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AVERTING MATERNAL DEATH AND DISABILITY

Availability and distribution of, and geographic access to emergency obstetric care in Zambia

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ABSTRACT

Objective: To assess the availability and coverage of emergency obstetric care (EmOC) services in Zambia. *Methods:* Reported provision of EmOC signal functions in the Zambian Health Facility Census and additional criteria on staffing, opening hours, and referral capacity were used to classify all Zambian health facilities as providing comprehensive EmOC, basic EmOC, or more limited care. Geographic accessibility of EmOC services was estimated by linking health facility data with data from the Zambian population census. *Results:* Few Zambian health facilities provided all basic EmOC signal functions and had qualified health professionals available on a 24-hour basis. Of the 1131 Zambian delivery facilities, 135 (12%) were classified as providing EmOC. Zambia nearly met the UN EmOC density benchmarks nationally, but EmOC facilities and health professionals were unevenly distributed between provinces. Geographic access to EmOC services in rural areas was low; in most provinces, less than 25% of the population lived within 15 km of an EmOC facility. *Conclusion:* A national Health Facility Census with geographic information is a valuable tool for assessing service availability and coverage at national and subnational levels. Simultaneously assessing health worker density and geographic access adds crucial information.

1. Introduction

Without functioning and accessible emergency obstetric care (EmOC) services to treat the complications that kill women in pregnancy, childbirth, and the postpartum, no country can expect maternal mortality to decline significantly. The 1997 UN Guidelines for Monitoring the Availability and Use of Obstetric Services and the 2009 UN handbook for monitoring EmOC [1,2] promote 6 process indicators for assessing EmOC availability and, to some degree, EmOC performance.

The first 2 indicators address availability and coverage of EmOC facilities. The UN handbook suggests that there should be at least 5 EmOC facilities per 500 000 population (or 20 000 births), of which at least 1 should be a comprehensive EmOC (CEmOC) facility, for the national level (indicator 1), and for all subnational areas to ensure equitable geographic distribution (indicator 2) [2].

Reviews of the UN process indicators and their application show that monitoring the geographic distribution of EmOC facilities has been neglected [3,4]. Studies have not always sampled sufficient facilities to provide reliable subnational estimates, and so far few have had geographic information on the location of facilities. An assessment in 2006 found that "[l]acking the technology (digital maps, geographic information systems), most projects have difficulty in assessing and expressing this important indicator of equity" [3].

As in most other Sub-Saharan African countries, maternal mortality in Zambia remains high. According to the newest UN estimates, the maternal mortality ratio is 470 maternal deaths per 100 000 live births (uncertainty range, 250–680) [5], without much change over recent decades. Challenges to reducing maternal mortality in Zambia include a critical shortage of health professionals [6,7] and a low population density.

Knowledge of the availability and geographic distribution of EmOC services is, therefore, a valuable decision-making tool for policymakers in Zambia. The 2005 Zambian Health Facility Census (HFC) provides most of the necessary data because it collected information on geographic location, staffing, and service provision of almost all Zambian health facilities, thus enabling subnational disaggregation at any level desired. Used in combination with the population census, population coverage of services can be estimated. Although such a general HFC does not enable as detailed a verification of service provision as an EmOC needs assessment, using existing HFC data for EmOC assessments is very resource efficient.

The present study assessed the first 2 EmOC process indicators for Zambia. In particular, it described the following nationally and for the 9 provinces of Zambia: which EmOC functions were available in hospitals and health centers; how the density of EmOC facilities compared with UN benchmarks; how health professionals were

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distributed; and what proportion of the population had adequate geographic access to an EmOC facility.

2. Methods

The HFC [8], developed by the Japan International Cooperation Agency (JICA), is a national-level assessment of the functionality of health system assets, providing extensive information usable for health system planning. There is no sampling; instead, information is collected on every facility. Data include the precise location (using GPS), availability, and condition of physical infrastructure and equipment, availability of services, and head counts of health workers.

The Zambian HFC 2005 [9] was carried out by the Zambian Ministry of Health, with support from JICA, and covered all public and semi-public (e.g. mission and nongovernmental organization) facilities in the country, as well as some larger private for-profit facilities. Functionality in terms of EmOC was assessed using reported capacity to perform 8 EmOC signal functions: injectable antibiotics; injectable oxytocics; injectable anticonvulsants; manual removal of placenta; manual removal of retained products; assisted vaginal delivery; cesarean delivery; and blood transfusion.

The literature on EmOC generally uses actual performance of these signal functions in the previous 3 months [2], but this was not ascertained in the Zambian HFC. Because reported theoretic capability overestimates actual functioning [1,10] and because there were no data on use in the past 3 months, criteria were added to the EmOC classification on opening hours, staffing, electricity availability, and referral capacity.

Two main levels of care were defined corresponding typically to hospitals and health centers: CEmOC services include provision of all 8 signal functions; and basic EmOC (BEmOC) services include the first 6 [1]. We also allowed for the signal function of assisted vaginal delivery, using either forceps or vacuum extractor, to be absent because it has been considered misleading to discount facilities as EmOC if they lack this signal function—which is not always routinely taught and performed [11]. These facilities are referred to as "BEmOC-1" or "CEmOC-1" [4,11]. Two further levels of care were defined for facilities not providing EmOC but some useful services, termed BEmOC-2 and BEmOC-4 (lacking 2 or 4 unspecified basic signal functions, respectively) [4].

Table 1 presents the criteria for determining the EmOC functioning levels of the 90 hospitals, 990 health centers, and 50 health posts nationwide that were recorded as offering delivery care in the HFC dataset.

To study health workers, we considered all professional cadres with the potential to conduct deliveries who were registered at facilities providing delivery care—namely, doctors, clinical officers, nurses, and midwives. In the Zambian HFC, nurse and midwife numbers were aggregated in a single category and could not be distinguished. However, there was information on 24-hour presence and on-call availability of midwives/doctors and other staff with midwifery skills.

The latest decennial Zambian Census of Population and Housing was conducted in 2000 by the Central Statistical Office [12]. The census contains population numbers down to ward level, with geographic data on administrative boundaries (provinces, districts, constituencies, and wards). It also provides figures of annual population growth rates by district, calculated by projecting growth between 1990 and 2000; thus, projected mid-year population figures can be calculated for the years following the census. The information on fertility, including crude birth rates for each province, enables numbers of births to be estimated.

In rural Zambia, motorized transport is owned by only 1% of households [13], and public transport is scarce. Thus, geographic accessibility was estimated as the proportion of the population within 15 km of services—to conform to the UN benchmark of 3 hours of travel time [2], assuming a walking speed of 5 km per hour. We mapped health facilities and ward areas in the geographic information system platform ArcGIS 9.2 (Esri, Redlands, CA, USA) and created circles of 15-km radius around each delivery facility and around EmOC facilities to calculate the proportion of total area covered. Assuming an even spatial distribution of the population, the proportion within 15 km of services was calculated.

3. Results

The 2005 HFC collected facility information on 1421 health facilities in Zambia; sufficient data were available to enable EmOC classification for 1370. Of these, 1131 were recorded as offering delivery services: 21 second- and third-level hospitals; 69 first-level hospitals; 117 urban health centers; 873 rural health centers; and 50 health posts (1 facility lacked information on facility type).

3.1. EmOC functioning of health facilities

Nearly all of the 90 hospitals had the capacity to provide the EmOC signal functions, although only 65 (72%) offered all 8 functions simultaneously. Fewer hospitals fulfilled the additional staffing

Table 1
EmOC classification of Zambian health facilities, Zambian Health Facility Census 2005.

Facility functioning level (No.)	Signal functions [a]	24-hour service every day	Staffing [b]	Referral
CEmOC (30)	All 8 functions (+ electricity)	Midwife/doctor present 24 hours	≥3 doctors registered; ≥1 doctor on duty	Not required
CEmOC-1 (24)	All 8 or all except assisted vaginal delivery (+ electricity)	Midwife/doctor present or on call 24 hours	≥2 doctors registered; ≥1 doctor on duty	Not required
BEmOC (42)	All 6 basic functions	Midwife/doctor present 24 hours	≥3 health professionals registered; ≥1 health professional on duty	Offer referral [c], provide vehicle for referral [d]
BEmOC-1 (39)	All 6 basic or all except assisted vaginal delivery	Midwife/doctor present or on call 24 hours	≥3 health professionals registered; ≥1 health professional on duty	Offer referral [c], provide vehicle [d], or have communication tool
BEmOC-2 (155)	At least 4 functions	Midwife/doctor present or on call 24 hours	≥2 health professionals registered; ≥1 health professional on duty	Offer referral [c], provide vehicle [d], or have communication tool
BEmOC-4 (375)	At least 2 functions	Any health professional with midwifery skills present or on call 24 hours	≥1 health professional on duty	Offer referral [c], provide vehicle [d], or have communication tool
Substandard delivery service (466)	No functions required	No opening hours required	No staff required	No referral vehicle or communication tool required

Abbreviations: BEmOC, basic EmOC; CEmOC, comprehensive EmOC; EmOC, emergency obstetric care.

[a] Six basic signal functions: injectable antibiotics; injectable anticonvulsants; injectable oxytocics; manual removal of placenta; manual removal of retained products; assisted vaginal delivery. Two comprehensive signal functions: cesarean delivery; blood transfusion.

[b] Health professional: doctor; nurse; midwife; clinical officer. Registered: recorded as working in the facility. On duty: present at day of visit.

[c] Not required if CEmOC functions available.

[d] Not required if next door to a facility with CEmOC functions.