

Household and Context-level Determinants of Birth Registration in Sub-Saharan Africa

Anne Lieke Ebbers¹ and Jeroen Smits¹

¹ Global Data Lab, Institute for Management Research, Radboud University, The Netherlands

Corresponding Author: Anne Lieke Ebbers,

Global Data Lab, Institute for management Research, Radboud University,

P.O. Box 9108, 6500 HK Nijmegen, The Netherlands

E-mail: annelieke.ebbers@ru.nl

Household and Context-level Determinants of Birth Registration in Sub-Saharan Africa

While birth registration is a human right, in sub-Saharan Africa (SSA) only half of new-born children is currently registered. To gain insight into the reasons behind this low registration rate, we study the role of determinants at household, local and country level using data on 567,407 children in 34 SSA countries. While most of the variation in birth registration is due to factors at the household level, context factors are found to play an important role as well. At the household level, poverty, low education, a missing father, restricted autonomy of women, and belonging to a traditional religion negatively affect registration. Lack of professional care during pregnancy, delivery, and early life are also associated with less registration. Important factors at context level are urbanization and availability of health facilities in the local area and birth registration legislation, a decentralized registration system, and lower overall fertility at the national level. To improve registration, the complex dynamics of the relevant factors at household and context level has to be taken into account.

Keywords: birth registration, sub-Saharan Africa, household and context factors, reproductive health, registration legislation, decentralization, poverty

1. Introduction

‘Birth registration is a human right, yet less than three quarters of children under 5 years of age worldwide are registered’ (UN, 2019, p.55). Birth registration is part of sustainable development goal 16; ‘promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels’ (UN, 2019, p.19). Notwithstanding that the problem is recognized, progress has been slow and limited (Bhatia, Ferreira, Barros, & Victora, 2017; Fagnäs & Odame, 2013). For example, according to Fagnäs & Odame (2013, p.459) in sub-Saharan Africa (SSA) ‘the average registration rate was 53% in 1999-2003 and 49% in 2004-2010, with only a few countries making notable progress’. The latest data from 2010-2018 shows that the registration rate in SSA even has decreased further since then (UN, 2019).

The consequences of not having a birth registration are enormous. Research shows that unregistered children have limited access to services, like health care, and cannot be protected by the law (Bequele, 2005; Todres, 2003; UNICEF, 2020). There are grave consequences for the child’s future since a birth registration is often needed for acquiring property, employment, social security, and to vote (Amo-Adjei & Annim, 2015; Harbers, 2020; Li et al., 2010; Mackenzie, 2008). It therefore is of the utmost importance to get a comprehensive understanding of the factors that drive this phenomenon.

Until around 1995, most research on birth registration was focused on developed countries (Årbyholm, 1978; Shapiro, 1954; UNICEF, 1998). Since then, the problem of under-registration in low and middle income countries (LMICs) has become apparent, shifting the focus of research to the causes of non-registration in these countries (Duff et al., 2016; Duryea et al., 2006; UNICEF, 2005). However, most of these studies focus on factors at the household level, where decisions regarding registration are generally taken. An important reason for this is that available data are usually derived from household surveys, as only few developing countries have a precise and objective assessment of birth registration coverage (Duryea et al., 2006; Harbers, 2020; UNICEF, 1998, 2005). Potentially relevant factors at other levels, like the

economic development of the region, a previous colonial regime, or the national legislative framework are often disregarded (Bequele, 2005; Li et al., 2010; Mohanty & Gebremedhin, 2018).

However, recent research for India indicates that studying factors at household and context level simultaneously can significantly improve our understanding of birth registration problems (Mohanty & Gebremedhin, 2018). It therefore seems important to study the role of context factors for other countries as well. In this study, this is done for countries in the SSA region, where the problem is even more pressing (UN, 2019). To make this possible, an encompassing framework is developed, including factors at household, subnational and – for the first time also -- national level, which are known or expected to influence birth registration outcomes. The predictions of this framework will be tested by applying multilevel logistic regression analyses to a database with information on 567,407 children living in 753 areas within 34 SSA countries. In this way, we aim to contribute to the literature in important ways. First, by studying the determinants of birth registration at the household and context level simultaneously, the relative contribution of risk factors at the different levels can be estimated. Second, by using a very large sample of children, more precise estimates of the effects of those risk factors can be obtained. Third, by using data for 34 SSA countries, the role of factors at the national level can be studied better than in earlier research focusing on only one or a few countries.

2. Birth registration

Birth registration is defined as: ‘the continuous, permanent, and universal recording, within the civil registry, of the occurrence and characteristics of births in accordance with the legal requirements of a country’ (UNICEF, 2013, p.4). Birth registration entails the following procedure: (1) an official statement of the birth of a child by a spokesman; (2) the registration of child and birth by some administrative level of the government that coordinates civil registry;

and (3) the publication and circulation of a birth certificate (Pais, 2002; UNICEF, 2013). The certificate includes information on the recording, such as the date and place of the birth, the names of the child, parents, and witness of the birth, and some additional relevant information like the nationality (Apland et al., 2014; Todres, 2003). This last step of the procedure often follows automatically (UNICEF, 2013). The procedure is improved by the notification role of hospitals, midwives and local government officials, who can report new births to the administrative level of the government coordinating civil registry (UNICEF, 2013). Although a healthcare worker can help with registration and notify the government as a control, the decision regarding the legal registration of a child's birth can only be carried out at the household level by parents or caregivers (Todres, 2003; UNICEF, 2013).

When the registration procedure is complete the child is legally existent and has documentation as proof, enabling the protection of other child's rights as well, such as access to healthcare and education and legal protection from crimes like child labour (Apland et al., 2014; Bequele, 2005; Manby, 2021; Todres, 2003). A birth registration cannot only secure rights in childhood, but is also important for securing rights in adulthood, like social security (Harbers, 2020; Li et al., 2010; Mackenzie, 2008; Todres, 2003). While compliance with these rights cannot be assured, a person faces a higher chance of compliance when having a birth registration (Todres, 2003). Moreover, identity documents are important for economic advancement since they are often needed for obtaining employment, property, and a functioning infrastructure (Amo-Adjei & Annim, 2015; Harbers, 2020; Pelowski et al., 2015; Szreter, 2007).

Although the benefits of having a birth registration are substantial, only 46% of children in sub-Saharan Africa is registered (Bequele, 2005; UN, 2019). In this region, the immediate costs of birth registration seem to be considered higher than the future benefits (Corbacho & Osorio Rivas, 2012; Harbers, 2020; Pelowski et al., 2015). Nevertheless, both between and within SSA countries, there is substantial variation in registration rates (Cappa et al., 2014;

Mohanty & Gebremedhin, 2018) , pointing towards the importance of context factors influencing the outcome of the decision (Pelowski et al., 2015; Smits & Huisman, 2013).

3. Determinants of birth registration

The context in which the birth registration decision is made has basically three relevant levels: the household, local and national level (Li et al., 2010; UNICEF, 2013). This study will therefore study potential determinants of birth registration on these three levels simultaneously. In the next sections the relevant socioeconomic, demographic and institutional factors at each of these three levels are discussed.

3.1 Household level

The birth registration decision is made at the household level, generally by the parents or caregivers of the child involved (UNICEF, 2005; UNICEF, 2013). Their decision might be influenced by socio-economic and demographic characteristics of the household. One of the most important determinants at this level is household wealth (Pais, 2002; UNICEF, 2005). In most SSA countries, a fee is involved in the birth registration procedure that may prevent poor parents from registering their children (Fagernäs & Odame, 2013; Pais, 2002; UNICEF, 2005, 2013). Even if parents do not have to pay for registration initially, there might be a fee for late registration (Mohanty & Gebremedhin, 2018). Besides these direct costs, indirect costs like travelling costs or opportunity costs, including time that cannot be spend on working, may play a role (Fagernäs & Odame, 2013; Pais, 2002; UNICEF, 2005, 2013). These indirect costs are often higher for poorer families as they most likely live in more disadvantaged neighbourhoods with worse infrastructures and are located further away from registration offices (Bequele, 2005; Fagernäs & Odame, 2013).

Associated with wealth, having a mobile phone in the household is argued to be beneficial for registration rates (Candia, 2019; Dunning et al., 2014). Firstly, according to

Candia (2019), a mobile phone may grant access to internet, which can improve the access to information about birth registration. The author argues that a mobile phone is especially important and useful in rural areas because these areas are often not accessed by other forms of mass media, for example due to the insufficient (technological) infrastructure. Secondly, technological advancement allows for the development of systems in which a birth can be registered by using a mobile phone (Dunning et al., 2014; Manby, 2021). In some countries, these systems are already starting to work and reduce the costs of birth registration (Dunning et al., 2014). One should take into account, however, that institutional safeguards are needed to protect the privacy of citizens (Manby, 2021).

Besides the proper resources, knowledge about the importance and procedures of birth registration is needed (UNICEF, 2005, 2013). Knowledge can create consciousness and in turn motivation to register births (Bequele, 2005). An important factor influencing knowledge is education (Anne & Ong'ondo, 2013; Makinde, Olapeju, Ogbuoji, & Babalola, 2016; UNICEF, 2005). The higher the level of education, the higher the chance that parents recognize the value of having a birth registration and know how to register a birth (Isara & Atimati, 2015; UNICEF, 2013). Besides direct effects of parental education, indirect effects can also be seen as educated parents often have better educated social networks, which can result in better advice in general (Mohanty & Gebremedhin, 2018). Social networks may play a very important role as knowledge about birth registration is mostly gained by talking to relatives or neighbours (Parmar, Jakasania, & Rathod, 2016).

Moreover, the demographic structure of the household can be an important variable influencing birth registration (Pais, 2002; UNICEF, 2005). First, older children have a higher chance of having a birth registration (Duff et al., 2016; Makinde et al., 2016). A birth registration becomes more useful with age since identity documents are sometimes needed in order to enter or graduate from school or to access health services (Corbacho et al., 2012; Harbers, 2020; UNICEF, 2013). Second, the composition of the family is important as a missing

parent or even both parents can make birth registration very difficult (Rodríguez, 2016; UNICEF, 2005). Missing one parent is sometimes problematic because in some countries legislation requires the father to register a child, which is impossible if he is not present (Pais, 2002; Rodríguez, 2016; UNICEF, 1998). A missing mother may lead to disregarding the birth registration, as mothers are primary caregivers regularly (UNICEF, 1998).

Not only the family structure, but also the relational structure within the household is important (Mohanty & Gebremedhin, 2018). Bloom, Wypij, & Das Gupta (2001) have shown that women with more autonomy seek more antenatal or prenatal care, which also leads to better child health outcomes. Mohanty & Gebremedhin (2018) consider the mother's ability to move around as crucial for activities that enhance the welfare of children, such as immunization, health check-ups, and birth registration. Furthermore, the mother's bargaining power is important, since women with more bargaining power are more likely to spend resources on their children (Mohanty & Gebremedhin, 2018). Accordingly, children from households in which women have more autonomy are more likely to have a birth registration.

Other household characteristics that may play a role in the SSA context are religion and ethnicity (Nomura et al., 2018; Pais, 2002; UNICEF, 1998, 2005). Ethnic and religious groups can have multiple reasons for not registering births. First, they may have certain traditions with regards to name giving that may make early birth registration problematic, for example if children only obtain a name after some period of time (Chereni, 2016; UNICEF, 1998, 2013). Second, ethnic and religious minorities might not register births due to having misgivings about the way birth registrations are handled (Cappa et al., 2014; Mohanty & Gebremedhin, 2018). These groups might fear that birth registration will be misused, as was the case in Rwanda in 1994 when this type of information was used to exterminate a particular group of people or for subduing as during the Apartheid in South Africa (Bequele, 2005; Pais, 2002; Szreter, 2007; UNICEF, 1998). Third, ethnic minorities and traditional religious groups may have the additional disadvantage of speaking a different language (Pais, 2002). In most SSA countries,

various languages exist within and across groups, which can cause language barriers and illiteracy in the language of the registration form (Nomura et al., 2018; Pais, 2002). In addition, there might be no information about birth registration available in the language of the group, which can cause ignorance about the importance of birth registration and the registration procedure (Mackenzie, 2008).

Besides socio-economic factors, also care-related factors may play a role at the household level. According to Fagernäs & Odame (2013, p.460), 'registration offices are often located within health facilities or close to them, which creates a direct connection between health care and registration.' Health care related to pregnancy and early life can be used to increase awareness of the importance of birth registration. Skilled health personnel is usually seen as a credible source of information. Health workers can provide women with information about birth registration, recommend to register the child, help with the paperwork needed and propose a registration office (Makinde et al., 2016; Mohanty & Gebremedhin, 2018). This is especially important as traditional birth attendants were found to motivate parents less to register births than skilled birth attendants (Candia, 2019; Nomura et al., 2018; UNICEF, 1998, 2013). Moreover, giving birth at home poses more restrictions on birth registration, for example due to travelling costs and not having help with filling in forms. Receiving care or giving birth in an institutional facility is therefore also of great importance.

Availability of primary care provided by health institutions in the first years of a child's life is important as well (Bhatia et al., 2017; Candia, 2019). For example, when administering vaccinations or vitamin supplements, health care personnel has the opportunity to discuss the missing birth registration with the parents (Fagernäs & Odame, 2013; UNICEF, 2005). According to Pelowski et al. (2015, p. 900), 'using vaccine delivery (particularly Diphtheria-tetanus-pertussis, DTP) as an occasion to register births may also provide a means of reaching children born outside health facilities'. The same reasoning holds for receiving vitamin A (Fagernäs & Odame, 2013; UNICEF, 2005).

3.2 Local context

Although the birth registration decision is made at the household level, the situation in the local context can influence the outcome of this decision, as both the availability and efficacy of services varies considerably across regions (Amo-Adjei & Annim, 2015; Corbacho et al., 2012; Mohanty & Gebremedhin, 2018). Households living in the same region face similar policies and infrastructures, which can in turn affect decisions such as whether to register children, where to deliver them, and whether or not to send them to school for example (Mohanty & Gebremedhin, 2018).

An important characteristic of a region is the degree of urbanization, because it reflects the infrastructure within the region, which can influence the awareness and the costs of birth registration (Amo-Adjei & Annim, 2015; Mohanty & Gebremedhin, 2018; Nomura et al., 2018). Birth registration systems and offices often do not stretch out to weakly developed and remote areas, making registration more difficult and expensive due to travelling and opportunity costs (Bhatia et al., 2017; Candia, 2019; UNICEF, 2005) A study using GPS data for Latin America and the Caribbean has shown that the further the travel distance to the nearest registry office, the higher the probability of not registering a child (Corbacho & Osorio Rivas, 2012). According to Corbacho & Osorio Rivas (2012), not only the costs are higher but also the information flow about registration is lower.

Besides the degree of urbanization, the availability of services is also important (Jackson, Duff, Kusumanigrum, & Stark, 2014; Mohanty & Gebremedhin, 2018). Following the reasoning of Corbacho & Osorio Rivas (2012), the further the travel distance, the higher the probability of not making use of available services. This means that less information on and help with birth registration will be obtained and the chance to receive and spread information about registration (spill over effects) is lower too (Huisman & Smits, 2015; Jackson, Duff, Kusumanigrum, & Stark, 2014; Mohanty & Gebremedhin, 2018).

3.3 National context

The huge differences in birth registration rates between developing countries can be mainly attributed to the variation between national factors (Cappa et al., 2014; Dunning et al., 2014; UN, 2019). The overall wealth of a country can affect the quality and availability of birth registration systems (Bequele, 2005; UNICEF, 1998). In low income countries, civil registration systems are often underdeveloped due to the lack of economic resources, which the government might not be willing to spend on the creation or maintenance of these systems accordingly (Mackenzie, 2008; Pais, 2002; UNICEF, 1998, 2013). This may lead to legislative barriers concerning birth registration too: no legislation at all, outdated legislation, and weak enforcement of the laws (Heap & Cody, 2009; Li et al., 2010; Pais, 2002). As mentioned by Bequele (2005, p.17), ‘Laws relating to births and deaths may not be well known or harmonized with other legislation’. Consequently, abiding the law and enforcement of the law is difficult.

Besides that, the content of the law might be harmful for registration rates (Mackenzie, 2008; Makinde et al., 2016; UNICEF, 2017). For example, a fee for registration can be detrimental when poverty is a major issue while specified legal time periods can lead to procrastination when given a lot of time or can make registration unfeasible for people living in disadvantageous living conditions when given little time (Duff et al., 2016; Li et al., 2010; Pelowski et al., 2015; UNICEF, 2005, 2013). Another consequence of imperfect legislation is that the formation of the appropriate institutions for birth registration is problematic (Bequele, 2005). Due to the complex and expensive nature of decentralized birth registration systems, as different institutions and actors must interact, centralized systems often are preferred even though these systems are less flexible and less accessible for people living in rural areas (Chereni, 2016; Mackenzie, 2008; Makinde et al., 2016). Countries like Bangladesh and Kenya have seen their birth registration rates go up after moving from a centralized to a decentralized system (Pelowski et al., 2015; Todres, 2003).

Not only socio-economic and legal factors, but also demographic variables may also be important (Dunning et al., 2014; Heap & Cody, 2009). The demographic effect is twofold. Higher fertility rates may make registering every child harder due to the costs of birth registration (Dunning et al., 2014; Fagernäs & Odame, 2013; UNICEF, 2005, 2013). High mortality rates may reduce the motivation of parents to bear the registration costs (Dunning et al., 2014; Heap & Cody, 2009). As having a birth registration has mainly future benefits, current costs may be too high when mortality rates are high (Corbacho & Osorio Rivas, 2012; Smits & Huisman, 2013).

A final relevant factor might be the history of the country. The colonial era and of periods of war and conflict may have long-lasting consequences for institutional arrangements (Pais, 2002; Szreter & Breckenridge, 2012; UNICEF, 1998). With regards to colonialism, path dependency may hamper the development of birth registration processes, for example when colonizers introduced birth registration in the colonies in which only non-Africans were allowed to register or registrations only existed in specific regions (Bequele, 2005; Szreter & Breckenridge, 2012; UNICEF, 1998). War and conflicts have devastating effects on existing registration systems as well, if there was one in the first place (Dunning et al., 2014; Heap & Cody, 2009; Pais, 2002). Misuse of these systems during (civil) war, may lead to mistrust and breaking down of them (Amo-Adjei & Annim, 2015; Cappa et al., 2014; Szreter, 2007; Todres, 2003). This may have long lasting consequences for the rate of registration, such as in Rwanda and the Democratic Republic of the Congo (Cappa et al., 2014; Pais, 2002; Todres, 2003).

4. Data and methods

4.1 Data

For this study, combined datasets from the Demographic and Health Surveys have been used (www.dhsprogram.com) which were derived from the Global Data Lab (www.globaldatalab.org). DHS are large, nationally representative household surveys. For each

survey, non-overlapping areas (often enumeration areas) are randomly selected. These areas (called “clusters” henceforth) are usually communities, villages, or city quarters. In the selected clusters, all households are listed and a random sample of 25–30 households is selected for the interviews. The DHS consists of a household survey, in which basic information is collected of all household members, and separate women’s and men’s surveys. Response rates are generally very high (above 90%). To get a maximum discriminatory power, the data of all available standard DHS surveys for SSA countries held since 2005 have been pooled.

Our combined dataset contains information on 607,330 children aged 0 to 4 years old who are living in 753 subnational regions within 34 sub-Saharan African countries (see appendix 1). As a consequence of missing cases in the dependent variable, 39,760 observations were not included in the analysis. Missing cases in the independent variables were handled by list wise deletion for the variables with less than 500 missing cases. For variables with missing characteristics of parents, birth registration legislation, or conflicts due to absence, dummy variable adjustment was used (Allison, 2001; Huisman & Smits, 2015). After adjustments, 567,407 cases (93.5%) remained for our analyses. In all analyses the household sampling weights included in the DHS surveys were applied (Makinde et al., 2016; The DHS Program, 2020).

Context factors at the sub-national level were derived from the Area Database of the Global Data Lab (www.globaldatalab.org/areadata), which contains a broad set of indicators for subnational regions (generally administrative level 1) within countries, constructed by aggregating data from the household surveys to the local area level (Smits, 2016). Data on birth registration systems and legislation were downloaded from UNICEF Data (UNICEF Data, 2020). Data for national income, rule of law, government effectiveness, fertility rate, and under-five mortality were derived from the World Bank (The World Bank, 2020, 2020a;). Information about the history of the country was retrieved from the Uppsala Conflict Data Program Version 19.1 (UCDP) (Eck, 2005; Therese Pettersson, 2019a, 2019b; Uppsala Conflict Data Program,

2018). In the 7 cases that no information on the colonial period was available at the UCDP, the Encyclopaedia Britannica was used instead (Encyclopædia Britannica, 2020; Uppsala Conflict Data Program, 2018).

4.2 Methods

A three-level multilevel logistic analysis is used to address the clustering of households within subnational regions and countries (Mohanty & Gebremedhin, 2018; Smits & Huisman, 2013). Logistic regression is used as the dependent variable is a binary outcome with value 1 if the child has a birth registration and value 0 if the child has no registration. The variable is based on the question: “Does (NAME) have a birth certificate? (If no, probe): Has (NAME)'s birth ever been registered with the civil authority?” The variable was computed by giving the categories ‘has certificate’ and ‘registered’ a value of 1 while the category ‘neither certificate nor registered’ a value of 0. The categories ‘don’t know’ and ‘missing’ were marked as missing values.

Following Mohanty & Gebremedhin (2018), first two empty models with random effects at the national and local level are estimated. ‘The aim here is to study any variations in the null models that were due to each of the confounding factors’ (Mohanty & Gebremedhin, 2018, p. 3). For these models the intraclass correlation will be estimated in order to determine the variation within and across different levels (Mohanty & Gebremedhin, 2018; Smits & Huisman, 2013). Following these models, household and context variables are added (Huisman & Smits, 2015; Smits & Huisman, 2013).

4.3 Independent variables

Household wealth was measured by the International Wealth Index (IWI), which indicates the standard of living of households based on their possession of durable goods, the quality of their housing and access to basic services (Smits & Steendijk, 2015). Mobile phone ownership is

measured by a dummy variable with value 1 if the household owns a mobile phone and value 0 if not. Education of the parents was measured by the years of education they completed.

Regarding demographics, age was measured in years. Missing of one or both parents was measured by two dummy variables, indicating whether (1) or not (0) the father or mother was missing from the household. The position of women in their households was indicated by two variables, a dummy indicating whether (1) or not (0) the mother has given birth before the age of 18 (Huisman & Smits, 2015) and whether the mother can decide on contraception (Mohanty & Gebremedhin, 2018) with three categories indicating whether the decision on contraception is taken by the mother herself (1), the partner (2), or whether it is a joint decision (3).

The variables ethnicity and religion were based on pre-coded questions with the option to add additional categories. Religion consists of 7 categories, namely: (1) Catholic, (2) Protestant, (3) Christian, not specified, (4) Muslim, (5) no religion, (6) other, and (7) traditional. For ethnicity a three-category variable was constructed indicating whether the ethnicity of the household is a (1) majority group, a (2) normal sized group, or a (3) minority group. These values were given based on the percentage distribution of the existing groups within the country. If a group concerned 0-10% it was seen as a minority, if it concerned 10-30% it was seen as a regular group, and if it concerned 30+% it was seen as a majority.

Prenatal care location indicates where the prenatal check was performed: (1) nowhere, (2) at home, (3) at a health institution other than a hospital, (4) or in a hospital. The place of delivery is indicated by a dummy variable with value 1 when the birth took place at (someone's) home while value 0 when at an institution. Assistance during delivery was computed to show whether the birth was assisted by: (1) no one, (2) a traditional birth attendant, (3) another person, (4) or skilled health personnel. The variable postnatal check reflects whether (0) or not (1) a postnatal check has been performed within 2 months after the birth. The variable vaccination

shows whether children have ever received a vaccination (0) or not (1) while the variable vitamin A reflects whether a child received vitamin A in the last 6 months (0) or not (1).

The variables availability of education and availability of health services were constructed following Smits & Huisman (2013, p.330), by taking ‘the average number of years of education of adult males’ and of the number of prenatal check-up visits of women in the cluster. Only the education of men was taken into account as the education of women is also dependent on other factors, such as patriarchy (Smits & Huisman, 2013). The variable urbanization reflects whether (1) or not (0) the household lived in an urban area.

The economic situation of the country was measured by the Gross Domestic Product per capita (in current US dollars). The variable birth registration legislation indicates whether a country has (1) a legislation for birth registration or not (0). In turn, the variable no update in legislation represents whether there has been an update in birth registration legislation over the years (0) or not (1). Time allowed for registration is a categorical variable with the following categories: (1) within 2 weeks, (2) within 1 month, (3) within 2 months, (4), within 2+ months, (5) and no legal period. Registration fee is a dummy variable indicating whether (1) or not (0) a fee was involved in birth registration. The organizational structure indicates whether the procedure is decentralized (0) or centralized (1). The level of governance of the country is proxied by the variable rule of law, in which -2.5 is the lowest score and 2.5 the highest (The World Bank, 2020b). The demographic situation of the country was indicated by the fertility rate and the mortality rate of children under 5 years old. Finally, the history of the country is represented by the number of conflicts between 1990 and the year of the survey, computed by adding non-state conflicts and state conflicts, and whether a country has been colonized (1) or not (0) (Gleditsch et al., 2002; Therese Pettersson, 2019a, 2019b; Therése Pettersson et al., 2019; Sundberg et al., 2012).

Table 1a: Descriptive statistics of household factors DHS SSA 2005-2018

| Variables | Mean | St. Deviation | Minimum | Maximum |
|---|-------------|----------------------|----------------|----------------|
| Birth registration | 0.573 | 0.49 | 0.00 | 1.00 |
| International Wealth Index (household wealth) | 32.09 | 22.67 | 0.00 | 100.00 |
| Household has phone | 0.614 | 0.49 | 0.00 | 1.00 |
| Child's age | 2.00 | 1.42 | 0.00 | 4.00 |
| Years of education father | 4.82 | 4.06 | 0.00 | 17.00 |
| Years of education father missing | 0.291 | 0.45 | 0.00 | 1.00 |
| Years of education mother | 3.93 | 4.09 | 0.00 | 17.00 |
| Years of education mother missing | 0.082 | 0.27 | 0.00 | 1.00 |
| Father not present | 0.281 | 0.45 | 0.00 | 1.00 |
| Mother not present | 0.077 | 0.27 | 0.00 | 1.00 |
| Age at first birth before age 18 | 0.304 | 0.46 | 0.00 | 1.00 |
| Age at first birth 18+ | 0.560 | 0.496 | 0.00 | 1.00 |
| Mother usually decides on contraception | 0.046 | 0.209 | 0.00 | 1.00 |
| Partner usually decides on contraception | 0.023 | 0.14 | 0.00 | 1.00 |
| Joint decision mother and another person | 0.136 | 0.34 | 0.00 | 1.00 |
| Ethnicity majority group 30(+)% | 0.274 | 0.446 | 0.00 | 1.00 |
| Ethnicity regular group 10-30% | 0.279 | 0.44 | 0.00 | 1.00 |
| Ethnicity minority group 0-10% | 0.238 | 0.42 | 0.00 | 1.00 |
| No religion | 0.029 | 0.167 | 0.00 | 1.00 |
| Religion Catholic | 0.150 | 0.35 | 0.00 | 1.00 |
| Religion Protestant | 0.180 | 0.38 | 0.00 | 1.00 |
| Religion Christian, not specified | 0.122 | 0.32 | 0.00 | 1.00 |
| Religion Muslim | 0.292 | 0.45 | 0.00 | 1.00 |
| Religion Traditional | 0.023 | 0.15 | 0.00 | 1.00 |
| Religion Other | 0.012 | 0.10 | 0.00 | 1.00 |
| Prenatal care hospital | 0.389 | 0.488 | 0.00 | 1.00 |
| No prenatal care | 0.058 | 0.23 | 0.00 | 1.00 |
| Prenatal care at home | 0.005 | 0.06 | 0.00 | 1.00 |
| Prenatal care other | 0.091 | 0.28 | 0.00 | 1.00 |
| Delivery at health institution | 0.534 | 0.499 | 0.00 | 1.00 |
| Delivery at home | 0.307 | 0.46 | 0.00 | 1.00 |
| Skilled birth attendant | 0.496 | 0.500 | 0.00 | 1.00 |
| No delivery assistance | 0.040 | 0.19 | 0.00 | 1.00 |
| Traditional birth attendant | 0.128 | 0.33 | 0.00 | 1.00 |
| Other attendant | 0.177 | 0.38 | 0.00 | 1.00 |
| Postnatal check within 2 months | 0.215 | 0.401 | 0.00 | 1.00 |
| No postnatal check within 2 months | 0.248 | 0.43 | 0.00 | 1.00 |
| Received vaccination | 0.255 | 0.436 | 0.00 | 1.00 |
| Never had vaccination | 0.063 | 0.24 | 0.00 | 1.00 |
| Received vitamin A in last 6 months | 0.465 | 0.499 | 0.00 | 1.00 |
| Not received vitamin A in last 6 months | 0.298 | 0.45 | 0.00 | 1.00 |

Valid N: 567,407

5. Results

5.1 Descriptive statistics

Table 1a and 1b show descriptive statistics for the variables used in our analyses. It can be seen that 42.7% of the children aged 0-4 in the sample did not have a birth registration. The average IWI of the households in this study is 32.09, showing that many of these households do not have a lot of assets and high quality housing. Nevertheless, 61.4% of the children do live in households in which a phone is present. Moreover, 71.9% of the fathers and 92.3% of the

mothers are still present in the household. The average years of education is higher for men. Also, 30.4% of the women have given birth before the age of 18 and only 4.6% of the mothers can decide on whether or not to use contraception herself.

About half of the children are born in a health institution with help of skilled health personnel. Nevertheless, the descriptive statistics also show that alternative options are often used as well, such as delivering the baby at home or with the help of a traditional birth attendant, which can partly be explained by the presence of ethnicities and traditional religions. In other cases, no care is being sought at all (no prenatal care 5.8%, no postnatal check 24.8%, no vaccination 6.3%, and no vitamin A 29.8%). The households live especially in rural areas (70.4%). Most countries have birth registration legislation (92.1%), meaning that the existing variation may be explained mostly by the content of the legislation.

Table 1b: Descriptive statistics of context factors DHS SSA 2005-2018

| Variables | Mean | St. Deviation | Minimum | Std. Deviation |
|---|-------------|----------------------|----------------|-----------------------|
| Local context | | | | |
| Average years education fathers in region | 4.79 | 2.16 | 0.51 | 12.80 |
| Average number of visits antenatal care region | 4.62 | 0.94 | 2.57 | 12.13 |
| Urban or rural area | 0.296 | 0.46 | 0.00 | 1.00 |
| National context | | | | |
| GDP per capita | 1276.67 | 1263.11 | 234.24 | 9813.48 |
| Birth registration legislation | 0.921 | 0.27 | 0.00 | 1.00 |
| Birth registration legislation not updated | 0.539 | 0.499 | 0.00 | 1.00 |
| Birth registration legislation updated | 0.382 | 0.486 | 0.00 | 1.00 |
| Birth registration centralized | 0.455 | 0.498 | 0.00 | 1.00 |
| Birth registration decentralized | 0.466 | 0.499 | 0.00 | 1.00 |
| Time allowed for registration – within 2 weeks | 0.085 | 0.278 | 0.00 | 1.00 |
| Time allowed for registration – 1 month | 0.456 | 0.498 | 0.00 | 1.00 |
| Time allowed for registration – 2 months | 0.161 | 0.367 | 0.00 | 1.00 |
| Time allowed for registration – 2+ months | 0.193 | 0.395 | 0.00 | 1.00 |
| Time allowed for registration - no legal period | 0.027 | 0.161 | 0.00 | 1.00 |
| Fee for birth registration | 0.666 | 0.472 | 0.00 | 1.00 |
| No fee for birth registration | 0.255 | 0.436 | 0.00 | 1.00 |
| Rule of law | -0.70 | 0.47 | -1.78 | 0.27 |
| Fertility rate, total (births per woman) | 5.18 | 0.85 | 3.24 | 7.38 |
| Mortality rate, under-5 (per 1,000 live births) | 88.34 | 30.86 | 41.30 | 180.30 |
| Number of conflicts | 7.03 | 8.48 | 0.00 | 27.00 |
| Ever been colonized | 0.969 | 0.17 | 0.00 | 1.00 |

Valid N: 567,407

5.2 Multilevel logistic analysis

The intraclass correlation coefficients (ICC) of the intercept only models in table 2 show that 25% of the total variation in birth registration in SSA is due to differences between countries

while 10% of the variation is a consequence of differences between subnational regions and 65% of the variation is caused by differences at the household level. Table 3a and 3b present the results of the multilevel logistic regression analysis. Table 3a shows that most of the household level factors have the expected effect: having more wealth, a phone, a higher age, and more years of education all significantly increase the odds of having a birth registration. When the father or mother is missing from the household, the odds of being registered is lower, but only for a missing father this effect is significant. The position of women in the household is also important: children of a mother who has had her first birth under age 18 have significant lower odds of being registered.

Table 3a and 3b present the results of the multilevel logistic regression analysis. Table 3a shows that most of the household level factors have the expected effect: having more wealth, a phone, a higher age, and more years of education all significantly increase the odds of having a birth registration. When the father or mother is missing from the household, the odds of being registered is lower, but only for a missing father this effect is significant. The position of women in the household is also important: children of a mother who has had her first birth under age 18 have significant lower odds of being registered.

Regarding ethnicity, we observe that children belonging to an ethnic minority or a middle-sized group have higher odds of being registered than children belonging to a majority group. Regarding religion, we see that children with a Catholic background have highest odds of being registered and children with a traditional religion the lowest odds.

Table 2: Intercept only models with national level effects (model 1) and national and local effects (model 2).

| | Model 1** | | Model 2** | |
|------------------------------|------------|------------|------------|------------|
| | Log Odds | Odds Ratio | Log Odds | Odds Ratio |
| Intercepts | | | | |
| National level | 0.06 | 1.07 | 0.06 | 1.06 |
| Province level | - | - | 0.02 | 1.02 |
| Fixed intercept | 0.60 | 1.82 | 0.63 | 1.87 |
| Number of observations | 567569 | | 567569 | |
| Residual | 0.19 | | 0.17 | |
| -2 Restricted log likelihood | 665245.483 | | 616607.645 | |
| ICC Nation | 0.25 | | 0.25 | |
| ICC Local | 0.25 | | 0.10 | |

* significant at the 5 per cent level, ** significant at the 1 per cent level.

Table 3a: Logistic fixed effects models with random intercepts household factors ^c

| | | Log Odds | Odds ratio |
|------------------------------------|------------------------------|-----------|------------|
| Intercepts | National level ^b | 0.190 | 1.209 |
| | Province level ^b | 0.010 | 1.010 |
| | Fixed intercept | 0.692* | 1.998 |
| Household level | IWI, household wealth | 0.003** | 1.003 |
| | Phone in household | 0.015** | 1.015 |
| | Age child | 0.021** | 1.021 |
| | Years education father | 0.004** | 1.004 |
| | Years education mother | 0.004** | 1.004 |
| | Father missing | -0.016** | 0.984 |
| | Mother missing | -0.011 | 0.989 |
| | Age at first birth 18- | -0.013** | 0.987 |
| | Decision maker contraception | | |
| | Mother | Ref | Ref |
| | Partner | 0.003 | 1.003 |
| | Joint decision | 0.013** | 1.013 |
| | Ethnicity | | |
| | 30+% | Ref | Ref |
| | 10-30% | 0.021** | 1.021 |
| | 0-10% | 0.009** | 1.009 |
| | Religion | | |
| | No religion | Ref | Ref |
| | Catholic | 0.063** | 1.065 |
| | Protestant | 0.054** | 1.055 |
| | Christian, not specified | 0.049** | 1.050 |
| | Muslim | 0.048** | 1.049 |
| | Traditional | -0.021** | 0.979 |
| | Other | 0.047** | 1.048 |
| | Prenatal care location | | |
| | Hospital | Ref | Ref |
| | No care | -0.067** | 0.935 |
| | Home | -0.005 | 0.995 |
| | Other health | -0.025** | 0.975 |
| | Place delivery | | |
| | Institution | Ref | Ref |
| | Home | -0.090** | 0.914 |
| | Delivery assistance | | |
| Skilled health personnel | Ref | Ref | |
| No assistance | -0.025** | 0.975 | |
| Traditional birth attendant | -0.008** | 0.992 | |
| Other | -0.017** | 0.983 | |
| No postnatal check within 2 months | -0.024** | 0.976 | |
| Never had vaccination | -0.060** | 0.942 | |
| No vitamin A in last 6 months | -0.025** | 0.975 | |
| Number of observations | | 567407 | |
| Residual | | 0.159 | |
| -2 Restricted Log likelihood | | 571750.79 | |

* significant at the 5 per cent level, ** significant at the 1 per cent level.

^b No significance level is given for the random intercepts.

^c Dummy variable adjustment indicators are not presented

Table 3b: Logistic fixed effects models with random intercepts context factors ^c

| | | Log Odds | Odds Ratio |
|-------------------------|--|-----------|------------|
| Intercepts | National level ^b | 0.190 | 1.209 |
| | Province level ^b | 0.010 | 1.010 |
| | Fixed intercept | 0.692* | 1.998 |
| Local context | Average years of education father | -0.012** | 0.988 |
| | Urban | 0.028** | 1.028 |
| | Average number of visits prenatal care | 0.043** | 1.044 |
| National context | GDP per capita (current US dollars) | 0.0001** | 1.0001 |
| | Legislation | 0.131** | 1.140 |
| | No update legislation | -0.026** | 0.974 |
| | Organizational structure birth registration system | | |
| | Decentralized | Ref | Ref |
| | Centralized | -0.357* | 0.670 |
| | Time allowed for registration | | |
| | Within 2 weeks | Ref | Ref |
| | Within 1 month | 0.046** | 1.047 |
| | Within 2 months | -0.278 | 0.757 |
| | Within 2+ months | -0.085 | 0.919 |
| | No legal period | 0.219 | 1.245 |
| | Fee birth registration | 0.094 | 1.099 |
| | Rule of law | -0.291** | 0.748 |
| | Fertility | -0.341** | 0.711 |
| | Mortality under 5 | 0.008** | 1.008 |
| | Number of conflicts | -0.003** | 0.997 |
| Colonized | 0.340 | 1.405 | |
| | Number of observations | 567407 | |
| | Residual | 0.159 | |
| | -2 Restricted Log likelihood | 571750.79 | |

* significant at the 5 per cent level, ** significant at the 1 per cent level.

^b No significance level is given for the random intercepts.

^c Dummy variable adjustment indicators are not presented

The coefficients of the care variables at the household level are all in the expected direction. Children born in a health institution, those born with assistance of skilled health personnel, those with a postnatal check within two months, those with at least one vaccination and those who obtained vitamin A, all have significantly higher odds of being registered. Regarding prenatal care, no difference is observed between those who received it in hospital or at home, but in both cases registration rates are higher than if no prenatal care was received.

At the subnational regional level, all three variables show significant effects. As expected, registration rates are higher among children living in urban areas and in areas with more health services, as measured by the frequency of prenatal care visits. However, the coefficient of the (male) educational level of the region is negative, thus indicating that all other

factors kept constant registration levels are lower in areas with higher educational level. This might seem surprising, but given that parental education at the household level has clear positive effects it might mean that it is the individual education and less so the context level education that is the determining factor.

With respect to the national level, GDP per capita has a significantly positive effect on the odds of having a birth registration. Moreover, the presence and content of birth registration legislation both have notable effects. A country that has birth registration legislation compared to no legislation significantly increases the odds of having a birth registration with 14%. If the legislation is not updated recently, the odds of having a birth registration are 0.974 times lower. Moreover, centralization of birth systems decreases the odds of having a birth registration with 33%. When birth registration must be performed within 1 month, the odds of having a birth registration for a child aged 0-4 years is 1.047 times higher than for children living in countries in which the time allowed for registration is only 2 weeks. The other time periods are not significant. Also, the variable fee is not significant. Nevertheless, these variables were significantly negative in the bivariate analysis and therefore might be influenced by other variables. Next to the content of birth registration legislation, the control factors rule of law, fertility, under five mortality and the number of conflicts are significantly related to birth registration.

6. Conclusion & Discussion

Birth under-registration is a huge problem in many LMICs (UN, 2019). Most research on the causes of this phenomenon focus on factors at the household level, although factors at higher levels arguably are important as well (Bequele, 2005; Li et al., 2010; Mohanty & Gebremedhin, 2018). This paper contributes to the literature by investigating the determinants of birth under-registration at household, regional and national level simultaneously, on the basis of data for

567,407 children aged 0-4 in 34 SSA countries. Our multilevel logistic regression analyses revealed that most (65%) of the variation in birth registration rates can be explained by factors at the household level, but that also a substantial part of over one-third is related to characteristics of the context in which households live.

At the household level, both socio-economic, demographic and care-related factors are important. Children from households with more wealth, a phone, parents with more years of education have higher odds of having a birth registration. With regards to demographics, younger children and children with a missing father seem especially vulnerable for birth under-registration. The variables concerning the relational structure indicate that bargaining power of women and non-traditional beliefs are essential for the chances of a birth registration. For instance, children of a household that belongs to a traditional religion have 2.1% lower odds of having a birth registration than children from households that belong to no religion at all. Children from women that have had children before the age of 18 have 1.3% lower odds of having a birth registration while children from women that have a say in the decision regarding contraception have 1.3% higher odds of having a birth registration.

Regarding the role of (reproductive) health care related factors most findings are in line with expectations. children from households that are less in contact with health facilities and health personnel, have lower odds of having a birth registration. Looking at the situation before and during delivery, receiving no prenatal care lowers the odds of birth registration with 6.5% while not being born in a health institution lowers the odds of registration with 8.6%. With

regards to care in the first years of a child's life, vaccination seems to be an essential factor. If a child never had a vaccination, the odds of having a birth registration are 5.8% lower.

The care variables all have significant effects except for prenatal care at home, which can be due to the fact that some people receive prenatal care from skilled health personnel at home. The results of the other care variables are in the expected direction and indicate that children from households that are less in contact with health facilities and health personnel, have lower odds of having a birth registration. Looking at the situation before and during delivery, receiving no prenatal care lowers the odds of birth registration with 6.5% while not being born in a health institution lowers the odds of registration with 8.6%. With regards to care in the first years of a child's life, vaccination is an important factor. If a child never had a vaccination, the odds of having a birth registration are 5.8% lower.

Important findings with regards to the regional context are that the availability of health facilities and urbanization both increase the odds of having a birth registration. If the average number of visits of prenatal care increases with 1, a child has 1.044 times higher odds of having a birth registration while living in an urban area compared to a rural area increases the odds with 2.8%. The availability of education in the region has a negative effect. Education at the household level is probably capturing this effect.

At the national level, the existence of birth registration legislation, the organizational structure of the birth registration system, level of economic development, and the fertility rate are important. If GDP per capita increases with 1 dollar, the odds of having a birth registration increase with 0.01%. If a country implements birth registration legislation, the odds of having

a registration increase by 14%, but if this registration system is centralized instead of decentralized, the odds decrease again by 33%. Regarding fertility, in countries where the mean number of births per woman is one higher, the odds of having a birth registration is 28.9% lower.

Given the large number of involved factors at different levels of analysis, we can conclude that the birth registration problem is very complex and context specific. The complexity of the problem might have been underestimated, explaining the limited and slow progress in obtaining universal birth registration (Bequele, 2005; Bhatia et al., 2017, 2019; Fagernäs & Odame, 2013).

The results of this study are highly relevant for policy making. Previous research has recommended to focus on household wealth, education, and access to governmental services such as health care (Candia, 2019; Todres, 2003; UNICEF, 2005). The results of this study indeed show that these factors are important for raising registration rates. However, we also find indications that children with a missing parent, children of mothers with a weak bargaining position within the household, or belonging to traditional religions are at an disadvantage. Reaching these households seems essential. This could be done by working together with local agents and organizations, like a church or NGO (UNICEF, 2005). But factors at the household level are only part of the story, and might be even the most difficult to change. Policies should therefore also focus on context factors, like those related to the local health care system and the national birth registration regulations.

Since by our knowledge this paper is the first to include national determinants while studying the determinants of birth registration at different levels simultaneously, further research on this subject must be performed in order to increase the robustness of the findings. While most findings are similar to those of earlier research of Mohanty & Gebremedhin (2018), there are some differences that need further attention, like those for education, religion and ethnicity. The data we use to measure birth registration also have their limitations. There is for example discussion about the birth registration question in the DHS surveys, which does not ask the parents for evidence (Bhatia et al., 2017; Makinde et al., 2016; UNICEF, 2013). As stated by Makinde et al. (2016, p. 331): ‘therefore, we cannot be certain that all those who stated that their child had been registered but did not present a birth certificate had actually registered the child.’ The fact that in our data 57.3% of the children were found to have a birth registration, whereas UN (2019) data for 2010-2018 reported a rate of 46% for children younger than 5 years old in SSA suggests that birth registrations are overestimated in this paper. Nevertheless, in spite of these restrictions, our simultaneous analysis of the major risk factors at household, local context and national level and our finding that over one-third of the variation in birth registration is due to factors at context level constitute major steps forward in the birth registration literature.

7. Acknowledgements

The authors are grateful to the DHS Program (www.dhsprogram.org) for their efforts to collect and process high-quality data and to make this data available to researchers worldwide.

8. Bibliography

- Allison, P. D. (2001). *Missing Data. Quantitative Applications in the Social Sciences*. SAGE Publications, Inc, Thousand Oaks (Vol. 136).
- Amo-Adjei, J., & Annim, S. K. (2015). Socioeconomic determinants of birth registration in Ghana. *BMC International Health and Human Rights*, 15(14), 1–9.
- Anne, K., & Ong'ondo, C. O. (2013). An Assessment of The Level of Awareness About Children ' s Rights Among Children in Eldoret Municipality , Kenya. *Journal of Emerging Trends in Educational Research and Policy Studies*, 4(2), 279–287.
- Apland, K., Blitz, B. K., Calabria, D., Fielder, M., Hamilton, C., Indika, N., ... Yarrow, E. (2014). *Birth registration and children's rights: a complex story*.
- Ârbyholm, F. E. (1978). Cleft lip and palate in Norway: I. Registration, incidence and early mortality of infants with CLP. *Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery*, 12(1), 29–34.
- Bequele, A. (2005). Universal Birth Registration : The Challenge in Africa. *Mombasa: The African Child Policy Forum*.
- Bhatia, A., Ferreira, L. Z., Barros, A. J. D., & Victora, C. G. (2017). Who and where are the uncounted children? Inequalities in birth certificate coverage among children under five years in 94 countries using nationally representative household surveys. *International Journal for Equity in Health*, 16(1), 1–11.
- Bhatia, A., Krieger, N., Beckfield, J., Barros, A. J. D., & Victora, C. (2019). Are inequities decreasing? Birth registration for children under five in low-income and middle-income

- countries, 1999-2016. *BMJ Global Health*, 4(6).
- Bloom, S. S., Wypij, D., & Das Gupta, M. (2001). Dimensions of women's autonomy and the influence on maternal health care utilization in a North Indian City. *Demography*, 38(1), 67–78.
- Candia, D. A. (2019). Determinants of birth registration of children under 5 years in Uganda. *International Journal of Advanced Medical and Health Research*, 6(1), 12–17.
- Cappa, C., Gregson, K., Wardlaw, T., & Bissell, S. (2014). Birth registration: A child's passport to protection. *The Lancet Global Health*, 2(2), e67–e68.
- Chereni, A. (2016). Underlying dynamics of child birth registration in Zimbabwe. *International Journal of Children's Rights*, 24(4), 741–763.
- Corbacho, A., Brito, S., & Rivas, R. O. (2012). *Birth registration and the impact on educational attainment*. IDB Working Paper Series No. IDB-WP-345. Washington, D.C. Retrieved from https://www.researchgate.net/publication/241760189_Birth_Registration_and_the_Impact_on_Educational_Attainment
- Corbacho, A., & Osorio Rivas, R. (2012). *Travelling the distance: A GPS-based study of the access to birth registration services in Latin America and the Caribbean* (IDB Working Paper Series No. No. IDB-WP-307). Washington, DC.
- Duff, P., Kusumaningrum, S., & Stark, L. (2016). Barriers to birth registration in Indonesia. *The Lancet Global Health*, 4(4), e234–e235.
- Dunning, C., Gelb, A., & Raghavan, S. (2014). *Birth Registration, Legal Identity, and the Post-*

2015 Agenda. *CGD Policy Paper 046 September 2014*. Washington DC.

Duryea, S., Olgiati, A., & Stone, L. (2006). *The Under-Registration of Births in Latin America* (No. 551). Washington, DC.

Eck, K. (2005). *A beginner's guide to conflict data. Finding and using the right dataset. UCDP Research Paper Series* (Vol. 1).

Encyclopædia Britannica. (2020). Encyclopædia Britannica. Retrieved May 21, 2020, from <https://www.britannica.com>

Fagernäs, S., & Odame, J. (2013). Birth registration and access to health care: An assessment of Ghana's campaign success. *Bulletin of the World Health Organization*, *91*, 459–464.

Gleditsch, N. P., Wallensteen, P., Eriksson, M., Sollenberg, M., & Strand, H. (2002). Armed conflict 1946-2001: A new dataset. *Journal of Peace Research*, *39*(5), 615–637.

Global Data Lab. (2020). Database Developing World. Retrieved April 7, 2020, from <https://globaldatalab.org/ddw/>

Harbers, I. (2020). Legal identity for all? Gender inequality in the timing of birth registration in Mexico. *World Development*, *128*, 104778.

Heap, S., & Cody, C. (2009). The Universal Birth Registration campaign. *Forced Migration Review*, *32*, 20–22.

Huisman, J., & Smits, J. (2015). Keeping Children in School: Effects of Household and Context Characteristics on School Dropout in 363 Districts of 30 Developing Countries. *SAGE Open*, *5*(4), 1–16.

Isara, A., & Atimati, A. (2015). Socio-demographic determinants of birth registration among

- mothers in an urban community in southern Nigeria. *Journal of Medicine in the Tropics*, 17(1), 16–21.
- Jackson, M., Duff, P., Kusumanigrum, S., & Stark, L. (2014). Thriving beyond survival: Understanding utilization of perinatal health services as predictors of birth registration: A cross-sectional study. *BMC International Health and Human Rights*, 14(1), 1–10.
- Li, S., Zhang, Y., & Feldman, M. W. (2010). Birth Registration in China: Practices, Problems and Policies. *Population Research and Policy Review*, 29(3), 297–317.
- Mackenzie, Y. (2008). The Campaign for Universal Birth Registration in Latin America: Ensuring All Latin American Children’s Inherent Right to Life and Survival by First Guaranteeing Their Right to a Legal Identity. *Ga. J. Int’l & Comp. L.*, 37(519), 519–554.
- Makinde, O. A., Olapeju, B., Ogbuaji, O., & Babalola, S. (2016). Trends in the completeness of birth registration in Nigeria: 2002-2010. *Demographic Research*, 35, 315–338.
- Manby, B. (2021). The Sustainable Development Goals and ‘legal identity for all’: ‘First, do no harm’. *World Development*, 139, 105343.
- Mohanty, I., & Gebremedhin, T. A. (2018). Maternal autonomy and birth registration in India: Who gets counted? *PLoS ONE*, 13(3), 1–19.
- Nomura, M., Xangsayarath, P., Takahashi, K., Kamiya, Y., Siengsounthone, L., Ogino, H., & Kobayashi, J. (2018). Socioeconomic determinants of accessibility to birth registration in Lao PDR. *BMC Public Health*, 18 (1)(116), 1–9.
- Pais, M. S. (2002). Birth registration: Right from the start. *UNICEF Innocenti Digest*, 2(1), 1–

- Parmar, S. R., Jakasania, A. H., & Rathod, D. M. (2016). A knowledge, attitude and practice study on registration of birth and death among the field practice area of department of community medicine B . J . Medical College , Ahmedabad. *International Journal of Medical and Health Research*, 2(12), 53–56.
- Pelowski, M., Wamai, R. G., Wangombe, J., Nyakundi, H., Oduwo, G. O., Ngugi, B. K., & Ogembo, J. G. (2015). Why Don't You Register Your Child? A Study of Attitudes and Factors Affecting Birth Registration in Kenya, and Policy Suggestions. *Journal of Development Studies*, 51(7), 881–904.
- Pettersson, Therese. (2019a). *UCDP/PRIO Armed Conflict Dataset Codebook Version 19.1* . *Journal of Peace Research*.
- Pettersson, Therese. (2019b). *UCDP Non-State Conflict Codebook Version 19.1*. Retrieved from <http://www.ucdp.uu.se/>
- Pettersson, Therése, Högladh, S., & Öberg, M. (2019). Organized violence, 1989–2018 and peace agreements. *Journal of Peace Research*, 56(4), 589–603.
- Rodríguez, L. (2016). Intrahousehold inequalities in child rights and well-being. A barrier to progress?. *World Development*, 83, 111-134.
- Shapiro, S. (1954). Recent testing of birth registration completeness in the United States. *Population Studies*, 8(1), 3–21.
- Smits, J. (2016). GDL Area Database. Nijmegen, The Netherlands, 16-101.
- Smits, J., & Huisman, J. (2013). Determinants of educational participation and gender differences in education in six Arab countries. *Acta Sociologica (United Kingdom)*, 56(4),

325–346.

Smits, J., & Steendijk, R. (2015). The International Wealth Index (IWI). *Social Indicators Research, 122*(1), 65–85.

Sundberg, R., Eck, K., & Kreutz, J. (2012). Introducing the UCDP Non-State Conflict Dataset. *Journal of Peace Research, 49*(2), 351–362.

Szreter, S. (2007). The right of registration: development, identity registration, and social security—a historical perspective. *World Development, 35*(1), 67-86.

Szreter, S., & Breckenridge, K. (2012). Recognition and Registration: The Infrastructure of Personhood in World History. *Proceedings of the British Academy, 182*, 1–36.

The DHS Program. (2020). Using Datasets for Analysis. Retrieved June 15, 2020, from <https://dhsprogram.com/data/Using-Datasets-for-Analysis.cfm>

The World Bank. (2020). DataBank World Development Indicators. Retrieved June 5, 2020, from <https://databank.worldbank.org/reports.aspx?source=2&series=SP.DYN.TFRT.IN&country=>

The World Bank. (2020a). DataBank. Retrieved May 21, 2020, from <https://databank.worldbank.org/home.aspx>

The World Bank. (2020b). DataBank Worldwide Governance Indicators. Retrieved June 5, 2020, from <https://databank.worldbank.org/source/worldwide-governance-indicators>

Todres, J. (2003). Birth Registration: An Essential First Step toward Ensuring the Rights of All Children. *Human Rights Brief, 10*(3), 32–35.

UN. (2019). *The Sustainable Development Goals Report*. New York.

UNICEF. (2020). Birth Registration. Retrieved March 28, 2020, from <https://www.unicef.org/wca/birth-registration>

UNICEF. (1998). UNICEF on Deficient Birth Registration in Developing Countries. *Population and Development Review*, 24(3), 659–664.

UNICEF. (2005). *The “rights” Start to Life: A Statistical Analysis of Birth Registration*.

UNICEF Data. (2020). CRVS profiles. Retrieved May 21, 2020, from <https://data.unicef.org/crvs/>

UNICEF. (2013). *Every child’s birth right: Inequities and trends in birth registration*. New York.

UNICEF. (2017). *A Snapshot of Civil Registration in Sub-Saharan Africa*. New York.

Uppsala Conflict Data Program. (2018). UCDP. Retrieved May 21, 2020, from <https://ucdp.uu.se>

9. Appendix

Appendix 1: The distribution of countries, years and the number of sub-national regions (provinces)

| Country | Years | Sub-national region |
|---------------------------|------------------------------------|---------------------|
| Angola | 2016 | 36 |
| Burundi | 2010, 2017 | 10 |
| Benin | 2006, 2011, 2018 | 12 |
| Burkina Faso | 2010 | 26 |
| Cote d'Ivoire | 2005, 2011 | 20 |
| Cameroon | 2011 | 20 |
| Congo Democratic Republic | 2007, 2013 | 21 |
| Congo | 2005, 2011 | 15 |
| Comoros | 2012 | 6 |
| Ethiopia | 2016 | 21 |
| Gabon | 2012 | 19 |
| Ghana | 2008, 2014 | 20 |
| Guinea | 2012, 2018 | 15 |
| Gambia | 2013 | 14 |
| Kenya | 2008, 2014 | 15 |
| Liberia | 2007, 2013 | 41 |
| Lesotho | 2010, 2015 | 20 |
| Madagascar | 2009 | 55 |
| Mali | 2006, 2013, 2018 | 15 |
| Mozambique | 2011 | 21 |
| Malawi | 2016 | 26 |
| Namibia | 2006, 2013 | 26 |
| Niger | 2012 | 14 |
| Nigeria | 2013 | 73 |
| Rwanda | 2010, 2015 | 10 |
| Senegal | 2011, 2012, 2014, 2015, 2016, 2017 | 20 |
| Sierra Leone | 2008, 2013 | 27 |
| Sao Tome en Principe | 2009 | 8 |
| Swaziland | 2006 | 8 |
| Chad | 2015 | 15 |
| Tanzania | 2010, 2015 | 50 |
| Uganda | 2006, 2011, 2016 | 17 |
| Zambia | 2007, 2014, 2018 | 18 |
| Zimbabwe | 2006, 2011, 2015 | 19 |