Original Article

Health Financing: Relationship between Public Health expenditure and maternal mortality in Zimbabwe between the years 1980 to 2010

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ABSTRACT

Health care expenditure in Zimbabwe has fallen below budgetary allocations since 2000. Health care financing in Zimbabwe rely more on donor funding and private expenditure than on government resources. These expenditures are unsustainable and inadequate considering the huge health care burden in Zimbabwe. The study sought to examine the association between government health expenditure and maternal mortality, and make policy recommendations. Association was examined using survey and annual expenditure data from Zimbabwe between 1980 and 2011. The study used multiple regression analysis to find the association between government health expenditure and maternal mortality while controlling for potential confounding variables. Government health expenditure had a statistically significant association with maternal mortality, with less expenditure associated with high rates of maternal mortality. This substantiates the proposition that government health expenditure is a major determinant of maternal mortality in Zimbabwe. Increasing government health expenditure will contribute to significant reduction in maternal mortality. Institutional delivery and the proportion of people living below the Total Consumption Poverty Line (TCPL) were negatively correlated with maternal mortality. The association of maternal mortality and other socio-economic determinants of health were examined. These included political and economic factors, isolationism, hyper-inflation, household income versus household expenditure and allocation of resources.

INTRODUCTION

Giving birth is far too often a life and death challenge for women in Sub-Saharan Africa (SSA). The risk ratio of maternal mortality in SSA is 1 in 38 compared to 1 in 3700 in developed regions.[1] According to United Nations MDG regions,[1]nations of the SSA region, which include Zimbabwe, account for more than 30 per cent of global maternal deaths, and more than 179 000 women died of childbirth related causes in 2013.

Maternal mortality ratio is defined by the number of women who die while pregnant or within 42 days of termination of pregnancy, from any cause related to pregnancy complications or its management per 100 000.[1]In Zimbabwe, the trend for the maternal mortality ratio (MMR) has worsened, rising to 960 per 100,000 live births in 2010 compared to 283 in 1994, a 239% increase in 16 years.[3] This is currently one of the highest in Sub-Saharan Africa and far from the MDG target of 145 per 100,000 by 2015.[4]

Keywords: *Maternal mortality, health expenditure, government, Zimbabwe*

As a result of spiked increase in maternal mortality, there was an increase (4% - 19%) in external funding which focused on maternal and child health in Zimbabwe from 2011-2015[13,21]. The funding targeted programmes such as Health Transition Fund (HTF) and Result Based Financing (RBF). Moreover, Global Health Fund increased its support to National Aids Council and the prevention of mother-to-childtransmission (PMTCT) programmes that have been focusing on HIV/AIDS/Malaria/TB, sexual and reproductive programmes[21].

According to several researchers, the main causes of maternal death in Zimbabwe are a lack of provision of high quality maternal health services during pregnancy and delivery to ensure the health of the mother and infant.[5, 6] Moreover, social disparities and infectious diseases were also found to be associated with the unprecedented increase of maternal deaths[22, 23, 32]. Furthermore, because of the healthcare costs and long distances to healthcare facilities, it was found that over half of the mothers do not return for post-natal checkups thereby increasing the risk of maternal death.[6, 7]

Analyses of the historical drop in maternal mortality rates in today's *developed* countries (for example Estonia, Czech Republic, Japan, Iceland and Sweden) indicated that, the vital drivers of this decline are increased public health expenditure and household income.[8, 9]Evidence from various studies revealed that increases in public health expenditure were associated with improvements in access to quality obstetric care, uptake of reproductive health services and targeted programmes against infectious diseases like HIV/AIDS and malaria.[10, 11]

The relationship between health care expenditure and health outcomes is of interest to policy makers in light of the steady increases in health care spending for most industrialized countries.[11, 12]However, establishing causal linkages is difficult because health care expenditure is only one of many factors that contribute to health outcomes. Muchabaiwa et al, points out that the relationship between public health expenditure and health outcome may be confounded by various factors which are outside the healthcare system collectively known as Social Determinants of Health (SDH), such as household income, educational status of women, and access to health facilities, transport, and sanitation facilities[6] The present study sought to substantiate the relationship between government health expenditure on health (as a percentage of total heath expenditure) and maternal mortality, while adjusting for potential confounding factors identified in the literature: female literacy, household economic status, access to sanitation facilities, use of skilled birth attendants and institutional delivery.

METHODOLOGY

This was a retrospective and secondary data analysis which used a multiple linear regression model to analyze survey panel and annual, from the years 1980 to 2011, to find the association between government health expenditure and maternal mortality, while controlling for potential confounding variables (household poverty, female literacy, skilled birth attendants, institutional delivery, access to sanitary facilities)that were identified in the literature.

The data was taken from Zimbabwe, a country with the total population of 13.1 million in 2010. Among the total population, 50% were males and 52% were females. The total fertility rate was 3.8 children born per woman and the workforce within the informal sector stood at 1.33 million respectively (Zimbabwe Population Census, 2012). Life expectancy at birth was estimated at 40 years for men and 38 years for women.[13]

All expenditure data were annual, while the maternal mortality data were survey data of 5 year intervals. Data on access to improved sanitation facilities, maternal mortality, female literacy, household income, skilled birth attendants and place of delivery was taken from the World Bank's World Development Indicators (WDI) and Zimbabwe Demographic Health Surveys (ZDHS), held in

2010/11. The data on government health expenditure was obtained from Zimstats, the National Government Statistical Agency, and is the source of all historical data. Triangulation of the data was done by referencing to other data sets from various publications within the ministries of health, finance and economic planning, the World Health Organisation and other international databases. Previous researchers used a similar data (Table 1) to assess the relationship between public expenditure and health outcomes.[10, 12, 14, 15]

Study variables

Study sample

Table 1: Description, source and measurement of variables included in the model

Variable	Description	Measurement	Data source
Dependent variable Maternal mortality	Maternal mortality represents deaths to women that occur during pregnancy, childbirth, or within 2 months post-partum	Maternal mortality ratio. The number of maternal deaths due to birth- or pregnancy-related complications per 100,000 per live births	ZDHS
Independent variables Government health expenditure	The recurrent and capital spending from government (central and local) budgets; money allocated for use in the health sector	Government health expenditure as a percentage % of total health expenditure	NHA
Household income	Includes an allowance for non -food minimum need requirements, such as housing clothing, transportation, health care etc. households or people whose per capita consumption expenditure is below the TCPL	The percentage (%) of people living below the Total Consumption Poverty Line (TCPL)	ZDHS
Female literacy	Number of females aged 15 to 45 years who can both read and write with understanding a short simple statement.	Percentage (%)of female literacy rates per year	WDI & ZDHS
Access to better sanitation	*Access* to improved sanitation facilities located within a convenient distance from the users dwelling	Measured by the proportion of population (%) with *access* to improved sanitation facilitieslocated at their residence.	WDI
Births attended by a Skilled professional	Use of an accredited health professional who has been trained to proficiency in the skills needed to manage normal pregnancies, in the identification, management and referral of complications in women and newborns	Proportion (%) of births attended by a skilled health worker	WDI& ZDHS
Institutional delivery	The type of place at which women gave births (Hospital or health centre)	Proportion (%) of Institutional delivery	WDI & ZDHS

All expenditure data series were annual data from 1980 to 2011; a total of 31 data points over the entire period. Maternal mortality data and data for other social determinants of health were survey data which were at 5 year interval. Analysis of the data was done at the country level. The period was stretched for 3 decades to provide sufficient data points and increase the precision of the study results. Moreover, Zimbabwe gained Independence in 1980 and the1990s were characterized by an economic decline and a fall in government health expenditure.

Statistical analysis procedures

Step 1: Preparing a data file. This involved setting options, setting up data structures and entering data in SPSS. Setting up structures involved putting labels and names on, types of variables, values of a variable, missing values and type of measurement scale. Lastly, data was manually entered on both independent and dependent variables.

Step 2: Screening and cleaning the data. It involved two steps. First, errors were checked through viewing the distribution of the data. Since the data was in continuous form, errors on numerical variables were checked using descriptive statistics such as mean, skewness, kurtosis, standard deviation, minimum and maximum values. Missing data and outliers were also checked for. Lastly, errors were corrected by sorting the cases or deleting the cases with missing data and in some cases imputing the missing data.

Step 3: Data Analysis process

For descriptive statistical analysis, data was organized, summarized and represented by values such as mean, standard deviation and range. The data was also presented in tables and graphs that included scatter plots and line graphs.

In exploring the relationship between variables, SPSS statistical package was used to analyze data between government health expenditure and maternal mortality. This was done by regressing maternal mortality ratio on the independent variable (government health expenditure) while controlling for female literacy, household income, access to improved sanitation facilities, birth attendance by a skilled worker and place of delivery.

Model equation for maternal mortality

The basic equation (in logarithmic form) below examines the direct association between government health expenditure and maternal mortality.

Maternal mortality ratio
(health outcome) $= \alpha$ (constant) + $\beta 1$ (government health expenditure)+
$\beta 2$ (household income) +$\beta 3$ (female literacy) +
$\beta 4$ (access to improved sanitation facilities)+
$\beta 5$ (place of delivery) + $\beta 6$ (skilled birth attendant)

Ethical considerations

There was no need to seek Institutional Review Board (IRB) approval when using secondary data that has been documented for archiving, and is publicly available.[16]The data used for analysis in this study was obtained from public databases.

RESULTS

Descriptive statistics

On average, maternal mortality ratio stood at 626.6 deaths per 100000 live births. The average share of government health expenditure (% of total health expenditure) was 43.3 %.The average percent of female literacy was at 76.9. The average population of women who delivered at a healthcare facility and percentage of women attended by a skilled birth attendant during delivery were 55%and 64.58%respectively.

The average percentage of people living below the Total Consumption Poverty Line (TCPL) in both urban and rural areas was 64.3% and an average of 38.8% had access to improved sanitation facilities. Table 2, shows a summary of descriptive statistics

and the study variables (dependent and independent) used in the analysis.

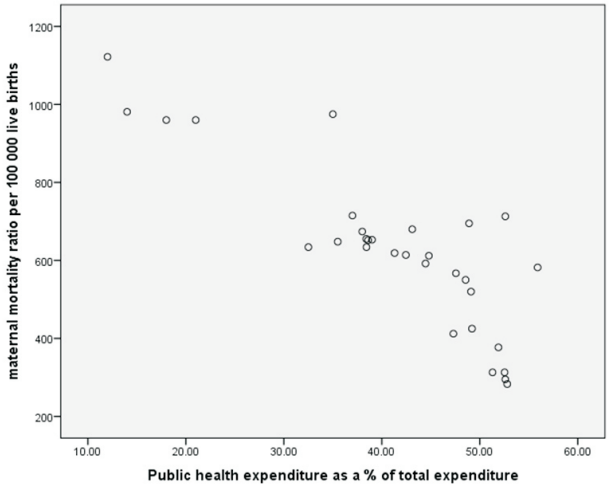
Table 2: Study Variables and Descriptive Statistics

Variable	N	Mean 1980	Mean 2010	% Change
Maternal mortality ratio	31	219	960	338.3
Government health expenditure	31	54.2	31.3	42.3
Female Literacy	31	76	92	22.2
Skilled birth attendant	31	64	60	6.3
Access to improved sanitation facility	31	38	30	21.1
Institutional delivery	31	69.9	63	9.9
% of people living < TCPL	31	55	72	30.9

BIVARIATE ANALYSIS

We present in this analysis a bivariate relationship between government health expenditure (% of total health expenditure) and MMR using a simple scatter plot. A Pearson product moment correlation coefficient was used to assess the relationship between the above two variables. There was a negative correlation between the two variables, r =-0.728, n= 31, p< 0.001. Figure 2 (scatter plot) below shows a negative relationship between government health expenditure and maternal mortality ratio.

Figure 1: Scatter plot of mean government health expenditure (% of total health) and mean maternal mortality rate



Overall, there was a strong correlation between government health expenditure as a percentage of total health expenditure and maternal mortality ratio. High government health expenditure was correlated with a low maternal mortality ratio.

Bivariate association before adjusting for confounders

Skilled birth attendants and institutional delivery were significantly associated with maternal mortality. A negative correlation between skilled birth attendant and maternal mortality was observed, and the relationship was statistically significant, r (29)=-.794, p<0.001.This means that a high proportion of skilled birth attendants was correlated with a low maternal mortality ratio. Using the Pearson product moment correlation coefficient, a significant negative correlation between institutional delivery and maternal mortality was also observed at significance level of 0.01, r (29)= -.663, p<0.001. Hence, a high proportion of women delivering in health facilities was associated with low maternal mortality ratio. The percentage of people living below the Total Consumption Poverty Line (TCPL) was also found to be significantly associated with maternal mortality. There was a strong positive correlation between the two variables r (29)= .687, p=0.001.

However, the correlations between access to improved sanitation facilities and proportion of female literacy were not statistically significant with maternal mortality at 1% level. A weak negative correlation but not statistically significant was observed between access to improved sanitary facilities and maternal mortality, r (29)=-.162, p=0.383. Another non-significant correlation was observed between female literacy and maternal mortality, r (29)=-.328, p=0.072.

Table 3 below summarizes the bivariate association between key variables and maternal mortality before carrying out multiple regression analysis. This reflects the relationship between key variables and maternal mortality before adjusting for confounders.

From all the significant bivariate associations below, it shows that government health expenditure accounts for some variance in maternal mortality although it may be confounded by other social determinants of health such as skilled birth attendant, access to improved sanitation facilities, institutional delivery and % people living below TCPL.

Table 3: **Summary of the bivariate correlations of key variables and MMR**

	Maternal mortality ratio per 100 000 live births		
Variables	N	Correlations r	P value
Government health expenditure as a % of THE	31	-.728**	p<0
Female Literacy	31	-.328	0.072
Skilled birth attendant	31	-.794**	p<0
Access to sanitation facility	31	-.162	.383
Institutional delivery	31	-.663**	.001
The percentage of people living below the Total Consumption Poverty Line (TCPL)	31	.687**	.001

***Correlation is significant at the 0.01 level (2-tailed).*

Results of association after adjusting for confounding

The results of maternal mortality equation are summarized in the table 4 below. Multiple regression results were presented using standardized slope (β) with the corresponding *t*-testand p value. The overall adjusted R^2 and the degrees of freedom (which is N-k-1) were also used to explain the relationship between the predictors and the outcome variable in the regression model. All the predictor variables were entered into the regression model simultaneously using the Enter method.

The overall model was a good fit. Except for percentage of female literacy(β= .186, p=0.315), skilled birth attendant (β= -.285, p=0.088), and access to adequate sanitary facilities (β= .092, p=0.714), all other predictors made a statistically significant contribution in predicting MMR. This means, lower maternal mortality was associated with higher proportion of government health expenditure, institutional of delivery and lower percentage of people living below the TCPL.

The relationship between government health expenditure (% of total health expenditure) and maternal mortality was statistically significant. The model showed that a percentage increase in government health expenditure would lead to a reduction in maternal mortality ratio by 0.505percent while holding constant all the other variables that influence maternal mortality, with a strong negative correlation between the two variables(β= -.505, p=0.001). This result supported empirical evidence, which shows that there is a relationship between government health expenditure and maternal mortality rate, controlling for female literacy, household income, access improved sanitation facilities, skilled birth attendant and place of delivery. Hence, maternal mortality is dependent on government health expenditure, which means an increase in public health expenditure would results in a reduction of maternal mortality ratio. The table 4 below summarizes the results of multivariate analysis and the study variables used in the analysis.

Table 4: **Multiple Regression model results for Maternal Mortality Ratio**

	Maternal mortality rate per 100 000 live births			
	standardized slope (β)	t value	P value	Overall adjusted R^2
Intercept				.839
Government health expenditure	-.505	-4.717	.0001	
Female Literacy	.186	1.025	.315	
Skilled birth attendant	-.285	-1.779	. 088	
Access to clean sanitation facility	.092	0.370	. 714	
Institutional delivery	-.553	-2.430	.023	
Household poverty	.326	2.267	.033	

The percentage increase of people living below the TCPL significantly predicted maternal mortality rate, β= .326, *t*=2.267, p=0.033. The two variables showed a strong positive correlation: an increase in the proportion of people living below the Total Consumption Poverty Line (TCPL) would lead to a .326% increase in maternal mortality rate while holding other factors constant. Thus the increase in poverty would result in more maternal mortality indicating that poverty is a major determinant of maternal mortality in Zimbabwe.

Interesting and unexpected results were found on the relationship between female literacy and maternal mortality. The model results showed that female literacy was not significantly associated with maternal mortality, β= .186, *t*=1.025,p=0.315. The model indicates that, every 1 % increase in female literacy leads to .186% increase in maternal mortality holding other factors constant. However, there was not sufficient evidence to substantiate this claim since the correlation was not significant at 1% level. This shows that female literacy is not a major determinant of maternal mortality in Zimbabwe, but could have been confounded by tastes, preference, culture and religion. There are some religious sects that are against the practice of giving birth at health facilities.

Similar results were found on access to improved sanitation facilities (for example, flush toilets, pit latrines and Blair toilets) and maternal mortality. The percentage increase of households without access to improved sanitation facilities was not a good predictor of maternal mortality,(β= .092, *t*=0.370, p=0.714). The model showed that an increase in proportion of households without access to improved sanitation facilities would result in a.35 percent increase in maternal mortality while holding other predictors constant. However, there was not sufficient evidence to support this hypothesis since the association between the two variables was not statistically significant.

Institutional delivery significantly predicted maternal mortality ratio, β=-.553, *t*=-2.430, p=0.023. Thus increase in the proportion of institutional delivery had a strong negative correlation on maternal mortality ratio. An extra increase in the proportion of women who deliver in health facilities or hospital delivery corresponds to -.55% decrease in maternal mortality given that all the other predictors remains constant. The relationship between the two variables was statistically significant; indicating that place of delivery is a good predictor of maternal mortality in this model. Skilled birth attendants (midwives, nurses and doctors) insignificantly predicted maternal mortality in this regression model, β= -.285, *t*=-1.779, p=0.088. The model shows that the number of skilled birth attendants is not a good predictor of maternal mortality ratio. Hence, the increase in the proportion of births attended by skilled health personnel corresponds to a-.285%decline in maternal mortality.

In summary, our model (which includes government health expenditure, access to sanitary facilities, skilled birth attendant, institutional delivery, and percentage people living below TCPL) explains about 83.9% of any variance in maternal mortality rate. Of these 5 variables, government health expenditure makes the largest contribution in predicting MMR. Moreover, institutional delivery, and % people living below TCPL also made a statistically significant contribution in the prediction of MMR. However, skilled birth attendant, access to improved sanitation facilities and female literacy were non-significant predictors of maternal mortality, hence they do not make contributions to the prediction of MMR.

DISCUSSION

The results of the st udy suggest that increasing healthcare expenditure is important in enhancing health outcomes in Zimbabwe. The findings show that government health expenditure as a percentage of the total health expenditure significantly reduces maternal mortality rate per 100 000 per live births. This was consistent with other study findings that government health expenditure is an important

determinant in health outcomes, for example maternal mortality rate, at both individual and national levels.[10, 11, 12, 15, 17, 18, 19, 20] The negative correlation between government health expenditure and maternal mortality might be reflective of other variables that are not addressed in this study, which include donor funding, policies targeted at maternal health and political will.However, it is very difficult to conclude that increase in government funding led to the decrease of maternal mortality because of fluctuations in household expenditure and donor driven programmes.[21]There were some external funding which focused on maternal and child health in Zimbabwe; Health Transition Fund (HTF) around $425 million for 5 years from 2011-2015, and Result Based Funding (RBF) 2011. International donor funding increased from mere 4% - 19% with targeted programmes such as the RBF and the HTF that focused on maternal and child health. Moreover, household expenditure through user fees increased also from 36% - 39%. Furthermore, the negative correlation between the two variables might have been confounded by the prevention of mother-to-childtransmission (PMTCT)programme that has been running since the year 1999, which might have had an effect on maternal mortality.[22]The National Aids Council programmesthat have been focusing on HIV/AIDS, sexual and reproductive programmes for many years might have contributed to the decline in maternal mortality. [23]In addition, the Global Health Fund that has been focusing on HIV/Malaria/TB programmescan also have a negative effect on maternal mortality. On the other hand, increase in maternal mortality might have been caused by hyperinflation, external debts and reduced total revenue, since these challenges can have an effect on total health expenditure. Therefore, the correlation established between government health expenditure and maternal mortality rate might have been significantly confounded by the above mentioned factors. Future studies are required forfurther clarification, after adjusting for these confounding factors.Contrary to the findings of this study, some other studies found a weak or statistically insignificant relationship between government health expenditure and maternal mortality.[20, 24, 25, 26, 27]Possible explanations for this could be due to different methodologies (different study designs, data sources and sample size) and variations in geographical settings.

The study design employed in this study was an improvement over cross sectional and time series studies used in past studies, because ecological designs are useful for evaluating impact (cost-effectiveness) of country-level interventions, for example, effects of increasing government health expenditure on maternal mortality rate. In addition, previous studies have been adjusting for factors affecting scaling up the healthcare systems, for example, physical inputs, access and physician density. However, this study controlled for both factors affecting the healthcare system and those determinants beyond the healthcare system such as female literacy, poverty and access to improved sanitation facilities. This study focused on one country unlike previous studies which studied participants from different settings (different countries) with different socio-economic context which may influence health outcomes differently. This reduces the potential for systematic errors (confounding and selection bias) and conflicting data.

There was no significant correlation between skilled birth attendant and maternal mortality rate. These results were unexpected since increase in the proportion of skilled attendance at delivery is expected to increase early identification, management and referral of pregnancy related complications leading to reduction of maternal mortality. Moreover, the results were unexpected since most health professionals, particularly those in public hospitals, left the country in search of better employment opportunities elsewhere during the economic crisis. The findings were inconsistent with the results of the other studies which found significant association between skilled birth attendant and maternal mortality.[6, 28, 29]The reasons for the insignificant association between the two variables might have been caused by an

unconducive environment during the economic crisis including unreliable referral systems to link different levels and poorly functioning health facilities. Moreover, there were shortages of drugs, equipment and supplies in all health facilities which might have hampered the effectiveness of skilled birth attendant on reducing maternal mortality.[4] In order to provide maternal health services, an enabling environment for skilled healthcare providers is needed. Hence skilled attendance at delivery should be backed up by reliable referral systems in case of emergency, provision of adequate drugs, equipment and supplies. Moreover, public hospital personnel lacked motivation due to low remuneration which also might have compromised the efficiency and effectiveness of skilled birth attendants in reducing maternal mortality. Most of them were receiving salaries below the poverty line. In addition, hyperinflation together with shortage of basic needs hampered the motivation of skilled health personnel in Zimbabwe.

The results of the study suggest that an increase in the proportion of people living below the TCPL remains an important determinant of maternal mortality ratio in Zimbabwe. The findings indicated a significant positive relationship between the two variables. An increase in the proportion of people living below the TCPL leads to an increase in maternal mortality ratio per 100 000 per live births. A similar sentiment was echoed by other researchers,[30, 31] suggesting that the risk of maternal mortality was higher among the poorest because of significant disparities in utilizing maternal health services between the rich and the poor. These results were expected since extreme poverty affects the ability of the families and individuals to afford basic healthcare services, housing, clothing, food and transportation.

Both before and after conducting multivariate analysis, female literacy remained uncorrelated with maternal mortality rate. These results were interesting and unexpected since maternal education is expected to lower maternal mortality. These findings are inconsistent with those of other studies.[15, 25, 32, 33These] authors found that, female literacy was a significant determinant of maternal mortality rate. In addition, they suggested that maternal education should be included in all policy to help precipitate reduction in maternal mortality. Under normal circumstances, it is possible that basic needs deprived through poverty and violations of basic human rights are precursors to education. However, in the case of Zimbabwe, considering that the country has a high adult literacy rate(above 90%) already, the reason for variation of these results may have been confounded by the economic and political crisis which causes a sharp rise of individual poverty rate and human rights abuses. Most Individuals could not have access to health services resulting in high home deliveries and traditional birth attendants.

Place of delivery matters for maternal mortality in Zimbabwe. Institutional delivery had a significant negative effect on maternal mortality rate. These findings were expected since institutional delivery promotes access to skilled obstetric care during the time of delivery. This will reduce the number of deaths among women from both unexpected and expected birth related complications such as sepsis, hemorrhage and severe infection associated with non-sterile delivery. These results were consistent with other study findings.[5, 20, 34] However, Mbizvo et al.,[6] found that high institutional delivery reduces maternal mortality mainly in rural areas, rather than in urban areas. These results contrasted with those found by those in other Sub-saharan African studies who found insignificant association between institutional delivery and maternal mortality.[35] The reason for differences in the relationship between the two variables might have been caused by different cultural factors and lack of confidence in the health systems which function as deterrents of delivering in health facilities. For example, a study done in Ghana indicated that most women in this country preferred home delivery because they have lost trust and confidence with the health system.[35]In addition, women in Ghana preferred home delivery

or traditional birth attendant since this method allows them to take their placenta home after delivery. However, in institutional health facilities family members are excluded from the labor ward or delivery ward. Moreover, a placenta is identified as something worthless and as a waste that should be discarded yet perceived valuable in other cultures. The negative correlation between institutional delivery and maternal mortality may be reflective of other variables that are not addressed in this study such as policies targeted at maternal health and political will.

There was an insignificant association between access to improved sanitation facilities and maternal mortality both before and after controlling for potential confounders. These findings were consistent with other studies.[37,38]

The findings of this study have generally been consonant with those found in other studies. However, inconsistent and unexpected findings were found in this study. Female literacy, skilled birth attendants and access to improved sanitation facilities were not significantly correlated with the reduction of MMR. Possible explanations for the inconsistent findings could be due to methodological issues, sample size, different economic and political situations. Moreover, cultural factors and behavioral factors might have contributed to these inconsistent and unexpected results. We suggests for further studies to investigate the effects of cultural factors, skilled birth attendants and female literacy on maternal health outcomes.

Limitations of study

Limitations in this study were mainly due to the combination of time series and panel data from different data sources. Real health expenditures data could also have been affected by exchange rate valuation since most of the time series data from the year 2000 to 2010 were affected by hyperinflation.

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