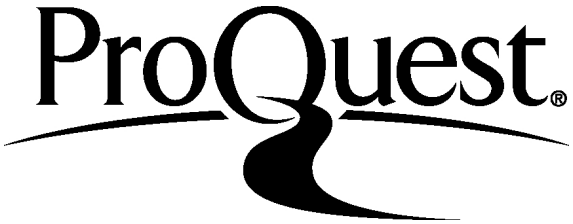
ASSESSING THE IMPACT OF 'PAKISTAN INITIATIVE FOR MOTHERS AND NEWBORNS' IN COMPARISON TO SOCIO-ECONOMIC DETERMINANTS OF MATERNAL HEALTH SEEKING IN PAKISTAN

by

Hira Rashid

A thesis submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Master of Urban Affairs and Public Policy

Spring 2015



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"Foreign Assistance is not an end in itself. The purpose of aid must be to create the conditions where it is no longer needed."

President Barack Obama

ACKNOWLEDGMENTS

This thesis is dedicated first and foremost to Dr. Danilo Yanich, my advisor and mentor, for his continuous support and unwavering faith in me. I know he has touched the lives of many of his students, but mine, he has shaped. I am indebted to Dr. Erin Knight for her contribution to my research through the course of this thesis. My appreciation and gratitude go out to Dr. Harvey White for the direction he provided in the formative phases of this research. I would also like to thank Jared Cummer and Dr. Mia Papas for their support. Finally, I cannot express in words, my gratitude to the people who have always been there to break my fall; Shahnaz Chaudhry, Shahida and Attif Irshad.

This research would not have been possible without the cooperation of the Pakistan Federal Bureau of Statistics, who provided the Pakistan Social and Living Standards Measurement Survey data for 2004-05 and 2012-13. This data were used in compliance with the coding and technical assistance manuals provided by the bureau of statistics. Modifications were limited to removal of vague or incomplete data and appropriate coding for the purposes of statistical analysis. This research also uses publications from Global Health Technical Assistance, Pakistan Initiative for Mothers and Newborns, John Snow Inc, John Snow Research and Training Center, Johns Hopkins University and the Population Council. This published material was acquired through web resources and has been cited as instructed by publishers in the copyright instructions.

This manuscript is dedicated to Ammara Shah, Francisco Lopez, Hina Razzaq and Ammad Rasheed for being my rocks, my mother for being the source of my passion, and my father for teaching me the value of perseverance.

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ABSTRACT

Efficacy of behavioral interventions to improve maternal health seeking behavior (MHSB) has been increasingly scrutinized, particularly in developing countries like Pakistan. The purpose of this study is to analyze the impact the Pakistan Initiative for Mothers and Newborns (2004-2010) in 22 exposure districts compared to districts with no intervention. The impact of socioeconomic and demographic indicators in comparison to that of the intervention is also discussed in this paper.

Data were obtained from the Pakistan Living Standards Measurement Survey 2004-05 and 2012-13.The sample consisted of 54706 women of reproductive age (15-50 years), from 22 intervention districts, and 72 control districts. Five utilization oriented indicators of MHSB were investigated; antenatal visits, tetanus toxoid vaccinations, health facility birth, skilled birth attendance and postnatal care. Using the Difference in Differences technique, binary logistic regression was used to assess the impact of PAIMAN relative to socioeconomic and demographic variables.

We find that the PAIMAN intervention had no significant impact on improving likelihood of women seeking maternal health care. With the exception of prenatal care, there were no statistically significant differences in the odds of women utilizing maternal health services in the intervention districts in comparison to the control districts.

DEFINITIONS

Maternal Death: The death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes (WHO, 2014).

Adult Lifetime Risk of Maternal Death: The probability that a 15-year-old women will die eventually from a maternal cause (WHO, 2014).

Indirect Causes of maternal death: Those resulting from previously existing diseases or from diseases that developed during pregnancy and that were not due to direct obstetric causes but aggravated by physiological effects of pregnancy (WHO, 2013).

PAIMAN Intervention Districts: The ten districts where the PAIMAN was initiated in 2005, hereon in referred to as the original intervention/PAIMAN districts.

PAIMAN Expansion District: The 14 additional districts where PAIMAN was initiated as a part of project expansion, in 2007.

Education System of Pakistan: The federal and provincial level public education system where primary education indicates grade one to five and is provided free of cost. Secondary education refers to grade six to ten, and college refers to Grade 11, 12 and above. Secondary education in public schools as well as grade 11 and 12 are offered at a significantly lower cost as compared to higher education (above grade 12).

Informal Education: Literacy and basic arithmetic skills taught at home or in combination with religious training at madrassas (centers of Quranic teachings).

Chapter 1

INTRODUCTION

There have been significant improvements in maternal and child health globally since the 1990's, particularly with the advent of the Millennium Development Goals (MDG)[1] (Ronsmans &Graham, 2006). However, it has become increasingly evident that a disproportionate burden of infant and maternal mortality is borne by developing countries, particularly in South Asia and Sub Saharan Africa (Save the Children, 2013; Ronsmans et al., 2006). Pakistan, the 5th most populous country in the world, ranks highest in 'lifetime risk of maternal death' among all South Asian countries, with the exception of Afghanistan. It is also one of the six countries that account for approximately 50% of maternal deaths in the world (World Health Organization (WHO), 2014). This may, in part, be attributed to the fact that Pakistan's health expenditure as a percentage of gross domestic product (GDP) has remained stagnant at three percent between 2000 and 2011, with no foreseeable policy changes to focus funds on health (WHO, 2014; Golding, Hall & Shah, 2011). However, external resources for health as a percentage of GPD increased from 0.8 to 7 percent between 2000 and 2011, making Pakistan 10th on the list of countries receiving an

[1] MDG no. 5: Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio and achieve, by 2015, universal access to reproductive health

increasing amount of Official Development Assistance[2] (ODA) for the health sector (WHO, 2014). Pakistan is also the recipient of the single highest amount of international funding for maternal, newborn and child health (MNCH) interventions (USD 36 Million) (Save the Children, 2013).

The country's maternal mortality rates declined by approximately 40% between 2000 and 2011 and its global ranking improved from 138th to 135th from among 194 countries monitored by the WHO (WHO, 2014)[3]. However, the aforementioned statistics show that the expenditure on maternal, neonatal and child health programs is not commensurate with the limited improvements in maternal health seen over the past decade (Bhutta et al., 2013). This trend has been identified in academic literature and is now being widely discussed. While program evaluations continue to provide evidence of efforts targeted at increased availability of health services, there is an acute shortage of research focusing on identifying the determinants of health service utilization (Agha & Carton, 2011; Mumtaz et al., 2014). Despite a considerable spread of interventions, lack of focus on targeting prevalent inequities has resulted in low coverage rates for provision of various essential services and unchecked quality of care standards, with large urban-rural differences across the country (Bhutta et al., 2013).

[2] Ranking is based on the rate/percentage increase between 2000 and 2011.

[3] This ranking must be interpreted with caution since maternal mortality statistics for 13 countries were found missing in the WHO 'World Health Statistics' 2014.

The Research and Advocacy fund proposes that while increased spending on public health care services, particularly availability and access, is associated with better health outcomes, 'ineffective and inequitable' spending may further widen health disparities (Malik & Janjua, 2013, p.2). The most recent nationally representative survey, Pakistan Social and Living Standards Measurement Survey (PSLM) 2012-13 confirms the persistence of large socioeconomic inequalities in access to and utilization of maternal health care services across every indicator[4], discussed in depth in this thesis. This raises important questions about the disparate impact of maternal behavioral health intervention strategies on socially marginalized and economically disadvantaged segments of the Pakistani population (Mumtaz et al., 2014). This field of research however has been left largely unexplored because data on maternal health seeking behavior and corresponding health outcomes is severely lacking in Pakistan. WHO classifies Pakistan as one of the 96 countries with incomplete civil registration and/or other types of maternal mortality data (WHO, 2013; Bhutta et al., 2013). This lack of information also poses significant challenges in the establishment of sound monitoring and evaluation mechanisms for ongoing maternal health programs (Bhutta et al., 2013).

Experimental research in various parts of Africa and Asia also brings into question the long term utility of maternal health interventions in resource limited settings. Pasha et al., (2010) argue that while individual clinical interventions are

[4] Maternal health care service utilization is explored by analyzing the prevalence of women seeking care along the following indicators; Antenatal Care, Tetanus Toxoid Vaccinations, Health Facility Birth, Skilled Birth Attendance and Post-Partum Care.

known to have been effective tools to improve maternal and neonatal health outcomes, the appropriate and sustained provision of these services have important implications for their success (Pasha et al., 2010). They also state that scientific evaluations of these programs that constitute a combination of these programs have not been conducted to determine overall impact (Pasha et al., 2010). To address this research gap, Pasha et al (2013) report the findings of a two-arm cluster randomized control trial investigating the impact of Emergency Obstetric and Neonatal Care (EmONC) in reducing perinatal mortality(Pasha et al., 2013).

This trial was conducted across seven sites of the 'Global Network for Women and Children's Health Research' with high perinatal and maternal mortality rates, in six countries including Pakistan (Pasha et al., 2013). The EmONC trial was carried out between 2009 and 2011 (duration 18 to 24 months) and included a sample population of 111529 births across 106 clusters divided into intervention and control groups (N, each group = 53 clusters) (Pasha et al., 2013). This multipronged intervention included; "community mobilization and birth attendant education focusing on birth planning and transportation to a hospital; birth attendant recognition of complications, stabilization and appropriate, timely referral to a hospital; and hospital staff training focusing on appropriate and timely management of medical complications did not reduce perinatal mortality" (Pasha et al., 2013. p.9).

This trial generated compelling evidence challenging the current maternal health intervention strategies. The findings of the study report EmONC to be ineffective in reducing perinatal, maternal and neonatal mortality in intervention

clusters in comparison to the control clusters (Pasha et al., 2013). The researchers touch on the significance of "addressing context specific delays" to achieve sustainable improvements in maternal and neonatal mortality and conclude that similar maternal health programs unless determined to be effective using scientific methods cannot be assumed to have an impact on improving outcomes (Pasha et al., 2013. p.2).

The focus of this paper is a similar large scale health intervention, the Pakistan Initiative for Mothers and Newborns (PAIMAN), funded primarily by USIAD and implemented by a consortium of eight national and international actors in Pakistan between 2004 and 2010. Atwood, Fullerton, Khan & Sharif, 2010). The goal of this intervention was to reduce maternal newborn and child mortality in Pakistan and it was aimed at promoting positive maternal and neonatal health behaviors, increasing access to maternal and child health services, enhancing service provider capacity, improving quality of care and health services management and encouraging integration of services at all levels (Atwood et al., 2010). The scope of this research project, however, is limited to an objective assessment of the impact of PAIMAN on maternal health seeking behavior by analyzing five outcome measures (dependent variables); antenatal care, tetanus toxoid vaccinations, health facility birth, skilled birth attendance and post-partum care. Ideally, maternal mortality statistics would provide an insight into the long term impact of the intervention; however, this data has not been collected at the district level on a national scale. The dependent variables identified for this research are proxy variables for maternal mortality. This methodology has been extensively used in existing research and increased utilization

of all five services is known to have a positive effect on curbing maternal death. This linkage further discussed in Chapter 2 of the paper.

Pakistan's growing population and high maternal mortality rates have raised international concern. Consequently, the country has drawn an array of international donors to target program interventions at curbing maternal mortality rates (Jafarey, Kamal, Queshi & Fikree, 2008). PAIMAN was singled out for this thesis project for a wide array of reasons. The project received acknowledgment for employing best practices through substantial focus on collaboration with the Government of Pakistan (GoP), targeting rural populations, engagement of existing district health system and lastly, its utilization of the 'Pathway to Care and Survival Model' as well as the 'Communication, Advocacy and Mobilization Strategy' (JSI Research and Training Institute, Inc., 2010). PAIMAN strategies, which included both clinical and non-clinical approaches have also been extensively documented and studied. Implementation agencies have published comprehensive evaluation reports in an attempt to isolate the impact of PAIMAN on maternal and neonatal health, and attributed the improvements in outcome indicators over the five year implementation period (2005-2010) to the project design and implementation model (Senlet, Ross and Peters., 2008; Johns Hopkins). Despite these ambitious claims, the only independent evaluation of the project conducted by Global Health Technical Assistance in 2010 voiced significant concerns regarding the shortcomings in the monitoring and evaluation design of the project (Atwood et al., 2010). Furthermore, despite a clear indication in this report that further investigation of the project impact is needed to

establish causal relationships between project strategies and improved maternal health outcomes, the PAIMAN project framework has been replicated across public health institutions in the country. Strategies developed under PAIMAN have been incorporated into the ongoing National Maternal and Child Health Program under the direct supervision of the GoP (TRF, Implementing National MNCH Communication Strategy).

The effectiveness of PAIMAN has also been contentious in academic literature; from studies reporting disparate impact on vulnerable populations and debatable improvements in behavioral determinants of health to critique aimed at evaluation and reporting mechanisms of the program (Bhutta et al., 2013; Mumtaz et al., 2014; Ravindran, 2010). This is further convoluted by the fact that with the exception of one evaluation conducted by Global Health Technical Assistance mentioned above, no comprehensive evaluation of the intervention was carried out independently. Implementing agencies, primarily John Snow Inc. and the Population Council (Pakistan) published comprehensive project completion and evaluation reports, showing significant improvements in maternal health indicators in the target population (JSI Research and Training Institute Inc. 2010; Mahmood, 2010) . However, concerns regarding conflict of interest in reporting as well as the lack of compliance with the United States Agency for International Development (USAID) evaluation guidelines bring the reliability of the findings of these reports under scrutiny.

The USAID evaluation policy states that "For impact evaluations, experimental methods generate the strongest evidence. Alternative methods should be utilized only when random assignment strategies are infeasible" (USAID, 2011, p.7). Consequently, this shortcoming in the PAIMAN evaluation plan is noted by the Global Health Technical Assistance Project Team, "The question arises, therefore, why the M&E (monitoring and evaluation) plan did not propose from the outset to conduct a within-and-between group analysis of PAIMAN districts in comparison to demographically comparable non-intervention districts. The possibility to attribute an effect to PAIMAN interventions is severely constrained by this omission" (Atwood et al., 2010, p.44).

The methodology adopted by this study attempts to address this design flaw in the evaluation plan of PAIMAN at the time of commencement. An important area of research discussed widely in literature and touched upon in Chapter 2 was the utilization of maternal health services made available through PAIMAN. This effect, however, could not be captured by this research design because of data availability constraints. Since the PSLM survey did not provide information on whether the sample respondents had been exposed to the PAIMAN intervention, any relationship between varying socioeconomic indicators, exposure to PAIMAN and utilization rates was not explored. The variables indicative of the socioeconomic and geographical factors included in this method of research do however allow for a comparative analysis whereby the impact of PAIMAN is compared to the impact of education, income, geographical location and physical access. Furthermore, addition of these

variables into the regression model (2) also allows for an assessment of the impact of PAIMAN while controlling for socioeconomic and demographic factors.

A difference-in-differences technique, frequently employed in policy evaluations, was used to conduct a comparative analysis of the maternal health seeking behavioral indicators, between districts that received the PAIMAN intervention and those that did not, over the duration of the program (2004-2010) (Lechner, 2011). The purpose of this technique is to assess the impact of the PAIMAN intervention on the intervention districts while adjusting for confounders such as improved infrastructure, technological advances, broad spectrum policy changes and cultural factors that cannot be quantitatively determined.

The implications of the findings of this thesis project range from strategies to create rigorous and accountable monitoring and evaluation mechanisms for donor funded maternal health interventions in Pakistan, to a reassessment of the strategic framework of Pakistan Maternal and Child Health Program. Targeted towards donor agencies, non-profit organizations and public health institutions, the results of this study raise important questions about the cost effectiveness and sustainability of short term, community based maternal health interventions similar in design and implementation strategy to PAIMAN.

Chapter 2 of this thesis provides a glimpse of the existing literature on the socio-economic determinants of maternal mortality and issues of access particular to developing country settings. It also touches on the design and implementation of maternal health interventions in low income countries and discussed their efficacy in

generating measurable outcomes. Chapter 3 provides an overview of the country's health institutions, health policy framework and care delivery structure. It also focuses on maternal mortality within the context of Pakistan's health system and documents the findings of methodologically relevant studies conducted to date. Chapter 4 subsequently discusses the PAIMAN intervention program design, including the program strategies employed to specifically target maternal health seeking behavior, cater to issues of access and facilitate service delivery. Chapter 5 comprises of a detailed description of the data used and methodology employed to draw statistically significant conclusions about the impact of PAIMAN. Chapter 6 encompasses a detailed description of the results generated from the data and Chapter 7 is dedicated to a conclusive analysis and discussion of the implications of the results of this research.

Chapter 2

LITERATURE REVIEW

Maternal mortality came to the forefront of the global health agenda in 1987 with the launch of the Safe Motherhood initiative. The importance of maternal survival was further reinforced in 2000, with the inclusion of 'Improving maternal health' into the Millennium Development Goals as the fifth MDG (Starrs, 2006). Significant progress towards the achievement of this goal has been reported, with a 47% decline in maternal mortality rates between 1990 and 2010 (IEG (b), 2013). Further improvements to achieve MDG five (75% decrease in maternal mortality rates) are needed, and to this effect, attention has increasingly been drawn to the disproportionate nature of the distribution of maternal deaths around the world (Say et al., 2014; WHO, 2014). Developing countries account for 99 % of global maternal deaths, with Sub Saharan Africa contributing the highest share, followed by South Asia. This variance in the burden of maternal mortality borne by developing and developed countries has notably been cited by Halfdan Mahler, a former Director General of the World Health Organization (1987), as "the largest discrepancy of all public health statistics" (Ronsmans et al., 2006, p.1190).

Maternal mortality ratio, while being the most widely used indicator of maternal health, is not the only outcome that should be used to judge progress towards the fifth MDG (Ronsmans et al., 2006). Not only does this indicator fail to account for

the impact of declining fertility rates on maternal death, it also overlooks the non-fatal health outcomes of pregnancy such as serious morbidity (Ronsmans et al, 2006). The maternal mortality rate and adult lifetime risk of maternal death are more comprehensive indicators that account for fertility rates as well as obstetric risk (WHO, 2014; Ronsmans et al., 2006). Morbidity caused by near-miss events (severe non-fatal life threatening complications) also has a detrimental impact on the long term psychological and physical health, economic conditions and social standing of women (Filippi et al., 2006). While maternal death has serious implications for the long term health of the infant, the most radical effects of maternal mortality on child survival are during the pregnancy and neonatal period (Filippi et al., 2006).

Accurate measurement of maternal mortality is, in itself, a challenging task. The launch of the Global Strategy for Women's and Children's Health in 2010 by the United Nations Secretary-General, highlights the importance of improving measurement of maternal and child deaths across the globe by emphasizing the need to establish "functioning health information systems that combine data from facilities, administrative sources and surveys" (WHO, 2014, p.39). Measurement constraints for maternal death exist also in countries with well-developed statistical systems, in part due to underreporting because of misclassification of causes, complications attributed to induced abortions and absence of a diagnosis or declaration of pregnancy (Ronsmans et al, 2006). Furthermore, challenges in standardizing what constitutes 'maternal death' also leads to underreporting. For example; maternal death caused by complications of pregnancy or childbirth can cause death after the six week

postpartum period, but does not count as maternal death in routine civil registration systems (WHO, 2014). Countries that bear the highest burden of maternal death also lack functional systems for gathering, managing and analyzing health data, a phenomenon referred to as the "information paradox" by the WHO (p.4) (Say et al., 2014; Ronsmans et al., 2006; WHO, 2011). A systematic analysis of the global causes of maternal death conducted by Say et al., (2014) found that of the 10 countries with the highest maternal mortality rates, data were available for only one (Say et al., 2014).

Despite large data discrepancies and a disproportional distribution of maternal deaths among the developed and developing countries, a 45% decline in the maternal mortality rates between 1990 and 2013 has been achieved, with at least a 37% decline in all 10 WHO regions[5]. With the exception of 17 countries, where maternal mortality rates increased over the past decade, 19 countries have achieved their maternal mortality target, and those that have not have been declared 'on track' or 'making progress' by the WHO. Hogan et al., (2010) attribute this global progress in reduction of maternal mortality to four drivers: declining total fertility rates from 3.26 in 1990 to 2.56 in 2008[6], increase in income per head, maternal educational attainment and

[5] WHO Regions: Developed countries, Caucasus and Central Asia, Northern Africa, Sub-Saharan Africa, Latin America and the Caribbean, Eastern Asia, Southern Asia, South-eastern Asia, Western Asia, and Oceania (WHO, 2015).

[6] In addition to the direct effect of fertility on exposure to risk of maternal death, Maternal Mortality Ratio and Total Fertility Rate are strongly correlated (Hogan et al., 2010).

coverage of skilled birth attendance (Hogan et al., 2010). Ronsmans et al, (2006) undertake an analysis of those country case studies that reported substantial gains in reducing maternal mortality and conclude that there is considerable diversity in the mechanisms that contribute to the decline in maternal death. Significant importance has also been placed on identifying epidemiological causes of maternal mortality so that strategic interventions may be designed to improve availability as well as utilization of services (Ronsmans et al., 2006; Ahmed, Creanga, Gillespie & Tsui et al., 2010; Say et al., 2014). The following section provides an overview of the medical causes of maternal death and the subsequent section briefly summarizes the literature on the correlation between socio-economic indicators and maternal mortality.

2.1 Direct and Indirect Causes of Maternal Deaths

The causes of maternal deaths are often multifactorial and involve complex interactions of several medical, obstetric, health service and social factors (Carroli et al., 2001). Kassebaun et al (2014) in a systematic analysis of the causes of maternal deaths in 188 countries disaggregated maternal deaths into nine causes: maternal hemorrhage, maternal sepsis and other pregnancy-related infections, hypertensive disorders of pregnancy, obstructed labor, abortion, other direct maternal disorders, indirect maternal disorders, HIV and late maternal deaths (Kassebaum et al., 2014). The highest risk of mortality lies close to or during the time of delivery, suggesting that direct causes are the dominant determinants of maternal death (Filippi et al.,

2006). Contributions to maternal deaths of diseases that are not unique to pregnancy are largely unknown in developing countries, owing partly to the poor diagnostic capability and partly because pregnancies are not reported for such causes (Rosmans et al., 2006). WHO (2014) identifies severe bleeding, indirect causes, hypertensive diseases and infections as the dominant medical causes for maternal death (WHO, 2014; Kassebaum et al., 2014).

Direct and indirect causes of maternal death vary across and within geographical regions (Khan, Wojdyla, Say, Gulmezoglu & Look, 2006; Say et al., 2014). Asian regions bear the highest burden of hemorrhage related death and hypertensive disorders are leading causes of maternal death in Latin American countries (Say et al., 2014). Mortality attributed to indirect causes is highest in Sub Saharan Africa (28.6%) and Southern Asia (29.3%) (Say et al., 2014). This categorization of causes highlights deeper issues of access to care for women in developing countries, depending on variations in cultural values and social structures (Say et al., 2014). Furthermore, direct causes such as hemorrhage can be differentiated in terms of stages of pregnancy; antepartum, intrapartum and post-partum (Say et al., 2014). The utility of this delineation lies in the designing of program interventions, which are significantly different depending on the stage of pregnancy at the time of hemorrhage (Say et al., 2014).

A breakdown of deaths attributable to indirect causes shows that over 70% of the causes comprise of pre-existing disorders, including HIV, exacerbated by pregnancy (Say et al., 2014). This systematic analysis of geographically disaggregated

pregnancy related health conditions has important implications for the design and implementation of maternal health interventions targeted towards specific populations.

2.2 Socio-economic Causes of Maternal Deaths

The Safe Motherhood initiative, launched in 1987, recognized the impact of socio-economic factors on maternal and neonatal health outcomes (McCarthy and Maine, 1992).Progress in reducing maternal mortality is hindered by inequities not only between, but also within countries (Lassi, Salam, Das & Bhutta, 2014). Maternal mortality rates and health care indicators differ substantially across geographical regions based on whether the location is rural or urban, as well as across socioeconomic status (Lassi et al, 2014). "Generally speaking, the more economically disadvantaged and marginalized a woman is, the greater the risk of death" (UNFPA, 2012, p.1).

Mortality due to pregnancy related conditions is amenable to intervention by skilled care providers approximately in 80% of the recorded cases (Ahmed et al., 2010). Physical access to emergency obstetric services at the time of birth is particularly important in determining the outcomes of pregnancies. The presence of a trained health-care worker during delivery is crucial in reducing maternal deaths (Kerber, et al., 2007). The number of maternal deaths is highest in countries where women are least likely to have skilled attendance at delivery, such as a midwife, doctor or other trained health professional (UNFPA, 2012). A skilled health

professional can administer interventions to prevent and manage life-threatening complications, such as heavy bleeding, or refer the patient to a higher level of care when needed (United Nations, 2011).

A multitude of factors play a part in determining whether women seek care during pregnancy. While availability and physical access to needed obstetric care are necessary factors in care seeking, they are not the only determinants of maternal outcomes (Austin, Langer, Salam, Lassi, Das & Bhutta, 2014). The impact of economic poverty on health seeking has been well documented in literature (Hart, 1971; McCarthy & Maine, 1992; Shaikh & Hatcher, 2004; Mumtaz et al.,2014). In 1971, Julian Tudor Hard proposed the 'law of inverse care' that defined that various factors that contribute to the socioeconomically vulnerable population's increased exposure to health related risk (Hart, 1971). McCarthy and Maine (1992) famously developed a comprehensive framework to explore the mechanisms and pathways whereby socioeconomic status leads to high maternal mortality and specifically identified; position within the family and community, education, occupation, personal wealth/income and finally, autonomy[7] as the most notable determinant factors (McCarthy & Maine, 1992).

Building on the continuum of care framework, Thaddeus and Maine (1994) suggest that while physical access is a precursor to maternal health care seeking, even

[7] Autonomy refers to the woman's ability to travel on her own or to make independent decisions to use health facilities (McCarthy and Maine, 1992).

in cases where women have physical access to health facilities, three main 'causes of delay' emerge (Thaddeus & Maine, 1994). First delay occurs when inadequate knowledge, personal, cultural and religious beliefs hinder the ability of women and families to recognize the need to seek care. Second delay is attributed to difficulties such as problems with the referral chain between facilities, barriers at the community (cultural) and individual level (affordability). The third delay reflects on the quality of health care services, and pertains to the delay in receiving effective interventions (Thaddeus & Maine, 1994).

Underutilization of available maternal health service, particularly among disadvantaged populations has drawn attention to the significant role of the socio-economic status of women in need of obstetric services (Ahmed et al., 2010). In an effort to highlight the significance of socio-economic conditions on women's ability to access care, Ahmed et al., (2010) propose the three 3E's model. This study finds strong associations between the 3E's; Women's Education, Empowerment and Economic status, and the utilization of critical maternal health services; contraceptive use, antenatal care and skilled birth attendance (Ahmed et al., 2010). Maternal mortality or severe morbidity is closely connected to socio-economic status, educational attainment, the prevalent cultural and societal values, and physical access to effective obstetric care (UNFPA, 2012). A recent study conducted by Nigatu et al. (2014) showed that employment is a prominent function of women's autonomy and economic independence influences women's position in the household (Nigatu et al.,

2014). Furthermore, employment also has a significant impact on the role of women as decision makers in the utilization of maternal health services (Nigatu et al., 2014).

While the significance of skilled birth attendance to maternal health outcomes is widely acknowledged, Sloan, Winikoff & Fikree, (2001) claim that access to skilled attendants is not the only function of availability of emergency obstetric care, but also of education and other factors such as availability of transportation (Sloan, Winikoff & Fikree, 2001). Subsequently, its linkage to, or impact on reduced maternal mortality cannot be definitively established (Bulatao & Ross, 2003). It has been widely argued that focus on preventing and treating the clinical causes of maternal death is insufficient to improve maternal health outcomes, since this approach ignores the 'macro structural' i.e. socio-economic, cultural and political, determinants of health (Gil-Gonzalez, Portino & Ruiz, 2006). Goodburn and Campbell (2001) recognize the interlinking nature of socioeconomic factors and health seeking behavior and advocate for sector wide approaches to ensure access to essential maternal health services (Goodburn & Campbell, 2001). They claim that functional health systems are crucial to designing long terms and cost effective intervention strategies to tackle high maternal mortality rates in developing country settings (Goodburn & Campbell, 2001).

Based on existing academic work, three themes regarding direct and indirect causes of maternal deaths and role of socio-economic indicators in maternal health seeking emerge:

i. The health issues that exacerbate the risk of maternal death are specific to geographical settings in various parts of the world and cannot be addressed with a one-size-fits-all approach.

ii. Improving utilization of maternal health services must be targeted to vulnerable populations to achieve long term, sustainable and large scale impact.

iii. While improved socio-economic status, education and physical access enhance women's ability to take precautionary measures against direct and indirect causes of maternal death, these determinants vary in importance across communities and cultural settings.

The following section provides a brief overview of the literature documenting evidence based approaches to maternal health interventions.

2.3 Maternal Health Interventions

Maine et al., (1997) propose that in order to achieve significant reduction in maternal mortality rates, maternal health programs must perform the following functions: a) Reduce the probability of pregnancy, b) Reduce the likelihood of complications during pregnancy or delivery and c) Reduce the risk of fatal outcomes in the event that complications the in the ante/intra/post-partum period arise (Maine, Akalin, Ward & Kamara, 1997). Subsequently, interventions to reduce maternal mortality can be targeted at three levels; Preventing pregnancy (Primary prevention),

Preventing obstetric complications (Secondary prevention) and preventing death once complications have arisen (tertiary prevention) (Burchett &Mayhew, 2009). The three delays proposed by Thaddeus and Maine (1994), discussed earlier, pertain to the provision of necessary medical care at the tertiary prevention level. Further categorizations of the maternal health interventions include clinical and non-clinical interventions, which are delivered as either single intervention or in the form of 'packages' (Burchett & Mayhew, 2009; Cambell & Graham, 2006).

Given the fact that the prevention and/or treatment of obstetric complications require a multitude of clinical and non-clinical procedures to prevent fatal outcomes, most interventions comprise of a combination of the two and are referred to as packages (Campbell & Graham, 2006). For example; EmOC is a package of medical (clinical) interventions, developed by the WHO to treat the five direct obstetric complications, obstetric hemorrhage, obstructed labor, septicemia, hypertensive disorders in pregnancy, and unsafe abortion, that cause 75% of maternal deaths (PATH, 2013). IEG, (2012) in an assessment of the utility of systematic reviews of maternal health program evaluations, state that effectiveness of interventions is constrained or enhanced by contextual factors such as economic growth, local culture and practices, public policies and the functionality of health systems (IEG, 2012). Nyamtema et al., in their multi country study find that interventions that were able to successfully reduce maternal mortality were ones that had established functional health systems, ensured access to skilled birth attendants and introduced systems of

referral to higher levels of medical care in the event of complications (Nyamtema, Urassa & Roosemalen, 2011). They also link the degree of impact of an intervention to the "type of intervention package, degree of integration, duration and efficacy of implementation and presence of enabling public policies"(Nyamtema, Urassa & Roosemalen, 2011, p.9).

The success of maternal health interventions in addressing the direct causes of maternal death is widely accepted (Austin et al, 2014). Due to the high ratio of preventable maternal deaths attributed to lack of access to skilled health providers, a core strategy has been to target interventions at increasing availability of emergency services at the time of birth (Ahmed et al., 2010). This has led to an increasing amount of focus on professional assistance for women during the pregnancy, birth and the post-partum period (Koblinsky et al., 2006).While the effectiveness of clinical interventions in reducing maternal mortality is indisputable, there is an ongoing debate over which delivery mechanisms ensure maximum coverage and utilization (Burchett & Mayhew, 2009). Campbell & Graham (2006) argue that there is a lack of prioritization in intervention outcomes which leads to ambiguity in targeting strategies (Campbell & Graham, 2006).Furthermore, the need for an evidence base, informed by objective evaluations of non-clinical intervention strategies targeted on improving service utilization, has also been highlighted (Campbell & Graham, 2006; Burchett & Mayhew, 2009). While the impact of socio-economic conditions on maternal outcomes has been well established in literature, improvements in availability and utilization of maternal health services has been known to lead to improved maternal

health outcomes, even while controlling for socio-economic factors (Austin et al., 2014; Bulatao & Ross, 2003).

2.4 Efficacy of Maternal Health Interventions

Evaluation practices for development interventions as well as specifically for maternal health programs have been standardized by numerous large donor and implementation agencies (Maine et al., 1997; USAID, 2011; WHO, 2011; IEG, 2012). Key evaluation practices listed in the USAID Evaluation Policy Document require that program evaluations be integrated into the design of the project, unbiased in measurement and reporting, based on best methods, oriented towards reinforcing local capacity, relevant and transparent (USAID, 2011). A review of literature shows that numerous maternal health program evaluations fall short in their ability to fulfill these criteria and therefore may lead to false perceptions of success, ambiguity in identification of replicable strategies and continuation of unsuccessful intervention techniques (Sakala & Corry, 2008). The major shortcomings in the evidence base of maternal evaluations discussed in the 2008 Milbank report (Sakala & Corry, 2008), also identified by various systematic reviews of maternal health program evaluations, are;

1. Due to a lack of clearly defined criteria for concepts such as ‘near miss’(severe morbidity), efficiency, access, quality, empowerment, equity and cost effectiveness (etc.) it is very difficult to say when interventions worked (Souza et al., 2013;

Bobadilla, 1992; Ahmed et al., 2010). Outcome indicators such as MMR and Lifetime risk of Maternal Death must be used parallel to proxy-process and performance indicators (Burchett & Mayhem, 2009).

2. Evaluations are lacking, incomplete or only report indicators that showcase intervention success, suggesting the possibility of selective outcome reporting (Burchett & Mayhew, 2009, Nyamtema et al., 2011;Austin et al., 2014). Clinical (tertiary) interventions are evaluated more often given that they are easier to evaluate as compared to complex interventions targeted on access and utilization (Burchett and Mayhew,2009).
3. Evaluation designs, particularly non-randomized trials, have methodological shortcomings and must be interpreted with caution. (Ross, Simkhada & Smith, 2005; Nyamtema et al., 2011).

Behavioral health intervention outcomes have been the subject of an increasing amount of scrutiny from the academic community and donor institutions. For example; Ronsmans et al. state that despite significant gains in the reduction of maternal and neonatal mortality rates globally, large disparities persist due to the limited impact of maternal health interventions on vulnerable populations (Ronsmans et al., 2006). Austin et al. (2014) acknowledge the scientific evidence supporting the utility of clinical obstetric practices, but express reservations regarding the delivery and reach of maternal health programs, particularly to “those who need them most” (Austin et al., 2014, p.2). Souza et al, 2013 in a cross-sectional study of near-miss events find large variations in coverage of interventions and reported severe morbidity

in maternal health outcomes in 29 countries (Souza et al., 2013). They claim that despite the emphasis on coverage of maternal health interventions, while coverage is easily measurable, quality of care[8] delivered is not, which is a major determinant of the effectiveness of interventions (Souza et al., 2013). This criticism of maternal health interventions is echoed in extensive literature dedicated to their outcome and impact assessment in developing and developing country settings alike.

2.5 Socioeconomic Factors versus Maternal Health Interventions

Maternal health interventions cannot be designed in isolation from socioeconomic, cultural and other contextual factors. Mumtaz et al, (2014) argue for a comprehensive approach, emphasizing the need for pairing essential clinical interventions with demand side communication strategies (non-clinical interventions) informed by "poor women's social and economic realities" to increase utilization (Mumtaz et al., 2014, p.S22). Replication of evidence-based interventions must therefore be re-evaluated within a socio-economic and cultural context, with a focus on targeting existing inequities, before formulating policy (Bhutta et al., 2013). Campbell and Graham further delineate the components of a 'best bet' intervention strategy by identifying its singular components as; an effective package of

[8] Souza et al., 2013 discuss 'good quality of care' as a notion constituting appropriate use of effective clinical and non-clinical interventions, with the overall goal of improving patient satisfaction and improving health outcomes (Souza et al., 2013).

interventions, means of distribution that can potentially reach high coverage and buy in by target population (and government) to ensure sustainability (Campbell & Graham, 2006).

Chakraborty et al. (2003) in a comprehensive study to identify factors affecting maternal health service utilization in Bangladesh find education, income and severity of condition to be the most significant predictors. Hou and Ma (2013) identify women's decision making power to be an additional factor in determining utilization of services in Pakistan. These findings are consistent with the findings of Ahmed et al. (2010), who conducted with data from 31 countries to examine factors affecting the use of maternal health services. While Ahmed et al. (2010) maintain that these factors have limited capacity to be impactful in the absence of quality health care services; they contend that utilization of health services is highly contingent on socioeconomic and cultural factors (Ahmed et al., 2010).

In populations with low levels of education, wealth and autonomy for women, maternal health interventions must overcome significantly more dominant barriers. Conversely, in settings where socioeconomic conditions and cultural settings are restrictive for women, maternal health interventions have a limited impact in the absence of a long term community engagement strategy. The following chapter explores the impact of contextual determinants of health service utilization in Pakistan by providing a descriptive background of the health system in Pakistan, its most prominent shortcomings and the most significant aspects of the country's maternal health system.

Chapter 3

MATERNAL HEALTH IN PAKISTAN

3.1 Health Care System in Pakistan

The health care system in Pakistan is comprised of the public sector; federal Ministry of Health, provincial health departments, and the private sector providers. The role of the federal government involves policy-making, coordination, technical support, research, training and seeking of foreign assistance. The provincial and district departments of health are responsible for the delivery and management of health services. The private sector comes under the regulatory domain of the federal and provincial health ministries and departments.

"The public health delivery system is a three-tiered system consisting of; outreach services (Expanded program of Immunization EPI, Maternal & Child Health, malaria program) along with Primary Health Care PHC units (comprising both the Basic Health Units, BHU and the Rural Health Centers RHC), Secondary care units (Tehsil or Taluka Headquarters Hospital), and Tertiary Care facilities (District Hospitals and large teaching hospitals)" (Nafees & Nayani 2011, p. 797). The private sector is primarily a fee-for-service system and comprises of both formal (modern scientific/allopathic physicians or Homeopaths) and informal sectors (traditional

healers).

The private hospitals in Pakistan cater to an increasing share of the patient base. 21% of the population utilizes public health services and 79% utilizes private health services, including a multitude of informal healthcare services (reliance on family members and traditional treatments or self-medication)(Zaidi & Nishtar, 2011). Despite the fact that Pakistan is reported to have one of the most extensive public health delivery systems in the world, it has largely remained underutilized (Nishtar. 2006). The Government of Pakistan in recent years has placed significant emphasis on decentralization of the health system, by focusing efforts on strengthening the district health systems (Mumtaz et al., 2014).

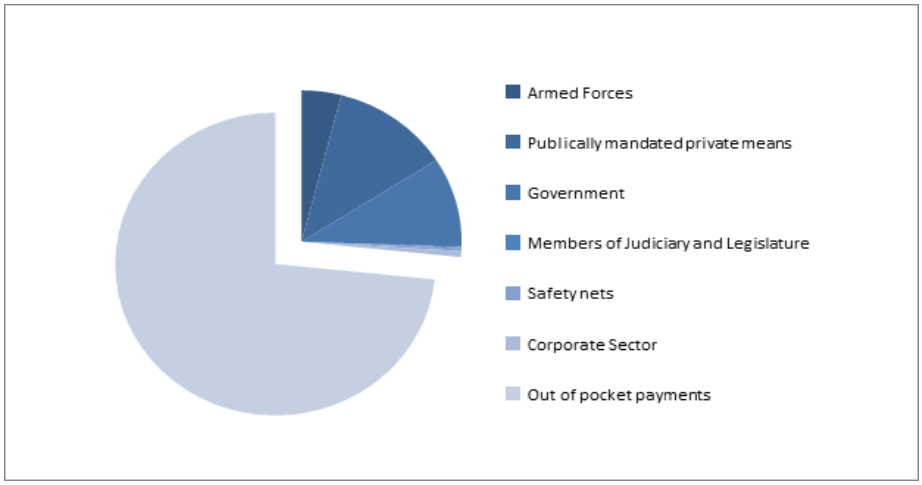
3.2 Health Financing

Pakistan's total per capita health expenditure is USD 39, far below the internationally recommended level of over USD 60. Figure 3.1 shows the national distribution of health care financing for the population. Pakistan's total health expenditure is 3.1% of the GDP (World Bank, 2014 a.). The country's public health expenditure is approximately one percent of its GDP, and has remained consistent over the past four years despite increased prevalence of communicable diseases such as polio, dengue and measles (World Bank, 2014, b.). Due to the absence of a functional public sector health care system, up to 79% of the population relies on the private sector for health care and 62% of the health expenditure in the country in the

country is borne by households (WHO 2014).

Figure 3.1 Percentage Population receiving coverage for health

Source: Sania Nishtar, Choked Pipes: Reforming Pakistan's Mixed Health Systems (Oxford University Press, 2010)



The private sector is primarily a fee-for-service system and comprises of both formal (modern scientific/allopathic physicians or Homeopaths) and informal sectors (traditional healers). The overall trend in Pakistan shows that 51.7% of the population relies on traditional, complementary and alternative medicine (TCAM) while 48.3% seek biomedicine (Hussain, Malik, Khalid, Qayyum & Riaz 2012.). Due to the high prevalence of demand for informal care, patient history and health records are rarely documented (Bhutta et al., 2013). This lack of information on patient outcomes and prescription practices leads to a vacuum in information regarding treatments and

patient outcomes.

3.3 Health Services in Maternal and Child Health

Pakistan has a four-tiered system for the provision of safe motherhood and newborn care services. At the local level, community-based activities are conducted through Lady Health Workers (LHW) and Traditional Birth Attendants (TBA). Primary health care is provided at facilities such as the Maternal and Child Health Centers (MCHCs), Basic Health Units (BHUs) and Rural Health Centers (RHCs). The district level health facilities such as the Tehsil Headquarters (THQ) and District Headquarters hospitals (DHQ) serve as basic care providers and first referral facilities. Finally, Tertiary care facilities, mostly located in urban areas are fully equipped to provide the highest level of care (PAIMAN annual report, 2004-05).

The 18th Amendment, voted into Pakistan's constitution in 2010, dissolved the Federal Ministry of Health and its constituent units. The administrative and regulatory powers were delegated to the five provincial health departments, which increased the role of the provincial Departments of Health in policy, intra-provincial coordination, monitoring and evaluation, medical and nursing education and tertiary care service delivery. In addition, in order to strengthen the district health systems, the district level Departments of Health were given the role of implementation, monitoring and supervision, management of healthcare delivery at and below District

Head Quarter Hospitals and implementation of National Priority Programs at the district level. For the past several decades, the country's policy and practice remains focused primarily on improving technical and managerial capacity in order to strengthen the district health systems (Mumtaz et al., 2014).

Pakistan as a participant of the Safe Motherhood Campaign (1997) and a signatory of the Millennium Declaration (2000) has made significant progress in formulating policy to address the country's high maternal and child mortality rates (Fikree, Mir & Haq, 2006; Mumtaz et al., 2014). This is reflected in the country's formal maternal and child health policy, implemented primarily under the umbrella of the national Maternal, Neo-Natal & Child Health Programme initiated in 2006 (GoP, 2006). However, as discussed in Chapter 1, the country's progress in improving its maternal health indicators has been slow in comparison to other countries with similar socioeconomic and political conditions. Two themes identified by existing literature to explain Pakistan's slow progress in curbing maternal death are; inadequacies in health interventions, and level of readiness of the recipient population, which is related to utilization of maternal health services made available through interventions (Fikree, Mir & Haq, 2006; Siddiqi, Haq, Ghaffar, Akhtar & Mahaini, 2003; Mumtaz et al, 2014).

Maternal health interventions in Pakistan, despite their large number, have deficient structural designs, insufficient implementation capacity (coverage and quality of activities) and poor monitoring and evaluation mechanisms (Siddiqi et al.,

2003). Mumtaz et al. 2014 argue that maternal health interventions in the country have little to no impact on maternal health seeking behavior, particularly on structurally marginalized low-income groups they are meant to target (Mumtaz et al., 2014). Agha (2014) also highlights the limited impact of maternal health interventions on the socially marginalized and poorest women (Agha, 2014). Significant emphasis has been placed on the need to maternal health interventions to devise strategies specifically to target low income, marginalized groups of women in Pakistan to tackle the high maternal mortality and morbidity rates (Agha, 2014).

Resilience of recipient populations to intervention strategies in Pakistan is influenced by physical access to health facilities, availability of needed facilities and care providers, fragmented care delivery system, quality` of care, affordability, women's decision making power, awareness and socio-cultural factors. (Siddiqi et al, , 2003; Shaikh & Hatcher, 2005; Fikree, Mir & Haq, 2006; Jafarey et al., 2008; Hou & Ma, 2013; Mumtaz et al., 2014 (c)). Physical access to the health facilities for women in Pakistan is also determined by the distance, presence of a relationship with the care provider as well as the availability of a travel companion (Shaikh & Hatcher, 2004). Other factors include a means of transport to the health facility, availability of alternative (informal) care providers at a closer location with lower cost, availability of a female care provider and community attitudes and practices towards formal care providers (Shaikh & Hatcher, 2004; Zaidi & Nishtar, 2011; Anwar, Green & Norris, 2012).

High maternal mortality in Pakistan is concentrated geographically in certain provinces and rural areas of the country (Golding, Hall & Shah, 2011). This has been attributed to poor health delivery in rural areas, discriminatory allocation of funds between provinces, and socio-cultural practices specific to certain regions of the country that limit women's mobility and adversely impact their social status (Shaikh & Hatcher, 2004; Hou & Ma, 2013). Furthermore, women's access to income in the country's socio-economic context is restricted, where men not only earn higher incomes, are engaged in formal sector occupations, but are also more likely to maintain employment than women (Agha, 2014). The impact of women's autonomy and decision making power on utilization of maternal health services has been well documented in literature (Shaikh & Hatcher, 2004, Anwar, Green & Norris, 2012; Hou & Ma, 2014). Utilization is also independently associated with personal autonomy as demonstrated by Agha and Carton (2011). In Jhang, Pakistan, Agha & Carton find that higher income and autonomy are significant determinants of increased utilization of antenatal care in rural areas (Agha & Carton, 2011). Furthermore, Hou and Ma (2013) and Agha, (2014) identify husband's education as a significant determinant maternal health seeking, particularly in settings where women have limited decision making power in the household (Hou & Ma, 2013; Agha, 2014).

The PSLM (2006-07) report finds that utilization of services in Pakistan is also severely hampered by a lack of awareness among pregnant women who reported lack of perceived benefit (57%) and prohibitive cost (38%) as the two major reasons for not

delivering in a health facility (NIPS, 2008). Rizvi & Nishtar (2008) also find that health systems in the country are comparatively less accessible to women and health providers at all levels are non-responsive to women's reproductive health needs (Rizvi & Nishtar, 2008). They argues that interventions must take under take into consideration the 'gender based lifestyle practices' integrated into the most vulnerable populations in Pakistan in order to design effective interventions (Rizvi & Nishtar, 2008).

In an effort to emphasize the significance of designing maternal health interventions within the socio-economic, political and cultural context of the target population, Mumtaz et al (b) employ an implementation research methodology to identify contextual factors impacting maternal health interventions in Pakistan (Mumtaz et al., 2014). They analyze the Pakistan's Community Midwifery Programme (CMWP) within the 'programme theory'[9] framework and find that CMW, aimed at improving rates of skilled birth attendance in rural areas, failed to account for market and consumer behavior, level of infrastructural development and influence of community perception of gender roles (Mumtaz et al., 2014 (b)).

Agha (2011) analyze the impact of the maternal health voucher scheme on institutional delivery among low income women in Dera Ghazi Khan, Pakistan (Agha,

[9] Programme theory is 'the construction of a plausible and sensible model of how a programme is supposed to work' (Multaz et al., 2014 (b))

2011). This year-long intervention was evaluated using a pretest-posttest study design and found that rates of antenatal visits, institutional delivery and postnatal care among the lowest income groups of women exposed to the voucher scheme increased significantly (Agha, 2011). The study also supports the association between maternal health seeking and education, travel time to nearest health facility (physical access), income and autonomy of women in decision making(Agha, 2011). However, even after adjusting for these factors, decrease in perinatal mortality among exposed groups of women remained significant (Agha, 2011). While the authors advocate for a demand side financing mechanism as a key non-clinical intervention in Pakistan, the limitations of the study include lack of a control group and generalizability of findings to rural populations in the country. The voucher scheme intervention and evaluation study was also replicated in Jhang, Pakistan and yielded similar results (Agha & Carton, 2011).

From among a wide array of scarcely documented clinical interventions implemented in the country Jhokio, Winter & Cheng (2005) document the results of a methodologically sound, controlled randomized trial implemented in seven subdistricts of Larkaha, a district in Sindh, Pakistan (Bhutta et al., 2013; Mumtaz et al., 2014; Johkio, Winter & Cheng, 2005). This clinical intervention comprised of comprehensive training of traditional birth attendants (TBA) in delivery care, provision of an emergency delivery kit, as well as awareness regarding utilization of existing social networks and health facilities, to improve perinatal and maternal

mortality rates in the target population (Jhokio, Winter & Cheng, 2005). The study found that training TBA's in risk identification, clinical procedures for delivery and referral practices significantly reduced the incidence of perinatal mortality (30%) due to direct causes such as hemorrhage (39%) and puerperal sepsis (83%)[10] (Jhokio, Winter & Cheng, 2005). Limitations of the study include small sample size and short duration of trial to effectively measure long term intervention impacts on late postpartum death and maternal morbidity.

A similar community randomized intervention (CRI) was implemented in 32 villages in Khuzdar, Baluchistan (province of Pakistan) between 1998 and 2002. The CBI package employed three strategies; training TBA's, Information and Education for Empowerment and Change (IEEC), and provision of transportation services for women in need of EmONC (Midhet & Becker, 2010). The project was designed to create awareness among husbands with respect to preparedness and recognizing signs of obstetric emergencies (Midhet & Becker, 2010). The study finds that women in intervention groups were much more likely to have received routine prenatal care, however, it had reserved effects on immunization, intake of adequate nutrition and prenatal supplements, postpartum complications, delivery in a health facility and contraceptive use (Midhet & Becker, 2010). This evaluation's most significant limitation was the impact of the cross-over effect between groups in control and intervention arms of the trail (Midhet & Becker, 2010).

[10] Only statistically significant results of the study are reported (Johkio, Winter & Cheng, 2005).

Bhutta et al., (2011) also document the results of a cluster randomized trial in two sub districts (Hala and Mitiari) in rural Sindh, with a population of 0.6 million (Bhutta et al., 2011). The intervention comprised three components; creation of volunteer based village health committees, training of TBA's and Lady Health Worker[11] support and training (Bhutta et al, 2011). While the findings of this study focused on reduction in the number of stillbirths and neonatal deaths, the authors also report significant results for increase is the likelihood of home deliveries using clean delivery kits (Bhutta et al, 2011).

While a comprehensive discussion of the impacts of maternal health interventions in Pakistan is beyond the scope of this thesis, this section documents studies that have employed rigorous methodological techniques in evaluation and reporting to capture the effects of the interventions. These studies also adeptly incorporated the geographical, social and economic determinants of maternal health seeking that are taken into consideration in this paper for the assessment of the impact of the PAIMAN intervention.

[11] The "Lady Health Worker" program constitutes trained community health workers who provide counseling and referrals to the residents of their assigned locality. Their primary functions are providing information on birth control, family planning, immunizations and maternal and neonatal health (Osanai, 2004).

Chapter 4

PAKISTAN INITIATIVE FOR MOTHERS AND NEWBORNS (PAIMAN) – *Oct 2004-Dec 2010*

4.1 Introduction

This chapter is divided into two sections. Section I will provide an overview of PAIMAN's objective, program design, implementation and evaluation of impact. This synopsis however will identify and elaborate where necessary, on those PAIMAN activities that were developed with the purpose of curbing maternal mortality and morbidity in the country. Section II will pinpoint the shortcomings of the PAIMAN intervention as identified by completed program evaluation reports as well as other academic literature. The purpose of this chapter is to describe the program design within the context of the socio-cultural dynamics of the target population and to highlight the structural flaws inherent in the health service delivery through which PAIMAN was implemented.

The goal of the PAIMAN project was to "reduce maternal, newborn and child mortality in Pakistan" (JSI Research and Training Institute Inc., 2010. p.16). The program employed an integrated health systems approach that catered to not only the immediate health care needs of the target population but also addressed the social, cultural and environmental determinants of access to and utilization of health services.

SECTION I

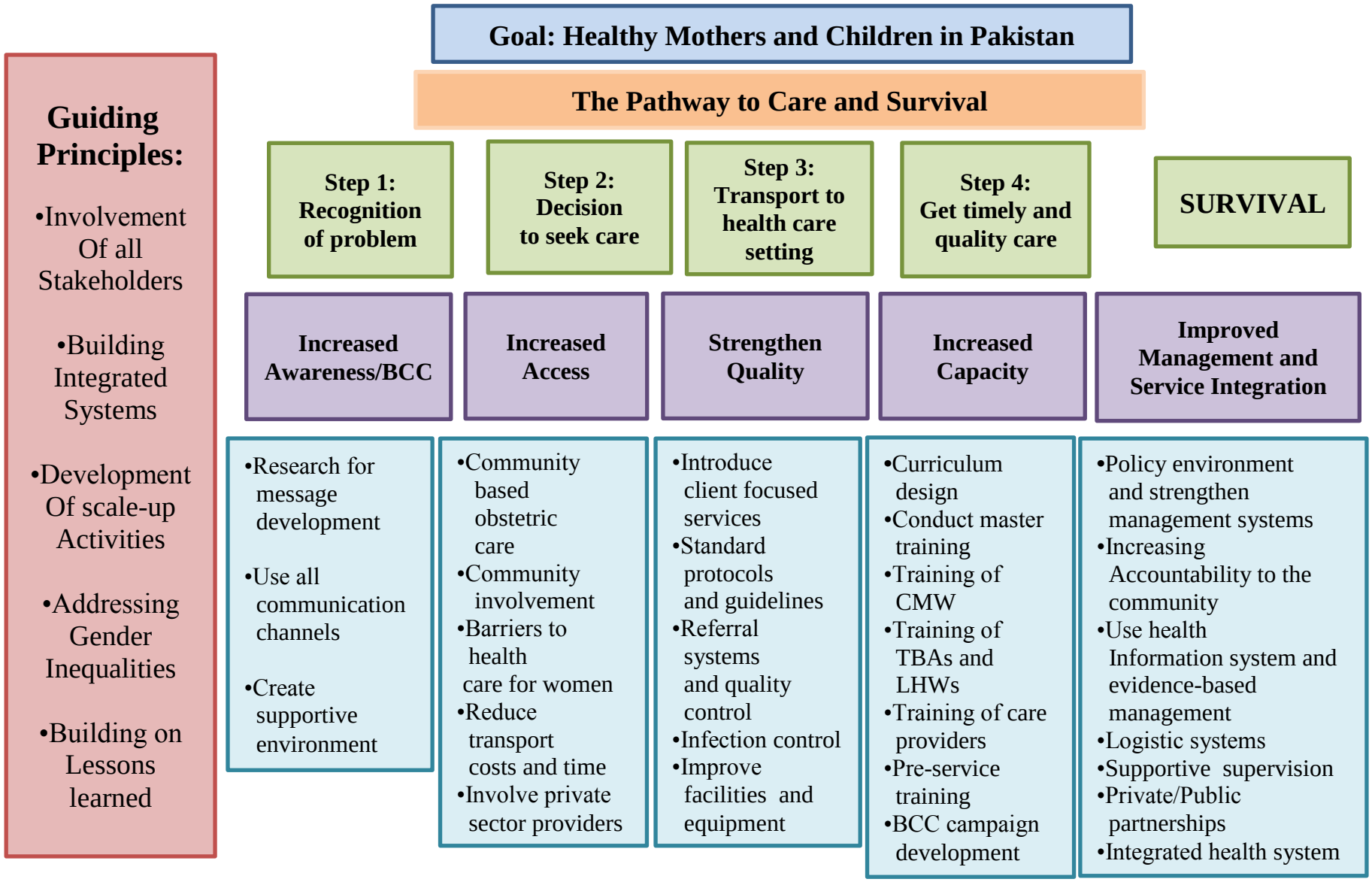
4.2 Program Model

The project was designed using a strategic framework; 'Pathway to care and survival' (Figure 4.1). This framework enabled the use of multiple interventions targeted at the interrelated issues that cause delays in access to quality obstetric services. Five key objectives were devised to support the care and survival framework:

1. "Increase awareness and promote positive maternal and neonatal health behaviors through a behavior change communication (BCC) approach.
2. Increase access (including essential obstetric care) to and community involvement in maternal and child health services and ensuring services are delivered through health and ancillary health services.
3. Improve service quality in both public and private sectors, particularly related to management of obstetric complications.
4. Increase capacity of Maternal and Newborn Health managers and care providers.
5. Improve management and integration of services at all levels."

(JSI Research and Training Institute Inc., 2010 p.16)

Figure 4.1 The PAIMAN Program Framework



Source: PAIMAN Project Completion Report, JSI Research and Training Institute (2010), p.17

4.3 PAIMAN Approach

PAIMAN was designed and implemented by John Snow Inc. in cooperation with a consortium of local and international organizations including Agha Khan University, Contech International, Greenstar Social Marketing, Johns Hopkins University, Population Council and Save the Children, USA. The project's strategic framework employed an evidence based approach, designing intervention strategies to target key obstacles to access to and utilization of maternal health services. The geographically isolated and culturally diverse nature of the PAIMAN intervention sites precluded the possibility of a standardized approach and program activities were tailored to the specific needs of the target populations, giving the program operatives significant flexibility in designing implementation strategies. In order to ensure physical access, quality and timely service delivery, PAIMAN adopted a systems oriented approach to the health sector and directed resources towards improving the functional capacity of the public health system.

PAIMAN's approach capitalized on the existing strengths of all project stakeholders by building partnerships early on in the project design phase. A key strategy was strengthening the role of the district health system as a functional service delivery mechanism. Public-private partnerships were formed to introduce quality improvement practices. Furthermore, a comprehensive strategy was fashioned to create a sustainable partnership with the media. The media was an integral part of

PAIMAN's Communication, Advocacy and Mobilization (CAM) strategy. Partnerships with the non-profit sector was also emphasized as an important capacity building tool to expand the program's outreach to remote rural areas and also to train the local organizations for future replication and sustainability of the PAIMAN model.

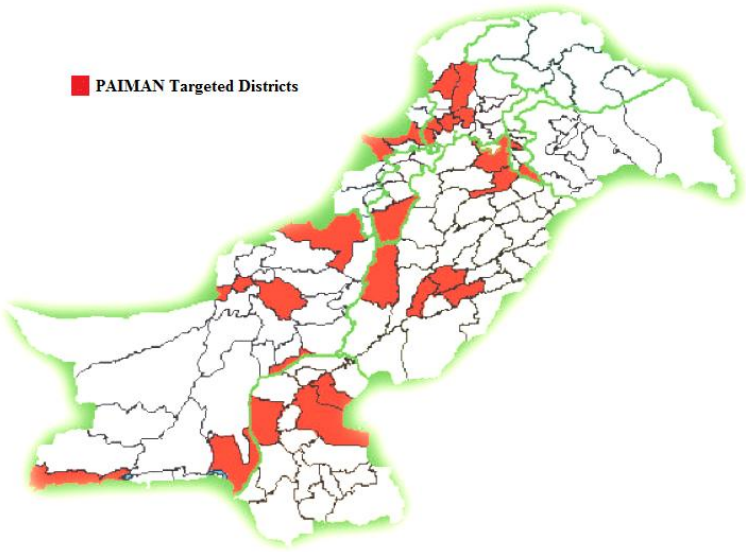
4.4 Scope

The program initially targeted 10 districts with a total population of 13 million (JSI Research and Training Institute Inc., 2010). In 2008, the scope of the project expanded to include 13 more districts (see Figure 4.2), increasing the target population to 34 million, and evolving into an integrated maternal, newborn, child health and family planning project (JSI Research and Training Institute Inc., 2010). The project budget was USD 92 million with a per capita expenditure of USD 2.70 for six years (JSI Research and Training Institute Inc., 2010).

The program was designed to target the needs of the local communities within the targeted districts. To this end, baseline surveys were conducted in all 10 implementation districts and comprehensive district profiles for all 10 districts were compiled. The project teams continued to carry out research and gather information throughout the course of the project in order to refine implementation strategy as needed in order to enhance the project impact. This project was designed to assist the GoP in implementing a full spectrum of interventions necessary to address maternal and newborn health issues in the country (maternal and newborn mortality and

morbidity). The key challenge identified by PAIMAN in order to achieve its objectives was access to skilled birth attendants at the time of delivery.

Figure 4.2 PAIMAN targeted districts highlighted on Pakistan's country map



Source: JSI Research and Training Institute Inc., 2009.

4.5 The Intervention

Key interventions implemented to achieve PAIMAN project goals within the PAIMAN districts consisted of two broad categories.

4.5.1 Health systems up-gradation

The health system up gradation comprised of facility up gradation, carried out in 31 health facilities in the original PAIMAN districts, (10 districts). The purpose was to ensure that the health facilities in these areas were equipped to provide emergency obstetric care at all times. Service delivery outcomes were targeted by training facility personnel, providers and managers to improve the quality of maternal and new born care in local facilities as well as public and private providers in the districts. Traditional birth attendants were identified as key actors to improve home-delivery outcomes, and were provided with training for early identification of danger signs, making timely referrals, improving use of clean delivery practices, and raising knowledge of maternal and neonatal health and family planning, etc. Furthermore, additional community midwives were trained through a national 18-month training program with the expectation that this would greatly increase the coverage of skilled birth attendance at home deliveries, especially in rural areas.

4.5.2 Behavior change communication/community mobilization

The second broad intervention category was behavior change communication and community mobilization at different levels. The range of activities included; women's support group meetings, training and involvement of community midwives, dramas and advertisements on TV and radio on maternal and newborn health, puppet shows in rural and remote areas, and involvement of ulama (Clerics in mosques) and religious scholars for creating awareness about maternal and newborn healthcare. In addition, the program targeted men, in view of the cultural and social context of the target cites, to educate and inform them about reproductive and neonatal health.

4.6 Program Sustainability

PAIMAN's project implementation strategy was designed with sustainability in mind. This involved the capacity building at two levels: scaling up existing programs and structures that constitute the health systems; and empowering communities to ensure long term improvements. It was anticipated that this would lead to the creation of supportive linkages in the continuum of accessing health care from the home to the hospital. In order to minimize investment in creating new institutional structures or parallel systems, PAIMAN capitalized on existing resources by utilizing existing institutional arrangements available in the public health system. The project focused on building the planning, management, supervision, and monitoring capacity at the district level and worked with all four tiers of maternal and child health service

provision facilities from Lady Health workers and Traditional Birth Attendants to Tertiary care hospitals.

4.7 Evaluation

The PAIMAN project evaluation design primarily depended on a series of process and outcome indicators. The outcomes of the project were identified as:

- "Increased demand for health services as reflected by improved health seeking behaviors of the mothers.
- Decreased complications of pregnancy and decreased case fatality rate for hospitalized mothers and children."

(JSI Research and Training Institute Inc., 2010, p.22)

The project was expected to achieve these outcomes through a series of linkages. PAIMAN project activities would build the capacity of health providers to deliver essential obstetric care, maternal and neonatal health counseling, and maintain health service quality. This improvement of health facilities, it was assumed would improve utilization rates in the target population. Counseling services provided at these health facilities were expected to improve the health seeking behavior, "knowledge and attitudes of the mothers" (JSI Research and Training Institute Inc., 2010, p.22). By targeting the public health sector and non-government organizations, the PAIMAN project was to strengthen the health systems and improve service delivery. Ownership of the program initiatives by local community representatives and

organizations was expected to serve as an accountability mechanism for the health system (JSI Research and Training Institute Inc., 2010).

SECTION II

4.8 Impact

The PAIMAN project has been cited as "successful in impacting positively on overall maternal and neonatal health indicators mainly rural districts of PAIMAN in a short period of six years" (Mahmood, 2010, p.xvii). The Population council reports that "women who were reached by PAIMAN communication efforts were significantly more likely to obtain maternal health services during pregnancy, delivery, and after giving birth..." (Mahmood, 2010, p.xvii). The project completion report published by

John Snow Research and Training Institute Inc., (2010) also reports significant improvements in the percentage of women seeking maternal health care (see Table 4.1). Improvements in actual maternal mortality rates were not reported and therefore are not being analyzed in this study.

Evaluation was conducted at two separate levels; actual change in health indicators/outcomes and change in perception/knowledge. Table 4.1 represents the changes in indicators of maternal health seeking. This section does not discuss the

changes in perception reported by PAIMAN as the discussion of these intervention outcomes lies beyond the scope of this project.

Table 4.1 Percentage Change in Maternal Health Seeking during PAIMAN:

	Outcome Indicators	Baseline-2005	Endline -2010
1	Neonatal Mortality (per 1000 live births)	30	23
2	Percent of births assisted by skilled birth attendants	41%	52%
3	Percent of women (15-49 years of age)with 3 or more ANC visits during pregnancy	34%	44%
4	Percent of women receiving at least 2 doses of TT vaccinations.	48%	56%
5	Percent of women with post partum visits within 24 hours after birth	40%	53%
6	District health budgets (in Million)	Rs. 1300	Rs. 2078

*District health budgets are not inclusive of USAID resources.
Objectively verifiable outcome indicators for PAIMAN.
Source: PAIMAN Project Completion Report, JSI Research and Training Institute(2010)

A number of program strategies employed by PAIMAN were launched as pilot projects and implemented as small scale interventions in controlled settings. These included neonatal supplements uptake and effectiveness trials as well as clinical interventions carried out by trained community health workers for reduced fatality risk in mothers and infants (PAIMAN Policy Brief, 2010). A number of these studies were

implemented and evaluated through a series of grants funded by the project (Agha, 2011). However, a majority of the PAIMAN activities were monitored using numerous process and outcome indicators. Ravindran (2010) in a study of privatization of reproductive health services in Pakistan points out that the PAIMAN intervention involved an excessively large number of partners and implementation organizations and was far too geographically spread out to ensure efficient utilization of project resources (Ravindran). Duplication of efforts, inadequate coverage, variations in program fidelity across targeted health facilities and deficiencies in training and capacity building modules of the program "...raise doubts as to whether they (these efforts) have translated into improved access to maternal health care for women" (Ravindran, 2010).

Atwood et al. (2010) point out that the investment in public health facilities, which constituted a major portion of the project budget, was recognized as a difficult component to sustain over a long period of time due to the volatile political environment of the country (Atwood et al., 2010). Furthermore, the training material developed to build the capacity of community health workers did not meet international quality and safety standards and was not adequately linked to clinical practices (Atwood et al., 2010). Consequently, the community health worker training activities failed to serve the target population adequately (Atwood et al., 2010). There was also no supervision or monitoring mechanisms to assess the retention of information communicated through these trainings. Atwood et al. (2010) note that less

than half of the trained community health workers could state the danger signs of pregnancy and delivery (Atwood et al., 2010).

As a part of the final evaluation of the project (independent evaluation for review by USAID), Atwood et al.(2010) use findings of existing PAIMAN evaluations published by implementing agencies to report increase in percentage of women seeking antenatal care, skilled birth attendance, post natal care and giving birth in a health facility(Atwood et al., 2010). However, this evaluation report repeatedly states that "without comparative data with non-PAIMAN districts, these increases cannot be conclusively attributed to PAIMAN's efforts to increase access to services" (Atwood et al., 2010, p.35). Furthermore, particularly with reference to resources directed towards renovation of the health facilities Atwood et al. (2010) point out "Comparative data are essential if a clear picture of the impact of the interventions is to emerge. Although PAIMAN had this opportunity from the outset of the project, it did not craft the monitoring and evaluation strategy to accommodate such a between-groups design" (Atwood et al., 2010, p. 44).

The Global Health Technical Assistance final evaluation team in its 'Evaluation Methodology and Constraints' section points out: "The pattern of these site visits was augmented by focus group discussions with community members organized by PAIMAN and run by Eycon staff[12] to assess the access and acceptability

[12] Eycon, established in 2003 was brought on board the PAIMAN project implementation to provide technical assistance with a web based monitoring and evaluation system and GIS mapping for community health workers in the 24 PAIMAN districts.

of services provided through PAIMAN support to the government, by planned discussions with clients of the CMW as well as with men and other members of the community. The routine- well prepared and well organized by PAIMAN staff in each instance and taking into consideration both programmatic and security requirements- tended to lose spontaneity and precluded the final evaluation team from making impromptu visits to communities and other institutions that were not on the itinerary." (Atwood et al., 2010. p.3)

PAIMAN has also been criticized for having no impact on the persistent health disparities prevalent in the income and educational quintiles in Pakistan (Mumtaz et al., 2014; Mumtaz, Salway, Bhatti & Mclntyre, 2014). Mumtaz et al. (2014) build on Population Council's project completion report and conclude that the PAIMAN intervention had no impact on improving access to or utilization of maternal health services among the poorest, most vulnerable groups (Mumtaz et al., 2014; Mahmood, 2010). Finally, the program evaluation conducted by Global Health Technical Assistance recommended a two year follow up of the intervention (after 2010), particularly in the PAIMAN expansion districts to assess ownership by the local government and draw conclusions about the sustainability of the project (Atwood et al., 2010). Despite this, no evidence of any such follow up activities by USAID was found.

In view of the results of the PAIMAN evaluations discussed in this chapter, it is expected that the intervention districts (original and expansion) will show a greater increase in all five outcome variables as compared to the control districts. Based on

this assumption, the research questions being investigated with the methodology discussed in the following chapter are:

a. *Was there a greater improvement in indicators of maternal health-care seeking behavior in women aged between 15 to 50 years in districts that received the PAIMAN intervention (2004 -2012) as compared to districts that did not?*

b. *What was the overall impact of the PAIMAN intervention on maternal health indicators in comparison to the impact of education, income, region, province, physical access and husband's education in a nationally representative sample of Pakistan?*

Chapter 5

METHODOLOGY

Previous sections of this thesis have served to establish the significance of rigorous evaluation mechanisms to inform the process of designing program strategies for maximum impact and coverage. This section provides an overview of the existing evaluation techniques employed in academia and incorporated into evaluation design guidelines recommended by donor institutions for the assessment of maternal health interventions.

Gertler, Martinez, Premand, Rawlings & Vermeerch (2011) discuss numerous program evaluation techniques and identify two counterfeit counterfactual designs as the most commonly used in program evaluations; the Pre-Post Test design and the Control-Treatment Group design (Gertler et al., 2011). Limitations of both these research designs have been widely discussed in literature. The most prominent ones relate to the impact of time trend in the Pre-Post Test method and the possibility of significant differences at baseline (permanent difference) in treatment and control group method (Ito, 2007). The randomized control trial (RCT) cited as the "gold standard" for evaluation is ideal for programs such as PAIMAN, however, in order to conduct an RCT, treatment and control groups must be identified and monitored throughout the duration of the program (Atwood et al., 2010; Gertler et al., 2011,

p.50). This evaluation mechanism was not introduced into the PAIMAN framework at any stage during the implementation of the program, and therefore data for a time series, comparative evaluation of control and treatment districts are not available (Atwood et al., 2010).

In analyzing the impact of behavioral health programs, sample selection models that account for the selection bias are popularly used (Guo & Fraser, 2014). Heckman's sample selection model developed using an econometric framework focuses on the analysis of non-randomly generated sample outcomes, using a two-step estimator (Guo & Fraser, 2014). The model's estimators are based on inclusion in program and intensity of exposure at the participant level, whereas data use in this paper do not include information regarding the individual participation of women in the sample in PAIMAN intervention activities. Statistical techniques used to analyze data to assess policy (treatment) impact on specific population groups are referred to as 'treatment effects' models (Buckley & Shange, 2003). These models include a wide range of techniques such as difference in differences, matching, propensity scores and heterogeneous treatment effects (Buckley & Shang, 2003; Hsieh, 2009; Grimmer, Messing & Westwood, 2014). With the exception of Difference in Differences, these statistical techniques, while potentially applicable to the dataset used in this paper, do not serve to fulfill the purpose of this investigation. This is because treatment effects using these models can only be estimated with cross sectional data at a single time point. Furthermore, the lack of information regarding specific individuals exposed to

the different levels of the PAIMAN intervention limit the choice of modeling frameworks for which the underlying assumptions can be met. Lastly, this paper studies a specific aspect/objective of the PAIMAN intervention; the impact of the intervention on maternal health seeking behavior. Since the project comprised multiple facets and a wide array of intervention activities aimed at reducing neo-natal and infant mortality, an assessment of the overall impact of the intervention on the treatment group is beyond the scope of this project.

Difference in Differences:

Difference in Differences is a statistical technique used to estimate intervention effects using non-experimental/observational data, and is a version of fixed effects estimation (Waldinger, 2010). This 'natural experiment approach' has been used widely in economics and policy/program evaluations, primarily because it only requires repeated cross sectional data at two or more time points (Buckley & Shang, 2003; Chaisemartin & D'Haultfoeuille, 2014). The Difference in Differences technique is more powerful than other treatment effects models and thus is able to detect small changes in outcomes between treatment and control groups (Buckley & Shang, 2003)

"The difference in differences (or double difference) estimator is defined as the difference in average outcome in the treatment group before ($\bar{Y}_0^T$) and after ($\bar{Y}_1^T$) treatment minus the difference in average outcome in the control group before ($\bar{Y}_0^C$)

and after ($\bar{Y}_1^C$) treatment" (Albouy, 2004, p.3).

$$\delta_{DD} = \bar{Y}_1^T - \bar{Y}_0^T - (\bar{Y}_1^C - \bar{Y}_0^C)$$

The application of the difference in differences model had become very widespread since its development by Ashenfelter and Card in 1985 (Ashenfelter & Card, 1985; Imbens, 2007). This technique originally designed to be employed for program evaluations in the absence of experimental data, was most popularly used by Card and Krueger (1994) to analyze the impact of increase in minimum wage on employment in New Jersey in comparison to Pennsylvania (a comparable population with no increase in minimum wage) (Care & Krueger, 1994). Since this method does not require the specification of rules by which the treatment and control groups are assigned (i.e. randomization), the application of this method in the evaluation of programs where RCT's are not possible has been recognized by the World Bank (Gertler et al., 2011).

The most significant limitation of this methodology is the parallel trends assumption; in the absence of the treatment, the treatment group would have followed the same trend as the control group (Albouy, 2004). In addition to this, the difference in differences approach is sensitive to the usual Guass Markov assumptions of absence of homoscedasticity, normality and autocorrelation (Buckley & Shang). However, unlike in a linear regression model, these assumptions do not apply to a binary logistic regression model. Other assumptions applicable to this model include; large sample

size, linearity of independent variables and log odds[13], independence of error terms[14] and a parsimonious model (Statistics Solutions, 2014).

5.1 Dataset

There are a total of 138 districts in Pakistan. The Pakistan Bureau of Statistics conducted the Integrated Household Survey in 100 in 2004 and in 114 in 2012. The remaining districts are either much too remote for efficient data collection or are inaccessible owing to terrorist activities or strict control of tribal leaders. Reliable data from the Pakistan Bureau of Statistics if available for 94 districts for both time points (2004-05 and 2012-13).

The dataset used for this analysis was retrieved from the 2004-05 and 2012-13 Pakistan Integrated Household Survey (PIHS), a nationally representative multi-stage cluster sample of approximately 80,000 households. The sample design and the data collection were done by the Federal Bureau of Statistics of Pakistan (FBS), with technical assistance from the World Bank. The questionnaire of the PIHS was based on the Living Standards Measurements Survey of the World Bank. Data on socio-demographic factors and income were collected for all households. Reproductive

[13] Met by turning independent variables into ordinal or nominal variables (Categorized data).

[14] No matching or before-after data. Independent variables must be independent from each other.

histories were gathered from all married women aged 15±49 years, who had given birth in the past three years (PSLM, 2004-05; PSLM, 2012-13).

As discussed in the previous chapter, the program evaluation conducted by Global Health Technical Assistance recommended a two year follow up of the intervention to assess sustainability, it was concluded that the 2012-2013 PSLM dataset could be used to determine the impact of the PAIMAN intervention since the project was completed in 2010. Furthermore, the data request for the 2010-11 dataset was denied on the premise that the Pakistan Bureau of Statistics collected data during alternate years, and a household level PSLM survey had not been conducted in 2010.

5.2 Dependent Variables

For this analysis, Antenatal visits, Tetanus Toxoid Vaccinations, Skilled Birth Attendance, Location of birth and Post-Partum Care were identified as the dependent variables. The impact of these factors on reduction of maternal mortality rates has been extensively discussed in literature, and also reviewed in Chapter 2. These dichotomous variables were obtained directly from the Living Standards Measurement survey. In the operationalization of Antenatal Care, Tetanus Toxoid Vaccinations and Post Natal Care, 'Yes' was coded "1" and 'no' was coded as "0". Care providers were classified as either 'skilled' (coded 1) or 'unskilled' (coded 0). Location of Birth outcomes were classified into 'health facility' (coded 1) or 'outside health facility'

(coded 0).

5.3 Independent Variables

The independent variables included in this data analysis comprised of 'exposure to the PAIMAN intervention' and six additional variables. These additional variables were identified through a review of existing literature documenting determinants of maternal health seeking behavior associated with improved maternal health in Pakistan. The approach served a dual purpose; firstly, it led to a significantly more exact measurement of the impact of the PAIMAN intervention, while controlling for all other significant socioeconomic variables that impact maternal health seeking, and secondly, it allowed for a comparison between the impact of the PAIMAN project, and socioeconomic determinants of maternal health. The inclusion of these socioeconomic determinants in the analysis was affected by the availability and reliability of data as well as time and resource constraints. A detailed description of these variables and their operationalization is provided below.

5.3.1 PAIMAN Intervention

The primary independent variable used in this analysis was the PAIMAN intervention. Since the original and expansion districts received different levels of the intervention, the two were divided into two separate groups, and compared with the

control group comprising 72 districts that did not receive the PAIMAN intervention. From among the 24 districts that received that PAIMAN intervention, cross-sectional data from the Integrated Household Survey is only available for 22 districts for 2004-05 and 2012-13.A comprehensive list with the systematic division of districts into three groups is shown in Appendix A (see Table 8.1).

5.3.2 Education

The impact of education on women's likelihood of seeking skilled care during pregnancy has been extensively discussed in chapter 2 of this thesis. Keeping in context, the culture of informal schooling in Pakistan, for the purpose of this analysis, literacy and education measures were incorporated as separate variables. Education level was divided into five categories; Illiterate, Informally Educated, Educational Attainment between Grade 1 and 5, Grade 6 and 10 and College and above. This division was made keeping the Pakistani public education system in perspective.

5.3.3 Income

Income measures at the individual and household level were collected using the Living Standards Measurements Survey. Individual level income levels however, could not be used because these were available for 50.5% of the observations recorded in the data. Aggregate household income was used as the primary indicator of income keeping in context the cultural and social setting of the region under study, also

discussed in depth in Chapter 2.

Due to the highly skewed income distribution (range = 5 to 880833, Skewness = 24.11, Kurtosis= 1256.12), the income variable was divided into four quintiles to minimize the impact of extreme outliers. The poverty line definition of a dollar a day was used to divide income into quintiles, instead of the current USD 1.25 a day as determined by the World Bank for the year 2012. This was done because monthly household income was adjusted for CPI and expressed in terms of 2004 income, at which time the poverty line had been set at one dollar a day. (The World Bank Group, 2015). Approximate household income was divided into four equal income quintiles; PKR 0- 3000, PKR 3001-6000, PKR 6001-9000 and PKR 9001 and above.

Limitation: Income data (for last month and last year) was collected for year 2011-2012, while the dependent variables pertaining to maternal health seeking were posed to women who had given birth in three years dated back from the time of the survey. Income volatility in Pakistan may have had an impact on household and personal incomes leading to a temporary change in health seeking behavior of expecting mothers. Furthermore, the income indicator does not take the household size into account, and therefor may not capture the disposable income aspect for expenditure on maternal health.

5.3.4 Region & Province

The Pakistan Living Standards Measurement Survey (2012) reports the urban

and rural nature of the sampling units within the districts surveyed, and divided the observation by provinces, which allows for the analysis to take into account the geographical placement of each district (PSLM 2012-13). Furthermore, this discriminatory pattern of health service availability and utilization between provinces and across urban and rural areas has been well documented in literature and discussed in depth in Chapters 2 and 3.

5.3.5 Access

Physical access was measured using the information collected from the data set with questions regarding travel time to the nearest health facility. Distance from the health facility was divided into five categories; 0-14 minutes, 15-29 minutes, 30-44 minutes, 45-60 minutes and over 60 minutes.

Limitation: The data used for this analysis did not report whether emergency obstetric services, or any form of maternal health services were available in the health facility most accessible (in terms of distance) to the sample respondents.

5.3.6 Husband's Education

Husband's education, also an important predictor of women's access to health care was also coded using the method used for women's educational attainment.

5.4 Sample Population

PSLM 2004-05 had a total of 78857 recorded observations for women

interviewed about maternal health seeking, of these, 35257 had given birth in the three years preceding the survey. The sample of 35257 women was further refined by eliminating observations from districts that were not surveyed in 2012, the primary sampling units that had missing weights and individual observations that had missing data for income, access or education. Approximately 141 observations in the 2004 dataset had incorrect values for age (as high as 90 years). A cut off point was established for the 2004 dataset, at the lowest and highest recorded age in 2012 dataset, and the remaining cases were deleted from further analysis. Further, three major cities were excluded from analysis (Islamabad, Lahore and Karachi). These districts are not only significantly more developed in comparison to the rest of the country, the population demography and socio-economic characteristics are considerably better than the rest of the country. There are also no comparable districts in the intervention group, and inclusion of these three had a disproportionate effect on the results. The total number of observations in the final dataset used as baseline (2004) data were 29,903. The selection criteria employed for selecting the 2004 sample population was then applied to the 2012 dataset. From a total of 79757 women surveyed, 31574 had given birth during the years before the date of the survey. 24803 final observations met the inclusion criteria from the 2012 dataset, and were included in the analysis. The 22 intervention districts were identified using PAIMAN resources. The control group comprised 72 districts from each, the 2004-05 and 2012-13 datasets.

5.5 Analysis

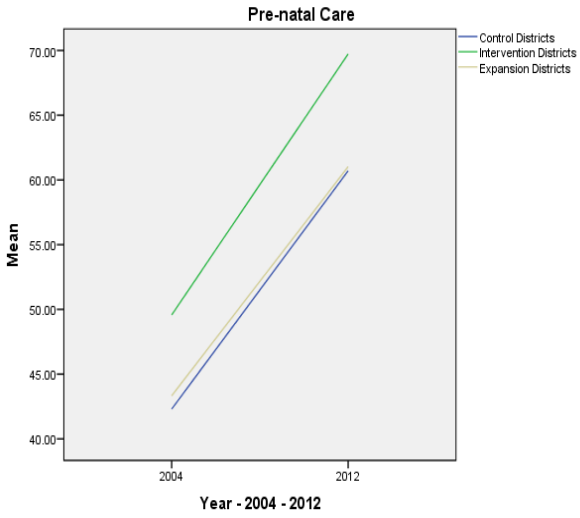
A multi-level logistic regression was used to conduct an individual level analysis to determine the impact of the PAIMAN intervention on ten original and twelve expansion districts. The regression models were developed using the literature reviewed in Chapter 2 and 3. Women's educational attainment (all five levels), income (five income quintiles), age, employment, region (urban/rural), provinces (all five provinces), physical access (five time categories), means of transport to nearest health facility and husband's level of education (all five levels) were identified as relevant determinants of maternal health seeking behavior. Age, employment and means of transport to the nearest health facility were removed from the models after initial analysis because these 3 variables did not meet the assumptions of difference in differences modeling technique, and were not statistically significant determinants of maternal health indicators.

Difference-in-Differences technique was employed to analyze the impact of the intervention in comparison to the other six socioeconomic variables, between 2004-05 and 2012-13, across intervention and control districts. Dependent or outcome variables were observed for the two groups (intervention and control) for two time periods (2004-05 and 2012-13). The intervention group comprised districts that have been exposed to the PAIMAN intervention in 2012-13 but not in 2004-05. The control group did not receive the PAIMAN intervention in either period. The purpose of this technique was to control for the impact of improved infrastructure, media and

technological advances, broad spectrum policy changes, and cultural factors that cannot be quantitatively determined and adjusted for in the analysis.

In addition to theoretical justifications for inclusion of socioeconomic independent variables in the model, chi squares and crammer's V statistics were also obtained as bivariate measures of association. The significance of the association was verified for each dependent variable before inclusion in the regression model. In order to test the parallel trends assumption, the percentages of women who accessed each of the five maternal health services were accumulated for each district, pre and post intervention. The mean value of these percentages was then obtained and plotted graphically for the two time points, for all five dependent variables (see figures 5.1 to 5.5)

Figure 5.1 Prenatal Care

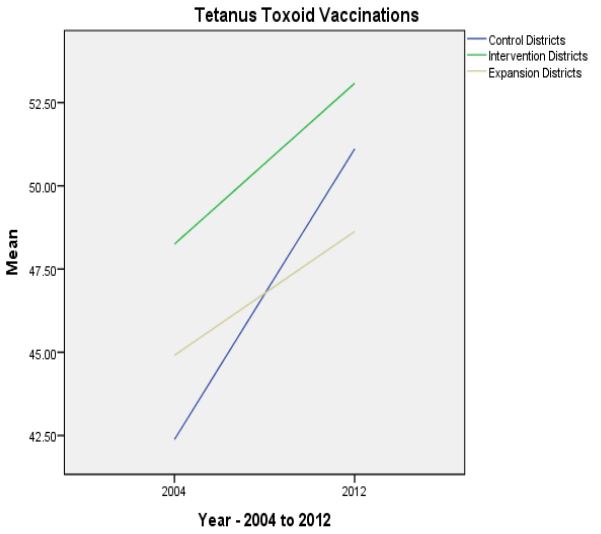


Lines represent mean values of district level pre-natal care utilization rates for all three groups

Figure 5.1 represents the utilization of prenatal care services in the intervention, expansion and control districts. While the number of women seeking prenatal care in the original intervention districts was higher than the control and expansion districts in 2004, the prevalence of women making at least one prenatal care visit increased only by a slightly higher margin in the original intervention districts, represented by the green line, as compared to control and expansion groups between 2004 and 2012,

represented by the almost parallel slopes of the yellow and blue lines. Increase in the prenatal care utilization in the expansion and control districts show a similar slope pattern, indicating that the likelihood of women seeking prenatal care in expansion and control districts improved by the same margin.

Figure 5.2 Tetanus Toxoid Vaccinations

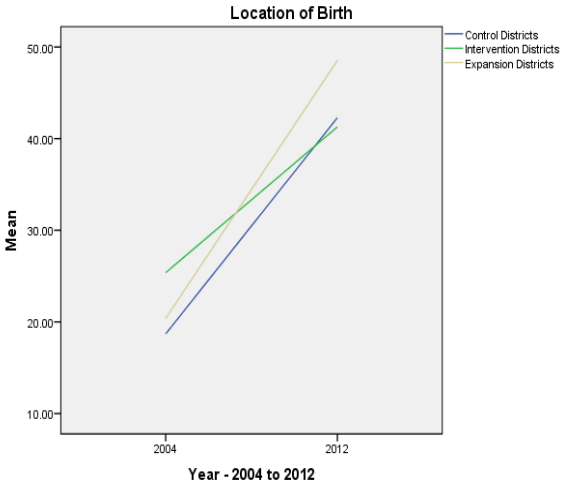


Lines represent mean values of district level Tetanus Toxoid Vaccination utilization rates for all three groups

Figure 5.2 represents the trends in women getting at least one tetanus toxoid vaccination during their last pregnancy between 2004 and 2012. While the vaccination rates in original intervention districts (green) were higher in 2004 and 2012 as compared to control and expansion groups, the steeper slope of the control group represented by the blue line shows that the vaccination rates improved more dramatically in the control districts as compared to the intervention and expansion districts.

Figure 5.3. Location of Birth

Figure 5.3 shows an increasing trend of women giving birth in health facilities in the expansion and control group districts (blue and yellow) from 2004 to 2012. While this trend is also observed in the original intervention districts, the mean

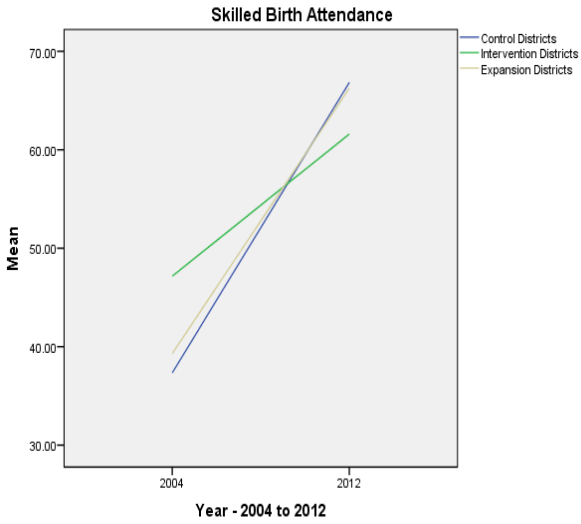


Lines represent mean values of district level Health Facility Birth rates for all three groups

percentage of women in these districts (represented by the green line) is lower than the comparison groups.

Figure 5.4 shows the trends in women having a skilled birth attendant present at the time of delivery. The slope of the control and intervention districts (yellow and blue lines) is much steeper than that of the original intervention districts (green line). Not only did the original intervention districts have higher rates of skilled birth attendance in 2004, the rate of increase in these districts lagged behind that of the comparison group districts.

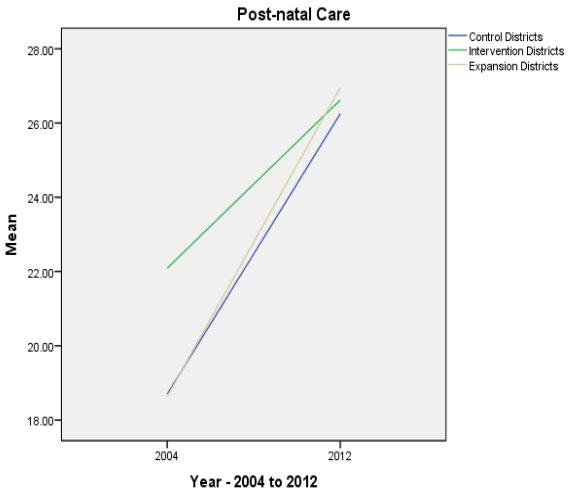
Figure 5.4 Skilled Birth Attendance



Lines represent mean values of district level Skilled Birth Attendance rates for all three groups

The increase in utilization of postnatal care, represented in figure 5.5, was similar in terms of the rate of increase between 2004 and 2012 in the control and expansion districts (blue and yellow lines). The utilization of post natal care in the original intervention districts was higher in 2004 as compared to the expansion and control districts but improved to

Figure 5.5 Post natal Care



Lines represent mean values of district level Post-Natal Care utilization rates for all three groups

approximately a similar level as the two comparison groups.

Chapter 6

RESULTS

6.1 Descriptive Statistics

The socio-economic factors discussed in Chapter 5 are detailed in table 6.1 and 6.2. Illiteracy among women declined from 73.9% to 60.4%, 78.1% to 67.0% and 76.3% to 63.5% in the intervention, expansion and control districts respectively between 2004 and 2012 (see Table 6.1). All levels of educational attainment among women, with the exception of informal education, were seen to increase between three to six percent, pre-to post-intervention for all three groups

Table 6.1. Educational Attainment of women

Education	**2004 – Pre-Intervention (Valid Cases=29903)**			**2012- Post-Intervention (Valid Cases=24803)**		
Educational Attainment	Intervention Districts	Expansion Districts	Control Districts	Intervention Districts	Expansion Districts	Control Districts
Illiterate	73.9%	78.1%	76.3%	60.4%	67.0%	63.5%
Informal Education	1.0%	0.4%	0.5%	1.2%	0.6%	1.0%
Class 1-5	8.8%	7.5%	9.0%	14.2%	10.5%	12.8%
Class 6 -10	10.7%	9.5%	10.1%	15.3%	13.8%	15.2%
College and Above	5.6%	4.5%	4.0%	9.0%	8.1%	7.6%
Total	100%	100%	100%	100%	100%	100%

Income distributions (see Table 6.2) show a decline in the proportion of people living below the poverty line in all three groups between 2004 and 2012. The percentage of people living with less than a dollar a day decreased from 25.8 to 20.1, 23.1 to 17.5 and 23.0 to 21.8 in the intervention, expansion and control districts. While the two middle income quintiles show variation, the proportion of people in the highest income quintile increased in all three groups; from 16.2% to 26.4% in the intervention districts, 24.0% to 35.3% in the expansion districts and 23.0% to 26.3% in the control districts.

Table 6.2 – Household Income

Household Income	**Pre-Intervention 2004 (Valid Cases=29903)**			**Post-Intervention 2012 (Valid Cases=24803)**		
CPI Adj. Income	Intervention Districts	Expansion Districts	Control Districts	Intervention Districts	Expansion Districts	Control Districts
PKR 0-3000	25.8%	23.1%	23.0%	20.1%	17.5%	21.8%
PKR 8,001-16,000	40.4%	35.3%	35.7%	32.6%	27.3%	32.3%
PKR 16,001-24,000	17.5%	17.7%	18.3%	20.9%	19.9%	19.6%
PKR 24,001 and above	16.2%	24.0%	23.0%	26.4%	35.3%	26.3%

Note: Adjusted for CPI and expressed in terms of 2004 wages.

Table 6.3 details the demographic characteristics of the intervention and control

groups in 2004 and 2012. In 2004, 27.1% of the original intervention districts, 36.1% of the expansion districts and 25.7% of the control group districts were urban. This number increased across all three groups to 30.7%, 37.5% and 28.5% in 2012 respectively.

Table 6.3. Region (Urban/Rural)

Region:	**Pre-Intervention – 2004 (Valid Cases=29903)**			**Post-Intervention – 2012 (Valid Cases=24803)**			
Pre-Intervention	Urban	Rural	Total	Post-Intervention	Urban	Rural	Total
Intervention Districts	27.1%	72.9%	100%	Intervention Districts	30.7%	69.3%	100%
Expansion Districts	36.1%	63.9%	100%	Expansion Districts	37.5%	62.5%	100%
Control Districts	25.7%	74.3%	100%	Control Districts	26.4%	73.6%	100%
Total	27.3%	72.7%	**100%**	Total	28.5%	71.5%	**100%**

Table 6.4 represents the population distribution pre and post intervention in the four provinces of Pakistan. While minor population decrease was observed in intervention districts in Khyber Pakhtunkhwa (KPK), Sindh and Baluchistan pre and post intervention, it was offset by increases in the expansion and control districts.

Table 6.4 Provinces

Province:	**Pre-Intervention – 2004 (Valid Cases=29903)**				**Post-Intervention – 2012 (Valid Cases=24803)**			
	KPK	Punjab	Sindh	Baluchistan	KPK	Punjab	Sindh	Balochistan
Intervention Districts	11.7%	11.7%	13.2%	9.4%	10.2%	11.8%	11.9%	7.3%
Expansion Districts	29.7%	8.1%	6.9%	19.9%	27.8%	8.5%	8.8%	22.0 %
Control Districts	58.6%	80.2%	79.9%	70.7%	62.0%	79.7%	79.3%	70.6 %
Total	100%	100%	100%	100%	100%	100%	100%	100%

Access (see Table 6.5) was operationalized using distance from the nearest health facility expressed in terms of travel time, and means of transport utilized by respondents. A higher percentage of respondents reported being able to reach a health facility in less than or up to 14 minutes in 2012 as compared to 2004. Percentages increased from 32.1 to 38.9 in intervention districts, 41.8 to 43.9 in expansion districts and 35.4 to 46.4 in control districts. Correspondingly, a lower percentage of respondents in all three groups reported travel time to be an hour or more to reach the nearest health facility in 2012. While a slightly higher percentage of respondents relying on mechanized transport vehicles to travel to the health facilities in 2012 in intervention and expansion districts, no significant change was observed in the control districts.

Table 6.5 Access – Distance in minutes to the nearest health facility

Travel Time	**Access - 2004 – Pre-Intervention (Valid Cases=29896, missing= 7)**			**Access - 2012- Post-Intervention (Valid Cases=24803)**		
Minutes	Intervention Districts	Expansion Districts	Control Districts	Intervention Districts	Expansion Districts	Control Districts
0-14	32.1%	41.8%	35.4%	38.9%	43.9%	46.4%
15-29	26.0%	23.1%	23.4%	28.7%	32.1%	26.4%
30-44	19.4%	18.9%	20.1%	19.5%	15.8%	16.4%
45-59	6.5%	6.2%	6.7%	4.0%	3.0%	4.4%
60+	16.0%	10.1%	14.4%	8.9%	5.2%	6.3%
Total	100.0%	100.0%	100%	100.0%	100.0%	100.0%

Descriptive statistics for education of health of the household (see Table 6.6) yielded a similar trend as educational attainment of women (an overlap was observed with 6.3 percent (709) of the women in the sample reporting themselves as heads of households). Illiteracy decreased from 50.2% to 37.2%, 52.5% to 41.5% and 51.3% to 42.8% in the intervention, expansion and control districts from 2004 to 2012. With the exception of a 1.3% decrease in primary education in intervention districts, educational attainment was seen to increase across the board for all levels of education.

Table 6.6. Educational Attainment of head of household

Education –Head of Household	**2004 – Pre-Intervention (Valid Cases=29903, Missing=2)**			**Education –Head of Household 2012- Post-Intervention (Valid Cases=24803)**		
Head of Household Education	Intervention Districts	Expansion Districts	Control Districts	Intervention Districts	Expansion Districts	Control Districts
Illiterate	50.2%	52.5%	51.3%	37.2%	41.5%	42.8%
Informal Education	0.9%	1.2%	1.1%	3.4%	3.5%	1.9%
Class 1 - 5	18.2%	13.8%	15.8%	16.9%	15.7%	17.6%
Class 6 - 10	20.7%	21.1%	22.2%	27.8%	25.2%	26.4%
College and Above	10.0%	11.4%	9.7%	14.7%	14.1%	11.3%
Total	100%	100%	100%	100%	100%	100%

The mean age of respondents was 29.05 years (28.97. 29.13) in 2004, and 28.84 years (28.76, 28.91) in 2012. The variation in age in intervention, expansion and control districts in 2004 was minimal, detailed in table 6.7.

Fewer than 20% of the respondents were engaged in employment or other income generating activities in across all three groups for 2004 and 2012. While the percentage of employed women increased from 13.3% to 15.6% and 14.7% to 19.3% in the intervention and control districts, it increased a small fraction (0.1%) in the expansion districts (see Table 6.8).

Table 6.7. Age distribution of sample respondents

Pre-Intervention 2004 (Valid Cases=29903)				**Post-Intervention 2012 (Valid Cases=24803)**	
Mean Value		29.05	Std. Error = 0.042	28.84	Std. Error = 0.040
95% CI	Lower Bound	28.97		28.76	
	Upper Bound	29.13		28.91	
Standard Deviation		6.932		6.25	
Minimum		10		16	
Maximum		49		49	
Range		39		33	
Interquartile Range		10		9	
Skewness		0.524	Std. Error = 0.014	0.587	Std. Error = 0.016
Kurtosis		-0.317	Std. Error = 0.028	-0.084	Std. Error = 0.031

Control Districts	Mean	29.14	Mean	28.94
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
	29.04	29.23	28.85	29.03
Intervention Districts	Mean	28.89	Mean	29.04
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
	28.66	29.12	28.80	29.29
Expansion Districts	Mean	28.75	Mean	28.19
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
	28.54	28.96	27.99	28.39

Table 6.8. Percentage of women engaged in employment

Employment	**2004 – Pre-Intervention (Valid Cases=29903)**			**2012 – Post-Intervention (Valid Cases=24803)**		
Women Employed	Intervention Districts	Expansion Districts	Control Districts	Intervention Districts	Expansion Districts	Control Districts
Yes	13.3%	10.9%	14.7%	15.6%	11.0%	19.3%
No	85.3%	89.1%	86.7%	84.4%	89.0%	80.7%
Total	100%	100%	100%	100%	100%	100%

Table 6.9 represents the percentage of women who received prenatal care, tetanus toxoid vaccinations, gave birth in a health facility, had skilled providers present during birth, and received post-natal care, in 2004 and 2012. The proportion of women receiving all five maternal health care services increased significantly between 2004 and 2012. Most prominently, women reporting utilization of at least one prenatal care visit increased by 21% in the intervention districts, 18.4% in expansion districts and 17.5% in control districts. Women who reported receiving at least one tetanus toxoid vaccination increased by 7.6%, 1.8% and 7.5% in the intervention, expansion and control districts.

Table 6.9 Dependent Variables

Outcome Indicators	**Pre-Intervention 2004 (Valid Cases=29903)**			**Post-Intervention 2012 (Valid Cases=24803)**		
Maternal HSB	Intervention Districts	Expansion Districts	Control Districts	Intervention Districts	Expansion Districts	Control Districts
Pre-Natal Care (Yes)	50.0%	44.2%	44.7%	71%	62.6%	62.2%
TT Vaccinations	49.3%	49.3%	45.5%	56.9%	51.1%	53.0%
Health facility Birth	25.5%	23.3%	21.4%	42.8%	49.1%	43.4%
Skilled Attendance	45.4%	44.6%	40.0%	64.2%	69.0%	70.3%
Post-Natal Care (Yes)	23.1%	20.4%	19.5%	28.3%	26.4%	27.4%

Percentage of women who gave birth in a health facility increased by 17.3%, 25.8% and 22% while women who reported having a doctor, nurse or trained midwife present increased by 18.8%, 24.4% and 30.3% in the intervention, expansion and control districts. Post natal care was seen to be the least utilized service among the respondents, and only increased by 5.2%, 6% and 7.9% in the intervention, expansion and control districts between 2004 and 2012.

6.2 Bivariate Measures of Association

As discussed in Chapter 5, in order to ensure the relevance of each independent variable included in the model as a predictor of the five dependent variables, chi square was used as the bivariate measure of association. Furthermore, Crammers V was used to test the strength of the relationship. With the exception of the chi-square value for the relationship between education of the head of household and tetanus toxoid vaccinations, all values were significant at $p<0.001$.

6.3 Logistic Regression Model

The logistic regression model detailed in Tables 6.1.1 and 6.1.2 were developed using the blockwise entry method. SPSS 20 was used to run binary logistic regressions for all five outcome variables; prenatal care, tetanus toxoid vaccinations, birth location, skilled birth attendance and post natal care. This method was chosen over the stepwise methods because a wide range of existing literature documents the factors that contribute to the increased utilization of maternal health services. These

factors were added to the model in the order specified below based on their influence on maternal health seeking behavior as measured by the bivariate measures of association (Chi square and Crammer's V). Furthermore, -2 likelihood ratios and the Nagelkereke R (least squares) were used to assess the impact of the addition of each new variable into the model.

Model 1 represents the impact of the PAIMAN intervention on intervention districts in comparison to the control districts. The variable 'Year' included in the regression analysis acted as a control variable for the time trend attributed to advances in technology, cultural and religious shifts, urbanization and other non-quantifiable variables that impact women's likelihood of seeking care during or after pregnancy. Education and income were the most widely documented predictors of access to and utilization of health care services, also supported by the Chi-square and Crammer's V values. These were therefore, the first two comparison variables included in model 2. Region (urban/rural), a well-established predictor of physical access to health facilities and quality of care was included, followed by province and time-measure of physical accessibility (Time to the nearest health facility). Means of transport (mechanized/ non-mechanized/on-foot) was also initially included in the regression analysis (Model 2) but later removed from the models as a multicolinearity trend emerged in the residuals and the inclusion of these distorted the odds ratios and corresponding p values of other significant variables. Chi square and Crammer's V values for the association between the education of the head of the household (98.7% male) and

utilization of maternal health services by sample respondents supported the inclusion of this variable in model 2. In addition, since the training and awareness campaigns for male members of community were a prominent feature of the PAIMAN intervention, the impact of education was assessed in comparison to that of the intervention activities targeted towards men. Lastly, employment was added to the regression model. However this variable was not found to be a significant predictor of access to or utilization of maternal health services and was removed. Because no significant variation in the age across pre and post intervention sample respondents, or intervention and control district sample respondents, was observed (table 6.7), this variable was also excluded from the model.

Table 6.1.1 represents the regression results and odds ratios for utilization of all five maternal health services by women. Model 1 represents the odds ratios for the likelihood of respondents residing in intervention and expansion districts making at least one pre natal care visit during the course of their pregnancy, in comparison to the control group respondents. Women in the original ten PAIMAN districts were more likely to seek prenatal care by a factor of 1.5 (95% CI: 1.36-1.63. $p<0.001$). The odds ratio of women in expansion districts seeking prenatal care were approximately the same as those of women in the control districts, however the results were not significant ($p>0.05$).

Table 6.10 – Logistic Regression Model 1

N = 54706 (Valid Cases)					
Model 1	**Prenatal Care**	**TT Vaccinations**	**Location of Birth**	**Skilled Birth Attendance**	**Postnatal Care**
	OR (95%CI)				
No Intervention	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)
PAIMAN Original	1.49 (1.36,1.63)	1.17 (1.08,1.27)	0.97** (0.90,1.06)	0.76 (0.70,0.83)	1.05** (0.96,1.15)
PAIMAN Expansion	1.02** (0.95,1.10)	0.92* (0.86,0.99)	1.26 (1.17,1.35)	0.94** (0.87,1.02)	0.95** (0.88,1.03)
-2 Likelihood (block 1)	73727.69	75479.18	65636.00	71029.61	59058.51
Nagelkerke R	0.04	0.01	0.08	0.10	0.01

**Not Significant at p<0.001*
***Not Significant at p<0.05*

The PAIMAN intervention was seen to have a small impact on the likelihood of women in intervention districts seeking tetanus toxoid vaccinations (OR 1.2, 95% CI: 1.08-1.27, p<0.001). In the expansion districts this trend was reversed, and women here were 0.08 times less likely to receive the vaccination as compared to the control districts (95% CI: 0.86-0.99, p<0.05).The intervention had no significant impact on improving the likelihood of women giving birth in a health facility (OR 0.97, 95% CI: 0.90-1.06, p>0.05), or receiving post-natal care (OR 1.05, 95% CI: 0.96-1.15, p>0.05). Furthermore, based on the sample data, the likelihood of women in intervention

districts having a skilled birth attendant present at the time of delivery was 0.24 times less compared to women in control districts (95% CI: 0.70-0.83, $p<0.001$). The regression model did not yield significant results for respondents in expansion districts for skilled birth attendance (OR 0.94, 95% CI: 0.87-1.02, $p>0.05$) and post-natal care (OR 0.95, 95% CI: 0.88-1.03, $p>0.05$). The odds of women giving birth in a health facility however were higher for respondents in expansion districts as compared to the control districts (OR 1.3, 95% CI: 1.17-1.35, $p<0.001$).

Model 2 was developed with the addition of educational attainment of the women, income, region, province, travel time to nearest health facility and education of head of the household to model 1 (graphical representation – Appendix B). The odds of women receiving prenatal care in the original PAIMAN districts remained consistent through models 1 and 2, indicating that PAIMAN had an independent effect on improving the likelihood of women receiving prenatal care by a factor of 1.5 in original PAIMAN districts, as compared to women in the control districts. Prenatal care remained statistically non-significant in PAIMAN expansion districts in both models. The likelihood of women being vaccinated for tetanus also remained consistent at approximately 1.1 (Model 4 - 95% CI 1.01-1.21. $p<0.05$) despite the addition of other predictors. With the addition of region, province and time to nearest health facility in model 2, the odds of women receiving tetanus vaccinations in expansion districts remain non-significant in model 2.

The odds of women giving birth in a health facility in model 2 (statistically

non-significant in models 1) were 0.1 times lower in original PAIMAN districts as compared to control districts (95% CI: 0.82-0.99. $p<0.05$). In the expansion districts women were more likely to give birth in a health facility by a factor of 1.2 (95% CI: 1.13-1.32, $p<0.001$) in model 2. Skilled birth attendance in original PAIMAN districts was less likely by a ratio of 0.3 (95% CI: 0.62-0.75. $p<0.001$) in model 2, as compared to the control districts, while in the expansion districts skilled birth attendance became statistically non-significant. The likelihood of women receiving post natal care was also statistically non-significant in both regression models in the original PAIMAN districts. In the expansion districts, the likelihood of women receiving post natal care was 0.1 times less than the control districts (95% CI: 0.83-0.98. $p<0.05$).

As with educational attainment of women, odds of women receiving care improved consistently as the level of education of heads of households increased. Informal education of heads of households however, was not significant in the likelihood of women receiving tetanus toxoid vaccinations, giving birth in a health facility and having a skilled attendant present at the time of birth. Conversely, informal education of women was not statistically significant in the location of birth and post natal care. This finding may have important implications for the impact of literacy (as opposed to formal education) of women and men on maternal health seeking.

The odds ratios tabulated in model 2 also show the comparative significance of each of the independent variables as a predictor of maternal health seeking behavior.

The odds of women receiving prenatal care were highest for women who had received college education (OR 3.1, 95% CI: 2.78-3.44, p<0.001), followed by women who reported having received secondary education (OR 2.3, 95% CI: 2.12-2.41, p<0.001). Women who had some informal education and were literate had higher odds of receiving prenatal care compared to all other independent variables, by a factor of 2.1 as compared to women who were illiterate (95% CI: 1.70-2.66, p<0.001). Income had a reserved effect on prenatal care, with the highest income quintile being more likely to seek prenatal care by a factor of 1.6 (95% CI: 1.47-1.65, p<0.001) as compared to the lowest income quintile. Region as an independent predictor of receiving prenatal care shows approximately twice as high odds for women in urban areas compared to those in rural areas (OR 2.3. 95% CI: 2.23, 2.41. p<0.001). However, when other geographically oriented variables are added to the model, these odds decrease to 1.4 (95% CI: 1.33, 1.46. p<0.001), suggesting significant interaction between region and province, travel time to nearest health facility, education and finally, income[15]. The effect of education of head of household on prenatal care was significantly mitigated by the addition of other predictor variables. Despite this, the odds ratios show an increasing trend in the likelihood of women in households with more educated heads receiving prenatal care.

Province was the most significant predictor of women receiving the tetanus

[15] This interaction effect was statistically verified, but not reported in this research because it lies beyond the purpose and scope of this paper.

toxoid vaccination in Model 2. Compared to women in Baluchistan, women in Punjab were 4.9 times (95% CI: 4.60-5.21. p<0.001), women in KPK, 3.0 times (95% CI: 2.81-3.20. p<0.001) and women in Sindh were 2.4 times (95% CI: 2.20-2.51. p<0.001) more likely to receive the tetanus toxoid vaccination. Education was also a significant predictor with women with informal education being 1.5 times (95% CI: 1.20-1.83. p<0.001) and college educated women being 3.2 times (95% CI: 2.92-3.60. p<0.001) more likely to receive tetanus vaccinations as compared to illiterate women. Region (OR 1.3. 95% CI: 1.24-1.37. p<0.001) showed similar interaction effects in "tetanus toxoid vaccinations" as in "prenatal care". The impact of distance to the nearest health facility and education of head of household on women being vaccinated was also approximately the same as that on the likelihood of women receiving prenatal care.

The likelihood of women giving birth in a health facility was only slightly impacted by women's education. Informal education had a statistically non-significant impact on the likelihood of women giving birth in a health facility. Women with primary education were 1.7 times (95%CI: 1.59-1.80. p<0.001) and college education women were as much as 4.4 times (95% CI: 4.03-4.85. p<0.001) more likely to give birth in a health facility. While distance from the nearest health facility and education of the head of household followed a similar pattern of odds ratios as the tetanus toxoid vaccinations, the second income quintile became statistically non-significant in model 2. This discrepancy may also be a reflection of the ability of women from households living just above the poverty line to receive maternal care in formal health care

institutions. The previously observed interactions between region and other independent variables were also observed in 'location of birth'.

The two most significant predictors of skilled birth attendance were educational attainment of women and the respective province where they maintained residence. Women with informal education were 2.7 times (95% CI: 2.09-3.39. $p<0.001$) and college educated women were 3.4 times (95% CI: 3.03-3.84, $p<0.001$) more likely to have a skilled birth attendant present as compared to illiterate women. Sample respondents who were residents of the Punjab province were 2.7 times (95% CI: 2.53-2.85. $p<0.001$), residents of Sindh 1.8 times (95% CI: 1.73-1.95. $p<0.001$) and residents of KPK 2.0 times (95% CI: 1.89-2.15. $p<0.001$) as likely to have skilled birth attendants compares to residents of the Baluchistan province. Women living in urban areas were 1.7 times (95% CI: 1.59-1.75. $p<0.001$) more likely to have a skilled attendant present at birth. The impact of region diminished as other variables were added to the model, as in the case of the three previous dependent variables. The impact of distance from the nearest health facility and education of the head of household on the odds of women having a skilled attendant present at the time of delivery was also similar to the impact of these variables on the likelihood of women receiving prenatal care.

Lastly, the odds of women receiving post natal care were also predominantly predicted by the level of education of the woman. While informal education was statistically non-significant, women who had received primary education were 1.3

times (95% CI: 1.23-1.41. p<0.001) and college educated women were 2.5 times (95% CI: 2.26-2.68. p<0.001) more likely to receive post natal care. Women in Sindh had slightly higher odds of receiving post natal care as compared to women in Baluchistan (OR 1.5. 95% CI: 1.07-1.24. p<0.001). The odds of women in Punjab and KPK receiving post natal care were negligibly higher. The odds of women receiving post natal care in urban areas (OR 1.3. 95% CI: 1.23-1.36. p<0.001) were higher than rural. As with all previous dependent variables discussed, the impact of region on maternal health seeking behavior diminished as addition predictive variables were incorporated into the model. Distance from the nearest health facility and education of the head of household showed similar pattern of odds ratios as observed in the regression model results for prenatal care.

Table 6.11 – Logistic Regression Model 2
**Not Significant at p<0.001*
***Not Significant at p<0.05*

Adjusted for income education region physical access province and head of household education					
Model 2	**Prenatal Care**	**TT Vaccinations**	**Location of Birth**	**Skilled Birth Attendance**	**Postnatal Care**
PAIMAN Original	1.49 (1.36,1.64)	1.11* (1.01,1.21)	0.90* (0.82,0.99)	0.68 (0.62, 0.75)	0.99** (0.90,1.08)
PAIMAN Expansion	1.07** (0.98,1.16)	1.02** (0.94,1.10)	1.22 (1.13,1.32)	0.94** (0.86, 1.02)	0.90* (0.83,0.98)
Illiterate	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)
Informal Education	2.13 (1.70,2.66)	1.48 (1.20, 1.83)	1.11** (0.89,1.39)	2.66 (2.09, 3.39)	1.17** (0.93,1.48)
Class 1-5	1.60 (1.51,1.71)	1.70 (1.60, 1.81)	1.70 (1.59,1.80)	1.62 (1.52, 1.73)	1.32 (1.23,1.41)
Class 5-10	2.26 (2.12,2.41)	2.48 (2.33, 2.65)	2.59 (2.43,2.75)	2.22 (2.07, 2.38)	1.76 (1.65, 1.88)
College &	3.09	3.24	4.43	3.41	2.46

Above	(2.78,3.44)	(2.92, 3.60)	(4.03,4.85)	(3.03, 3.84)	(2.26, 2.68)
Income (PKR 0-3000)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)
PKR (3001-6000)	1.16 (1.10,1.21)	1.20 (1.14, 1.26)	1.03** (0.98,1.09)	1.16 (1.10, 1.22)	1.09* (1.03,1.16)
PKR (6001-9000)	1.30 (1.23,1.38)	1.34 (1.26, 1.42)	1.23 (1.15,1.31)	1.32 (1.25, 1.40)	1.30 (1.22,1.40)
PKR 9001 and above	1.56 (1.47,1.65)	1.77 (1.66, 1.87)	1.49 (1.40,1.59)	1.66 (1.56, 1.77)	1.60 (1.49, 1.71)
Region	1.38 (1.31,1.44)	1.30 (1.24, 1.37)	1.52 (1.44,1.58)	1.67 (1.59, 1.75)	1.30 (1.23, 1.36)
Health Facility 60+ minutes	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)
0-14 minutes	1.67 (1.56,1.79)	1.81 (1.68,1.94)	1.65 (1.52,1.80)	1.96 (1.82,2.11)	1.68 (1.53,1.85)
15-29 minutes	1.47 (1.37,1.58)	1.61 (1.49,1.73)	1.49 (1.36,1.62)	1.82 (1.69,1.96)	1.68 (1.53,1.84)
30-44 minutes	1.37 (1.28,1.47)	1.45 (1.34,1.56)	1.28 (1.17,1.40)	1.43 (1.32,1.54)	1.47 (1.33,1.62)
45-59 minutes	1.33 (1.21,1.46)	1.33 (1.21,1.47)	1.33 (1.18,1.49)	1.43 (1.30,1.58)	1.26 (1.11,1.43)
Province - Baluchistan	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)
Punjab	1.77 (1.68,1.88)	4.89 (4.60,5.21)	1.36 (1.27,1.45)	2.68 (2.53, 2.85)	1.10* (1.02,1.17)
Sindh	1.57 (1.48,1.67)	2.29 (2.14,2.44)	1.57 (1.46,1.68)	1.83 (1.72, 1.95)	1.53 (1.42,1.64)
KPK	1.23 (1.16,1.31)	3.04 (2.84,3.25)	1.56 (1.45,1.67)	2.02 (1.89,2.15)	1.15 (1.07,1.24)
HoH Education - Illiterate	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)	1.0 (Ref)
Informal	1.25* (1.09,1.45)	1.11** (0.96, 1.29)	1.08** (0.92,1.27)	1.08** (0.93, 1.26)	1.25* (1.06, 1.48)
Class 1-5	1.19 (1.13,1.25)	1.23 (1.17, 1.30)	1.18 (1.11,1.25)	1.18 (1.12, 1.24)	1.15 (1.09,1.23)
Class 5-10	1.32 (1.26,1.39)	1.37 (1.31, 1.44)	1.37 (1.30,1.44)	1.32 (1.25, 1.38)	1.36 (1.29,1.43)
College & Above	1.66 (1.55,1.78)	1.65 (1.54, 1.77)	1.78 (1.66,1.91)	1.54 (1.43, 1.66)	1.64 (1.53,1.76)
-2 log likelihood	67842.54	65256.07	58840.17	63165.67	55590.40
Nagelkerke R	0.18	0.23	0.23	0.27	0.10

Chapter 7

DISCUSSION AND CONCLUSIONS

This thesis aimed to move beyond a critique of maternal health interventions in Pakistan to identify the reasons behind their limited impact. To this end, this research was modeled as an evaluation that serves to add to the limited body of evidence on the effectiveness of these interventions in the country. The PAIMAN project was chosen particularly because it is one of the largest and most well documented maternal health programs implemented in Pakistan. While the PAIMAN model is a widely acclaimed maternal and neonatal health intervention framework, the strategic planning and implementation of the consequent project left much to be desired, as evident in the results of this thesis. The ambitious goals of the program to design a sustainable and replicable model with nationwide impact on maternal and neonatal health indicators were not matched by an equally efficient implementation design. Moreover, any progress in improving the intended health indicators was not validated through scientific evidence and this lack of a regimented monitoring and evaluation model was in turn attributed to a design flaw in the program model.

The PAIMAN project had three major components; communication strategy for behavior change, training of community health workers to improve the rates of skilled birth attendance and up gradation of health facilities to establish a functional

health system. PAIMAN's communication and advocacy strategy focused on media campaigns through workshops and community outreach. These activities however were heavily contingent upon the target population's ownership of a television/radio, literacy rates and religious orientation. The 2012-13 PSLM survey report states that 51 percent of the women in Pakistan aged 15 to 50 have no exposure to any mass media on a weekly basis (NIPS, 2013). These numbers are worse when the electricity shortage in the country that causes up to 16 hour outages is taken under consideration. 43 percent of the women aged 15 to 50 are illiterate. These rates were significantly lower in 2006 (35 percent) and lower still, in 2004 (NIPS, 2008). Lastly, a large majority of the most economically vulnerable and socially marginalized population of the country is comprised of religious minorities; Christians, Hindus and Ahmedis. Estimated at approximately 12 million, these minorities face institutionalized discrimination and a significant number are slum dwellers in urban areas (Malik, 2002).

The training of lady health workers, traditional birth attendants and hospital staff, while resourceful strategies, were poorly planned and executed. In the absence of training quality standards and long term follow up evaluations, the impact of the community health worker training program cannot be determined. Poor training and unskilled assistance during pregnancy and child birth could not only prove to be dangerous for the mother and infant but also serve to discredit the community health worker program in the local communities.

PAIMAN investment in the health infrastructure in rural districts was a vital component of the program. However, this investment was not adequately monitored for outcomes and overall impact. Furthermore, functional health facilities can only have long lasting impact if complimented by a trained medical staff and increased service utilization rates among patients, which are two of the more substantiated caveats of PAIMAN planning and implementation strategy. A prominent feature of the PAIMAN project was sustainability; however post completion, follow up program evaluations that could attest to the lasting impact of PAIMAN were not carried out.

The methodology and results of this thesis have widespread implications for public health interventions, specifically in Pakistan and broadly in other developing country settings. Most significantly, the technique employed in this paper allowed for the analysis of the impact of the PAIMAN intervention, while controlling for a majority of known confounders, such as education, income, physical access and geographical location. Our analysis shows that the intervention had no significant impact on the likelihood of women in the original PAIMAN district giving birth in a health facility, having a skilled birth attendant present or receiving post natal care. It is pertinent to note here that the PAIMAN project objective identify skilled birth attendance as a key strategy to improve maternal and neonatal health outcomes. The residents of the PAIMAN districts however were no more likely to utilize this service as compared to the residents of the control group district.

The intervention increased the likelihood of women receiving antenatal care by a factor of 1.5. Women residing in PAIMAN intervention districts were also more

likely to receive Tetanus Toxoid Vaccinations by a factor of 1.2, as compared to women in control districts. In the expansion districts, women were 1.3 times more likely to give birth in a health facility. However, the impact of PAIMAN in the expansion districts was not statistically significant for any of the other four indicators. Notably, skilled birth attendance, a key strategy identified by PAIMAN to cater to maternal mortality in the country, was a service approximately 0.3 times more likely to be used in districts that did not receive the PAIMAN intervention.

The addition of demographic and socioeconomic indictors fulfilled a dual purpose. Firstly, this allowed for an analysis of the impact of PAIMAN on the five identified outcome variables while removing possible confounding effects. Secondly, the addition of these variables in the models allowed for an insight into the impact of exposure to PAIMAN in comparison to the impact of educational attainment, geographical location, physical access and income. The results not only show that all of the six additional variables included in the regression model had a significantly larger impact on the likelihood of women utilizing maternal health services, but also that the impact of PAIMAN did not vary across income quintiles, educational attainment categories, geographical location or physical access. The implication of this finding is that PAIMAN was unable to capitalize on the existing strengths of the target population. Furthermore, the program failed to improve the likelihood of vulnerable, low income and illiterate rural populations to seek care.

As demonstrated by previous research, education and income were the two most significant predictors of women utilizing maternal health services. Women in

urban areas were also far more likely to access these services. Physical access and geographical location was also a significant predictor of maternal health seeking. Lastly, the health disparities existing not only within provinces (rural/urban divide) but also between provinces shed further light on the discrepancies in provision of quality maternal health services across the country.

The limitations of this study include the methodological constraints discussed in Chapter 4 as well as the data limitations in operationalization of the independent variables. The most significant shortfall of this research however is the use of outcome indicators as opposed to impact indicators (maternal mortality and morbidity). In addition, the findings of this study may vary with the inclusion of data from more than two time points (for example utilization of the difference in difference in difference technique). In addition, while the PAIMAN intervention was assumed to have facilitated the entire population of the targeted districts, not all of the sample respondents of the PSLM survey (2004-05 and 2012-13) used in this study may have been exposed to the intervention , and therefore do not represent accurately the impact of the behavior change strategies employed by the program. Lastly, due to the poor maternal health indicators in the country, multiple on going interventions are targeting high impact areas in the country, particularly in rural settings. While these interventions are not specific to control group districts and are evenly spread out between the three comparisons groups used in this thesis, the likelihood of a concentration of efforts on a sub group within the control group, leading to an increased probability of maternal health service utilization, was not investigated.

Lastly, this paper investigated the behavioral change PAIMAN aimed to accomplish and therefore focused on service utilization as opposed to service availability. In addition, little or no data documenting the availability and quality of services provided in the PAIMAN exposure districts are publically accessible.

Future research should replicate this research model to assess the impact of PAIMAN with more comprehensive data, at more than two time points, between the initiation of the PAIMAN project (2004) to date. Furthermore, Pakistan's National Maternal and Child Health Program, initiated in 2006 must reevaluate the policy implications of building on the PAIMAN model to devise the national maternal, neonatal and child health program framework. Lastly, the monitoring and evaluation framework of programs as vast and costly as PAIMAN must be designed in a comprehensive manner, with the participation of all stakeholders, prior to project implementation. Parallel monitoring systems must be put in place to appropriately counter reporting bias evidenced in PAIMAN evaluation reports published by implementing agencies.

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Appendix A

METHODOLOGY – DIVISION OF DISTRICTS

Table A.1 – Division of districts for regression analysis

	PAIMAN Intervention Districts		**PAIMAN Expansion Districts**
	Punjab		**Punjab**
1.	Dera Ghazi Khan	1.	Multan
2.	Khanewal	2.	Vehari
3.	Jehlum	3.	**Khyber Pakhtunkhwa**
4.	Rawalpindi	4.	Dera Ismail Khan
	Khyber Pakhtun Khwa		Swat
5.	Bonair	5.	Mardan
6.	Upper Dir	6.	Charsadda
	Sindh		Peshawar
7.	Dadu	7.	**Sindh**
8.	Sukkur	8.	Khairpur
	Baluchistan		**Baluchistan**
9.	Lasbella	9.	Gawadar
10.	Jafferabad	10.	Quetta
		11.	Sibbi
		12.	Zhob

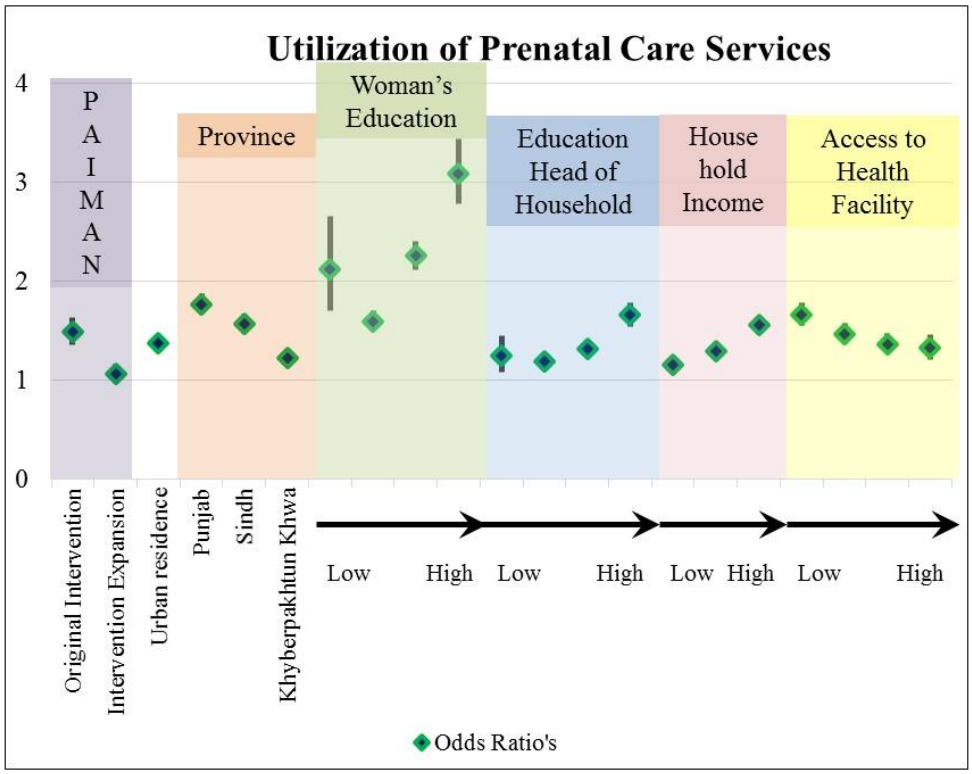
Control Districts (No PAIMAN intervention)			
	Punjab	37.	Abbotabad
1.	Attock	38.	Batagram
2.	Chakwal	39.	Kohistan
3.	Sargodah	40.	Haripur
4.	Bhakkar	41.	Bannu
5.	Khushab	42.	Lakki Marwat
6.	Mianwali	43.	Swabi
7.	Faisalabad		**Sindh**
8.	Jhang	44.	Nawabshah
9.	Toba Tek Singh	45.	Noshero Feroz
10.	Gujranwala	46.	Ghotki
11.	Gujrat	47.	Jacobabad
12.	Sialkot	48.	Shikarpur
13.	Hafizababd	49.	Larkana
14.	Mandi Bahawdin	50.	Hyderabad
15.	Narowal	51.	Badin
16.	Kasur	52.	Thatta
17.	Okara	53.	Sanghar
18.	Shekhupura	54.	Mirpurkhas
19.	Sahiwal	55.	Tharparkar
20.	Pakpattan		**Baluchistan**

21.	Loralai	56.	Peshin
22.	Rajanpur	57.	Qilla Abdullah
23.	Layyah	58.	Chaghi
24.	Muzaffargarh	59.	Ziarat
25.	Bahawalpur	60.	Kalat
26.	Bahawalnagar	61.	Mustang
27.	Rahim Yar Khan	62.	Khuzdar
	Khyber Pakhtunkhwa	63.	Awaran
28.	Lower Dir	64.	Kharan
29.	Chitral	65.	Ketch/Tarbat
30.	Shangla	66.	Loralai
31.	Malakand	67.	Barkhan
32.	Nowshera	68.	Musa Khel
33.	Karak	69.	Qilla Saifullah
34.	Hangu	70.	Nasirabad
35.	Tank	71.	Jhal Magsi
36.	Mansehra	72.	Bolan/Kachi
PAIMAN Expansion districts not included in analysis			
1.	Bhimber		**Azad Jammu and Kashmir**
2.	Sidhnoti		

Appendix B

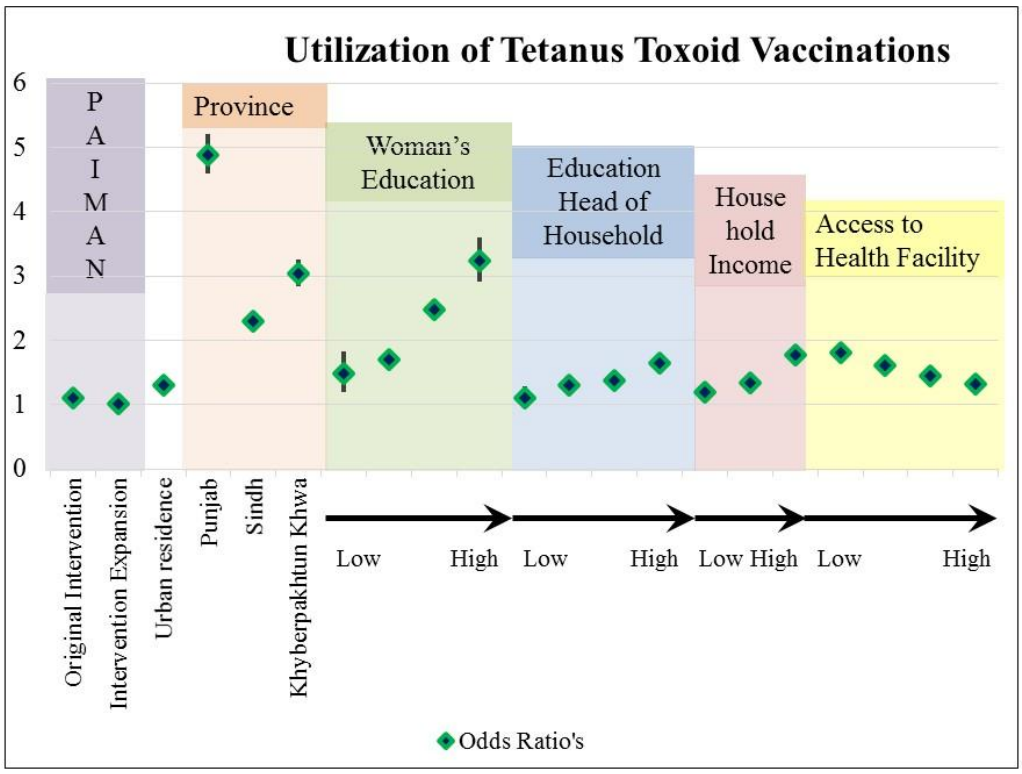
GRAPHICAL REPRESENTATION OF REGRESSION RESULTS

Figure B.1 Odds Ratios and 95% confidence Intervals of Utilization of Prenatal Care Services (Model 2).



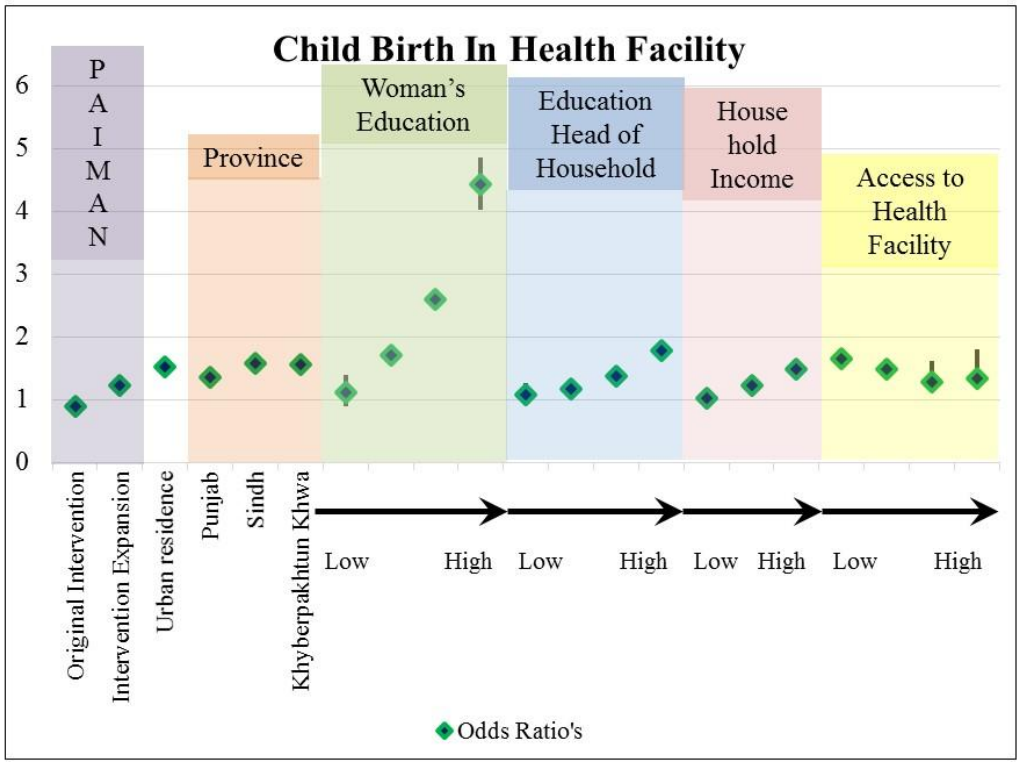
Note: Access to Health Facility was measured in terms of distance in minutes from the nearest health facility.

Figure B.2 Odds Ratios and 95% confidence Intervals of Utilization of Tetanus Toxoid Vaccinations (Model 2).



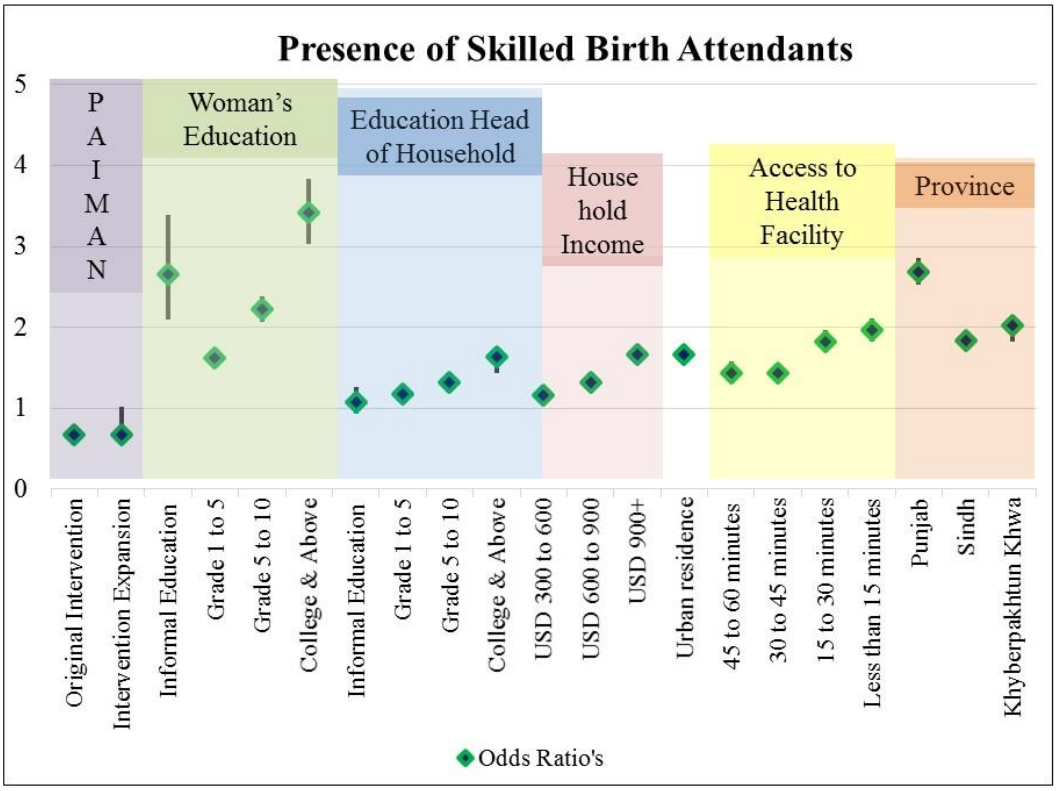
Note: Access to Health Facility was measured in terms of distance in minutes from the nearest health facility.

Figure B.3 Odds Ratios and 95% confidence Intervals of women giving birth in a health facility (Model 2).



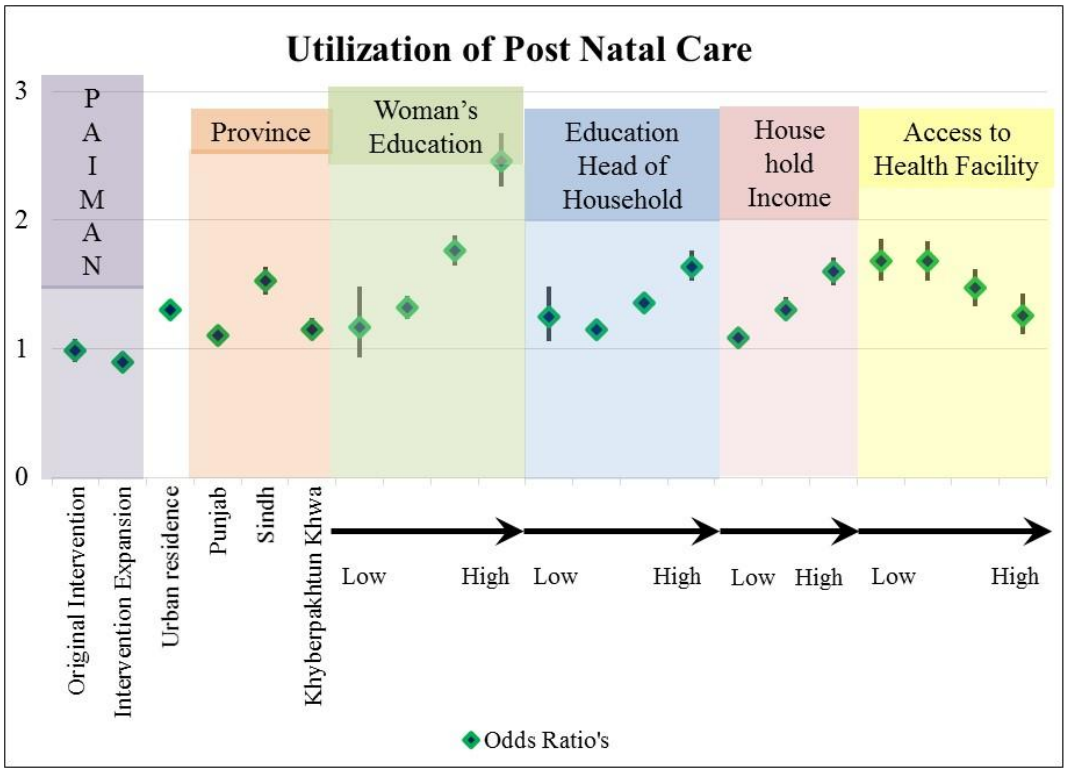
Note: Access to Health Facility was measured in terms of distance in minutes from the nearest health facility.

Figure B.4 Odds Ratios and 95% confidence Intervals of having a skilled birth attendant present at the time of delivery (Model 2).



Note: Access to Health Facility was measured in terms of distance in minutes from the nearest health facility.

Figure B.5 Odds Ratios and 95% confidence Intervals for utilization of post natal care services up to six weeks after delivery (Model 2).



Note: Access to Health Facility was measured in terms of distance in minutes from the nearest health facility.