

Table 2 Frequency of variables examined in the studies

Background variables	No. (%) (n = 40)
Maternal factors	
Maternal age	11 (27.5)
Antepartum haemorrhage	1 (25.0)
Antenatal care visits	5 (12.5)
Use of contraception (family planning)	2 (5.0)
Number of children	1 (25.0)
Parity	5 (12.5)
Newborn outcomes	1 (25.0)
Complications during last pregnancy	1 (25.0)
Gestational age	2 (5.0)
Birth weight	4 (10.0)
Multiple births	2 (5.0)
Type of delivery (normal or caesarean section, emergency or elective)	3 (7.5)
Birth order and interval	3 (7.5)
Socioeconomic factors	
Educational level of pregnant woman	10 (25.0)
Parents' educational level	3 (7.5)
Household wealth	9 (22.5)
Mother's ethnicity	3 (7.5)
Mother's occupation	2 (5.0)
Women's autonomy within society	3 (7.5)
Marital status	4 (10.0)
Employment of head of household (employed/unemployed)	1 (25.0)
Sex of head of household	1 (25.0)
Sex of the newborn	2 (5.0)
Sex of infants who have died	1 (25.0)
Religion	1 (25.0)
Exposure to media	2 (5.0)
Exposure to family planning messages	1 (25.0)
Residential area(urban, rural)	9 (22.5)
Year of birth of mother	1 (25.0)
Health care service factors	
Human resources	3 (7.5)
Maternity and delivery beds	2 (5.0)
Type of facility	4 (10.0)
Level of delivery care (basic or comprehensive)	3 (7.5)
Readiness of facilities to provide good delivery care	1 (25.0)
Type of birth attendant (skilled or traditional)	2 (5.0)
Place of delivery	3 (7.5)
Ecological determinant factors	
Level of social vulnerability in catchment area	1 (25.0)
Proportion of indigenous people in catchment area	1 (25.0)
Environmental factors	
Drinking-water quality	1 (25.0)
Health-related factors	
Chronic diseases (high blood pressure, diabetes, heart disease)	2 (5.0)
Smoking and tobacco use during pregnancy	2 (5.0)
Alcohol use during pregnancy	1 (25.0)
HIV	1 (25.0)

Table 2 Frequency of variables examined in the studies (Concluded)

Background variables	No. (%) (n = 40)
<i>Geographic factors visualized on GIS</i>	
Season of birth	3 (7.5)
Distance to facility	16 (40.0)
Travel time to facility and emergency obstetric care	17 (42.5)
Type of transport taken to facility (on foot, vehicle, ambulance)	4 (10.0)
Distribution health services and emergency obstetric care facilities per population	11 (27.5)
Distribution of human resources	1 (25.0)
Childbirths per region at health facilities, at home, or outside home or health facility (e.g. in car/ambulance)	5 (12.5)
Distribution of childbirths occurring unassisted by health professionals	1 (25.0)
Distribution of early neonatal, early fetal and late fetal deaths	4 (10.0)
Distribution of woman receiving antenatal care	2 (5.0)
Distribution of women who had caesarean sections	2 (5.0)
Distribution of women of reproductive age	2 (5.0)
Distribution of private and public maternity units	1 (25.0)
Distribution of maternity beds	1 (25.0)
Distribution of women with high-risk pregnancies	1 (25.0)
Distribution of births with poor neonatal outcomes (national)	1 (25.0)
Distribution of facility-based peripartum fetal care	1 (25.0)

and health outcomes. Therefore, the use of tools such as GIS is needed to evaluate these associations. Pregnant women's access to health care centres and improvement in their health status are basic rights of women and can be thought of as an index of development in any country.

Our study had some limitations. First, the variables examined in some of the studies were not clearly reported and may have been missing. Second, we classified the extracted variables based on expert consensus for a better reporting. As such, we may have misclassified some variables. Third, although we reported the effect of these variables on maternal care, we could not undertake a precise analysis because of the large number of descriptive studies and the many different objectives of the studies. We only included articles in English and

searched only two databases which is another limitation as there might have been some relevant articles published in other languages and included in other databases.

Conclusion

Our review highlights the various applications of GIS in examining important variables in maternal care, and the need for programmes to improve the accessibility, use and quality of care for pregnancy and childbirth. Health care planners can use GIS to determine the best location and capacity of new health care facilities, and assess the costs. Furthermore, electronic health technologies, such as telemedicine, may be a way to overcome barriers of geographic access.

Acknowledgement

We thank Dr Reza Khajouei and Dr Khodadad Sheikhzadeh for their comments.

Funding: None.

Competing interests: None declared.