Factors Associated with Perinatal Deaths in Kenya

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This paper uses data collected from the Kenya Demographic and Health Survey of 2003 (KDHS), to examine factors associated with perinatal deaths in Kenya. There were 232 perinatal deaths and 6181 pregnancies in the five years preceding the survey. The results of bivariate analysis indicate that among the socio-demographic factors, older woman and those whose first birth was after 30 years of age, women of birth order 7 and above and whose pregnancy interval was less than 15 months also had higher proportion of perinatal deaths. The regression results show that the odds of having a perinatal death are significantly higher for women who have their first birth before reaching 20 years of age, for women with higher birth order (4+) and pregnancy intervals of less and more than 24 months. Socio-demographic factors were not significant. This analysis underscores the need to examine predisposing factors for perinatal deaths and their contribution to the upsurge in infant mortality in Kenya in line with the targets set for MDG 4.

Introduction:

Perinatal mortality reflects the quality and utilization of prenatal, delivery and immediate post-delivery care available to women and their newborn infants. Perinatal mortality, comprising of still births and early neonatal deaths is one of the sensitive indices of the quality of prenatal, obstetric and early neonatal care available to women and newborns. Perinatal health is a good indicator of both maternal health status and the level of socioeconomic status attained in any community. In addition infant mortality remains a challenge in the care of pregnant women worldwide, but particularly for developing countries and the need to understand contributory factors is crucial for addressing appropriate perinatal health. Hence, further reductions in infant mortality will largely depend on decreasing deaths due to perinatal causes. Improvements in the coverage and particularly in the quality of antenatal and delivery care are urgently needed.

In the conceptualization of the main risk factors of perinatal deaths (Mortality), Kikhela (1989) identified a number of variables that may influence these deaths. Among these were variables that existed before conception (i.e., parent's socio-economic and cultural characteristics, mother's demographic characteristics and mother's habitat and environment); variables appearing during pregnancy (i.e., medical supervision in pregnancy, maternal health during pregnancy and maternal nutrition during pregnancy); delivery-related variables (i.e., medical supervision at delivery, delivery complication, child's characteristics at birth and a child's immunity) and finally, variables whose influence appears after delivery (i.e., care offered (pediatrics), use of care after delivery (these influence care given to the newborn), child's resistance to disease , exposure to disease carrier (these influence child's health in the first week) all these in turn influence a child's death or survival in the perinatal period.

Given that this paper uses population based retrospective data rather than prospective data as used in Kikhela report, only variables existing before

pregnancy and those relating to pregnancy (i.e, maternal nutrition) will be considered as well as selected delivery-related variables such as child's characteristics at birth. Below is the schematic representation of the adopted framework:

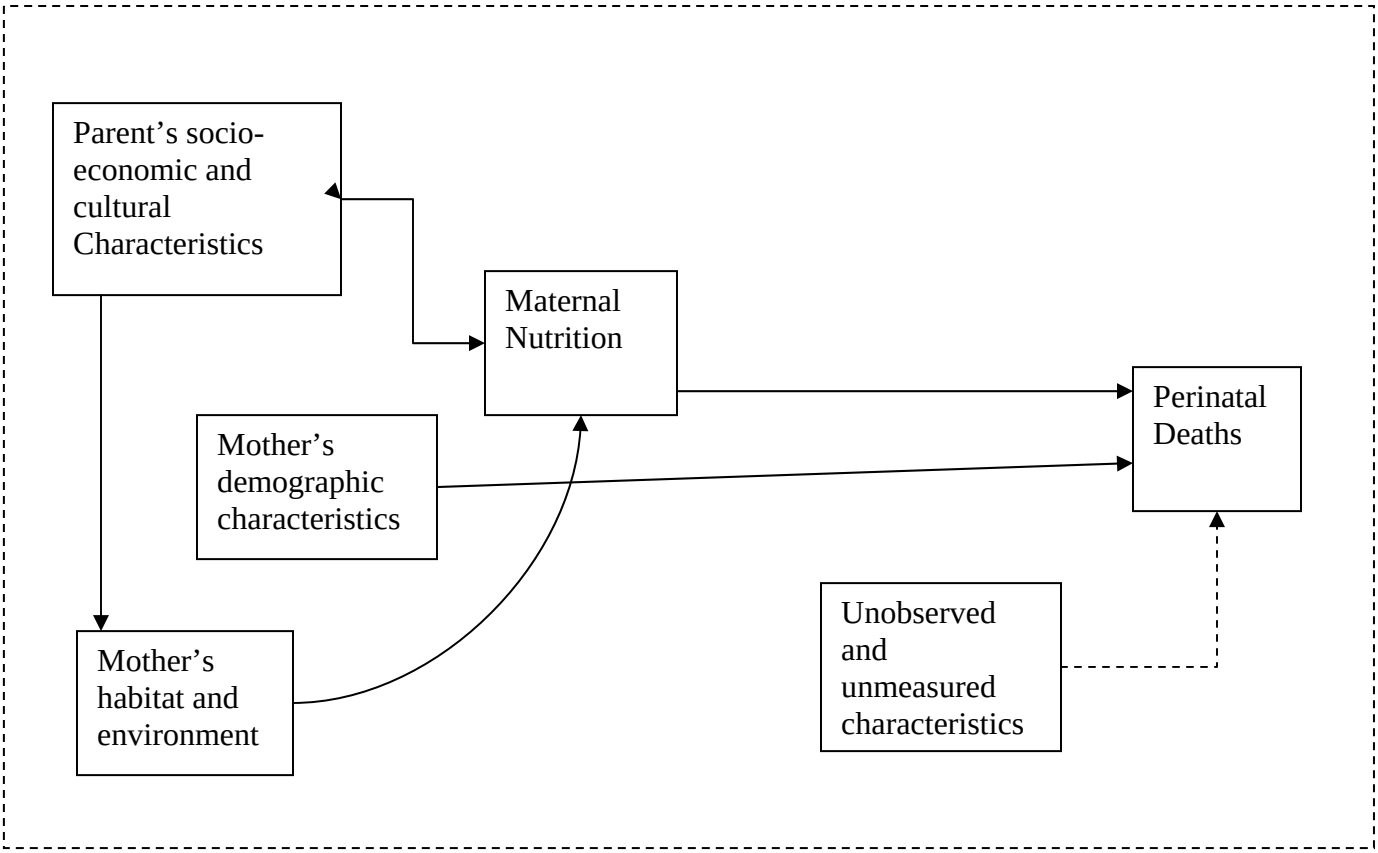

Fig.1 A conceptual framework for the study of perinatal deaths (adopted from Kikhela (1989). (see Appendix)

Parent's socio-economic and cultural factors such as education (both maternal and paternal), work status, wealth and religion as well as mother's habitat and environment (depicted by region of residence) are likely to influence perinatal mortality through maternal health status as depicted by nutritional status of the mother. Further maternal demographic characteristics such as age, parity, birth order and pregnancy interval may directly influence perinatal mortality. There are also some unobserved/unmeasured characteristics (genetic make up of the parents, and characteristics that are delivery-related and those that relate to

after delivery) relating to mother and child that may also have an influence on perinatal mortality.

Literature Review

A number of risk factors have been observed to influence adverse pregnancy outcomes including perinatal deaths. Among these are maternal age at first delivery; short birth intervals, (less than 24 months, combined with higher parities of birth order 4 and above), maternal nutrition, and utilization of maternal health care services more specifically prenatal and delivery care.

Maternal age at first birth continues to be a risk factor for perinatal mortality in both hospital studies and population based studies. In cross sectional retrospective study carried out in Zimbabwe, it was observed that older maternal age was associated with risk of perinatal death (Feresuet al., 2005). Similarly, in another study carried out in a hospital in Saudi Arabia, Pre Eclampsia was encountered at a high percentage in women at the extreme of their reproductive age (< 20 and >40 years) with regard to being a risk factor for maternal and perinatal outcomes (Al-Mulhim et al,.2003). These findings corroborate earlier studies that have looked at adverse pregnancy outcomes (Magadi et al., 2001).

Other factors that have been identified as important predictors of perinatal mortality relate to utilization of maternal health care services during pregnancy. In studies reviewed, it was observed that women delivering stillbirths and early neonatal deaths were less likely to receive prenatal care and in a study carried out in Ilesa, Nigeria it was reported that out of the 260 women studied, 24 (9.2%) took no form of prenatal care (Feresu et al., 2005,Tinuade A; Ogunles, 2005). Mode of delivery has also been identified as a risk factor for perinatal mortality. Feresu et al. noted that Stillbirths were less likely to be delivered by Cesarean section but more likely to be delivered as breech, as were early neonatal deaths.

Other factors that have been indicated in perinatal mortality are prematurity and low birth weight, intrapartum asphyxia and intercurrent medical conditions during pregnancy. In addition, there was association between perinatal mortality, previous abortion, and inadequate or complete lack of antenatal care (Obwaka and Ruminjo, 1995).

Labour complications have also been indicated in perinatal deaths. In a study carried out in Kilifi District, it was observed that complications of labour such as haemorrhage, premature rupture of membranes/premature labour, and obstructed labour/ malpresentation increased the risk of death between 8- and 62-fold, and 53% of all perinatal deaths were attributable to labour complications (Weiner et al., 2003). These findings are consistent with those from other studies in Kenya and elsewhere. Kavoo-Linge & Rogo identified prolonged labour as a particularly important factor for perinatal deaths occurring within the first 24 hours after hospital delivery in Kenya, while labour complications were associated with perinatal death in almost 40% of deliveries in another rural district. Data from West Africa, Bangladesh, and Guatemala also confirm high perinatal mortality following prolonged labour or malpresentation. Premature labour is a known risk factor for perinatal death and the importance of haemorrhage during labour as a risk factor for perinatal mortality has previously been documented in West Africa and India (.

The study by Weiner et al., 2003 also identified Poor maternal nutrition as having an elevated risk for perinatal mortality in other developing countries. It was

observed that, weight gain during pregnancy appeared to be important and decreases in perinatal deaths associated with increasing maternal weight have been demonstrated suggesting that nutritional interventions during pregnancy are important.

In another study carried out in rural Kenya, it was observed that most perinatal complications increased significantly by maternal and environmental factors. Among these were poor pregnancy care, malaria and anaemia during pregnancy, poor socioeconomic conditions of the mother and poor sanitary conditions in the household (Ondimu, 2001).

Whereas studies that have identified risk factors for perinatal mortality are numerous, both in developed and developing countries, these have been mainly based on data from health facilities. However, given that the majority of women in developing countries deliver at home, those who deliver in hospitals may be a select few who may have gone to a health facility as a result of experiencing complications.

This paper is an attempt to contribute to studies that have used population based data to examine factors that influence perinatal mortality as an adverse pregnancy outcome. This is necessary if Kenya is to meet the targets set for the Millennium Development Goal Number 4 which stipulates reduction by two thirds in deaths of children aged under five years by the year 2015. In order for this goal to be attained, a substantial reduction in perinatal deaths will be required more specifically neonatal deaths.

Data and Methods

Data Source

The data used in this paper are from the household and individual woman's questionnaire of Kenya demographic and Health survey of 2003. Household questionnaire provided the information to assess socioeconomic and cultural characteristics, while the individual woman questionnaire provided the information for assessing the characteristics of the woman's demographic and nutritional status as well as information relating to pregnancies and child deaths. The analysis is based on 232 perinatal deaths and 6181 pregnancies in the five years preceding the survey.

Dependent Variable

The perinatal mortality rate is defined by dividing the number of perinatal deaths (stillbirths and early neonatal deaths) by either the number of live births or by the sum of live births and stillbirths. Both definitions are prevalent in the literature. The definition of the pregnancy duration for stillbirth in general has changed over time. Originally, it was the product of pregnancies lasting 28 weeks that ended in a fetal death. The duration limit was subsequently lowered to 24, 22, and even 20 weeks. For the purpose of calculating perinatal mortality, however, the definition remains at 28 weeks. DHS asks and records pregnancy duration in months so that the equivalent of seven months is used. The durations of pregnancy are taken as reported by the respondents and do not necessarily have a clinical basis. Missing values are not allowed for any of the variables that make up the rate. Age at death for living children is imputed if unknown or missing (see Appendix for more details).

Independent Variables

The selected variables that might be associated with perinatal deaths in Kenya include socio-economic and cultural factors, demographic factors and maternal

nutritional status (proxy for maternal health). Socio-economic and cultural variables include region of residence, mother's education, partners education, wealth index and religion while demographic variables include mother's age, birth order, previous birth interval, age at first birth and marital status. The variables have been selected in accordance with what has been stated in the literature regarding their influence on the dependent variable (prenatal deaths).

The statistical techniques used

Descriptive statistics are used to describe the basic features of the data, while logistic regression is used to identify predictors of perinatal deaths in Kenya.

Results

Preliminary analysis

There were 232 perinatal deaths and 6181 pregnancies in the five years preceding the survey. This gives a perinatal mortality rate of 37.5 per 1000 pregnancies (calculated as total live births plus perinatal deaths). Deaths that occurred in the early neonatal period, constituted 35 per cent of all infant deaths in the period under study. These may however be underestimates as a result of underreporting and omission of these deaths.

Bivariate Analysis

Socioeconomic and cultural factors

The results indicate that Nyanza urban had the highest proportion of perinatal deaths, followed by Western and Coast. These are traditionally high mortality regions in the country. Among the rural stratas, North Eastern and Rift valley have higher proportions of perinatal deaths. The striking aspects of the results are that when the region of residence is stratified by Urban and rural, the urban

stratas (except Central and Rift valley) have higher proportions of perinatal deaths. With respect to the mother's educational levels, the highest proportions of perinatal deaths are observed among those with no education and higher education while the Muslims are observed to have the highest proportion of perinatal deaths among the religious groups. In addition, those with no education and primary education are observed to have higher proportions of perinatal deaths with regard to partner's education. The results also indicate that those whose wealth index falls in the middle and richest categories are observed to have higher proportions of perinatal deaths. It is important to note here that these factors were not significant on the basis of chi-square tests. Table 1 below presents the results.

Table 1. Percentage Distribution of perinatal Deaths by socioeconomic factor

Socioeconomic Factors	Percentage of Deaths	Total No. of Pregnancies
Region		
Nairobi	4.4	548
Central Urban	1.8	113
Coast Urban	5.5	237
Eastern Urban	2.9	35
Nyanza urban	7.7	142
Rift Valley Urban	1.2	169
Western Urban	5.7	175
North Eastern Urban	2.6	115
Central Rural	2.8	617
Coast Rural	4.5	462
Eastern rural	3.9	665
NyanzaRural	3.7	650
Rift Valley Rural	4.1	1031
Western Rural	3.1	653
North Eastern Rural	4.7	335
Total	3.9	5949
Educational Level (Maternal)		
No Education	4.8	1210
Primary	3.8	3456
Secondary	3.1	1032
Higher	4	251

Religion		
Roman Catholic	3.8	1252
Protestant Christian	3.7	3555
Muslim	4.9	945
No Religion	2.9	174
Other	0	16
Partner's Educational Level		
No Education	4.9	910
Primary	4.3	2674
Secondary	2.8	1477
Higher	3.2	439
Don't Know	4.2	72
Wealth index		
Poorest	3.7	1499
Poorer	3.4	1117
Middle	4.7	1077
Richer	3.3	937
Richest	4.3	1319

Demographic Factors

The demographic factors included in this analysis are mother's age, birth order, previous birth interval, marital status, and age at first birth. The distributions of perinatal deaths by demographic factors are presented in table 2 below. At bivariate analysis, all the demographic factors were significantly associated with perinatal deaths. Mother's aged 35 and above were observed to have higher proportions of perinatal deaths while those with birth order 7 and above also had higher proportion of perinatal deaths. With regard to age at first birth, older women (aged 30+) and teenage mothers (aged <20) were observed to have higher perinatal deaths. There were no real differences in relation to marital status.

Table 2. Percentage Distribution of Perinatal Deaths by Demographic factors

Demographic Factors	Percentage of Deaths	Total No. of Pregnancies
Mother's Age		
15-19	3.9	407
20-24	3.9	1616
25-29	3.1	1690
30-34	3.7	1147
35-39	4.1	665
40-44	5.6	337
45-49	13.8	87
Birth order		
1	3.8	1488
2 to 3	3.6	2105
4 to 6	3.5	1572
7+	5.7	784
Previous Pregnancy Interval in Months		
First Pregnancy	3.7	1498
<15	7.4	229
15-26	4.1	1264
27-38	3.5	1412
39+	3.7	1546
Age at First Birth		
<20	4	3576
20-29	3.6	2322
30+	9.8	51
Marital status		
Never Married	3.7	355
Married	4	4666
living Together	3.1	457
Widowed	1.3	149
Not living Together	3.7	82

Multivariate Analysis

Predictors of Perinatal Deaths

This section presents the results of the multivariate analysis. Three models were run, however only two are presented here. The dependent variable was perinatal deaths. The first model consisted of socio-economic and cultural variables run against the dependent variable. This model is not presented here because these variables were observed not to have an influence on perinatal deaths. The second model involved running the demographic variables against the dependent variable. The results are presented in table 2 below. In this model the variables that are observed to significantly influence perinatal deaths are age at first birth, parity, birth order and previous birth interval. Mothers who had their first birth in the age range 20-29 and those above 30 years were less likely to experience a perinatal death in relation to teenage mothers. The results also indicate that mothers of higher parities (2 and above) were less likely to experience a perinatal death. However, mothers of birth order 2-3 and a previous birth interval of less than 24 months were 3.3 times more likely to experience a perinatal death. Similarly mothers of birth order 4 and above with a previous birth interval of less that 24 months or over 24 months were more likely to experience a perinatal death in relation to those with birth order 2 to 3 and a previous birth interval of more than 24 months (i.e., 2.2 and 1.6 times respectively).

Table 3: Logistic Regression Model for Perinatal Deaths (With only demographic factors)

	B	S.E.	Sig.	Exp(B)
Age at First Birth				
<20 (Ref)			.076	
20-29	-1.065	.490	.030	.345*
30+	-1.117	.493	.023	.327*
Total No. of Children				
1 (Ref)			.001	
2	-2.060	.479	.000	.128***
3	-1.069	.392	.006	.343**
4	-1.005	.382	.008	.366**
5	-.511	.277	.065	.600+
6	-.599	.281	.033	.550*
7+	-.567	.307	.065	.567+
Birth order / Interval				
2-3 and >24 Months (Ref)			.003	
First Months	.445	.330	.177	1.561
2-3 and < 24 Months	1.192	.395	.003	3.292**
4+ and < 24 Months	.809	.350	.021	2.245*
4+ and >24 Months	.496	.222	.025	1.642*
Current Marital Status				
Never Married (Ref)			.239	
Married	-.168	.415	.685	.845
Living Together	-.492	.301	.101	.611
Widowed	-.706	.397	.075	.494
Divorced	-1.616	.773	.037	.199
Not living together	-.455	.656	.488	.635
Constant	-1.356	.592	.022	.258

Source: Derived from KDHS, 2003 data based on deaths and pregnancies reported by women respondents during the 5 years preceding the survey

+p<0.10 *p<0.5, **p<0.01, *** p<0.001.

The third and final model consisted of both some socio-economic and demographic variables. The results indicate that even with the inclusion of some socio-economic variables such as region of residence mothers education, partner's education and wealth index, the demographic variables still remain significant with only slight changes in some parameter estimates. The results are presented in table 4 below. It is important to note that although the socio-economic variables are not observed to significantly influence perinatal deaths, some of the parameter estimates exceed those of the reference category.

Table 4: Logistic Regression Model for Perinatal Deaths (With some socioeconomic and demographic factors)

	B	S.E.	Sig.	Exp(B)
Region				
Nairobi (Ref)			.545	
Central Urban	.251	.465	.589	1.286
Coast Urban	-.454	.807	.574	.635
Eastern Urban	.341	.470	.469	1.406
Nyanza Urban	-.158	1.101	.886	.854
Rift Valley Urban	.631	.544	.246	1.880
Western Urban	-1.108	.802	.167	.330
North Eastern Urban	.331	.491	.500	1.392
Central Rural	-.727	.646	.261	.483
Coast Rural	-.429	.430	.319	.651
Eastern Rural	.129	.372	.729	1.137
Nyanza Rural	-.062	.386	.872	.940
Rift Valley Rural	.035	.384	.928	1.035
Western Rural	.038	.334	.909	1.039
North Eastern Rural	-.279	.397	.482	.756

Partner's Education				
No Education (Ref)			.029	
Primary	.316	.629	.615	1.372
Secondary	.118	.606	.845	1.125
Higher	-.422	.620	.496	.656
Don't know	-.338	.665	.611	.713
Age at First Birth				
<20 (Ref)			.062	
20-29	-1.125	.512	.028	.325*
30+	-1.201	.511	.019	.301*
Birth order / Interval				
2-3 and >24 Months (Ref)			.003	
First Months	.461	.336	.170	1.586
2-3 and < 24 Months	1.256	.408	.002	3.512**
4+ and < 24 Months	.827	.355	.020	2.286*
4+ and >24 Months	.509	.224	.023	1.664*
Wealth index				
Poorest (Ref)			.060	
Poorer	-.530	.328	.106	.588
Middle	-.322	.329	.328	.724
Richer	.109	.309	.725	1.115
Richest	-.226	.308	.464	.798
Total No. of Children				
1 (Ref)			.007	
2	-1.879	.496	.000	.153***
3	-1.134	.409	.006	.322**
4	-.964	.390	.013	.381*
5	-.445	.284	.117	.641
6	-.586	.285	.040	.556*
7+	-.480	.310	.122	.619
Mother's education Attainment				
No Education (Ref)			.928	
Incomplete Primary	.225	.530	.671	1.252
Incomplete Primary	.172	.499	.731	1.187
Incomplete Secondary	.164	.487	.737	1.178
Complete Secondary	.365	.516	.479	1.440
Higher	-.066	.516	.898	.936
Constant	-1.735	.964	.072	.176

Source: Derived from KDHS, 2003 data based on deaths and pregnancies reported by women respondents during the 5 years preceding the survey

+p<0.10 *p<0.5, **p<0.01, *** p<0.001.

Discussion

The analysis has shown that demographic factors such as age at first birth, parity, birth order and birth interval are the main predictors of perinatal deaths in this study. These findings are consistent with other studies that have looked at factors associated with unfavourable birth outcomes in Kenya (Magadi et al, 2001). It is important to note however, that population based data such as the Kenya Demographic and Health Survey (KDHS) limits the analysis to only variables that are collected in such surveys. Another limitation is that information on utilization of maternal health care services (e.g., antenatal care and delivery care) which are core for intervention for intervention in perinatal deaths, are only available for live births and not for those that died.

It has been observed that for many of the factor such as age, nothing can be done to alter the risk, but additional care and watchfulness may prevent a complication arising or enable its early detection (Magadi et al,.2001). According to the literature reviewed, use of prenatal/antenatal and delivery care services have been recommended for the management of unfavourable birth outcomes such as perinatal deaths (Vitora and Barros, 2001; Ogunles, 2005).

Whereas the identified risk factors for perinatal deaths are crucial for interventions in ensuring that unfavourable birth outcomes are minimized, it is also important to highlight the contribution of perinatal deaths more specifically early neonatal deaths to overall infant and child mortality in Kenya if the country is to achieve the targets set for the Millennium Goal (MDG) number 4.

According to KDHS (2003), deaths in the early neonatal period constituted 32 per cent of all under five deaths, i.e., 161 out of 502 deaths and 82 per cent of all neonatal deaths (deaths up to 28 days) i.e., 161 out of 196 deaths. MDG 4 Stipulates a reduction in of two-thirds in deaths in children aged under five years by the year 2015. The above statistics for Kenya indicate that the focus should

be on reduction in neonatal deaths. Reduction of neonatal deaths should become a major public-health priority. There are various reasons why the health of newborn babies has been neglected despite the huge number of deaths. Most neonatal deaths are unseen and undocumented more specifically in developing countries where the majority of births take place at home (Lancet, March 2005). Improvements in neonatal mortality is related to improvements in maternal health and mortality and given that the factors that were identified to be associated with perinatal deaths in this paper relate to maternal risk factors focus in the reduction of perinatal deaths will require interventions in care during pregnancy and delivery.

The Delhi Declaration of 9th April 2005 recognized the need to take an integrated approach to reproductive, maternal, newborn and child health, by ensuring a continuum of care from pregnancy through childhood, recognizing that maternal, newborn and child health are inseparable and interdependent, and that the achievement of their MDGs must be based on a strong commitment to the rights of women, children and adolescents (Delhi, 2005).

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Appendix

Perinatal Mortality Rate
Statistics: *Perinatal Mortality Rate*
Definition
A. Coverage:
1. Population base: Pregnancies of seven or more months to women age 15–49 at time of survey.
2. Time period: Five-year period preceding the survey.
B. Numerator: Number of fetal deaths in pregnancies of seven or more months plus number of deaths of live-born children in the 0–6 days following birth.
C. Denominator: Number of pregnancies of seven or more months that terminated in a fetal death plus pregnancies that ended with a live birth.
Calculation
A. Numerator:
1. Number of stillbirths—From the reproductive calendar, number of pregnancies that lasted seven or more months and terminated in a fetal death in the five years preceding the survey.
2. Number of early neonatal deaths—Number of children who died at age 0–6 days after birth in the five years preceding the survey.
3. Numerator is the sum of (1) plus (2) above.
B. Denominator:
1. Number of stillbirths, given in numerator "A" above.
2. Number of live births in the five years preceding the survey.
3. Denominator is the sum of (1) plus (2) above.
Perinatal Rate—Quotient of numerator divided by denominator multiplied by 1,000.

Handling of Missing Values

Missing values are not allowed for any of the variables that make up the rate. Age at death for living children is imputed if unknown or missing.
Notes and Considerations
The perinatal mortality rate is defined by dividing the number of perinatal deaths (stillbirths and early neonatal deaths) by either the number of live births or by the sum of live births and stillbirths. Both definitions are prevalent in the literature.

The definition of the pregnancy duration for stillbirth in general has changed over time. Originally, it was the product of pregnancies lasting 28 weeks that ended in a fetal death. The duration limit was subsequently lowered to 24, 22, and even 20 weeks. For the purpose of calculating perinatal mortality, however, the definition remains at 28 weeks. DHS asks and records pregnancy duration in months so that the equivalent of seven months is used. The durations of

pregnancy are taken as reported by the respondents and do not necessarily have a clinical basis.

Changes over Time

Earlier DHS reports used a somewhat different basis for perinatal rates. Deaths of live-born children were considered early neonatal deaths if they occurred 0 to 7 days after birth, given the large amount of heaping on day 7 and the consideration of the likelihood of rounding “in the first week of life” by interviewers to seven days, due to questionnaire coding requirements. Also, the denominator for the rates was the number of live births rather than the sum of stillbirths and livebirths.

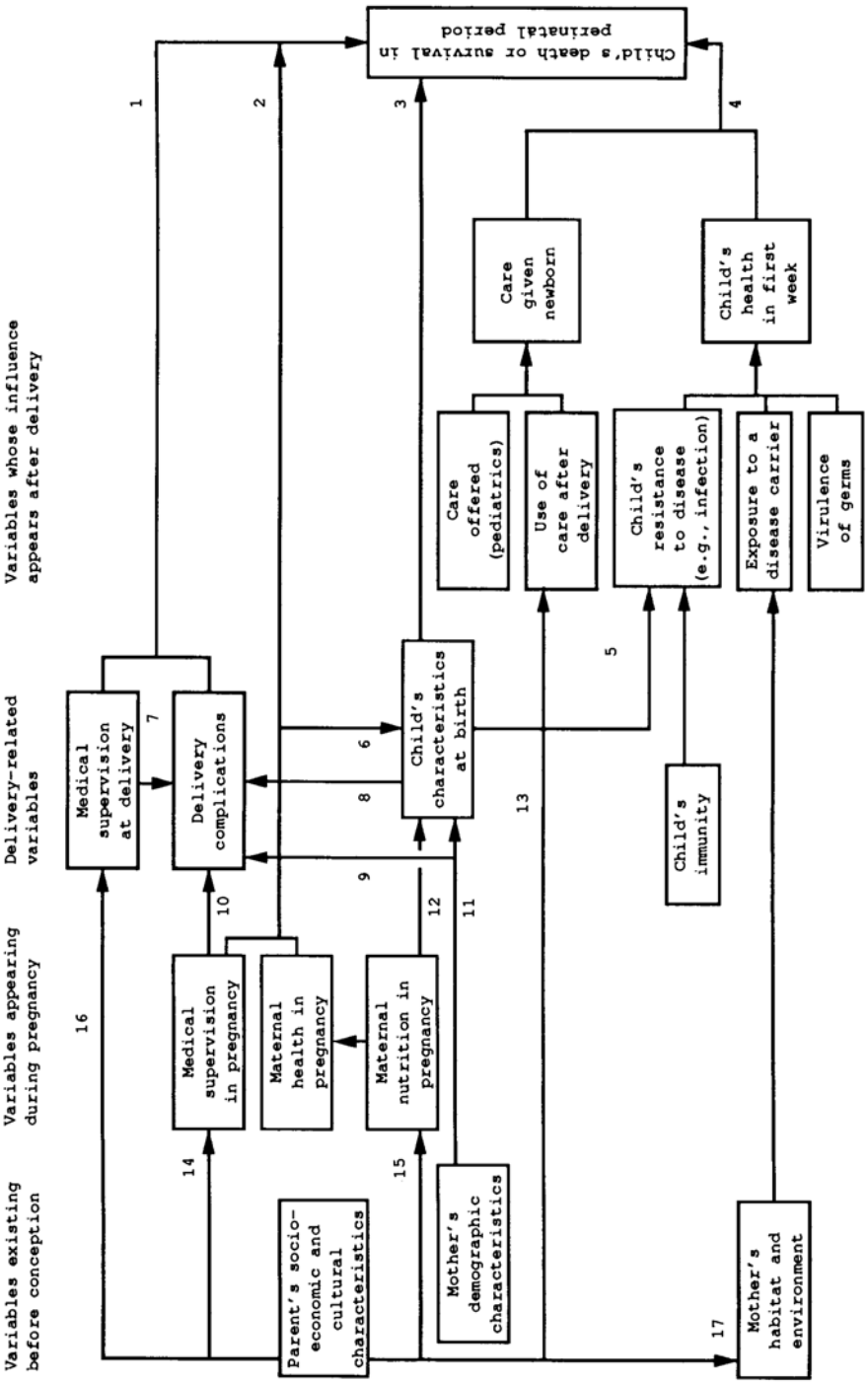

Fig. 1. A conceptual framework for the study of perinatal mortality. (For data gathered over several years, the central year is noted.)