for Modern Contraception	53.3%	56.7%

Source: Govt. of Pakistan, 2017a.

lation Policy of Pakistan, the role of media is taken into consideration as an important tool for the full realization of the policy goals through mass awareness.

Numerous attempts have been made by the government to influence both the demand-side and supply-side determinants of the fertility rate in Pakistan. It has been examined in the case of Pakistan that transition has occurred in terms of reduced fertility rates and the main determinants have been the demand-side factors [Shah, et al., (1986), Sathar and Casterline (1998), Soomro (2000), Ali, et al., (2001), Sathar and Zaidi (2009), Nasir, et al., (2015)]. The Population Policy of Pakistan 2002 was aimed for the revival of the social and economic status of the country through curtailing the rapidly increasing population growth. The vision of the said policy was to stabilise the population growth by completing the demographic transition. The policy aimed to delay childbirth by increasing the birth spacing and changing the fertility preferences in favour of reduced family size. This was to be achieved by promoting family planning through increased access and improving the quality of reproductive health services. For this purpose, an awareness campaign has been used as a policy intervention to highlight the negative consequences of the high population growth rate and to incentivise the use of modern contraceptives. This policy is virtually still intact even after the 18th amendment due to delays in policy formulations and implementations on the part of provinces.

The short-term goals of this policy were to reduce the population growth rate to 1.9 per cent and the fertility rate to 4 births per woman by the year 2004. On the other hand, the long-term goals included a reduction in the population growth rate to 1.3 per cent and to bring down the fertility to a replacement level of 2.1 births per woman by the year 2020. Therefore, the Government of Pakistan took steps to ensure the availability of modern contraceptives among the masses and mass media has been used as an important policy instrument for the spread of family planning information and contraceptive usage [Government of Punjab (2017c)]. Nevertheless, Pakistan Population Census 2017 provides evidence that the annual population growth rate has remained at 2.4 per cent since 1998 as against the short-term and long-term targets of 1.9 and 1.3 per cent, respectively [Government of Pakistan (2017b)]. This analysis that targets of the 2002 population policy have been only partially achieved.

The present study is an attempt to undertake the impact evaluation of the Population Policy of Pakistan 2002 by examining the effectiveness of mass media campaigns as a policy instrument on influencing fertility behaviour. The objective is to analyse the role of media access in increasing the birth gaps up to the fifth child by applying the Cox proportional hazard model which is a survival analysis to determine birth gaps.

The relevant literature on the key theme is discussed in Section II, followed by the theoretical framework in Section III. Section IV provides a brief discussion on the dataset and methodology. Section V discusses the empirical results and finally, Section VI concludes the study with policy recommendations.

II. Literature Review

Robey, et al., (1993) observe that family planning is a powerful tool to influence the fertility rate and found that 90 per cent variation in the fertility rate is explained by differences in the prevalence of contraceptive usage. Therefore, the availability of contraceptives brings a substantial decrease in childbearing practices. Likewise, Jones and Leete (2002) study that a dramatic change has occurred in the demography of the Asian region with a fall in fertility rates during the period between 1970 to 1990s. These changes were found to be strongly linked with government population policies and population welfare programmes. However, Becker (1974) provides an alternative argument i.e., the use of birth control practices is an induced response to decrease in demand for children rather than a direct cause. Similarly, Pritchett (1994) finds that family planning policies influence the fertility rate, but it is not as much a dominant factor as the desire for children which is strongly influenced by social and economic conditions such as the female education, health status, economic position as well as social status of the women. Nevertheless, many studies have been conducted to explore the impact of population policies on fertility behaviours and the results found that there exists a built-in association between population control policies and the population dynamics [Mauldin (1963), Leeuw (1985), Jain (1985), Bongaarts (1994), Phan (2013)]. Ross and Hardee (2013) also suggest that the availability of contraceptives significantly reduces fertility response which can be a hindrance for demographic transition in poor and developing countries. The rapid transition in population dynamics of the developed world also provides a strong evidence to believe in the importance of population policies.

The past literature has established the fact that population policies are crucial in determining fertility rates, but the role of media cannot be ignored in this regard. For effective implementation of such policies, information diffusion is essential to influence society's preferences regarding the use of birth control methods. Barber and Axinn (2004) provide strong evidence from rural Nepal that there is a significant role of media in shaping social behaviour. This fact was established by examining the impact of mass media on childbearing practices. Media shapes behavioural preferences in favour of small family sizes and increases the tolerance toward the use of contraceptives.

There are numerous other studies like Lieberman (1972), Olaleye and Bankole (1994), Jato, et al., (1999), Kabir and Islam (2000), Gupta, et al., (2003), that have examined the role of mass media in bringing behavioural changes for effective implementation of a family planning policy. Olaleye and Bankole (1994) examine a similar relationship in the case of Ghana. The study finds that women who heard or saw the contraceptive advertisement used or intended to use such practices as opposed to those who were not aware of it. Similar results are also found by Gupta et al., (2003) who examine a significant association between mass media exposure and society's attitude towards family planning in the case of Uganda. Cheng (2011) studies the impact of family planning programmes in the case of Taiwan. The study indicates that social networking and

mass media have been effective tools in information diffusion of contraceptive usage and play a significant role in changing the fertility preferences in favour of lesser children. Williams and Singh (1976) also determine a similar relationship between mass media and fertility rates for a sample of 96 countries. In addition, it is found that newspapers had a stronger influence which served as a primary source of information sharing as compared to entertainment sources that include television, radio, and cinema.

Among different sources of media coverage, Kabir and Islam (2000) find that radio and television play an important role in disseminating information regarding family planning practices. Jato, et al., (1999) explored the impact of family planning communication regarding contraceptive usage through multiple media sources in the case of Tanzania. It is concluded that multimedia campaigns reinforce each other for effective dissemination of information which creates a feasible environment to perceive birth control methods as a socially acceptable norm. Similarly, Parr (2001) examines that there is a high rate of acceptance of birth control methods by women having access to mass media as compared to those who lacked information. The most challenging task in designing an effective family planning policy is to chalk out a communication strategy for the proper diffusion of information among the masses. Prata (2009) undertakes a case study of Ghana and explores some of the critical phases required in reducing the barriers to easy access to family planning. Among those, one of the most important factors is the increase in knowledge diffusion about safe birth control methods. For an effective reduction in fertility rates, the couples need to have correct information about contraceptives [Prata (2009)]. In the case of Bangladesh, Rabbi (2012) examines that mass media significantly reduced fertility rates by raising the conscience about family planning programmes. The study used the proportional hazard model to measure the policy impact.

Thummalachetty et al., (2017) undertake a qualitative study on Uganda and it is found that men do not have accurate knowledge about contraceptive use as they are ill-informed and the most common misconception is the perceived side effects of contraceptive usage. Thus, family planning can be strengthened through the provision of correct information. The national-level campaigns must be carried out to increase the demand for contraceptives. Asif and Pervaiz (2019) have also found similar results in the case of Pakistan that fear of side effects is the major obstacle in adopting family methods. The study used the data set of PDHS (2012-13) to examine the determinants of unmet needs of family planning.

Tsehay, et al., (2017) examine the impact of mass media on family planning decisions in Ethiopia. Exposure to television, radio and newspaper is found to be significantly and negatively associated with the demand for a higher number of children. However, the impact of television is larger as compared to print media. Similar results are also found by Das et al., (2021) in the case of Myanmar and the Philippines. The mass media proves to be an effective policy intervention. It contributes significantly towards improving reproductive health by increasing contraceptive usage even after controlling for socio-economic and demographic factors. Ahmad and Seid (2020) re-examine the association

between mass media campaigns and the use of modern contraceptives among young women belonging to urban and rural areas of Ethiopia. The Ethiopia Demographic and Health Survey (EDHS) dataset is used for analysis. The study finds insignificant results for rural women, but a significantly negative association is found among urban women. Therefore, socio-economic factors and cultural and geographical barriers must be addressed during mass media campaigns.

In the recent past, the rate of contraceptive prevalence in Pakistan has also shown a continuous increase and is thought to be the dominant source of fertility transition. Butt and Jamal (1993) analyse the determinants of fertility behaviours in Pakistan with special reference to the adoption of fertility control methods. The social, economic, and cultural factors are explored along with the role of information towards the voluntary adoption of family planning methods. The analysis is undertaken using Easterlin and Crimmins (1985) and Ahmed (1987) framework, based on Pakistan's data of the National Population Survey, Labour Force Survey and Migration Survey. Using the same data sources with the additional dataset of the Pakistan World Fertility Survey (WFS), Khan and Soomro (1993) examine the proximate determinants of birth intervals and explain some biases related to sample selection. Using the logistic model, Mahmood, et al., (1993) estimate the likelihood of contraceptive prevalence and find no association between a desire for an additional child and the actual use of contraceptives. It is found that contraceptive usage has increased but the desired number of children remained unaffected. Using the data from PDHS 1990-1991, Qureshi and Adamchak (1996) explores the impact of social, economic and demographic variables on fertility level among Pakistani women. The model is estimated for women between the age of 15 to 49 years of age.

Many studies have analysed the fertility transition in Pakistan Shah, Pullum and Irfan (1986), Sathar and Caterline (1998), Soomro (2000), Ali et al., (2001) and it has been concluded that the fertility rate has declined in the country. Sathar and Casterline, (1998) argue that this decline has occurred at a much slower pace, but the contributing factor has been the use of modern contraception to favour smaller family sizes. On the other hand, Soomro (2000) observes that the demand-side factors like delayed age of marriage, the decline in fertility age and non-marriage are also the reasons for declining fertility rates as opposed to the earlier conclusions provided by Sathar and Casterline (1998). Sathar and Zaidi (2009) also conclude that an increase in female education and employment opportunities, rapid urbanisation and improvement in communication channels have greatly influenced the underlying factors that determine the social norm about fertility behaviours in Pakistan. In addition, the study points out that there is still a high proportion of unmet needs for family planning due to the mismatch between its demand and supply. This analysis is similar to Hakim and Mahmood (1994) who conclude that education level, age of marriage, region, place of residence and female work status are key determinants of fertility differentials across various age groups. By applying the classical Bongaarts model, Nasir, et al., (2015) also conclude that similar determinants of fertility rates in Pakistan. It is observed that the urban areas of Baluchistan and Punjab

are ahead in terms of fertility transition that mainly resulted from demand-side factors. The primary factors in determining the fertility rates were contraceptive usage and age of marriage.

Among the many obstacles to family planning practices in Pakistan, Casterline, Sathar and Haque (2001) observe that knowledge and awareness about contraceptives, social and cultural tolerance towards its usage, fertility preference of the husband, the motivation to avoid pregnancy, perceptions about health and access to family planning services are the major determinants to family planning outcomes. Ali and Zahid (1998) present an overview of the achievements and failures of the population policies in Pakistan by discussing the policy performance during the various five-year plans. The study observes that the health outlet for the provision of family planning services remained unsuccessful till the 8th five-year plan due to the overlapping of the family planning programme with the health programme. The contraceptive prevalence has mainly resulted from the efforts of NGOs and social marketing. It is concluded that to obtain fruitful results from family planning policies, the social, cultural and traditional norms need to be changed. Similarly, Siddiqui et al., (2001) state that the population policy can be effective only when the prime focus is given to the knowledge factors that affect the demand-side for fewer children. The financial as well as real costs of fertility regulations, along with the motivation for reduced family size, play an important role in shaping fertility preferences.

III. Theoretical Framework

The theories of fertility can be broadly discussed under biological, behavioural, technological, and economic aspects [Trivers, and Willard (1973), Almond and Edlund (2007)]. The economic theory of fertility behaviour was first proposed by Becker (1960), who linked family size with consumer behaviour. According to Becker (1960), the decision about the number of children is perceived in the same way as the decision about consumer items. Parents invest in children because they perceive them as support in old age. Later, Becker (1974) came up with an explanation on household production function by examining how time and monetary costs influence a household's decision on family size. The most central theory on demand for children is based on the quantity-quality tradeoff which explains that parents limit childbearing to enhance the quality of their children by educating them. Given the limited resources, parents maximise their utility by investing more in fewer children [John (1982), Knodel and Wongsith (1987) and Gamst (1991)]. The theories on 'demand for children' give rise to other hypothetical linkages such as a negative relationship between the cost of children and the number of children. The nature of these 'demand for children' theories is somewhat narrow because fertility varies with parents' preferences and the costs they face [Easterlin and Crimmins (1985)]. Easterlin (1975) presented a framework in which the supply of children, demand for children and fertility regulation costs determine the level of fertility.

The rapid transition in population dynamics of the developed world is strong evidence to believe in the importance of population policies [Pritchett (1994)]. Some studies found strong evidence for the existence of a built-in association between population control policies and population growth rate [Mauldin (1963), Leeuw (1985), Jain (1985), Bongaarts (1994) and Phan (2013)]. The modern development in the knowledge of contraceptives has broadened the scope of decision-making about the family size [Becker (1960)]. The early phases of family planning programmes in most developing countries typically sought to provide a range of contraception methods and to favour small-family norms through active mass-media campaigns. Studies have also found that female education, knowledge about family planning and the use of contraceptives are the main determinants of fertility [Cleland and Sathar (1984), Aziz and Ali (1994) and Hermalin (1983)]. Bbaale and Mpuga (2011) find that access to information sources and services outlets tends to increase contraceptive usage, irrespective of the place of residence. According to Barber and Axinn (2004), the awareness in a society can be spread in two ways i.e. education and arranging awareness seminars for members of the society.

Coale's Transition Theory Model proposes three preconditions for fertility decline; first, the acceptance of calculated choice as a valid element in marital fertility; second, the existence and perception of advantages from reduced fertility; third, knowledge and mastery of effective techniques of fertility control [Coale (1984)]. These preconditions suggest that media campaigns act as an important moderator for the acceptance of family planning. Media affects fertility preference by providing information and bringing awareness to alternative choices available to consumers. The attitude development theory and balance theory help in explaining the impact of mass media on fertility preferences [Barber and Axinn (2004)]. The attitude development theory explains that mass media affects consumers' attitudes towards fertility preferences through correction of misinformation, provision of knowledge and self-identification of the consumer. It also brings positive stimulus from contacts and networking. The provision of knowledge corrects misinformation about its usage, methods, and effects of contraceptive usage. This correction in information alters consumer choices regarding contraceptive use that can affect fertility preferences positively in terms of desire for lesser children. The self-identification of consumers through mass media as affluent beings also motivates them to incentivise the use of contraceptives; because of this reason, rich people will be prone to contraceptive consumption to favour lesser children. Furthermore, people's contact with mass media programmes on the usage of contraceptives as well as awareness about the benefits of smaller nuclear families provides motivation for lesser children [Zajonc (1968)]. Faria and Potter (1999) and Hornik and McAnany (2001) have pointed out that commercial advertisement for contraceptives lowers the fertility preferences of the consumers. Thus, the balance theory predicts that if new information (which comes through media) is disseminated by the experts, famous, admired and respected then there are greater chances of influencing the people's attitudes [Heider (2013) and Perloff (1993)]. Consumers recalibrate their fertility preferences from higher to lower family sizes by ascribing the standard behaviour to the mentioned personalities.

IV. Data and Methodology

1. Data Source

The study is conducted by using the data from the Pakistan Demographic and Health Survey (PDHS) 2012-13 which is the third survey conducted in Pakistan with the support of the Ministry of National Health Services, Regulations and Coordination. The programme is implemented by the National Institute of Population Studies (NIPS) through technical and financial assistance from USAID. The earlier two surveys were conducted in 1990-91 and 2006-07, respectively. The survey includes both men and women who are in their reproductive age i.e., 15–49 years. The data is collected from 13558 women and 50238 men. The survey contains detailed information on the reproductive histories of the individuals along with data on knowledge, awareness and practice of family planning, fertility levels and fertility preferences. The analysis is based on a sample of those married women who were born in 1980. The main focus of the current study was to study the birth histories of those married women who started facing the parity risks of first or second childbirth when the policy was implemented. The study has taken the birth histories, from PDHS survey 2012-13, of individuals from 1995 to 2012 as a woman is fertile between the age of 15 and 49 years [Adjei and Billingsley (2017)].

2. Econometric Model

The survival model (also known as the hazard model) is a widely used methodology to examine the association of various factors with the occurrence and timing of an event. There are many specifications of hazard models. The present study has employed Cox proportional hazard model (Cox, 1972) which specifies a continuous-time hazard model. The dependent variable consists of two parts. The first part is the event indicator i.e., whether the birth has occurred or not and the second part consists of the measurement of time from baseline to the occurrence of the event or censoring. The objective of this study is to examine whether there is an increase in birth gaps, therefore the occurrence of birth is considered a "hazard". On the other hand, women who did not bear a child during the prescribed time period are treated as "censored". The general representation of the model is given in Equation (1):

$$\lambda_{i(t)} = \lambda_{0(t)}\, e^{xi(t)\beta} \tag{1}$$

where $\lambda_{i(t)}$ is the corresponding hazard to the individual i for the time interval t, $\lambda_{0(t)}$ is the baseline hazard for the time interval t and $e^{xi(t)\beta}$ is the relative risk for an individual with covariate x_i, for a given time period t, compared to the baseline hazard. The outcome variable in the study is the parity risk, also called the hazard ratio, of bearing another child (up to the fifth child). Parity risk can be defined as the risk of having an

additional child. It is calculated by dividing the regression coefficient of any category by the coefficient of the reference category. The representation of the hazard ratio is given in Equation (2):

$$\frac{\lambda_{i(t)}}{\lambda_{j(t)}} = \frac{\lambda_{0(t)}\, e^{xi(t)\beta}}{\lambda_{0(t)}\, e^{xj(t)\beta}} = \frac{e^{xi(t)\beta}}{e^{xj(t)\beta}} \tag{2}$$

The analysis is based on a sample of those married women who were born in 1980. A woman is fertile between the age of 15 and 49 years [Adjei and Billingsley (2017)]. The focus of the current study is to examine the birth histories of those married women who already started facing the parity risks of childbearing for the first and second birth even before the policy was implemented in 2002. By taking the sample of these women, the comparison of hazard ratios is made to show the differences in birth gaps, before and after the policy implementation. The study has not included those women who faced higher birth orders prior to policy 2002. This is because, after the policy implementation, these women would inevitably face low parity risk based on biological factors of old age. After 2002 when the policy was implemented, such a sample of women would be in that age bracket when biologically their chances of conceiving a child would be less. Therefore, the sample of women included during the study period is between the age 15 to 32 years. The study has taken the birth histories of individuals from 1995 to 2012. These eighteen years were then divided into six calendar periods (1995-97, 1998-00, 2001-03, 2004-06, 2007-09, and 2010-12); each period consisted of three years. The calendar period is the key indicator in this study to observe whether there is any change in parity risks or hazard ratios before and after the implementation of the Population Policy of Pakistan 2002. The impact of policy comes with a delay; the study has used different calendar periods in the analysis to capture the extent to which the parity risks change from the first child to the fifth child, over the course of time. The calendar period 2001-03 is taken as the reference category because the aforesaid policy was implemented in 2002, after which the hazard ratio is expected to decline i.e., an increase in the birth gap is expected. The parity risk or hazard ratio of each calendar period is compared with the reference category.

There are also some socio-economic indicators which contribute to the decisions regarding family size. The existing literature also suggests that education, place of residence and income are the strong determinants of fertility preferences [Becker (1960), O'Dowd and Philipp (2000), Barber and Axinn (2004)]. These variables are used as covariates in the estimation of the Cox proportional hazard model. It has been observed that these covariates are also relevant in determining fertility preferences in Pakistan.

The model is estimated in Equation (3):

$$\lambda_{(Yit)} = \lambda_{0(Yit)} * \exp\left[\beta_1 CP_{1i} + \beta_2 CP_{2i} + \beta_3 CP_{3i} + \beta_4 CP_{4i} + \beta_5 CP_{5i} + \beta_6 CP_{6i}\right] \tag{3}$$

where λ is the hazard function which depends upon the six calendar periods whose impact is measured by β_1, β_2 …β_6. The hazard ratio may vary over time i.e., Y_{it} is the time interval before a birth happens (in months). λ_0 is the baseline hazard and the subscript "*i*" indicates the i^{th} child for which the hazard ratio is calculated i.e., the birth order from the first child to fifth child. CP refers to the calendar period i.e., CP_1 = 1995-97, CP_2 = 1998-00, CP_3 = 2001-03, CP_4 = 2004-06, CP_5 = 2007-09 and CP_6 = 2010-12. The hazard ratio estimated for each calendar period is compared with the value of the reference category which takes the value of 1. A value of exp (β_i) < 1 indicates a decreased propensity for a woman of bearing another child i.e., an increase in birth spacing between successive children will occur. On the other hand, if exp (β_i) > 1 then there is relatively an increased chance of bearing another child i.e., a woman is prone to face a reduced birth gap between two successful children. The model is re-estimated by controlling for socio-economic factors like education, area of residence and wealth. The dummy for each covariate is incorporated i.e., education (illiterate = 0, educated = 1) and area of residence (urban = 0, rural = 1). Furthermore, a categorical variable is added i.e., wealth quintiles index (1 = poorest, 2 = poorer, 3 = middle, 4 = richer, 5 = richest) to determine their impact on hazard ratios.

Under the Population Policy of Pakistan 2002, the Government of Pakistan incentivised the use of modern contraceptives with the help of its free distribution and information diffusion through media coverage. These two policy inputs were the major tools employed by the policy to target reduced fertility rates. The main focus of the present study is to analyse the role of media coverage in policy effectiveness. Table 3 indicates that television is the main source of information diffusion in Pakistan. Therefore, to capture the variable on media coverage, the study estimated Equation (3) by taking the following dummy:

Heard about family planning on TV (yes =1, no = 0)

V. Results

Table 2 shows the descriptive statistics of some covariates that have been used in estimations of hazard ratios. The sample of individuals taken for analysis was from urban as well as rural areas comprising 52.3 per cent and 47.7 per cent, respectively. In terms of education level, the individuals were almost equally divided between illiterate and educated. The information on the wealth quintile index has revealed that the highest percentage of individuals belonged to the richest, followed by the poorest and the lowest percentage was observed for middle income.

Mass media has been used as a policy instrument, under the Population Policy of Pakistan 2002, for disseminating information about family planning and encouraging the use of modern contraceptives. Radio, television, and newspaper/magazine are the channels that have been used for the dissemination of information. PDHS (2012-13)

TABLE 2

The Socioeconomic Status of the Individuals

Area of Residence		Urban		Rural		Total
		413		452		865
		(47.7%)		(52.3%)		(100%)
Education Level		Illiterate		Educated		Total
		437		428		865
		(50.5%)		(49.5%)		(100%)
Wealth Quintile Index	Poorest	Poorer	Middle	Richer	Richest	Total
	175	172	153	171	194	865
	(20.2%)	(19.9%)	(17.7%)	(19.8%)	(22.4%)	(100%)

Source: Pakistan Demographic and Health Survey, 2012-13.

has revealed that around 74.6 per cent of the individuals were not listening to the radio whereas around 63.7 per cent were reading newspapers/magazines and the majority of the individuals (94.9 per cent) were watching television (Table 3). The study also observed during estimations that television is the main source of information dissemination.

Table 4 reveals summary statistics for the spread of family planning messages through various sources of mass media. The proportion of women who got aware about family planning through radio is relatively small, followed by those who were exposed to print media (newspaper and magazines) consisting of 25.5 per cent. It shows that radio and print media were not the major source of communication channels in the spread of family planning messages. On the contrary, television was the leading source of information diffusion about family planning as 78.5 per cent of the individuals became aware about family planning through television. It was also asked to the respondents of PDHS

TABLE 3

Access to Mass Media

Listening Radio	No	Yes	Total
	645	220	865
	(74.6%)	(25.4%)	(100%)
Watching Television	No	Yes	Total
	44	821	865
	(5.1%)	(94.9%)	(100%)
Reading Newspaper or Magazine	No	Yes	Total
	314	551	865
	(36.3%)	(63.7%)	(100%)

Source: Pakistan Demographic and Health Survey, 2012-13.

(2012-13) whether the family planning message was effective or not and 71.3 per cent of individuals responded in its favour i.e., the family planning message was effective.

The analysis is undertaken for six calendar periods. The reference category used in this study is the calendar period 2001-2003 as the policy was introduced in 2002. The parity risk or hazard ratio of each calendar period is compared with that of the reference category which is assigned a value of 1. Table 5 shows the estimated results of the Cox proportional hazard model for each calendar period up to the birth of the fifth child. It is observed that the hazard ratios have a declining trend for each successive child even before the implementation of the population policy. However, the hazard ratios were higher and greater than 1 before the implementation of the policy which ultimately decreased to smaller values of less than 1 after the policy implementation. Hence, the results show that the Population Policy of Pakistan (2002) has been relevant in decreasing the fertility rates and changing the fertility preferences in favour of smaller family sizes.

The hazard ratio for the first child in the first calendar period (1995-1997) is 1.929 and significant. It shows that a woman was almost two times more prone to having a first child during 1995-1997 than in the reference period (2001-2003). This indicates there was a 92 per cent greater probability of bearing the first child. Similarly, in the second calendar period (1998-2000), there was a 44 per cent higher chance for a woman to bear a first child. This parity risk is less than the previous calendar period but still greater than the reference category. The hazard ratios calculated after the policy implementation have lower values indicating that there is a decline in parity risks, but the results are statistically insignificant for the first child. The results can be seen for the second child, but

TABLE 4

The Spread of Family Planning Message Through Mass Media and Perception About Its Effectiveness

Heard on Radio	No	Yes		Total
	759	106		865
	(87.7%)	(12.3%)		(100%)
Watched on Television	No	Yes		Total
	186	679		865
	(21.5%)	(78.5%)		(100%)
Read in Newspaper or Magazine	No	Yes		Total
	644	221		865
	(74.5%)	(25.5%)		(100%)
Perception about the effectiveness of family planning message	Effective	Ineffective	Don't Know	Total
	617	216	32	865
	(71.3%)	(25.0%)	(3.7%)	(100%)

Source: Pakistan Demographic and Health Survey, 2012-13.

the parity risk is significant only for the fifth calendar period. This can be attributed to the social norms prevalent in the Pakistani culture where families do not often use family planning methods to delay births at least for the first and second child. On the other hand, for a higher order of childbirth i.e., third, fourth and fifth, the hazard ratios are found to be declining and statically significant in all cases except for the fifth child during the fourth calendar period (2004-2006).

Table 5 shows that during the first calendar period (1995-1997) women were facing a relative risk of 4.1, indicating four times higher chances of reduced birth gaps for the third and fourth child as compared to the reference category. In the case of second calendar period (1998-2000), there was 39 per cent and 170 per cent more risk of having a third and fourth child, respectively, as compared to the reference period. On the other hand, after the implementation of the population policy, the hazard ratios have shown a declining trend along with the decreased values. The parity risk for a third child is 24 per cent, 43 per cent, and 51 per cent lesser for each successive calendar period i.e., fourth, fifth and sixth. In the case of the fourth child, women had a 32 per cent lesser risk of experiencing childbirth during 2004-2006. For each successive calendar period, after 2004-2006, the hazard ratios have declined further and the risk of having a fourth child has declined to 49 per cent and 69 per cent. Similar results are also observed for the fifth child in the case of the fifth and sixth calendar periods. During the first calendar period (1995-1997) no value is assigned to the hazard ratio in the case of the fifth child. This is

TABLE 5

Hazard Ratios (Parity Risks) of Child Birth Among Women Aged 15-49 Years

Calendar Period	1st Child	2nd Child	3rd Child	4th Child	5th Child
	Hazard ratio/ Parity risks	Hazard ratio/ Parity risks	Hazard ratio/ Parity risks	Hazard ratio/ Parity risks	Hazard ratio/ Parity risks
1995-1997	1.9294***	2.306***	4.1190**	4.1857	-
	[0.2587]	[0.5020]	[2.4204]	[4.243]	
1998-2000	1.4400***	1.4602***	1.39481**	2.7095***	5.5931***
	[0.1423]	[0.1686]	[0.2355]	[0.9292]	[3.599]
2001-2003 (Reference)	1	1	1	1	1
2004-2006	0.9726	0.9152	0.7618**	0.6885**	0.7085
	[0.1039]	[0.0935]	[0.0864]	[0.6885]	[0.1850]
2007-2009	0.9699	0.7789**	0.5794***	0.5147***	0.4730***
	[0.1179]	[0.0904]	[0.0709]	[0.785]	[0.1211]
2010-2012	0.8568	0.8441	0.4915***	0.3185***	0.3223***
	[0.1311]	[0.1110]	[0.0686]	[0.0541]	[0.0828]

Source: Authors' estimation. *** p<0.01, ** p<0.05,* p<0.1. The standard errors are given in [ ].

because women included during this calendar period were within the age bracket of 15-18 years and naturally could not face the parity risk of a fifth child. Hence, the results provided in Table 5 show that the impact of population policy remained successful in increasing the birth gaps, especially for higher birth orders.

The Cox proportional hazard model is re-estimated after controlling for the covariates which reflect the demand-side determinants of fertility behaviour [Becker (1960), O'-Dowd and Philipp (2000), Barber and Axinn (2004)]. The variables included as covariates are education, wealth index and place of residence. The results are provided in Table 6.

Table 6 shows that the hazard ratios/parity risks for first and second childbirth are statistically significant, and the values assigned are almost the same compared to the estimates without covariates (Table 5). However, the hazard ratios for a third, fourth and fifth child show a slightly declining trend with the inclusion of covariates in each successive calendar period. This indicates that women face statistically significant and relatively less parity risk for higher birth order after controlling for education, area of residence and wealth. These results imply that socio-economic indicators contribute significantly toward decisions making regarding delays in childbirth in the case of higher birth order.

It is well documented under the Population Policy of Pakistan 2002 that the Government of Pakistan will make use of mass media to spread family planning information.

TABLE 6

Hazard Ratios (Parity Risks) of Childbirth Among Women Aged 15-32 Years After Controlling for the Covariates (Education, Wealth Quintiles Index and Place of Residence)

Calendar Period	1st Child	2nd Child	3rd Child	4th Child	5th Child
	Hazard ratio/ Parity risks	Hazard ratio/ Parity risks	Hazard ratio/ Parity risks	Hazard ratio/ Parity risks	Hazard ratio/ Parity risks
1995-1997	1.809***	2.3335***	5.2514***	4.3675	-
	[0.2483]	[0.5126]	[3.0981]	[4.4361]	
1998-2000	1.3750***	1.4596***	1.320*	0.9492***	6.042***
	[0.1375]	[0.1703]	[0.2244]	[0.9492]	[3.9257]
2001-2003 (Reference)	1	1	1	1	1
2004-2006	0.9919	0.9158	0.7141***	0.6879**	0.7138
	[0.1070]	[0.0943]	[0.0819]	[0.1054]	[0.1889]
2007-2009	1.0243	0.7757	0.5270***	0.5163***	0.4482***
	[0.1275]	[0.0931]	[0.0655]	[0.0799]	[0.1181]
2010-2012	0.874	0.8403	0.3908***	0.3186***	0.3043***
	[0.1342]	[0.1137]	[0.0568]	[0.0546]	[0.0812]

Source: Authors' estimation. *** p<0.01, ** p<0.05,* p<0.1. The standard errors are given in [ ].

To examine the impact of media campaigns as a policy instrument, the Cox proportional hazard model is re-estimated for two separate categories of individuals i.e., who were exposed and not exposed to family planning media campaigns. The objective is to explore whether the parity risks/hazard ratios differ for individuals who were exposed to this policy instrument compared to those who were not. It is expected that the value of hazard ratios should be smaller for those individuals who were exposed to policy instruments i.e., the birth gaps must increase with greater access to family planning knowledge through mass media. Since, the information about family planning methods and the availability of outlets is strongly related to contraceptive prevalence [Koenig, et al., (1997)]. The results, after re-estimation, are provided in Table 7.

As discussed earlier, television remained the main source of information diffusion in Pakistan (Table 3). To capture media coverage, Equation (3) is estimated by taking the media dummy as 1 if heard about family planning on television and zero otherwise. The results in Table 6 show that media has played a significant role as a policy instrument to increase the birth gaps in Pakistan. The hazard ratios for individuals who have heard about family planning through television are less as compared to those who were not exposed to media campaigns. In addition, it is also observed that the hazard ratios during a given calendar period have also declined across the different childbirth numbers and this decline is relatively more for higher birth orders. However, the hazard ratios are significant for a third, fourth and fifth child. So, it can be inferred from these results that the population policy of 2002 was successful in increasing birth gaps with the use of mass media as a policy instrument. So increased birth gaps can induce low fertility rates in Pakistan.

VI. Conclusion and Policy Recommendations

The present study explores the impact of a media campaign on fertility preference in Pakistan. The population policy of 2002 is taken as a reference which has used mass media campaigns as one of the important policy tools to influence fertility behaviour. For this purpose, the Cox proportional hazard model is applied to determine the hazard ratios. Numerous studies have observed fertility transition in Pakistan in favour of smaller family sizes by taking into consideration the demand-side factors [Shah, et al., (1986), Sathar and Casterline (1998), Soomro (2000), Ali, et al., (2001), Sathar and Zaidi (2009), Nasir, et al., (2015)]. However, the demand for family planning can be greatly influenced by its information diffusion. The estimates of hazard ratios have shown a declining trend even prior to the implementation of the population policy of 2002 i.e., the birth spacing has increased, but the values of hazard ratios are still greater than the reference calendar period. On the other hand, there has been a greater decline in parity risks after the policy implementation and showed even smaller/values of hazard ratios with the intervention of mass media. Thus, the policy of 2002 has been effective in increasing the gap for the higher order of childbirth and it can be concluded

TABLE 7

Hazard Ratios (Parity Risks) of Child Birth Among Women Aged 15-32 Years
In the Presence/Absence of Mass Media Campaign

Calendar Period	1st Child		2nd Child		3rd Child		4th Child		5th Child	
	Hazard ratio/ Parity risks		Hazard ratio/ Parity risks		Hazard ratio/ Parity risks		Hazard ratio/ Parity risks		Hazard ratio/ Parity risks	
	Policy intervention = Information diffusion through media coverage									
	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
1995-1997	-	1.9290***	-	2.2989***	-	4.4251**	-	4.1007	-	-
		[0.2679]		[0.5.28]		[2.6039]		[4.1586]		
1998-2000	1.2542	1.4703***	4.1422**	1.4087***	-	1.3766*	-	2.6913***	-	4.968**
	[0.3955]	[0.1558]	[2.5789]	[0.1671]		[0.237]		[0.9255]		[5.4391]
2001-2003 (Reference)	1	1	1	1	1	1	-	1	-	1
2004-2006	1.000	0.9522	1.007	0.9114	1.0933	0.7407**	-	0.7217**	-	0.3672**
	[0.2257]	[0.1284]	[0.400]	[0.0994]	[0.6070]	[0.0866]		[0.1104]		[0.1517]
2007-2009	0.9683	1.0337	0.7872	0.7287	1.3299	0.5327***	-	0.4729***	-	0.2335***
	[0.2257]	[0.1987]	[0.2966]	[0.1126]	[0.6781]	[0.0686]		[0.0742]		[0.0901]
2010-2012	0.7564*	0.8255	0.6878	1.2214	1.141	0.4031***	-	0.2985***	-	0.2305***
	[1.1294]	[0.1337]	[0.2599]	[0.2663]	[0.5628]	[0.0638]		[0.0520]		[0.0886]

Source: Authors' estimation. *** p<0.01, ** p<0.05,* p<0.1. The standard errors are given in [ ].

that media coverage has increased social tolerance towards the use of family planning methods.

The policy did not have a significant impact on the birth of the first and the second child. This is due to the social norms prevalent in Pakistan that usually people do not use family planning methods for bearing the first and second child. Mahmood and Zahid (1993) have also observed in the case of Pakistan that there is a considerable difference between the actual fertility rates of women compared to their desired preferences. If women can follow their stated desire, then they might restrict themselves to warranted births and fertility rates would decline substantially [Lightbourne (1985)]. Furthermore, the demand for children is also affected by socio-economic and demographic factors [Lee (1983), Easterlin (1975), Easterlin and Crimmins (1985)].

Hence, media helps in changing the social norms in favour of adopting family planning methods and television has been an important source of information diffusion in Pakistan. Media helps to overcome the obstacles of limited awareness about contraceptive use, the sources of its supply as well as its perceived side effects. This is very well supported by the attitude development theory according to which media provides a positive stimulus to change fertility preferences. The family planning awareness, channelized through mass media, increases the contraceptive usage that results in increasing the birth space. Thus, the study recommends that the family planning programs can be effective only if proper measures are taken for the dissemination of information and knowledge about the use of contraceptives and television plays a vital role in this regard.

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