

Summary

The studies presented in this thesis were designed to apply the principles of operations research to develop a set of sound and scientifically derived solutions for maternal health care in Tanzania. This thesis describes the results of studies carried out in Dar es Salaam and Kilombero district in Tanzania from 2005 to 2010.

Chapter 1 is a general introduction which describes the magnitude of the problem of maternal health, factors for change and the application of the concept of operations research in an attempt to test the feasibility and effectiveness interventions for maternal health in Tanzania. It highlights poor maternal health indicators in Tanzania; maternal mortality ratio 449/100,000 live births, health facility delivery 47%, met need for EmOC 15-30% and caesarean section rate 3%.

Chapters 2 – 6 describe definition of the problem of maternal health care in Tanzania. Findings from these studies indicate that during the study period the majority (72%) of all deliveries in Dar es Salaam took place in the four available public hospitals. Two of these hospitals did not provide theatre and blood transfusion services for 24 hours per day. Two public health centres did not provide delivery services at all and 83% of the dispensaries had poorly established obstetric services. There was only one public neonatal unit that served as a referral institution for all sick newborns delivered in public health institutions in the region. On the other hand, there was a severe shortage of essential categories of health staff for perinatal care in all institutions. The ranges of WISN ratios for nursing staff working in the municipal hospitals' labour wards were; nurse officers 0.5 – 1, trained nurses/midwives 0.2 - 0.4 and nurse assistants 0.1.

This section indicates also that of all partograms reviewed, 50% had no records of duration of labour. Although cervical dilation and fetal heart rates were recorded in 97% and 94% of the partograms respectively, 63% and 91% of these were judged to be substandard. Substandard monitoring of fetal heart rates was strongly associated with poor fetal outcome (p-value

0.001). Blood pressure, temperature, and pulse rates were not recorded in 47%–76% of partograms.

The study on Health Management Information System for maternal health care in Tanzania indicated that of all respondents, 81% had never been trained on HMIS, 65% did not properly define this system, 54% didn't know who is supposed to use the information collected and 42% did not use the collected data for planning, budgeting and evaluation of services provision. Although the attitude towards the system was positive among 91%, the reviewed HMIS booklets were never completed in 25% - 55% of the facilities. The gaps in the current HMIS were linked to lack of training, inactive supervision, staff workload pressure and the lengthy and laborious nature of the system.

The section indicates that out of 8 major hospitals in Dar es Salaam maternal and perinatal systems only existed in 4 and 3 hospitals respectively, and key decision makers did not take part in audit committees. Sixty percent of care providers in the study area were not aware of even a single action which had ever been implemented in their hospitals because of audit recommendations. There were neither records of the key decision points, action plan, nor regular analysis of the audit reports in any of the facilities where such audit systems existed.

A systematic review of maternal health interventions in resource limited countries revealed that programs integrating multiple interventions were more likely to have significant positive impacts on maternal outcomes. Training in EmOC, placement of care providers, refurbishment of existing health facility infrastructure and improved supply of drugs, consumables and equipment for obstetric care were the most frequent interventions integrated in 52% - 65% of all 54 reviewed programs. Statistically significant reduction of maternal mortality ratio and case fatality rate were reported in 55% and 40% of the programs respectively. Insufficient implementation of evidence-based interventions in resources limited countries was closely linked to a lack of national resources, leadership skills and end-users factors.

Chapters 8 – 11 form a section describing the formulation of models, model solutions, and validation and analysis. The first model was on introduction of audits for maternal mortality and severe maternal morbidity in a rural district hospital in Tanzania. The audit results indicated that 94% of all severe morbidities had at least one area of substandard care. Patients, health workers and administration related substandard care factors were identified in 50% - 61% of women with severe morbidities. Improving responsiveness to obstetric emergencies, capacity building of the workforce for health care, referral system improvement and upgrading of health centres located in hard to reach areas to provide CEmOC were proposed and implemented as a result of audit.

Studies on antenatal care services delivery in rural Tanzania indicated that essential parameters like hemoglobin and urine albumin were assessed in 22% – 37% and blood pressure in 69% - 87% of all ANC visits. Fifty two (20%) severe maternal morbidities were attributed to substandard ANC, of these 39 had severe anemia and eclampsia combined. Substandard ANC was mainly attributed to shortage of staff, equipment and consumables.

This section presents also results from a second model of introduction of CEmOC services in remote health centres in Tanzania following training of Non-Physician Clinicians in CEmOC and anaesthesia. It shows that the first 8 months after introduction of CEmOC services in 3 health centres resulted in 179 caesarean sections, a remarkable increase of institutional deliveries by up to 300%, decreased fresh stillbirth rate (OR: 0.4; 95% CI: 0.1-1.7) and reduced obstetric referrals (OR: 0.2; 95% CI: 0.1-0.4)). There were two maternal deaths, both arriving in a moribund condition.

Chapter 12 presents the general discussion, conclusions and recommendations of this thesis. It indicates that the pre-test results summarized in this thesis from the study designs of this operations research, demonstrate a worrisome state of substandard care in maternal health care in Tanzania and a complex picture of interlinked underlying factors. The successes of post test of the two models of this operations research (i.e. introduction of obstetric audit in a rural

district hospital and CEmOC services in health centres located in hard to reach remote areas) contribute to the body of evidence-based solutions to the problem of maternal health in resource limited settings.