Review of health and non-health sector indicators for monitoring service provision along the continuum of care for maternal health

Mamothena Mothupi (✉ mamothena@gmail.com)

University of the Western Cape School of Public Health <https://orcid.org/0000-0002-1139-1639>

Lucia Knight

University of the Western Cape

Hanani Tabana

University of the Western Cape

Research note

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Abstract

Objective : This study uses health and non-health sector data sources to select and assess available indicators for service provision along the continuum of care for maternal health at subnational levels in South Africa. It applies the adequacy approach established in another study to assess the multi-dimensionality of available indicators. Using adequacy and the process of assessment in the study, the comprehensiveness of the continuum of care for improving maternal health outcomes can be assessed. **Results:** We found 27 indicators of care utilization and access, linkages of care, and quality of care from the routine district health information system. The General Household Survey contained 11 indicators for the social determinants of health on the continuum of care framework. Indicator gaps include health promotion during and after pregnancy, maternal nutrition, empowerment and quality of care. At present, the available indicators measure about 74% of the interventions on the continuum of care framework. We make recommendations regarding improvements needed to better measure and monitor the continuum of care for maternal health. These involve actions within the health system and include integration of non-health system indicators.

Introduction

The continuum of care is a strategy for improving the efficiency and effectiveness of service delivery for maternal health[1], [2]. It is the delivery of services from preconception to the postnatal period, including those related to social determinants of health. The continuum of care (CoC) framework, developed by national stakeholders in South Africa, is presented in Figure 1. It outlines linked intervention packages from the family/community to the district level of care. South Africa (SA) has a strategic goal to deliver and monitor services along the CoC in maternal and related health areas [3], [4]. However, there is a gap in defining the indicator set for monitoring service delivery (mainly inputs, outputs and processes) along the CoC to support these goals.

Figure 1. Continuum of care framework for maternal and newborn health in South Africa. Source:[2].

In a previous study, we described the construct of adequacy, which emerged from a systematic review and critical interpretive synthesis of gaps in measurement of the CoC[5]. The adequacy approach states that the CoC should be measured and monitored in a comprehensive and multidimensional manner. This means all aspects of timely access to care, quality of care, linkages between levels of care, and social determinants of health should be measured. The framework in Figure 1 guides the essential interventions and highlights their linkages, while the adequacy approach integrates multidimensional quality of care measurement. . In this study we used the framework in Figure 1 and the adequacy construct to i) propose an indicator tool for the CoC for maternal health in SA , and ii) describe current gaps to be addressed in improving monitoring and provision of services.

Methods

In this study we assess available indicators currently used for health and non-health sector policy and planning in government programs. They thus have a defined monitoring purpose which is re-assessed for suitability to the CoC framework.

Indicator extraction

We used the routine district health information system (DHIS) to extract relevant health system indicators. The DHIS monitors health programmes, track patients and map service availability in the health system in SA[6]. The National Indicator Data Set (NIDS) within the DHIS contains indicators of service inputs, processes, outputs and outcomes (where relevant) extracted for this study, for the reference period April 2017 - March 2019 [7]. For social determinants of health/ intersectoral factors as outlined in Figure 1, we assessed datasets on the Statistics SA Nesstar portal and selected the General Household Survey (GHS) (reference year 2017) as the most suitable source. The GHS is annually collected and contains data on all intersectoral factors, which are used in policy and planning in SA[8], [9]. All GHS data can be obtained from the DataFirst Portal of the University of Cape Town in SA[10].

Indicator evaluation

The health service indicators from the DHIS were evaluated for suitability to the framework based on their current monitoring purposes and recommendations from existing guidelines. These guidelines included:

- Annual performance plans of the Department of Health in SA
- Guidelines for maternity care in South Africa
- The strategic objectives of the global network to improve Quality, Equity and Dignity in maternal, newborn and child health [11].
- Resources exploring the WHO Quality of Care Framework for maternal and new-born health [12], [13].
- Global Review of Key Interventions related to reproductive, maternal, newborn and child health [14].
- Guidelines for positive birth experience with a focus on monitoring Intrapartum care [15].
- Quality of care at primary (Ideal Clinic Realization and Maintenance Program) and hospital (National Core Standards) level in SA[16], [17]

For social determinants of health, we relied on literature focusing on the relationship between interventions and maternal health outcomes. We also relied on recommendations by the WHO and Commission on Social Determinants of Health[18], conceptual framework of the social determinants of health[19], and frameworks for practice at country level[20]. The evaluation of indicators also revealed outstanding gaps in measuring interventions on the framework, which we describe in this study.

Results

Indicator set

In Figure 2 we present a set of 38 indicators that were extracted and evaluated from the DHIS and GHS (27 indicators from the health system and 11 for the intersectoral factors). The figure also describes measurement gaps per intervention package of the CoC. As Figure 2 shows, indicators are available for most of the intervention packages on the CoC framework. The exceptions were danger sign recognition and emergency preparedness, healthy behaviour promotion and indicators for emergency pregnancy care. The lack of indicators demonstrates unavailable services and/or poor monitoring by the health system. Sometimes indicators are available that do not directly measure maternal health outcomes. Figure 2 shows proxies such as food fortification compliance rates (Indicator 3) used by the health system at community level. Other proxies include Ideal Clinic status (Indicator 20) and national core standards (Indicator 21), which are summary measures of quality of care at facility level. Where only proxies are available, we recommend health information system improvements to measure and integrate measures that are more directly related to maternal health outcomes.

Figure 2 Description of indicators and gaps in monitoring interventions along the continuum of care for maternal health in South Africa

Even where indicators are available, measurement improvements can be made in order to monitor each intervention package comprehensively. Each intervention package consists of more than one intervention, as shown in Figure 1. For example, while Reproductive Care at district hospital may include timely termination of pregnancy indicators, there is a gap in monitoring post-abortion care and treatment of complicated STIs as part of the package. Thus, more research is needed to assess the extent to which the health system provides services within each intervention package of the CoC. New health system interventions, such as Human Papillomavirus (HPV) vaccinations for school going girls and health promotion through mobile phones (MomConnect program), should be monitored through the DHIS. This will improve the comprehensiveness of the data set and ease of monitoring the CoC in the health system.

Quality of care was an under-measured aspect of interventions such as antenatal care visits, normal and Caesarean deliveries, and postnatal visits. There is a need for intervention specific qualities of care indicators, as exemplified by retest rates for HIV positive clients during antenatal care (Indicator 11, Figure 2). The health system runs parallel quality of care systems for maternal health, particularly the confidential maternal mortality audits[21]. We recommend the establishment of routine measures from these sources for integration into the DHIS. Routine quality of care monitoring should also include reporting of safety incidents and experience of care surveys disaggregated by population groups.

While indicators are available for the intersectoral factors in the framework, we observed gaps in monitoring indoor air pollution, maternal nutrition counselling, and women's empowerment for decision making and demand for healthcare. Like health system interventions, each intersectoral factor could be measured by more than one indicator. For instance, in the water and sanitation intervention package, the GHS had variables that could assess safety of water, infrastructure and basic sanitation (Indicators 28-30). While educational achievement indicators may be straightforward, factors such as empowerment

and nutrition are more multifaceted. Thus, a variety of indicators can be isolated for their measurement, depending on data availability.

In summary, Figure 2 is the indicator tool which provides a description of available indicators and gaps that need to be addressed to monitor the CoC for maternal health. The gaps identified should not preclude use of the tool to assess the nature and extent of provision of services along the CoC for maternal health in future studies. The improvement and validation of indicators in maternal health should be a continuous process, tied to evolving policies and information system improvements[22].

Adequacy assessment

In Figure 3 indicators are grouped according to adequacy dimensions, and the information in Figure 2 used to subjectively assess the level to which intervention packages can be measured by available indicators. We assign “partial” (orange) measurement if indicators are available but there are measurement gaps identified. When assigned “no” (red) if no indicators or proxies were identified from the data sources. And we assigned “yes” (green) if, according to literature and existing guidelines, there are indicators available to measure the intervention package. Availability of indicators for an intervention package does not preclude future rigorous validation processes and iterations; this is a normal process within the health information system that is encouraged.

All dimensions of the CoC can be measured by current indicators, although gaps remain within specific intervention packages. Data gaps were most prevalent in the care access and utilization dimension, where 40% (6/15) of intervention packages had no indicators available. Dimensions of quality and linkages of care can only be partially measured; while only 40% (2/5) of social determinants of health domains have available indicators. In general, the GHS and the DHIS provide indicator data for measurement and monitoring of the majority (74%) of CoC intervention packages (17/23) as defined by the framework in Figure 1.

Figure 3. Assessment of availability of indicators over dimensions and domains of the continuum of care for maternal health in South Africa

Discussion

This study developed and assessed the indicator tool for the continuum of care framework for maternal health in South Africa. This process can be applied to newborn and child health indicators within the framework, using relevant data sources. These processes contribute to the operationalization of the framework, in order to fulfil health system goals in comprehensive monitoring and evaluation of maternal health[23]. Our study also advances the application of the adequacy approach to assess the multi-dimensionality of the available indicators. The adequacy approach complements the framework developed by health system actors by integrating quality of care measures. The CoC has been criticized for under-emphasizing quality of care[24]. For instance, there is still a gap in monitoring quality of care signal functions for maternal health through the DHIS. Data from many programs in the health system

are collected separately and only later incorporated into the DHIS[25]. We recommend future research for assessing feasibility of integration of quality of care and service programs data into the routine monitoring and evaluation systems.

Interventions that signify “linkages of care” were also not well defined prior to our study. For that purpose, we proposed the use of indicators for patient transport from community to facility and in-between facilities. Transport facilitates referrals between different levels of care, and an important determinant of maternal mortality in SA [26]. Referrals encompass not only transport but also matching skills to patient needs and managing congestion in facilities[26]. Thus, more research is needed to identify indicators for monitoring human resources and patient management factors in facilities that can contribute to the framework. Our study identified a gap in linkages between one intervention package and another, which is also an important determinant of maternal health outcomes[27], [28]. The CoC framework improves on the country’s strategic plan because it includes more social determinants than water and sanitation[23]. Other frameworks propose even more social determinants, such as occupation, social class, race and ethnicity, social environment and psychosocial circumstances, and behavioural factors[19]. In this study we focused on the domains specified by the framework and recommend future research to explore feasibility of additional indicators.

In conclusion, this study proposed a multidimensional, comprehensive indicator set that can be used to assess the continuum of maternal health care in public health research and practice. The indicator set integrates the under-specified aspects of the framework, such as quality of care and broader social determinants of health, thus improving its potential use from a multisectoral perspective.

Limitations

The indicators used are only applicable to the South African context, but the adequacy model can be used by researchers from other LMICs to guide a multidimensional analysis of information in their context. We identified and assessed indicators only for the intervention packages outlined in the CoC framework and the dimensions proposed through the adequacy model. We recommend on-going research to refine the framework and indicators suitable for maternal health CoC.

List Of Abbreviations

CoC - Continuum of Care

DHIS – District Health Information Systems

GHS – General Household Survey

HPV – Human Papillomavirus

LMIC – Low- and Middle-Income Countries

NIDS – National Indicator Data Set

SA – South Africa

STIs – Sexually Transmitted Illnesses

WHO – World Health Organization

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Availability of data and materials

The datasets generated and/or analysed for the General Household Survey during the current study are available in the DataFirst repository,

[\[https://www.datafirst.uct.ac.za/dataportal/index.php/catalog/central\]](https://www.datafirst.uct.ac.za/dataportal/index.php/catalog/central)^[10]. The datasets generated and/or analysed for the District Health Information System during the current study are available in the National Department of Health Data Dictionary repository, [\[https://dd.dhmis.org/\]](https://dd.dhmis.org/)^[7].

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

MM and LM conceptualized the study. MM conducted data collection and analysis. LM and HM guided additional analysis of data. MM, LM, HT were involved in writing and revision of manuscript. All authors read and approved the final manuscript.

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Figures

Figure 1

Continuum of care framework for maternal and child health in South Africa. The continuum of care framework for South Africa was developed by national health system stakeholders and decision makers [2]. It outlines important evidence based interventions to improve maternal and child health outcomes across the continuum of care. Our study focuses on maternal health aspects. Interventions are implemented across the lifecycle from pre-pregnancy to postnatal period. The levels of care are outlined vertically, and the framework recommends connectedness or linkages between these levels to improve care. In addition, connection between intervention packages (boxed and colour coded) are important. As a primary health care framework, delivery of services on the continuum of care occurs at the district level and below. Besides health system interventions are “intersectoral factors” that represent important social determinants of health for maternal health. These include good living conditions, empowerment and education.

	Level of care	Intervention package	Indicator(s)	Units	Description	Gaps
1-2	Pre-pregnancy Community	Reproductive Health	Female and male condom distribution coverage	DEHS	Condoms distributed from a primary distribution site to health facilities or points in the community (e.g. campaigns, one-to-one outlets, etc.)	There is need to monitor screening and vaccination for Human Papilloma Virus (HPV) as per core policy of vaccination to school-going girls.
3	Adolescent	Preconception services	MMA distribution compliance rate	DEHS	Operational flow and master listing establishments that were compliant with Fertilisation Regulations under the FCTD Act as a proportion of listing establishments that were inspected	This indicator reflects community level response. More indicators can be explored that are directly related to adolescent and preconception services, such as provision of contraceptive counselling.
4	Pre-pregnancy Primary health facility	Reproductive Health	Contraceptive use rate	DEHS	Women protected against pregnancy by using modern contraceptive methods, including sterilisations, as proportion of female population 15-49 years.	Need to monitor post-partum family planning
5-7	Pre-pregnancy District hospital	Reproductive Care	Termination of pregnancy <12 weeks rate, 13-20 weeks rate and under 20 years rate	DEHS	Pregnancies terminated in health facilities at specified gestation period, time, or age of women, as a proportion of total terminations of pregnancies	Need to monitor post-abortion care and treatment of complicated STIs.
8	Pregnancy Community	Healthy behaviours				Outreach to households through ward based outreach teams could potentially include health promoters to encourage health behaviours. In addition, the MomConnect platform which disseminates cellphone messages for pregnant women can promote healthy behaviours. It is important to monitor the promotion of healthy behaviours through these interventions and additional care services.
9	Pregnancy Primary	Antenatal Care	Antenatal 1st visit	DEHS	Women who have a booking visit (first visit)	Indicators that monitor water services such as MomConnect which were cellphone messages to promote healthy pregnancies need to be integrated into the DEHS as well as in public health facilities in the country across the full range of care during.
10	Health facility (with PMCTCT)		before 20 weeks rate		before they are 20 weeks into their pregnancy as proportion of all antenatal 1st visits	Antenatal care as included in clinical management modules of the Integrated Clinical quality improvement assessment tools.
11			Antenatal 1st visit coverage	DEHS	The proportion of potential antenatal clients coming for at least one (booked) antenatal visit. The census number of children under one year increased by 1.1% in a given demographic area 0.11 (17%) is a rough estimate to care for late messages (1.01-2.0), stillbirths (after 28 weeks gestation) and infant mortality. Pregnant women are regarded as potential antenatal clients from around 10 weeks' gestation, i.e. spontaneous abortions before that as well as TOP cases are included.	Besides MCT, there is need to integrate monitoring indicators for TB diagnosis and treatment.
12			Antenatal client not tested for HIV as a proportion of antenatal clients tested during current pregnancy	DEHS	Antenatal clients who started the HIV as a proportion of the total number of antenatal clients who are HIV positive and not on ART.	
13			Antenatal client not on ART rate	DEHS	Antenatal clients who started on ART as a proportion of the total number of antenatal clients who are HIV positive and not on ART.	
14			Triphasic positive pregnant females who received their penicillin 15, 20 or 25% dose as a proportion of pregnant females who tested positive for syphilis	DEHS	Triphasic positive pregnant females who received their penicillin 15, 20 or 25% dose as a proportion of pregnant females who tested positive for syphilis.	
15	Pregnancy District hospital	Reproductive Care	Emergency	Emergency cases	Emergency cases	Need for indication of high risk pregnancy care to be integrated into the DEHS
16	Birth Primary health facility	Care for normal delivery and PMCT	Delivery in facility rate	DEHS	Deliveries in health facilities as proportion of expected deliveries in the population. Expected deliveries are estimated as population under 1 year multiplied by 1.023 to compensate for still births and infant mortality.	Indicators for management of post-partum haemorrhage and other quality of care signal functions during childbirth needed.
17	Birth District hospital	Emergency childbirth care	Delivery by caesarean section	DEHS	Delivery by Caesarean section as proportion of total deliveries in health facilities as proportion of expected deliveries in the population.	Need to monitor quality of care during Caesarean deliveries.
18	Post-natal care Community	Recognition of danger signs and care-seeking	rate			Outreach to households (OHDS) with potential care indicators may include recognition of danger signs and care seeking. However, current indicators only measure visits and not the content of care. This intervention is also not provided to all women who deliver in public facilities.
19	Early detection and referral of complications	Maternal postnatal visit within 6 days	DEHS	Mothers who received postnatal care within 6 days after delivery as proportion of deliveries in health facilities.	Need to monitor the content of care in postnatal visits or otherwise referrals.	
20	Quality of care Primary health facility	Cross-cutting	Maternal Clinical Status rate	DEHS	Score out of 100 based on multidimensional measure of quality of care: maternal health, without regard to facility for maternal health. The main dimensions include: 1. Antenatal care 2. Inpatient Clinical Services Management 3. Midwifery, Reproductive and Laboratory Services 4. Human Resources for Health 5. Support Services 6. Substructure 7. Health Information Management 8. Communication 9. District Health System Support 10. Implementing Partners and Stakeholders. All main dimensions have sub-components and specific domains to be measured.	May be supplemented with more detailed signal function data e.g. from the Department's maternal death audits and observational data. Reporting specific maternal health safety incidents using newly developed tool for Patient Safety Incident Reporting and Learning to be reported with future clinical care related data.
21	Quality of care District Hospital	Cross-cutting	Hospital achieved 75% and more on National Core Standards (NCS) self-assessment rate	DEHS	Score out of 100 on a multidimensional measure of quality of care: maternal health, without regard to facility for maternal health. Availability of guidelines for clinical management of obstetric/gynaecological conditions assessed via the NCS: 1. Patient Rights 2. Patient Safety, Clinical Governance and Clinical Care 3. Clinical Support Services 4. Public Health 5. Leadership and Governance 6. Operational Management 7. Facilities and Infrastructure.	May be supplemented with more detailed signal function data e.g. from the Department's maternal death audits and observational data.
22	Linkages of care Community	Cross-cutting	Obstetric emergency rate	DEHS	Emergency obstetric care facility transfers response times under 60 minutes as a proportion of total EMD cases transported	Linkages across packages of care can be explored through research and formulation of new indicators.
23			Facility transfer rate		proportion of EMD obstetric rural inter-facility transfers, Emergency obstetric inter-facility transfers response times under 30 minutes as a proportion of EMD obstetric urban inter-facility transfers	
24			Obstetric response times and client transport rates	DEHS	Obstetric clients as a proportion of total EMD clients transported	
25	Cross-cutting Community (Domestic Water Factors)	Water and sanitation	Environmental Health, Domestic water compliance rate	DEHS	Domestic technological and chemical water samples taken from 1000 households. Authorities and water service interventions at a point of use that conforms to the standards set out in SANS 241 for drinking water quality and safety as a proportion of water samples collected.	Similar sanitation indicators may be collected by the health system as part of their Environmental Health assessment.
26	Water and sanitation		% women 15-49 drinking safe water	GRS	Proportion of women 15-49 in households that perceive their water to be safe	
27			% women 15-49 in households with adequate water infrastructure	GRS	Proportion of women 15-49 in households with adequate water supply infrastructure	
28			% women 15-49 with basic sanitation facility	GRS	Proportion of women 15-49 in households with basic sanitation facilities.	
29			% women 15-49 with access to electricity	GRS	Proportion of women 15-49 in households with access to electricity	
30			% women 15-49 living in adequate housing	GRS	Proportion of women 15-49 living in households with 'good' or 'very good' wall, roof, and floor conditions of the dwelling.	
31			% women 15-49 living in formal housing	GRS	Proportion of women 15-49 in households classified as formal housing (by Reproductive Development Plan (RDP) plan of the country).	
32			% women 15-49 with adequate food access	GRS	The mean proportion of women 15-49 in households that 'never' had sufficient food, one out of money for food, or the use of meals, skip a meal, or small variety of meals.	May be supplemented with other sources of data on macro and micro-level poverty. Lower income households consulting health professionals on lifestyle factors that impact
33		Household Dietary Diversity Score	DEHS	The Household Dietary Diversity Score by consumption of between 0-10 food groups, in households with women 15-49 years of age	Dietary indicators e.g. diet diversity	Monitoring of interventions to address outcomes such as post-partum weight retention and consideration of a maternal nutrition dietary diversity score for women. Dietary diversity may also not indicate the quantity and quality of food consumed.
34	Education	% women 15-49 who are literate	GRS	Proportion of women 15-49 who are literate		
35	Employment	% women 15-49 with medical aid	GRS	Proportion of women 15-49 who have medical aid		
36	% women 15-49 with income source	GRS	Proportion of women 15-49 with at least one of social grant, working for wage, own business, or involved in business activities.			

Figure 2

Description of indicators and gaps in monitoring interventions along the continuum of care for maternal health in South Africa. The indicator tool was developed to summarize available indicators, their source, and the data gaps that were observed in the study of the continuum of care for maternal health in South Africa. The levels of care and intervention package columns are based on the continuum of care framework developed by health system actors, and presented in Figure 1 of this study, and indicators are

grouped together to make the figure more concise (e.g. indicators 5-7 represents three indicators within the reproductive care package). The detailed definition and numerator and denominators of each indicator can be found in the metadata of the relevant data sources as specified in the Figure. The description of indicators gives a general guidance of the measures involved. Data gaps are also summaries from literature, global and national guidelines as specified in the manuscript.

<i>Dimension</i>	<i>Level of care</i>	<i>Intervention package</i>	<i>Indicators/proxies available</i>
Timely access and utilization of care	Family and community/Pre-pregnancy	Adolescence and pre-pregnancy nutrition	Yes
		Prevention of HIV/STIs	Yes
	Family and community/Pregnancy	Healthy Behaviour	No
		Danger Sign Recognition and Emergency Preparedness	No
	Family and Community/Postnatal	Danger sign recognition and appropriate care seeking, nutrition	No
	Primary health facility/ Pre-pregnancy	Family planning	Yes
		Prevention of HIV/STIs	Yes
		Preconception folic acid	No
	Primary health facility/Pregnancy	Basic Antenatal Care with PMTCT	Yes
	Primary health facility/Childbirth	Care for normal deliveries	Yes
	Primary health facility/ Postnatal care	Early detection and referral of complications	Partial
		Termination of pregnancy	Yes
		Post-abortion care	No
Quality of Care	District Hospital / Pre-pregnancy	Treatment of complicated STIs	No
		Care for high risk pregnancies	Partial
		Quality of care at secondary level	Partial
	Primary health facility/cross-cutting	Quality of care at primary level	Partial
	All levels/cross-cutting	Linkages of care levels (referrals)	Partial
		Housing	Partial
		Water and Sanitation	Yes
	Family and community/cross-cutting	Nutrition	Partial
		Empowerment	Partial
		Education	Yes
		Linkages of care levels (referrals)	Partial
	Family and community/cross-cutting	Housing	Partial
		Water and Sanitation	Yes
		Nutrition	Partial
		Empowerment	Partial
		Education	Yes

Figure 3

Assessment of availability of indicators over dimensions and domains of the continuum of care for maternal health in South Africa. The dimensions of the continuum of care are defined according to the adequacy construct developed in a previous study[5]. The level of care and intervention packages contain indicators found in Figure 2 and are based on the continuum of care framework in Figure 1. We assign “partial” (orange) measurement if indicators are available but there are measurement gaps identified. When assigned “no” (red) when no indicators or proxies were identified from the data sources. And we assigned “yes” (green) if, according to literature and existing guidelines, the indicators available to measure the intervention package are considered adequate.