Maternal Health, What Matters: A Study of Individual and Contextual Factors Related to Maternal Health Care Utilization

Sadaf Khan and Donna Strobino

Background and Rationale:

Globally an estimated 536, 000 women die each year in childbirth (WHO 2007). The United Nations Millennium Development Goal Number 5(a) is to reduce the maternal mortality ratio by three-quarters between 1990 and 2015 (UN 2000). For every woman who dies of maternal causes, it is estimated that approximately twenty to thirty more suffer serious disease or disability attributable to the same causes (Fortney 1999, Maine2000). Indeed, maternal death and disability are the leading cause of healthy years of life lost for women of reproductive age in developing countries (Abou Zahr 1999). Maternal mortality is closely intertwined with factors related to health care access, resource availability and socio-cultural issues, including women's status and beliefs regarding pregnancy and childbirth (McCarthy1992, Thaddeus1994, McCarthy1997). Additionally, the interplay between technical elements and the policy environment has also facilitated maternal mortality reduction in some settings while serving as an obstacle in others (Van Lerberghe 2001).

Underlying immediate medical causes is a complex network of determinants including socio-cultural factors and problems with access to health care that lead to maternal mortality. Reproductive health behaviors are strongly influenced by community norms, economic and social development, and community access to health services, particularly with regard to fertility-related behaviors and outcomes (Hirschman 1990, Midhet1998, Hoj2002, Stephenson2002, Stephenson 2006). These factors include the wealth of the community, access to facilities, staffing of facilities in the community as

well as gender-related factors such as women's education levels, women's autonomy and the status of women within the community.

Previous research has shown substantial variation both within and between countries in the determinants of health care seeking in the peripartum period. At the program level, resource allocation and health care system factors determine accessibility, availability and quality of care; these factors in turn influence care-seeking and health outcomes for the individual. There is identified need to focus on the macro structural determinants of health care seeking unique to the socio-cultural milieu. Context shapes women's beliefs and preferences regarding health care and thus directly influences their use of health care services. Say and colleagues (2007), in a systematic review of maternal health care utilization, found substantial differences both within and between countries on the variables that predicted maternal health care utilization. At an individual level, woman's education is one of the most consistent factors correlated with the use of maternal health care services across multiple settings, even though the magnitude of this relation varies across settings. Other variables such as age, parity, previous obstetric history, employment and socioeconomic status have a mixed effect on care-seeking behaviors, depending upon the setting.

Most literature on maternal health care utilization is focused on the antenatal and intrapartum periods. There is scant evidence on the prevalence or determinants of care seeking in the postpartum period. Most existing literature on postpartum care, particularly from developing countries, focuses on the infant and not the mother. The postpartum period constitutes an important transitional period and, given its importance to maternal health, there is a definite need to understand determinants of postnatal care.

The goal of this study was to add to the research on maternal health in Pakistan. Most studies of maternal health from Pakistan are either facility-based or based on small-scale surveys, predominantly from peri-urban areas. Nearly all exclusively focus on individual determinants. With sixty percent of the Pakistani population being rural, the available literature provides little information on health and health behaviors of a majority of Pakistani women. There also is a dearth of research on how individual health behaviors and outcomes are shaped by contextual factors in this setting

The objectives of the study were to first determine individual and contextual correlates of care seeking in the intrapartum period and second individual and community correlates of care seeking in the postnatal period in a nationally representative sample of Pakistani women aged 15-49.

Conceptual Framework

The study used an adapted framework that brings together the Behavioral Model of Health Services Utilization developed by Andersen and colleagues (1998) and the McCarthy-Maine (1992) framework for maternal mortality. Factors for health care utilization were classified as either predisposing, factors that affect the propensity of an individual to use services, such as age and those facilitating, or "enabling" care seeking, such as availability of social and economic resources at the individual and community levels. Factors related to actual or perceived severity of the illness or that were "need-related" were also included in the framework.

Methods:

Data Source and Study Participants

The source of data was the Pakistan Demographic and Health Survey 2006-07, a nationally representative sample of over 95,000 Pakistani households, selected using a

multi-stage sampling design. For a random sample of 10% of these households (and for all households reporting a death of an adult female of reproductive age) detailed information was collected on households and all married women aged15-49. For the purpose of the current research, women reporting at least one birth during the preceding five years formed the study sample (n=5,724). While delivery care information was available for all births in the last five years, only the last birth to each woman was considered. Reasons included the potential for increasing recall errors, the longer the recall period. Another reason is that health care utilization patterns in most cases are highly correlated for successive births to the same woman. Also, information on certain key independent variables of interest was available for only the most recent birth

Variables:

Table 1 presents the variables used in the data analyses and their definitions. A brief summary of the variables is outlined below:

Dependent variables

Maternal health service utilization was the outcome of interest. Three specific variables were examined, each defined as dichotomous: delivering with a "skilled" attendant (the WHO definition of a doctor, nurse or nurse midwife), delivery at a health facility (public or private), and receipt of any postnatal care with a skilled provider (WHO definition).

Independent variables:

Individual characteristics of women included age, parity, educational attainment, previous obstetric history, antenatal care, extent of birth preparation and asset ownership.

Community and health systems variables were the extent of availability of outreach services, level of community development and poverty concentration and contraceptive use in the community.

Data Analysis:

Frequency distributions and summary statistics including means and variance for quantitative variables and proportions for categorical variables were estimated using design-based analyses that took the complex survey design into consideration. Community level variables were created by aggregating relevant household (economic status, infrastructure availability) and individual variables (education, contraceptive use) at the PSU level. Simple logistic regression was used to assess the unadjusted effect of the independent variables on each outcomes. Variables with p values over 0.15 for the unadjusted effect were excluded from subsequent analyses, unless they were integral to the theoretical framework or hypotheses. Data were analyzed using Stata version 9.0.

Model building

Multilevel logistic regression models (Diez-Roux 2000, Rabe-Hesketh 2008) were used to take account of the hierarchical structure of the data. The multilevel random-effects model allows for identification of correlates of individual health at multiple levels and for analyses of contextual effects for population subgroups as well as the identification of clustering of outcome at different levels. The first step (Model1) included only the individual level "predisposing" variables, Model 2 included variables in Model 1 and the individual "enabling" variables, and Model 3 included variables in

Model 2 as well as PSU level variables. Each outcome was modeled as a binary variable with the assumption of a Bernoulli distribution, and the regression parameters for the individual and contextual variables are presented as odds ratios and their 95% confidence intervals. The value of the random parameters for each model was used to assess the extent of heterogeneity that was unexplained after addition of each subsequent group of variables.

Results:

Overall, 62% of all births did not occur at a health facility and the majority of women (53%) delivered without a skilled attendant. Slightly more than a quarter (27%) of women received postpartum care from a skilled attendant.

The use of health services is a function of both individual characteristics as well as characteristics of their environment. Results from the bivariate analyses are presented in Table 2; they indicate that the distribution of each outcome by the contextual and socio-demographic characteristics included in the final model.

There was an increasing trend for the use of services with increasing education, household wealth, and levels of antenatal care use and birth preparation. Parity was inversely related to the use of maternal health services.

Levels of maternal health care use varied significantly by context. Women in communities with higher levels of infrastructure availability tended to deliver in health facilities more often; the prevalence of institutional delivery varied from about 23 percent in communities with the lowest infrastructure availability to 74% of women in the communities with highest infrastructure availability. Women in these communities were also more likely to receive postpartum care (53% versus 15%). Maternal health care also differed by province of residence. The proportion of women using maternal health

services in Sindh was more than twice that in Balochistan. Availability of outreach services in the community had an inconsistent relation with maternal health care use in the bivariate analysis.

Multilevel Modeling

Table 3 shows the results from the hierarchical logistic regression for facility-based delivery, delivery with a skilled attendant and postpartum care. Initially only individual predisposing and need factors were included in the model (model I), followed sequentially by individual enabling and contextual variables (models II and III). Addition of each group of variables did not markedly alter the coefficients for the majority of the variables previously included in the model; the table therefore shows results for each outcome for the final, reduced model only. With few exceptions, the pattern of results for the socio-demographic and contextual variables was fundamentally similar for all three outcomes.

In bivariate analysis age showed an overall decline in use of delivery care services with age. In the model adjusting for enabling and contextual characteristics, age was significantly related to the use of services, with older women showing greater odds of use maternal health services during delivery. Odds of postpartum care, however, did not vary by age group. A history of severe complications during the index pregnancy and labor was associated with significantly higher odds of use of delivery care as well as postpartum care. Parity had a strong inverse association with the use of maternal health services with successively declining odds of seeking care with increasing levels of parity; grandmultiparas had significantly lower odds of having an institutional delivery,

delivering with a skilled attendant and receiving postpartum care when compared to primiparous women.

Among enabling variables, higher levels of birth preparation were associated with increased odds of use of health services, except for use of postpartum care. Receipt of antenatal care, even if less than the recommended minimum of 4 visits, significantly improved the odds of receiving care. The odds of use of all services, however, was over 6 fold greater for women with over 4 visits than for women with none.

Of the contextual factors, level of community development and reproductive health behaviors such as contraceptive use in the community were associated with markedly increased odds of health utilization, while concentration of poverty in the community had a significant negative association with use of delivery care but not postpartum services. The last row of Table 3 shows the random community effect for each outcome. While the magnitude of the random effect decreased, as each group of variables was included, a significant portion of heterogeneity still remained.

Discussion:

The objective of this paper was to examine the individual and contextual correlates of care seeking of mothers in the intrapartum and postpartum period and identify what factors (enabling, predisposing or need) correlate with the use of formal services as well as overall use of services.

Any use of antenatal care services was strongly associated with institutional delivery, skilled attendance at birth and postpartum care. This finding is in concordance with research in other settings (Gage 2007, Mpebemi 2007, Wu 2008, Bazant 2009). Prenatal care serves as an entry point for women to the health care system provide an opportunity for providers to educate and motivate women to seek health care in the

intrapartum and postpartum periods. There is, however, a potential selection effect with women's characteristics that determine prenatal care use also governing use of other maternal health services (Stephenson 2006). Use of antenatal care may also capture unmeasured dimensions of psychological and physical access to maternal health services in this population. Nonetheless, these results point to the pivotal role that prenatal care can play in promotion of safe delivery practices.

The birth preparation score strongly influenced the choice of care; the greater the logistic and financial preparation, the greater the women's odds of receiving optimum delivery care and even postpartum care. Levels of birth preparedness in Pakistan are generally low (Syed 2008, ul Haq 2009). By incorporating birth preparedness counseling into regular antenatal and outreach care to sensitize women and families, marked improvements in maternal health utilization behaviors can be achieved (Moran 2006).

Parity showed a negative association with utilization of maternal health services, an observation in concordance with research from other settings (Mekonnen 2003, Duong 2004, Gage 2007, Gabrysch 2009). Women's perception of risk is likely to be highest for their first as compared to subsequent births. Having more children also results in competing constraints on resources and time that are likely to reduce seeking care.

Obstetric complications were associated with higher odds of seeking care. A significant proportion of women with complications however, did not seek care. In the Pakistani context, events surrounding labor and childbirth are regarded as physiological processes that do not need care; it is only cases of protracted complications that, in the opinion of woman and families, warrant any attention (Towghi 2000, Fikree 2004, Fikree 1997).

A special focus of this study was examining the influence of context in maternal care-seeking. Several contextual factors were associated with either an increase or a decrease in the odds of using maternal health care. The concentration of neighborhood poverty showed a negative association with delivery care. This finding is consistent with those of Lindstrom (2006) and Gage (2006). Wealth of a community has the potential to increase the range of medical options available within a community as well as the demand for and sustainability of health programs and facilities. Providers, particularly those in the private sector, may also tend to cluster in richer communities and make investments in health infrastructure in more prosperous communities.

Contraceptive prevalence of the community, a measure that captures community attitudes to reproductive health as well as actual use of services, was closely related to use of maternal health services. This finding also may reflect the availability of reproductive health services with individuals living in these communities also more likely to access and use other reproductive health services.

Availability of outreach services did not influence receipt of delivery or postpartum care. This result may be attributable to non-random placement of services, targeting communities with the poorest performance on relevant health indicators. They may also be the communities, which initially had the lowest demand for services (Gage 2006); factors that may be reflected in these results. Also, the survey measured only visits to health workers and not the content and quality of counseling and services provided.

Significant variation at the community level remained unexplained even after inclusion of all individual and contextual variables. Given data limitations, this study was

not able to examine the influence of health systems variables. While the use of modern contraceptive methods was an attempt to estimate access and availability of reproductive health services, maternal health care necessitates a higher level of specialization, and distance, transport and time pose bigger barriers to its use. These factors could not be considered in the present analysis because the relevant data was not collected in PDHS, but should be considered for future research. Similarly, as noted above perceptions and beliefs that are known to influence care seeking could not be considered, as they were not collected in the PDHS.

Despite these limitations, data from the PDHS provide valuable insight into Pakistani women's use of delivery care services. The large sample allowed for estimation of the influence of multiple variables at both individual and community levels. This study based on a nationally representative sample adds to the sparse literature on maternal health care use in Pakistan, particularly as relates to the contextual correlates of reproductive health.

Conclusion:

This study identified disparities in use of maternal health services both across and within provinces. It thus has implications for service provision and targeting of specific subpopulations. Given the association of neighborhood effects with health seeking behaviors there is a need to focus interventions, including the provision of reproductive health services, towards the most economically deprived communities.

Table 1: Definitions of variables used in modeling intrapartum and postpartum care	
Dependant Variables	
Delivery with a skilled attendant	Use of a doctor, nurse or auxiliary nurse-midwife during delivery, using the World Health Organization's classification of health personnel skilled in conducting a normal delivery
Facility Based Delivery	*Delivering at a government or private hospital, clinic or a government Maternal and Child Health facility. Dichotomous*
Postpartum care	*A postpartum visit/check-up with a doctor, nurse or auxiliary nurse-midwife up to 6 weeks after delivery*
Independent Variables	
Individual Characteristics	
Predisposing	
Age in years	*Grouped in five categories*
Mother's education	*Level of schooling completed. Categorical(1.None, 2. Some primary-some secondary, 3.Complete secondary or greater*
Parity	*Categorical. (Primiparous, 1-2, 3-4, ≥5)*
Need-Related	
Obstetric History	*Complications in index pregnancy or delivery. Dichotomous* (antepartum hemorrhage or fits, prolonged or heavy postpartum bleeding, infected lochia or fits)
Enabling:	
Birth preparation score	*Composed of three dichotomous variables that measure financial preparation, logistic preparation and knowledge of delivery care (range 0-3)*
Household assets	Cumulative based on number of durable consumer goods: (radio, television, bed, sewing machine, refrigerator, bicycle, motorcycle/car) Categorized as Low (0-1), Medium (2-4), High (>4)
Antenatal care	*Prenatal contacts with a skilled health worker. Categorical. (None, <4, ≥4)*
Complication awareness:	Based on ability to name danger signs of pregnancy unprompted. Coded as categorical with values 0-2 (0: no correct response, 1: 1-2 danger symptoms correctly identified, 2: 3 symptoms correctly identified)
Contextual Variables	
Poverty Concentration	*Percentage of homes in the community in the lowest wealth quintile. Continuous*
Modern contraceptive prevalence rate	*Percentage of fecund women (in union) reporting use of a modern contraceptive method, by community. Continuous*
Coverage of outreach services	*Percentage of women in the community reporting visits by a lady health worker in the last twelve months. Categorical (None, Some ≤50%, High>50%)*
Mean Community Infrastructure Score	*Score based on availability of electricity, telephone, source of water, sanitation and cooking fuel. Calculated as a mean of the scores of households in the community. Categorized into tertiles*
Province	*Province in which the PSU is located . Categorical*

Table 2: Percentage of women receiving delivery and postpartum care by individual and community characteristics

	Facility based delivery (n=5,703)	Delivery with a skilled attendant (n=5,700)	Postpartum care (n=5,680)
Predisposing Variables			
Maternal Age(years) ***			
<20	35.7	42.0	23.5
20-29	40.5	45.8	30.1
30-34	36.8	42.0	27.0
35-39	32.9	35.3	19.4
40-49	22.8	27.1	14.5
Maternal Education ***			
None	24.8	30.1	16.2
Some Primary-some secondary	49.2	56.0	35.1
Completed secondary or greater	77.4	80.8	59.8
Parity**			
Primiparous	51.5	58.0	35.5
1-2	43.5	49.2	31.9
3-4	32.2	37.4	22.9
≥5	23.7	28.2	15.4
Need-Related: Complications in labor and puerperium* **			
No	29.4	35.5	18.7
Yes	51.0	55.2	39.5
Enabling Variables			
*Household Asset Ownership****			
Lowest	18.1	22.7	11.0
Middle	32.1	38.1	22.0
Highest	59.1	64.1	43.9
Antenatal Care**			
None	11.6	15.7	7.1
<4 visits	37.7	45.8	23.6
≥4 visits	70.7	74.8	54.7
*Complication Awareness***			
None	35.2	40.9	23.8
Some	46.1	50.3	36.3
High	41.8	47.5	36.1
*Birth Preparation score****			
0	19.5	23.8	11.0
1	34.4	40.9	23.1
2	55.6	61.6	40.3
3	61.6	66.2	51.1
Community Characteristics			
*Province****			
Punjab	36.7	42.1	24.4
Sindh	45.1	48.2	36.9
NWFP	31.9	40.5	19.0
Balochistan	18.7	25.7	14.2
*Outreach Service Coverage***			
None	37.7	42.4	26.2
Some	34.2	41.6	24.4
High	43.9	46.2	31.1
*Infrastructure score****			
Low	22.9	27.5	14.5
Medium	39.5	46.9	25.8
High	73.7	77.1	53.3

P value for chi square with Rao-Scott correction·. *p<0.01, **p<0.001, ***p<0.001

Table 3: Odds of receiving delivery and postpartum care by individual and community characteristics Odds Ratio (95%CI)			
	Facility Based Delivery	**Skilled Attendance at Birth**	**Postpartum Care**
Predisposing Characteristics			
Age in years			
<20:	0.89 (0.67, 1.18)	0 .94 (0.73,1.21)	0 .84 (0.58, 1.24)
20-29: ref	1.00	1.00	1.00
30-34:	1.34 (1.09, 1.64)*	1.37 (1.12, 1.68)**	1.38(1.0,1.62)
35-39	1.48 (1.12, 1.94)**	1.69 (1.30, 2.19)***	1.21(0.94, 1.56)
40-49:	1.77 (1.22, 2.57)**	1.69 (1.19, 2.45)***	1.24(0.96, 1.88)
Mother's education: by level of schooling completed			
None: (ref)	1.00	1.00	1.00
Some primary-some secondary	1.51 (1.25, 1.82) ***	1.51(1.26, 1.81) ***	1.56(1.28,1.90)***
Complete secondary or greater	2.62(2.02, 3.40) ***	2.53 (1.94, 3.30) ***	2.11(1.63,2.71)***
Parity			
Primiparous(ref)	1.00	1.00	1.00
1-2	0.66 (0.53, 0 .81)***	0.62 (0.50, 0.76) ***	0.76(0.61, 0.93)**
3-4	0 .42 (0.33, 0.54) ***	0.39 (0.31, 0 .50) ***	0.54(0.42,0.69)***
≥ 5	0.37 (0.28, 0.50) ***	0.33 (0.25, 0.44) ***	0.45(0.34,0.61)***
Obstetric History *Complications in pregnancy and labor*			
No (ref)	1.00	1.00	1.00
Yes	1.99 (1.71, 2.31) ***	1.79 (1.54, 2.07) ***	1.28(1.07,1.51)***
Enabling Characteristics			
Household assets			
Lowest (ref)	1.00	1.00	1.00
Middle	1.09 (0.88, 1.34)	1.02 (0.84, 1.25)	1.23(0.97,0.56)
Highest	1.75 (1.37, 2.25) ***	1.49 (1.18, 1.88)*	1.78(1.37,2.32)***
Antenatal Care			
None (ref)	1.00	1.00	1.00
<4 visits	2.99 (2.49,3.61) ***	3.17 (2.67, 3.77) ***	2.42(1.97,2.99)***
≥ 4 visits	6.65 (5.39, 8.20) ***	6.48 (5.30, 7.93) ***	5.61(4.49,7.00)***

Birth Preparation Score			
0 (ref)	1.00	1.00	1.00
1	1.15 (0.95, 1.39)	1.29(1.28, 1.54)**	1.23(1.01,1.51)*
2	1.86 (1.53, 2.27) ***	1.94 (1.69, 2.55) ***	1.85(1.51,2.27)***
3	1.92 (1.47, 2.50) ***	2.17 (1.79, 3.17) ***	2.62(2.03,3.38)***
Complication Awareness			
None (ref)	1.00	1.00	1.00
Some	1.10 (0.91, 1.34)	1.06 (0.87, 1.28)	1.21(1.00,1.46)
High	1.00 (0.68, 1.77)	1.07 (0.67, 1.70)	1.55(0.98,2.43)
Contextual Variables			
Province			
Punjab (ref)	1.00	1.00	1.00
Sindh	1.89 (1.50, 2.38)***	1.59 (1.28, 1.98)***	2.30(1.86,2.85)***
NWFP	1.40(1.09, 1.79)**	1.78 (1.41, 2.25)**	1.07 (0.84,2.36)
Balochistan	0.89 (0.64, 1.23)	1.07 (0.79,1.44)	1.08(0.79,1.48)
Outreach Services			
None (ref)	1.00	1.00	1.00
Some	0.79 (0 .66, 1.02)	0.86 (0.70, 1.04)	0.92(0.76, 1.11)
High	0.94 (0.72, 1.22)	0.94 (0.73,1.20)	0.95(0.75,1.21)
Community Infrastructure			
Lowest (ref)	1.00	1.00	1.00
Middle	0.94 (0.72, 1.22)	1.05(0.83,1.34)	1.02(0.79,1.31)
Highest	2.07 (1.45, 2.95)***	2.40 (1.71, 3.37)***	1.69(1.17,2.42)**
Modern Contraceptive Use	1.22 (1.07, 1.37)**	1.18 (1.05, 1.33)**	1.15 (1.02,1.29)**
Poverty Concentration	0.42 (0.24, 0.72)**	0.44 (0.27, 0.73)**	0.62(0.37,1.06)
Random Effects (SE)	0.599 (0.094)	0.494(0.083)	0.257 (0.076)
*p<0.05, **p<0.01, ***p<0.001			

References:

AbouZahr C & Wardlaw T (2001) Maternal mortality at the end of a decade: signs of progress? Bulletin of the World Health Organization; 79(6): 561 568.

Andersen R (1998). The Multiple and Changing Faces of Access. Medical Care; 36(3): 252-253.

Bazant ES, Koenig MA, Fotso JC, Mills S (2009). Women's use of private and government health facilities for childbirth in Nairobi's informal settlements. Studies in Family Planning;40(1):39-50

Diez-Roux AV. Multilevel analysis in public health research. *Annu Rev Public Health* 2000; 21:171–92

Duong DV, Binns CW, Lee AH (2004). Utilization of delivery services at the primary health care level in rural Vietnam. Social Science & Medicine; 59 (12): 2585-2595.

Fortney JA, Smith JB. Measuring Maternal Morbidity (1999). In: Berer M, Ravindran TKS, eds. Safe Motherhood Initiatives: Critical Issues. Special Edition, Reproductive Health Matters; 43-50.

Gabrysch S, Campbell OM.(2009). Still too far to walk: literature review of the determinants of delivery service use. BMC Pregnancy and Childbirth; epub 9:34. doi:10.1186/1471-2393-9-34

Gage AJ, Calixite MC (2006). Effects of the physical accessibility of maternal health services on their use in rural Haiti. Population Studies; 60(3): 271-288.

Gage AJ (2007). Barriers to the utilization of maternal health care in rural Mali. Social Science & Medicine;65(8):1666-82.

Hirschman C, Guest P (1990). Multilevel models of fertility determination on four Southeast Asian countries: 1970–1980. Demography. 27(3):369–396.

Høj L, Stensballe J, Aaby P (1999). Maternal mortality in Guinea-Bissau: the use of verbal autopsy in a multi-ethnic population. International Journal of Epidemiology; 28(1):70-6.

Lindstrom DP, Muñoz-Franco E (2006). Migration and maternal health services utilization in rural Guatemala. Social Science & Medicine;63(3):706-21

Loudon I. Death in Childbirth: An International Study of Maternal Care and Maternal Mortality, 1800-1950. (1992). Clarendon Press: Oxford, England.

Maine D, McGinn T (2000). Maternal Mortality and Morbidity. In: Goldman MB, Hatch MC, eds. Women and Health. San Diego, CA: Academic Press; pp:395-403.

McCarthy J, Maine D (1992). A framework for analyzing the determinants of maternal mortality. Studies in Family Planning;23(1):23-33.

McCarthy J (1997). The conceptual framework of the PMM Network. International Journal of Gynaecology and Obstetetrics;59 Suppl 2:S15-21.

Mekonnen Y, Mekonnen A (2003). Factors influencing the use of maternal healthcare services in Ethiopia. Journal of Health Population and Nutrition;21(4):374-82

Midhet F, Becker S, Berendes HW (1998). Contextual determinants of Maternal Mortality in Rural Pakistan. Social Science in Medicine; 46(12): 1587-98.

Moran AC, Sangli G, Dineen R, Rawlins B, Yaméogo M, Baya B. (2006). Birth-Preparedness for Maternal Health: Findings from Koupéla District, Burkina Faso. Journal of Health, Population and Nutrition; 24(4):489 -97

Mpembeni RNM, KillewoJZ, Leshabari MT, Massawe SN et al (2007). Use pattern of maternal health services and determinants of skilled care during delivery in Southern Tanzania: implications for achievement of MDG-5 targets. BMC Pregnancy and Childbirth; 7: 29 epub. doi: 10.1186/1471-2393-7-29

Rabe-Hesketh, S. and Skrondal, A. (2008). Multilevel and Longitudinal Modeling Using Stata. (2nd Edition) College Station, TX: Stata Press

Say L, Raine R (2007). A systematic review of inequalities in the use of maternal health care in developing countries: examining the scale of the problem and the importance of context.Bulletin of the World Health Organization;85(10):812-9.

Stephenson R, Tsui AO (2002). Contextual influences on reproductive health service use in Uttar Pradesh, India. Studies in Family Planning; 33(4): 309-20.

Stephenson R, Baschieri A, Clements S, Hennink M, Madise N (2006). Contextual Influences on the Use of Health Facilities for Childbirth in Africa. American Journal of Public Health; 96(1):84-93.

Syed U, Khadka N, Khan A and Wall S (2008). Care-seeking practices in South Asia: using formative research to design program interventions to save newborn lives. Journal of Perinatology 28, Suppl 2:S9-13

Thaddeus S and Maine D (1994). Too far to walk: maternal mortality in context. Social Science & Medicine; 38 (8): 1091–1110.

ul Haq Z, Hafeez A, Khanum A, Southall D (2009). Birth preparedness and the role of the private sector: a community survey. Journal of the Pakistan Medical Association;59(5):302-6

United Nations (2000).United Nations Millennium Declaration. Fifty-fifth Session of the United Nations General Assembly. New York: United Nations; 18 September 2000 (General Assembly document, No. A/RES/55/2).

Van Lerberghe W and De Brouwere V(2001).Of blind alleys and things that have worked: history's lessons on reducing maternal mortality. In: W Van Lerberghe, G Kegels and V De Brouwere, Editors, Safe motherhood strategies: a review of the evidence, ITG Press, Antwerp, pp.7-33.

WHO(2007). Maternal mortality in 2005: estimates developed by WHO, UNICEF and UNFPA and the World Bank. World Health Organization, Geneva

Wu Z, Viisainen K, Li X, and Hemminki E. (2008). Maternal care in rural China: a case study from Anhui province. BMC Health Services Research; 8:55: epub