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Reasons for low birth registration in Sudan

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The birth registration environment in Sudan is mature but confused. This study was undertaken on the birth registration practices in Sudan with a view to ascertaining the causes and effects of low birth registration. The registration of births is not improved with time, there is no progressive procedure in the registration application and the registration system effect according to sex ratio, number of women in the reproductive age (MWRA) and number of health facilities. To test these hypotheses, we proceed by considering regression model for which time series and cross-section as statistical tools for analyzing data are available by applied fixed effect model.The overall situation of birth registration in the country is characterized by limited coverage and unclear coordination between institutions both at central and local levels; and some geographic and financial barriers and birth registrations affect the number women in the reproductive age (MWRA), number of health unit which provides registration services and sex ratio. To improve the birth registration environment in Sudan, first, increase awareness of the importance of birth registration; secondly, birth registration infrastructure of capacity building support is needed at all levels of birth registration system.

Key words: Birth, registration, fixed effect model.

INTRODUCTION

Registration may not be seen as important by the society at large, by a government facing severe economic difficulties, by a country at war, or by families struggling with day-to-day survival. It is often considered to be no more than a legal formality, unrelated to child development, health, education or protection. Major factors that influence the birth registration levels in a country include: the magnitude of national commitment to birth registration as a priority; the value that individuals and families place on birth registration; the existence of an adequate legislative framework; the existence of sufficient infrastructure to support the logistical aspects of registration; and the number of barriers that families encounter during registration.

A boy or a girl whose birth is not fully registered and who is not provided with a birth certificate is denied the right to a name and nationality, a situation that may also lead to barriers in accessing other rights including health care, education, or social assistance. Later in life, identity documents help protect children against early marriage, child labor, premature enlistment in the armed forces or, if accused of a crime, prosecution as an adult. Registration also enables the individual to access further identity documents, including a passport. The value of

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birth registration as a fundamental human right is often overlooked due to the continuing lack of awareness that registration is a critical measure to secure the recognition of every person before the law, to safeguard his or her rights and to ensure that any violation of these rights does not go unnoticed.

Birth registration has been an issue which received attention of international community since some time. International Covenant on Civil and Political Rights (ICCPR) states, “Every child shall be registered at birth …” (ICCR article 1966).

The1986 United Nation (UN) Convention on the Rights of Child (CRC) specifies, “The child shall be registered immediately after birth and shall have the right to have a name, the right to acquire a nationality …..” (CRC article 1986).

Despite the great efforts made by international organizations and UN in particular, the situation of birth registration is not improving in many developing countries. According to UNICEF Report of 1998, about 40 million newborn children did not receive birth registration; 10.5 million of them were in Africa. Same organization report of 2002 showed that the number of unregistered children in 2000 reached 50 million (41% of births worldwide).

Reasons for no registration

There are many reasons for the lack of birth registration in all countries around the world Caretakers of children that have not been registered were asked: “Why is (name’s) birth not registered?” The reasons coded for analysis were: (UNICEF report of 2005).

1. Costs too much
2. Must travel too far
3. Did not know child should be registered
4. Late and did not want to pay fine
5. Does not know where to register
6. Does not know why the child was not registered
7. Other reasons.

Data related to the reasons why a child were not registered were available for 48 countries. Unfortunately, across several countries a large percentage of responses were coded as “other reason” or “don’t know,” potentially hiding commonly encountered reasons for not registering a child. Based on the remaining number of responses that fall within the pre-coded reasons for non-registration, it is possible to ascertain some of the major reasons for non-registration by ranking the responses.

The most common reason cited in (20) countries was that birth registration cost too much. Households in (14) countries were most likely to find the distance to the registration centre to be the primary barrier to the registration of their children. In eight countries, not knowing that the birth should be registered was the most common reason given by caretakers for not registering their child. While incurring a late fee was the most common reason for non-registration in only two countries, it was the second most common reason in five additional countries. Lack of knowledge of where to register was the most common barrier in Sierra Leone and Venezuela, and the second major reason in five additional countries (UNICEF Report 2005).

Birth registration in Sudan process

History of official birth registration dates back to1900 during the colonial era, though an act by the office of the Governor General. Birth registration was started at limited number of urban center (e.g. Sudan, Atbra, and Wadi Halfa). The main users of this service were foreigners residing in Sudan (British, Syrians and people from other nationalities), who were using available health facilities for deliveries of their children. Nationals due to many factors had very limited access to birth registration, due to multiple factors like very high level of illiteracy, remoteness of birth registration facilities and unawareness about the importance of birth registration. In 1929, a law regulating birth registration was enacted, but nationwide access to birth registration remained limited. Registration of birth as a vital event was the responsibility of Ministry of Health through its Health Information Department in coordination with Central Bureau of Statistics (CBS). Birth registration system was centralized until 1993. All birth registration data were gathered at the Birth Registration Office under the (CBS). With the introduction of Federal System of governance in Sudan in 1993 the birth registration also was decentralized, and each State established its own birth registration database. Although, state’s offices are obliged to send regular reports to the head office of Civil Registry to maintain national database.

Administrative system for birth registration

Generally, the birth registration process is conducted at three levels: National, State, Grassroots level (Table 1). According to administrative regulations in the country, the birth registration from the first day of birth up to three months of age is the responsibility of health institutions (Hospitals, Health Commissions at localities etc). Children older than three months and up to fifteen years of age are registered at the Civil Registry Office in their area. Registration of children older than three months at Civil Registry Office requires a notarized court resolution. Unregistered children older than fifteen years will be referred (with a letter of non-registration from the Civil Registry) to the Medical Commission Functioning based on a law issued in 1974) for age estimation. No feedback

Table 1. The Sudanese administrative system for birth registration.

Administrative level	Competent authorities
National Level	Civil Registry./ Ministry of Health (MOH)
State level	Civil Registry Office / MOH
Locality level	Health Commission /Health Statistician.
City level	Health institutions / Midwives.
Grassroots level (village and mobile communities).	MOH staff (MD, Midwives) or entrusted people at areas where there no health facilities.

Source: Study- secondary data.

system from the Medical Commission to Civil Registry exists. The only link between the Civil Registry and Medical Commission is that the Civil Registry issues a letter of non-registration for those who are older than 15 years, and present to them for issuance of a birth certificate if their birth registration data are not found in the birth register. Age estimation has its negative impact on different spheres of life, because it never reflects the exact age.

Machinery of birth registration

Despite the fact that Civil Registry law was issued in 2001,The official start of Civil Registry was in the 1st of January 2005 under the Ministry of Interior. The functional infrastructure of Civil Registry still not in place due to preparatory works needed to be done. A special committee was established to design a work plan .After studying the relevant experience of civil registration in other countries; the committee developed a work plan for introduction of civil registry in Sudan. Since its official establishment, the Civil Registry opened Offices at all States of the country starting to deal with birth and death registration and other civil affairs. Its activities relating to birth registration at present are limited to late registration (after three months and up to 15 years of age), and issuance of birth certificates (Official Extract from the General Birth Register) and letters of non-registration. The main constraints and barriers facing the immediate implementation of planned activities are related mainly to lack of financial resources and trained personnel. Activities relating to timely birth registration are still carried out by staffs of Ministry of health MOH and report about birth events are sent to the Civil Registry on monthly and yearly bases.

At present birth registration is carried out at three levels.

Grassroots level

Notification of birth event is done most of the time by midwives, who usually attend births at home or at rural health establishments. If birth of the child occurred at home the concerned midwife has to register this vital event in her own book (ordinary exercise book).
The following information is required for registration:

1.Name of the child.
2.Sex of child.
3.Time and date of birth.
4.Father's name (full four names), age, occupation, Religion, and place of residence
5.Mother's name (full four names), occupation and place of residence.
6. Name of informer.

Information registered by a midwife should be delivered to the nearest health facility in her area to make a notification about the event of birth within a period of maximum one week. The concerned entity in the health facility (usually the health statistics staff member or entrusted health worker) enters the information in the prescribed register (Birth Register book No.1) i.e. a book with preprinted columns and numbered pages, and then issue a birth certificate after payment of fees (that may differ from one place to another); variations in fees depend largely on service fees put on the issuance of birth certificate by local authorities, which depends on local estimations. No clear provision in the law, that fixes the fees for certificates issuance. This birth certificate should be received by one of the child's guardians but sometimes the notifying midwife receives the certificate and delivers it to the child's family. The study observed that there are no supervisory or corrective measures exerted by authorities for control of birth certificate fees.

Locality and city level

Each locality has to have a health commission within its structure. This health commission is supposed to be responsible for entry of birth data received from midwives or other notifies in (Birth Register Book No 1), which an official document is issued by the Federal Ministry of Health – National Center of Health Information. The book has a serial number for each page (original and one copy). After registering the data in this book the responsible person at health commission issues a birth certificate. On monthly basis the locality sends a copy of

filled register (Book 1) to the MOH or sometimes to Civil Registry authorities, where they are stored for future use and issuance of birth certificate for late presenting people.

National level

It is essential that there is a central (National) unit with full-time staff for the birth registration in the country to be in charge of legislative changes, co-ordination, standardization of forms and practices, the management of central database and data processing. This Job is still carried out by the National Health Information Center (NHIC) at the Federal Ministry of Health (FMOH). This center coordinates its birth registration activities with the newly established Civil Registry.

Up to 1993, legislation and data management of the birth registration system in Sudan was centralized. All data about birth registration were sent from different parts of the country to the NHIC and CBS, where they are processed, disseminated and stored. Birth registration data in combination with other vital data are used by relevant authorities for developing national indicators (e.g. Analysis of fertility and mortality rates by age, and development of projections of demographic change) and planning of development policies, particularly in health, education, housing, water and sanitation and other services. According to the head of Civil Registry Office Sudan "the last vital statistics report done was in 1968 (Figures 1 and 2).

METHODOLOGY

A pool data (cross sectional/times series) is a statistical method, widely used in social science, epidemiology, and econometrics, which deals with two-dimensional. The data are usually collected over time and over the same individuals and then a regression is run over these two dimensions. Multidimensional analysis is an econometric method in which data are collected over more than two dimensions.

Data were collected mainly from secondary sources (Reports, books etc). There are not accurate estimates for birth registration rates in the country due to rudimentary system of birth registration, data collection, transfer, and processing. An important consideration for the accuracy and completeness of birth registration system is the number and distribution of local registration facilities and their accessibility to the public. Large geographic area, difficult terrain, lack of transportation, low population density and civil unrest in some areas of the country may make it difficult and not feasible to locate registration facilities in remote areas. For these reasons timeliness, accuracy and coverage of birth registration often varies significantly cities, towns and rural areas and even among states.

Pooling data

These are data which variables vary both over time and across cross-sectional units. We will always refer to the units as i = 1, 2 ..., N, and to the time points as t = 1, 2, ...T . The total number of observations (i.e., lines of data in the worksheet) is equal to NT.

Some general conventions for naming these kinds of data are:

1. Panel data generally refer to data which are cross-sectionally dominated; that is, where N is significantly larger than T. Examples are the NES panel studies (N = 2000, T = 3) or the Panel Study of Income Dynamics (N = large, T = 12 or so). Such data usually have a fixed T, so that these data's asymptotic are in N, which is important.
2. Time-series cross-sectional (TSCS) data usually means data in which either T is dominant, or N-T. These data are common in comparative politics. But, it can also refer to data where N is dominant, but T is larger than in panel data (e.g. all-dyads all-years IR data, with N = several thousand and T = 50 or more). Here, N is usually fixed, and the asymptotic are in T; moreover, if we have enough data, we can say something about the time-series properties of the data as well as the cross-sectional part (Galwey, 2006; Muller and Stewart, 2006; Long, 2009).

Data structure

In panel or TSCS data, we have multiple lines of data for each unit of observation. Such data are arranged as follows (Table 2).
When analyzing such data, its good practice to -sort- the data on the N and T identifier variables periodically (Galwey, 2006; Muller and Stewart, 2006; Long, 2009).

General time-series cross-sectional TSCS regression issues

A general regression model for cross-sectional data:

$$\boldsymbol{Y_i} = \propto + \boldsymbol{Bx_i} + \boldsymbol{\mu_i} \qquad \textbf{(1)}$$

This model assumes several things:

1. All the usual OLS assumptions, plus
2. That the constant term is constant across different
3. That the effect of any given variable X on Y is constant across observations (at least, to the extent that non-constancy is not specified in the model, e.g. through interaction terms).

We can write a similar model in the TSCS context as follows:

$$\boldsymbol{Y_{it}} = \propto + \boldsymbol{Bx_{it}} + \boldsymbol{\mu_{it}} \qquad \textbf{(2)}$$

Note that this model assumes the same things as the earlier one, especially about the effects of constants and covariates.
In any regression context, the two assumptions mentioned are critical; violating them leads to a form of specification bias. In the TSCS context, these two assumptions are often going to be problematic. This is because, since we are observing multiple units over time, there is usually some reasons to believe that there may be differences in either α or β over either i or t. (Galwey, 2006; Muller and Stewart, 2006; Long, 2009).

Pooled model estimation

There are a number of ways that you can use information about the structure of your pooled data in estimating an equation. You might estimate a fixed or random intercept model, or perhaps a model with selected variables that have different coefficients across cross-sections, as well as separate AR (1) coefficients. On the other hand, you could estimate a separate equation for each cross-sectional unit.
The class of models that can be estimated using a pool object can

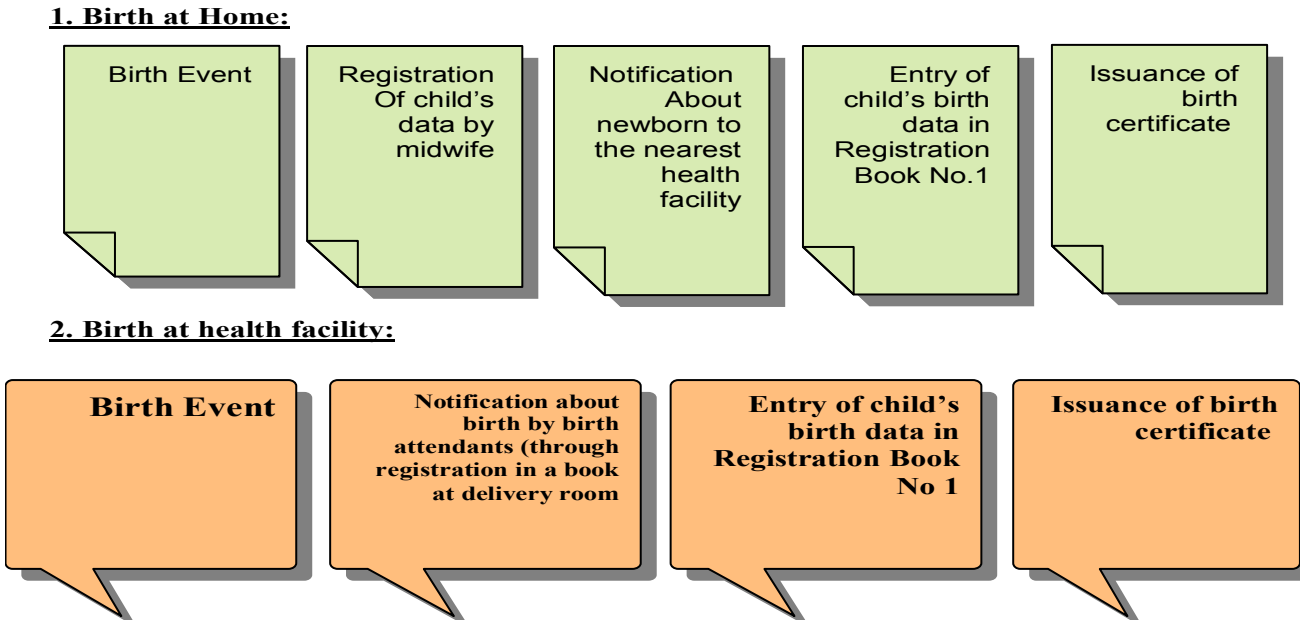

Figure 1. Birth registration. * constructed by researcher.

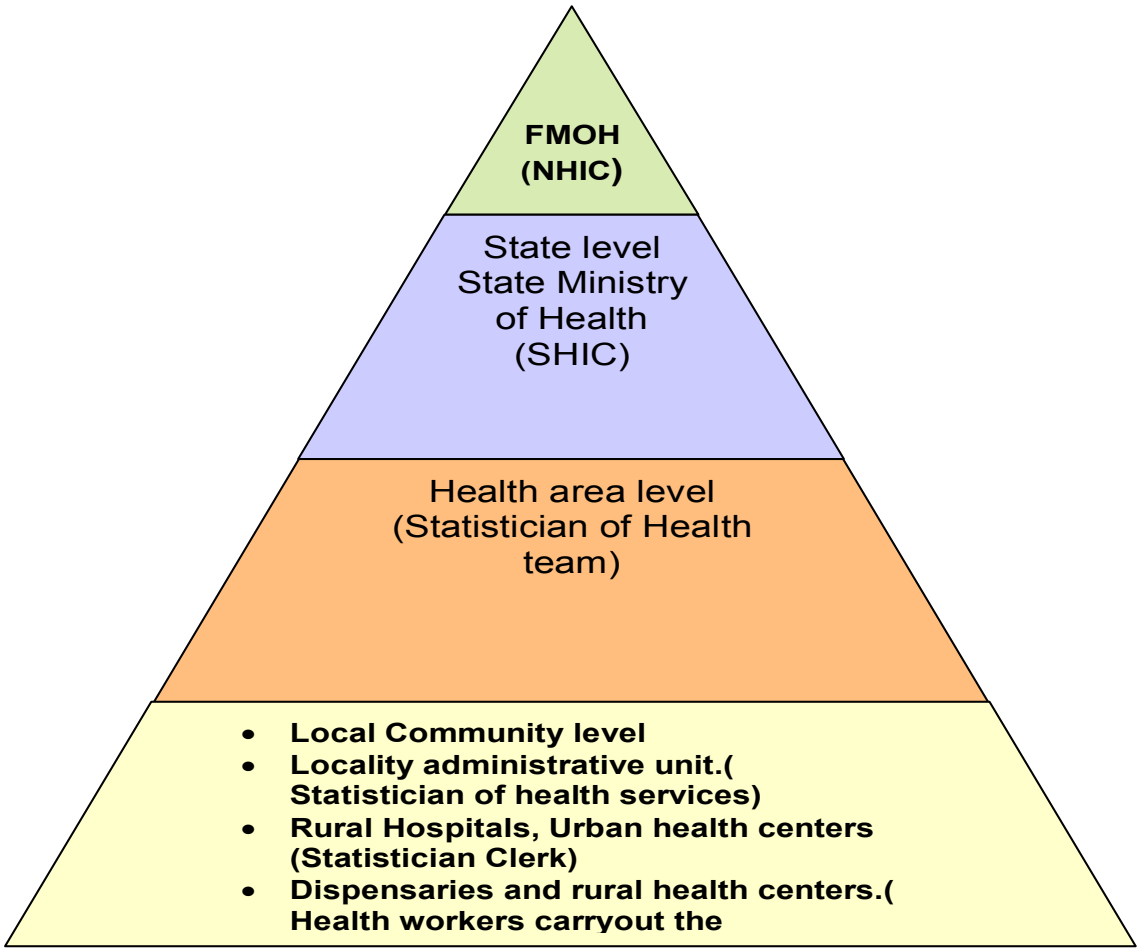

Figure 2. Level of birth registration and data flow. *Source: constructed by researcher.

Table 2. Arrangement of multiple lines of data for each unit of observation.

ID	T	Y	X_1	…
1	1	250	3.4	…
1	2	290	3.3	…
…	…	…	…	…
…	…	…	…	…
2	1	160	4.7	…
2	2	150	4.9	…
…	…	…	…	…
…	…	…	…	…

be written as,

$$\boldsymbol{Y_{it}} = \propto + \boldsymbol{Bx_{it}} + \boldsymbol{\varepsilon_{it}} \quad \textbf{(3)}$$

Where Y_{it} is the dependent variable, and x_{it} and $\boldsymbol{Bx}$ are -vectors of non-constant regresses and parameters for i = 1, 2 , …. , N cross-sectional units. Each cross-section unit is observed for dated periods t = 1, 2, … T .

While most of our discussion will be in terms of a balanced sample, we can view these data as a set of cross-section specific regressions so that we have N cross-sections equations:

$$\boldsymbol{Y_i} = \propto + \boldsymbol{Bx_i} + \boldsymbol{\varepsilon_i} \quad \textbf{(4)}$$

Each with observations, stacked on top of one another, we will refer to the stacked representation:

$$Y = \alpha + \beta + \varepsilon \quad \textbf{(5)}$$

Where α, β and X are set up to include any restrictions on the parameters between cross-sectional units. The residual covariance matrix for this set of equations is given by:

$$\Omega = E(\varepsilon\acute{\varepsilon}) = \begin{pmatrix} \varepsilon_1^2 & \varepsilon_1\varepsilon_2 & \ldots\ldots & \varepsilon_1\varepsilon_N \end{pmatrix} \quad \textbf{(6)}$$

The basic specification treats the pool specification as a system of equations and estimates the model using system OLS. This specification is appropriate when the residuals are contemporaneously uncorrelated, and time-period and cross-section homoscedastic:

$$\Omega = \sigma^2 I_N \otimes I_T \quad \textbf{(7)}$$

The coefficients and their covariance's are estimated using the usual OLS techniques applied to the stacked model (Galwey, 2006; Muller and Stewart, 2006; Long, 2009).

Fixed effects

The fixed effects estimator allows α_i to differ across cross-section units by estimating different constants for each cross-section, computes the fixed effects by subtracting the "within" mean from each variable and estimating OLS using the transformed data:

$$Y_i - \bar{Y}_i = (Xi - X\bar{i})\beta + (\varepsilon_i - \bar{\varepsilon}_i) \quad \textbf{(8)}$$

Where

$$\bar{Y}_i = \sum_t Y_{it}/T \;,\; \bar{X}_i = \sum_t X_{it}/T \text{ , and } \bar{\varepsilon}_i = \sum_t \varepsilon_{it}/T \quad \textbf{(9)}$$

The coefficient covariance matrix estimates are given by the usual OLS covariance formula applied to the mean differenced model:

$$\text{Var}(b_{FE}) = \hat{\sigma}^2{}_w \left(\tilde{X}'\tilde{X}\right)^{-1} \quad \textbf{(10)}$$

Where $\tilde{X}$ represents the mean differenced X, and

$$\hat{\sigma}^2{}_w = \frac{e'_{FE'} e_{FE}}{NT-N-K} = \frac{\sum_{it}\left(\tilde{y}_{iy} - \tilde{x}_{it}' b_{FE}\right)^2}{NT-N-K} \quad \textbf{(11)}$$

Where e_{FE} e_{FE} is the SSR from the fixed effects model. If the pool is unbalanced, NT is replaced by the total number of observations excluding missing values. The fixed effects themselves are not estimated directly. We report estimated fixed effects computed from

$$\hat{\alpha}_i = \sum_t \left(\bar{Y} - \bar{X}' b_{FE}\right) / N \quad \textbf{(12)}$$

Standard errors are not reported for the fixed effects coefficients. If you wish to obtain standard errors for the fixed effects, you should re-estimate a model with no intercept, including the constant term as a cross-section specific regressor. You should note that estimating the cross-section specific constant regression model with a large number of cross-section units may be time-consuming, and may result in estimates that are less accurate than those obtained using the fixed-effects option (Galwey, 2006; Muller and Stewart, 2006; Long, 2009).

DATA ANALYSIS RESULT AND INTERPRETATION

Eview *outputs* for estimating the model by using Fixed Effects are as follows (Table 3):

1. The parameters, women in the reproductive age, number of health unit which provide register services and sex ratio are significant since the probability is less than *5%*, except the literacy rate; so that means the birth registration is affected by the number of women in the reproductive age, number of health unit which provides registration services and sex ratio .
2. R-squared is 0.91, which is good for predicting the values of the dependent variable and R-squared adjusted is 0.89 which is goodness of fit of the model.
3. Durbin-Watson statistics is 2.06, in which there is no serial correlation problem in the model among errors.
4. F-statistics is 209.62 and F- Probability is 0.000, which is less than 1*%;* so the model is significant and the alternative hypothesis is accepted that birth registration is affected by the number of women in the reproductive age, number of health unit which provides registration services and sex ratio.

Table 3. Outputs of the fixed effects model analysis.

Variable	Coefficient	Std. error	t-Statistic	Prob.
LITRACY?	-74.7485	278.6194	-0.26828	0.7894
UNIT?	-462.296	138.7324	-3.33228	0.0015
MWRA?	-33.2464	16.45521	-2.02042	0.0478
SRATIO?	1036.822	292.503	3.544652	0.0008
Fixed Effects				
_SDN--C	105927.6			
_GEZ--C	45580.86			
_WNIL--C	-51666.2			
_BNIL--C	-92145.5			
_SIN--C	-67987.3			
_RNIL--C	-14272.9			
_NORT--C	-48864			
_KAS--C	-54028.2			
_GAD--C	-56952.7			
_RED--C	-80846.8			
_NKOR--C	-60646.1			
_SKOR--C	-65063.8			
_WKOR--C	-75577.1			
_NDAR--C	-70809.7			
_SDAR--C	-70890.5			
_WDAR--C	-85800.8			
R-squared	0.912899	Mean dependent var		15913.99
Adjusted R-squared	0.885318	S.D. dependent var		30077.78
S.E. of regression	10185.78	Sum squared resid		6.23E+09
F-statistic	209.6197	Durbin-Watson stat		2.061749
Prob (F-statistic)	0.000000			

5. Fixed effect model: BIRTH_SDN = C(5) + C(1)*LITRACY_SDN + C(2)*UNIT_SDN + C(3)*MWRA_SDN + C(4)*SRATIO_SDN

Substituted coefficients

BIRTH_SDN=105927.6007-74.7484782*LITRACY_SDN-462.2955202*UNIT_SDN-33.24636714*MWRA_SDN+ 1036.821537*SRATIO_SDN

According to the results shown in the Sudan equation above we find that C(5) is the intercept of the model and C(1) , C(2), C(3) and C(4) represent the model coefficient of the variable literacy, health unit, married women in reproductive age and sex ratio affecting the birth registration in Sudan; the model fit of R-square 91% explains the change in birth registration process by literacy, health unit, married women in reproductive age and sex ratio. The model is significant and the alternative hypothesis is accepted that birth registration is affected by literacy, health unit, married women in reproductive age and sex ratio since F- probability is of significant value.

Conclusion

The two models agree with the variables in the model coefficient, which are literacy, health unit, married women in reproductive age and sex ratio. These factors affect the birth registration process in Sudan and this finding is approved by UNCIF 2005 Report and Sudan Household Health Survey (SHHS I & II) 2006 and 2010 shows that is registration rate is low.

Implementation of birth registration system through a civil registry is a slow process, which requires an intensive, continuous follow-up and long-term commitment of the government. It will take some time to develop a common understanding of the key functions of such a system and its importance. The overall situation of birth registration in the country is characterized by limited coverage and unclear coordination between institutions both at central and local levels and some geographic and financial barriers. There are many areas that still need to be studied in-depth (e.g. geographical and cultural specificities…) to develop a clear legal frame and coordination mechanism between all authorities related to birth registration, Civil Registry, MOH, MOE, NCCW, CBS and strategic planning entities. Areas that need immediate

attention are: promotion and awareness raising, capacity building of birth registration system and increase of its coverage to reach the remote areas and specific groups of populations (nomads, street children etc), involvement of civil society, grassroots organization and community leaders and activists, statistical analysis of the data of children who are likely to be registered at birth. In general, the data in this study show that:

1. People who live in rural areas have limited access to health care, are not registered at birth.
2. People like to register males than females.
3. Rural poverty may negatively affect numbers of registered children
4. Improving mother's knowledge and education might benefit birth registration rates
5. No programming to increase birth registration rates.

Conflict of Interests

The author has not declared any conflict of interests.

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