

ORIGINAL RESEARCH ARTICLE

The State of Maternal and Infant Health and Mortality in Chad

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Abstract

The level of Chad's government expenditure on health is a predictor of the general health of the population and, consequently, life expectancy. We used data from the World Bank's World Development Indicators and publications from the World Health Organization to assess the state of maternal and infant health and mortality. The primary objective of this research was to investigate whether Chad had reduced the risk of maternal and infant mortality after signing the Abuja Declaration in 2001. We hypothesised that increased general government health expenditure was associated with improved health mediated by increased numbers of skill health workers and minimum out-of-pocket health expenditure. Our secondary objective was to assess effective implementations of health policies in line with the Millennium Development Goals that Chad has agreed to achieve by 2015. We observed that, as of 2015, the government health expenditure was only 6.28% and the population out-of-pocket spending was over 56%. Furthermore, only 20% of women give birth in a hospital. These results led to three major policies recommendations in order to improve maternal and infant health in Chad: skilled birth attendants training, enhanced social status of nurses, and the development of a supplemental nutrition care program for women. (*Afr J Reprod Health* 2020; 24[1]:26-34).

Keywords: sub-Saharan Africa, maternal mortality, infant mortality, poverty, Abuja Declaration, Chad

Résumé

Le niveau des dépenses publiques concernant la santé au Tchad est un indicateur de la santé générale de la population et, par conséquent, de l'espérance de vie. Nous avons utilisé les données des indicateurs du développement dans le monde de la Banque mondiale et les publications de l'Organisation mondiale de la santé pour évaluer l'état de santé et de mortalité maternelle et infantile. L'objectif principal de cette recherche était de déterminer si le Tchad avait réduit le risque de mortalité maternelle et infantile après la signature de la Déclaration d'Abuja en 2001. Nous avons émis l'hypothèse qu'une augmentation des dépenses publiques de santé générale était associée à une amélioration de la santé grâce à un nombre accru d'agents de santé qualifiés et des dépenses de santé remboursables minimales. Notre objectif secondaire était d'évaluer la mise en œuvre efficace des politiques de santé conformément aux objectifs du Millénaire pour le développement que le Tchad a convenu d'atteindre d'ici jusqu'à 2015. Nous avons observé qu'en 2015, les dépenses publiques de santé n'étaient que de 6,28% et la population hors les dépenses de poche dépassaient 56%. De plus, seulement 20% des femmes accouchent à l'hôpital. Ces résultats ont conduit à trois recommandations sur les politiques majeures afin d'améliorer la santé maternelle et infantile au Tchad: la formation d'accoucheuses qualifiées, l'amélioration du statut social des infirmières et l'élaboration d'un programme complémentaire de soins nutritionnels pour les femmes. (*Afr J Reprod Health* 2020; 24[1]: 26-34).

Mots-clés: Afrique subsaharienne, mortalité maternelle, mortalité infantile, pauvreté, Déclaration d'Abuja, Tchad

Introduction

The Republic of Chad (Chad) is a landlocked country sharing borders with Libya to the north, Sudan to the east, Niger to the west, the Central African Republic to the south, and with Cameroon and Nigeria to the southwest. Chad is one of the

six-member countries of the Central African Economic and Monetary Community (CEMAC), including Cameroon, the Republic of Congo, Gabon, Equatorial Guinea, and the Central African Republic. The country is the fifth largest country in Africa in terms of area (1,284,000 square kilometers). Yet, only 1 out of 5 women give birth

in hospitals and most infant deaths in the country are preventable. This is mostly due to over 45% of its population living at or below the national poverty line according to the World Bank¹. The *poverty line* is defined as the amount of income needed to afford the necessities of life, such as food, water, and shelter². The Human Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable, and having a decent standard of living³. While Chad's population grew from 5.96 million in 1990 to 14 million in 2015 (Table 1), HDI results, which considers life expectancy as a key element of human development, was 0.396, ranking Chad 186 out of 188 countries⁴.

Chad has potential for economic development, especially since it started oil exploration in 2003. Oil rents (i.e., the profit difference between the cost of crude oil production and its selling price) have doubled current government revenues. However, the population remains poor with those first being affected negatively being women living in a lower socioeconomic status and children under 5 years old. If the health of the mother and her child are determinants of the country's overall health situation, factors such as low Gross Domestic Product (GDP)⁵, poor socioeconomic status (SES)⁶, and malnutrition will adversely affect their health, increase maternal and infant mortality, and consequently decrease life expectancy at birth (life expectancy). We had previously shown the relationship between socioeconomic status, dietary intake, food insecurity (malnutrition), and health⁷. SES is commonly conceptualized as the social standing or class of an individual or group. It is often measured as a combination of occupation, income, and education. A mother's ability to buy or consume enough safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life appears to determine their dietary practices and socioeconomic status. Therefore, a low socioeconomic status is often linked with malnutrition, poor health, and consequently a higher mortality rate. The socioeconomic level of the mother is an

important predictor of malnutrition and poor health.

The primary objective of this research was to investigate whether Chad has reduced the risk of maternal and infant mortality after 15 years through the adoption of the Abuja Declaration in which African leaders decided to allocate 15% of their government expenditure on health. We hypothesised that increased general government health expenditures are associated with improved health that are mediated by increased numbers of skilled health workers and a minimum out-of-pocket health expenditure. A secondary objective of this study was to propose effective health policies in line with the Millennium Development Goals that Chad agreed to achieve by 2015. These goals include eradicating extreme poverty and improving maternal and infant health. It is hoped that this initiative will help prevent children and maternal mortality in Chad.

In this study, we first present Chad's general socio-demographic and health status. Next, we analyze Chad's maternal and infant nutrition and health status. We then examine the country's healthcare system. The final section discusses possible nutrition and health policies for Chad's most vulnerable populations: children and their mothers.

Methods

Our data are mainly from the World Bank's World Development Indicators (WDI) database and publications from for the World Health Organization (WHO). In September 2000 189 countries signed the Millennium Declaration with the goal of improving the socioeconomic status of the poorest countries around the world by 2015. The following year, African Union countries pledged to spend 15% of their annual budget to improve the health of their populations. Thus, the data of this study cover the period 2000 to 2015. For missing data, we employed the imputation method using the most frequent value. Furthermore, through process tracing methods, we examined the impact of the Chadian governments' health expenditure in relation to its impact of the population out-of-pocket health expenditures from

2000 to 2015. The results are then compared with Botswana.

Results and Discussion

Socio-demographic and health status

In 1990, Chad's population was approximately 5.96 million and has since grown by an average annual rate of 3% or 2 million every 5 years (Table 1). Despite its low life expectancy (52.58 years in 2015) and high death rate (13.22 per 1000 people), Chad's population is relatively young. Approximately 47.58% of the population was 14 years old or younger in 2015, with only 2.46% over the age of 65 (Table 1).

A younger population should in theory be a predictor of economic development, a healthy population, and a higher life expectancy. Life expectancy at birth (e.g., life expectancy) is the mean number of years expected to be lived by a person from birth⁵.

In comparison to the other six CEMAC countries, Chad had the second lowest life expectancy at 52.57 years in 2015 (the Central African Republic was the lowest). The level government expenditure on health is a predictor of the general health of the population, and consequently life expectancy. Adopted in 2001, the Abuja Declaration indicated the priority of the government to spend on health from their own domestic public resources. According to Piabuo, only Botswana, Zambia, and Ghana achieved this target⁸. Since the Abuja Declaration, from 2005 to 2015 Botswana's average life expectancy increased from approximately 52 years to 66 years (14 years), Zambia from 50 years to 61 (11 years), and Ghana from 59 years to 63 years (12 years) (Table 1). However, Chad's population life expectancy has only increased by 4 years in the same period.

Maternal and infant malnutrition: anemia and wasting

Worldwide maternal under nutrition contributes to 800,000 neonatal deaths annually through gestational age at births. Stunting, wasting, and

micronutrient deficiencies are estimated to underlie nearly 3.1 million child deaths annually⁹. Malnutrition has two components resulting in diet and health related problems: over nutrition and under nutrition. Over nutrition is due to excess of some nutrients. In Chad, maternal and infant malnutrition is associated with the absence or insufficient amounts of some nutrients (i.e., under nutrition). Consequences associated with malnutrition in Chad are problems of anemia, absence of exclusive breastfeeding, and child wasting (i.e., a lower than average weight for one's height). The country is still among the 34 countries with the highest burden of malnutrition and accounts for 90% of the global burden of malnutrition⁹.

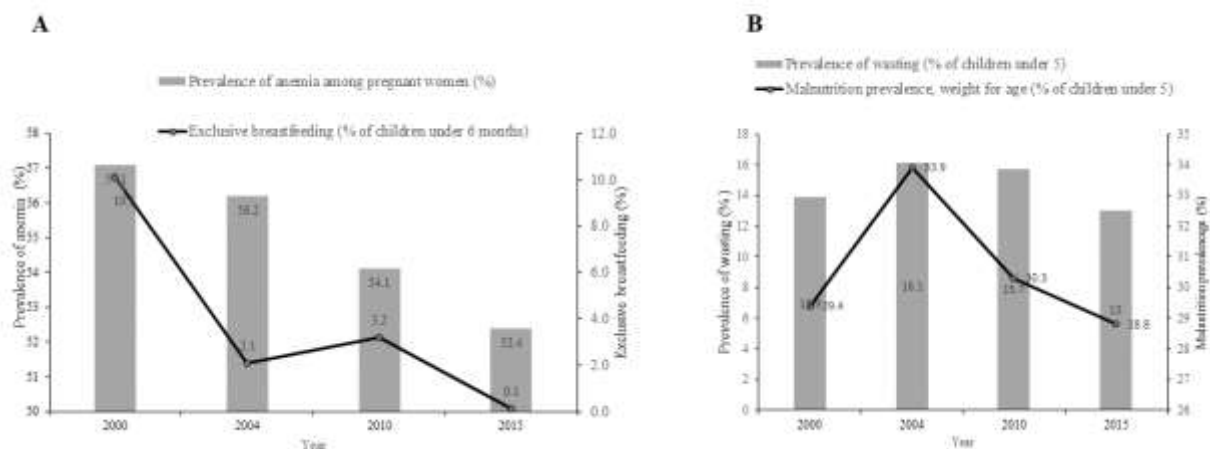
Anemia is a decrease in the total amount of red blood cells or hemoglobin in the blood. Anemia in pregnancy is observed when the hemoglobin concentration is below 110 g/L. Anemia in pregnancy affects more than 56 million women globally¹⁰. It is therefore a public health problem prevalent among children, women of childbearing age, and pregnant women. The condition is associated with poor birth outcomes such as an increased risk of stillbirth, low birth weight in infants, intrauterine growth restriction, and neonatal sepsis in pregnancy^{11, 12}. In Chad, more than 50% of pregnant women are anemic (Figure 1A). The WHO recommends mothers to exclusively breastfeed for the first six months of a child's life to achieve optimal growth, development, and health¹³; however, the percentage of mothers practicing exclusive breastfeeding decreased from 10.1% in 2000 to less than 1% in 2015 (Figure 1A). This decline is in line with Chad's malnutrition problem, since 45% of its population still lives in poverty¹. Poverty is associated with under nutrition and poor health with women and children being the most affected.

Child wasting contributes to the global disease burden and increases mortality in children aged ≤ 5 years¹⁴. In Chad, the prevalence of malnutrition among children under 5-years old slowly decreased from 16.1% in 2004 to 13% in 2015 (Figure 1B) through the help of different

Table 1: Population socio-demographic indicators in Chad

	1990	1995	2000	2005	2010	2015
Population, total (millions)	5.96	7.00	8.34	10.07	11.89	14.01
Population, female (% of total)	50.36	50.27	50.19	50.08	49.99	49.95
Population growth (annual %)	3.22	3.32	3.67	3.61	3.29	3.19
Population density (people per km ²)	4.73	5.56	6.63	7.99	9.44	11.13
Population 0-14 years (% total)	47.45	48.23	48.84	49.07	48.58	47.58
Population 65 and over (% total)	3.23	3.04	2.86	2.70	2.57	2.46
Birth rate (crude/per 1000 people)	50.99	51.38	50.88	49.31	46.68	43.86
Death rate (crude/per 1000 people)	19.00	18.39	17.83	17.04	15.13	13.22
Life expectancy at birth, total (year)	46.95	47.43	47.59	48.05	50.23	52.58

Source: World Bank; v:

**Figure 1:** Prevalence of maternal and infant malnutrition: anemia, breastfeeding, and wasting in Chad from 2000 to 2015

international aid programs such as UNICEF and Doctors Without Borders. We also observed a decrease in the prevalence of wasting from 33.9% in 2004 to 28.8% in 2015. However, these numbers are still alarming and require an urgent intervention from the government of Chad. There is a direct relationship between undernourished children and wasting as moderately wasted children are 3.4 times more likely to die than well-nourished children¹⁴. Thus, development of supplemental nutrition and care programs for children is required.

Skilled birth attendants and prevalence of maternal and infant mortality

Chad's maternal mortality rate, while improving from 1450 in 1990 to 856 per 100,000 live births

in 2015, remains high (Figure 2A). Skilled birth attendants (SBAs) are known to improve maternal and newborn survival through their service. However, only 20% of women in Chad give birth at the hospital (Figure 2A). Consequently, they do not use medical services, nor are they attended by nurses when giving birth.

This number (20%) is way below other countries such as Botswana (99.8%), France (97.1%), and South Korea (100%) in 2015 (Figures 3A, B, C, & D). Having only 20% of Chadian women being attended to by qualified skilled birth attendants means that the government must invest in health personal training throughout the country. Births attended by skilled health staff are the percentage of deliveries attended by personnel trained to give the necessary supervision, care, and advice to women

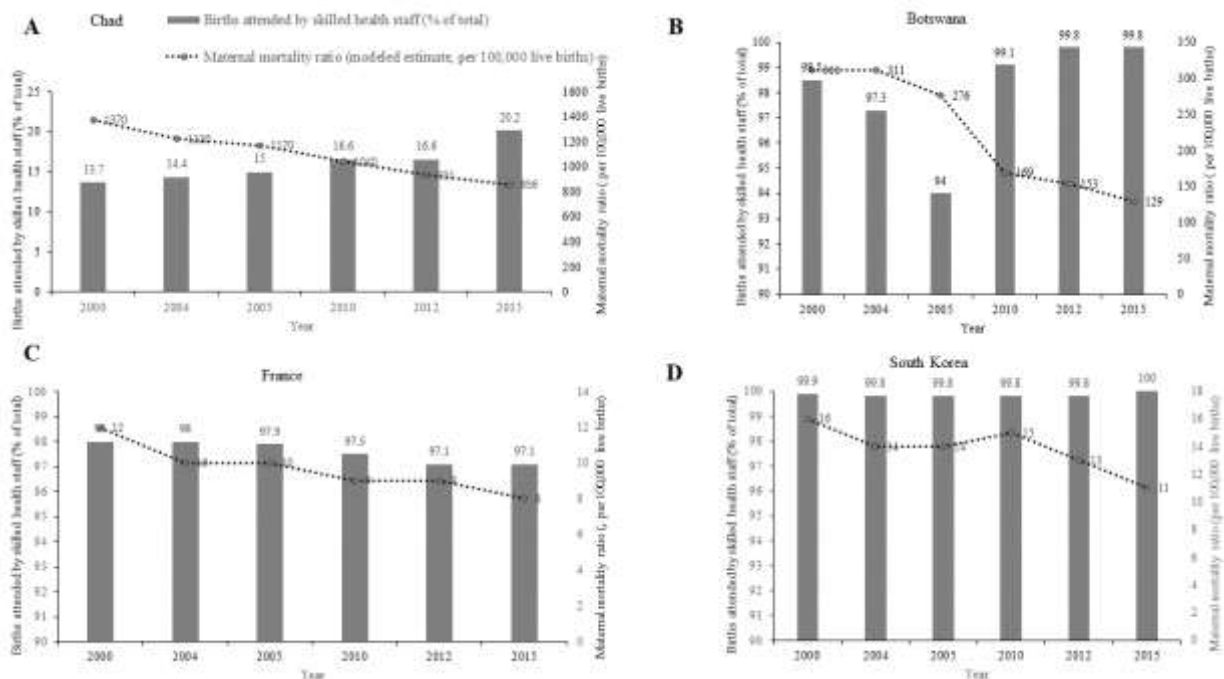


Figure 2: Trends in prevalence of maternal mortality and births attended by skilled health staff

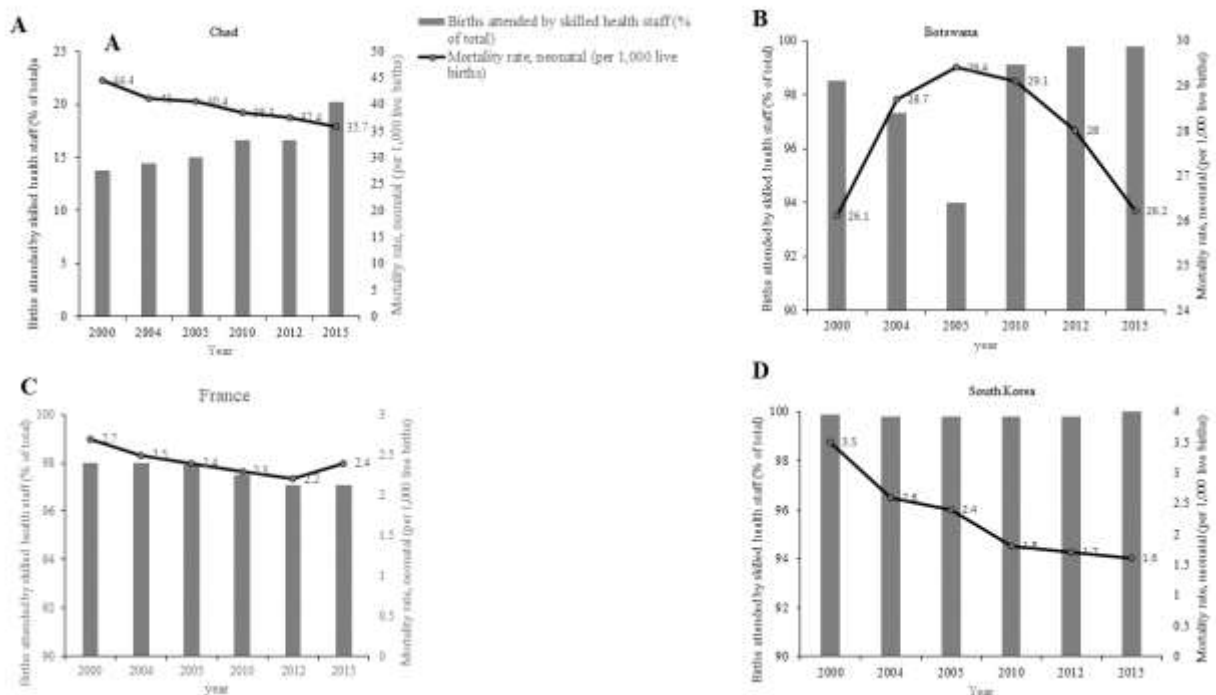


Figure 3: Trends in prevalence of neonatal mortality and births attended by skilled health staff

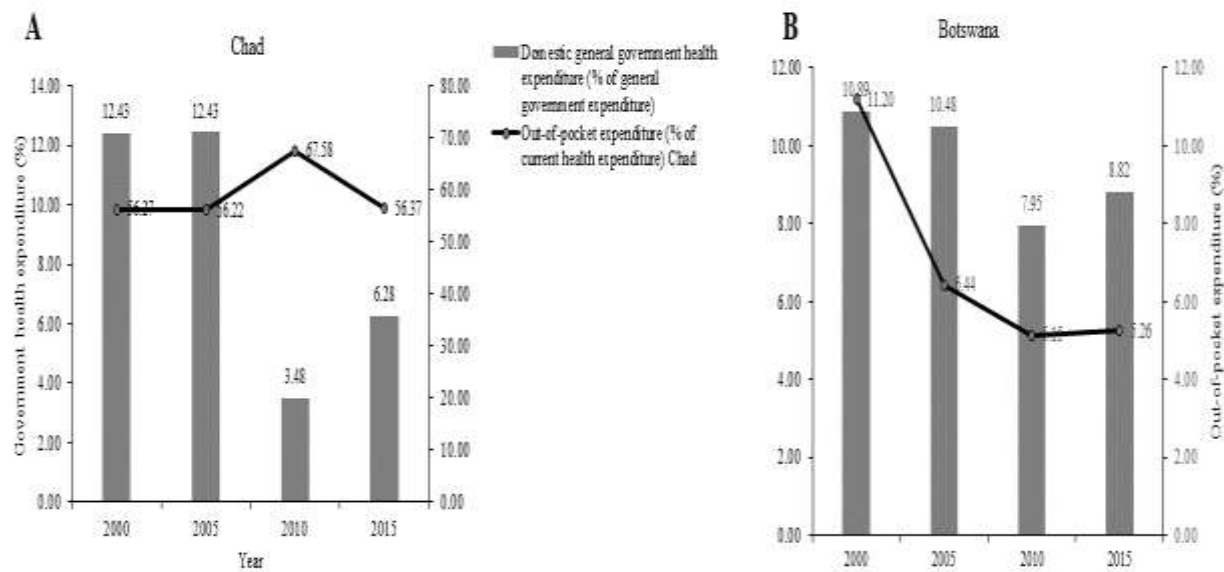


Figure 4: Government health expenditure and Population out-of-pocket spending

during pregnancy, labor, and the postpartum period; to conduct deliveries on their own; and to care for newborns¹⁵. The absence of trained health personnel could be a significant cause of a high prevalence of preventable maternal mortality. In Chad, 856 women out of an estimated 100,000 live births die compared to 129 in Botswana, 8 in France, and 11 in South Korea (Figures 3A, B, C, & D). It is estimated that the training of SBAs can prevent two-thirds of all maternal deaths¹⁷.

The same trends are observed when it comes to neonatal mortality. Neonatal mortality rate is the number of neonates dying before reaching 28 days of age per 1,000 live births in a given year. When compared to France (2.4%) and South Korea (1.6%), Chad's 2015 neonatal mortality (35.7%) was alarmingly high (Figure 3A, B, C, & D). Supporting and training SBAs with basic life-saving competencies could reduce newborn deaths by 43%¹⁸.

Chad health care system financing

Botswana, Ghana, and Zambia are the only three countries who allocated 15% of their budget on health expenditure. These increased health

expenditures should improve life expectancy, since the basic needs of pregnant women could be met. Increased life expectancy leads to increase in labor productivity, increase in incomes, and subsequent increase in socioeconomic status. Socioeconomic status is often measured through a person's education, income, and occupation. It affects food habits and consequently the person's health⁷. Health is an important determinant of life expectancy and subsequently decreases in maternal and infant mortality. Through the Abuja Declaration, the Chadian government's health expenditures had to finance healthcare using domestic sources as a share of total public expenditure with the goal of reducing the population's out-of-pocket expenditure.

Chad's domestic general government health expenditure went from 12.43% in 2005 to 3.48% in 2010. The modest jump at 6.28% in 2015 (Figure 4A) came from Chad's government in 2012 pledging to increase the number of public health workers and raise health sector expenditure to 15% of the budget in order to be in line with the Abuja Declaration¹⁹. However, these numbers are way below the aspirations of the declaration. Spending on health directly out-of-pocket by

households is consequently still above 50% as compared to, for example, Botswana (5.26%) (Figure 4B). Furthermore, Chad has international partners helping its health system. However, the geographical distribution of international aid and the field of intervention do not allow them good coverage of all regions of the country, especially in rural areas.

Health Policy Recommendations

This study addressed the problem of maternal and infant health and mortality in Chad specifically. Fifteen years after the Abuja Declaration, women and their children are still experiencing health inequity. Therefore, in view of the results obtained, we recommend the following three policies.

Skilled birth attendants training

In Chad, only 1 out of 5 women give birth in a hospital, and it is estimated that more than 80% of all newborn deaths being preventable. According to the WHO, there is currently an average of 3.7 physicians for every 100,000 people in Chad²⁰. The WHO helps train Chadian medical doctors and offers scholarships to medical students. However, the country only has 2.1 nurses and midwives for every people²⁰. It is therefore essential for the Chadian government to also train nurses to improve its health system and consequently reduce the number of infant and maternal deaths. The Human Resources for Health (HRH) situation is aggravated by a geographic maldistribution of health workers, with 65% of physicians and 35% of nurses and midwives concentrated primarily in Chad's capital N'Djamena. Hence, mothers living in rural districts are likely receiving their treatment from non-modern healthcare trainees or traditional birth attendants (TBA). These TBAs are not trained in procedures such as caesarian sections or resuscitation. The Chadian government is therefore encouraged to strengthen maternal health by offering free healthcare during pregnancy and for a year after childbirth to reduce maternal and infant mortality. Furthermore, Chad does not have

a family planning policy (the total fertility rate is 6.6 children per woman) and teenage mothers (12 to 15 years) contribute to 15% of its birthrate²¹.

Enhance social status of nurses

While the training of nurses is necessary for an effective healthcare system, the profession must be attractive so young people can enroll in the program. The valorization of the nursing profession must start with the government showing the socioeconomic advantages of pursuing such a career: increased wages, career development, adequate working condition, and social recognition of nurses as pivotal actors in the development of the country. Given the serious lack of medical doctors in Chad, nurses, who deliver general out-patient care, are responsible for vaccinations and perform deliveries on their own²². Thus, additional incentives must be given to nurses willing to move and work in rural districts to enable them to provide optimal care as only 14% of women in rural areas gave birth in health facility. Indeed, inadequate salaries and lack of incentives have been reported to be dominant demotivation factors among health workers²³⁻²⁵.

Development of supplemental nutrition care program for women

Based on maternal and infant malnutrition in Chad in relation to their socioeconomic status, the Chadian government must implement a supplemental nutrition care program for women. Implementing such a policy could allow, for example, anemic women in reproductive age to have free iron supplements from the first semester to up to 3 months after giving birth. During pregnancy, there is a substantial increase of maternal daily iron due to the fetal iron demand. Maternal iron stores are not enough as deficiency may lead to risk of perinatal mortality and morbidity. Free iron supplements may be applicable for women living in rural areas and/or low socioeconomic status. Chad has a significant number of international partners involved in HRH development including the WHO, World Bank, European Union, UNICEF, and Doctors Without

Borders. Such programs would substantially reduce the high prevalence of iron-deficiency anemia among pregnant Chadian women and the prevalence of stunting and wasting among children under the age of 5. Unfortunately, international partners such as European Regional Development Fund have been complaining of mismanagement of the funds made available to health delegations²¹.

Consent for Publications

The authors have read and approve the publication of the manuscript in its current form. This manuscript has not been submitted for publication elsewhere and has not been previously published.

Competing Interests

The authors declare they have no conflict of interest.

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Authors' Contributions

Obiang-Obounou conceived the initial idea and wrote the initial stage of the manuscript. Fuh did additional literature search and contributed intellectually. Both authors agree on the current version of the manuscript.

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