Graduate Institute of Development Studies
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The Case of Fertility Transition: Will it ever reach the desired levels in Pakistan?

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Preface

The Graduate Institute of Development Studies (GIDS) was established in 2012 by the Lahore School of Economics. Its overarching aim is to stimulate an interdisciplinary approach to development policy and practice that will help promote equitable and sustainable development in a period of rapid globalization and technological change.

An important goal of GIDS is to promote public debate on policy issues through conferences, seminars and publications. In this connection GIDS Working Paper series was initiated to encourage research and discussion on the policy challenges facing the developing world-and Pakistan in particular. The GIDS Working Paper series aims to bring to a wider audience the research carried out at the institute. It is hoped that these papers will contribute to a better understanding of the challenges and development issues that Pakistan faces and will help in policy reforms.

The problem of an ever-increasing population in developing countries is central to the discourse on development. In particular, researchers have often debated the role played by fertility as a policy tool for reducing the high growth rate of population. This working paper discusses recent fertility trends in Pakistan and their determinants and highlights some important factors that can help in bringing it to more desired levels. Comments and feedback on this paper are welcome.

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Abstract

The study aims to explore the link between Human Development Index (HDI), Immunization Rate (IR) and the Total Fertility Rate. It argues that although female education plays a vital role in influencing fertility behavior and has a strong negative association, there are complex set of factors, individuals, economic and socio-cultural issues that also contribute towards the fertility transition. Focusing on female education or family planning services alone has not produced the desired result. Rather, a more focused and consolidated policy approach that effectively incorporates the components of HDI and IR is needed to address the issue of ever increasing population. Indeed, any major policy response to the issue should consider the entire gamut of socio-economic, cultural, societal, individual and related factors to lead to positive outcomes.

The Case of Fertility Transition: Will it ever reach the desired levels in Pakistan?

1. Introduction

Total Fertility Rate (TFR) is the average number of children that can be born to a woman over her reproductive lifespan or childbearing age of 15-49 years (World Bank, 2014). According to Pakistan Demographic and Health Survey, the TFR in 2006 was 4.1 and by 2013 it decreased to 3.8 births per woman while the TFR is expected to be 2.75 births in 2015 (World Fact Book, 2015).The 1998 Population Census revealed that Pakistan has a population of about 130.5 million, making it the sixth most populous country in the world and second among the Muslim countries. Pakistan's population in 2014 was estimated at 188.2 million (Pakistan Economic Survey 2013-2014) and has been estimated to be growing recent years at a rate of around 2.0 per cent. According to UN projections, Pakistan will become the world's sixth most populous country by 2050 with a population of 310 million people. The Government of Pakistan had aimed in its 2002 Population policy that by 2020, the TFR will decrease and there will be two births per woman and all provinces will reach replacement levels in order to reduce the current high growth rate of population. However, this target is now expected to be missed.

Fertility rate has changed in Punjab, Pakistan's largest province accounting for almost sixty per cent of the total population, between 1985 and 2012. In 1990-1991, the fertility rate was 5.4 children per woman and it decreased to 3.9 in 2006-2007 and it further decreased to 3.8 births per woman in 2012-2013. The fertility rate of Punjab is the lowest among other three provinces at 3.8 births per woman while for Sindh and Khyber Pakhtunkhwa it is 3.9 and for Baluchistan it was 4.2 births per woman in 2012-2013. This indicates that on average in Punjab, a woman conceives or gives birth to 3.8 children till the end of her reproductive period. Thus, Punjab with a population over 90 million people that is about 56 per cent (Khan, 2011) of the country's total population must have taken some effective measures that have helped it to reduce its fertility rate and in coming years it is predicted that its population will also decrease if the government takes appropriate measures and ensures proper focused policy formulation and implementation.

Several empirical studies over the years have revealed that reducing gender disparities in education i.e. increasing female education helps in reducing the fertility rate (Basu, 2010). This proved true as Punjab has focused on female education and has been able to reduce the provincial TFR both in rural and urban settings. Punjab has the lowest TFR among other three provinces but it is still higher than the desired level of two births per woman. This shows that there are serious gaps either at the policy formulation or implementation stages that need to be identified and urgently addressed to ensure fertility transition. The aim should be to identify factors that can lead to a rapid shift in the fertility rate as a decrease in TFR can solve many other issues tied to it such as poverty, gender inequalities, child labor and many more.

While Pakistan remains at the centre of debate regarding population issues much more attention comes from international agencies such as the Population Action International, World Bank, United Nations Population Division and even the White House calling for greater attention to be paid to population policy (Lodhi, 2010; Sathar & Miller, 2013). At the same time it is unfortunate that till 2015, the efforts of the Government of Pakistan have been largely half hearted and not proved to be very effective and the fertility transition has remained elusive and not connected with the development framework.

The Pakistan Government and international community has stressed the importance of education is as it improves women's earning ability and contributes towards economic development of the country (Boserup, 1970). It also lowers their dependence on male members, delays marriage, increases awareness regarding family size and birth control techniques and increases their social status and self-esteem as well as empowers them to take decisions regarding their own self, family size and other household and family related decisions (Acharya, 2008). Overall, female education improves the bargaining power of women within the family and in outside matters.

However, there is a complex set of factors, individuals, economic and socio-cultural matters that contribute towards the fertility transition. Any effective policy response to the issue should consider the entire gamut of socio-economic, cultural, societal, individual factors to achieve the desired outcomes.

2. Background

The 1997-98 Pakistan Fertility and Family Planning Survey showed that contraceptive prevalence doubled both in rural and urban areas to 19 percent and 36.5 percent respectively. Therefore, the decline on fertility rate was termed to be on a fast track with TFR moving from 6.1 births per woman in 1991 to 4.8 in 1998 in just seven years. It was the fastest decline in Asia (Sathar & Miller, 2013). The reasons for this rapid fertility transition were fair commitment of the Government and all other political parties, provision of services and institutional responsiveness to family planning needs. However, in later years the TFR transition was not like this as initially they were able to create the need for family planning and use of contraceptives but were not able to sustain that for long as little changes were made to female literacy and morality.

Women in Pakistan are not provided equal opportunities of education and have a weaker and subordinate status; this has served as an important reason for the delay in fertility transition. Gender bias is not only a primary cause for poverty but according to many researchers, the single most important cause of rapid population growth as it keeps the TFR high (Abadian, 1996). Furthermore, Vavrus and Larsen (2003) and Singh (1994) highlighted that the longer a woman stays in school, the lower are her chances of giving birth to too many children as she is likely to get married at a later age. Marrying at a later age means that the reproductive span of a woman will be shorter (Maitra, 2004). With education comes exposure, women gain information about their body and health and are more likely to process that information to their advantage. Mason (1986) & Boonto (2008) highlighted the positive impact of women's education on their autonomy leading to later marriages, increased use of contraceptives and lower fertility (Ullah et al., 2011; Ullah, 2011).

More importantly, higher levels of woman's education are associated with lower child mortality rates (Schultz, 1993; Cochrane, 1979). This is because higher levels of a woman's education lead to improved child care, nutrition, basic health and child immunization. In broad terms, education affects women's fertility, maternal health and child health by either improving her knowledge base or income (Sinha, 2005; Saleem & Bobak, 2005; Magnuson & Shager 2008). Women's autonomy in decisions related to her health and family are positively related to her education, employment, her age at marriage and number of living children (Siddique, 1998; Gabrielson 2010).

Furthermore, empirical evidence from both developed and developing countries explicitly reveals that female education and participation in labor market are linked with decrease in fertility rate (Sackey, 2005; Lam and Duryea, 1999; Vavrus and Larsen, 2003; Singh, 1994; Ben-Porath, 1973; Gardner, 1973; Schultz, 1973). The reasons identified both by economists and sociologists for this change in household behavior are that with the increase in women's access to education, they are more likely to participate in labor market and this increases the economic value of their time, which in turn increases the opportunity cost of raising children (Guilkey, 1998; Singh, 1994; Ben-Porath, 1973; Gardner, 1973; Schultz, 1973; Chanda et al., 2012).

Without disputing the general statistical association that exists between female education and fertility rate, a lot of literature asserts that this association is neither universal nor well established. The process through which education influences fertility and how other factors also play a role in determining this fertility transition remains complex and far from clear. Female education without doubt is important as it helps in fertility transition but there are other factors too that, together with education are important and impact fertility transition. Bbaale and Mpuga (2011) in their research in Uganda highlighted that wealth is an important factor in the fertility transition process. As they showed through empirical evidence that as the wealth of the household increases, people start thinking and become conscious about maintaining a healthy lifestyle and a certain standard of living and that impacts the decision of how many children to have and this is irrespective of female education. Moreover, they also proved that as wealth of a household increases, the use of contraceptives increases and thus, that decreases fertility rate as unwanted pregnancies are reduced. According to Bbaale and Mpuga, in Uganda 34per cent women in the richest quintile used contraceptives and decided to have fewer children as compared to 8per cent women in the poorest quintile.

Furthermore, husband's education irrespective of the education status of the women is also an important factor in patriarchal societies where husbands are the ultimate decision makers. In case of Uganda, evidence revealed that husband's education played a pivotal role as they decided on the family size and use of contraceptives. Statistics show that use of contraceptives (any method) increased from 11per cent to 42per cent if husbands had some basic primary level education and this helped in reducing the unwanted pregnancies. Therefore, husband's education is equally important as that of wives when aiming for reduction in the TFR (Dev et al.2002).

Moreover, research highlights that a link exists between maternal and infant health and TFR, but so far none of the studies have highlighted the exact nature of the link. In the case of Pakistan, the issue of maternal health care arises due to the inadequacy of primary health care services, antenatal care and post-partum care which leads to high maternal and infant mortality rate in the country (Bhutta, Ali, Hyder & Wajid, 2004). Study conducted by Sathar and Kazi (2000) attests that in Pakistani domain, there exists a vital relationship of women's autonomy and maternal health care issues. Another study highlights that women's autonomy with its sub-indicators impacts the prenatal and postnatal care of women in Pakistan (Khan et al.2013). However, women in many instances do not have the power to take decisions regarding their own health or that of their children or family. One of the principal reasons is that many developing societies are dominated by the traditional culture and mindset and orthodox societal setup prevailing since centuries. Adoption of up-to-date modern facilities and technologies are sometimes not preferred in the rural setup. In many cases, sending women to hospitals for treatment is not preferred.

Dreze and Murthi (1999) in their empirical study highlighted that access to public services by both mother and child can play an integral role in reducing the fertility rate. This is based on the assumption that access to and availability of better health services will lead people to use them to their advantage. They will get their children vaccinated and treated if they fall sick. It also ensures that during and after pregnancy, women can seek medical health and maintain a healthy lifestyle. Access to public health services and health workers is likely to spread awareness regarding birth control, female and child health, family planning and it will also improve supply, knowledge and use of contraceptives. It reduces fertility rate by improving child survival by reducing infant and child mortality. If couples especially women have access to hospitals and lady health workers, they can frequently visit the hospital and be in a better position to understand the advantages of having smaller families, birth control techniques and use of contraception. However, availability of public health services alone cannot guarantee a transition in TFR as there is a strong son preference in many developing countries.

Mutharayappa et al (1997) in their research highlighted three factors that depict parents' choice for a son in countries such as in India and Pakistan. Firstly, sons provide economic benefits as they can work on the farm or

in the family business they earn and provide support to the parents in the old age. Secondly, when the son gets married, he brings the daughter in law which provides additional help in the household chores and brings economic reward in terms of dowry. Thirdly, sons have a socio-cultural utility as well. In patriarchal societies, having a son guarantees continuation of the father's name or family line and they provide additional status and pride to the family. When societies value sons so much and consider daughters as nothing more than an economic liability who has to leave her father's house, get married and take dowry for which the father saves money, there is lot of stress on women to produce male children. In Indian societies, it is observed that husbands get influenced by their mothers when taking the decision of having children and deciding the family size. Here, the decision is taken by husband and mother in law, not by the wife irrespective of her education status.

However, in many developing countries, women's education and autonomy helps reduce their dependence on sons for social recognition and support in old age and this might reduce the desired family size. Large families are generally a consequence of a desire to have more sons or an adequate number of surviving sons that provide old age security and take part in the productive work and add to the household income. Numerous studies have highlighted that a number of cultural, social, economic and political factors influence the benefits and costs of having sons and daughters and this ultimately depicts parents' preference of a son and the size of the family (Atif et al, 2012).

Dreze and Murthi (1999) pointed that generally, couples in countries where high infant and child mortality rates are high tend to have more kids than they desire in anticipation of losing some. If the probability is 0.75 that a new born child will reach adulthood, a mother who wants to reduce the risk of not having an adult son and wants to reduce it to 0.05, will have to give birth to three sons on average and this will require six births per woman. By contrast if sons and daughters are considered equal and the probability of survival increases from 0.75 to 0.80 with access to public health services, then two births per woman will be enough. Thus, by reducing infant and child mortality rate through provision of better public health services to both mother and child and by improving the immunization rate and ensuring child survival can all lead to the fertility transition that many developing countries are aiming for.

A lot of research studies validate that there exists a relationship between mother and child health, infant mortality rate and TFR (McCrary & Royer, 2011). But still, empirical research is needed to find out how much it impacts TFR. Health alone cannot explain this relationship and the fertility transition. There is a mix of factors that are needed to reduce the TFR of a country. To add to factors like family background, mother's awareness regarding child health and nutrition, standard of living and individual preferences also impact health and fertility behavior (Cutler and Lleras-Muney, 2006).

Rahman et al. (2011) highlighted from his empirical research that Bangladesh has witnessed a rapid decline in fertility rate and that sets an example for all developing countries to follow. It was further highlighted by Portner et al (2011) that decline in fertility rate in Bangladesh was more successful in areas where governments extensively focused on family planning programs and women were informed about use and advantages of contraception and having smaller families (Pitt et al.1993). Thus, pointing out that education does play an important role in order to interpret these messages but at the same time, availability and access to these services is also important. People might have knowledge of contraceptives but if supply and use are unknown, they might not be able to take advantage of it. In that case, unwanted pregnancies can be high leading to a higher fertility rate.

Furthermore, Rahman et al. (2011) highlighted that inter spousal communication is also an important factor in determining the fertility behavior. If the couple communicates with each other, it is more likely that they will talk about family size and use of contraceptives and will take the decisions mutually. A positive relationship exists between spouse communication and use of contraception. In family settings where the partners do not communicate, there is a danger that partners might overestimate each other's demand for children or use of contraceptives (Zafar, 1996).

Hence, a holistic view is required for fertility transition to take place and should be considered simultaneously so as to solve the problem of over-population in some South Asian countries.

3. Methodology

A review of the existing literature shows that there is a commonality in one aspect i.e. most work on the determinants of fertility has been done using micro level data. That is to say that the source of information in most research studies is household level data or in several cases, the women. The explanation for this is quite straightforward since economic theories of fertility assume that parents decide on the number of children so they use data on household to estimate fertility determinants.

In this paper, I will highlight the relationship of Total Fertility Rate with HDI and immunization rate. Although many researchers have highlighted the importance of health, education (especially female education) and standard of living in reducing TFR, my research reinforces the importance of these factors and stresses that all policies to deal with TFR should focus on an integrated approach rather than dealing with the above mentioned factors in complete isolation. It is important to understand the link between these components and come up with a focused and a well-integrated policy approach to address the problem of high TFR.

Multiple regression analysis has been used to see the relationship between the dependent (TFR) and the independent variables (HDI and IR). The HDI is a composite of three indices: life expectancy/health index, education index and income index. To calculate each of these indices, minimum and maximum values for each of the required indicators are used. The final value of each of the three indices ranges between 0 and 1 and is calculated using the following formula:

Dimension index = [(actual value – minimum value / maximum value – minimum value)] = $0 \geq 1$

However, education index is calculated in a simple way by using 100 per cent as a maximum and 0 per cent as a minimum for all levels of educational attainment.

Total fertility rate was taken from the Punjab Bureau of Statistics website and it was taken for each district. HDI and IR for districts of Punjab was taken from UNDP report on Pakistan 2011.The data for all the variables was taken for the year 2011 and it only focused on the province of Punjab and its 34 districts.

As all the components within the HDI index are important for human well-being, the purpose of this research is to see if HDI affects TFR or not.

The first hypothesis is set to explain the relationship between HDI and TFR.

H0: Total fertility rate is not affected by HDI.

H1: Total fertility rate is negatively correlated with HDI so the strategy to reduce fertility rate should be direct (family planning programs) as well as indirect (focus on HDI components).

If HDI affects TFR in a desired way, then the policies to deal with fertility rate should incorporate components within HDI and a more integrated and focused approach is needed. Past researches and empirical studies (Sackey, 2005; Lam and Duryea, 1999; Ainsworth et al., 1996; Vavrus and Larsen, 2003; Singh, 1994; Ben-Porath, 1973; Gardner, 1973; Schultz, 1973) have highlighted that education, especially female education is an integral factor to deal with the problem of increasing population and TFR while others have stressed on health, presence of hospitals and trained staff as the important factor. We have witnessed that focusing on education policy or health policy alone or in complete isolation has not produced any desirable results. Thus, an integrated policy approach that combines education, health and income should be proposed to combat the problem of ever increasing population and a high TFR.

Furthermore, my research highlights that another important factor that affects TFR is Immunization Rate. In order to see how and how much it can affect TFR, regression analysis has been carried out. Numerous studies and researches have focused on family planning methods and awareness as the sole important factor to decrease TFR but my research highlights that by focusing on improving components of HDI and Immunization Rate, we can produce the desired result i.e. decrease the TFR.

Similarly, a lot of empirical research has been done on the importance of immunization and vaccination and how it can help reduce infant and child mortality rate but no study has shown that there exists a strong link between Immunization Rate and TFR. The second hypothesis shows the relationship of Immunization Rate with TFR via its effect on infant mortality rate. The hypothesis below aims to reveal the relationship between IR and TFR.

H0: Total fertility rate is not affected by Immunization Rate (IR) through its effect on infant mortality rate.

H1: Total fertility rate is negatively correlated with IR depicting that proper immunization and vaccination will cause reduction in infant and child mortality rates that in turn, will decrease total fertility rate.

Multiple regression analysis was done to understand how HDI and Immunization rate affect TFR of Punjab, Pakistan. And on the basis of that, the above null hypothesis's (H0) will either be accepted or rejected. The results of the above hypothesis may lead to some interesting findings and a basis to form effective policies to tackle the problem of high fertility rate for the coming years.

4. Results Analysis

$$TFR = \alpha + \beta_1 * HDI + \beta_2 * IR$$

The above equation states that changes in total fertility rate (TFR) are explained by human development index (HDI) and immunization rate (IR).We have estimated the above equation by using OLS technique, the results are given below

Table 1: Regression Results

TFR	CONSTANT	HDI	IR
Coefficients	7.95	-3.0*	-0.03*
T- Statistic	6.90	-4.27	-2.27
		R Square = 0.57	D-W = 1.50

*indicate significant at 5 per cent level of significance.

The results in Table 1 show that both HDI and IR affect TFR negatively, meaning that an increase in HDI and IR will reduce TFR. R- square value is 0.57 which reflects that about 57 per cent of the variation in TFR is explained by both the variables HDI and IR.

T- Statistic for HDI and IR indicate that both variables are significant at 5 per cent level of significance.

As shown by Table 2 in Appendix A, the P-value for HDI is 0.0002 which is less than common alpha value of 0.05, indicating that it is statistically significant. Similarly, the value of IR is 0.0305 which is again less than alpha value of 0.05, meaning that it is also statistically significant, so null hypothesis in both cases are rejected and we accept the H1 hypothesis. Thus, the results prove that if both; HDI components and IR are improved; it will lead to a definite decrease in TFR.

The table shows that TFR and HDI and IR are negatively correlated i.e. when HDI and IR increase the total fertility rate decreases.

Table 2: Elasticity's

Elasticities	EFH = df/dh* $\overline{h}/\overline{f}$ TFR with HDI	-0.399393605
TFR with IR	EFI = df/DI* $\overline{I}/\overline{f}$	-0.788489802

To further establish the relationship between HDI components and IR with TFR, elasticities have been calculated. They show how much both the independent variables i.e. HDI and IR affect the dependent variable TFR. Elasticity has been calculated by dividing coefficient of fertility rate with coefficient of HDI. Then, dividing the mean value of HDI with the mean value of fertility rate, and then multiplying the results of the two. Same procedure is followed for IR. The table shows that 1 per cent increase in immunization rate (IR) decreases TFR by 0.79 per cent. Similarly, 1 per cent increase in HDI components decreases TFR by almost 0.40 per cent. Thus, pointing out that improving HDI, which includes education, standard of living, health and also child immunization rate (IR), can prove to be an efficient method of reducing the total fertility rate rather than just focusing on a single component to reduce TFR.

It is clear from the results above that the improvement in the components of HDI does affect TFR. But what is important to understand is that improving one component out of the three may not produce desirable results. Table 3 in "Appendix A" highlights the relationship between Education and TFR. It depicts that although it is statistically significant, R squared is 0.485 showing that 48.5per cent variation in TFR can be caused by education alone. However, if Governments focus on HDI components that include education, health and income together with IR,

then about 57per cent variation in the TFR can be explained by these variables alone. In the past, Governments have often stressed on education alone especially female education to play a pivotal role in the fertility transition. Although fertility rate has decreased over the years, it is still high and not close to the desired benchmark of 2 births per woman. Similarly, the Government placed a lot of stress on health especially mother and child health, and family planning programs like Green Star, still the TFR could not be brought down to the desired level and remains high. Hence, it is not wrong to conclude that there are clearly some policy gaps. The purpose of this research is to highlight that these policies should not work separately but should be integrated into one focused policy approach. The importance of income and standard of living should also be incorporated into these policies as studies by Toor (2007) and Schultz (2005) highlighted that income and standard of living affect total fertility rate in a desirable way.

To add to it, Toor (2007) in his empirical study pointed out that about 57per cent variations in the TFR can be caused by the index of economic development. Household income, standard of living and wealth are a component of HDI and one of the most discussed welfare attributes, however, direct income data on provincial or district level is not available. Therefore, various proxies are used to estimate income and wealth position of a district. Various indicators have been integrated to develop a composite index of economic development. It basically measures economic potential and achieved levels of income and wealth and standard of living. The relationship between TFR and economic development is negative at the highest level of development. As income and standard of living improves, there is greater concern for quality of children rather than quantity. Quality of children may require greater investment than return, a rise in income leads to a reduction in the total fertility rate. So any effective policy response to address the problem of a high TFR should consider the improvement of HDI components as a whole.

Furthermore, all policies that are formulated and implemented to address the problem of ever increasing population and fertility rate place a lot of stress on the importance of family planning programs. However, provision of family planning programs can affect TFR only to an extent but if, with these programs, the government also focuses on an integrated approach that targets important social indicators such as health, education and standard of living (Components of HDI), then the effect of TFR can reach desired levels of two births per woman. Therefore, focusing on all

the three components that include education, health and income and understanding their linkage and formulating a well-balanced and an integrated policy approach can lead to desired results. To validate this, the results above show that improving the components of HDI by 1 per cent will lead to a reduction of 0.40 per cent in the TFR.

Furthermore, the results also indicate that immunization rate helps reduce TFR via its effect on infant mortality rate. Reduction in infant mortality rate is likely to affect TFR in rural settings where couples tend to have more children in anticipation that only a few will reach adulthood as some will die of diseases. Immunization and proper vaccination makes sure that infants do not die of diseases like measles, pneumonia or diarrhea etc. Thus, if parents anticipate that their child will not die of diseases, they will tend to have fewer children and this will affect the TFR. In case of Pakistan where majority of the population lives in rural settings, about 62 per cent (World Bank, 2014), this relationship between IR and TFR can lead to some interesting policy formulations and may lead to a permanent solution to curb the problem of increasing population. Pakistan from the very beginning has been trying to address this issue but no policies have been effective enough to generate the desired result. The results above clearly indicate that immunization rate affects TFR by reducing it. Thus, any effective policy response to address the problem of TFR should incorporate the angle of immunization rate. The authenticity of this argument is proved above by the results that show that an increase of 1 per cent in immunization rate leads to a decrease of almost 0.80 per cent in the TFR.

5. Conclusion and Policy Recommendations

This paper presents an empirical exercise to estimate the elasticities of HDI and IR with respect to TFR. The objective of this study was to quantify the impact of HDI components and IR on TFR using the aggregate cross section data for the districts of Punjab, Pakistan. The results highlight that there exists a negative relationship between components of HDI, IR and TFR. Therefore, by improving components of HDI and IR, the TFR can be brought down to the desired level of 2 births per woman. Moreover, the research provides a new angle that immunization or a vaccination not only helps in reducing disease or infant/child mortality rates but also helps to reduce the total fertility rate. If the relationship between IR and TFR is understood and policies that target population and fertility rate incorporate this new angle, it can undoubtedly produce some breakthrough results.

Fertility rate is one of the significant determinants in population growth. Pakistan's current TFR is 3.8 with 4.2 in rural and 3.2 in urban areas (Pakistan demographic survey 2013).While TFR of Bangladesh and India are 2.2 and 2.5 respectively, which are less than that of Pakistan. Total Fertility rate below 2.1 leads to a decrease in population and that above 2.1 is considered to increase population. In case of Pakistan, the desired TFR is 2.1 which is considered to be replacement rate. However, the current high TFR of Pakistan is a consequence of wanted and unwanted pregnancies. Unwanted fertility is a condition defined as women having more children than they desire. The number of these kinds of pregnancies is high in Pakistan and at about 43.2per cent, of which 15.3per cent end up having an abortion, 22per cent are unintended births and almost 6per cent end up in miscarriage (Ezeh et al., 2012). Population growth and TFR can both be reduced in case of Pakistan if unwanted pregnancies can be controlled.

Government should expand family planning services and encourage, motivate and incentivize people to use these services. Moreover, government can implement programs like pre-marital contraception counseling in order to better inform couples so that unwanted pregnancies can decrease. As the TFR of the rural areas is particularly high, the focus and coverage of these programs should be expanded to these areas. There are a total of 2461 District Health Units (DHUs) in Punjab with 293 Rural Health Centers (RHC) and about 48000 Lady Health workers (Punjab Bureau of Statistics, 2015). They should all be rigorously trained to help educate both men and women about family planning, use of contraceptives and infant health and importance of vaccination and immunization. The DHUs should have a proper set up for family planning services. Moreover, the pre-marital contraception counseling should be made mandatory and all DHU's and RHC's with the help of LHW's launch programs for districts where they should educate and spread awareness regarding family planning, also that quality of children is more important than quantity and the importance of infant health and proper immunization.

The implementation of the above policy will ensure that unwanted births are reduced in Pakistan as the un-met need for contraception is 25per cent (NIPS, 2008). Due to lack of knowledge and access to birth control techniques such as contraceptives, many couples end up having more children than they want. Thus, if they are given the right knowledge and access to the birth control techniques, it will help reduce fertility rate by 1.1 fewer births.

Government of Pakistan should focus on improving components of HDI as 1per cent increase in HDI will reduce fertility rate by 0.40per cent.This reflects that improvement in HDI components can help Punjab as well as Pakistan to achieve its targets set for TFR. HDI can be improved, firstly, by improving the education system and making sure that all children go to school. There should be absolutely no gender disparities in access to education. Education must be free for all both in urban and rural settings. The World Bank Data 2013 shows that about 3 million girls are out of school and never get a chance to even get primary level education and majority of these girls belong to rural areas. Hence, it is not wrong to conclude that this can be a major contributor of high TFR in rural settings. Sending girls to school will not only delay their age at marriage but will also help them understand the importance of education and health. So the Ministry of Education should focus on girl's education and incentivize parents to send their daughters to school. The awareness and importance of family planning, focusing on quality of children rather than quantity, proper vaccination and immunization, healthy lifestyle should all be made part of the curriculum. Schools should have special lectures and seminars to educate both boys and girls on these matters.

As education plays an important part in determining the family size, educated women are more aware of family planning, contraceptives and its usage. This usage has increased from 30per cent among women with no education to 41per cent among women that have basic primary education (Pakistan demographic Survey, 2013). Clearly, this depicts that women with education are better able to understand and interpret information and are likely to use it to their advantage. Thus, women education should be emphasized more and more and coverage of family planning services should be improved both in rural and urban areas so that they are easily accessible.

Secondly, health dimension needs to be improved. For this, access to hospitals, provision of healthcare services to both urban and rural areas, family planning services, presence of trained healthcare staff and up to date technology and methods should be used. Both health and education are basic human rights and they should be accessible and free for all. This is what Millennium Development Goals and most recently, Sustainable Development Goals and other international organizations have stressed on. Then, the third dimension is of increasing the household income or standard of living of people and this can be done by creating better

employment opportunities. Once these three components improve i.e. HDI improves, it will help reduce the TFR. The Government of Pakistan and especially that of Punjab are working to achieve these targets and improve HDI but the need of the time is to have a well-balanced and focused approach with better policies and much more stress on proper implementation of these policies.

Another interesting issue that this research has highlighted is the relationship between IR and TFR. Improving IR by 1per cent will lead to 0.80per cent decrease in TFR. This highlights that IR is not only a tool to combat disease and reduce infant and child mortality but now it's an important tool to reduce the total fertility rate. It reflects that if the government, with its direct interventions like family planning programs also introduces massive immunization programs, the TFR can be pulled down to the desired level. If this policy is implemented, the results would not take a long time to show their impact on TFR. Government should take a proactive approach and make sure that infants and all children get vaccinated especially in rural settings. Civil society and international organizations should also join hands with the Government of Pakistan and should make sure that IR improves as this can address the two acute problems that Pakistan is facing; one is of high infant mortality rate and the other is of high total fertility rate. Immunization is a new angle, a way to control and decrease child related diseases and high infant child mortality rate. Also, it is an indirect way to decrease fertility rate as many couples in Pakistan tend to have more children in the anticipation that few will die because of disease.

Fertility transition is only possible when it diffuses to rural areas too. There is still a vast difference between the service delivery and social development of rural and urban areas. According to the 18th amendment of the Constitution, all provinces now have full control over issues including health, population, education and women related issues. Only a focused and a well-integrated policy approach can make a difference. For this to happen, the departments and the Ministries of Health, Education, Economic Affairs and Statistics, Population welfare, Rural Development and all other stakeholders who have interest in population issue need to work in unity and develop a policy framework and implementation mechanism. They should work in coordination rather than working in isolation to address the problem of ever increasing population and a high TFR.

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Appendix A: Table 1

	Districts (Punjab)	combined primary, middle and matric enrollment ratio	Immunization ratio	HDI	TFR
1	Lahore	85	92	0.72	3.48
2	Rawalpindi	101	98	0.712	2.98
3	Chakwal	89	98	0.655	2.51
4	Sialkot	93	99	0.623	3.32
5	Jehlam	91	94	0.61	3.45
6	Gujranwala	79	92	0.601	3.43
7	Gujrat	86	100	0.594	3.25
8	Faisalabad	75	89	0.58	3.45
9	Attock	83	99	0.527	2.8
10	Sarghodha	78	91	0.522	3.39
11	Mianwali	82	99	0.517	2.87
12	Sheikhupura	71	94	0.513	3.45
13	Mandi Bahuddin	76	97	0.51	3.2
14	Toba Tek Singhl	80	97	0.505	3.43
15	Multan	56	86	0.505	3.44
16	Khushab	73	99	0.471	2.91
17	Narowal	89	99	0.461	3.59
18	Sahiwal	67	96	0.451	3.76
19	Layyah	78	100	0.449	3.97
20	Hafizabad	69	95	0.44	4.1
21	Kasur	65	88	0.435	4.38
22	Okara	57	98	0.414	3.78
23	Dera Ghazi Khan	62	88	0.414	4.57
24	Bhakhar	66	94	0.404	3.56
26	Vehari	55	93	0.4	3.74
27	Jhang	57	89	0.397	4.01
28	Bahawalnagar	57	97	0.391	n/a
29	Lodhran	51	86	0.383	3.26
30	Pakpatten	55	95	0.381	4.28
31	Bahawalpur	48	88	0.367	4.02
32	Muzaffar Garh	49	75	0.342	4.65
33	RahimYar Khan	44	87	0.336	4.25
34	Rajanpur	42	93	0.316	4.84

Source: UNDP Report 2011
Source for TFR: Punjab Bureau of Statistics Data 2

Results from Regression Analysis Using EVIEWS software and Data from Table 1:

Table 2

Dependent Variable: TFR
Method: Least Squares
Date: 05/04/15 Time: 22:34
Sample: 1 33
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.946652	1.158443	6.859768	0.0000
HDI	-2.999661	0.702743	-4.268505	0.0002
IR	-0.030627	0.013466	-2.274358	0.0305

R-squared	0.568888	Mean dependent var	3.628750
Adjusted R-squared	0.539156	S.D. dependent var	0.561276
S.E. of regression	0.381025	Akaike info criterion	0.997156
Sum squared resid	4.210220	Schwarz criterion	1.134569
Log likelihood	-12.95450	F-statistic	19.13394
Durbin-Watson stat	1.500379	Prob(F-statistic)	0.000005

Table 3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.378098	0.336898	15.96360	0.0000
EDU	-0.024858	0.004675	-5.316644	0.0000

R-squared	0.485126	Mean dependent var	3.628750
Adjusted R-squared	0.467964	S.D. dependent var	0.561276
S.E. of regression	0.409399	Akaike info criterion	1.112210
Sum squared resid	5.028232	Schwarz criterion	1.203818
Log likelihood	-15.79535	Hannan-Quinn criter.	1.142575
F-statistic	28.26670	Durbin-Watson stat	1.876803
Prob(F-statistic)	0.000010		

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