

Field research



Papers, posters, abstracts
from cooperation activities
in Africa
2014



Doctors with Africa CUAMM

Doctors with Africa CUAMM is the largest Italian organization involved in promotion and protection of health in Africa. A long arduous, daily journey alongside the poorest of the poor, living on the fringes and unseen by most eyes. Since 1950, when it was founded under the name of CUAMM (University College for Aspiring Missionaries and Missionary Doctors), Doctors with Africa CUAMM conducts long-term projects, from a development and cooperation perspective, to ensure improved access to health services for all.

In more than 60 years of history:

- 41 countries have benefitted;
- 217 hospitals have received services;
- 1569 people have been sent to serve on projects, 411 of these have returned to Africa once or more;
- 5021 years of service have been spent, with an average of over 3 years per expatriate;
- 153 health programmes developed in collaboration with the Italian Ministry of Foreign Affairs and various international agencies;
- 1053 students have been accommodated in the college.

Doctors with Africa CUAMM is currently present in 7 Sub-Saharan African countries: Angola, Ethiopia, Mozambique, South Sudan, Tanzania, Uganda and Sierra Leone. Most volunteers are working in the field to guarantee African people the right to health: in hospitals, districts, schools or universities, alongside local doctors and nurses. Others work to ensure the procurement of equipment and materials and provide administrative support.

- 168 doctors, paramedics, technicians and administrative staff work in the field;
- 38 key cooperation projects are activated in the countries;
- 17 hospitals are supported;
- 26 districts for public health activities, mother-child care, fight against AIDS, tuberculosis and malaria are active;
- 2 universities are sustained;
- 5 nursing schools are activated.

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Padova, March 2015

“Field research is part of a larger research that aims to define new models and measures of cooperation”

*Prof. Anacleto Dal Lago, Doctors with Africa Cuamm
December 14, 1984*

Preface

This publication is the result of Doctors with Africa CUAMM's commitment to incorporate an operational research component into all of our projects and programs in Africa. A collection of the work done in 2014, it complements our previous report entitled "*Field research: Articles, posters and scientific abstracts from CUAMM's health care cooperation activities in Africa, 2003-2013*" and includes seven articles dealing primarily with Mozambique, South Sudan, Uganda and Tanzania and six abstracts or posters presented at international conferences and focused on the chief health and social problems afflicting the most vulnerable populations in African communities, for example HIV-positive pregnant women and children, at-risk adolescents and the chronically ill.

The work behind the publication was carried out within a broader international context. There is growing awareness, in fact, that in order for the post-2015 Sustainable Development Goals to be achieved it is crucial that the research capacities of developing countries be strengthened. This is understood as a process of development engaging an ever wider community of stakeholders that enables both individuals and institutions to acquire better-quality skills and to increase their ability to undertake high-quality, relevant research¹.

Drawing inspiration from this approach, Doctors with Africa CUAMM is committed to doing its own part to strengthen research capacity in the countries where it is active. We do so by identifying the health care needs of local communities and proposing innovative solutions based on those and the most pressing priorities of evolving health systems in order to help improve understanding and to overcome the barriers that get in the way of achieving higher standards of quality, equity and efficiency in health care, even in settings where there is a severe lack of resources.

Operating as it does in settings where studies and analyses are rare, Doctors with Africa CUAMM continues to believe in the pressing need to develop field-based research projects focused on the issues most important to local communities, working in close cooperation with the latter as well as with health care workers and home-grown institutes for research and development. This is the only way to guarantee that decision-making processes and political choices are based on and validated by high-quality evidence, i.e. evidence that is anchored to the real-life problems of people and systems. Strengthening Africa's research capacities is of vital importance if we are to achieve this goal.

Don Dante Carraro

Director, Doctors with Africa CUAMM

Padua, 1 March 2015

¹"Seven principles for strengthening research capacity in low- and middle-income countries: simple ideas in a complex world", ESSENCE on Health Research, WHO 2014.

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Operational research of Doctors with Africa–CUAMM: strategy, scientific debate, effectiveness of intervention

Operational research has become a core element of Doctors with Africa–CUAMM and its working strategy, with the goal of understanding the work settings in depth, encouraging discussion between international specialists and improving intervention in the field.

In the vast realm of international healthcare cooperation, Doctors with Africa–CUAMM works committedly on several issues, which have become an essential part of its identity, including **child and maternal health**, which is deeply bound to the overall **quality of the healthcare system** and the social and cultural context in which we operate. With the “Mothers and Children First” program launched three years ago in four countries, attention to **safe motherhood** and the study of issues like **maternal, fetal and newborn mortality** and **delivery incentives** are essential for developing increasingly effective working models that can bring the **hospital** to the center of the process for bringing care to people. In this area, as well as others, many studies seek to understand in depth the **determinants of health** to work on the issue of parity and global health. One of these is the particular attention given to the **referral system**: breaking down barriers that separate people from the hospital is a primary tool for ensuring **access to care**.

Other issues of study include research in infectious diseases, such as **HIV**, the subject of one of the articles in this collection, and **TB**, on which Doctors with Africa–CUAMM has been working on several fronts, including pediatric TB, comorbidity of TB and diabetes, mammary TB and its social and economic impact on the patients.

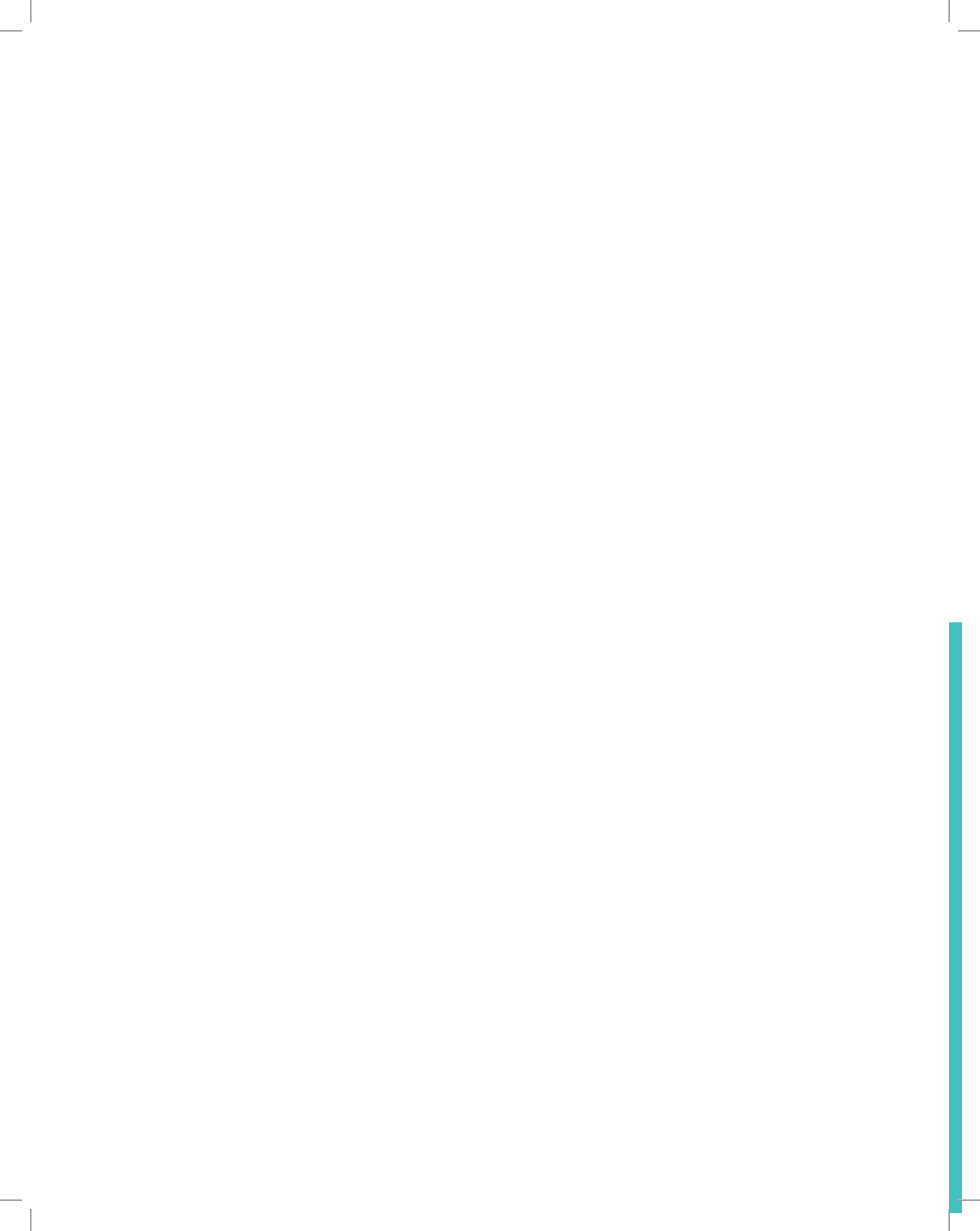
An area taking on growing importance is **training for young doctors and medical students**. Several of the writings collected here are about the training program that Doctors with Africa–CUAMM offers to SISM — Segretariato Italiano Studenti di Medicina — and JPO — Junior Project Officer, those enrolled in specialization schools. On this front, academic knowledge is joined by work in the field, letting young doctors and students support CUAMM doctors and gain direct experience in a country with limited resources.

Lastly, we cannot fail to mention **Ebola**. Though the writings in this publication do not yet include specific studies, during 2015, two publications are planned on the topic, which affected Doctors with Africa–CUAMM directly throughout 2014, as it sought both to fight the epidemic and keep the rest of the healthcare system’s operation as intact as possible to avoid excessive indirect effects on the people.

This publication collects the 2014 scientific publications about Doctors with Africa CUAMM, organized by country studied and divided by category: *abstracts* and *posters* refer to projects presented at conferences; *articles*, *papers* and *comments* were published in scientific journals. Each is preceded by a brief summary presenting the project’s theme in accessible terms.

OPERATIONAL RESEARCH AREAS: A MAP







ETHIOPIA

ARTICLE 15

- **Title:** Describing differences in disease patterns between females and males across age groups: analysis of 54,519 medical records of in-patients admitted to Wolisso Hospital (2005-2011)
- **Authors:** S. Accorsi, A. Seifu, P. Farese, B. Shiferaw, F. Manenti
- **Date of publication:** April 2014
- **Place of publication:** Federal Democratic Republic of Ethiopia, Ministry of Health, Quarterly Health Bulletin, Volume 6, Number 1, pp. 36-44

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Describing differences in disease patterns between females and males across age groups: analysis of 54,519 medical records of in-patients admitted to Wolisso Hospital (2005-2011)

The difference between men and women in health and access to healthcare treatments is a focus of national and international study. However, significant efforts are lacking to gather information that allow for an adequate response in the field, particularly in contexts with limited resources.

The study, published in the first 2014 issue of the quarterly bulletin on health by the Ministry of Health of Ethiopia, focuses on this area, setting itself the goal of describing the main differences between men and women. Studying the impact of sex and gender on vulnerability and access to health services highlights how biological factors (such as women's reproductive role) and socially and culturally constructed roles and norms strongly affect the risk of contracting certain diseases and causes of hospitalization.

Research based on data collected at the hospital of Wolisso, Ethiopia, with particular attention to differences between men and women in different age groups in terms of disease incidence and access to health services. Delivery is the leading cause of admission to hospitals, which leads to about 60% of patients being women. If we analyze the other major causes (such as injuries and malaria), male patients are in the majority. This is due to social factors such as the frequency of high-risk behavior and employment, considered more significant for men.

The goal of the study is to highlight the importance of an in-depth analysis of these differences in the light of biological and social factors. This is essential for implementing effective actions to improve health services and reduce gender inequalities.

DESCRIBING DIFFERENCES IN DISEASE PATTERNS BETWEEN FEMALES AND MALES ACROSS AGE GROUPS: ANALYSIS OF 54,519 MEDICAL RECORDS OF IN-PATIENTS ADMITTED TO WOLISSO HOSPITAL (2005-2011)

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Summary

This study is based on data routinely collected in 54,519 medical records of in-patients admitted to a non-profit hospital in Ethiopia (St. Luke Hospital in Wolisso) in the period 2005-2011. It aims to describe differences between females and males in use of in-patient services and in disease patterns, explaining these differences with reference to sex (biological) and gender (socially constructed) factors. The leading cause of admissions was delivery (26.0% of total admissions), followed by injuries (8.5%), and malaria (6.8%). The number of admissions was higher for females (60.5% of the total) due to the high frequency of admissions for childbirth and gynaecological-obstetric conditions. Men had more admissions for the other leading causes, with the highest male-to-female ratio being found for injuries (M:F ratio=2.7): this pattern reflects the higher risk of road traffic accidents, occupational injuries, interpersonal violence and risk-taking behaviours among adult males. Malaria (11.0%) was the leading cause of in-hospital deaths, followed by pneumonia (10.6%), and injuries (9.7%). The analysis of medical records at Wolisso Hospital offers interesting insights into the ways in which delivery of health care interacts with the patient's demand and meets gender-specific health needs, the most obvious differences being related to reproductive health needs. It helps also to disentangle biological differences between females and males from those which are created by the social construct of gender. A greater understanding of these mechanisms helps to develop strategies for addressing gender inequalities in order to achieve the dual goal of improving health status and ensuring equity.

1) Introduction

It is well known that women and men differ with respect to morbidity and mortality, and that biological and socio-environmental factors may mediate these differences (Payne, 2006). In this context, the term “sex” is used in reference to biological factors: it is more than reproduction and includes hormonal, immune, and genetic differences which impact on vulnerability to different diseases as well as on chances of survival (WHO, 2002). The term “gender” refers to socially constructed differences between women and men; that is, the conventions, roles, and expectations of women and men that are culturally ascribed (WHO, 2002).

Sex and gender can act alone in determining differentials in the burden of disease. However, while some health conditions seem to be more closely linked to either sex or gender, most are shaped by both (Payne and Doyal, 2009). The distinct roles and behaviours of women and

men in a given culture, dictated by that culture's gender norms and values, give rise to gender differences (WHO, 2002). Gender norms and values, however, also give rise to gender inequalities; that is, unfair differences between men and women that systematically empower one group to the detriment of the other. Both gender differences and gender inequalities can give rise to inequities between women and men in health status and access to health care. This means that gender issues are not just of concern to women. Men's health, too, is affected by gender divisions in both positive and negative ways (Connell and Messerschmidt, 2005).

As a result, sex and gender can lead to differences in vulnerability to illness, in access to health care and in the impact of illness at both the individual and household levels (Diderichsen et al., 2001). However, the intense concern for gender inequalities frequently expressed in national and international fora failed to produce comparable significant efforts to collect the information

needed to act upon this concern (Wizeman and Pardue, 2001), especially in resource-poor contexts. There are various reasons for this, including the fact that most health information systems and disease control programmes fail to produce sex-disaggregated data (Payne and Doyal, 2009), and few studies in Africa have focused on differences in health between females and males. In Ethiopia, it is crucial to develop sex- and gender-related analysis of data derived from the Health Management Information System (HMIS) to guide informed decision and evidence-based practice (FMOH, 2013a).

This paper is based on data routinely collected in 54,519 medical records of in-patients admitted to a private, non-profit hospital (St. Luke Hospital in Wolisso, Oromia Region) in the period 2005-2011. It aims to describe differences between males and females in use of in-patient services and in disease patterns, explaining these differences with reference to sex (biological) and gender (socially constructed) factors, and documenting mechanisms that link gender, sex, disease profile, service use, and health outcomes as well as actions undertaken to address gender inequalities.

2) Material and methods

Wolisso Hospital is a private, non-profit facility located in Wolisso town, capital of the Southwest Shoa Zone (Oromia Region), with a catchment area of about 1,200,000 population (CSA, 2007), and it is the referral hospital in the zone. It is owned by the Catholic Church, and is supported by an Italian Non-Governmental Organization (Doctors with Africa-CUAMM), hosting also a college of nursing. It began services in January 2001, with a number of beds increasing over time from 83 in 2001 to 198 in 2011, and a bed occupancy rate of about 90% in the study period.

Concerning obstetrical services, out of 14,172 deliveries assisted at Wolisso Hospital in the period 2005-2011, 5,236 (36.9%) were abnormal, with 3,257 caesarean sections being performed in the study period. Preventive services performed by the hospital included antenatal visits for pregnant women (57,020 in the period 2005-2011), immunizations for infants (94,730) and voluntary counselling and testing for HIV/AIDS (23,241). The hospital has a policy of giving priority to economically and socially disadvantaged individuals in terms of access to services, which are provided at subsidized prices. Vulnerable groups (infants, children and women) accounted for 84.5% of admissions, a percentage which is higher than their share in the general population (56.9%) (CSA, 2007).

This study is based on retrospective analysis of the discharge records of 54,519 patients admitted to the

hospital in the period 2005—2011, including 2,611 patients who died in the hospital. The analysis was limited to the principal cause of hospital admission, that was coded according to the International Classification of Diseases (10th revision; ICD-10) (WHO, 1994). For mortality analysis, the principal cause was considered as the cause of death. The diagnostic procedures in the hospital were standardized and consistent over time. The data from the discharge records were routinely entered into a computerized database by trained and authorized personnel; during the study period, the procedures for collecting and storing data did not change.

3) Results

The leading cause of admissions was childbirth, with over a quarter (26.0%) of the total, followed by injuries (8.5%), malaria (6.8%), pneumonia (6.4%), and complications of pregnancy (5.6%) (Table 1).

The total number of admissions was higher for females (60.5% of the total) due to high frequency of admissions for childbirth and gynaecological-obstetric conditions. Men had more admissions for the other leading causes, with the highest male-to-female ratio being found for injuries (M:F ratio=2.7) and musculoskeletal diseases (M:F ratio=1.8). As a result, there were more admissions among men in all of the age groups except in reproductive age (15-44 years).

The number and percentage of hospital bed days by disease, related to both frequency of admissions and duration of hospital stay, can be considered a good indicator of the relative burden of different diseases on hospital services. Injuries and deliveries were the most important conditions in terms of service utilization, accounting for a similar number of bed days (45,644 and 45,197, respectively).

The age- and sex-related patterns of admission were different across diseases: for example, malaria showed a peak in childhood (higher in males), followed by a diverging pattern in young adult ages (a decrease in males and an increase in females), with a subsequent decrease in both sexes in the older age groups. In particular, there were 179 male malaria admissions in 15-24 years and 173 in 25-34 years, while there were 348 and 335 admissions among females for the same cause in the same age groups (Figure 1A). Similar age- and sex-related patterns were observed for anaemia, with a marked increase in reproductive age only among females (Figure 1B).

Conversely, an increase in injuries was observed among males, especially in young adult age groups (Figure 2).

Table 1. Number of admissions by sex with bed days and average length of stay (ALOS) for the ten leading causes of admission.

	Male admissions		Female admissions		Total admissions		M:F Ratio	Male bed days		Female bed days		Total bed days		ALOS (days)
	n	(%)	n	(%)	n	(%)		n	(%)	n	(%)	n	(%)	
Delivery	-	-	14,172	43.0%	14,172	26.0%	-	-	0.0%	45,197	34.0%	45,197	14.8%	3.2
Injuries	3,376	15.7%	1,253	3.8%	4,629	8.5%	2.7	32,442	18.9%	13,202	9.9%	45,644	15.0%	9.9
Malaria	1,861	8.6%	1,822	5.5%	3,683	6.8%	1.0	10,326	6.0%	9,778	7.4%	20,104	6.6%	5.5
Pneumonia	2,061	9.6%	1,415	4.3%	3,476	6.4%	1.5	13,766	8.0%	9,273	7.0%	23,039	7.6%	6.6
Complications of pregnancy	-	-	3,063	9.3%	3,063	5.6%	-	-	0.0%	9,952	7.5%	9,952	3.3%	3.2
Malnutrition	1,223	5.7%	1,032	3.1%	2,255	4.1%	1.2	16,462	9.6%	14,922	11.2%	31,384	10.3%	13.9
Musculoskeletal diseases	1,332	6.2%	750	2.3%	2,082	3.8%	1.8	16,972	9.9%	10,099	7.6%	27,071	8.9%	13.0
Diarrhoea	1,093	5.1%	680	2.1%	1,773	3.3%	1.6	6,906	4.0%	3,862	2.9%	10,768	3.5%	6.1
Cardiovascular diseases	858	4.0%	792	2.4%	1,650	3.0%	1.1	5,924	3.5%	5,603	4.2%	11,527	3.8%	7.0
Tuberculosis	843	3.9%	729	2.2%	1,572	2.9%	1.2	9,266	5.4%	8,445	6.3%	17,711	5.8%	11.3
Other diseases	8,879	41.2%	7,285	22.1%	16,164	29.6%	1.2	59,437	34.7%	47,884	36.0%	107,321	35.2%	6.6
Total	21,526	100.0%	32,993	100.0%	54,519	100.0%	0.7	171,501	100.0%	178,217	100.0%	349,718	100.0%	6.4

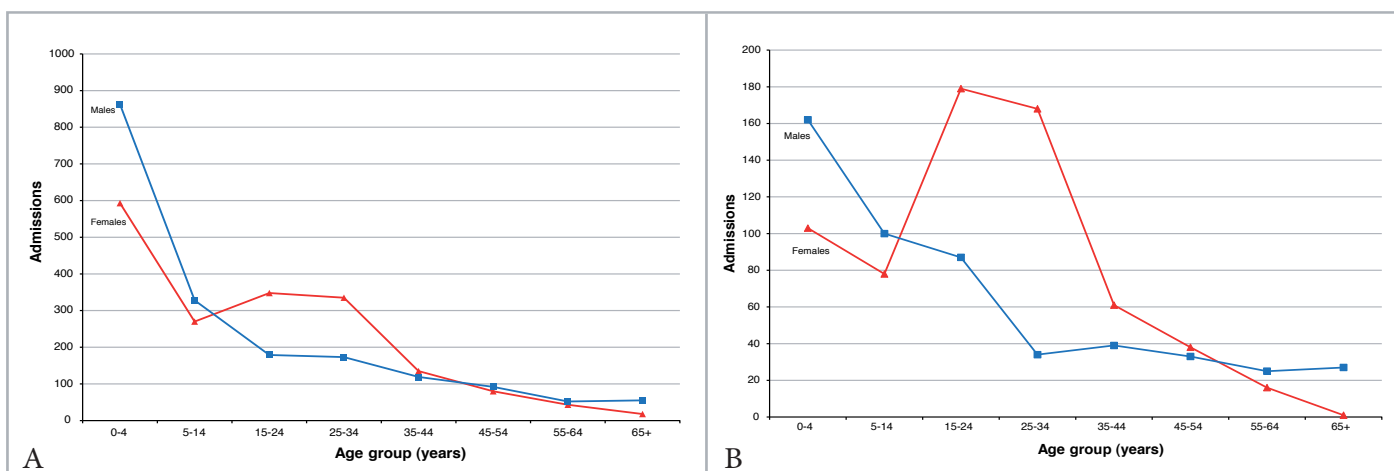


Figure 1. Number of admissions by sex and age group for malaria (1A) and anaemia (1B).

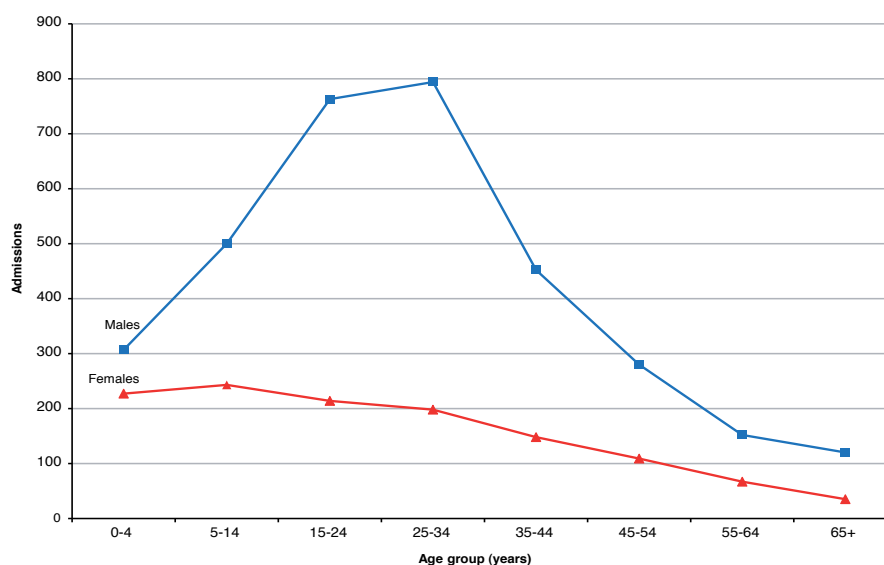


Figure 2. Number of admissions by sex and age group for injuries.

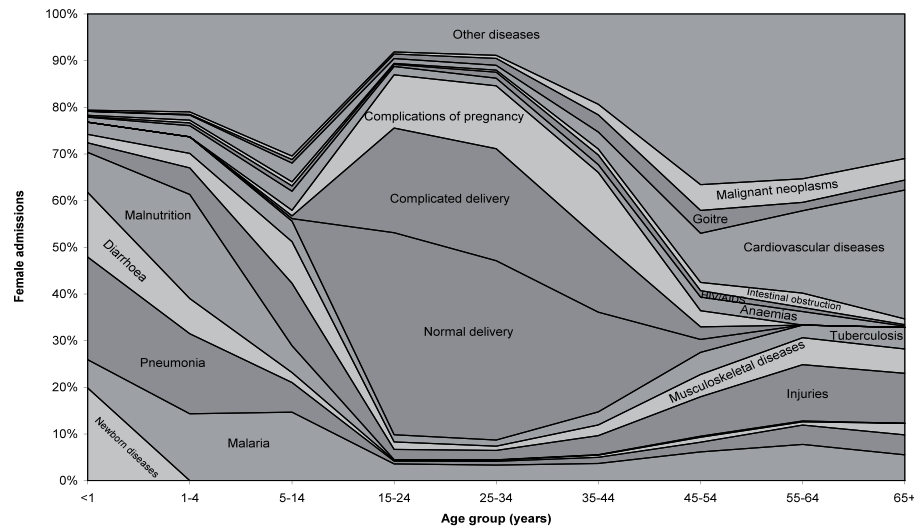


Figure 3. Proportion of admissions to Wolisso Hospital 2005-11 for the leading causes of admission by age group among female inpatients.

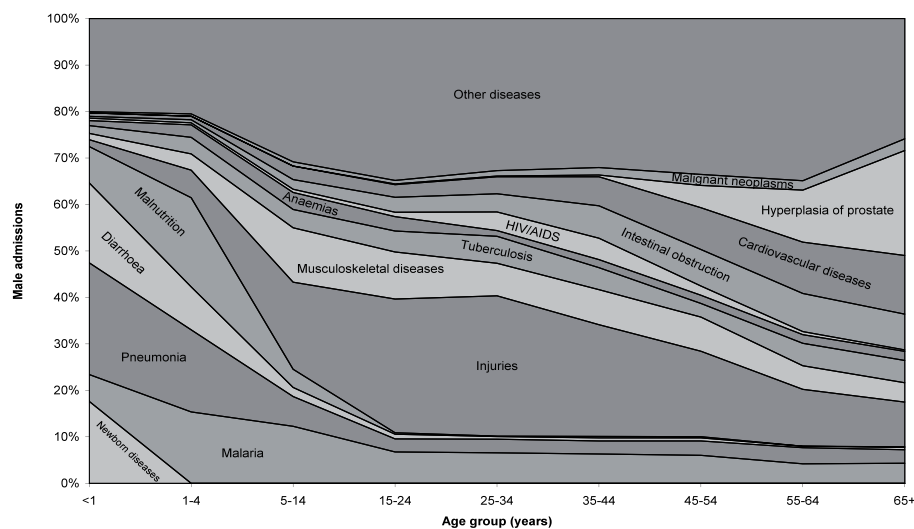


Figure 4. Proportion of admissions to Wolisso Hospital 2005-11 for the leading causes of admission by age group among male inpatients.

The relative contribution of different conditions to the overall admission patterns is illustrated in [Figures 3](#) and [4](#), showing age-specific distribution of the percentage of admissions for the leading causes of admission in females and males, respectively.

Since it is a relative measure, the percentage for a specific cause depends on patterns of other diseases. Childhood communicable diseases did not show any marked difference by sex, with malaria, pneumonia and diarrhoea, together with malnutrition, accounting for the majority of the under 5 admissions in both sexes (56.8% among girls and 58.6% among boys). Conversely, wide differences were observed in the following ages, with delivery and complications of pregnancy accounting for a high percentage of admissions among young adult females (77.1% in 15-24 age group and 75.9%

in 25-34 age group), while injuries were the leading cause of admissions among young adult males (28.8% and 30.2% of all male admissions in 15-24 and 25-34 age groups, respectively). Cardiovascular diseases, neoplasms (i.e. prostatic hyperplasia in males) and other non-communicable conditions accounted for an increasing percentage of admissions in older ages in both sexes. The top ten leading causes of admission in the different age groups (under 15 years, 15-44 years, 45 years and more) are shown in [Table 2](#).

The distribution of in-hospital deaths, the proportional mortality rate (PMR) and the case fatality rate (CFR) for the ten leading causes of death are shown in [Table 3](#). Malaria was the leading cause of in-hospital deaths (11.0% of the total), followed by pneumonia (10.6%), injuries (9.7%), and cardiovascular disease (9.4%); whereas

AIDS, newborn diseases and meningitis were the most severe conditions, as shown by the high CFRs (21.8%, 20.5%, and 17.5%, respectively). The total number of deaths was slightly higher for males (54.2% of the total), with women having more deaths from malnutrition and AIDS and fewer from intestinal obstruction, injuries,

meningitis, newborn diseases, pneumonia and TB; the number of deaths was balanced between women and men for malaria and cardiovascular diseases. A total of 75 maternal deaths were recorded during delivery and postpartum and for complications of pregnancies in the study period (data not shown in table).

Table 2. Number of admissions to Wolisso Hospital 2005-11 by sex for the ten leading causes of admission by age group (<15, 15-44, ≥45 years).

Cause	Males		Females		Total		M:F ratio
	No. Admissions	%	No. Admissions	%	No. Admissions	%	
< 15 years							
Pneumonia	1,730	16.8%	1,158	15.9%	2,888	16.4%	1.5
Malnutrition	1,202	11.6%	1,008	13.9%	2,210	12.6%	1.2
Malaria	1,191	11.5%	863	11.9%	2,054	11.7%	1.4
Diarrhoea	1,018	9.9%	591	8.1%	1,609	9.1%	1.7
Injuries	810	7.8%	473	6.5%	1,283	7.3%	1.7
Newborn diseases	574	5.6%	447	6.1%	1,021	5.8%	1.3
Musculoskeletal diseases	510	4.9%	304	4.2%	814	4.6%	1.7
Tuberculosis	315	3.1%	253	3.5%	568	3.2%	1.2
Other respiratory diseases	255	2.5%	182	2.5%	437	2.5%	1.4
Anaemia	251	2.4%	175	2.4%	426	2.4%	1.4
Other diseases	2,464	23.9%	1,820	25.0%	4,284	24.3%	1.4
Total	10,320	100.0%	7,274	100.0%	17,594	100.0%	1.4
15 - 44 years							
Delivery	-	-	14,080	59.8%	14,080	45.9%	-
Complications of pregnancy	-	-	2,996	12.7%	2,996	9.8%	-
Injuries	2,011	28.1%	568	2.4%	2,579	8.4%	3.5
Malaria	471	6.6%	818	3.5%	1,289	4.2%	0.6
Musculoskeletal diseases	594	8.3%	335	1.4%	929	3.0%	1.8
Tuberculosis	362	5.1%	384	1.6%	746	2.4%	0.9
Cardiovascular diseases	286	4.0%	340	1.4%	626	2.0%	0.8
Anaemia	147	2.1%	403	1.7%	550	1.8%	0.4
HIV/AIDS	218	3.0%	249	1.1%	467	1.5%	0.9
Goitre	68	0.9%	381	1.6%	449	1.5%	0.2
Other diseases	3,009	42.0%	2,982	12.7%	5,991	19.5%	1.0
Total	7,166	100.0%	23,536	100.0%	30,702	100.0%	0.3
≥ 45 years							
Injuries	555	13.7%	212	9.7%	767	12.3%	2.6
Cardiovascular diseases	435	10.8%	325	14.9%	760	12.2%	1.3
Hyperplasia of prostate	500	12.4%	-	-	500	8.0%	-
Intestinal obstruction	320	7.9%	44	2.0%	364	5.8%	7.3
Malaria	199	4.9%	141	6.5%	340	5.5%	1.4
Musculoskeletal diseases	228	5.6%	111	5.1%	339	5.4%	2.1
Tuberculosis	166	4.1%	92	4.2%	258	4.1%	1.8
Malignant neoplasms	93	2.3%	115	5.3%	208	3.3%	0.8
Pneumonia	127	3.1%	64	2.9%	191	3.1%	2.0
Hernia	127	3.1%	28	1.3%	155	2.5%	4.5
Other diseases	1,290	31.9%	1,051	48.1%	2,341	37.6%	1.2
Total	4,040	100.0%	2,183	100.0%	6,223	100.0%	1.9

Table 3. In-hospital deaths, proportional mortality rate (PMR) and case fatality rate (CFR) by sex for the ten leading causes of in-hospital death.

Cause	Male deaths		Female deaths		Total deaths		M:F ratio	Case fatality rate ^a (%)		
	n	PMR ^b (%)	n	PMR ^b (%)	n	PMR ^b (%)		Males	Females	Total
Malaria	142	10.0%	146	12.2%	288	11.0%	1.0	7.6%	8.0%	7.8%
Pneumonia	149	10.5%	128	10.7%	277	10.6%	1.2	7.2%	9.0%	8.0%
Injuries	184	13.0%	68	5.7%	252	9.7%	2.7	5.5%	5.4%	5.4%
Cardiovascular diseases	121	8.5%	125	10.5%	246	9.4%	1.0	14.1%	15.8%	14.9%
Newborn diseases	117	8.3%	92	7.7%	209	8.0%	1.3	20.4%	20.6%	20.5%
Malnutrition	71	5.0%	78	6.5%	149	5.7%	0.9	5.8%	7.6%	6.6%
AIDS	64	4.5%	74	6.2%	138	5.3%	0.9	20.3%	23.4%	21.8%
Tuberculosis	67	4.7%	54	4.5%	121	4.6%	1.2	7.9%	7.4%	7.7%
Intestinal obstruction	47	3.3%	16	1.3%	63	2.4%	2.9	6.4%	8.1%	6.8%
Meningitis	39	2.8%	22	1.8%	61	2.3%	1.8	18.8%	15.6%	17.5%
Other diseases	415	29.3%	392	32.8%	807	30.9%	1.1	4.4%	1.6%	2.4%
Total	1,416	100.0%	1,195	100.0%	2,611	100.0%	1.2	6.6%	3.6%	4.8%

^a The proportion of deaths out of the number of cases for a specific disease.

^b The proportion of deaths from a given cause out of the total number of deaths.

4) Discussion

The analysis of medical records at Wolisso Hospital offers interesting insights into the ways in which delivery of health care interacts with the patient's demand and meets gender-specific health needs, the most obvious differences being related to reproductive health needs. It helps also to disentangle biological differences between females and males from those which are created by the social construct of gender. In particular, sex-related biological differences may affect both susceptibility and immunity, while gender differences in patterns of behaviour and access to resources may influence the degree of exposure to risk and use of health services.

At Wolisso Hospital, over half (60.5%) of the inpatient services were targeted to women, mainly as a result of the priority given to the protection of maternal health. However, except for reproductive age (15-44 years), male admissions were more frequent in all of the other age groups. In particular, although there were similar disease patterns in childhood, more admissions were found among boys than among girls in this age group. This differential pattern of care has been reported in other developing countries (Lawn et al., 2005), where girls are less likely to receive treatment than boys, reflecting unequal access to health care due to cultural norms and different roles in the society (Payne and Doyal, 2009; Victora et al., 2003).

Furthermore, striking differences emerge in adults. Firstly, and most obviously, women suffer disproportionately from their reproductive role. In addition, there are

differences reflecting gendered distribution of power, resources, and role expectations with an increase in conditions (such as injuries) related to risky behaviours (i.e., alcohol and substance use) among men. Masculine practices also increase some health risks for women, notably the risks associated with male violence and sexually transmitted infections. Therefore, biological factors interact with social and environmental factors, and the health of women and men is also shaped in a number of ways by socially constructed gender inequalities.

A greater understanding of these mechanisms and the development of strategies for addressing these inequalities may help to achieve the dual goal of improving health status and ensuring equity (Theobald et al., 2006). For this purpose, gender-related analysis should be extended to the overall disease profile, with a special focus on the leading causes of morbidity and mortality.

Malaria provides a good example of this analysis, showing a peak in childhood age in both sexes (higher in males), and an increase in young-adult ages (starting in the 15-24 age group) among females due to malaria in pregnancy. This peculiar distribution reflects differential patterns of vulnerability in young children and pregnant women (Morrow and Moss, 2009). Young children experience their first malaria infections at early age, when they have not yet acquired adequate immunity, which makes these malaria cases particularly severe. In addition, repeated malaria infections make young children more susceptible to other common childhood illnesses, such as diarrhoea and respiratory infections, thus contributing indirectly to mortality.

Adult women in malaria-endemic areas have a high level of immunity, but this is impaired especially in the first pregnancy, with subsequent increased risk of infection (Allotey and Gyapong, 2005); furthermore, pregnant women are more “attractive” to mosquitoes and are therefore more likely to be bitten, increasing their exposure to malaria (Dobson, 2000). As a result, malaria in pregnancy increases the risk of maternal anaemia, stillbirth, spontaneous abortion, low birth weight, as well as maternal and neonatal death (Nosten et al., 2004; Steketee et al., 2001). Worldwide, it is estimated that about 10,000 pregnant women and 200,000 of their infants die each year as a result of malaria infection during pregnancy, and severe malarial anaemia contributes to more than half of these deaths (WHO, 2012).

Of note is the fact that the analysis of age- and sex-related patterns of diseases may be useful to explore possible associations between different conditions: for example, malaria and anaemia shared similar patterns in females and males across age groups, therefore supporting the hypothesis that most anaemia cases may be related to malaria. This has implications for the design of health interventions: in fact, health programs primarily designed to control the spread of a single disease entity in vulnerable groups (such as malaria in children and pregnant women) can exert a disproportionate impact on mother and child health by simultaneously reducing morbidity and mortality from associated conditions (such as anaemia). For this purpose, interventions have been designed for control of malaria and anaemia, including use of insecticide treated nets to prevent infection, iron supplementation to prevent anaemia, and intermittent preventive treatment to prevent asymptomatic infection among pregnant women, as well as effective case management for malaria illness and anaemia (WHO, 2012). In this context, Wolisso acted not only as referral hospital for severe malaria cases, but it was also in charge of training and supportive supervision of peripheral health units.

The patterns of other infectious diseases can be also interpreted in the framework of sex- and gender-related differences. For example, patterns and trends of AIDS-related admissions seem to be consistent with the so-called “HIV/AIDS pandemic’s feminization” observed over the last decade (DeLay, 2004), with more admissions being recorded in young females and an increasing number of admissions in older age among males. These patterns seem also consistent with the results of the Ethiopia Demographic and Health Survey in 2011, showing a higher HIV prevalence among young adult females and an increasing HIV prevalence among males in older age groups (CSA and ICF 2012). Women are vulnerable to HIV/AIDS due to a mixture of biological factors, such as

greater female biological susceptibility, and gender-linked factors, such as social status and lower power in sexual decision-making (Stillwaggon, 2006). In particular, earlier sexual activity by young females, and the fact that they often have older partners, may contribute to explain earlier infection and disease among females. At Wolisso Hospital, a gender-sensitive approach has been adopted, including education activities at community level and in the antenatal clinic, implementation of mother-to-child transmission prevention programmes with antiretroviral drugs for HIV-infected pregnant women, and provision of continuum of care from the community to the referral hospital for women living with AIDS.

Another striking example of gender-based differential pattern of care in males and females is provided by injuries, showing a high increase among young adult males, that reflects not only higher risk of trauma from road traffic accidents, but also from other causes, including occupational accidents, interpersonal violence and individual risk-taking behaviours (Ayana et al., 2012). It is estimated that the health care costs for injuries are among the highest of all diseases, as is the loss of productivity, due to the age-group primarily affected (Norton et al., 2006).

These patterns of morbidity and mortality highlight that most of the disease burden is attributable to a limited number of conditions for which either preventive or curative interventions exist. In general, a higher burden among males is related to gender norms and the association of “masculinity” with risk-taking behaviours, including excessive consumption of alcohol, drug use and risky driving (Payne and Doyal, 2009; Connell and Messerschmidt, 2005). Ensuring an increase in service coverage (such as for maternal care) may be more feasible than changing health-related behaviours deeply embedded in male gender norms; as a result, cost-effective public health interventions currently available offer the potential for greater gains in reducing morbidity among women than men (Wang et al., 2002). For example, it is estimated that routine maternal care for all pregnancies, including skilled attendance at birth, emergency obstetrical care and basic neonatal care, is among the best cost-effective interventions in low-income countries (Laxminarayan et al., 2006). These interventions should include preventive services, such as prevention and control of malaria and anaemia during pregnancy (Geelhoed et al., 2006). Despite this evidence, maternal mortality ratio, although decreasing from 1990 levels (990 per 100,000 live births), is still unacceptably high in Ethiopia (673 and 676 per 100,000 live births in 2005 and 2011, respectively) (CSA and ORC Macro, 2006; CSA and ICF, 2012).

To address this challenge, Wolisso Hospital gives priority to the provision of cost-effective safe motherhood services with a strategy of combining prenatal care (focusing on maternal risks and the prevention and treatment of complications) and improved access to emergency obstetrical care, ensuring a continuum of care during pregnancy and delivery and after birth. Recently, the hospital has started providing maternal and child services free of charge and the referral system from the community to the hospital (including transportation and communication systems) has been strengthened, together with supporting the peripheral health units and training of Health Extension Workers in the community. Health Development Army is playing a crucial role in ensuring behavioural change and in promoting use of maternal health services, so that the communities can produce and sustain their own health, including maternal health. These activities have been implemented in accordance with the national strategies to remove the bottlenecks hampering access to safe motherhood services, such as harmful traditional beliefs and practices, poor infrastructure, shortage of transportation facilities, and inadequate care at health facilities, so that to address the 3 delays in seeking appropriate medical care for an obstetric emergency, reaching an appropriate emergency obstetrical care facility, and receiving adequate care when the facility is reached (FMOH, 2013b).

Other initiatives were put in place to address gender-related health issues. For example, based on the evidence of the heavy burden related to injuries and the high demand for these services, the hospital management opened an orthopaedic ward in 2007 to provide specialist services for trauma cases.

5) Conclusion

Despite its limitations (i.e. hospital statistics are prone to selection bias, and no community-wide inferences should be made), this study shows that the analysis of gender differentials are useful for clinical and management purposes, highlighting that inequalities in health are dynamic and driven by the interplay of biology, social organization, and health systems (Krieger, 2003). Using age- and sex-disaggregated data from readily available sources may help to explore pathways and mechanisms that link gender, sex, disease profile, service use, and health outcomes in a cost-effective and sustainable way, providing a framework of the thinking process leading from information to decision and action in order to support evidence-based practice.

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MOZAMBIQUE

ABSTRACT 27

- **Title:** Indicadores obstétricos de emergência em um ambiente urbano: uma pesquisa nas maternidades das USs da Beira
- **Authors:** C. Wilunda, G. Putoto, L. Brumana, D. Mahotas, C. Farnela, M. Romanelli, M. Melo, F. Rusalen, A. Silva
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ABSTRACT 29

- **Title:** Equidade na utilização dos serviços de saúde materna na Beira: uma oportunidade para maximizar prevenção e tarv pediátrico
- **Authors:** C. Wilunda, G. Putoto, L. Brumana, D. Mahotas, C. Farnela, M. Melo, M. Romanelli, F. Rusalen, A. Silva
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ABSTRACT 31

- **Title:** Scaling up health services for young and adolescents in Beira – Mozambique
- **Authors:** Alexandra George, Alessandro Cassini, Arturo Silva, Giovanni Putoto
- **Date of presentation:** 5 November 2014
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Indicadores obstétricos de emergência em um ambiente urbano: uma pesquisa nas maternidades das USS da Beira

The abstract, published in the Jornadas de Saude di Beira, presents the critical situation of emergency healthcare support in obstetrics. Though Mozambique has shown recent improvement in child and maternal health and there is a high rate of hospital delivery (95%), there continues to be a critical problem in the quality of emergency services during and after delivery.

The research was conducted in 2013 in ten maternity wards in the country, showing quality indicators below the minimum parameters considered sufficient. None of the centers in the study provided primary EmOC services (Emergencia Obstetrica e Cuidados). The least available services were assistance for vaginal delivery and manual placenta removal. The obstetric mortality rate was 3.1%, three times the acceptable standard.

Though in the district of Beira, almost all deliveries are in the health centers, there are excessive shortcomings in the availability, use and quality of EmOC services, with a still critical impact on maternal mortality in the district.

INDICADORES OBSTÉTRICOS DE EMERGÊNCIA EM UM AMBIENTE URBANO: UMA PESQUISA NAS MATERNIDADES DAS USS DA BEIRA

AUTORES E AFILIAÇÕES: C. Wilunda¹, G. Putoto¹, L. Brumana², D. Mahotas², C. Farnela³, M. Romanelli⁴, M. Melo⁴, F. Rusalen⁴ e A. Silva^{*4}.

RESUMO:

Introdução: Apesar das melhorias recentes nos indicadores materno-infantil em Moçambique, a taxa de mortalidade materna continua a ser elevada (408/100.000 nascidos vivos). Evidências sugerem que, nos países em desenvolvimento, apenas o acesso ao parto institucional não é suficiente para reduzir a mortalidade materna. É a Emergência Obstétrica e Cuidados (EmOC) de qualidade, que é fundamental para salvar a vida de mães e seus recém-nascidos quando ocorrem complicações e portanto, a maneira mais eficaz de alcançar o quinto objectivo de Desenvolvimento do Milénio. Beira é a segunda maior cidade de Moçambique (457.799 habitantes), com uma taxa de parto institucional de mais de 95%. O estudo foi realizado para determinar a disponibilidade, utilização e qualidade dos serviços de EmOC, neste contexto de elevado acesso aos serviços de saúde materna.

Metodologia: Um estudo transversal das 10 USs com maternidades e HCB no Distrito de Beira durante 2013. Os dados foram colectados através de entrevista pessoal e de rever os registos. Os indicadores EmOC das Nações Unidas (ONU) foram calculados.

Resultados: Apenas o hospital (HCB) havia realizado todas as nove funções EmOC nos últimos três meses. Nenhum US tinha realizado todas as seis funções básicas EmOC. Parto vaginal assistido e remoção manual da placenta foram as funções mais frequentemente ausentes; ter sido realizado apenas por 2 e 3 USs respectivamente. O número de instalações com serviços EmOC por 500.000 habitantes foi de 1 contra 5 recomendado pela ONU. A taxa de letalidade obstétrica foi de 3,1%, três vezes mais elevado do que o nível aceitável. A proporção de todos os nascimentos com serviços EmOC foi de 27%, as necessidades de EmOC encontradas foi 35,6% e 11,3% dos partos esperados foram por cesariana. A proporção de mortes maternas por causas indirectas dos serviços EmOC foi de 37,9%, destacando o peso de outros factores de mortalidade materna neste contexto.

Conclusões: Apesar que o Distrito da Beira tem uma alta utilização de assistência ao parto institucional, existem lacunas na disponibilidade, uso e qualidade dos serviços EmOC, com especial atenção aos serviços EmOC Básicos, conseqüentemente a redução da mortalidade materna vai continuar a ser incerto no distrito.

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Equidade na utilização dos serviços de saúde materna na Beira: uma oportunidade para maximizar prevenção e tratamento pediátrico

The study that the abstract describes was published in the Jornadas da Saúde Beira, analyzing access to healthcare services to measure parity of care, focusing on HIV-positive mothers and children.

Maternal health centers are key points for HIV prevention and treatment in mothers and children.

The study was conducted on women in urban areas in five provinces of Mozambique. An analysis was done to measure possible correlation between social class and access to care. Women were classified in five categories of wealth, crossed with six variables (electricity, apartment, roof, cooking fuel, phone, clock) and then related to the actual use of maternity services.

The results show that in Beira there is almost universal (97.9%) access to delivery without differences of wealth between the women who come to the hospital. This coverage also ensures that HIV-positive mothers and children can optimize prevention and treatment.

EQUIDADE NA UTILIZAÇÃO DOS SERVIÇOS DE SAÚDE MATERNA NA BEIRA: UMA OPORTUNIDADE PARA MAXIMIZAR PREVENÇÃO E TARV PEDIÁTRICO

AUTORES E AFILIAÇÕES: C. Wilunda¹, G. Putoto¹, L. Brumana², D. Mahotas², C. Farnela³, M. Melo⁴, M. Romanelli⁴, F. Rusalen⁴ e A. Silva^{*4}.

RESUMO:

Introdução: Sistemas de saúde fortes são essenciais para programas com equidade e sustentáveis relacionados ao HIV/SIDA. Acessibilidade universal é um requisito chave para a Equidade. Isto é particularmente importante em áreas urbanas em países de baixa renda, onde há um crescimento da pobreza. Na Beira, apenas 34% das crianças seropositivas estão com TARV. A Maternidade é ponto crítico de entrada para mães e crianças aos serviços relacionados com prevenção e tratamento do HIV/SIDA. Este estudo foi realizado para desenvolver e aplicar uma ferramenta para medir a equidade na utilização dos serviços de assistência ao parto e avaliar a disponibilidade dos serviços de HIV/SIDA em um cenário urbano Moçambicano.

Metodologia: Mulheres em áreas urbanas em cinco províncias de Moçambique (DHS 2011) constituíram a população de referência. Foi realizado a análise factorial das variáveis de bem-estar e as mulheres foram classificadas em quintos de riqueza e cruzadas com seis variantes (energia elétrica, piso, telhado, combustível para cozinhar, telefone celular e relógio). As variáveis foram atribuídas pontuações cuja validade e confiabilidade foram avaliadas com referência ao índice de riqueza DHS. Foi utilizado um questionário para colectar os dados das mulheres que utilizam os serviços das 11 maternidades (HCB e 10 USs) e disponibilidade dos serviços de HIV/SIDA, suprimentos e medicamentos.

Resultados: A ferramenta da equidade foi válida e confiável. Participaram 1423 mulheres. Entre os usuários dos serviços, 16,1%, 17,8%, 19,2%, 22,8% e 24,1% pertencem a 1, 2, 3, 4 e 5 quintis de riqueza respectivamente. A distribuição não foi significativamente diferente comparado com os dados de DHS ($p=0,420$). Não existe diferença de estado de riqueza entre as mulheres atendidas no HCB e USs ($p=0,272$). Cobertura de parto institucional foi de 97,9%. Todos os serviços estavam realizando teste HIV e fornecendo TARV. ARV combinados para mães e recém-nascidos estavam faltando em 4 USs.

Conclusões: O acesso ao Parto institucional na Beira é praticamente universal e equitativa. Essas duas propriedades do sistema de saúde são uma excelente oportunidade para maximizar a prevenção e tratamento do HIV/SIDA para mães e crianças. Escassez de drogas nas USs pode resultar oportunidades perdidas e ameaçam a qualidade do atendimento.

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- **Date of presentation:**
5 November 2014
- **Authors:**
A. George, A. Cassini,
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Scaling up health services for young and adolescents in Beira – Mozambique

For the Symposium held in November 2014 in Basel about youth and sexual and reproductive health in international cooperation, “Not without us!” Doctors with Africa–CUAMM presented a project for evaluating activities and services for adolescents in Mozambique (SAAJ - Serviço Amigo do Adolescente e Jovem).

Mozambique has a lack of adequate health services for the younger segment of its population, despite the fact that 32% of its population is between 10 and 24 years old. Education and interventions in sexual and reproductive health, nutrition, mental health and community medicine are needed to build a fair society aware of the right to health.

Though improvements have been seen in services for this group, there is still much to be done, particularly to prevent teenage pregnancy.

**“Not without us!”: Youth and sexual and reproductive health in International cooperation.
14th annual Swiss Health Cooperation Symposium,
organizzato da Medicus Mundi Switzerland,
Basel (Svizzera)**

**SCALING UP HEALTH SERVICES FOR YOUNG AND ADOLESCENTS
IN BEIRA – MOZAMBIQUE**

Authors: Alexandra George, Alessandro Cassini, Arturo Silva, Giovanni Putoto.

Introduction

Healthy, educated and skilled adolescents are a key asset and resource for the future and present of any community.

Countries in the African region are tackling with the lack of adolescent-friendly health services and inadequate policy guidance to meet the health needs of young people. In Mozambique youth from 10 to 24 years represent 32% of the population (approx. 8 million, INE, 2013), 48% are boys and 52% Girls, 34% in urban areas. Of this group, about 40% of girls (28% boys) have no access to any formal education; 52% of girls <18 are formally or informally married (17.7% before age 15) and 40% of girls 15 to 19 years had at least one pregnancy (INSIDA, 2009). Contraceptive use in adolescents 15 to 19 years is 5.9% (11.4% on 20-24 years) (DHS, 2011).

SAAJ (Serviço Amigo do Adolescente e Jovem) are integrated and specialized health services for adolescents and young people aiming to improve health education, besides access and health care ; it includes four areas of intervention: sexual and reproductive health, nutrition, community health, and mental health.

We undertook an independent evaluation of SAAJ activities and its impact on health of youth in Beira, Mozambique by assessing the strengths and weaknesses.

Materials and Methods

We reviewed SAAJ reported activities from 2011 and 2013 and compared the results in order to describe, assess and analyse the progress and the quality of selected services and monitoring & evaluation potential.

Such review and assessment used a retrospective study of statistical reports concerning SAAJ 2011 and 2013.

Results

There was a two-fold increase in young people attending SAAJ, and a three-fold increase in HIV testing whilst number of positives decreased. Most consultations were related to education for HIV/AIDS prevention; girls seeking contraception increased and in 2013 more girls than boys procured condoms.

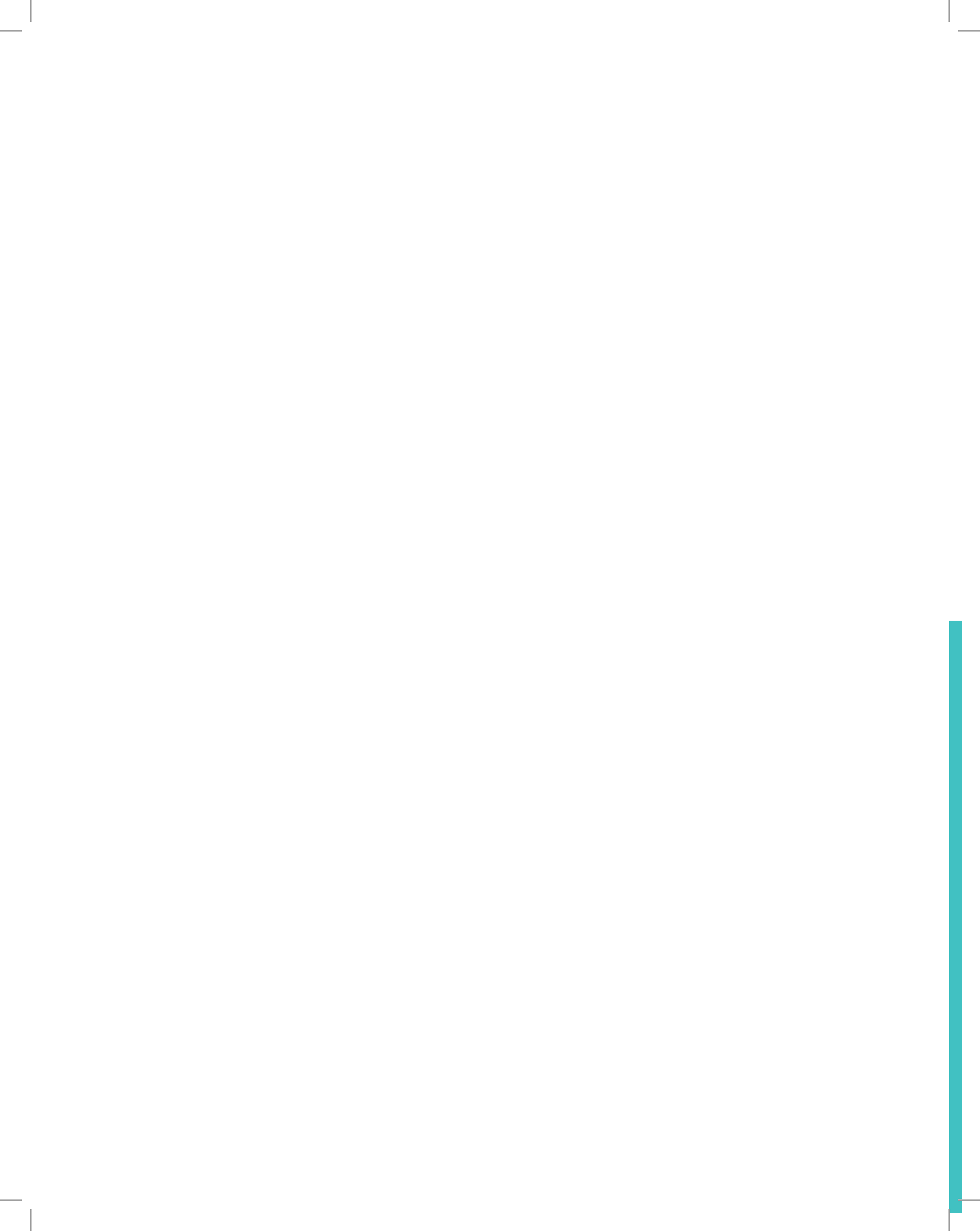
However, 50% of young girls attend SAAJ for ante-natal and post-natal consultations; 10-14 years age group are less aware of SAAJ and attended the least (14% of consultations).

Conclusions

The evaluation noted critical areas of improvement in terms of quality and systematic reporting; identification of standard and measurable outcomes assessing the health impact is a area for improvement.

Adolescents have specific health needs but are often among those least well served by health services; the interventions should have a strategic, integrated and systematic approach to facilitate the access. In this direction, Doctors with Africa CUAMM collaborated in the developing of specific SAAJ with the following distinct characteristics: having its own specific and independent facility (possibly outside its perimeter); ensuring privacy, respect, quality services and humanized care environment (“mahala”, it means free of payment); dedicated health providers, routinely trained, engaged and motivated for youth target group. Moreover, CUAMM is supporting youth activists who contribute in every aspect of SAAJ.

Although some clear improvements have been made, work needs to be done on prevention: tailored interventions focusing on preventing adolescent pregnancy and involvement of younger age groups at community and school level.



A stylized map of South Sudan. The map is filled with a textured, orange-brown color. It is set against a solid teal background. The text "SOUTH SUDAN" is written in a black, sans-serif font across the center of the map. There is a small, irregular white shape on the map, possibly representing a specific region or a geographical feature.

SOUTH SUDAN

PAPER 37

- **Title:** A hospital-centered approach to improve emergency obstetric care in South Sudan
- **Authors:** L. Groppi, E. Somigliana, V. Pisani, M. Ika, J. L. Mabor, H. N. Akec, J. A. Nhial, M. S. Mading, C. Scanagatta, F. Manenti, G. Putoto
- **Date of publication:** September 2014
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A hospital-centered approach to improve emergency obstetric care in South Sudan

Between 1990 and 2014, significant results were obtained for reducing child and maternal mortality, as set by the fourth and fifth Millennium Development Goals. However, there are alarming disparities from country to country and between rural and urban regions with concentrations of mortality in the poorest rural areas of Sub-Saharan Africa and Southern Asia. To address these problems, top priority should be given to interventions designed to make emergency obstetric services (EmOC) available and accessible to everyone.

The study, published in the *International Journal of Gynecology and Obstetrics* presents data collected in the Yirol hospital of South Sudan, managed by the NGO Doctors with Africa–CUAMM. It considered the number of women admitted to the hospital for delivery in 2012 and highlights improvements over previous years. An increase was seen in the total number of hospital births, which more than doubled over 2009, reaching about 13% of the 8,213 births in the area (compared to 5.9% in 2009).

The causes of this improvement can be found in an approach centered on the hospital's operation. One of its strong points was the introduction of an ambulance in 2011. Though it is also used for other emergencies, the ambulance is managed by the maternity department, providing a free service 24 hours a day which helps women be quickly admitted to the hospital.

The study's goal is to show how in underprivileged remote settings, such as rural South Sudan, a hospital-centered approach, supported by an ambulance referral service to peripheral areas to the main healthcare center, is a major first step to improve emergency obstetric services and directly combat high maternal and child mortality rates.



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CLINICAL ARTICLE

A hospital-centered approach to improve emergency obstetric care in South Sudan

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ABSTRACT

Objective: To assess provision of emergency obstetric care (EmOC) in Greater Yirol, South Sudan, after implementation of a hospital-centered intervention with an ambulance referral system. **Methods:** In a descriptive study, data were prospectively recorded for all women referred to Yirol County Hospital for delivery in 2012. An ambulance referral system had been implemented in October 2011. Access to the hospital and ambulance use were free of charge. **Results:** The number of deliveries at Yirol County Hospital increased in 2012 to 1089, corresponding to 13.3% of the 8213 deliveries expected to have occurred in the catchment area. Cesareans were performed for 53 (4.9%) deliveries, corresponding to 0.6% of the expected number of deliveries in the catchment area. Among 950 women who delivered a newborn weighing at least 2500 g at the hospital, 6 (0.6%) intrapartum or very early neonatal deaths occurred. Of 1232 women expected to have major obstetric complications in 2012 in the catchment area, 472 (38.3%) received EmOC at the hospital. Of 115 expected absolute obstetric indications, 114 (99.1%) were treated in the hospital. **Conclusion:** A hospital-centered approach with an ambulance referral system effectively improves the availability of EmOC in underprivileged remote settings.

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1. Introduction

Improving reproductive health is a global priority. The fourth and fifth Millennium Development Goals aim at a reduction in the mortality of children younger than 5 years (the under-5 mortality rate) by two-thirds and a reduction in the maternal mortality ratio by three-quarters between 1990 and 2015 [1,2]. Big gains have been made for both targets. The global under-5 mortality rate dropped by 41% between 1990 and 2011, from 87 to 51 deaths per 1000 live births [3]. The maternal mortality ratio decreased by 47% between 1990 and 2010, from 400 to 210 maternal deaths per 100 000 live births [3]. However, despite these remarkable improvements, efforts must be intensified to meet these global targets [3,4].

Importantly, there are alarming disparities in maternal and child deaths between countries, and between urban and rural regions. Maternal and child deaths are concentrated in the poorest regions, and in particular in Sub-Saharan Africa and Southern Asia [3]. Worldwide,

it has been reported that, by 2011, only half of the women in rural areas in the poorest regions received skilled attendance at delivery compared with 84% in urban areas [3]. In Sub-Saharan Africa and South Asia, the gap between urban and rural areas is even larger [3].

There is a general consensus regarding the priority interventions that are needed to reduce maternal deaths and improve reproductive health generally. These interventions include the provision of universally available and accessible emergency obstetric care (EmOC) of good quality, the presence of a professional skilled birth attendant at all births, and the integration of these key services into health systems [5–8]. To achieve these aims, the existence of an integrated and comprehensive hospital-/community-based health program is generally required [9,10]. However, the implementation of such an integrated approach is frequently unrealistic in neglected, remote settings. Stakeholders of nongovernmental organizations (NGOs) acting in these areas have to prioritize some of the interventions, at least in early phases of implementation.

South Sudan is an underprivileged country in Sub-Saharan Africa. In 2006, the under-5 mortality rate was 135 deaths per 1000 live births, and the maternal mortality rate was 2054 per 100 000 live births [11]. The aim of the present study was to assess provision of EmOC in 2012 in an area of South Sudan, after implementation of a project to improve EmOC in the local community in 2011.

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2. Materials and methods

The present descriptive study assessed EmOC in Greater Yirol (Fig. 1), which is part of the Lakes region, one of the 10 states of South Sudan. Pre-interventions evaluations and assessments of the area were performed by two of the authors (F.M. and G.P). Greater Yirol comprises the counties of Yirol West, Yirol East, and Awerial, with a total surface area of 15 084 km². The population was estimated to be 244 950 in 2012 [12], with 24, 14, and 11 inhabitants per km² in the three counties, respectively. All connecting roads are rough. There are two hospitals in the area, both of which provide comprehensive EmOC services. One is governmental and is located in Yirol town (where the study took place), and the other is private and located in Mapuordit. Mapuordit is close to the state boundary and connections are problematic, if not impossible during the rainy season, so the hospital there and its catchment area are excluded from the present analysis. Yirol County Hospital covers the remaining catchment area, which has 205 327 inhabitants [13]. In this catchment area, there are also three health centers, two in Yirol West and one in Awerial, but none fulfills the criteria for basic EmOC.

Since 2007, Yirol County Hospital has been run by Doctors with Africa CUAMM. The hospital was renovated in 2007–2008. It has a total capacity of 80 beds, 15 of which are dedicated to the maternity ward. The operating theater is available 24 hours a day and is equipped for cesarean deliveries. Blood transfusions are available 24 hours a day and the service relies on volunteer or family donors. The medical staff includes two permanent expatriate medical doctors, one of whom has experience in obstetrics, and several visiting doctors spending short periods of time at the hospital. The maternity ward is staffed by four qualified midwives, two auxiliary nurses, and seven traditional birth attendants. The hospital costs are covered entirely by Doctors with Africa CUAMM; no support from the Ministry of Health is provided. Direct hospital management costs in 2012 were equivalent to US\$ 242 279. Doctors with Africa CUAMM act in strict collaboration with the local health institutions.

In October 2011, an ambulance-based referral system to Yirol County Hospital was implemented. The maternity ward was equipped with a mobile phone, allowing midwives on call to receive and triage phone calls from local citizens, and to contact the drivers to arrange a referral by ambulance when indicated. One ambulance is stationed at the hospital, and three drivers are used to ensure the service is available 24 hours per day. Time from the call for the ambulance to arrival varies substantially (from 5 to 90 minutes) depending on the distance and the

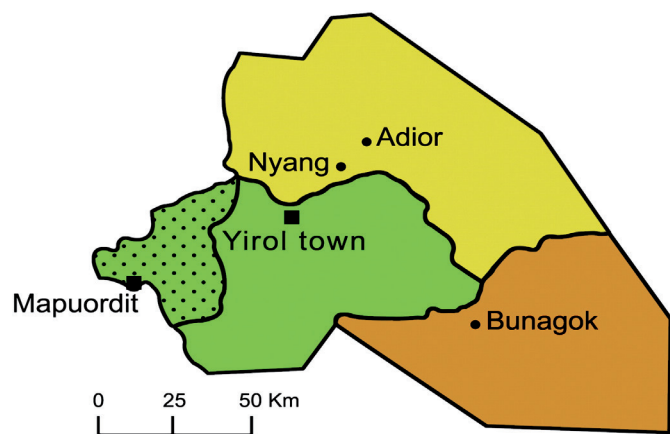


Fig. 1. Simplified map of the study area (Greater Yirol, South Sudan). Greater Yirol includes the counties of Yirol West (green), Yirol East (yellow), and Awerial (orange). The dotted area signifies the catchment area of the hospital in Mapuordit, which was not included in the present study. In the catchment area of Yirol Hospital, assisted deliveries could also occur in three non-EmOC health centers (Adior, Nyang, and Bunagok).

weather conditions. All local citizens are allowed to call for the ambulance. The referral system was introduced through systematic provision of information during prenatal care visits and by informing traditional leaders, traditional birth attendants, and local authorities. The service was originally directed at maternal care. It was rapidly extended to sick children, unconscious adults, and accident casualties but remained under the maternity ward coordination. The service is free of charge.

The present assessment included all women who were referred to the hospital for delivery between January 1, 2012, and December 31, 2012. On arrival at the hospital, all women were evaluated and managed by a senior expatriate medical doctor (V.P.), who had extensive experience in obstetrics in low-resource settings and had been active at Yirol County Hospital since 2009, and an expatriate resident in gynecology (L.G.). The study was approved by the local institutional review board, and patients or their relatives gave informed consent for participation.

Information about the cases was collected prospectively in a standardized way (L.G.). Data regarding the health centers were obtained by regular monitoring of the facilities and using information from the local authorities. Major obstetric complications and absolute (life-threatening) obstetric indications that required obstetric surgery were defined according to the classifications included in the WHO/UN handbook for EmOC monitoring [8]. The data were analyzed using Excel 2010 (Microsoft, Redmond, WA, USA). No measures of statistical significance were calculated.

3. Results

The total number of deliveries at Yirol County Hospital was 482 in 2009, 480 in 2010, 744 in 2011, and 1089 in 2012 (Fig. 2). On the basis of an official birth rate of 4% [13], the number of expected deliveries in the hospital catchment area in 2012 was 8213. Assuming that the number of deliveries per year had remained steady, the proportion of all births occurring at the hospital—and so at EmOC facilities—was 5.9% in 2009, 5.8% in 2010, 9.1% in 2011, and 13.3% in 2012.

In 2012, 1089 women delivered in the maternity ward of Yirol County Hospital. An additional 282 women delivered at one of the three health centers offering non-EmOC maternity services. Therefore 1371 deliveries occurred in institutions, corresponding to 16.7% of the expected deliveries in the catchment area. Delivery was by cesarean in 53 (4.9%) of the women who delivered at Yirol County Hospital, corresponding to 0.6% of the expected number of deliveries in the catchment area in 2012. Among the 950 women who delivered a newborn with a birth weight of at least 2500 g in the hospital, 6 (0.6%) intrapartum or very early neonatal deaths occurred (two fresh stillbirths and four early neonatal deaths).

Considering that, based on WHO indicators, 15% of all deliveries are expected to be affected by major obstetric complications [8], 1232 women would have had such complications in the catchment area in 2012. In fact during the study period, 525 major obstetric complications were recorded among 472 women at Yirol County Hospital (Table 1). Therefore, 38.3% of women in the catchment area who would have needed EmOC received such care. Three (0.6%) deaths related to these 525 major obstetric complications were recorded (one prepartum hemorrhage from placental abruption; two postpartum hemorrhages). In addition, three indirect deaths of pregnant women were recorded in the hospital (due to severe anemia, uncontrolled diabetes, and acute heart failure). Blood transfusion was required for 57 (10.9%) major obstetric complications. Of the 472 women who had major obstetric complications, 333 (70.6%) declared their area of residence to be Yirol West, 130 (27.5%) came from Yirol East, and 9 (1.9%) came from Awerial. In total, 221 (46.8%) women with major obstetric complications had been referred by ambulance. This number corresponds to 22.0% of all 1005 ambulance referrals.

The expected proportion of deliveries with absolute obstetric indications is 1.4% [8], so 115 such indications would have been expected in

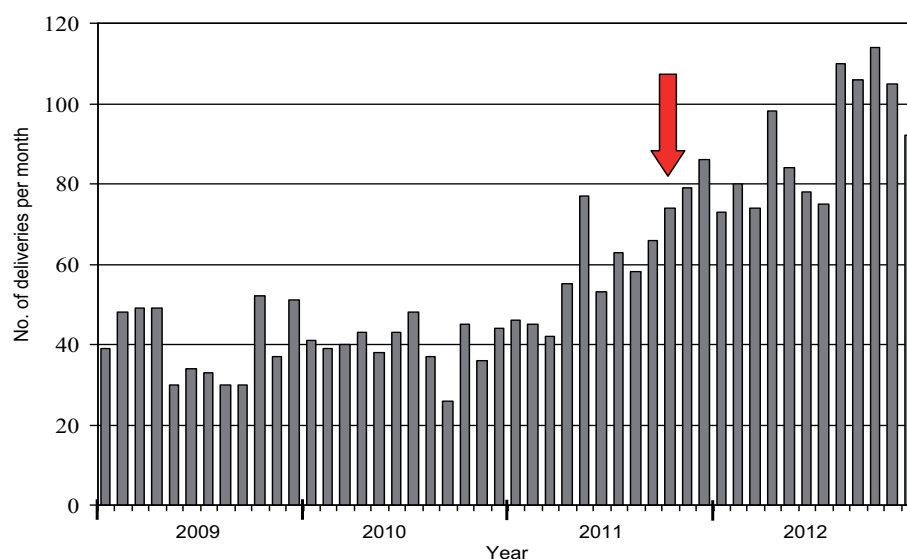


Fig. 2. Number of deliveries per month at Yirol County Hospital, South Sudan, 2009–2012. The red arrow indicates the starting point of the ambulance service.

the catchment area in 2012. The total number of women with an absolute obstetric indication treated in the hospital was 114 (13 placenta previa; 20 placental abruption; 19 uncontrollable postpartum hemorrhage; 22 cephalopelvic disproportion or scarred uterus; 35 transverse, brow, or face presentation; and five ruptured uterus). Therefore, 99.1% of the expected absolute obstetric indications were treated at the hospital.

Table 2 summarizes the indicators for EmOC in the area during the study period.

4. Discussion

The scenario emerging from the present analysis confirms that Greater Yirol is an underprivileged and neglected area in terms of maternal health. Only one indicator for EmOC was satisfied, and the results for some indicators were alarming. In particular, the number and geographic distribution of EmOC facilities is far below the acceptable level. These findings are even more worrying if the fact that Greater Yirol is a huge area with a low-density population and major transport limitations is considered. Accordingly, the proportion of births occurring in EmOC facilities is very low (13.3%). Moreover, only 38.3% of the need for EmOC is met, and the proportion of cesarean deliveries among all births is also insufficient (0.6% rather than $\geq 5\%$).

Nevertheless, the present analysis reveals some important achievements of the project implemented in 2011. Almost all absolute obstetric indications were treated in the EmOC facility, and the proportion of births in EmOC facilities increased from 5.8%–5.9% in 2009–2010 to 13.3% in 2012. This positive trend is confirmed by data from 2013 (unpublished). Moreover, considering the indicators of EmOC quality, the present performance was positive. The direct obstetric case fatality rate was 0.6% (below the recommended maximum level of 1%) and

the intrapartum and very early neonatal death rate was 0.6% (a target is not reported for this indicator but 0.6% is fairly low).

The current situation in Greater Yirol is obviously far from ideal, but a hospital-centered approach seems to be an effective initial step in the implementation of EmOC in disadvantaged areas. Notably, even though the met need for EmOC was below the recommended 100%, a percentage of 38.3% is satisfactory considering the demanding setting. Even if an unmet obstetric need close to 0% could be an overestimation, this result has to be viewed as positive.

The present efforts now need support from the local authorities and other donors to achieve further improvements in EmOC. Existing health centers need to be upgraded so that they can provide basic EmOC services and new, evenly distributed EmOC facilities should be set up to ensure better coverage of the whole area. The analysis of the area of residence for women with major obstetric complications pointed toward an unbalanced distribution. The vast majority of the treated women were from Yirol West, where the hospital is located.

Unfortunately, public health support for the development of local health resources in South Sudan is presently a weak possibility. The public health system collapsed following independence and health services are now mainly provided by NGOs and faith-based organizations. It is estimated that they now provide 80% of the minimum health service package for an estimated 25% of the population. Some progress may now take place with implementation of the Ministry of Health's Health Sector Development Plan 2011–2015 [11], but the role of NGOs and faith-based organizations will remain fundamental.

Identification of the factors that enabled the positive achievements is difficult because of the plurality and concomitancy of the provided measures. However, at least four main factors could have had a role. First, Yirol County Hospital guaranteed good standards of quality. It is qualified as a comprehensive EmOC facility and performed well in the context of quality indicators. Second, access to the hospital was free of charge—presumably one of the most important aspects considering the upset economic situation of the area [13]. Third, the ambulance service probably had an important role. Previous data [12] have demonstrated the outstanding cost-effectiveness of an ambulance service for reproductive health care in remote settings, and a recent independent study from Médecins Sans Frontières [14] confirms these findings. In the present study, an increase in the number of deliveries was observed after implementation of the ambulance service (Fig. 2) and almost half the women with major obstetric complications were referred by

Table 1
Major obstetric complications in Yirol County Hospital in 2012 (n = 525).

Obstetric complication	No. (%)
Abortion-related complication	162 (30.9)
Prolonged or obstructed labor	181 (34.5)
Postpartum sepsis	47 (9.0)
Hemorrhage	33 (6.3)
Pre-eclampsia or eclampsia	13 (2.5)
Retained placenta	26 (5.0)
Other	63 (12.0)

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Table 2

Indicators for EmOC (adapted from the WHO/UN handbook for monitoring EmOC [8]) in Greater Yiroi in 2012.

Indicator	Acceptable level	Situation in Greater Yiroi	Conclusion
Coverage of EmOC services	≥ 5 EmOC facilities (including ≥ 1 comprehensive) per 500 000 population	Comprehensive EmOC: 4.1 facilities per 500 000 Basic EmOC: 0 facilities per 500 000 Total EmOC: 4.1 facilities per 500 000 ^a	Indicator not met
Geographic distribution of EmOC facilities	All subnational areas should have ≥ 5 EmOC facilities (including ≥ 1 comprehensive) per 500 000 population	Comprehensive EmOC: 2.4 facilities per 500 000 Basic EmOC: 0 facilities per 500 000 Total EmOC: 2.4 facilities per 500 000 ^b	Indicator not met
Proportion of births in EmOC facilities	To be set locally (no target set for Greater Yiroi)	13.3% (1089/8213)	NA
Met need for EmOC	100% of women with major obstetric complications should be treated in EmOC facilities	38.3% (472/1232)	Indicator not met
Cesarean delivery as a proportion of all births	5%–15%	0.6% (53/8213)	Indicator not met
Direct obstetric case fatality rate	< 1%	0.6% (3/525)	Indicator met
Intrapartum and very early neonatal death rate	To be set locally (no target set for Greater Yiroi)	0.6% (6/950)	NA
Proportion of deaths attributable to indirect causes in EmOC facilities	No standard can be set	50.0% (3/6)	NA

Abbreviations: EmOC, emergency obstetric care; NA, not applicable.

^a Calculated as the number of EmOCs (n = 2) divided per the population of greater Yiroi (n = 244 950) and multiplied per 500 000.^b Refers to the catchment area of Yiroi hospital. It is calculated as the number of EmOCs (n = 1) divided per the population of the area (n = 205 327) and multiplied per 500 000.

ambulance. Fourth, the local community was included and the local culture respected, which meant that the ambulance service could be implemented rapidly. For instance, blood transfusions and cesarean deliveries are poorly tolerated in the area. Therefore, it was decided to limit their use as much as possible.

Some strengths and limitations of the present study should be acknowledged. A complete baseline assessment before initiation of the intervention was not possible. Only data on the number of deliveries in the hospital were reliably available. Nevertheless, a consistent baseline evaluation would require a long period of observation (several months if not more) without modifying the context. Even though this approach would be more scientifically valid, it would be unacceptable in practice in view of the scarce resources and the urgent need for interventions.

Additionally, the data used for the estimations of community indicators are based on official data from the Ministry of Health, which might be unreliable. The last census was performed in 2008. However, this source of information was the only one available.

A further limitation is related to the area of residence of the referred women. At hospital admission, women stated the payam (administrative level below counties) where they spent the last days before being admitted as their area of residence and not the payam where their family house was located. Therefore, women who had been staying at a relative's house in Yiroi town to wait for delivery were erroneously classified as originating from Yiroi West. This situation is not uncommon in Greater Yiroi, considering the nomad culture of the population. This misclassification would have led to an overestimation of the number of referrals from Yiroi West. A more precise picture of the flow of the women would have led to clearer indications for future interventions. Finally, this study is descriptive and no definite conclusions can be drawn regarding a causal relationship between the interventions and the outcome.

Nevertheless, the present study has some strengths. The data are reliable because they were collected by a dedicated gynecology resident at the only EmOC facility in the intervention area. Moreover, because the study period covered a whole year, the sample was large and the confounding effects of seasonal variation could be excluded.

In conclusion, the present study indicates that a hospital-centered approach can be an effective first-step intervention to improve EmOC availability in underprivileged and neglected remote settings provided that it is free of charge, supported by an ambulance service, and properly integrated in the local community. Although valuable as an initial step, a more comprehensive intervention is warranted to improve EmOC indicators.

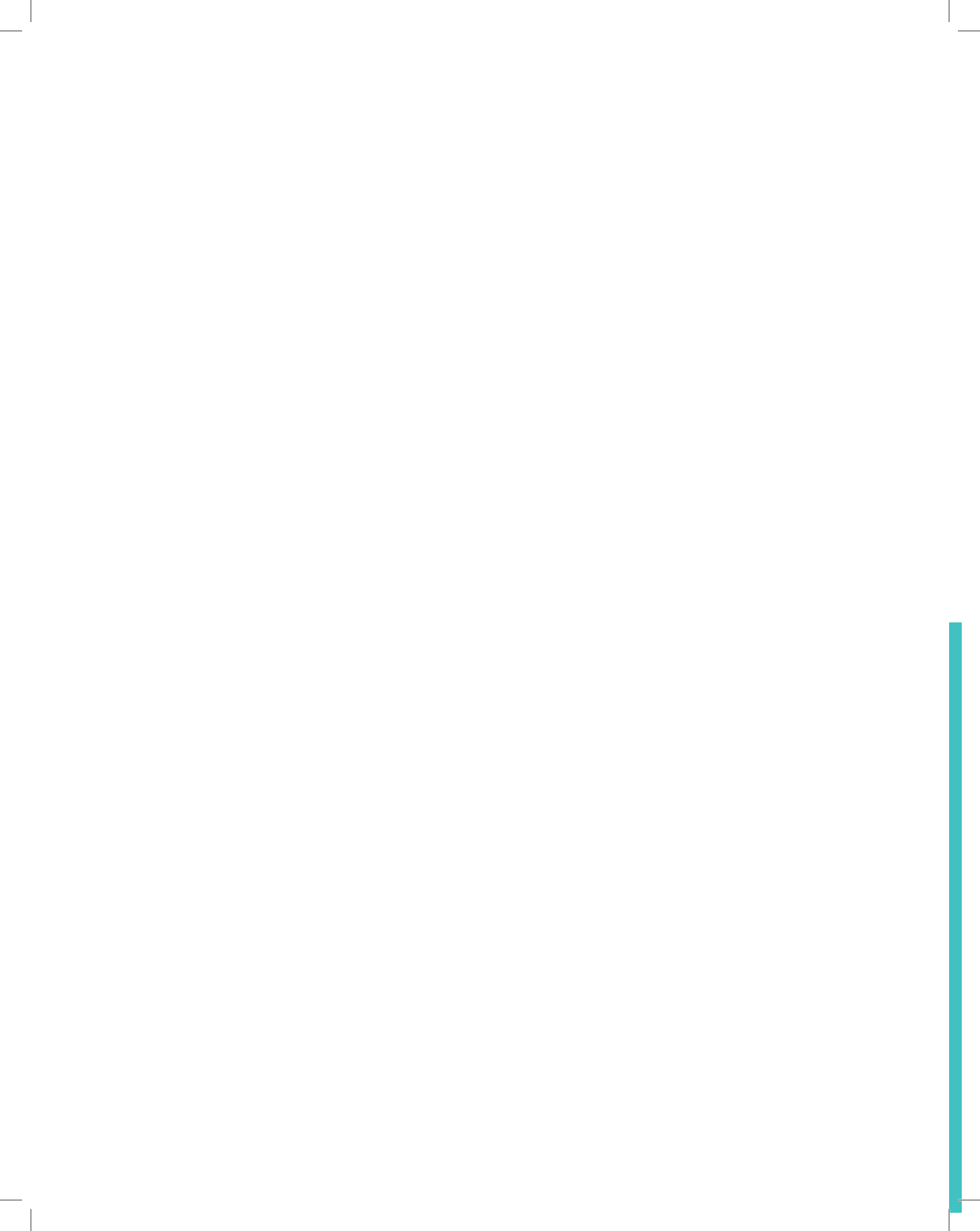
Conflict of interest

The authors have no conflicts of interest.

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TANZANIA

PAPER 45

- **Title:** Where do the rural poor deliver when high coverage of health facility delivery is achieved? Findings from a community and hospital survey in Tanzania
- **Authors:** M. Straneo, P. Fogliati, G. Azzimonti, S. Mangi
- **Date of publication:** December 2014
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• **Authors:**
M. Straneo,
P. Fogliati,
G. Azzimonti,
S. Mangi

Where do the rural poor deliver when high coverage of health facility delivery is achieved? Findings from a community and hospital survey in Tanzania

In Tanzania, like in the rest of Sub-Saharan Africa, there are high maternal mortality rates. In response to the fifth Millennium Development Goal, the government has put in place strategies to extend the coverage of health facilities to increase the number of deliveries in health facilities. As a result, in the district of Iringa, in 2012 there were 73 facilities, including 66 dispensaries, six health centers and one hospital. The high healthcare coverage has meant that in recent years births in health facilities surpassed 80%. Can these numbers be considered a success in terms of mortality reduction?

The study, published in December 2014 in *Plos One* analyzes data from several studies and surveys conducted among women who gave birth in hospitals and other health facilities in the district of Iringa, finding socio-economic differences in access to different levels of healthcare coverage. It has been observed that women of high socio-economic levels tend to give birth in hospitals and poorer women are more likely to go to the closest dispensaries. However, these dispensaries often provide low-skilled services. The high number of dispensaries does not correspond to an adequate number of skilled health personnel. The result is that women of lower socio-economic levels receive less skilled care and are therefore more susceptible to death.

This study's results highlight the problems of increasing first-line healthcare facilities; this is not an adequate response to high maternal mortality rate if not combined with a commitment to improve the quality of services as well. To solve this conflict between coverage and quality, it is recommended to reduce the number of dispensaries in the area to improve their quality and foster a more equitable health service.

RESEARCH ARTICLE

Where Do the Rural Poor Deliver When High Coverage of Health Facility Delivery Is Achieved? Findings from a Community and Hospital Survey in Tanzania

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Abstract

Introduction: As part of maternal mortality reducing strategies, coverage of delivery care among sub-Saharan African rural poor will improve, with a range of facilities providing services. Whether high coverage will benefit all socio-economic groups is unknown. Iringa rural District, Southern Tanzania, with high facility delivery coverage, offers a paradigm to address this question. Delivery services are available in first-line facilities (dispensaries, health centres) and one hospital. We assessed whether all socio-economic groups access the only comprehensive emergency obstetric care facility equally, and surveyed existing delivery services.

Methods: District population characteristics were obtained from a household community survey ($n=463$). A Hospital survey collected data on women who delivered in this facility ($n=1072$). Principal component analysis on household assets was used to assess socio-economic status. Hospital population socio-demographic characteristics were compared to District population using multivariable logistic regression. Deliveries' distribution in District facilities and staffing were analysed using routine data.

Results: Women from the hospital compared to the District population were more likely to be wealthier. Adjusted odds ratio of hospital delivery increased progressively across socio-economic groups, from 1.73 for the poorer ($p=0.0031$) to 4.53 ($p<0.0001$) for the richest. Remarkable dispersion of deliveries and poor staffing were found. In 2012, 5505/7645 (72%) institutional deliveries took place in 68 first-line facilities, the remaining in the hospital. 56/68 (67.6%) first-line facilities reported ≤ 100 deliveries/year, attending 33% of deliveries. Insufficient numbers of skilled birth attendants were found in 42.9% of facilities.

Discussion: Poorer women remain disadvantaged in high coverage, as they access lower level facilities and are under-represented where life-saving transfusions and caesarean sections are available. Tackling the challenges posed by low caseloads and staffing on first-line rural care requires confronting a dilemma between coverage and quality. Reducing number of delivery sites is recommended to improve quality and equity of care.

Introduction

The majority of maternal deaths are concentrated in limited resources countries, and within them the poorest bear the greatest burden [1]. This inequity has been linked to reduced access of the rural poor to professional delivery services. Underlying factors are limited health services' availability or accessibility in rural areas and lower demand by the population [2, 3].

Timely access to skilled attendance at birth is essential to maternal mortality reduction [4]. In sub-Saharan Africa, in practise, this is only available in health facilities [5]. The type of obstetric care offered varies, ranging from the full comprehensive emergency obstetric care (c-EmOC) package, which includes caesarean sections and blood transfusions [6], generally only available in hospitals, to lower, variable levels of care in first-line facilities.

To reduce mortality among the rural poor, the focus of the international public health community has been on improving coverage of institutional delivery [7], though the evidence of the effectiveness of this intervention is scarce [8]. As Millennium Development Goal 5-related strategies take effect, coverage of institutional deliveries will inevitably improve. Will all socio-economic groups equally benefit from high coverage? Limited available data appear to indicate that this may not be so. In Indonesia for example, primary health care has been strengthened by ensuring every village has a midwife. The strategy was successful in ensuring access of all socio-economic groups to skilled attendance at birth, however poorer women remained disadvantaged in accessing caesarean sections [9]. Trends of caesarean sections across different countries have shown that the poorest consistently lower access to this potentially life-saving procedure [10]. In Tanzania, Ferry et al [11] found inequity in access to inpatient care at health centre level, in spite of existing fee exemptions for children, pregnant women and the elderly.

This issue is central to planning of maternal services in limited resources countries beyond the basic objective of coverage. Lack of quality and equity of services represent barriers to achieving maternal mortality reduction, particularly among the poorest [12].

The question was addressed in Iringa District, a rural District in Tanzania, where high coverage of institutional delivery has been achieved. Data from this paradigmatic area can help to understand ahead of time what will happen in

limited resources countries as coverage improves. The United Republic of Tanzania is no exception to the high maternal mortality ratios in sub-Saharan Africa in spite of a well developed primary health care network. A ratio of 417.5 deaths per 100 000 live births is estimated corresponding to 7990 deaths countrywide [13]. The health system is organized at District level and includes dispensaries, health centres and hospitals [14]. Women can obtain assistance at childbirth in all types of facilities. The former two are first-line facilities where delivery care is part of reproductive and child services, though staffing is often insufficient [15]. Delivery services are free of charge according to Tanzanian government policy [11, 16]. Though nationwide home deliveries remains common (52%) [17], a district-representative household survey carried out in 2009 in Iringa District (unpublished) documented 88% of facility births among women with a recent delivery. These data were confirmed by the 2010 Tanzanian Demographic and Health Survey findings (institutional deliveries for the whole Iringa region 80.4%) [17]. High coverage in the area is linked to a high facility density (3629 people per first-line facility), nearly double that of the country as a whole (6064 per facility) [14].

The overall aim of the study was to investigate how different socio-economic classes access delivery services in an area of high coverage of institutional deliveries in order to draw conclusions on childbirth services for the rural poor. To complete the picture, we assessed existing obstetric services in the District, in particular with regards to distribution of deliveries between first-line and secondary care facilities, as these factors are crucial for the overall objective of improving care and reducing mortality. The results of the study will provide insights to address maternal health policies in limited resources countries.

Methods

Study setting

Iringa District (formerly Iringa rural) is within Iringa Region, in the Southern Highlands of Tanzania. The population according to the 2012 census was 254,023 [18]. It is mostly rural, with 85% relying on subsistence farming. The District includes 122 villages. Health services in 2012 were available in 73 facilities, of which 66 dispensaries, 6 health centres and one diocesan District hospital [19]. The majority of health facilities are public, with only 27% run by private non-profit organizations.

Baseline population data

Baseline information on the District population including socio-economic data was obtained from a cross-sectional household survey carried out in October 2009 (*Community survey*). Objective of the survey was to collect information on access to health services in the area, as part of a health system strengthening programme. A representative sample of the District population was obtained through two-

stage cluster sampling. Thirty villages were randomly chosen in the first stage with probability proportional to size. Twenty-five households were selected in each village in the second stage through random systematic sampling. Women with a delivery in the last five years were included in analysis.

Data on women who accessed hospital delivery services

The socio-economic profile of women accessing the only comprehensive emergency obstetric care facility was obtained from a cross-sectional survey of women discharged from the District hospital Maternity Ward between October 2011 to May 2012 (*hospital survey*). The survey was conducted as part of a development programme, on access, quality and equity of maternal services. Interviews at discharge were conducted in Swahili by female trained interviewers using a pretested structured questionnaire. For women who had died, information was collected from relatives. In the hospital survey, only women who had delivered in the hospital and lived within the District were included in analysis. Women from outside the District (who have travelled beyond their District hospital) may belong to a higher socio-economic group, therefore creating bias in the analysis.

As validation of collected data, records collected were matched with hospital Maternity registers.

Data entry and analysis

Data entry and cleaning was carried out using Epidata software (version 3.1) by a principal investigator, and analysis was carried out using STATA (version 9) software.

Baseline characteristics of the two populations

Characteristics of women from the two surveys were compared (Dataset S1).

Variables examined were age (at index delivery for the community survey), parity, education, sex of household head, type of delivery and socio-economic status. Proportions and 95% CI were estimated for both populations taking study design into account. After merging of data sets, bivariate and multivariable analysis were performed. Crude odds ratios for belonging to the hospital population were produced, with a 95% confidence interval.

Multivariable logistic regression including all variables significant in bivariate analysis was performed to estimate adjusted odds ratios of belonging to the hospital compared to the District population. Svysset commands were used to account for clustered design.

Socio-economic stratification

Socio-economic status (SES) was assessed based on durable household possessions (bicycle, radio, mobile phone) and housing characteristics (non-grass roof, non-

mud floor and electricity) as applied by Bernard et al [20] in rural Tanzania. Principal Component Analysis was used to define weights to each variable and to construct a household socio-economic score for the community and for the hospital population respectively [21]. Although the score from the first principal component does not give information on absolute level of wealth, it can be used for comparison across different settings, provided that calculation is based on the same variables [21].

We classified the district population into five SES groups (1–5), from poorest to richest by dividing the community household socio-economic score into quintiles. We thus applied the quintile cut-off values derived from the community sample to the hospital population socio-economic score to create five comparable SES categories across the two settings.

Availability and utilization of District obstetric services

Details of available services and the distribution of deliveries within them in 2012 were obtained using the routine District Health Management Information System (HMIS, MTUHA in Tanzania), through the District Medical Office.

Annual reports are compiled by each health facility on a national standardized form (F005), and sent to the District Medical Office yearly. The annual reports for 2012 for the facilities of Iringa District were examined, and data on deliveries was collected (Dataset S2). Reported data was cross checked with data at facility level during supervision visits.

Human resources availability

Data on health facility staffing in 2012 was obtained from the Human Resources Information System, available in the District Medical Office (Dataset S2). The information was validated and where necessary updated during health facility supervision visits.

Skilled birth attendants (SBA) are accredited health professionals with the necessary skills to manage childbirth and to identify, manage and refer complications in women and newborn [22, 23]. In Tanzania, clinicians (medical officers, assistant medical officers, clinical officers), and enrolled and registered nurses are classified as skilled birth attendants; lower cadres such as nursing assistants are not [24].

Ethical statement

Ethical clearance for the study was obtained from the National Institute for Medical Research, Dar es Salaam, Tanzania. Participants to both community and hospital surveys provided signed informed consent.

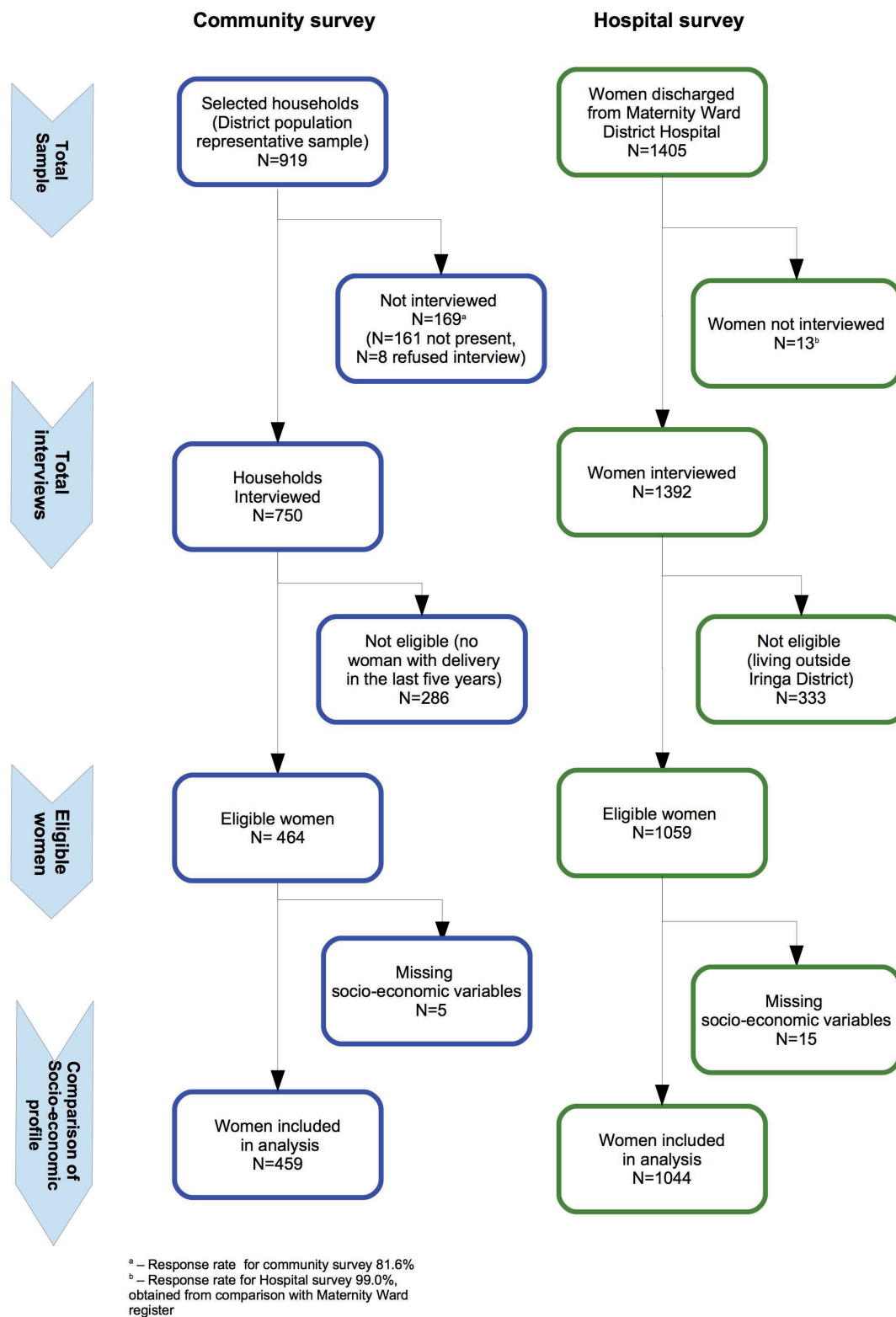


Figure 1. Data flow for the community and hospital surveys.

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Results

The flow chart in [Figure 1](#) summarizes data collection.

District population data

In the community survey, 919 households were visited: inhabitants were absent in 161, and in 8 refused the interview (response rate 81.6%). In the interviewed households, there were 463 women with a recent delivery, and their data was analysed for this study. Mean age at delivery was 28.0 years (95% CI, 27.3–28.6), and median parity was 3 (2–5). Most belonged to the Hehe or Bena tribes (81.1%, 95% CI, 74.6–87.7), only 0.2% (95% CI, 0–0.6%) were semi-nomadic Masai, and the rest belonged to other tribes (18.7%, 95% CI, 12.2–25.1).

Hospital survey

1072 women living within the District were interviewed. In the study period, by comparison to the Maternity Ward register, 99.0% of women admitted were interviewed. Women living outside the District were excluded from analysis. Mean age was 25.7 years (95% CI, 25.4–26.1) and median parity was 2 (range 1–4). Here too, most women were Hehe/Bena, 86.1% (95% CI, 84.0–88.2); Masai were 0.9% (0.4–1.5), the rest belonged to other tribes (12.9%) (95% CI, 10.9–15.0).

Out of 1072 childbirths, 34 were twin deliveries, with a total of 1106 newborn. 1071 were born alive, the remaining were either fresh (16) or macerated stillborn (19). 1034 newborn were discharged alive while 37 died (36 within 7 days, 1 after the first week). Early neonatal mortality was 33.6 per 1000 live births (95% CI, 30.2–37.3).

During the survey period, 6 women died, of which 5 due to direct obstetric causes (Eclampsia 3, infection 1, septic shock 1).

1043 women provided information on the reason for hospital delivery. The most frequent answer was “I chose myself” to deliver in the higher level facility (55.0%, 95% CI, 52.0–58.1). 37.7% (95% CI, 34.7–40.6) were advised on hospital delivery during antenatal care, only 5.6% (95% CI, 4.2–7.0) were referred during labour. The remaining were either advised by relatives/husband, or had attended ANC in the hospital.

Comparison of the two populations

[Table 1](#) compares baseline characteristics of the two populations. There were differences in frequency distribution of age, parity, education, sex of household head, type of delivery and socio-economic status.

Crude and adjusted odds ratios, with 95% confidence intervals and p values, of belonging to the hospital population compared to the District population are shown in [Table 2](#).

Table 1. Socio-demographic characteristics of women who delivered at District hospital compared to women from the community of provenance.

Variable	Community survey (N=463)			Hospital survey (N=1072)		
	n	%	(95% CI)*	n	%	(95% CI)
Age (years)						
≤19	38	8.3	(5.4–11.3)	176	16.4	(14.2–18.7)
20–39	395	86.6	(83.2–90.1)	868	81.1	(78.8–83.5)
≥40	23	5.0	(2.8–7.3)	26	2.4	(1.5–3.4)
Parity						
1	74	16.1	(12.0–20.1)	429	40.1	(37.1–43.0)
2–4	257	55.7	(50.7–60.8)	445	41.5	(38.6–44.5)
≥5	130	28.2	(22.6–33.8)	197	18.4	(16.1–20.7)
Education (years)						
0	58	12.5	(9.0–16.1)	74	7.0	(5.5–8.6)
1–6	35	7.6	(4.8–10.3)	22	2.1	(1.2–3.0)
7	353	76.2	(71.5–81.0)	821	78.0	(75.5–80.5)
≥8	17	3.7	(1.2–6.2)	135	12.8	(10.8–14.9)
Sex of household head						
Male	412	89.4	(86.0–92.8)	965	92.6	(91.0–94.2)
Female	49	10.6	(7.2–14.0)	77	7.4	(5.8–9.0)
Type of delivery						
Vaginal	420	90.7	(87.3–94.1)	736	68.7	(65.9–71.5)
Cesarean section	43	9.3	(5.9–12.7)	335	31.3	(28.5–34.1)
SES						
Very low	91	19.8	(14.2–25.5)	64	6.1	(4.7–7.6)
Low	92	20.0	(15.6–24.5)	120	11.5	(9.6–13.4)
Medium	84	18.3	(14.8–21.8)	180	17.2	(14.9–19.5)
High	88	19.2	(14.5–23.8)	252	24.1	(21.5–26.7)
Very high	104	22.7	(17.3–28.0)	428	41.0	(38.0–44.0)

*adjusted for cluster design.
Iringa District, Tanzania. 2009–2012.

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The youngest age group appeared more likely in bivariate analysis to be part of the hospital population (OR 2.11, $p < 0.001$). The oldest age group [≥ 40] appeared less likely to be part of the hospital population (OR 0.51, $p = 0.0061$). These differences were however not significant in multivariable analysis.

Women with a first pregnancy were more represented in the hospital, with the difference remaining significant in multivariable analysis (adjusted OR 3.45, $p < 0.001$). Unexpectedly, women of high parity (≥ 5) were not more represented in the hospital after adjusting for other variables (OR 1.23, $p > 0.05$).

OR for education levels were inconsistent. Only women with incomplete primary education (1–6 years) were significantly less represented in the hospital (OR 0.35, $p < 0.001$), compared to women with complete primary education (7 years). For women with no formal education, adjusted OR was not significant. When education was dichotomized (complete primary or greater versus none/

Table 2. Association between covariates. Study population from hospital survey compared to the study population from community survey.

Variable	OR crude	(95% CI)	p-value*	OR adjusted	(95% CI)	p-value*
Age (years)						
≤19	2.11	(1.44–3.09)	0.0004	1.15	(0.74–1.79)	0.5159
20–39	1	-	-	1	-	-
≥40	0.51	(0.32–0.82)	0.0061	0.63	(0.37–1.06)	0.0798
Parity						
1	3.35	(2.51–4.47)	0.0000	3.45	(2.58–4.61)	0.0000
2–4	1	-	-	1	-	-
≥5	0.88	(0.67–1.15)	0.3204	1.23	(0.91–1.66)	0.1810
Education (years)						
0	0.55	(0.39–0.76)	0.0008	0.89	(0.62–1.28)	0.5187
1–6	0.27	(0.18–0.40)	0.0000	0.35	(0.23–0.54)	0.0000
7	1	-	-	1	-	-
≥8	3.41	(1.71–6.81)	0.0010	1.43	(0.72–2.87)	0.2973
Sex of household head						
Female	1	-	-	1	-	-
Male	1.49	(1.04–2.13)	0.0306	2.10	(1.16–3.81)	0.0163
Type of delivery						
Vaginal	1	-	-	1	-	-
Cesarean section	4.45	(2.98–6.63)	0.0000	4.23	(2.88–6.21)	0.0000
SES						
Very low	1	-	-	1	-	-
Low	1.85	(1.34–2.56)	0.0005	1.73	(1.22–2.45)	0.0031
Medium	3.05	(2.00–4.64)	0.0000	2.58	(1.63–4.09)	0.0002
High	4.07	(2.57–6.45)	0.0000	3.54	(2.17–5.78)	0.0000
Very high	5.85	(3.78–9.06)	0.0000	4.53	(2.86–7.17)	0.0000

*Adjusted Wald test.

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incomplete primary ≤6 years), the adjusted odds ratios was 2.66 (95% CI 1.09–1.99, p=0.0125) (data not shown).

When the households were male-headed, the OR was double compared to female-headed ones (adjusted OR 2.10, p=0.0163).

As expected, the odds of Caesarean section was significantly greater for the hospital population (OR 4.23, p<0.001).

In adjusted analysis, OR increased progressively across SES categories, compared to the baseline of the poorest group (OR 1.73 up to 4.53), indicating women are increasingly more represented in the hospital as household poverty decreases (Figure 2).

District obstetric services

7645 institutional deliveries were recorded in 2012 in Iringa District Health Management Information System. 5505 (72%) took place in 68 first-line facilities,

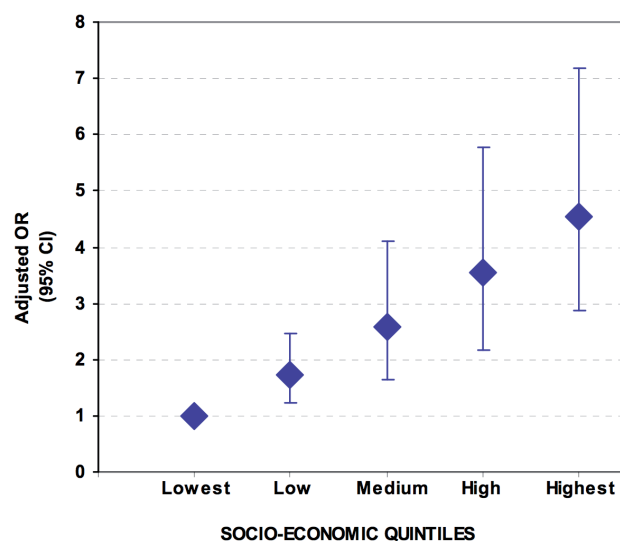


Figure 2. Odds ratios of belonging to hospital population compared to District population by socio-economic quintiles, with respective 95% confidence intervals. Iringa District, Tanzania. 2009–2012.

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and 2140 (28%) in the District Designated hospital. 2 dispensaries did not provide reproductive services, and no data was available for two dispensaries.

In health centres, deliveries ranged from 56–277, with a median of 158.5. In dispensaries, the number ranged from 2–203, with a median of 62.5.

The distribution of deliveries by facility caseload in Iringa District has been summarized in [Table 3](#).

Overall, approximately one third (2524/7645, 33.0%) of deliveries took place in facilities with caseload ≤ 100 /year.

Human resources

68 first-line facilities had a total of 191 health workers in 2012, of which 140 were skilled birth attendants. Health workers in the hospital were 139, of which 81 were SBA. Numbers in the hospital were calculated on the whole institution, not simply on the Maternity Ward.

In health centres, health workers ranged from 5–13, median 10.5; skilled birth attendants' range was 3–9, median 6.5. In dispensaries, total health workers were 1–7, with a median of 2; available SBA were 0–5, with a median of 1.5. There were less than two SBA in 28/68 (40%) first-line facilities, all of which were dispensaries. Thus, nearly half of the dispensaries (28/62 dispensaries, 45%) had insufficient staff to provide maternal services 24 hourly.

Table 3. Distribution of deliveries by facility caseload in Iringa District in 2012 (based on HMIS data).

Facility delivery caseload/year	Deliveries (%)	N. facilities (%)
0–50	684 (8.9)	21 (30.9)
51–100	1840 (24.1)	25 (36.8)
101–150	1423 (18.6)	12 (17.6)
151–200	854 (11.2)	5 (7.4)
201–250	427 (5.6)	3 (4.4)
251–300	277 (3.6)	1 (1.5)
>300	2140 (28.0)*	1 (1.5)*
Total	7645	68

*District Hospital.

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Discussion

Evidence from this study indicates that poorest women are accessing lower level health services for delivery, which offer worse quality of care, due to limited caseloads and poor staffing. Two major findings support this. The first is that the poorest women are disproportionately under-represented in the hospital, the only facility able to provide all functions of comprehensive emergency obstetric care. There is a gradient across socio-economic groups, with increasing odds of hospital delivery as wealth increases. The second finding emerges from analysis of available services: deliveries are remarkably dispersed over poorly staffed facilities.

The findings will be discussed separately.

Access of socio-economic groups to c-EmOC facility

Poorer women are disadvantaged in access to higher level delivery services. There are two implications to this finding. The first is that women from the lower SES groups are less likely to deliver where blood transfusions and caesarean sections are available. They are thus disadvantaged with regards to potentially life-saving procedures. The second implication is that these women, in this context, are more likely to receive childbirth care in first-line facilities.

An additional finding which has emerged is that women mostly access comprehensive emergency obstetric care by choice, bypassing the first-line facility. This may appear in contrast to the findings by Kruk et al [7]. In their study on women’s bypassing of the nearest facility in Western Tanzania, no association with wealth was observed. The latter study was carried out in a low facility coverage context (<40% of facility deliveries), thus very different from the described in this manuscript, and examined by-passers to any health facility (including same level facilities). Only half the by-passers (93/186) had accessed a hospital [7]. Our study, focused on by-passers to the c-EmOC facility, and suggests poorer women bypass less. Greater education, economic resources, and smaller family sizes probably contribute to wealthier women’s preference for delivery in a higher level facility.

Distribution of deliveries and human resources for health

Additional important information to understand where the poorest deliver is contributed by analysis of District delivery services. As noted previously, excellent coverage is associated to high facility density. Just over a quarter of institutional deliveries had taken place in the c-EmOC facility, with the rest in first-line facilities. One third of childbirths were attended in facilities with very low delivery volume (<100 deliveries per year). In the framework of the Primary Health Care Development Programme, the Tanzanian government aims to expand health facilities, with a dispensary in every village and a health centre in every ward (an administrative area with approximately 50000 people) [25], which corresponds to approximately doubling the dispensaries (n=5607 in 2011), and quadrupling the health centres (n=684 in 2011) [14]. Development of primary care in Tanzania has been successful in shortening the distance between users and services. For example, living within 5 km of a dispensary has a documented advantage on under-five survival [26]. The consequence of the expansion of primary health care on childbirth care is that deliveries are dispersed over a large number of facilities. There is not much available evidence on the optimal number of deliveries to be assisted per year to ensure quality, though a caseload greater than 150 per year has been suggested [24].

Severe shortage of qualified staff in the District completes the picture. Human resources for health shortage in resource limited countries has been repeatedly reported, and is considered a major obstacle to achieving MDGs [14]. The gap for all cadres in Tanzania was estimated at 64% in 2012/13 [14]. Though it has reduced from 72% in 2006, it is unlikely to be filled in the short term, considering the planned expansion of facilities. Furthermore, absences from work stations are frequent, due to annual leave, sickness, travel to District offices or trainings [27, 28]. One survey in Tanzania found 49% of nurses absent from the work station [27]. As part of the “workload indicator of staffing needs” WHO tool [29], an available working time (“the time a health worker has available to do his/her work, taking into account authorized/unauthorized leave”) of 202 days per year was reported in an urban context in Tanzania [28]. In rural areas, absences are likely to be more frequent, due to longer travelling times, thus reducing available working time further. On the basis of days present at the work station only, to ensure full-time delivery care there is a requirement of at least two skilled birth attendants. 40% of first-line facilities (45% of dispensaries) did not have sufficient skilled birth attendants to ensure full-time delivery care.

Maternal health policy implications

The detailed picture provided by this study in a limited geographical area highlights a conflict between coverage and quality of delivery care in rural contexts. The study’s findings can provide useful insights to adjust maternal health policy without compromising accessibility, and can be used to extrapolate recommendations applicable to other limited resources contexts.

We argue that delivery is inherently different from other primary health care activities, as it cannot be planned and may be associated to life-threatening complications. For effective coverage, care must be offered every day, 24-hourly, which is hindered by the shortage of qualified staff. Complications must be handled by staff with the necessary knowledge, skills and equipment. Though gaps in equipment and knowledge can be filled even at peripheral level, low caseloads hinder staff from maintaining the necessary skills.

An adjustment of policy on where childbirth care is available is a possible solution. A reduction in the number of delivery sites offers several advantages. 1. Greater quality of care. A limited number of first-line facilities could be upgraded to delivery sites, with adequate staffing to provide full time care, and a planned caseload greater than 150/year, to ensure staff maintain knowledge and skills through practise. Other first-line facilities would continue to provide other maternal care services, such as antenatal and postnatal care, but not delivery care. 2. More rational and efficient distribution of scarce human resources for health, as the latter facilities would require fewer human resources to function. 3. A likely improvement in cost-effectiveness of delivery care in limited resources countries. There are two potential disadvantages of the proposed policy change. The first is a reduction of women's access to delivery services, due to greater traveling distances; the second, local opposition, due a reduction of services available.

Further studies in Iringa District on health facilities' accessibility using a geographical information system could provide valuable, more detailed information on women's utilization of services. This mapping could contribute, together with other local factors, to identifying potential delivery sites among existing facilities. A small scale study in a limited geographical area on the outcome of reduced numbers of delivery sites could provide useful information to policy makers.

Strengths and limitations of the study

To the authors' knowledge, this is the first demonstration of inequity of access to the full package of obstetric services where excellent institutional delivery coverage has been achieved. The study's greatest strength stems from the comparison of the socio-economic profile of women in the c-EmOC facility with women from the population of origin, not more general regional data from a Demographic and Health survey.

In addition, data was collected from first-line health facilities and a secondary facility in the same District, allowing more detailed analysis than when lower level facility data is compared with data from the country as a whole. The study's high response rate is an additional strong point.

There are limitations to the study which should be considered. The first is that the two populations analysed are not time-matched. The surveys were part of two different studies, and community data was collected in 2009, while in the hospital 24 to 31 months later. The main criticism could be that availability of household assets (such as mobile phones) may have varied in the country. Though mobile

phone use has increased in Tanzania, power availability in rural areas may not have increased in the same way.

A second possible criticism is on the validation of data collected for socio-economic stratification. Though both surveys used respondents' answers to a questionnaire, in the first survey interviewers visited women's homes, therefore were able to confirm directly availability of some assets (such as floor and roofing materials); in the second survey, no direct observation was possible, as interviews were conducted in the hospital. Though some degree of social desirability misclassification is possible, it is unlikely to have a major impact on the findings.

The third limitation to the findings stems from the use of routine District data, which have intrinsic low accuracy and reliability. However, the data on facilities' caseload and staffing were validated during ad-hoc supervision. The findings are consistent with those of other studies [24].

Another point is that the use of routinely collected data to map where women deliver in the District does not allow to take into account migration outside the District. HMIS in Tanzania is organized per District, and there are no records on whether women who deliver in facilities actually live in the District. It is possible that some women may have chosen to move beyond District boundaries or to private facilities for delivery, but these are likely to be wealthier women, thus the inequity observed may have in fact been greater.

A fifth point is that seasonal variations to access to the higher level facility are possible. Richer women may be disproportionately represented because they have the economic means to reach the hospital even when the roads are flooded. The major rain season in Iringa District is January to April, and hospital data was collected during both dry and rainy seasons, thus any effect should not be relevant.

Another limitation is that no variables measuring quality of maternal care was collected, such availability of equipment, supplies and knowledge. This has been examined in other studies [24, 30]. Insufficient staffing and volume of deliveries too low for staff to maintain skills are upstream challenges for first-line facilities, which make them unable to offer quality even if other requirements are fulfilled. There are no studies that have addressed the relation between caseload and quality of care in first-line facilities in limited resources countries. The definition of signal functions of basic and comprehensive emergency obstetric care [6] confirms that skills need practise to be maintained. To qualify as able to provide a signal function, facilities must have performed it at least once in the previous 3 months.

Lastly, no distinction was made among first-line facilities. Delivery services provided by dispensaries and health centres are very similar, and they share a role in fragmentation of deliveries, though health centres have greater numbers of skilled birth attendants (median 6.5, in dispensaries 1.5) and tend to attend greater numbers of deliveries.

Further studies, in particular on the relation between quality and caseload, will help to define the picture more accurately.

Conclusion

In limited resources countries, when high coverage of facility deliveries is achieved, the poor remained disadvantaged. To tackle maternal mortality, a conflict between coverage and quality of delivery care in first-line health facilities should be addressed; the findings of the study suggest an adjustment of policy on where delivery care is available.

Supporting Information

Dataset S1. Study population dataset.

[doi:10.1371/journal.pone.0113995.s001](https://doi.org/10.1371/journal.pone.0113995.s001) (XLS)

Dataset S2. Health facilities dataset.

[doi:10.1371/journal.pone.0113995.s002](https://doi.org/10.1371/journal.pone.0113995.s002) (XLS)

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Author Contributions

Conceived and designed the experiments: MS PF. Performed the experiments: MS PF. Analyzed the data: MS PF. Wrote the paper: MS PF GA SM FK.

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UGANDA

PAPER 65

- **Title:** Effects of improved access to transportation on emergency obstetric care outcomes in Uganda
- **Authors:** S. Mucunguzi, H. Wamani, P. Lochoro, T. Tylleskar
- **Date of publication:** September 2014
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PAPER 74

- **Title:** A qualitative study on barriers to utilisation of institutional delivery services in Moroto and Napak districts, Uganda: implications for programming
- **Authors:** C. Wilunda, G. Quaglio, G. Putoto, P. Lochoro, G. Dall'Oglio, F. Manenti, A. Atzori, R. M. Lochiam, R. Takahashi, A. Mukundwa, K. Oyerinde
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Effects of improved access to transportation on emergency obstetric care outcomes in Uganda

WHO has estimated approximately 358,000 maternal deaths occurred during pregnancy, childbirth or within 42 hours of birth (2008 data) with a considerable reduction (about 34%) since 1990. However these data are less positive if we look at Sub-Saharan Africa, which accounts for more than half of maternal deaths. Many studies have shown the importance of interventions in emergency obstetric care (EmOC) in order to reduce maternal mortality. The biggest component needed to improve EmOC is providing effective emergency transport services, a major component of lowering maternal mortality.

Effective hospital transport service is still rare in many areas of Sub-Saharan Africa; even in Uganda, where there is a free service provided by the police, it is often not accessible to mothers. Published in September 2014 in the *African Journal of Reproductive Health* the study sought to evaluate the effects of a program that CUAMM implemented in the district of Qyam, in the north of Uganda, making a free ambulance service available 24 hours a day and providing all health facilities with communication systems. Comparing cesarean delivery rates in the district during the program's implementation with the rates recorded in the nearby Apac district, where the intervention was not implemented, the study showed a slight improvement in data on maternal mortality.

While recognizing the limitations of the study, restricted to a limited area of the country, the goal was to recognize the importance of adequate hospital transport service, supported by communication tools. These are the first steps and a necessary condition, though not enough by themselves, to address the problem of high maternal mortality rates.

ORIGINAL RESEARCH ARTICLE

Effects of Improved Access to Transportation on Emergency obstetric Care Outcomes in Uganda

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Abstract

Reduction in maternal mortality has not been appreciable in most low-income countries. Improved access to transport for mothers is one way to improve maternal health. This study evaluated a free-of-charge 24-hour ambulance and communication services intervention in Oyam district using 'Caesarean section rate' (CSR) and compared with the neighbouring non-intervention district. Ecological data were collected retrospectively from maternity/theatre registers in October 2010 for 3 years pre and 3 years intervention period. The average CSR in the intervention district increased from 0.57% before the intervention to 1.21% ($p=0.022$) during the intervention, while there was no change in the neighbouring district (0.51% to 0.58%, $p=0.512$). Hospital deliveries increased by over 50% per year with a slight reduction in the average hospital stillbirths per 1000 hospital births in the intervention district (46.6 to 37.5, $p=0.253$). Reliable communication and transport services increased access to and utilization of maternal health services, particularly caesarean delivery services. (*Afr J Reprod Health 2014; 18[3]: 76-83*)

Keywords: caesarean section, emergency obstetric care, ambulance services, accessibility, referral and communication system

Résumé

La réduction de la mortalité maternelle n'a pas été appréciable dans la plupart des pays à faible revenu. L'amélioration de l'accès aux transports pour les mères est une façon d'améliorer la santé maternelle. Cette étude a évalué l'intervention des services gratuits d'ambulance et des communications assurés pour 24 heures dans le district d'Oyam à l'aide de « taux d'opération césarienne » (TOC) et nous l'avons comparé avec le quartier voisin de non-intervention. Les données écologiques ont été recueillies rétrospectivement à partir des dossiers de maternité / théâtre en octobre 2010 au cours de trois ans avant et pendant la période d'intervention de 3 ans. Le TOC moyen dans le district d'intervention a augmenté de 0,57% avant l'intervention à 1,21% ($p = 0,022$) au cours de l'intervention, alors qu'il n'y avait pas de changement dans le district voisin (0,51% à 0,58%, $p = 0,512$). L'accouchement à l'hôpital a augmenté de plus de 50% par an, avec une légère diminution dans les mortinaissances en milieu hospitalier pour 1000 naissances dans le district d'intervention (de 46,6 à 37,5, $p = 0,253$). Les services de communication et de transport fiables ont augmenté l'accès aux, et à l'utilisation des services de santé maternelle, notamment les services d'accouchement par voie césarienne. (*Afr J Reprod Health 2014; 18[3]: 76-83*)

Mots-clés: césarienne, soins obstétricaux d'urgence, services ambulanciers, accessibilité, orientation et le système de communication

Introduction

Globally, it is estimated that about 358,000 mothers died during pregnancy, child birth or within the first 42 days after giving birth in 2008; a reduction of 34% from 546,000 in 1990^{1,2}. Sub-Saharan Africa contributes more than a half of the world's maternal mortality and has had the slowest annual reduction rate of maternal mortality from 1990^{1,3}. In Uganda, the maternal mortality ratio

(MMR) for a seven year period preceding the survey is estimated to only have reduced from 524 per 100 000 live births in 2001 to 418 in 2006 and increased to 435 in 2011⁴. This shows that there has been no significant change in maternal mortality ratio over the last ten years and Uganda's target for Millennium Development Goal (MDG) five may unfortunately not be met.

In a recent Lancet review, skilled care at birth and emergency obstetric care were highlighted as

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having the greatest potential of reducing maternal and neonatal deaths as well as stillbirths of all the priority interventions proposed⁵. Effective and reliable emergency transport services and communication, which is a major component of emergency obstetric care, is therefore an important element if maternal deaths are to be averted in these countries.

Assessing maternal mortality is still a major obstacle for maternal mortality reduction programmes, owing to the fact that it is a rare event and poorly reported hence prone to misclassification. One would thus need unbearable large sample sizes to come up with reliable estimates. To circumvent this, the United Nations (UN) has come up with six process indicators that can be used to monitor maternal mortality progress in a health district, region/province or country⁶: availability of emergency obstetric care (EmOC) services; geographical distribution of EmOC facilities; proportion of births in EmOC facilities; met need for EmOC; Caesarean section as a proportion of all births (Caesarean Section Rate, CSR); facility direct obstetric case fatality rate.

In Uganda, although ambulance services are free in the Public Health Sector by policy, in most cases the ambulances are not available or are inaccessible to the mothers. This study evaluated a project with improved transport for emergency obstetric care in Northern Uganda by comparing caesarean section rates and hospital-based deliveries between an intervention district and a neighbouring non-intervention district for six years, three pre-project years and three project years.

Methods

Study area

The study was conducted in neighbouring districts of Oyam and Apac, in Lango sub-region, Northern Uganda. The region is located approximately 350 km north of Kampala. Oyam District was carved out of Apac district in 2006. The two districts are predominantly inhabited by the Luo-speaking Langi ethnic group who are largely subsistence farmers.

The two districts are in Northern Uganda the region that was affected by the Lords' Resistance

Transportation for Emergency Obstetric Care

Army (LRA) war which ended in 2005. The people who were living in Internally Displaced Persons (IDP) camps were now resettled back to their villages. This meant increased distances to the health facilities which had been constructed around the camps.

Apac district was selected for comparison because of its similarity to Oyam district in many aspects including the demographics, culture, history and economic activities.

The intervention

In 2007, 'Collegio Universitario Aspiranti e Medici Misionari' (CUAMM), an Italian founded non-governmental organisation, started implementing a three-year programme providing free-of charge ambulance service and communication between health facilities in the post conflict Oyam district. A 4x4 wheel Landcruiser ambulance was made available 24-hours and seven days a week. Each health facility was provided with a mobile phone and airtime to communicate with the ambulance team and the referral facility in case of an obstetric emergency. The ambulance was stationed at the referral facility (Hospital) and would be called to pick mothers from the different health centres within Oyam district. The referral facility was not centrally located in the district and reported to-and-fro travel time to different peripheral facilities ranged from 30 minutes for those nearby to two to three hours for the furthest.

Data collection

Information about the number of caesarean sections and the number of deliveries in health facilities as well as still births was collected retrospectively in October 2010 covering a period of six years (three pre-intervention and three intervention years). Secondary data from maternity registers and or theatre operating log books was used. Additional data on annual health unit deliveries were obtained from the respective district health management information systems annual reports. Registers were photographed digitally page-by-page using a Sony DSC-W220, 4x Zoom x 12.1 Megapixels. The data on hospital deliveries and caesarean sections was first entered

using EpiData version 3.1 and transferred into SPSS version 17 for analysis.

For Oyam district we were able to disaggregate the data according to whether the patient had an address in or outside the district, yielding two categories called 'Oyam strict' (only patients with an address inside the district) and 'Oyam all' (all patients included irrespective of address or missing address). For Apac District this disaggregation was not possible and only one category was created, called 'Apac all' including all patients. Student's t-test was used to compare the mean caesarean section rates and deliveries at the two hospitals for the pre-intervention and intervention periods.

We further calculated the caesarean section rates using actual number of caesarean sections as numerator and as denominator we used 5% of the total population which is the number of expected annual deliveries in the district based on projections from the census 2002^{7,8}.

In Oyam district, hospital stillbirths were collected and disaggregated into 'all stillbirths' and 'fresh stillbirths'. Student's t-test was used to compare the mean stillbirths for the pre-intervention and intervention periods. We were able to collect stillbirth data in the neighbouring Apac district due to missing data and inconsistencies in documentation of stillbirths (It was difficult to tease out fresh stillbirths from macerated stillbirths as these were all recorded as 'stillbirths'). Delivery data was missing at the non-intervention Apac hospital for the first two pre-intervention years (one log book missing) and counting was started one year before the intervention. In addition, data for the 6 months October 2007 to March 2008 were missing and were replaced using an average of the previous three quarters before them.

Ethical considerations

The permission to carry out the research was sought from the Uganda National Council of Science and Technology (Reference Number: HS 830). Further permission was sought from the Oyam district and Apac district Administrative Offices and from Doctors with Africa CUAMM – Uganda Office.

Results

At the time of data collection, Oyam district had one Hospital (Private not for profit) with 112 total bed capacity and was the only centre for Comprehensive EmOC (figure 1), one Health Centre (HC) IV (the next lower level after the hospital which should provide Comprehensive EmOC, five HCIIIs (the next lower level after HCIV which should provide Basic EmOC) and 11 HCIs (lowest level HC which should provide antenatal care, outpatient and immunisation services) whereas Apac district had one Hospital (Public) with 100 total bed capacity also the only Comprehensive EmOC centre (figure 1), two HCIVs, 14 HCIIIs and 22 HCIs. In both districts, HCIVs and HCIIIs had maternity units although, Oyam district had 100% coverage of midwives in all health centres in Oyam and some level II health centres had maternity units and were able to conduct deliveries (Table 1).

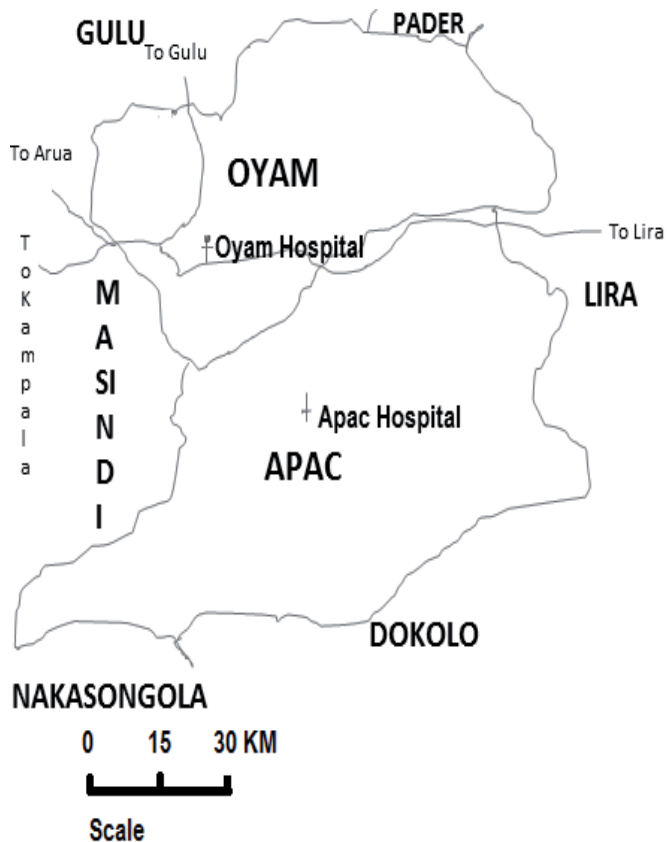


Figure 1: Map of Oyam and Apac districts showing the location of Apac and Oyam Hospitals

Table 1: Demographic and health service indicators for the intervention Oyam District and the non-intervention Apac District¹⁶⁻¹⁹

Item	Oyam District Intervention district	Apac District Neighbouring district
Projected population for mid-year 2010	354,000	543,000
Population growth rate	3.6%	3.5%
Crude birth rate per 1000 population	49.6%	49.6%
Fertility rate (no. of children per woman)	7.6	7.6
Rural population	98%	98%
Female literacy rate	58%	58%
Male literacy rate	83%	83%
Number of		
Level IV health centres	01	02
Level III health centres	05	14
Level II health centres	11	22
Total	17	38
Centres with emergency obstetric care	1 missionary hospital	1 public hospital
Comprehensive EmOC centres and ownership	Private not for profit (Aber Mission Hospital)	(Apac Hospital)
Hospital total bed capacity	112	100

The monthly costs for running this 24-hour free ambulance services was USD 1,875 including paying the drivers and airtime for mobile telephone communication.

Table 2: Number of Caesarean sections per 3-month periods in the intervention district Oyam and the non-intervention district Apac before and during (grey) the intervention

	Caesarean sections from within the intervention Oyam District			All Caesarean sections in the intervention Oyam District			All Caesarean sections in the neighbouring Apac District		
	Quarterly	Annually	3-year quarterly mean	Quarterly	Annually	3-year quarterly mean	Quarterly	Annually	3-year quarterly mean
Oct-Dec'04	22	96	21	34	154	32	20	77	29
Jan-Mar'05	23			33			21		
Apr-Jun'05	25			47			16		
Jul-Sep'05	26			40			20		
Oct-Dec'05	22	78		37	120		32	115	
Jan-Mar'06	25			42			22		
Apr-Jun'06	20			25			27		
Jul-Sep'06	11			16			34		
Oct-Dec'06	22	73		43	113		45	148	
Jan-Mar'07	22			32			35		
Apr-Jun'07	17			22			35		
Jul-Sep'07	12			16			33		
Oct-Dec'07	42	156	50	66	221	70	39	140	35
Jan-Mar'08	46			56			32		
Apr-Jun'08	36			53			40		
Jul-Sep'08	44			61			29		
Oct-Dec'08	51	190		69	257		32	144	
Jan-Mar'09	34			49			38		
Apr-Jun'09	44			59			27		
Jul-Sep'09	61			80			47		
Oct-Dec'09	63	236		86	347		45	142	
Jan-Mar'10	54			77			30		
Apr-Jun'10	61			93			30		
Jul-Sep'10	58			91			37		

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The absolute numbers of caesarean sections in the intervention district increased from 113 per year before the intervention to 347 per year at the end of the intervention, while there was no clear increase in the neighbouring district, Table 2. For hospital births, there was a similar increase in absolute numbers from just over 1000 per year to over 1500 at the end of the intervention while the

numbers in the neighbouring district remained stable, Figure 2. Both the 'Oyam strict' and 'Oyam all' had a more than a twofold increase from a mean per quarter of 20.5 to 49.5 ($p < 0.001$) and 32.1 to 70.0 ($p < 0.001$) for 'Oyam strict' and 'Oyam all', respectively; while there was only a slight change for the neighbouring 'Apac all' from 29.1 to 35.5 ($p = 0.06$), Table 2.

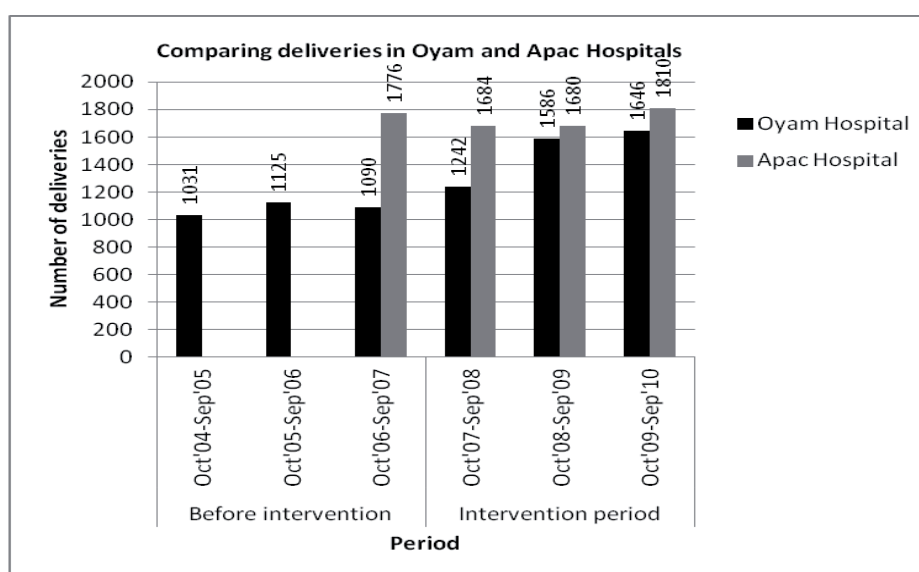


Figure 2: Comparing annual deliveries from the Hospital in Oyam and Apac districts

Similarly, the mean annual CSR calculated with the expected number of births as denominator increased from 0.56% to 1.18% ($p = 0.022$) for 'Oyam strict' and 0.87% to 1.66% ($p = 0.034$) for

'Oyam all' for the pre-intervention and intervention periods, respectively; while CSR for 'Apac all' only increased from 0.50% to 0.56% ($p = 0.512$), Table 3 and Figure 3.

Table 3: Expected number of deliveries, actual number of deliveries within health facilities, Caesarean section rates in Oyam District and the neighbouring Apac District over a 6-year period

		2004/5	2005/6	2006/7	2007/8	2008/9	2009/10
Total population	Oyam	287,690	295,420	307,590	318,280	329,580	343,520
	Apac	444,620	459,170	474,300	490,360	507,240	528,130
Expected deliveries	Oyam	14,385	14,771	15,380	15,914	16,479	17,176
	Apac	22,231	22,959	23,715	24,518	25,362	26,407
Deliveries in all health facilities (actual numbers)	Oyam	No data	No data	1,658	3,225	4,189	5,455
	Apac	No data	No data	5,987	3,918	6,684	6,926
Deliveries in health unit (%)	Oyam	No data	No data	11.1%	20.9%	26.2%	32.7%
	Apac	No data	No data	26.0%	16.5%	27.2%	27.0%
Caesarean sections (actual numbers)	'Oyam strict'	96	78	73	156	190	236
	'Oyam all'	154	120	113	221	257	347
	'Apac all'	77	115	148	140	144	142
Caesarean section rates (% of expected deliveries)	'Oyam strict'	0.67%	0.53%	0.48%	0.98%	1.15%	1.40%
	'Oyam all'	1.07%	0.81%	0.74%	1.40%	1.56%	2.02%
	'Apac all'	0.35%	0.52%	0.62%	0.57%	0.57%	0.54%

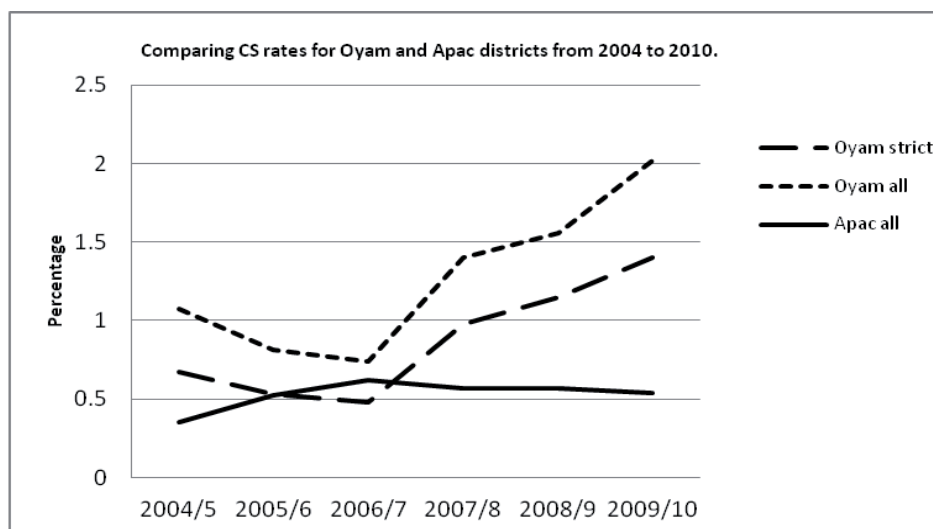


Figure 3: Caesarean section rates in ‘Oyam strict’, ‘Oyam all’ and ‘Apac all’ from 2004/05 to 2009/10 in relation to expected number of deliveries based on population data

In Oyam district, the mean hospital stillbirths per 1000 births disaggregated ‘all stillbirths’ and ‘fresh stillbirths’ decreased from 46.6 to 37.5, $p=0.253$) and 27.8 to 24.0, $p=0.412$) for pre-intervention and intervention periods respectively.

Discussion

The free ambulance services and the communication system between health facilities in Oyam district increased accessibility to emergency obstetric care as shown by a doubling of the CSR and motivated more mothers to deliver in health facilities as shown by an increase in hospital-based deliveries in Oyam. Our interpretation is that this has saved lives of both mothers and babies, even if the numbers could not be easily quantified.

A similar intervention in Mali showed that reducing transport time and elimination of financial barriers doubled utilisation of major obstetric interventions mainly caesarean sections and was also correlated to increased utilisation of health centres for deliveries⁹.

The intervention had not targeted quality improvement in the management of deliveries at Oyam hospital (the ‘third delay’) but availability of transport per se led to a slight decrease in the proportion of stillbirths per 1000 births in Oyam hospital. This shows that availing transport could probably have been more significant if improved access to means of transport was coupled other

interventions that enhance access like quality improvement initiatives.

It should be noted that free ambulance services is not a magic bullet and indeed it needs to be delivered in a supportive environment that enhances accessibility to and quality of emergency obstetric care. The presence of mobile telephone network, the road network, equipped health facilities and health workers as well as political support must have contributed to this achievement in Oyam district for instance there is 100% coverage of midwives in all health centres in Oyam. Recent studies including a study in western Uganda established that the distance and availability of quality transport were more important factors in the choice of place of delivery compared to cost and quality of health services in the health facility^{10,11}. Additionally, one of the limitations of this vehicle ambulance was the inability to pick mothers from their homes. This probably can be improved by using it in combination with motorcycle ambulances such as one described in Malawi¹². The motorcycle ambulance can be stationed in the community or nearby health facility so that they can pick mothers from their homes where the vehicle may not reach to nearby health centres.

In Uganda, many district hospitals have ambulances. However, it is not routine for ambulances to pick patients from the lower level units, in most cases probably due to fear of costs.

Our study results and the cost-effectiveness study by Somigliana and colleagues have illustrated that a free ambulance service is an effective intervention with reasonable and affordable costs¹³. Therefore, efforts should be harnessed to improve funding and management of referral for emergency obstetric care so that ambulances stationed at higher level health facilities are able to pick mothers from the poorly equipped lower level health facilities for life saving interventions like caesarean sections and blood transfusion.

Although one ambulance may not have been adequate for a district with a population of 353,000 people, especially taking into account that the referral facility was not located centrally in the district with a response time ranging from half an hour to three hours, far longer than the recommended time for emergency teams' response in medical related emergencies of four to six minutes and an emergency team for every 50,000 people¹⁴. However, the optimal number of ambulances required by a given population in low-income countries will depend on the local context.

Although user fees were abolished in Uganda in order to remove financial barriers for maternal health and other healthcare services, costs of transport were not considered as well as costs of delivery services in private non-for-profit hospitals. Mothers may therefore still incur high costs in addition to non-official payments in public hospitals. The exponential increase in utilization of preventive services like immunization and curative services like out-patient attendance for infectious diseases has therefore not been paralleled by a corresponding increase in maternity services¹⁵.

Methodological issues

Although there may be concerns about the power of this study when comparing only one district with a neighbouring district, there are not so many alternative strategies given the size of the intervention. Of course, it would have been preferable to have a large intervention with say 20 intervention districts and another 20 comparative districts. But for ethical and political reasons it would be difficult to have a control group in such an intervention. The only defensible strategy would be a step-wise introduction of the intervention in all the study districts and then

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compare the intervention time to the non-intervention time.

Taking the design constraints into account, comparing retrospectively available secondary data from registers for the pre-intervention and intervention periods was useful. A larger number of comparative districts without the intervention around Oyam would have been preferable to better factor in any secular changes in Caesarean section rate. The quality of the data would have been improved if the data had been collected prospectively during the project implementation; recording ambulance travel distances, cases brought to hospital and their outcomes. Assessing hospital deliveries in the two districts corroborated our findings since the two parameters behaved in a similar way in the respective districts. In addition, there was a slight reduction in hospital stillbirths per 1000 births in Oyam district although the overall picture for the entire district for this outcome could not be established since this data was only collected for one hospital.

The selection of the neighbouring Apac district for comparison could also be discussed but as earlier alluded to, alternative strategies were not available. Although structural, administrative, political and economic differences may exist between Oyam and Apac, comparing data for the 3-year pre-intervention and 3-year intervention periods minimized the chances that the changes in caesarean section rates could have been greatly influenced by other factors other than the intervention unless the factors followed similar trends as the intervention. However, we agree that in the intervention district, the caesarean section rates could have been influenced by other program elements like advocacy for the utilization of maternity services, training of health workers as well as adequate medical supplies from the project, although we feel these would not have caused a significant increase without the free ambulance service and mobile phone communication between facilities.

Conclusion

Providing reliable communication and 24-hour transport services for picking mothers with complications during pregnancy, delivery and/or post-partum from primary health care facilities to

the hospital increased access to and utilization of emergency obstetric care services and improved the process indicator CSR towards reducing maternal mortality in Uganda. There is need for more studies designed to assess the effect of improved communication and transport services of stillbirths at population level. In addition, there is need for more investment geared towards improving documentation and record keeping for improved maternal and neonatal health outcomes.

Competing interests

None

Acknowledgments

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Authors' contributions

SM and TT participated in the conception and data analysis. SM, PL and TT participated in design and implementation. SM drafted the manuscript. HW, PL and TT reviewed the manuscript. All the authors approved the final manuscript.

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A qualitative study on barriers to utilisation of institutional delivery services in Moroto and Napak districts, Uganda: implications for programming

With a population that is about 11% of the world population, Sub-Saharan Africa has half of maternal and child deaths. Partly as strategies to meet the Millennium Development Goals (4 and 5), numerous interventions have been implemented to combat mother and infant mortality, with special attention to health services for skilled attendance at birth. Why do the majority of women in low and medium-income countries continue to give birth outside of institutional healthcare services, increasing the risk of death?

The study, published in *BMC Pregnancy and Childbirth*, tried to answer this question. Analyzing data collected in the Moroto and Napak districts of Uganda (where hospital births in 2010 were 19% and 10%, respectively), the authors found a number of barriers, related to four areas: socio-cultural factors, perceived needs and benefits, economic inaccessibility and physical inaccessibility, with the latter two most dominant.

This was the first qualitative study published about the barriers to hospital delivery in the Karamoja region. Despite numerous limitations, the study deserves credit for identifying the main reasons that women do not give birth in hospitals. On the basis of these factors, the authors highlight the need for strategies targeted at alleviating poverty, improving infrastructure, raising awareness about health, and most importantly forging a dialogue between healthcare institutions and traditional birth attendants. Only a comprehensive approach considering all of these factors that lead to significant results and increase access to institutional healthcare services to directly lower the high maternal mortality rate.

Predictors of treatment failure in HIV-positive children receiving combination antiretroviral therapy: cohort data from Mozambique and Uganda

RESEARCH ARTICLE

Open Access

A qualitative study on barriers to utilisation of institutional delivery services in Moroto and Napak districts, Uganda: implications for programming

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Abstract

Background: Skilled attendance at delivery is critical in prevention of maternal deaths. However, many women in low- and middle-income countries still deliver without skilled assistance. This study was carried out to identify perceived barriers to utilisation of institutional delivery in two districts in Karamoja, Uganda.

Methods: Data were collected through participatory rural appraisal (PRA) with 887 participants (459 women and 428 men) in 20 villages in Moroto and Napak districts. Data were analysed using deductive content analysis. Notes taken during PRA session were edited, triangulated and coded according to recurring issues. Additionally, participants used matrix ranking to express their perceived relative significance of the barriers identified.

Results: The main barriers to utilisation of maternal health services were perceived to be: insecurity, poverty, socio-cultural factors, long distances to health facilities, lack of food at home and at health facilities, lack of supplies, drugs and basic infrastructure at health facilities, poor quality of care at health facilities, lack of participation in planning for health services and the ready availability of traditional birth attendants (TBAs). Factors related to economic and physical inaccessibility and lack of infrastructure, drugs and supplies at health facilities were highly ranked barriers to utilisation of institutional delivery.

Conclusion: A comprehensive approach to increasing the utilisation of maternal health care services in Karamoja is needed. This should tackle both demand and supply side barriers using a multi-sectorial approach since the main barriers are outside the scope of the health sector. TBAs are still active in Karamoja and their role and influence on maternal health in this region cannot be ignored. A model for collaboration between skilled health workers and TBAs in order to increase institutional deliveries is needed.

Keywords: Traditional birth attendants, Maternal health, Rural health, Pastoralist health care

Background

Each year, about 1.1 million newborns and 179,000 mothers die in sub-Saharan Africa [1,2]. Half of the world's maternal, new-born, and child deaths occur in Sub-Saharan Africa, yet this geographic area has only 11% of the world's population [3,4]. The millennium development goals (MDGs) were adopted to support the improvement of social and economic conditions in the world's poorest countries by 2015. While most countries have made some progress with some of the MDGs, the

progress towards achieving MDG4 (reducing child mortality) and MDG5 (reducing maternal mortality and improving maternal health) has been uneven and the pace is too slow to meet set targets in most African countries [5]. Interventions to prevent maternal and newborn deaths are available and well known [6-9]. Of great significance in reduction of maternal and neonatal mortality is delivery care by a skilled provider [3,10,11]. Skilled attendance at delivery is arguably the single most important factor in preventing maternal deaths [10,12]. However, many women in low- and middle-income countries still deliver outside health facilities for various reasons.

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Determinants of utilisation of maternal care services have been widely investigated both qualitatively and quantitatively in different settings [10,13,14]. Whereas some determinants can be generalised, others are context specific [14,15]. The practical factors influencing one behaviour are often different to those influencing another behaviour and the most effective interventions will be those directed at changing specific behaviours [10,16]. Interventions for the reduction of perinatal and maternal mortality tend to focus on the skilled birth attendants and health facilities.

In Karamoja, the prospect of all births taking place within a health facility with skilled health personnel is still far from becoming reality; traditional birth attendants (TBAs) attend to a significant number of deliveries. Karamoja is a semi-arid and vulnerable region in North-East Uganda [17,18]. The region has consistently demonstrated the nation's lowest scores on key development and health indicators. In this region for example, coverage for skilled birth attendance and institutional delivery are 31% and 27% compared to the national averages of 58% and 57%, respectively [19]. Over 45% and 58% of men and women aged above 5 years have no formal education compared to the national averages of 12.5% and 20%, respectively [19]. Doctors with Africa CUAMM, an Italian non-governmental organisation, has been operating in Karamoja for about 30 years; working with district health offices and health facilities. The organisation has adopted the continuum of care approach as its main health service delivery strategy in its interventions [20].

Recent improvements in the policy environment in Uganda, rising socio-economic status and improvements in security have not resulted in robust increases in utilization of obstetric services at health facilities or a significant reduction in maternal deaths [21]. This study was carried out in order to identify barriers to utilisation of institutional delivery care services in Moroto and Napak districts in Karamoja.

Methods

Study area

Karamoja region, near the border with Kenya, occupies an area of 35,007 Km² and has a population of 1,074,600. This study was conducted in April 2010 in Moroto and Napak districts. The two districts, with a total area of 8,516 Km², had a population of about 270,650 in 2010. Although both districts are predominantly rural, Moroto District hosts Moroto town which has an urban/peri-urban population of about 11,600. Moroto town is the administrative headquarters of Karamoja Region and has a regional referral Hospital for the entire Karamoja. Most parts of Napak District have a flat terrain but parts of Moroto District are mountainous making them difficult to access even by car. Both districts are inhabited

by Karamajong people whose main sources of livelihood are nomadic pastoralism and subsistence crop farming.

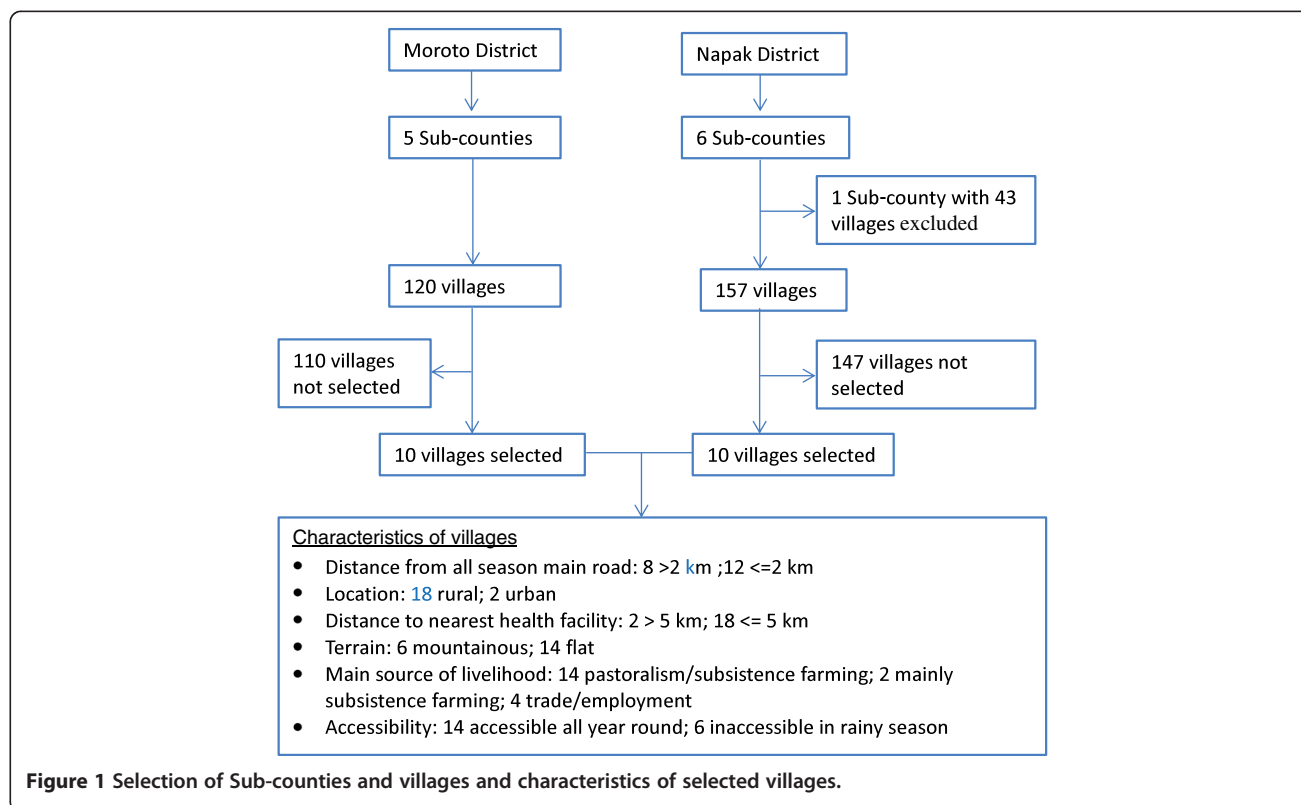
In Uganda, districts are subdivided into sub-counties, then parishes and villages. At the time of the study, Napak District had 6 sub-counties (Iriiri, Lokopo, Lopei, Lotome, Matany and Ngoloriet) and 200 villages whereas Moroto District had 5 sub-counties (Katikekile, Nadunget, Rupa, Northern Division and Southern Division) and 120 villages [22]. The districts had 61 nurses/midwives of different cadres, 11 doctors, 19 clinical officers and about 315 TBAs. In 2010 only 19% and 10% of deliveries took place in health facilities in Napak and Moroto districts, respectively [23], with most women delivering at home, attended to by either family members or TBAs. About 49% and 59% of the population in Moroto and Napak districts, respectively, is within five kilometres of a health facility. However, some of the health facilities are level II Health Centres which typically don't offer maternity services. During rainy seasons most parts of the districts become inaccessible by motor vehicles due to muddy roads.

Study population

The study was conducted in the catchment communities of health facilities in Moroto and Napak districts. These two districts were purposively selected because they were targets of a planned intervention to increase institutional delivery service by Doctors with Africa CUAMM. In consultation with district health authorities, twenty villages (ten in each district) located in 10 different sub-counties were selected purposively, to reflect the different geographic and socio-demographic characteristics of the communities in the districts. Figure 1 summarises the selection of villages and characteristics of the selected villages. In the selected villages, all women who had delivered in the past 5 years and their partners were eligible for the study.

Study design and data collection

Data were collected through participatory rural appraisal (PRA). A total of 887 adult participants (459 women and 428 men) were recruited to participate in the PRA sessions. Participating villages were visited a day before the study and with the help of village leaders, potential participants were verbally invited to participate in the study the following day. The PRA data collection team consisted of a supervisor, two facilitators and two note takers. The supervisor and facilitators were experienced in PRA methodology having conducted similar studies in the same area in the past. The supervisor (co-author RML) further conducted a short training for facilitators and the note takers; covering the PRA methodology, the study objectives and a review of the tools. In order to overcome cultural factors that would limit freedom of



expression, participants were divided into male and female groups. A male facilitator guided the male group while the female group was led by female facilitator. All members of data collection team were natives of the study districts and had a good understanding of the local culture and language. Two PRA sessions per group were held in each village and each session was made up of about 20 participants and lasted for about 3 hours. The sessions were held in public spaces selected by the communities, such as under trees and in local school buildings. Tools used during the sessions included community resource maps, Venn diagrams, matrix ranking, daily routines, and seasonal calendars. During the sessions, information on barriers to utilisation of maternal health services in the districts was collected using an open ended question guide which allowed for free discussion of the participants’ perceptions. During the discussions, the two note takers independently took notes. The discussions took place at alternate times for the male and female groups to allow the supervisor to attend both of them and also take notes. All notes were written in English as it was found to be easier to do so than to write in Karamojong (the local language). In case of lack of clarity, immediate clarification was sought. The main topics included in the question guide were: i) traditional practices and beliefs during delivery; ii) family support and decision making on health

services during delivery; iii) the role of TBAs; iv) perceived quality of care and fee for services used; v) obstacles when using trained attendants’ services; vi) experience of delivery (including the services provided by the delivery attendants); and vii) reasons for a delivery outside a health care facility.

Matrix ranking was performed by asking participants to list main reasons why women in the village don’t deliver in health facilities. Participants were then asked to use stones to assign a score to each reason to reflect the relative weight of the reason in preventing women from using skilled birth attendants. One stone represented a weight of one. A literate member in the group facilitated the scoring exercise which was done by consensus among group members. Locally prepared refreshments were provided at the end of PRA sessions. No cash incentives were provided.

Ethical considerations

This study was approved by the National Bioethics Committee at Uganda National Council for Science and Technology and by the Moroto District Health Management Team. Because most PRA participants were illiterate, and given that they participated in the study in groups, verbal informed consent was obtained from each PRA group after an explanation about the study.

Data analysis

Data were analysed using deductive content analysis [24]. At the end of each PRA session, the study team reviewed, edited and harmonized the notes taken. They then read through the notes several times, triangulated the data collected from men and women groups, identified and coded all recurring issues by consensus and summarized them in a table. The issues were grouped under four themes in an adapted framework: (1) socio-cultural factors, (2) perceived benefit/need of skilled attendance, (3) economic inaccessibility and (4) physical inaccessibility [10]. The themes formed the framework for reporting. Scores from matrix ranking were summarized using a spider plot to reflect the perceived relative significance of each barrier identified by participants in preventing utilization of delivery services. Scores for each barrier at

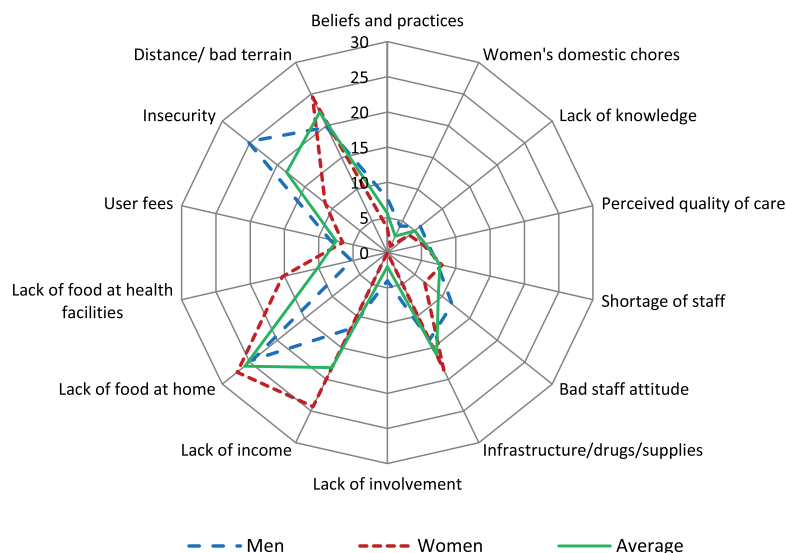
each site were rescaled to take values of 0–5 and then summed up.

Results

This study revealed a range of perceived barriers towards utilisation of institutional delivery services in Moroto and Napak districts. Table 1 presents a summary of the results and the details are presented below according to the four themes framework. The results of matrix ranking by study participants are presented in Figure 2. Women gave higher scores than men to lack of food at health facilities and lack of income. Men tended to give higher ranking than women to insecurity and bad staff attitude. Overall, factors related to economic and physical inaccessibility and lack of infrastructure, drugs and supplies at health facilities were the highly ranked barriers to

Table 1 Barriers to utilisation of skilled delivery services in Moroto and Napak districts, Uganda

Barrier	Findings
I. Socio-cultural factors	
Beliefs and practices	Cowards deliver at health units, beliefs related to disposal of placenta; cutting and tying of umbilical cord and expressing fear during delivery, delivering position, delivery is a private family issue, the ceremony of showing the baby to the public, the ceremony of naming a child, administration of traditional herbs
The role of men	Perceive maternal health as a women's issue. Men are less emotionally and practically involved in maternal health
Women's domestic chores	Nobody to prepare food at home and take care of children left behind while the woman is admitted
II. Perceived benefit/need	
Lack of knowledge	Lack on information about benefits of delivering in health units, low education status of women, lack of health education
Infrastructure, drugs and supplies	Lack of beds; light at night; drugs; supplies; equipment and water.
Shortage of staff	Facilities not equipped to handle complications, few staffs to attend to women, long waiting time
Perceived quality of care	
Bad staff attitude	Disrespectful staff, staff coming to work drunk or late, poor relationships between community and health staff, harsh treatment during delivery
Role of the TBAs	TBAs are acceptable, accessible, and affordable and offer a range of services. Confidence in trained TBAs. Women don't deliver at health facilities unless they have been referred by TBAs.
Lack of involvement	Community not consulted about where to build health facilities, lack of information about facility catchment areas
III. Economic inaccessibility	
Lack of income	Poverty, costs of drugs and supplies, cost of ambulance, transportation costs
Lack for food at home	Lack of food at home for the family
Lack of food at health facilities	Lack of food for women delivering in health facilities and their caretakers
User fees	User fees at some health facilities
IV. Physical inaccessibility	
Insecurity	Inter-clan feuds and cattle rustling, insecurity at night, fear of the military
Distance/bad terrain	Long distance to health facilities, bad terrains, flooding of river valleys and muddy roads during rainy seasons
Lack of transportation means	Lack of reliable means of transportation even if women had money to pay for transportation



*The role of traditional birth attendants and the role of men were not ranked by participants as they did not identify these factors as barriers. These two factors emerged as barriers through our data analysis.

Figure 2 Relative scores of perceived barriers to utilization of delivery services among men and women in Moroto and Napak districts – scores obtained from matrix ranking*.

utilisation of delivery care services. Only a few differences in the results were noted between the two districts: physical inaccessibility due to insecurity and bad terrain featured strongly in Moroto District whereas poor staff attitude and user fees came out more frequently in Napak District.

Socio-cultural factors

Under this theme, the barriers identified were categorized as: i) traditional beliefs and practices, ii) the role of men and iii) women’s chores.

Traditional beliefs and practices

Herbs were believed to both prevent and treat a variety of problems during pregnancy and childbirth. They were believed to ease pain, to facilitate delivery and to avoid infection, as revealed in this quote:

“There are local herbs to be administered for milk production and for stopping bleeding and it is inappropriate to give these herbs together with modern medicines” (a woman in Loyaraboth village, Katikekile Sub-county, Moroto District).

Some participants declared that they preferred to give birth at home because the placenta needed to be handled with care, since the disposal of it is related to traditional rituals and is associated with luck and misfortunes.

“After pregnancy the placenta needs to be put in a certain location, to avoid evil spirits and bad omen” (a man in Nakiloro village, Rupa Sub-county, Moroto District).

Participants also voiced cultural issues related to the handling of the umbilical cord. Tradition required that the umbilical cord of a baby girl be cut with a knife (the one used by women to prepare food), while the one of a baby boy is to be cut with an arrow (the one typically used by a man/warrior), but this could not be done in the health unit. It also emerged that the tying of the umbilical cord was a preserve of particular individuals as highlighted in this quote:

“Only particular women of the village are allowed to tie the umbilical cord, with a special fibre from the bark of a tree, otherwise something wrong may happen. This is not possible in health facilities” (a woman in Naoi village, Lopei Sub-county, Napak District).

The ceremony of bringing the newborn to the public is interfered with when a child is born at the health unit because the baby is exposed immediately after birth, and not kept in a particular house until the ceremony is done. It was believed this may bring misfortune. Some women said that they were used to their own traditional methods/positions of delivery (kneeling, squatting, sitting and lying on the side) which were disregarded in

health facilities; therefore some of them preferred to deliver at home. Some women said the family perceived the health staff as strangers, as manifested in this citation:

“Delivery is a family matter and mothers do not trust strangers with their babies” (a woman in Natapar Apalemu village, Lotome Sub-county, Napak District).

It was believed that women should not show signs of fear during labour pains. But in case this happened in a health unit, external people would see it, delaying the delivery and bringing shame to the family. This perception is captured in this statement:

“If the mother shows fear during delivery and this is noticed by the people of the village, this can delay the delivery and result into complications” (a woman in Kobulin village, Iriir Sub-county, Napak District).

Child naming norms also emerged as a barrier to utilizing institutional delivery. In some villages the ceremony of giving the right name to the baby involves elderly women well conversant with the names of the clan. Before the baby suckles for the first time, a list of names is mentioned, and the newborn takes the name mentioned at the very moment when the baby touches, with the mouth, the breast of the mother for the first time.

The role of men

Participants gave the impression that a man is the head of the household and the first decision maker. Nevertheless, maternal and child health care in the study districts was seen as a “women’s issue”. Men knew little about pregnancy and delivery, and were not fully involved. In several places, it emerged that, for the few women who make it to health facilities to deliver, the role of men was merely that of “sending” their partners to health facilities. The involvement of men appeared to be limited; both practically and emotionally. In some villages, men’s PRA groups demonstrated lack of emotional involvement by mentioning about the “cowardice” of women who fear to deliver at home and go to the health units.

“Some coward women who cannot deliver by themselves go to that facility to be assisted to deliver” (a man from Loyaraboth village, Katikekile Sub-county, Moroto District).

Women’s domestic chores

Women preferred to deliver at home to allow them to continue with family responsibilities like taking care of children and preparing meals. It was mentioned that women, especially those with other young children at home, disliked being admitted in health facilities because doing so

caused suffering to children left at home with no one to take care of them, as highlighted in the statement below:

“It is not good to leave other children alone at home with nobody to prepare food for them and go to stay in a health facility for two days to deliver. If you deliver at home you are able to continue to take care of your family” (a woman in Kadilakiemy village, Rupa Sub-county, Moroto District).

Perceived benefit/need

The barriers identified under this theme were categorized as: i) lack of knowledge, ii) infrastructure, drugs, supplies staff shortage and perceived poor quality of care, iii) bad staff attitude, iv) the role of TBAs and v) lack of community involvement.

Lack of knowledge of the benefits of facility utilisation

Women did not deliver in health units because they didn’t know the benefits of doing so. The underlying cause of this problem was the low education status of women and a lack of health education on maternal health in their communities. Participants felt that there was a general lack of knowledge on maternal and child health issues in the communities in general and among women specifically.

Lack of infrastructure, drugs, supplies, staff and perceived poor quality

At some study sites, participants complained of a chronic lack of drugs and supplies at health facilities. As a result clients were always referred to private clinics and drug stores to buy drugs and supplies using their own money. This made them shy away from using health facilities. At some sites, women also complained of inadequacy of beds and beddings for mothers and children; a problem that often resulted into them sleeping on the floor. They also noted availability of only one delivery bed at health facilities resulting into problems in case two mothers are to be attended to at the same time as highlighted below.

“There are not enough beds for mothers and their babies in most health facilities. Our nearest facility has only one bed in the maternity unit. Supposing two women come to deliver at the same time, what will one of them use? The facility also doesn’t have enough blankets and something to cover the baby” (a woman in Kobulin village, Iriir Sub-county, Napak District)

Lack of light at night was also cited as a reason for not utilizing health facilities especially if the mother had to stay overnight. Participants also noted lack of water supply at some health facilities. The quality of care at some health facilities was thus perceived to be poor. Besides

lack of infrastructure, equipment and supplies, participants further noted that in some health facilities, there was only one staff to handle many patients. This was perceived to be an important factor that compromised the quality of care delivered, and increased waiting hours. Additionally, participants felt that some facilities were not well equipped to handle complicated deliveries.

Bad staff attitude

Bad staff attitude towards clients was mentioned in some communities as a reason for low utilization of health services in general and maternity services in particular. Some participants said their communities did not have a good relationship with staff of their health facility. They said health workers had a negative attitude towards them and did not attend to them with respect. Health workers were reported to be very rude which scared away mothers and made them to deliver at home. These quotes from two participants in different villages captures the issue of perceived bad staff attitude towards clients:

“There is one health staff at our health facility who is rude, at times she beats mothers, and also refuses to give treatment to the patients” (a man in Naoi village, Lopei Sub-county, Napak District).

“The in-charge of the health unit is not cooperative with the patients and the staff. We have been appealing to the Government for the last five years, to transfer or to dismiss, but in vain...” (a woman in Kobulin village, Iriir Sub-county, Napak District).

Role of the TBAs

The communities considered TBAs to be very important. Their services were accessed in the prenatal period and at the time of delivery. The participants said TBAs served multiple roles: giving advice especially to young women, sensitizing the community on maternal health issues, providing antenatal care, helping mothers at the time of delivery, administering local medicines and herbs as first aid since the health centre is far, massaging the pregnant women, referring complicated cases and escorting mothers and their newborns to health units for registration and immunizations. With TBAs being easily accessible, affordable and offering a range of services, they were preferred over health facilities in care seeking especially during delivery, as demonstrated by these statements:

“We prefer TBAs, they are understanding and help us in many ways. If a woman is pregnant they visit and palpate the abdomen to see that the baby is fine and provide information on how to take care of the pregnancy. TBAs are also able to solve any problem

that occurs during pregnancy. When labour begins a nearby TBA is called to help the woman to deliver. Sometimes when there is a problem, and she has tried and failed, she refers the woman to the health facility” (a woman in Kadilakiyen village, Rupa Sub-county, Moroto District).

“TBAs are of great help to mothers especially those who deliver at night and cannot walk to the hospital due to insecurity and the long distance to the hospital” (a woman in Kokeris village, Matany Sub-county, Napak District).

At most PRA sites, participants perceived that the role of TBAs was to attend to deliveries at home and refer mothers to health units for delivery only if a complication developed as revealed in this statement.

“In our village, mothers do not use the nearby health facilities for delivery unless they are referred by TBAs” (a woman in Lotorir village, Nadunget Sub-county, Moroto District).

However, further discussion on the services provided by TBAs brought up some challenges faced by these service providers, such as lack of equipment, lack of transport to refer complicated cases, limited knowledge, risk of infections, poor cleanliness and lack of motivation. In line with this, participants said that there was need to equip TBAs with necessary skills and supplies to enable them to perform their roles better as captured in this quote:

“There is need for delivery kits to be given to TBAs because presently, they have only gloves and cotton” (a woman in Kangolechin village, Ngoloriet Sub-county, Napak District).

Although the discussion on TBAs raised some criticisms, overall participants appreciated the role of TBAs and did not perceive them to be part of the problem and hence they did not include them in the matrix ranking (Figure 2).

Lack of community involvement

Participants in some areas felt that they were not involved in deciding where to locate health units. They felt that some of the current health facilities had been built with little consideration of where most people stayed. Some communities did not have an idea about the “health facility catchment areas” as always referred to by health workers. This was demonstrated by some participants wanting to have health units in their villages, despite having a health unit nearby.

Economic inaccessibility

The barriers identified under economic inaccessibility were categorized as: i) lack of income, ii) lack for food at home, iii) lack of food at health facilities and iv) user fees.

The problems of lack of income, lack of food at home and at health facilities were ranked highly by women than men (Figure 2). Participants noted that some health facilities, the private-not-for-profit, charged fees for delivery services, and this affected the decision to deliver at those units. Although government health facilities were said to be free of charge, they had many hidden costs. Some health facilities required women to buy supplies such as cotton wool, soap, basins, clothes and polythene paper to use during or after delivery.

The issue of lack of food at health facilities for mothers admitted for delivery care came up at most PRA sites. At some facilities, mothers and their accompanying attendants were required to make their own feeding arrangements. With shortage of food at home, or nobody at home to prepare the food, it was difficult for women to feed during admission; additional feeding costs were incurred by women delivering in health facilities. The quote below highlights the problem of food in health facilities:

"If you want to increase deliveries at the health facilities you have to distribute food for delivering mothers and their attendants" (a woman in Kangolechin village, Ngoloriet Sub-county, Napak District).

The cost of the ambulance (20,000 Ugandan shillings, about 8 US \$) was perceived to be too high, and well beyond the means of many families as expressed in the quote below:

"We need an ambulance in Morulinga Health Centre to take us to Matany at a cheaper fee. We cannot afford the current fee they charge us for using the ambulance" (a woman in Kokeris village, Matany Sub-county, Napak District).

Financial costs were exacerbated by high poverty levels and famine. Poverty was associated with lack of job opportunities to generate income and promote self-reliance. Participants went further to provide suggestions on how to solve the problem of poverty in the region such as provision of farm inputs to enable them to cultivate crops and support with setting up income generating activities.

Physical inaccessibility

Regarding this theme, the barriers identified were categorized as: i) insecurity, ii) distance/bad terrain and iii) lack of transportation means.

Insecurity

Insecurity theme came up in all study sites and in both men and women PRA groups. Insecurity prevented mothers from attending deliveries in health units especially when labour began at night. Inter-clan feuds result in the displacement of some communities to areas that are far away from health units exacerbating the problem of geographical accessibility. During one of the PRA sessions in Naoi village, Lopei sub-county, Napak District, one woman gave a personal testimony of how she lost her baby due to insecurity.

"The baby developed complications but I could not go to the health facility for security reasons. At that time there was an inter-clan feud. Women belonging to my clan were prevented from accessing care in the health unit because it is located in the other clan's territory. Consequently, I lost my baby after delivery".

Although the Ugandan government had deployed the army in the area to maintain security, the community felt terrified by the presence of the military. They said the army was more concerned with protecting livestock. Men gave a higher ranking to insecurity compared to women (Figure 2).

Distance, transportation and bad terrain

Long distance to health units, rough terrain and poor road network were cited as problems in accessing care at health facilities in most of the PRA sessions. Additionally, most health facilities did not have an ambulance to transport women during emergencies. The problem of terrain featured more in mountainous regions. Participants said it was very difficult for a mother to walk up and down the mountains during labour, putting her life and that of her baby at risk.

"...expectant mothers with complications die before reaching the health unit on the other side of the mountain; there are no means of transport in this mountain, and the health unit is far..." (A woman in Loyaraboth village, Katikekile Sub-county, Moroto District).

"Please, finish constructing this nearby health unit to solve the problem of walking for a long distance to get to a health unit" (a man in Lotirir village, Nadunget Sub-county, Moroto District where there is a HC II that does not offer normal delivery care).

The problem of rough terrain and poor road network became more severe during rainy season when roads in villages become impassable, and dry river beds become flooded making them impossible to cross. It was also

noted that in some places even if women had money to pay for transportation, reliable means of transportation were lacking.

Discussion

This study identified key perceived barriers to utilisation of institutional delivery care in Moroto and Napak districts in Uganda. Insecurity, lack of income, socio-cultural factors, long distances and poor terrain, lack of food at home and at health facilities, lack of basic infrastructure, drugs and supplies, availability of alternative providers (TBAs), perceptions of poor quality of care at health facilities and lack of participation in planning for health services were the main barriers to utilisation of delivery services. The problems of poverty and lack of food at health facilities were considered a major obstacle. Other reasons found were the trust and tradition that TBAs engendered; they shared the same culture and were long-serving members of the community. Our study found that home delivery was considered more convenient for some women because of their responsibilities to children or other household members. As observed by Kyomuhendo, in most communities in Uganda, the woman who delivers by herself is highly respected. On the contrary, those who deliver by caesarean section and those who die in childbirth are perceived to be weak. These perceptions partially help in understanding why women decide to deliver at home [21].

Socio-cultural factors

This study confirms the implication of several beliefs recognized in previous studies in influencing choice of delivery site in Uganda [21,25-27]. For example, women were reported to be shy about exposing their genitals during child birth and hence preferred squatting or kneeling [21,26,27]. Because these different delivery positions are not offered in health facilities in Uganda some women preferred to deliver at home. This is also the case in Moroto and Napak. Cultural sensitivity by health workers and accommodation, as much as possible, of the local cultural practices in service delivery could attract women to deliver in health facilities. For example, women could be allowed to deliver in their preferred birthing positions and the cultural practices related to the handling of umbilical cord and placenta by family members could be permitted at health facilities with modifications to ensure hygiene.

There is a growing awareness of the need to involve men in all stages of delivery. Men need to be targeted as key allies in improving institutional delivery utilisation [28,29]. Current strategies in Uganda tend to focus mainly on women, yet it is men who provide financial support and frequently also make decisions to seek care [30]. Men in Napak and Moroto should be mobilised to participate

in maternal health issues and provide support to their pregnant spouses for instance through existing social networks such as men's groups, religious setups, and through public gatherings. The community needs to be involved in the future planning for maternal and neonatal health care services. It has been suggested that a community-based approach to dialogue among women, parents and communities to increase "demand" for institutional deliveries [30,31], coupled with an improvement in the quality of delivery services, could improve attendance in Uganda, as it did for example in Nepal [32].

Perceived benefit/need

A lack of awareness about the importance of skilled delivery attendants coupled with the non-recognition of the need for health services emerged from this study. Childbirth is often perceived in Uganda (and in other countries) as a normal event rather than an event which requires medical attention [13,21,33]. The lack of knowledge about danger signs can lead to delays in recognition of complications. Health promotion strategies can improve community awareness of the importance of skilled delivery attendance. This could be done through antenatal clinics [33,34] since almost 97% of women in Karamoja attend at least 1 antenatal care visit [19], or community health education [35].

Considering the barriers of access to health facilities, it seems quite understandable that TBAs' services are widely used. The high number of TBAs and the low number of professional health workers in the districts make TBAs easily accessible. As observed in other studies, TBAs' kind and caring approach and their social and emotional closeness to the community, which creates loyalty and understanding, is highly appreciated [25,33]. However, in 2009 the Ugandan Ministry of Health officially banned TBAs from conducting deliveries. After training in safe motherhood and referral management, willing TBAs were recruited into Village Health Teams (VHTs) [36]. The ban however has had little impact; many deliveries, mostly in rural areas, are still carried out by TBAs [37]. Among other impediments, a main obstacle of incorporating TBAs into VHTs is their loss of income. VHTs members are volunteers while TBAs are paid either monetarily or materially. So they cannot quit their 'trade' that easily.

In a recent meta-analysis of studies of deliveries assisted by TBAs, Wilson *et al.*, found that offering training, support, and resources to TBAs had a favourable impact on neonatal and perinatal mortality [38]; they provide evidence that trained and supported TBAs can contribute to reducing perinatal mortality. The authors recognized the heterogeneity of interventions in the included studies; however they argue that the consistency of the individual studies' findings supports the message that TBAs make a difference [38,39]. Considering that training of TBAs has a

positive effect on perinatal outcomes, this strategy is worth reconsidering in Uganda, particularly in areas where health care facilities and personnel are still lacking and the utilization of TBAs is high. TBAs could be trained to support community-based care of the newborn and postpartum care of the mother, accompanied by a strong supervision by professional health workers. A study in Uganda has shown the benefit of training TBAs to refer cases of obstructed labour and fistulas but the authors note that for full efficacy of the TBA intervention, training must be accompanied by greater collaboration between health workers and TBAs [40]. Banning TBAs risks creating an operational pool of TBA practitioners without support of training and supervision and could break a linkage between the community and the formal health system.

The unwelcoming attitudes of health workers towards mothers may discourage institutional delivery. An intervention to promote better staff attitudes, such as using the patient-centred approach to care [41], and good interpersonal communication when dealing with service users [42] is warranted. Although change may be difficult to achieve, an intervention to improve the quality of maternity care could be rewarding, as observed in other studies in Uganda [25]. There is also need to promote regular dialogue between the community and the health workers to gather feedback on service delivery through for instance the health unit management committees. Lack of equipment, drugs, supplies and poor infrastructure can compromise both the perceived and the actual quality of care provided. The government and development partners need to increase resource allocation to ensure availability of these health system inputs in Moroto and Napak.

Economic inaccessibility

Poverty appears to be a major factor influencing people's decision-making about health services, as observed by other authors [33,43,44]. Since the main economic activities in Karamoja region is peasant farming and pastoralism, which have low earnings, the minimal costs related to institutional delivery were more likely to be unaffordable. Although user-fees were officially abolished in Uganda in 2001 [45], in practice some health facilities charge fees for delivery services. In some cases this is combined with additional costs for drugs and other medical supplies. There is need for the Ministry of Health to enforce the user fee policy through sufficient resource allocation and supervision. Women require more support in setting up income generating activities to improve household incomes. Experience from Bangladesh shows that women who are helped with loans from micro-credit programmes to start small income generating activities improve their household incomes and consequently their health care seeking behaviour including skilled birth attendance [46]. A deprived financial situation

affects one's ability to seek the most appropriate health care services [33,44,47].

Physical inaccessibility

Poor road conditions and lack of transportation are associated with increased costs of visits to health care providers. This is a typical problem in remote rural areas in Africa. In Karamoja, this problem is aggravated by the unwillingness of women to make long trips at night, as a consequence of insecurity. Insecurity was ranked higher by men compared to women probably because besides preventing delivery service use, it directly affected men: they were more often targets of any insecurity crackdown by security agencies. In Uganda, rural communities are particularly affected by geographical barriers mainly because health facilities are mostly located in towns along main roads. A lot of progress to increase geographical accessibility by building more facilities has however been made in the country in the recent past with the proportion of households living within 5 km radius to a health facility having increased from 57% in 2000 [35] to 72% in 2010, and with a target of 80% by 2015 [48].

Strengths and limitations

To the best of our knowledge this is the first ever published qualitative study from Karamoja region on barriers to institutional delivery. This study collected data from both men and women, and by triangulating the findings from the two groups, a comprehensive view of the perceived barriers to institutional delivery has been obtained. Additionally, purposive sampling ensured that the results obtained captured views of participants of different geographic and socio-demographic characteristics in the districts. This study has a number of limitations. The PRA sessions were not audio recorded as doing so would have inhibited free speech especially if it touched on insecurity related issues. Even though efforts were made to write down all important issues that arose during the discussions, some data might have been lost during the process. Data collectors however tried to minimize this, by reading back their notes to the participants and seeking clarification on unclear statements. Additionally, we did not use computer software to analyse the data and this might have led to loss of information. Despite these limitations, the findings of our study fit well into the main themes of barriers to institutional delivery use [10].

Conclusions

This study has identified socio-cultural factors, perceived benefit/need, economic and physical inaccessibility issues as reasons why women don't deliver at health facilities. Our findings suggest that: i) poverty alleviation strategies will contribute to improving access to and utilisation of

maternal health care services; ii) the provision and maintenance of infrastructure may improve utilisation of maternal health care services, especially for communities living in remote areas; iii) health promotion programs to increase community awareness about safe delivery services may increase demand for maternal health services; iv) there is need to adopt a more inclusive approach to increase the accessibility of maternal health care services; v) in dealing with service users, health workers need to change their attitudes and improve interpersonal communication in a culturally sensitive manner; and vi) with many births taking place at home and with the high regard the community has for TBAs, involvement of TBAs in delivery of maternal health care is still important. Because they won't disappear until every woman has access to a skilled health professional, there is need to define a model for a strong collaboration between professional health workers and TBAs in order to increase institutional delivery. The findings of this study provide local evidence that could help policy makers to develop strategies for the improvement of maternal and child health services.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

CW, PL, GP, FM and GD conceived the study. CW, GD, GP, PL, AA, AM and KO designed the study. RML collected data. RML, CW, GQ and RT contributed to data analysis. CW, GQ, PL, AM and KO drafted the manuscript. All authors made significant contributions to the interpretation of the data and in revision of the manuscript. All authors approved the final manuscript and agree to be accountable for all aspects of the work.

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UGANDA

MOZAMBIQUE

PAPER 89

- **Title:** Predictors of treatment failure in HIV-positive children receiving combined antiretroviral therapy: cohort data from Mozambique and Uganda
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Predictors of treatment failure in HIV-positive children receiving combination antiretroviral therapy: cohort data from Mozambique and Uganda

The increase in treatments for people affected by HIV virus has led to a global reduction of new childhood infections. Nonetheless, particularly in settings with limited resources, the level of emergency is still high, despite the efforts to expand access to combined antiretroviral therapy (cART). One of the main causes of the still high percentage of HIV-infected children is delay in identifying treatment failure to then go to the second line of treatment. This delay causes drug resistance and a resulting overall difficult in combating the infection.

Starting from a comparative analysis of therapies implemented in hospitals in Beira, Mozambique and Nsambya, Uganda between 2005 and 2009 with the support of the NGO Doctors for Africa CUAMM and the Associazione Casa Accoglienza alla Vita Padre Angelo, the authors of the article, published in 2014 in the *Journal of the Pediatric Infectious Diseases Society*, sought to identify cART failure predictors in children in two situations.

Treatment failure is due to factors such as being simultaneously infected with tuberculosis or other WHO stage 4 defining diseases. Reasons for delay in moving to the second line of treatment are difficult to identify, which is to say that it is not clear if the responsibility lies with the healthcare personnel or if it is objectively difficult to identify failures. There are also differences between the two countries, such as the age of the children, the stage of the disease and number of visits. Nonetheless, the conclusion the authors reach by presenting data collected is essential for simplifying clinical and immunological criteria to identify treatment failures and move quickly to the next stage. This is the only way to increase cART effectiveness.

Predictors of Treatment Failure in HIV-Positive Children Receiving Combination Antiretroviral Therapy: Cohort Data from Mozambique and Uganda

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Background. Delays detecting treatment failure and switching to second-line combination antiretroviral therapy (cART) are often observed in human immunodeficiency virus (HIV)-infected children of low-middle-income countries (LMIC).

Methods. An observational study included HIV-infected children attending the Beira Central Hospital (Mozambique) and the Nsambya Hospital, Home Care Department (Uganda) evaluated clinical and immunological failure according to World Health Organization (WHO) 2006 guidelines. Baseline predictors for cART failure and for drug substitution were explored in unadjusted and adjusted Cox proportional hazard models.

Results. Two hundred eighteen of 740 children with at least 24 weeks follow-up experienced treatment failure (29%; 95% confidence interval [CI] 26–33), with crude incidence of 20.0 events per 100 person-years (95% CI 17.5–22.9). Having tuberculosis co-infection or WHO stage 4, or starting a nontriple cART significantly increased risk of failure. Two hundred two of 769 (26.3%) children receiving cART substituted drug(s), with crude incidence of 15.4 events per 100 person-years (95% CI 13.4–17.7). Drug toxicity (18.3%), drug availability (17.3%), and tuberculosis drugs interaction (52, 25.7%) were main reported reasons, while only 9 (4%) patients switched cART for clinical or immunological failure. Children starting lamivudine-zidovudine-nevirapine or lamivudine-stavudine-efavirenz or lamivudine-zidovudine-efavirenz were more likely to have substitute drugs. Increased substitution was found in children with mild immunosuppression and tuberculosis co-infection at cART initiation as well as poor adherence before drug substitution.

Conclusions. Considerable delay in switching to second-line cART may occur despite an observed high rate of failure. Factors including WHO clinical stage and tuberculosis co-infection should be evaluated before starting cART. Toxicity and drug adherence should be monitored to minimize drug substitution in LMIC.

Key words. drug substitution; HIV; children; treatment failure

BACKGROUND

The global scaling up of treatment and care for people living with human immunodeficiency virus (PLWH) has led to a 43% decline in new HIV pediatric infections since 2003, with 330,000 newly infected children in 2011. Despite efforts to expand access to combination antiretroviral therapy (cART), only 28% of eligible children have received it [1]. Expansion of early HIV diagnosis coverage,

prompt cART initiation, and better retention in care remain major goals [2, 3], and the lack of laboratory monitoring frequently observed in low and middle-income countries (LMIC) should not represent a barrier to cART distribution in children [4]. However, optimization of the clinical management of PLWH and prompt diagnosis of treatment failure are becoming increasingly critical in the context of lifelong treatment and limited drug availability.

Although virological failure is widely considered the criterion standard to detect treatment failure, clinical and immunologic parameters are often the only criteria available in LMIC [5, 6]. CD4 cell monitoring has been shown to be a poor predictor of virological failure in treatment-experienced children [7–9], particularly when severely immune-compromised [10]. Studies in LMIC have reported high rates of virological suppression in children up to 5–6 years after treatment initiation [11, 12]; however, treatment failure rates of 10–34% were observed among children after 2–3 years of cART [13–18]. Program reports suggest that only a small proportion of patients on treatment are receiving a second-line therapy, an estimated 4% of adults and 1–14% of children [16, 18–20]. Delays in detecting treatment failure and switching to second-line therapy lead to the development of HIV drug-resistance, compromising subsequent regimens [6, 21]. This is particularly relevant for children, due to the lack of pediatric formulations.

Randomized trials were conducted to evaluate the optimal first antiretroviral regimen for reducing the risk of treatment failure. Findings from the P1060 trial reported an increased risk of failure starting a nevirapine (NVP)-based cART in infants and young children [13, 22, 23]. This was not confirmed by the PENPACT1 trial, where no difference in clinical and virological outcomes were shown between non-nucleoside reverse-transcriptase inhibitors (NNRTI) and protease inhibitors (PI)-based regimens in older children [24]. Data to inform the most durable nucleoside reverse-transcriptase inhibitors (NRTI) backbone in the context of a triple therapy is still limited. Conflicting results were reported concern the use of abacavir (ABC) as first-line regimen: Green et al. suggested that abacavir (ABC) may be preferable to zidovudine (AZT) combination with lamivudine (3TC) [25], while poorer early virological outcomes were recently observed in children starting ABC/3TC-based first-line regimens, compared to stavudine (d4T)/3TC [26, 27]. Identifying optimal regimens is particularly relevant for children with HIV/tuberculosis (TB) coinfection living in LMIC, where NVP is widely preferred to efavirenz (EFV) or a triple NRTI-based regimen, due to its better acceptability and relatively low cost [28].

Drug substitution is often required to optimize antiretroviral treatment [19, 29]. Results from observational studies estimate a probability of cART discontinuation or modification ranging between 2.8% and 20% in adults of LMIC [19, 30–34]. A randomized study conducted in children shows a cART switching/discontinuation rate up to 29% [24]. Acute and chronic toxicity, drug intolerance, poor adherence, and treatment failure remain the major determinants of cART modification [35–38]. Drug costs and/or

being out of stock due to challenges in adequately forecasting and maintaining an effective supply chain have been cited as further reasons for cART discontinuation in LMIC [31, 33].

The aim of this study is to estimate the rate and predictors of cART treatment failure in 2 pediatric cohorts from Mozambique and Uganda during a 5-year follow-up period, and to explore the rate of and factors associated with drug substitution.

METHODS

Setting and Study Design

We conducted a retrospective cohort study among children starting cART between January 2005 and December 2009 at the Beira Central Hospital (HCB) in Mozambique and the Nsambya Home Care (NHC) department of St. Raphael of St. Francis Hospital in Uganda. Two Italian nongovernmental organizations, Doctors with Africa Cuamm (Mozambique) and Associazione Casa Accoglienza alla Vita Padre Angelo (Uganda), partnered with these hospitals to provide pediatric HIV care.

Both programs provided HIV counseling and testing, cotrimoxazole prophylaxis, cART, laboratory investigations, and management of opportunistic infections. Infants and children under 18 months of age, known or suspected to be exposed to HIV, were diagnosed through HIV-1 DNA testing. Patients were considered eligible for cART according to WHO 2006 guidelines [39].

Laboratory examinations including full blood count, liver function tests, creatinine, and CD4 count were required before starting cART, as well as a chest radiograph and acid-fast bacilli testing to exclude TB if suspected. In the absence of contraindications, written consent was collected when enrolling in the programme and before starting cART. Throughout the study, patients were switched to second-line cART when treatment failure was identified following WHO 2006 guidelines [39].

The study was approved by the ethics committees of HCB and Nsambya Hospital and registered by the Uganda National Council for Science and Technology and by the Gabinete Do Director Gerar, Ministerio Da Saude of HCB (Mozambique).

Data Collection. In Mozambique, data were collected from clinical charts and paper registries and entered in the hospital's electronic patient database system. Similarly, in Uganda, routine clinical data were recorded in paper-based patient files and registries and entered into an electronic interface by trained staff.

Children were examined at least monthly during the first 6 months of cART and then every 3 months in Mozambique, while in Uganda monthly visits were

maintained throughout the follow-up according to the project design. Weight and height were measured at every clinic visit. Full blood count, liver function tests, and glucose assays were performed every 6 months, and CD4 counts every 6–12 months. Adherence to cART was assessed at every follow-up visit and defined as “good” or “poor” if the self-reported number of doses was more or less than 95% of expected monthly number of doses. HIV-related clinical events were diagnosed with or without biological confirmation, depending on lab facilities available, while immunodeficiency was classified as mild, advanced, and severe according to the WHO 2006 thresholds [39]. For the treatment failure analysis, the period of follow-up was from cART initiation up to the treatment failure outcome, while follow-up was from treatment initiation to first cART drug substitution for drug-substitution analysis. For children without treatment failure or drug substitution, follow-up was censored at date of death, loss to follow-up (LTFU, defined as missing follow-up visits for more than 6 months), transferred to other clinic, confirmed HIV-negative or aged more than 18 years old, last CD4 measurement, or last anthropometric or adherence record, whichever occurred latest.

Endpoint Definitions and Study Population. Drug-substitution was defined as substitution of one or more drugs of the first antiretroviral regimen for any reason. Reasons for drug substitution were classified retrospectively from the inspection of what was reported by clinicians in patient’s clinical charts. Clinical and immunological failure were defined according to the WHO 2006 criteria, using CD4 measurements and WHO disease stage from at least 24 weeks after cART initiation [39]. Treatment failure, when both clinical and immunological failures were observed, was considered to occur at the earliest of the two events.

For analysis of treatment failure, only children with at least 24 weeks of follow-up post-cART initiation were included to ensure sufficient time for treatment response.

For analysis of cART drug substitution, children who received an ABC component in their initial cART regimen were excluded, as first-line ABC treatment was systematically administered to children diagnosed with active TB and all patients initially on ABC were routinely switched to EFV once the TB infection cleared.

Statistical Analyses. In this intent-to-treat analysis, all children were included from cART initiation, regardless of subsequent modifications. All analyses were conducted in R version 2 (R Development Core Team, Vienna, Austria) and Stata version 12.0 (Stata Corporation, College Station, TX).

For both treatment failure and drug-substitution analyses, frequency distributions and median and interquartile

range (IQR) were used to describe baseline patient characteristics. Baseline characteristics of interest were gender, age at treatment initiation, body-mass index (BMI, $\text{weight}[\text{kg}]/\text{height}^2[\text{m}]$) for age z-score, WHO disease stage, initial cART treatment regimen (also by most potent component), adherence to cART, CD4 count and percent, and immunodeficiency classification. All descriptive analyses were stratified by hospital. Differences in all key variables at baseline between these strata were determined using Pearson’s χ^2 test for categorical variables, the *t*-test for difference in means for baseline BMI for age z-score, and the Wilcoxon rank-sum test for all other continuous variables.

Unadjusted Cox proportional hazards models were used to determine the odds of treatment failure and cART drug substitution. The following variables were considered in a multivariate adjusted Cox proportional hazards model of treatment failure: cART treatment regimen, age, adherence, gender, country of treatment, baseline disease stage, immunodeficiency status, and BMI for age z-score. The following variables were considered in a multivariate adjusted Cox proportional hazards model of cART drug substitution: cART treatment regimen, adherence, classification of immunodeficiency status, WHO disease stage, and age group. A backward-selection procedure was used to create these adjusted models, with a variable being included in the model if it resulted in an improvement in the model fit as defined by the Akaike Information Criterion (AIC).

RESULTS

Between January 2005 and December 2009, 1075 HIV-infected children less than 15 years old began cART in HCB and NHC. Two hundred thirteen (20%) children were excluded from the study due to missing data (Table 1). Children excluded from both treatment-failure and drug-substitution analyses were more likely to be Ugandan ($P < 0.01$), female ($P = 0.049$), younger ($P < 0.01$) and enrolled and starting cART later ($P < 0.01$ and < 0.01 , respectively) than children included in the study.

Treatment Failure Analyses

Among 862 children eligible for analysis, 740 children (492 from Mozambique and 248 from Uganda) with at least 24 weeks of follow-up were included for a total of 1088.5 person-years of follow-up. At the time of data collection, 24/740 (3.24%) children died, 68 (9.19%) were LTFU, 7 (0.95%) were transferred to another clinic, and 1 (0.14%) was confirmed HIV-negative. A total of 218 treatment failure events (29%; 95% CI 26–33) occurred, with a crude incidence rate of 20.0 events per 100 person-years (95% CI 17.5–22.9). Median time to treatment

Table 1. Baseline Characteristics of 862 Children Included and 213 Children Excluded from Analyses Due to Missing Data

Variable	Value	Included children n = 862	Excluded children n = 213 (20%)	P value
Gender	Male	449 (52)	99 (46)	0.049 ^a
	Female	413(48)	113 (53)	
Country	Mozambique	583 (68)	102 (48)	<0.01 ^a
	Uganda	279 (32)	111 (52)	
Year of birth	Median (IQR)	2002 (1998–2005)	2001 (1996–2005)	0.02 ^b
	<1995	76 (9)	34 (16)	
	1995-1999	219 (25)	54 (25)	
	2000-2004	289 (34)	58 (27)	
	2005-2009	278 (32)	59 (28)	
	missing	0 (0)	8 (4)	
Age at treatment initiation (years)	Median (IQR)	4.83 (2.09–9.11)	6.33 (2.62–11.56)	<0.01 ^b
	<12 months	62 (7)	11 (5)	
	12–35 months	256 (30)	48 (23)	
	36–59 months	120 (14)	22 (10)	
	5–8 years	157 (18)	40 (19)	
	>8 years	267 (31)	92 (43)	
WHO clinical stage at treatment initiation	Missing	0 (0)	8 (4)	0.14 ^a
	Stage I or II	75 (9)	14 (7)	
	Stage III with TB	36 (4)	11 (5)	
	Stage III w/o TB	57 (7)	22 (10)	
	Stage IV with TB	10 (1)	6 (3)	
	Stage IV w/o TB	47 (6)	13 (6)	
	Unknown	637 (74)	147 (69)	
Age at enrollment (years)	Median (IQR)	3.94 (1.48–8.09)	5.57 (1.61–9.47)	0.01 ^b
	Missing	0 (0)	8 (4)	
Initial treatment regimen	3TC + 4DT + NVP	369 (43)	70 (33)	0.06 ^a
	3TC + AZT + NVP	231 (27)	60 (28)	
	3TC + AZT + EFV	80 (9)	35 (16)	
	3TC + 4DT + EFV	57 (7)	15 (7)	
	3TC + AZT + ABC	48 (6)	15 (7)	
	Other triple	68 (8)	15 (7)	
	Other dual	3 (0)	1 (<1)	
	missing	6 (1)	2 (1)	

Abbreviations: ABC, abacavir; AZT, zidovudine; 4DT, stavudine; EFV, efavirenz; IQR, interquartile range; NVP, nevirapine; TB, tuberculosis; 3TC, lamivudine; WHO, World Health Organization.

^aPearson χ^2 test.

^bKruskal-Wallis test.

failure was 379 days (IQR 229–649). Immunological failure alone occurred in 100 (46%) children, while clinical failure alone was found in 116/218 (53%) cases. Two children (1%) had concomitant clinical and immunological failure. Baseline characteristics are shown in Table 2.

The adjusted Cox proportional hazards model of treatment failure with the lowest AIC included age, treatment type, and baseline disease stage. Incidence rates and crude and adjusted relative hazards from the model are shown in Table 3.

Patients with TB and those with other WHO stage 4 defining diseases were significantly more likely to experience treatment failure (Hazard Ratio [HR] 2.27, 95% CI 1.5–3.4, $P < 0.01$ and HR 1.57, 95% CI 1.02–2.4, $P = 0.04$, respectively) compared to children with WHO stage 3 disease without TB. As expected, starting cART with an unconventional regimen (not containing an NRTI backbone in combination with EFV, NVP, lopinavir/ritonavir (LPV/r), or ABC) was also significantly associated with risk of treatment failure (HR 3.37, 95% CI 1.12–11.89, $P = 0.03$).

Drug Substitution Analysis. Among 862 eligible children, 4 with unknown ART regimen and 89 who received ABC in their initial cART regimen were excluded from the cART drug-substitution analysis. The remaining 769 children had an overall follow-up of 1499 person-years. Baseline characteristics of this cohort are provided in Supplementary Table 1 (see online Supplementary Material for this table).

Throughout the study period, 202 (26%, 95% CI 23–30) patients substituted treatment, with median time to substitution of 9.69 months (IQR 25.82). Overall incidence of substitution was 15.4 events per 100 person-years (95% CI 13.4–17.7). Reported reasons for substitution included any toxicity (37, 18.3%), of which 3 were d4 T toxicity (1.5%), 25 (12.4%) AZT toxicity, and 9 (4.5%) NVP toxicity, clinical and immunological failure (9, 4.5%), drug availability (35, 17.3%), drug interaction (1, 0.5%), provider preference for a better option (32, 15.8%), simplification associated with nonadherence (4, 2%), caregiver health problem (1, 0.5%), and TB drugs interaction (52, 25.7%). Among the 9 patients with drug substitution for clinical or immunological failure, median time to

Table 2. Baseline Characteristics of Children Included in the Treatment Failure Analysis: Demographics and Treatment

Variable	Value	All children n = 740 (100.00%)	Mozambique n = 492 (66.49%)	Uganda n = 248 (33.51%)	P value ³
Gender	Male	382 (51.62)	260 (52.85)	122 (49.19)	0.348
	Female	358 (48.38)	232 (47.15)	126 (50.81)	
Age at treatment initiation (n = 205)	Median (IQR)	5.05 (7.00)	3.42 (5.49)	8.22 (7.13)	<0.01
	<12 months	51 (6.89)	44 (8.94)	7 (2.82)	<0.01
	12-35 months	216 (29.19)	186 (37.80)	30 (12.10)	
	36-59 months	97 (13.11)	68 (13.82)	29 (11.69)	
	>5 years	376 (50.81)	194 (39.43)	182 (73.39)	
BMI for age z-score		-0.92 (1.94)	-1.10 (1.95)	-0.75 (1.82)	
	Median (IQR)	(n = 564)	(n = 327)	(n = 237)	0.019
WHO disease stage	Stage I or II	174 (23.51)	46 (9.35)	128 (51.61)	<0.01
	Stage III with TB	83 (11.22)	68 (13.82)	15 (6.05)	
	Stage III w/o TB	305 (41.22)	224 (45.53)	81 (32.66)	
	Stage IV with TB	52 (7.03)	48 (9.76)	4 (1.61)	
	Stage IV w/o TB	101 (13.65)	81 (16.46)	20 (8.06)	
	Unknown	25 (3.38)	25 (5.08)	0 (0.00)	
Initial treatment regimen	3TC + d4T + NVP	325 (43.92)	269 (54.67)	56 (22.58)	<0.01
	3TC + AZT + NVP	195 (26.35)	114 (23.17)	81 (32.66)	
	3TC + AZT + EFV	69 (9.32)	13 (2.64)	56 (22.58)	
	3TC + d4T + EFV	50 (6.76)	24 (4.88)	26 (10.48)	
	3TC + AZT + LPV/r	18 (2.43)	0 (0.00)	18 (7.26)	
	3TC + d4T + LPV/r	6 (0.81)	0 (0.00)	6 (2.42)	
	3TC + d4T + ABC	25 (3.38)	25 (5.08)	0 (0.00)	
	3TC + AZT + ABC	40 (5.41)	39 (7.93)	1 (0.40)	
	Other ^b	12 (1.62)	8 (1.63)	4 (1.61)	
Initial treatment regimen (by most potent component)	EFV-containing	120 (16.22)	37 (7.52)	83 (33.47)	<0.01
	NVP-containing	523 (70.68)	383 (77.85)	140 (56.45)	
	LPV/r-containing	24 (3.24)	0 (0.00)	24 (9.68)	
	ABC-containing ^c	67 (9.05)	66 (13.41)	1 (0.40)	
	Other ^d	6 (0.81)	6 (1.22)	0 (0.00)	
Adherence	Good	485 (65.54)	294 (59.76)	191 (77.02)	<0.01
	Poor	255 (34.46)	198 (40.24)	57 (22.98)	
CD4 percent (mean, 95% CI)	<12 months	15.95 (9.60)	15.60 (9.20)	18.93 (4.60)	<0.01
	12-35 months	14.50 (8.70)	15.00 (8.20)	10.62 (8.12)	
	36-59 months	12.16 (7.90)	12.85 (7.05)	11.81 (8.77)	
	>5 years	9.60 (10.00)	11.05 (10.00)	8.47 (9.76)	
CD4 count (mean cells/mm ³ , 95% CI)	<12 months	784.00 (971.00)	746.50 (765.50)	1404.00 (1145.00)	<0.01
	12-35 months	721.00 (606.00)	730.50 (585.00)	554.00 (765.00)	
	36-59 months	467.00 (395.50)	420.50 (292.50)	551.00 (509.00)	
	>5 years	239.00 (286.00)	265.00 (363.00)	226.00 (224.00)	
CD4 count z-score	Median (IQR)	-0.30 (1.07)	-0.14 (1.12)	-0.54 (0.69)	<0.01
		(n = 736)	(n = 492)	(n = 244)	
Classification of immunodeficiency ^e	Not significant	58 (7.84)	40 (8.13)	18 (7.26)	0.092
	Mild	35 (4.73)	19 (3.86)	16 (6.45)	
	Advanced	66 (8.92)	37 (7.52)	29 (11.69)	
	Severe	581 (78.51)	396 (80.49)	185 (74.60)	

Abbreviations: ABC, abacavir; AZT, zidovudine; BMI, body-mass index; CI, confidence interval; d4 T; EFV; IQR, interquartile range; LPV/r; NVP, nevirapine; TB, tuberculosis; 3TC, lamivudine; WHO, World Health Organization.

³P values refer to differences between Mozambique and Uganda subcohorts on baseline characteristics.

^bOther regimens include mono or dual therapies and those with missing information on combination antiretroviral therapy regimen.

^cABC-containing regimen includes a 3 NRTI regimen containing ABC.

^dOther regimens include only those without an EFV, NVP, LPV/r, or ABC component, regardless of number of components.

^eImmunodeficiency was classified as mild (CD4% of 30–35, 25–30, 20–25 and CD4 cell count of 350–499 for children ≤11 months, 12–35 months, 36–59 months or ≥5 years, respectively), advanced (CD4% of 25–29, 20–24, 15–19 and CD4 cell count of 200–349 for children ≤11 months, 12–35 months, 36–59 months or ≥5 years, respectively) and severe (CD4% <25, <20, <15 and CD4 cell count <200/<15% for children ≤11 months, 12–35 months, 36–59 months or ≥5 years, respectively) according to the WHO 2006 thresholds.

substitution was 26.65 months (IQR 23.95). Reasons for substitution were unknown for 31 (15.3%) children.

Drug substitution was more likely among patients starting 3TC-AZT-NVP (adjusted HR 3.29, 95% CI 2.27–4.76, $P < 0.01$), 3TC-d4T-EFV (adjusted HR 3.22, 95% CI 2.02–5.13, $P < 0.01$), or 3TC + AZT + EFV (adjusted HR 1.74, 95% CI 1.03–2.95, $P = 0.037$) compared to 3TC-d4T-NVP.

Mildly immunosuppressed patients (adjusted HR 2.23, 95% CI 1.24–4.02, $P < 0.01$), infants (adjusted HR 2.74, 95% CI 1.54–4.90, $P < 0.01$), children with TB (adjusted HR 3.38, 95% CI 2.28–5.01, $P < 0.01$) and those with good treatment adherence before drug substitution (adjusted HR 0.53, 95% CI 0.37–0.77, $P < 0.01$) were also more likely to substitute cART. Incidence rates and crude and adjusted

Table 3. Relative Hazards for Treatment Failure in Children from Mozambique and Uganda (n = 740 Children)

Variable	Person time (years)	Events	Crude incidence rate ^a (95% CI)	Unadjusted relative hazard	95% CI	P value	Adjusted relative hazard	95% CI	P value
Treatment type				Reference			Reference		
NVP-containing	781.2	150	19.2 (16.4,22.5)	1.38	(0.84,2.25)	0.20	0.76	(0.43,1.34)	0.34
ABC-containing ^b	62.0	18	29.0 (18.3,46.1)	1.09	(0.76,1.56)	0.65	0.95	(0.64,1.41)	0.80
EFV-containing	187.5	37	19.7 (14.3,27.2)	1.08	(0.56,2.08)	0.81	1.03	(0.53,2.02)	0.93
LPV/r-containing	53.8	10	18.6 (10.0,34.5)	3.32	(1.05,10.43)	0.04	3.73	(1.17,11.89)	0.03
Other ^c	3.9	3	76.1 (24.6,236.1)	Reference					
BMI for age z-score tertiles				Reference					
Lowest tertile	410.7	96	23.4 (19.1,28.6)	0.69	(0.48,0.99)	0.04			
Middle tertile	260.6	42	16.1 (11.9,21.8)	1.04	(0.71,1.51)	0.85			
Highest tertile	154.1	38	24.7 (17.9,33.9)	0.68	(0.48,0.98)	0.04			
Unknown	263.1	42	16.0 (11.8,21.6)	Reference					
Female	540.7	100	18.5 (15.2,22.5)	1.17	(0.89,1.52)	0.26			
Male	547.8	118	21.5 (18.0,25.8)	Reference					
Country of treatment				Reference					
Mozambique	681.5	143	21.0 (17.8,24.7)	0.91	(0.69,1.21)	0.51			
Uganda	407.0	75	18.4 (14.7,23.1)	Reference					
Adherence				Reference					
Good	1027.3	202	19.7 (17.1,22.6)	1.24	(0.74,2.06)	0.41			
Poor	61.1	16	26.2 (16.0,42.7)	0.58	(0.31,1.10)	0.10			
Classification of immunodeficiency ^d				Reference					
Not significant	78.6	10	12.7 (6.8,23.6)	0.89	(0.49,1.64)	0.72			
Mild	57.9	11	19.0 (10.5,34.3)	0.64	(0.36,1.12)	0.12			
Advanced	90.3	13	14.4 (8.4,24.8)	Reference					
Severe	861.7	184	21.4 (18.5,24.7)	1.28	(0.72,2.23)	0.41	1.08	(0.59,1.96)	0.80
Age group				1.12	(0.83,1.52)	0.46	1.08	(0.77,1.50)	0.66
0–11 months	46.0	13	28.2 (16.4,48.6)	0.67	(0.43,1.05)	0.08	0.64	(0.41,1.00)	0.05
12–35 months	275.5	64	23.2 (18.2,29.7)	Reference					
35–59 months	176.8	23	13.0 (8.6,19.6)	1.12	(0.79,1.58)	0.52	1.17	(0.81,1.67)	0.40
≥5 years	590.1	118	20.0 (16.7,24.0)	1.96	(1.38,2.79)	<0.01	2.27	(1.50,3.42)	<0.01
WHO disease stage at baseline				Reference					
Stage 1 or 2	289.0	52	18.0 (13.7,23.6)	Reference					
Stage 3 or 4 with TB	145.8	50	34.3 (26.0,45.2)	1.54	(1.01,2.35)	0.40	1.57	(1.02,2.414)	0.04
Stage 3 w/o TB	510.9	83	16.2 (13.1,20.1)	0.65	(0.24,1.78)	0.045	0.67	(0.24,1.82)	0.43
Stage 4 w/o TB	106.3	29	27.3 (19.0,39.3)	Reference					
Unknown	36.5	4	11.0 (4.1,29.2)						

Abbreviations: ABC, abacavir; BMI, body-mass index; CI, confidence interval; EFV, efavirenz; LPV/r, lopinavir/ritonavir; NVP, nevirapine; WHO, World Health Organization.

^aPer 100 years.^bABC-containing regimen include a 3 NRTI regimen containing ABC.^cOther regimens include only those without an EFV, NVP, LPV/r, or ABC component, regardless of number of components.^dImmunodeficiency was classified as mild (CD4% of 30–35, 25–30, 20–25 and CD4 cell count of 350–499 for children ≤11 months, 12–35 months, 36–59 months or ≥5 years, respectively), advanced (CD4% of 25–29, 20–24, 15–19 and CD4 cell count of 200–349 for children ≤11 months, 12–35 months, 36–59 months, or ≥5 years, respectively) and severe (CD4% <25, <20, <15 and CD4 cell count <200/<15% for children ≤11 months, 12–35 months, 36–59 months or ≥5 years, respectively) according to the WHO 2006 thresholds.

relative hazards from the model are shown in Supplementary Table 2 (see online Supplementary Material for this table).

DISCUSSION

In this study, a notable proportion (29%) of HIV-positive children experienced clinical and/or immunological cART failure, with a crude incidence rate of 20.0 events per 100 person-years. Our findings appear to be in line with evidence from the literature referring to immunological failure [16–18]. Considering that virological failure tends to precede clinical and immunological failure, this figure could underestimate a greater impact of virological failure.

WHO clinical stage 4 and TB co-infection at cART initiation were significantly associated with treatment failure. Poor clinical status has been observed to negatively affect treatment response; in particular, malnutrition and chronic diarrhea independently increase the risk of treatment failure as much as baseline low immunity, high viral load (VL), and younger age [15–17]. As suggested by Hermans et al. [40, 41], TB co-infection may impair immune recovery after cART initiation in adults. In addition, poor adherence may occur as a result of high pill burden, and interaction with rifampicin may affect the bioavailability of HIV drugs, particularly for NVP and LPV/r [42]. Development of better options for TB co-treatment appears to be critical to prolong effectiveness of first-line regimens.

As expected, unconventional regimens were associated with treatment failure compared to triple cART [37]. Treatment failure was not different between PI-based and NNRTI-based regimens; however, the validity of this finding may be questionable considering that only a few children were receiving a PI-based regimen at the time of the study. Few randomized trials investigated the most effective first-line cART regimen in HIV-positive children. The P1060 trial [13, 23] showed an increased risk of virological failure in children (<3 years) on NPV-based cART, regardless of prevention of mother to child transmission (PMTCT) exposure; however, this was not confirmed by the PENPACT trial conducted in older children of high-income countries [24]. Due to the nature of our cohort's age and lack of reliable PMTCT exposure data, our observational retrospective findings are not comparable to those from either controlled trial.

Reasons for drug substitution were assessed to explore whether this was in response to treatment failure. However, over a 5-year period, only 4% of 202 patients who substituted cART switched to a second-line regimen due to treatment failure. Drug substitution occurred after a median time of 26.65 months, indicating a significant

delay in switching to second-line despite the high rate of failure retrospectively observed in the cohort. Although reasons for substitution may have been misclassified, the small number of children switching due to treatment failure implies that a prolonged exposure to failing regimens may have occurred in these two settings. Several studies reported a low proportion of children on second-line cART in LMIC [19, 20]. Our switch rate appears even lower than those observed by Davies et al. [16] and by 2 other observational studies showing that around 14% children switched to second-line due to clinical and/or immunological failure [17, 18]. Reasons explaining the alarming gap between a recognized clinical and/or immunological failure and the initiation of a second-line cART were not well identified. In our program, we hypothesize that limited availability and costs of second-line drugs may be major barriers to second-line therapy. Furthermore, the tradeoff that clinicians are facing when considering the limited options for children failing first-line and the risk of maintaining them on a failing regimen can be very challenging and may result in further delays in switching to second-line cART. Underdiagnosis of treatment failure may also have contributed to the low rate of switching observed, as reasons for switching were collected retrospectively based on clinician report, leading to possible misclassification.

Determining when to switch to second-line cART is a critical decision in settings where virological monitoring is not available. Although evidence shows that VL is not essential to identify treatment failure [34], using clinical and immunological parameters leads to delays in switching to second-line therapy [17], resulting in longer exposure to failing regimens, which contributes to development of drug-resistant HIV strains [6]. In our study, reasons for delays to cART switching were not completely clarified; in particular, we were unable to understand if clinicians did not switch cART in children with recognized treatment failure or if clinical/immunological criteria were too complicated to recognize treatment failure. Earlier cART initiation and VL monitoring are currently recommended by WHO 2013 consolidated guidelines [3]. Based on our data, advanced disease and TB co-infection should be considered as warning signals requiring closer follow-up and counseling to improve treatment outcomes and prolong duration of first line therapy. Adherence to cART was found to be a poor indicator of treatment failure, maybe due to the low accuracy of self-reporting adherence monitoring.

About 26% (203/769) of patients substituted treatment with an overall incidence rate of 13.5 events per 100 person years and 95% of these were for causes other than treatment failure. This figure is consistent with previous

observational studies among HIV-positive children [17, 24, 40] living in LMIC. Toxicity/intolerance was one of the main reasons reported for substitution (18.3%), mostly related to AZT toxicity (12.4%), as reported in other studies [17, 38, 41]. Due to high prevalence of HIV/TB co-infection (88/769, 11.4%), drug interaction in TB/HIV co-treatment (25.7%) was another major reason to substitute drugs. Drug availability (17.3%) was another considerable reason, reflecting the importance of ensuring adequate and continuous supply of cART in settings where drug costs are still a major barrier for PLWH. Reasons for drug substitution were not classified prospectively but assessed from inspection of patient clinical charts, potentially leading to inaccurate classifications.

Higher rates of drug substitution were observed among children starting AZT-containing or EFV-based regimens. Increased drug substitution while on AZT is often the result of AZT-related anemia as well described previously [23, 31, 36]. AZT toxicity was more prevalent among the Mozambique cohort, where children were younger and malnutrition and/or more advanced WHO disease stages were observed, suggesting that AZT anemia may have been exacerbated. Despite the lack of more robust evidence, our findings suggest that AZT may not be the preferred NRTI to be used in these settings, particularly in younger children.

Further description of EFV substitution was not possible in this dataset due to the limited number of children receiving this drug, and we could not rule out specific EFV-related toxicity.

As previously mentioned, our results may be confounded by country-specific differences. Mozambique patients were younger, had a more advanced WHO stage, and a lower BMI z-score at cART initiation. These differences may reflect clinicians' preference in first-line treatment choice, accounting for the wider use of AZT and EFV in Uganda as much as for the increased choice of NVP-based regimen observed in children from Mozambique. Country-specific differences may potentially confound the relationships seen between cART regimen and treatment failure and drug substitution. In terms of follow-up visits, the Ugandan children were followed up much more frequently (monthly) than those in Mozambique (every 3 months). This difference between program performances may have provided further confounders, potentially influencing the trends observed in older children at lower risk of failure and the higher rate of drug substitution observed in infants.

In conclusion, our data reinforce the need for simplification of more effective clinical and immunological criteria for prompt recognition of cART treatment failure. Children presenting with advanced disease and TB

co-infection should be targeted for closer and more sensitive monitoring of treatment response. This should be matched with a regular provision of appropriate antiretrovirals and with optimization of first-line drugs and treatment sequencing. Supply of new pediatric formulations for second-line regimens and drug optimization should be considered as critical milestones to allow scaling up of early cART and reduction of treatment failure in children.

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Potential conflicts of interest. All authors have significantly contributed to the manuscript and agreed with the content. They also declare that they have no conflicts of interest.

All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

Supplementary Data

Supplementary materials are available at the *Journal of The Pediatric Infectious Diseases Society* online (<http://jpid.oxfordjournals.org>). Supplementary materials consist of data provided by the author that are published to benefit the reader. The posted materials are not copyedited. The contents of all supplementary data are the sole responsibility of the authors. Questions or messages regarding errors should be addressed to the author.

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MISCELLANEOUS

POSTER 103

- **Title:** Standardization of clinical laboratories in Africa: a multidisciplinary approach to identify innovative and sustainable technical solutions
- **Authors:** A. Cortese, R. Musi, I. Pecorari, G. Putoto, E. Nunziata
- **Date of presentation:** 17-18 September 2014
- **Place of presentation:** AHT 2014, "The 8th International Conference – Promoting access to healthcare through technology", London (Regno Unito)

COMMENT 105

- **Title:** Calling on Europe to support operational research in low-income and middle-income countries
- **Authors:** G. Quaglio, A. Ramsay, A. D. Harries, T. Karapiperis, G. Putoto, C. Dye, O.F. Olesen, G. Tomson, R. Zachariah
- **Date of publication:** June 2014
- **Place of publication:** The Lancet, volume 2, pp. 308-310

PAPER 109

- **Title:** International child health elective for pediatric residents
- **Authors:** L. Da Dalt, G. Putoto, D. Carraro, A. Gatta, E. Baraldi, G. Perilongo
- **Date of publication:** 2014
- **Place of publication:** Italian Journal of Pediatrics

ABSTRACT 117

- **Title:** A 8-year long successful project of global health education for pediatric residents: the Junior Project Officer (JPO)
- **Authors:** L. Da Dalt, G. Putoto, D. Carraro, A. Gatta, E. Baraldi, G. Perilongo
- **Date of presentation:** 17-21 October 2014
- **Place of presentation:** 5th Congress of the European Academy of Paediatric Societies (EAPS), Barcelona (Spagna)

• **Sede di presentazione:**
AHT 2014, "The 8th International Conference – Promoting access to healthcare through technology", London (Regno Unito)

• **Date of presentation**
17-18 September 2014

• **Authors:**
A. Cortese, R. Musi,
I. Pecorari, G. Putoto,
E. Nunziata

Standardization of clinical laboratories in Africa: a multidisciplinary approach to identify innovative and sustainable technical solutions

At the 8th International Conference on Appropriate Healthcare Technologies (AHT), organized by the Institution of Engineering and Technology, "Promoting access to healthcare through technology," held in September 2014 in London, Doctors with Africa –CUAMM, with the University of Trieste, presented a poster on laboratory medicine in Africa.

The inadequacy or lack of laboratories, frequent in African healthcare settings, cause incorrect diagnoses which results in giving the wrong medicines and treatments. Doctors with Africa–CUAMM presented a program aimed at creating a standardized model for laboratories in healthcare facilities in Africa. This helps determine urgent interventions and assess financial resources to invest them in order of priority, starting from basic equipment to then focus on other specialized technologies so as to reduce waste and make the most of the advantages that technology offers.

Standardization of Clinical Laboratories in Africa: a Multidisciplinary Approach to Identify Innovative and Sustainable Technical Solutions

Authors: A. Cortese (*), R. Musi (°), I. Pecorari(*), G. Putoto (**), E. Nunziata (°)

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AHT2014 «The 8th International Conference - Promoting access to healthcare through technology» 17 - 18 September 2014

AFRICAN LABORATORY MEDICINE

African health context is characterized by widespread poverty and corruption, high birth rate, low life expectancy, health systems lacking of management and assets. There are no sufficient resources – structures, drugs, equipment, workforce - to deal with major African health challenges: HIV/AIDS, tuberculosis and malaria. In an effective and efficient health system laboratory medicine should play a critical role: this does not occur in Africa, where there is lack of demand of diagnostic exams due to mistrust in health laboratories performance. This often cause misdiagnosis and, consequently, wrong drugs deliveries and therapies. Several efforts have been recently attempted in order to strengthen health laboratory systems through the standardization of laboratory activities, procedures and equipment.

DOCTORS WITH AFRICA - CUAMM

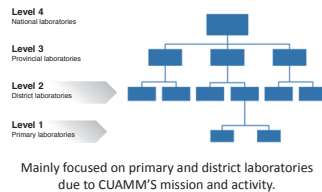


Doctors with Africa – CUAMM is a no-profit organization that works mainly in sub-Saharan Africa (Angola, Ethiopia, Mozambique, Sierra Leone, south Sudan, Tanzania and Uganda) to help and sustain local health systems. CUAMM collaborates with African institutions to improve quality of health service, supporting peripheral and rural hospitals such as health centers, primary and district hospitals. CUAMM's activity is also focused on training future health workforce. Recently Doctors with Africa has exhibited the need of a standardized model for health laboratories in order to assess and evaluate performances of the structures in which they operate. CUAMM trusts that this model will also help them to prioritize investments.

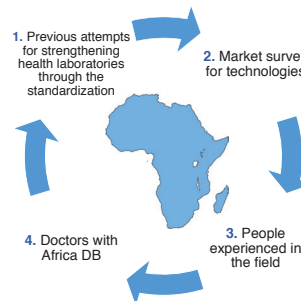
GOALS

The present work has been issued to create a new, up to date, standardized model for African health laboratories. It has been developed a standard for laboratory procedures and equipment in order to face toward the commoner diseases in African region. The model has been realized to support Doctors with Africa- CUAMM in strengthening local health systems. Comparison between the standard and the performances of actual health structures would allow the identification of gaps in the anticipated health service. In order to proof the effectiveness of the model, it has been used to assess and evaluate four case studies managed by CUAMM: Aber's laboratory (Uganda), Lui's laboratory (South Sudan), Pujehun's laboratory (Sierra Leone) and Yirof's laboratory (South Sudan). They are all district laboratories.

CONTEXT: Health laboratory network



MATERIALS AND METHODS

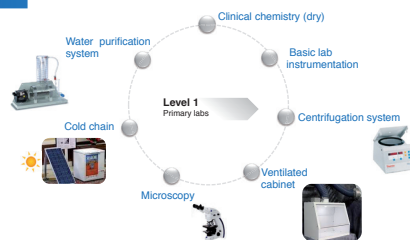


1. E.g. District laboratory practice in tropical countries (M. Cheesbrough, 1998). Consultation on Technical and Operational Recommendations for Clinical Laboratory Testing (Maputo, 2008)
2. New RDTs (e.g. SD Bioline HAT), new technologies (e.g. Xpert® MTB/RIF, SolarChill), new initiatives (e.g. Ventilated Workstation)
3. Interviews to physicians working with CUAMM
4. Data about laboratories managed by CUAMM (four case studies)

THE MODEL

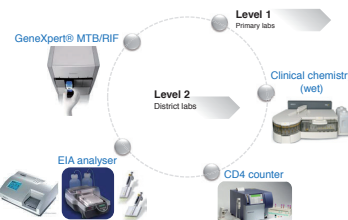
Primary Laboratories

- ❖ Rapid diagnostic tests (RDTs) for HIV/AIDS
- ❖ RDTs for malaria
- ❖ RDTs for syphilis
- ❖ Reagent strips for urine analysis
- ❖ Pregnancy test
- ❖ Microscopy for malaria diagnosis
- ❖ AFB for tuberculosis
- ❖ HGB estimation
- ❖ Glucose estimation
- ❖ ALT estimation
- ❖ Creatinine estimation
- ❖ Microscopy



District Laboratories

- ❖ EIA/ELISA techniques
- ❖ Xpert® MTB/RIF
- ❖ RPR, TPPA/TPHA
- ❖ Full clinical chemistry panel
- ❖ Type and crossmatch
- ❖ ESR
- ❖ HCV e HbsAg
- ❖ Cell counts
- ❖ CD4 counts
- ❖ Cryptococcal antigen
- ❖ CSF analysis
- ❖ Tests for endemic diseases



ASSESSMENT of CASE STUDIES

Main shortages in the panel of activities

- ❖ Scarce execution of thin film analysis for malaria diagnosis
- ❖ No EIA techniques
- ❖ No cryptococcal antigen test
- ❖ Scarce execution of CD4 counts
- ❖ Incomplete or absent panel of clinical chemistry

Main shortages in the equipment

- ❖ No data about basic laboratory instrumentation
- ❖ No ventilated cabinet/workstation
- ❖ Scarce availability of GeneXpert® MTB/RIF
- ❖ No EIA analyser

CONCLUSIONS

It has been demonstrated that comparing situations of actual laboratories with the developed standard – which is the best context which every African health laboratory would tend to - allows identifying lacking in the expected service and then prioritizing interventions. This would also permit to evaluate the amount of financial resources to invest in order of priority: first the basic and essential equipment, then the other specialized technologies. This way waste of resources will hopefully be avoided and African laboratories will advantage of what technological progress make available.

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G. Tomson,
R. Zachariah

Calling on Europe to support operational research in low-income and middle-income countries

Operational research in the field of public health, meant as the study of strategies, inventions, tools and knowledge that can improve the quality and effectiveness of healthcare services, is taking on growing importance, essential for planning strategies and invention to improve the healthcare system.

Especially in low-income and middle-income countries, research is often not matched with actual implementation. Much can be done in this area by the European Union to support operational research, which in turn fosters connections between organizations with technical expertise in the field and national public health programs.

This was discussed at the workshop organized in May 2014 by the European Parliament – Science and Technology Options Assessment Body (STOA) with a commitment for the European Union to act for real change.

Calling on Europe to support operational research in low-income and middle-income countries



Operational research in public health is the investigation of strategies, interventions, instruments, or knowledge that can enhance the quality, coverage, effectiveness, or performance of health systems, health services, or disease control programmes.¹ By showing what works and what does not in various contexts, operational research can provide evidence to help policy makers to adapt health interventions and services for maximum public health benefit.²

During a recent workshop organised by the Science and Technology Options Assessment body (STOA) of the European Parliament, experts in the field of operational research concluded that the European Union (EU) should increase its support for this form of research. STOA, which provides independent assessments of scientific and technological options in various sectors including the life sciences, organised the workshop in collaboration with Médecins Sans Frontières, the International Union Against Tuberculosis and Lung Disease, and WHO/TDR.

The participants discussed several overarching themes, concluding that research is too often separate from implementation. A crucial gap remains between the development of efficacious health interventions and their optimum delivery in real-life settings. This gap is particularly true in many low-income and middle-income countries (LMICs). For example, two-thirds of childhood deaths are potentially avoidable with known technologies that are implemented to scale.³ Similarly, results of clinical trials have shown major benefits of parenteral artesunate compared with quinine to treat malaria, but quinine remains the standard treatment in most malaria-endemic countries.⁴ Operational research could show how to introduce and scale up such interventions, which could have a major effect on global health.⁵

Many LMICs are rich in data, but have insufficient information. Massive amounts of routine data are collected within public health systems such as by ministries of health (MOH) and non-governmental organisations (NGOs), but are underused, reducing the potential effect of research on policy and practice. Compounding the problem, most data collected at

national level are of little use at the point of care; research instruments to assess equity need to be easily manageable at district level to prompt effective actions.⁶ The World Health Report 2013 by WHO⁷ recommended that all countries should become producers as well as consumers of research, and that research capacity should extend beyond academic centres to public health programmes—close to the supply and demand for health services.

In this context, the Structured Operational Research and Training Initiative (SORT IT), a global partnership led by the WHO/TDR, could serve as a global springboard for country-level capacity building. SORT IT programmes support countries to undertake operational research in accordance with their own priorities, develop adequate and sustainable operational research capacity in public health programmes, and create an organisational culture of policy and practice being informed by operational research, leading to improved programme performance.⁸

The initiative teaches the practical skills needed to undertake and publish operational research.⁹ SORT IT holds training programmes of 10–12 months with clear targets. By January, 2014, 18 programmes had been run, enrolling 212 participants from 60 countries, mainly in Africa and Asia. Of the first eight completed courses, 89% of 93 enrolled participants successfully completed these courses and 93% of 96 submitted papers were published within 18 months of completion. Of published papers, 74% were reported to have had an effect on policy and practice. Moreover, the average cost per publication was only €6800. Although the comparison is not completely appropriate because of the potential greater value of long-term basic scientific research, the average cost of EU-funded research is €140 000–220 000 per publication.¹⁰

Researchers and experts recognised that very little funding is available for operational research within health programmes and they discussed some possible solutions. Embedding research into national programmes and health systems would be one way of ensuring cost-efficiency. In this way, the traditional call for funding applications would need

For more on the STOA workshop see <http://www.europarl.europa.eu/stoa/cms/home/events/workshops/developing>

For the SORT IT programme see <http://www.who.int/tdr/capacity/strengthening/sort/en/>

to be complemented with integrated funding made available within the programme structure, which would encourage MOHs and NGOs in LMICs to embrace operational research more fully.¹¹ Through NGOs, settings often excluded from research activities, such as those in conflict and disaster, could also benefit.¹² Although international institutions such as the Global Fund to Fight AIDS, Tuberculosis and Malaria allow a sizeable proportion of country grants to be invested in operational research, absorption of such funds has been poor because of the absence of operational research capacity in-country. The SORT IT model is one way to maximise the use of such funding opportunities.

Arising from these issues, identified by the European Parliament event, was the contribution that the EU could make to operational research. As the world's largest aid donor, the EU is well positioned to support international research collaboration, which works as a type of science diplomacy. Until now, EU investment in research has been directed towards innovation, an essential part of the EU Framework Programmes mission. However, knowledge of how to implement new findings for maximum public health benefit is too often insufficient and should be enhanced by complementary EU actions for social innovations that enable operational research. The European and Developing Countries Clinical Trials Partnership (EDCTP), which is part of the EU Framework Programmes, plays an important part in supporting clinical research and capacity building in African countries. However, although the new extended remit of EDCTP includes elements of implementation research, the main focus is on product development, and a necessary continuum would be to support operational research so that the results of EDCTP trials can be effectively applied.

In LMICs, the EU could effectively boost operational research, which could in turn connect organisations that have technical skills in operational research with national public health programmes and strengthen capacity building through north-to-south and south-to-south partnerships. Operational research fellows could be key to building a critical mass of researchers in the public sector who could then be retained. As part of this, the European Commission should establish a clear strategy for operational research, develop a common policy, and increase coordination between different Directorates-General (Research, Development).

The EU is one of the world's most prolific funders of both research and development cooperation, but only very few actions relate specifically to operational research in LMICs. There is ample opportunity to use the available financial and political power to better meet these ends.

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For the EU Framework Programme for Research and Innovation see <http://ec.europa.eu/programmes/horizon2020/h2020-sections>



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International Child Health Elective for Pediatric Residents

The growing awareness of global health's importance in the careers of young doctors has led to the incorporation of international training in many medical, pre- and post-graduate programs. The goal is to train a new generation of doctors who are multicultural and aware of global dynamics, including in the healthcare field.

Despite these programs' advantages, they are lacking the chance for residents to gain experience in the field in countries with limited resources, which is essential for developing international medicine skills. An exception is the JPO (Junior Project Officer) program, a partnership between the School of Specialization in Pediatrics, University of Padua and the NGO Doctors with Africa–CUAMM.

The program provides a training course for residents with the option of spending a training period in the field from six to 12 months in one of the hospitals where CUAMM operates in Ethiopia or Mozambique.

The article, published in 2014 in the *Italian Journal of Pediatrics*, describes the implementation of the project between 2006 and 2012, with 16 residents in the field. The authors, among the project's organizers for both parties, sought to provide a clear example of the importance of programs like this and stimulating debate on the topic, encouraging other pediatric specialization schools to offer similar opportunities for training in the field.

RESEARCH

Open Access

International Child Health Elective for Pediatric Residents

Liviana Da Dalt^{1*}, Giovanni Putoto², Dante Carraro², Alessandra Gatta², Eugenio Baraldi¹ and Giorgio Perilongo¹

Abstract

Background: There are increasing evidence highlighting the importance of incorporating issues of global health into pre- and post-graduate medical curricula. Medical international cooperation is a fundamental component of strategies to include global health issues in post-graduate medical curricula.

Methods: Here we describe a seven-year cooperation between the Non Governmental Organization (NGO) "Doctors for Africa CUAMM" and the Pediatric Residency Program (PRP) of the University of Padua (Italy) that offers residents a well-articulated personalized international child's health (ICH) elective in Africa, called "Junior Project Officer". The elective includes: a careful candidate selection process; pre-departure educational course; preceptorship in Padua and Africa, personalized learning objectives, a personalized job description, a six-month hands-on learning experience in Africa, evaluation of the experience, and formal private and open feed-backs/reports.

Results: Between 2006 and 2012, 14 residents aged from 27 to 31 years, six attending the III, nine the IV and two the V year of residency completed the six-month stage in Africa. All worked in pediatric in-patient units; seven also worked in out-patient clinics, six in emergency rooms and seven in community health centers. Eleven were involved in teaching activities and four in clinical research projects. All residents claimed to have achieved their learning objectives.

Conclusions: A strong partnership between the NGO and the PRP, and well-articulated personalized learning objectives and job description contributed to a successful ICH elective.

Keywords: Pediatrics, Medical education, International cooperation, Global health

Introduction

There is increasing pressure to incorporate issues of global health into pre- and post-graduate medical curricula in order to provide new generations of doctors with a multicultural perspective on health care [1-3]. The North American Association of Pediatric Program Directors included the commitment to improve global health education in its recent strategic plan [4] and in North America, a model curriculum in global health for pediatric residents has been proposed and implemented. Elements of domestic and/or international child health (ICH) electives are a fundamental component of this curriculum [5,6].

Despite the relevance and benefits of programs offering ICH electives, and despite numerous recommendations and guidelines on how to build them [7-12] major effort is still required to offer to residents work experience in medical international setting in countries with limited resources. The scarcity of reports describing ICH experiences could be a sign of this challenge [13-16].

Between 2006 and 2012, the Pediatric Residency Program (PRP) of the University of Padua (Italy) joined the Junior Project Officer (JPO) program promoted by the Italian non-governmental organization (NGO) "Doctors with Africa CUAMM (Collegio Universitario Aspiranti e Medici Missionari)" [17], which offers doctors-in-training the possibility of undertaking a six-month health elective in an African hospital. Here we report our seven years' experience with this program in the hope that the articulated personalized framework of our ICH elective may be useful for other programs that offer ICH electives.

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Methods

CUAMM, the first NGO in the field of healthcare to be officially recognized in Italy, is the largest Italian body working to improve and safeguard the health of African populations. The organization has long-term goals, and provides quality healthcare services that are open to all. Its philosophy is to help Africa by creating, supporting and promoting training environments and to create within the international medical community a culture open to global health issues. It is present in seven Sub-Saharan African countries: Angola, Ethiopia, Mozambique, South Sudan, Uganda, Sierra Leone and Tanzania. It operates through volunteers, namely, health professionals such as doctors, nurses, midwives, technicians and administrative staff. These volunteers provide support to hospitals, health districts (for public health activities, mother-child care, the fight against AIDS, tuberculosis and malaria, and training), motor rehabilitation centers, nursing schools, and Medical Universities (in Uganda, Mozambique and Ethiopia).

The JPO project launched in 2002 offers doctors in training the possibility of a rotation in one of hospitals in Africa in which CUAMM volunteers work. It also aims at eliciting a vocation to work in the field of international medical cooperation. It is directed to residents in Infectious Diseases, Internal Medicine, Obstetrics and Gynecology, Pediatrics, Public Health and Surgery.

The PRP of the University of Padua is a 5-year national accredited program for post-graduate training in Pediatrics. Approximately 80% of learning activities takes place in the clinical setting, in which medicine is practiced under the supervision of a faculty member with the goal of increasing levels of responsibilities during training. The remaining learning activities are formal lectures, seminars, workshops. Residents rotate through 15 of the 25 divisions/services of the Department of Woman's and Child's Health of Padua and of affiliated hospitals during their first three years devoted to provide general pediatric competences; rotations last between 3 to 6 months. During the last 2 years of training, residents select elective rotations in pediatric subspecialties involving, at most, 3 divisions; each rotation lasts from 6 to 12 months.

The elements of the JPO elective

The JPO elective is open to residents in their third year onwards. Only one resident at a time can go to Africa.

Selection

Candidates are selected based on their professional profile, notably pediatric knowledge, level of autonomy, manual skills and reliability, and on the results of an interview with members of the Resident Affairs Committee (RAC) and with representatives of CUAMM. The interview is designed to understand the candidate's motivation to join the project, to describe all the potentially negative

and positive aspects of the experience and to try to evaluate the probability that the candidate will successfully complete the program.

Pre-departure educational course

After the initial screening, residents are required to attend a professional training course ("Cooperating for Health in Africa") organized by CUAMM. This consists of six three-day modules held on a monthly base; the first is devoted to the basic principles of health cooperation with countries that have limited resources and the inspiring concepts of "Doctors with Africa CUAMM"; the second module introduces the basis of "Strengthening Health Systems" and the strategic approach adopted by the NGO in Africa. The remaining modules provide general concepts of hospital management and public health, and information about the diagnostic and therapeutic guidelines established for the main tropical infectious diseases, about the status of mother and child health in Africa, and about the more relevant critical issues and the main programs activated to address them.

Identification of the site in Africa and preceptorship

Once a candidate has successfully undergone the interview and the pre-departure course, the possible destination in Africa is identified, based exclusively on the presence on site of a pediatrician from CUAMM who can function as a local tutor and on safety issues related to the local social and political situation. A preceptor in Padua (one of the authors – LDD), chosen among RAC members because of experience in international medical cooperation and commitment to the JPO project, was assigned to each resident.

Learning objectives

Once the resident, the hospital in Africa and the CUAMM volunteer serving as local tutor are selected, the overall learning objectives of the training (see Table 1) are collegially discussed. A personalized job description is also prepared for each resident. Ideally, a simple epidemiological and/or clinical research project related to the local reality is conceived.

Activities in Africa

In the hospital in Africa, the resident is required to participate in all the daily activities of the service to which they have been assigned (e.g. patient's visit, case discussion, procedures, meetings with nurses and families). All his/her activity is carried out under the supervision of the local tutor in Africa.

Evaluation

The 6-month ICH elective is counted as any other rotation that is mandatory for residents during their training.

Table 1 General learning objectives of the international child health elective, and numbers of residents who declared they had achieved these goals at the end of the elective

	Positive replies
Learn how to diagnose and manage the most common pediatric tropical diseases	14/14
Learn how to practice medicine in settings of limited resources	14/14
Gain insight into the world of international medical cooperation	10/14
Acquire empathy and experience in addressing the health care needs of underserved communities through exposure to alternative modes of health care delivery and resource allocation	13/14
Develop professional values through exposure to different philosophies of medical ethics, relationships and child rights	13/14

Consequently, it is subject to the usual PRP evaluation process, which foresees evaluation of the residents by tutors, and of the quality of the rotation and of the tutors' performance by residents, based on validate questionnaires [18]. Therefore, the RAC of the PRP in Padua evaluates residents, tutors, the quality of rotations, and the six months spent in Africa. In addition, upon their return to Padua, residents are requested to complete another questionnaire specifically designed to evaluate their experience in Africa, which is then discussed during an oral interview with RAC members and a representative of the NGO. Finally, residents are invited to present their experience during an ad hoc seminar, ideally attended by all other residents and the faculty of the Hospital in Padua.

Practicalities

CUAMM provides participants with the necessary insurance coverage for personal and professional risks, and assistance in applying for VISA and work permits, as required, and lodging on site in residences rented by CUAMM. The residency program covers travelling costs, whereas residents must pay for all other expenses they incur in Africa from the salary they continue to receive from the University.

Other components

Memorandum of understanding (MoU)

The JPO program is governed by a memorandum of understanding, signed by CUAMM and the University of Padua, according to which the NGO and the University undertake to cooperate to improve the health status of the population in Africa by making available their own specific resources and competences.

Site visit

Before the JPO project started in October 2005, RAC members visited the hospitals chosen for the project. The aims

of the site visit was to meet the local political and health authorities, to describe the PRP, to see the hospitals and their facilities in order to acquire an overall sense of the environment where residents are expected to work.

Results

Between 2006 and 2012, of the 135 residents who participated in the PRP and were eligible for the JPO, 22 declared their interest in joining the project and attended the preparatory course. One dropped out because she did not feel psychologically prepared, and seven were unable to go to Africa for contingent reasons. Thus, 14 residents went to Africa (Figure 1). All successfully completed a six-month stage; four in St. Luke's Hospital (Wolisso, Ethiopia), and 10 in Central Hospital (Beira, Mozambique). The features of the two hospitals are listed in Table 2. No temporal gaps elapsed between one stage and another and stages did not overlap.

All 14 residents but one were women (essentially reflecting the female prevalence in our program - 85% of the residents). Their age ranged from 27 to 31 years; six were attending the III, nine the IV and two the V year of residency. While in Africa, all worked in pediatric in-patient units; seven were also involved in out-patient clinics, six in emergency rooms and seven in territorial health centers. Eleven were also involved in teaching activities for local nurses and doctors in-training, and four carried out a clinical research project while in Africa.

As reported in Table 1, all residents declared they had achieved the learning objectives of the ICH elective, except four who felt they had not gained "deep insight into the world of international cooperation" because of the short duration of their permanence abroad. It could be

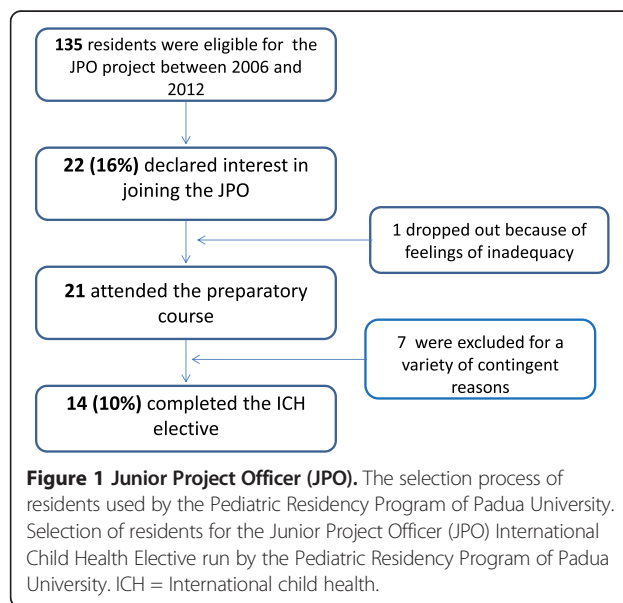


Figure 1 Junior Project Officer (JPO). The selection process of residents used by the Pediatric Residency Program of Padua University. Selection of residents for the Junior Project Officer (JPO) International Child Health Elective run by the Pediatric Residency Program of Padua University. ICH = International child health.

Table 2 Main features of the Wolisso (Ethiopia) and Beira (Mozambique) hospitals

	Beira (Mozambique)	Wolisso (Ethiopia)
Hospital authority	State	Catholic Church (CUAMM)
Total number of beds	730	200
Total number of pediatric beds	128	55
Pediatric units/services	General Pediatrics	General Pediatric
	Infectious Diseases	Emergency room
	Malnutrition	
	Neonatology	
	Emergency room	
Medical and surgical units	Internal Medicine	Internal Medicine
	Surgery	Surgery
	Obstetrics & Gynecology	Obstetrics & Gynecology
	Orthopedics	Intensive Care
	Intensive Care	Rehabilitation
Pediatric hospital admissions (year)	9,000	2,500
Pediatric ER care visits	30,000	10,000
Newborns per year	6,000	3,000
University affiliation	With the Catholic University of Beira	No

also hypothesized, that these four residents were overwhelmed by the pressure of treating patients, and they failed to see the overall picture of the environment in which they were working. In general, residents appreciated all components of the program; in fact all would repeat the experience and would recommend it to others (Table 3). The two negative replies regarding the adequacy of the tutorship in Africa were due, in one case, to personality issues between the resident and tutor; and in the other case, the tutor had to leave Africa and no suitable substitute was found. Five residents declared they encountered problems related to the different life style; one found the situation too difficult and stressful due to the many deaths she assisted mainly related to the lack of resources commonly available in the place she was used to work); two had communication problems due to languages barriers; and one experienced personal security issues after suffering a street theft. Upon their return to Padua, all residents delivered a seminar describing their experience. One participant joined CUAMM after completing her residency, and another had a second experience of international medical cooperation in an African hospital.

Discussion

To our knowledge, this is the first article to describe the strategic framework of an ICH elective for students enrolled in a European PRP. Furthermore, no other Italian pediatric residence programs offer similar experience based on such an articulated framework. During the seven years that the PRP of Padua University participated

in the JPO project, there was always a candidate for the ICH elective. Moreover, all the 14 residents who participated in the elective completed the six-month stage abroad, without having encountered any major problems, which is remarkable given the duration of the stage. Notably, all felt they had undergone an important human and professional experience. Therefore, the JPO project, as carried out by the PRP of Padua University, is a useful example of how to offer ICH electives to pediatricians in training (Table 4).

A cornerstone of our program was careful selection of residents for the ICH elective. Although aware that the residents would work in a structured medical environment and under supervision, RAC members were concerned that residents might not be able to continue if their motivations, their psychological profile, their level of professional and human maturation and their expectations were not in line with the reality they would face in Africa. To obviate this, all JPO fellows attended a preparatory course, which, upon their return, they recognized to be very important. Similarly, they also recognized the importance of having established precise educational objectives and general work descriptions before their departure (see Table 3). They declared that that these two elements helped to keep them focused on the ultimate aims of their ICH elective and on their motivation to take part in the program.

Approval of an ICH elective depended on the availability of motivated tutors both in Padua and in Africa. The task of the tutor in Padua, who had undergone a lengthy ICH elective in Africa and thus served as a role model,

Table 3 Questionnaire used by the residents to evaluate their experience in Africa and main results

Questions	% (Positive replies)
Was the preparatory course helpful?	14/14
Were the learning objectives of your stay in Africa clear?	13/14
Was your personalized job description sufficiently clear and respected?	13/14
Was the setting where you went to work well described before your departure?	12/14
Do you think that the ICH elective:	
Prepared you sufficiently?	13/14
Adequate time-wise?	12/14
Enabled you to grow professionally?	13/14
Was the preceptorship that was provided to you in Padua important?	14/14
Was the tutorship you had in Africa adequate?	12/14
Do you think you have achieved the learning objectives?	See Table 1
Do you think it was an added value to have been part of a CUAMM project?	14/14
Are you happy with this experience?	14/14
Would you repeat it?	14/14
Would you recommend it to others?	14/14
Did you suffer from:	
The different life style in Africa?	05/14
Too difficult and stressful situations?	01/14
Communication problems?	02/14
Personal security issues?	01/14
Any diseases?	-/14

was to understand the residents' vocation, to guide them through the thinking process underlying their decision to participate in the ICH and finally to provide them with human and professional "long distant" support (via internet) while in Africa. As witnessed by the residents' feedbacks, this tutorship was greatly appreciated. The tutorship in Africa was considered equally effective. In the two cases in which the resident did not experience a positive tutorship in Africa, the situations were carefully

monitored, and the problems did not prevent the residents from completing their ICH elective and reporting positive comments.

The MOU of the University of Padua, within which the PRP operates, is a key factor of our ICH elective. In fact, in this MOU the University of Padua endorses the CUAMM-PRP partnership and thus recognizes the educational value of the JPO project and its impact on society as a whole. Thus, the CUAMM-PRP partnership has the

Table 4 Key components of the junior project offer elective

Pre-departure	<p>The partnership with CUAMM, a non-governmental organization operating in countries with limited resources, that focuses on the role of education</p> <p>The MoU signed by the University of Padua (to which the PRP belongs) and CUAMM</p> <p>The site visit to the Africa hospitals</p> <p>The selection process of the candidates</p> <p>The pre-departure course</p> <p>The definition of the learning objectives and the personalized job description</p>
During the elective	<p>The preceptorship both in Padua and in Africa</p> <p>The active involvement in all clinical activities</p> <p>The evaluation process</p>
At the end of the elective	<p>The feed-backs</p> <p>The summary report presented to the PRP, the residents and the hospital staff</p>

Legend: ICH: International Child Elective; MoU: Memorandum of understanding; PRP: Pediatric Residency Program.

status of an academic endeavor and consequently sets rigorous standards for its development and implementation. The MOU served also to provide the administrative and legal elements necessary to run the project in Padua. Our experience suggests that PRPs offering ICH electives should have a formal, officially recognized (by the authorities governing the PRP) relationship with international medical organizations that are well positioned in countries with limited resources. Such organizations are able to facilitate the access of residents to hospitals in Africa, identify local expert tutors and provide all the resources necessary to support the residents' presence in Africa. Ideally, they should share CUAMM's commitment to education.

We are aware that such an ICH does not fulfill all the requirements of a complete pediatric global health education [5]. Undoubtedly, much more should be done in terms of theoretical education and practice and, at least in Italy, in terms of official recognition of an educational curriculum in global health. In fact, in Italy the initiative described herein was possible only because of the University of Padua's independent decision to endorse it. On the other hand we believe that it is quite a unique feature of this project the fact that the residents can spend a fair amount of time at the overseas site and thus getting a much better sense of global health that most of other programs can do which constrict the residents to 2- to 4-week overseas visits [13-15].

Finally, if one of the reasons to offer an ICH was to solicit professional vocations in the field of international medical cooperation, it is noteworthy that two of the residents who participated in the ICH are currently involved in programs of international medical cooperation (and one of them with CUAMM).

In conclusion, we decided to make the pediatric community aware of the model we used to offer an ICH elective with the aim of stimulating a debate on this matter and of generating criticisms and ideas. This, in turn, might encourage other PRPs to offer ICHs to residents. Indeed, more should be done to implement the culture of medical global health in medical post-graduate programs. It is important to raise future generations of doctors with the concept that we live in a world of strong inter-dependency where everyone should practice medicine in the part of the world in which they work but with their gaze directed to wider horizons.

Abbreviations

ICH: International child health; JPO: Junior project officer; MoU: Memorandum of understanding; NGO: Non Governmental Organization; PRP: Pediatric residency program; RAC: Resident affairs committee.

Competing interests

All authors declared no competing interest with the contents of the manuscript.

Authors' contributions

LDD: Among the ones conceiving the MPO project for the Pediatric Residency Program of Padua; intervened in collecting the data of the experience, analyzing them and in writing the paper; preceptor in Padua for the residents in Africa. GPer & EB: Past and present chairman of the Pediatric Residency Program of Padua, they intervened in supporting the JPO project, in analyzing the data and in writing the manuscript. DC & GPut: the Founder of the JPO project in Italy; they intervened in supporting the JPO from the CUAMM side, in supervising the analysis of the data and of the manuscript. AG: Chair of the organizing committee of the JPO project, she intervened in developing the capturing forms for analyzing the data regarding the experience, in data managing and in formulating the first set of analysis. All authors read and approved the final manuscript.

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A 8-year long successful project of global health education for pediatric residents: the Junior Project Officer (JPO)

At the fifth congress of the European Academy of Pediatric Society (EAPS), held in October 2014 in Barcelona, the authors presented an update to the Junior Project Officer (JPO) program described in a recent publication in the *Italian Journal of Pediatrics*. The program, which came out of a partnership between the School of Specialization in Pediatrics, University of Padua and the NGO Doctors with Africa–CUAMM, offered residents the chance to have a training period of 6–12 months in Africa, meeting the growing demand to integrate experiences in global health in medical programs.

This thorough field training program seems to be unique on the current international scene. The discussion seeks to stimulate the creation of similar programs to help foster awareness of international medicine in young doctors.



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A 8-year long successful project of Global Health Education for Pediatric Residents: The Junior Project Officer (JPO)

Authors: Liviana Da Dalt¹, Dante Carraro², Giovanni Putoto², Alessandra Gatta², Eugenio Baraldi¹, Giorgio Perilongo¹.

Background - The pressure to incorporate issues of global health into pre-/post-graduate medical curricula is increasing in order to provide new generations of doctors with a multicultural perspective on health care. Herein we update the experience of a partnership between the Pediatric Residency Program (PRP) of the Padua University (Italy) and the Non-Governmental Organization “Doctors for Africa CUAMM” (CUAMM), recently published in the Italian Journal of Pediatrics, which aims to offer residents the opportunity to attend a 6-month elective in Africa, called “JPO”.

Methods - The constitutive elements of the JPO are: a memorandum-of-understanding between Padua University and CUAMM; periodic site-visits; candidate selection process; pre-departure educational course; preceptorship in Padua and Africa; personalized learning objective sand job description; hands-on experience; evaluation; feed-backs/reports. The African hospitals (Beira-Mozambique and Wolisso/Ethiopia) were chosen based on the presence of pediatrics in staff from CUAMM.

Results - Between 2006 and 12/2013, 16 residents, aged 27-33 years, three attending the III, ten the IV and three the V year of residency consecutively joined the JPO. All worked in pediatric in-patient units; eight in out-patient clinics, six in emergency rooms, nine in community health centers. Thirteen were involved in teaching activities; six in clinical research. All residents completed successfully the 6-month elective and achieved their learning objectives.

Conclusions - To our knowledge no other European PRP provides international electives based on such strategic framework. We updated this experience convinced of the importance of stimulating a debate on this matter, of generating criticisms, ideas and hopefully inspiring similar experiences.

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