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NATIONWIDE CAUSE SPECIFIC MATERNAL MORTALITY SURVEY 2004 - 2005



**NATIONWIDE CAUSE SPECIFIC
MATERNAL MORTALITY SURVEY 2004 - 2005**

Ministry of Health
Department of Health, Myanmar

Women and Child Health Development Project, 2005

Supported by UNICEF

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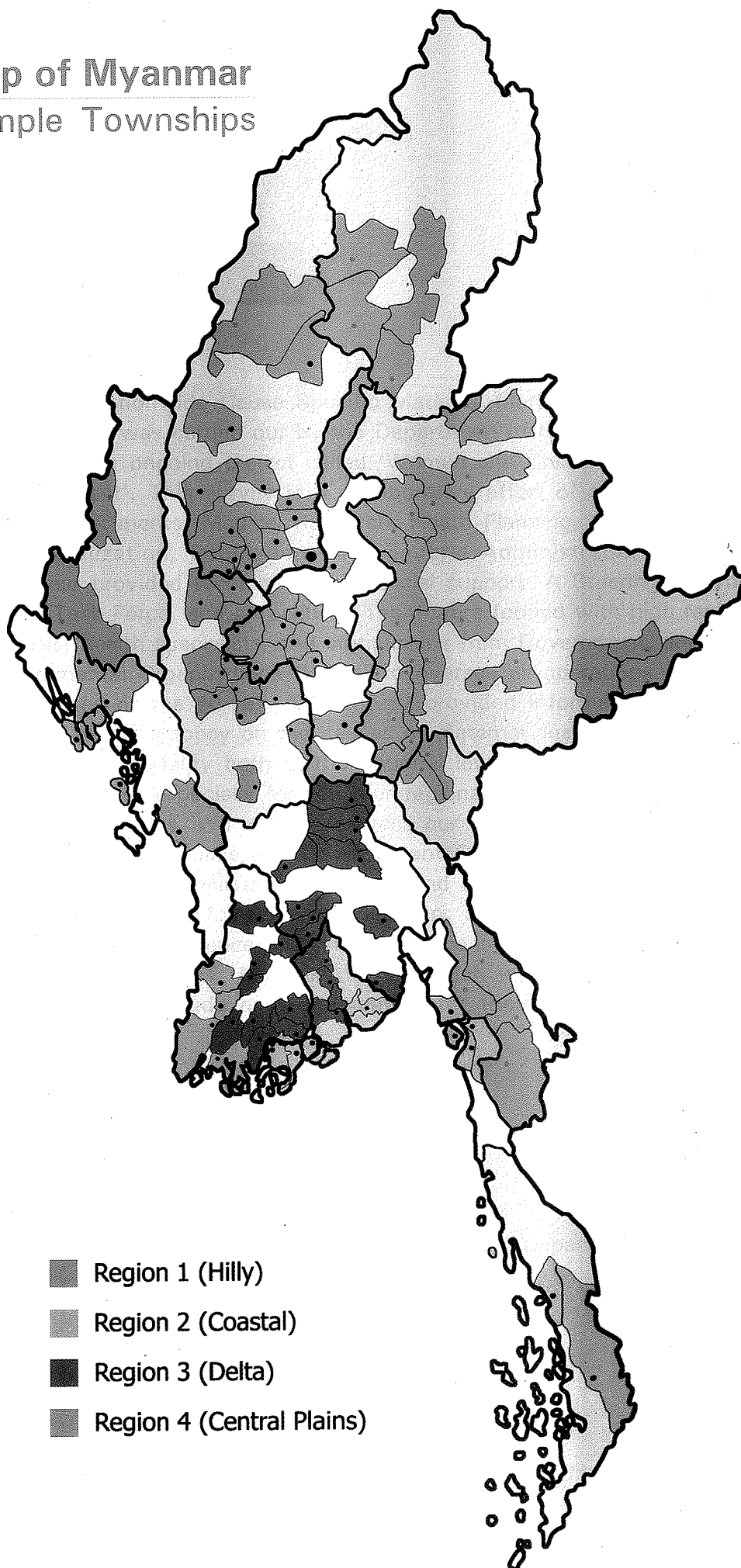
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Map of Myanmar

Sample Townships



Acknowledgements

The Nationwide Cause Specific Maternal Mortality Survey, 2004-2005 was carried out by the Department of Health as an activity of the ongoing project called 'Women and Child Health Development Project'. This survey is a collaborative effort of several Government Departments: Medical Research, Health Planning, Central Statistical Organization, Population, and General Administration. UNICEF, Myanmar provided technical and financial support. A Steering Committee, a Task Force, and a Technical Team were formed with high ranking officials, health specialists, and statisticians from Government, and Non-governmental Organizations (NGOs) to oversee all operations at different phases of the survey. The survey provided information collected through verbal autopsy on the causes of maternal death, and estimates of maternal mortality both at the national level as well as at the sub-national levels, especially for the four regions viz. Hilly, Coastal, Delta, and Central Plains. We wish to express our indebtedness to officials at various levels of Peace and Development Council and the Ministry of Health (MOH) for their understanding, and cooperation, to health staff at grassroots level for their participation, and to all respondents for their hospitality, patience and time in answering questions put them by surveyors. To UNICEF, Myanmar, in particular, we would like to extend our deepest gratitude and appreciation for their encouragement and support.

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Executive Summary

Myanmar has established a comprehensive healthcare infrastructure, and an efficient healthcare delivery system, which functions within the framework of national health plans. Although there is an active health information system for collecting health related data, computing health indicators, and disseminating health statistics, gaps in these health related statistics still exist. *Ad hoc* surveys have to be conducted whenever a need for generating new information arises. Often estimated values of a given indicator, say for example MMR, differ from one source to another. The present study *Nationwide Cause Specific Maternal Mortality Survey 2004-2005* was carried out by the Department of Health as an activity of the ongoing project: Women and Child Health Development.

The findings from the 2004-05 Nationwide Cause Specific Maternal Mortality Survey seem to suggest that women in their reproductive ages were experiencing high risks of death during pregnancy and childbirth. Important findings from this survey are given below in brief.

Maternal Deaths

- 83 pregnancy related deaths were reported from 251,000 sample households visited in the whole country; of which 71 deaths were identified as maternal deaths, 12 as late maternal deaths.
- 11.27% of the total observed maternal deaths were reported from urban areas, and 88.73% from rural areas.

Maternal Mortality Ratio

- MMR, at the national level, is estimated at 316 per 100,000 live births. At the sub-national levels, it was 132 for the Hilly Region, 264 for the Coastal Region, 337 for the Delta Region, and 449 for the Central Plains.
- MMR, at the national level, is found to vary from 177 to 451 per 100,000 live births; (95% CI: 177-451).
- MMR seemed to increase with advancing age of mothers; it increased from 196 per 100,000 live births in the age group 20-24 years to 922 per 100,000 live births in the age group 45-49 years with the exception of the age group 15-19 years for which it was 298.

Respondent's Characteristics

- Age range of most of the respondents was 50-54 years; and a majority of the respondents (38%) happened to be husbands, followed by mothers of the deceased (23%).
- Education Attainment of most of the respondents (37%) was found to have completed Primary School Level; 13% of respondents have higher and 50% of them has lower than primary school level.

Cause of Maternal Death

- Nine causes Postpartum Haemorrhage, Eclampsia, Abortion related, Puerperal Sepsis, Hypertensive Disease, Prolong/Obstructed Labour, Antepartum Haemorrhage, Ruptured Uterus, and Embolism were identified as Direct Causes, and the four: Heart Disease, Malaria, Tuberculosis, and Chest Infection were identified as Indirect Causes.
- Over eighty percent of maternal deaths were attributed to direct causes while less than twenty percent to indirect causes.
- At the national level, Postpartum Haemorrhage accounted for 31% of all maternal deaths, eclampsia 11%, and abortion related causes 10%.
- PostpartumHaemorrhage ranked first both in the urban (50%) as well as in rural areas (29%), and abortion related causes ranked third both in the urban areas (13%) as well as in rural areas (10%).

Timing of Maternal Deaths

- At the national level, 42% of maternal deaths occurred during intrapartum. At the sub-national level, the timing of most of the maternal deaths occurred during intrpartum: Hilly (33%), Coastal (38%), Delta (24%), and Central Plains (58%).
- Among intrapartum maternal deaths, (30%) occurred to women in the age group 30-34.

Mode of Delivery

- Babies were delivered by five modes: normal labour 75%, forceps 4%, vacuum extraction 4%, caesarean section 8% and mal-presentation 8%.

Access to Health Care

- At the national level, about 25% of the cases had to travel over 9 miles to reach the nearest EmOC from home, and the rest (75%) had to travel less than 9 miles to reach that service.

- 27% of the death cases were less than one hour away from the nearest EmOC.
- 90% of the death cases could be able to reach the nearest EmOC within 5 hours.

The current survey produced an MMR estimate of 316 for Myanmar in 2004-05. The 3 UN agencies: WHO, UNICEF and UNFPA developed an approach to estimating maternal mortality for countries with no data and to correct available data for underreporting and misclassification. MMR, according to their approach, for Developing Countries in Asia in 2000 was 330. It was 360 for Myanmar, Cambodia 450, Indonesia 230, Laos 650, Malaysia 41, Philippines 200, and Thailand 44. The level of maternal mortality in Myanmar is high compared to neighbouring countries in the ASEAN region. It is envisaged that higher priorities should be attached to the following interventions recommended to bring about a fall in maternal mortality: (Maternal Mortality in 2000: Estimates Developed by WHO, UNICEF, and UNFPA)

Major Recommendations

- Support programs for capacity building especially to those healthcare providers involved in domiciliary deliveries and provision of adequate clean delivery kit.
- Raise community awareness about early recognition of danger signs associated with pregnancy and delivery.
- Encourage institutional delivery for High Risk Pregnant Women at Emergency Obstetric Centres.
- Promote community awareness for importance of quality antenatal care, and for acquiring skill birth attendants.
- Strengthen referral services such as transportation, and provision of flying squads.
- Organize donor banks for safe blood transfusion at emergency obstetric care facilities.



1. Introduction

Myanmar, since early 1950, established a comprehensive healthcare infrastructure along with national health plans for improving the living standards of the people. At the same time, it is required to strengthen the Ministry of Health (MOH) for enhancing the health information system in order to produce reliable indicators capable of monitoring the progress of interventions being implemented, and evaluating their impact in the country. Additional information on health is also available from other sources, but the methods applied and the scopes covered were, however, designed to satisfy the needs of specific institutions.

Gaps in data still exist, and ad hoc surveys have to be undertaken whenever a need for generating new information arises. In 2003, the Department of Health (DOH) conducted an Overall and Cause Specific Under-five Mortality Survey. In this survey, an attempt was made to determine the level of maternal mortality by administering a brief questionnaire designed to detect deaths due to pregnancy or related to childbirth. This exercise produced an MMR estimate of about 384 per 1,000 live births, (unpublished data).

The Maternal Mortality Ratio (MMR), derived from this survey, was of an acceptable degree of precision. The survey was designed to produce estimates of MMR for the four geographic regions; the sample design was not intended to produce estimates for administrative areas smaller than the said four regions. It is felt that a further trial with a larger sample size would produce MMR estimates not only for the national level, but also for areas at the sub-national levels dis-aggregated by such areas as states, divisions, districts, townships, etc.

Background

The United Nations, at the Millennium Summit in September in 2000, set an inter-connected and mutually reinforcing Millennium Development Goals (MDGs), and a number of time-bound targets aimed at eradicating poverty and at achieving sustainable human development. Myanmar on her part is committed to attain all round development by implementing National Development Plans that were drawn to cover a wide range of MDGs.

The health delivery system, in Myanmar, functions within the framework of national health plans. Among various health programs implemented the two:

- (i) Integrated Management of Maternal and Childhood Illnesses (IMMCI) initiative in 1998, and
- (ii) Women and Child Health Development (WCHD) in 2001 had produced a tremendous impact on the health status of the mother and her child.

The ongoing Five-year Reproductive Health Strategic Plan (2004-2008), which was initiated following the adoption of the Reproductive Health Policy in 2002, gave a high priority to the initiative: *Making Pregnancy Safer*, and placed a special emphasis on the collaboration between programs associated with reproductive health and those with public health. Programs like Immunization (utilization of safe delivery kits, improving TT2), Nutrition (management of anaemia in pregnancy, iron folic tablets, de-worming in pregnancy), Malaria (prevention and management of malaria in pregnancy), etc. have had a significant effect on the improvement of maternal health.

Indicators for a single variable of interest at a specified point of time were often derived from institution-based data, which were either compiled from routine reporting systems or from *ad hoc* sample surveys. Often, estimated values of a given indicator differ due to differences in the objective, study design, coverage, and method of estimation. MMR was 3.60 in 2002 (UNICEF: *The State of the World's Children, 2004*) and 3.84 in 2002-2003 (DOH, WCHD Project, unpublished survey result).

The present study, *Nationwide Cause Specific Maternal Mortality Survey*, which was carried out by DOH as an activity of the WCHD project, is expected to produce dependable information on maternal morbidity and mortality together with selected measures of population and vital events.



2. Objectives

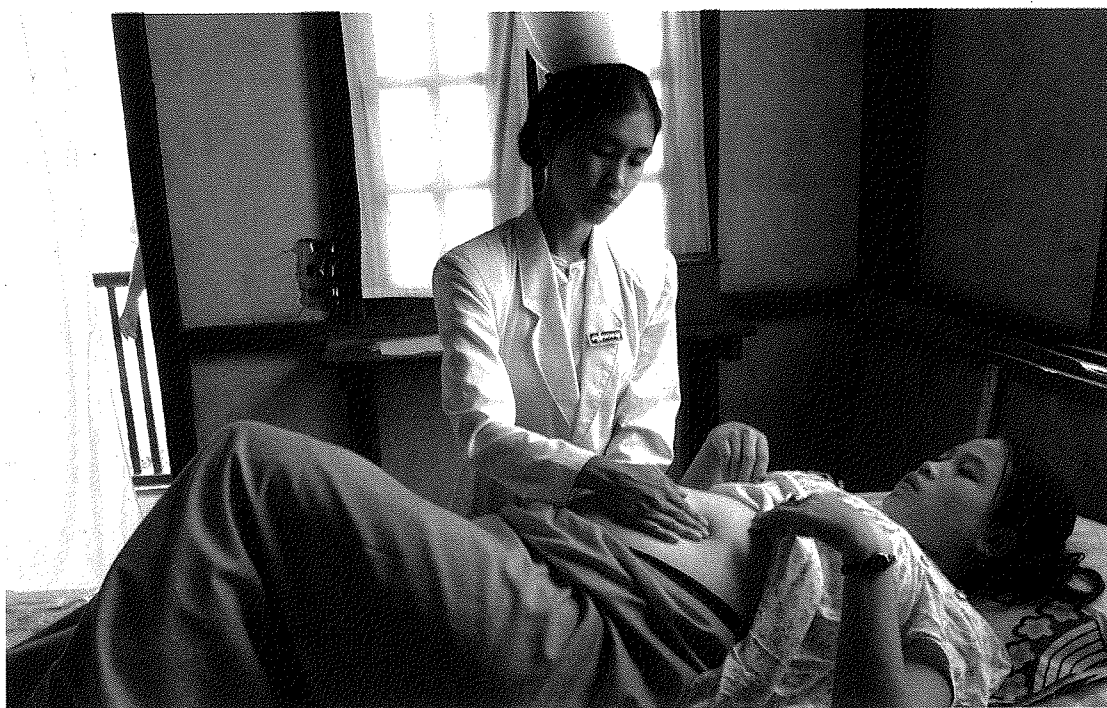
The objectives of the survey in broad terms can be described as follows:

General Objective

To determine the level and cause of maternal mortality, at the national as well as sub-national levels

Specific Objectives

- To estimate Maternal Mortality Ratios in 2004-05 at the national level and at sub-national levels, particularly for the four geographic regions viz. Hilly, Coastal, Delta, and Central Plains.
- To calculate upper and lower bounds for selected mortality ratios using the precision of point estimates.
- To identify leading causes of death of women related to pregnancy or childbirth.
- To study health related factors and treatment seeking patterns of deceased mothers.





3. Materials and Methods

A number of interrelated measurement objectives were taken into consideration in choosing the sample design. The primary objective, at the national level, was to produce an estimate of maternal mortality ratio, and a set of maternal mortality ratios at the sub-national levels for the four geographic regions: Hilly, Coastal, Delta, and Central Plains. The secondary objective was to provide causes of death of women related to pregnancy or childbirth. These objectives had been crucial in making decisions on the choice of the design.

3.1 Survey Design

A modified version of the Extended Program of Immunization (EPI) Cluster Survey was used to obtain reliable national estimates by four geographical regions and by urban-rural residence. The EPI Cluster Survey Design is also referred to as the 30 by 7 design. In this study, a stratified three-stage sampling scheme, similar to the one used in 2002-03 Under-five Mortality Survey, was adopted with modifications to suit the current Maternal Mortality Survey. The survey design was not intended to provide MMR estimates for areas viz states/Divisions, districts, townships, etc, smaller than the four geographic regions. The survey was cross-sectional, descriptions study using verbal Autopsy.

At the first stage, a fixed number of sample townships were selected systematically from each stratum by Probability Proportional to Estimated Size (PPES), after arranging the townships in decreasing order of magnitude of size, size being the total number of households in the township. At the second stage, a predetermined number of clusters were selected systematically from each township by PPES, after arranging the wards and villages/village tracts in decreasing order of magnitude of size, size being the total number of households in wards and villages/village tracts. At third stage, a household was first chosen at random in the selected ward or village tract and then using this household as the starting point, contiguous households were visited until 100 households had been interviewed.

The survey design was not intended to provide MMR estimates for areas viz. States/Divisions, Districts, Townships, etc. smaller than the four geographic regions.

Replication

At the first stage, the number of townships from each stratum was selected in 5 replicates for easy calculation of sampling variance.

Stratification

The standard EPI design is widely acclaimed for its low cost, simplicity and for the ease of calculations in estimating the coverage of infant immunization within a community. This design was modified to obtain a reliable estimate of the maternal mortality ratio at the national level, and other information related to the cause of maternal death. The intensity of maternal mortality was expected to vary not only between regions but also between urban and rural areas. Two levels of stratification viz.

(1) Geographic Location, and (2) Urban-Rural Residence were incorporated into the original design in order to increase the level of precision of the estimates. The introduction of stratification could also increase the flexibility of control over the field operations.

The country, for administrative purposes, has been divided into 7 states and 7 divisions. Recently, Shan State had further been divided into 3 regions and Bago Division into two regions. In this survey, these States and Divisions were reorganized first, into four geographic regions, and the settlements within each region are then separated into urban and rural areas. The rationale for this stratification was to ensure a proper spread of the sample, and to provide efficient estimates both for the national as well as for the four sub-national levels: Hilly, Coastal, Delta and Central Plains. Information on stratification is given in Table 3.1.

Table 3.1
Stratification of States and Divisions

Stratification	Region	State/Division
1	Hilly	Shan, Kachin, Kayin, Chin, Kayah
2	Coastal	Mon, Rakhine, Tanintharyi
3	Delta	Yangon, Ayeyarwady*, Bago
4	Central Plains	Mandalay, Magway, Sagaing**

* Seven Townships from Ayeyarwady Division and one Township from Yangon Division were regrouped into the Coastal Region.

** One Township from Sagaing Division was regrouped into the Hilly Region.

Sample Size Determination

The sample size was determined by the standard method of choosing values on the basis of cost, logistics, feasibility, practicability, and usefulness of the results.

Sample Size

$$n = [t^2 (1-p) / \{e^2 \times p\}] \times d$$
$$= \{1.96^2 [1-0.0034] / [0.2^2 \times 0.0034]\} \times 1.2 = 33,781 \text{ live births}$$

where the proportion of maternal deaths per 100,000 live births

$$p = 340 / 100,000 = 0.0034$$

[MMR estimate for Myanmar for 1986-90, FRHS, 1997, Department of Population]

$$e = \text{allowable margin of error} = 20\%$$

$$d = \text{minimum design effect} = 1.2$$

Required Sample Households

$$= \text{Live Births} / [\text{Crude Birth Rate} \times \text{Household Size}]$$

$$= 33,781 \times 1,000 / [23.9 \times 5.37]$$

$$= 263,209 \text{ households, where}$$

Crude Birth Rate = 23.9 Live Births per 1,000 population and

Household Size = 5.37 persons

[CSO, 2002 Statistical Yearbook]

In this exercise, it would require to interview at least 250,000 households to come up with a reliable estimate of MMR, provided that the value of MMR, the key parameter, was close to the true value. A trial made with 126, 000 sample households in connection with the 2002-03 Under-five Mortality Survey could identify 46 incidences of maternal death. It was therefore thought that 250,000 households would be large enough to produce the estimates required for planning purposes.

Sample Allocation

A stratified 3-stage design was used with *township* as the first stage sampling unit, *ward / village* tract as the second stage sampling unit and *household* as the third stage sampling unit. The sample selection procedures for the first and second stage units were balanced PPS Systematic method, which would ensure the inclusion of a mix of both large and small townships as well as wards and villages/village tracts.

It is apparent that people living in urban areas are in a better position regarding access to health care facilities than those in rural areas. According to recent population estimates, about 70% of total population was living in rural areas. In order to give a greater rural representation in the survey, clusters were assigned to urban and rural areas in the ratio 3:7. Clusters (wards in urban areas

and village tracts in rural areas) were selected at the Project Office using the method of balanced PPS Systematic selection. Moreover, 120 townships were allocated proportionately to each stratum according to the number of townships in each stratum, and 2,500 clusters to each stratum according to the population size of each stratum. The distribution of sample clusters by region and by place of residence is given in Table 3.2. The urban-rural ratio as observed in the sample might differ slightly from the actual urban-rural ratio of clusters; but the difference would not in any way affect the final estimates of the parameters of interest.

Table 3.2
Allocation of Sample Clusters

Region	Township	Cluster			Household		
		Urban	Rural	Total	Urban	Rural	Total
1	35	92	328	420	9,200	32,800	42,000
2	20	111	389	500	11,100	38,900	50,000
3	30	303	447	750	30,300	44,700	75,000
4	35	154	686	840	15,400	68,600	84,000
Total	120	660	1,850	2,510	66,000	185,000	251,000

Note: One cluster = 100 households

3.2 Survey Forms

A structured questionnaire consisting of the following five forms was used in the Cause Specific Maternal Mortality Survey:

- Form 1: Cluster Mapping
- Form 2: Sample Cluster Household Listing
- Form 3: Household Form
- Form 4: Sample Cluster Summary Listing, and
- Form 5: Cause Specific Maternal Mortality Questionnaire

The first four forms formed one entity and the last form another entity. The former was meant for collecting background characteristics in identifying maternal deaths, and the latter for collecting facts through verbal autopsy about women who died due to causes related to either pregnancy or childbirth. Most of the questions were pre-coded, for the pre-coded design would lighten the job of completing the forms in the field, and at the same time would help save time for canvassing with respondents.

Pre-tests

Before printing and shipment of survey instruments, the third draft of the

questionnaire developed in Myanmar Language was put to field tests in Dagon Myothit (South) Township, belonging to Yangon Division on February 12, 2005. The Task Force in consultation with the Technical Team carried out field-tests with the help of the TMO and her staff. Experiences gained from these field tests were useful in evaluating the adequacy and in revising the questionnaire, and in determining the efficiency of instruction materials, survey guides and manuals developed for use in the main survey. A set of Myanmar era calendars was appended to the Interviewer's Manual in order to facilitate the conversion of dates from Lunar Year Calendar to Solar Year Calendar.

Workload Determination

Time likely to be taken in making a household visit and administering all five forms in the structured questionnaire was determined for calculating the workload of surveyors. The interviewing-time would be about 5 to 15 minutes, if maternal deaths did not occur in a sample household. It would probably take 15 to 30 minutes, whenever the death of a woman was reported. However, it would take longer, about 60 to 90 minutes, for asking all questions and filling in relevant responses, if the causes of death of the woman were related to either pregnancy or childbirth. It was estimated that the average enumeration time would be around two to three days for covering all the households in one cluster i.e. one hundred.

3.3 Organization Structure

A steering committee was formed, at the central level, with the Director-General from DOH as the chairperson, and the Director (Public Health) from DOH as the Project Manager-cum-Principal Investigator for executing various tasks at different stages of the nationwide sample survey. The members of the steering committee were made up of professors from the Departments of Child Health, University of Medicine (1) and University of Medicine (2) and high-ranking officials from the Departments of Disease Control and Public Health and Health Planning. The members of all committees including (i) Task Force, and (ii) Technical Team were given in Annex-B.

A Project Office, established at DOH, was made up of the following four units: (i) Administration, (ii) Survey Methods and Statistics, (iii) Computer, and (iv) Field Operations

The Organization Chart of this Survey is given in Annex-A.

3.4 Recruitment and Training

A Basic Health Staff, who was stationed in a community, could be familiar with local conditions, people, culture, language, common illness, climate, means of transport and communication, etc. Five enumerators, living within a given

township included in the sample, were entrusted with the task of covering a predetermined number of clusters: ranging from a minimum of 12 to a maximum of 25 clusters. In other words, one enumerator would have to visit 240 to 500 households i.e. 2 to 5 clusters over a period of 12 working days during the two months: May to June, 2005.

Recruitment of Field Staff

The survey was planned as a project activity of DOH, and the Health Staff were presumed to give their services as a part of duty; but honoraria were given in appreciation of their contribution towards this survey. In addition, a provision was given to interviewers for hiring interpreters, if none of the interviewers could speak or comprehend local dialects. Selection Criterion of an enumerator is defined below:

Essential Qualities of an Enumerator

1. Persons employed as Basic Health Staff (BHS) and stationed within the sample townships.
2. Persons having interest and prior experience in data collection activities.
3. Persons who were fluent in Myanmar Language and who could communicate with people including authorities.
4. Persons who could read out questions given in the forms and who could ask questions in getting information from respondents.
5. Persons who could go (travel) to the wards / village tracts assigned.
6. Persons who used to take responsibilities and fulfill duties assigned to them.

Persons who did not qualify for Enumerators

1. Persons who were stationed in those wards/village tracts included in the sample
2. Persons who could neither read nor understand Myanmar Language
3. Persons who had poor eyesight or who had difficulty in hearing (deaf).
4. Persons who were not good at public relations i.e. persons who could not deal smoothly either with authorities or with people.
5. Persons who for various reasons could not go to the wards/village tracts assigned.

A master list containing the names of all townships including those of wards/village tracts was first prepared, and copies of these listing were made available to all State/Division level health directors and to all Township Medical Officers (TMOs) concerned. The strength of field staff is given in Table 3.3.

Table 3.3
Staff Strength for Fieldwork

Region	State/Division	Sample Township	Township Supervisor	State/Division	Supervisor Surveyor
1. Hilly	5	35	21	70	175
2. Coastal	3	20	9	40	100
3. Delta	3	30	12	60	150
4. Central Plains	3	35	9	70	175
Total	14	120	51	240	600

Note: Local Interpreters were hired in the field, whenever necessary.

Training Programs

The training program for field staff was divided into two:

- (i) Training of Trainers, and
- (ii) Multiplier Training.

The former was held at Myanmar Medical Association (MMA) in Yangon, whereas the latter at all State/Division Level Health Departments.

Training of Trainers

The Training of Trainers was intended for 51 State/Division Level Supervisors who would, in turn, be giving training to enumerators/surveyors and field supervisors at the township level. The training course for trainers was given to State and Division level health directors, medical officers from those townships included in the sample, and staff from the Project Office in Yangon,.

The 3-day intensive training covered various aspects of the survey. Classroom teaching, role-play, mock interviews, and demonstration exercises were followed by field observation through face-to-face interviews with members of a few households in which women had died while pregnant or during or after giving birth.

Members of the Technical Team, Consultant Obstetricians and Gynaecologists, Statisticians, and invited Resource Persons conducted the training; the approach adopted was that of participatory. The program on Training of Trainers was conducted in two batches.

The first batch was given from 21 to 23 March 2005 to State/Division level supervisors from Kachin State, Kayah State, Kayin State, Rakhine State, and Shan State inclusive of South, North and East regions, along with trainees from Sagaing Division, Tanintharyi Division, Bago Division (East), and Yangon Division.

The second batch was given from 28 to 30 March, 2005 to trainees from Chin State, and Mon State along with those trainees from Bago Division (West), Magway Division, Mandalay Division, and Ayeyarwady Division.

The first batch received one day field practice in Thongwa Township, Yangon Division on March 22, 2005 and the second batch in Shwepyithar Township, Yangon Division on March 29, 2005.

Multiplier Training

State/Division Level Supervisors gave a-four-day intensive multiplier training upon their return to Township-level Supervisors (TSs), Field Supervisors, and Surveyors/Enumerators (ENs). The course content was kept almost identical to that of TOT with minor changes to suit local conditions. The date for holding the training course was left flexible, but within March or April 2005 in consultation with local authorities. At the end of the multiplier course, ENs and TSs prepared micro-plans for making house visits, and for interviewing caregivers, preferably mothers or mothers/sisters-in-law of the deceased women.

Logistics Support

The project office took the responsibility of developing all survey instruments and shipping out stationeries and supplies to all areas included in the sample, at least one week ahead of the time of enumeration. All forms were shipped out, about 25%, in excess of the actual number required for covering damage, loss and training purposes.

At the end of the Multiplier Training Courses, Directors of Health at state/division level allocated sample clusters, oversaw the drafting of micro-plans, and issued supplies in order to achieve greater efficiency in shipping survey instruments.

3.5 Data Collection

A face-to-face interview method was adopted for collecting data, and the process of interviewing all respondents in a cluster was to be completed by one interviewer within two days. A structured questionnaire was used to collect information on maternal mortality from caregivers by means of the face-to-face interviewing technique. Basic Health Staffs, in most cases midwives, stationed at the grassroots level, served as enumerators (ENs), Township Medical Officers (TMOs) as Field Supervisors (FSs), and State/Division Health Directors as Chief Supervisors (CSs). As a rule, a health-staff was assigned to sample clusters that fell in areas outside the domains of his or her official duty station. A total of 600 enumerators, 240 field supervisors, and 51 chief supervisors were involved in the interviewing process.

Debriefing sessions were held in the evening by enumeration teams for reviewing the filled in forms, and checking entries for completeness, omissions, and response errors.

The data collection work was done over a period of two months: May-June 2005. The Project Office issued all directives, instructions, guides, etc. with respect to the conduct of this survey. All requests, complaints, problems, etc. arising from the field while making house visits and canvassing with respondents were addressed to the Project Office via TMOs through State/Division Level Health Departments. Township Level Field Supervisors were instructed first to approach local SPDC officials in dealing with problems encountered in the field, and then resort to other venues to find solutions.

Enumerators, after checking filled in forms for omissions, errors, and inconsistencies, and making necessary corrections, handed in completed questionnaires to field supervisors. The supervisors, in their turn, made final checks particularly regarding geo graphic identification on all forms, and forwarded all forms they had collected to the project office through State/Division Health Departments. State/Division level chief supervisors put their signatures on the control sheets as an indication of certifying that all sample townships under their charge had been covered.

Field supervisors, especially in some remote areas in which means of transportation and communications were difficult, were instructed to transmit the returns from the field directly to headquarters, bypassing State/Division Health Departments.

3.6 Supervision and Fieldwork

The performance of enumerators was crucial in collecting relevant data. Proper supervision was exercised at all stages of field operations. Five enumerators were placed under the charge of two supervisors. Chief supervisors assigned a reasonable workload to each enumerator. During the period of enumeration, field supervisors observed enumerators at work, assisted enumerators in making entries, clarified ambiguities that arose while interviewing, and took note of those enumerators who were slow in filling out forms, and lagging behind. Field Supervisors also prepared an itinerary, which helped trace the whereabouts of the enumerators. Visits made by supervisors either from State/Division level or from the project office were planned to coincide with the time of making interviews. As planned, the actual enumeration work in a township could be carried out within 10 to 12 days. Follow-ups or revisits were encouraged, whenever the responsible member of a household, who was supposed to provide information, was absent or was expected to be back home within one or days.

Supervisors from headquarters, Project Office, in fact formed a number of roving teams, and visited more than one state/division within a given geographic region. Similarly, supervisors from State/Division level made arrangements with the project office to meet supervisors in selected sample townships. Concurrent visits by personnel from different levels afforded opportunities for solving certain non-anticipated problems, in a few communities.

Representatives from UNICEF, Myanmar also accompanied central level supervisors in making field visits to some sample townships viz. Mudon in Mon State, Tatkone in Mandalay Division, Yinmarbin and Taze in Sagaing Division, and Yatsauk, and Nyaung Shwe in Shan State (South).

Channel of Communication

Speedy flow of information either from the Project Office down to the field or from the field to the Project Office was crucial to the success of every phase of the field operations. As the quality of data collected in this survey depended partly on the skill and performance of enumerators, and partly on the supervisory work done by field staff, free flow of information was encouraged in order to ensure timely solutions to all problems as they arose while the interviewing process was in progress. Supervisors were sent immediately to the community in which enumerators faced problems associated either with ambiguities in the questionnaire or with unforeseeable problems.

The process of enumeration in the field began with briefings from Field Supervisors to Enumerators. Enumerators often worked alone, sometimes in teams depending upon the local condition. Interviewers were instructed to meet with local authorities before visiting households, and to ask for help whenever necessary in identifying households for interviewing.

Supervisor's Assessment

Supervisor's Report covering various aspects of the survey was extremely important for evaluating not only the quality of data collected in survey, but also for judging the performance of the interviewers. Moreover, it provided an opportunity for making an assessment of the strengths and weaknesses of all survey instruments developed and used. Additional information provided by supervisors was useful to obstetricians, and gynaecologists for specifying diagnoses on the basis of verbal autopsy.

3.7 Data Quality

All entries made in the questionnaire were first checked in the field by supervisors for omissions, inconsistencies, ambiguities, etc. TMOs later reviewed all entries, and verified responses with prior knowledge gained from administrative records, publications, etc., before sending these forms to the project of-

fice. The computer unit, on receipt of completed forms, undertook manual editing, keyed in entries into PCs, carried out machine verification of entries, prepared databases, and produced tables by using the software EPI version 6.1. Estimates of MMR along with their precision were computed by using the software SPSS.

3.8 Post Enumeration Check

A total of 14, 400 households or nearly 6% of 250,000 sample households was used for the post enumeration check (PEC). These households were chosen by means of a stratified two-stage cluster sampling. At the first stage, it was decided to cover 10% of total sample townships or 12 townships at random:

- Four Townships from Region 1: Nyaung Shwe, Yatsawk, Shwegu, and Pa-an (1)
- Two Townships from Region 2: Thongwa, and Mudon
- Two Townships from Region 3: Paungde, and Seikkyi Kanaung To
- Four Townships from Region 4: Yenan Chaung, Tat Kone, Yin Ma Bin, and Taze

At the second stage, 12 clusters were chosen at random from each township by means of systematic sampling; special emphasis was placed on urban-rural differential in selecting sample clusters.

In evaluating the completeness of coverage, house visits were made using the same survey instruments in conducting PEC as those used in the main survey. Health Assistants (HAs), who had prior experience in fieldwork, were sent to the field as interviewers. Consultants from the project office gave a two-day training. They went on tours in turn along with these highly skilled HAs during their fieldwork. No difference was observed either in the number of live births or in the number of deaths of women related to pregnancy or childbirth.

Response Rate

The project office provided every interviewer a list containing the names of village/village tract in rural areas or wards in urban areas from townships included in the sample along with the number of clusters to be covered. Once in the sample ward/village, the team leader first selected a street at random and then a house also at random as the starting point for making house visits. Interviewers continued visiting contiguous houses, following one direction, until one hundred households had been covered. If a village included in the sample happened to have fewer households than 100, interviewers moved from the house visited last in the first village to the nearest house located in the second village. A total of 251,000 sample households were covered by the survey as planned, i.e. owing to the selection procedure, the survey had a cent percent rate of response.

Summary Measures

Clean data from updated files were used for estimating mortality measures along with their precision. Estimates of maternal mortality ratios by region are given in Tables 3.4 with their respective 95% confidence limits.

Table 3.4

Maternal Mortality Ratios by Region along
with Coefficient of Variation and 95% Confidence Limits

Region	MMR (per 1,000 live births)	CV%	95%Lower	Confidence Limits Upper
1. Hilly	1.32	32.11	0.47	2.16
2. Coastal	2.64	40.20	0.52	4.77
3. Delta	3.37	10.55	2.66	4.09
4. Central Plains	4.49	14.71	3.17	5.81
Union	3.16	21.77	1.77	4.51

The precision of an estimate is usually measured in terms of the coefficient of variation (CV). The value of CV for MMR at the national level had been estimated as 21.77%; the low value of CV reflected a high degree of precision of the parameter being estimated. MMR for the whole country during the reference period 2004-2005 is expected to fall between 1.77 and 4.51 per 1,000 live births. At the sub-national levels, MMR could vary from a minimum of 0.47 maternal deaths per 100, 000 live births in the Hilly Region to a maximum of 5.81 in the Central Plains.

Summary measures of selected population and vital events viz. household size, sex ratio, birth rate, and maternal mortality ratio estimated for the four regions are given in Table 3.5.

Table 3.5

Summary Measures by Region

Indicator	Hilly	Coastal	Delta	Central Plains	Union
1. Household Size	5.2	4.9	4.6	5.0	4.9
2. Sex Ratio at Birth	100.3	109.1	103.0	104.1	104.0
3. Crude Birth Rate	21.03	19.30	18.24	16.60	18.39
4. Maternal Mortality Ratio	1.32	2.64	3.37	4.49	3.16

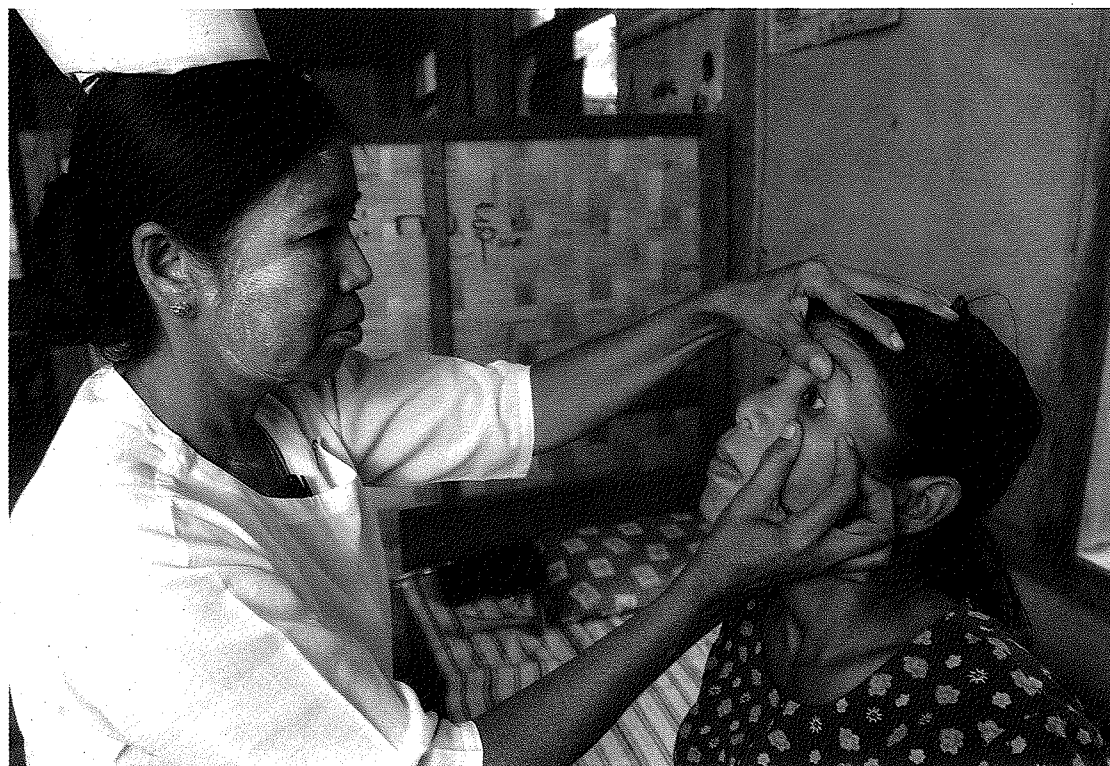
About 5 persons were found to live, on the average, in a household. The household size was slightly bigger in the Hilly Region. The Crude Birth Rate (CBR) is defined as the number live births per 1,000 population. It was found to be 21.03 in the Hilly Region, 19.30 in the Coastal Region, and 18.24 in the Delta Region; it was 16.60 in the Central Plains. CBR for the Hilly Region was found to be the highest. Even though a higher level of CBR was observed in the Hilly Region, it had a lower level of maternal mortality. The contrast was observed in the Central Plains; it implies that women in the Central Plains were exposed to higher risks of death associated with pregnancy and childbirth. Information on fertility by urban-rural residence is given in Table 3.6.

Table 3.6

Crude Birth Rates by Region and by Urban-Rural Residence

Stratum	Crude Birth Rate		Region
	Urban	Rural	
1. Hilly	17.30	22.22	21.03
2. Coastal	16.62	20.75	19.30
3. Delta	15.15	20.59	18.24
4. Central Plains	14.99	16.89	16.60
Union	15.73	19.51	18.39

An urban-rural differential exists in fertility; the level of fertility seemed to be higher in rural than in urban areas.





4. Findings

Respondents, over the age of 18 years, who were present at the time of death of deceased women, provided information to surveyors. Interviewers asked caregivers to describe the history of maternal death in their own words. A structured questionnaire was administered for identifying the causes of death.

One panel of three Senior Obstetrician and Gynaecologists from teaching hospitals in Yangon City viz. Central Women Hospital, North Okkalapa General Hospital and Thingangyun Sanpya Hospital were formed. Each member of the panel was provided with coded answers of the questionnaire and was asked to give his or her opinion independent of others concerning the cause of maternal death.

One diagnosis was then identified for every death as the leading cause on the principle *the best of three*. A good agreement is found to between every two members of the panel: A & B (Cohen's Kappa=0.91), A & C (Cohen's Kappa = 0.84), and A & D (Cohen's Kappa = 0.83) in giving their assessments about the causes of mortality.

4.1 Respondents' Characteristics

Information was collected from an adult, responsible member of the household included in the sample; most preferably the mother or else the caregiver. Respondents in most cases happened to be husbands, mothers, sisters or sisters-in-law of the deceased women. The characteristics of main respondents i.e. those, who provided answers to questions put to them by interviewers, are given in Table 4.1.



Table 4.1

Main Respondents by Relationship to the Deceased Women (Percent)

Sr.	Relationship	Union	
		Number	Percentage
1	Husband	27	38.03
2	Mother	16	22.54
3	Mother-in-law	3	4.23
4	Father-in-law	2	2.82
5	Sister	9	12.67
6	Brother	6	8.45
7	Sister in law	2	2.82
8	Son	4	5.63
9	Daughter	1	1.41
10	Others	1	1.41
	Total	71	100.00

At the national level, among the respondents, the proportion of husbands happened to be the highest (38%); it was followed by mothers (23%), sisters (13%), and brothers (9%) in that order. At the sub-national level, husbands were the majority in Delta (48%) and in Central Plains (45%); whereas mothers the majority in the Hilly (33%), and in the Coastal Region (39%). Enumerators on the average had to visit two times in less than 5% of household to gather all the relevant information. Over 85% of the respondents answered in Myanmar language and about 15% had to be interviewed with the help of local interpreters. In Chin, Kachin, Kayah and Shan States local villagers, school teachers, and members of Myanmar Maternal and Child Welfare Association acted as interpreters.

A similar pattern was found, in Table 4.2, among respondents in rural areas; but a slightly different pattern was observed in urban areas. Among immediate relatives, sisters ranked third in rural areas, while sisters-in-law second in urban areas.

Table 4.2

Main Respondents by Relationship and by Urban-Rural Residence

Relationship	Urban n = 8	Rural n = 63	Union	
			Number	Percentage
1.Husband	37.50	38.09	27	38.03
2.Mother	12.50	23.81	16	22.54
3.Mother-in-law	-	4.76	3	4.23
4.Father-in-law	-	3.18	2	2.82
5.Sister	25.00	11.11	9	12.67
6.Brother	-	9.52	6	8.45
7.Sister-in-law	12.50	1.59	2	2.82
8.Son	-	6.35	4	5.63
9.Daughter	12.50	-	1	1.41
10.Others	-	1.59	1	1.41
Total	100.00	100.00	71	100.00

to the Deceased Women and by Urban-Rural Residence (percent)

Immediate relatives especially mothers, sisters or sisters-in-law of the deceased women were usually present at the time of delivery or final illness.

Age

Any knowledgeable member of a given sample household would naturally be an adult, and he/she was expected to be at least 18 years of age. The age distribution of main respondents by region is given in Table 4.3, and that of main respondents by urban-rural residence in Table 4.4.

Table 4.3

Main Respondents by Age (Percent)

Age (years)	Union	
	Number	Percent
15 - 19	2	2.82
20 - 24	8	11.27
25 - 29	10	14.09
30 - 34	6	8.45
35 - 39	9	12.67
40 - 44	9	12.67
45 - 49	8	11.27
50 - 54	11	15.49
55 - 59	2	2.82
60 - 64	5	7.04
65 +	1	1.41
Total	71	100.00

At the regional level, about 16% of the respondents were in the age range 50-54 years, and the proportion was found to be slightly higher in rural areas, 18%. The median age of a respondent was about 40 years, 38 years in urban areas and 41 years in rural areas.

Usually, mothers who looked after the delivery of their daughters were elderly. If the age of a main respondent was considered with his or her urban-rural residence, the age range of about 18% of respondents was reported to be 50-54 years in rural areas and that of 25% of respondents 45-49 years in urban areas.

Table 4.4

Main Respondents by Age and by Urban-Rural Residence (Percent)

Age (years)	Urban n=8	Rural n=63	Number	Union Percent
15 - 19	-	3.18	2	2.82
20 - 24	25.00	9.52	8	11.27
25 - 29	-	15.87	10	14.09
30 - 34	12.50	7.94	6	8.45
35 - 39	25.00	11.11	9	12.67
40 - 44	-	14.28	9	12.67
45 - 49	25.00	9.52	8	11.27
50 - 54	-	17.46	11	15.49
55 - 59	-	3.18	2	2.82
60 - 64	12.50	6.35	5	7.04
65 +	-	1.59	1	1.41
Total	100.00	100.00	71	100.00

Education

Details about the educational attainment of respondents are given in Table 4.5.

Table 4.5

Main Respondents by Educational Attainment (Percent)

Education	Number	Union Percent
1. Illiterate	5	7.04
2. Can read and write	11	15.49
3. Monastic education	10	14.08
4. Lower Primary	10	14.08
5. Primary School completed	26	36.62
6. Middle School	8	11.27
7. High School	1	1.41
Total	71	100.00

Most of the respondents (93%) were literates; 37% completed primary school level and 1.4% completed high school level. Among respondents, a majority of them had completed primary level, almost in all regions.

4.2 Maternal Deaths

The survey identified a total of 83 pregnancy related deaths; of which 59 cases were classified as direct obstetric deaths, 12 cases as indirect obstetric deaths. The 11 deaths, occurred between 43 days and 364 days (postpartum) after delivery, were considered as late maternal deaths. There was one incidental death during pregnancy due to rabies; details given in Figure 1.

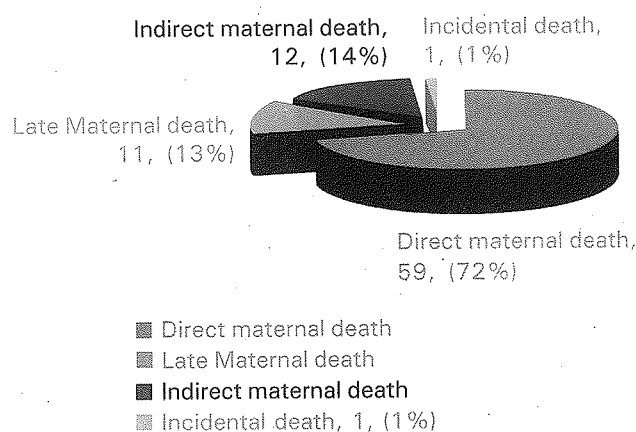


Figure1. Causes of Pregnancy related Deaths (n=83)

During the 12-month reference period i.e. from 1st April 2004 to 31st March 2005, there were 22,478 live births in 251,000 households visited. Maternal Mortality Ratio was estimated at 316 maternal deaths per 100,000 live births. MMRs estimated for each five-year age group within the childbearing ages are given in Table 4.6.

Table 4.6
Maternal Mortality Ratio by Maternal Age

Age (years)	Maternal Deaths	Live Births	MMR per 100,000 Live Births
15 - 19	3	1,007	297.91
20 - 24	10	5,091	196.43
25 - 29	13	6,414	202.68
30 - 34	14	5,267	265.81
45 - 49	2	217	921.66
Total	71	22478	315.86

Maternal Mortality Ratios were also estimated at the urban-rural type of residence, it was 363 in rural areas and at 140 in urban areas. These ratios were illustrated in Figure 2. The level of maternal mortality in rural areas was about 2.5 times that of in urban areas. Moreover, MMR values seemed to increase with advancing age of maternal deaths; it was highest for the age group 45-49. About 43% of maternal deaths occurred in the age groups 35-39, 40-44, and 45-49. Around 15.5% of maternal deaths occurred in the age group 40-49 and 42% in the group 15-19. On analyzing the prevalence of contraceptive use, 72% respondents did not mention anything about contraception or birth spacing.

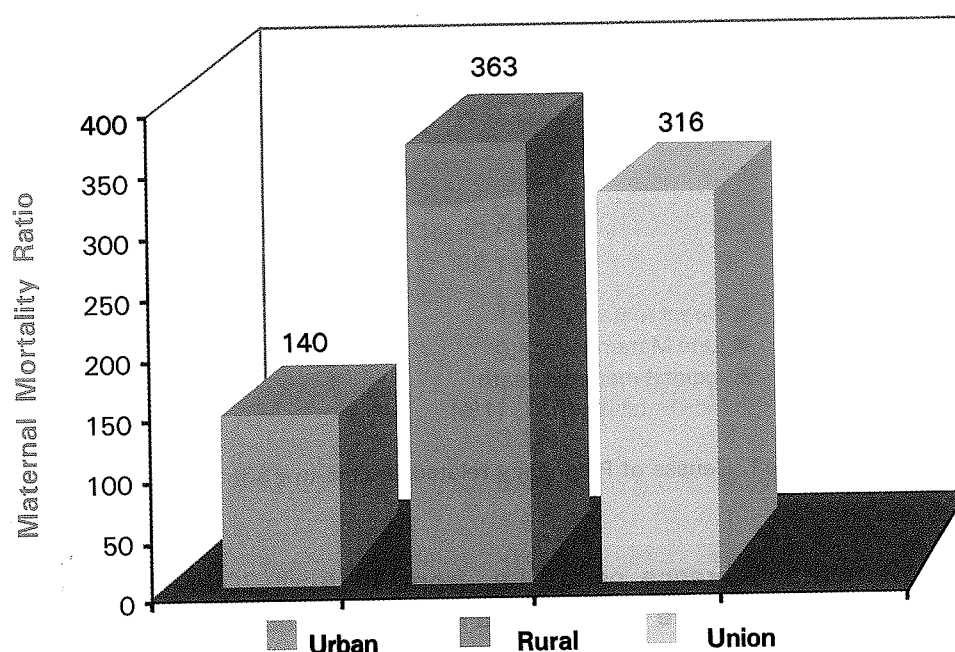


Figure2. Maternal Mortality Ratio by Urban-Rural Residence

Cause of Maternal Mortality

The causes of maternal deaths, as diagnosed by a three-member of specialists, were illustrated in Figure 3. About 16.90% of maternal deaths were due to indirect causes such as heart failure (including cardiomyopathy, organic heart disease, and anaemic heart failure), malaria, tuberculosis and chronic chest infection.

Information on the causes of maternal deaths cross-classified by region is given in Table 4.7.

Table 4.7

Maternal Deaths by Cause and by Region

Causes of Death	Hilly n=6	Coastal n=13	Delta n=21	Central Plains n=31	Union n=71
1. Postpartum Haemorrhage	49.99	15.39	14.29	45.16	30.98
2. Eclampsia	-	38.46	9.52	3.23	11.27
3. Abortion related	-	15.39	23.81	-	9.86
4. Puerperal Sepsis	16.67	-	4.76	9.68	7.04
5. Hypertensive Disease	16.67	7.69	4.76	3.23	5.63
6. Prolonged / Obstructed Labour	-	-	9.52	12.90	8.46
7. Antepartum Haemorrhage	-	-	9.52	3.23	4.23
8. Ruptured Uterus	16.67	-	4.76	3.23	4.23
9. Embolism	-	-	-	3.23	1.41
10. Indirect Causes	-	23.07	19.05	16.13	16.90
Total	100.00	100.00	100.00	100.00	100.00

Postpartum haemorrhage accounted for most of the maternal deaths in the Hilly Region (50%) and in the Central Plains (45%). In the Coastal Region, 7.69% of maternal deaths were also due to hypertensive disorders, and 38.46% to eclampsia. The proportion of deaths due to abortion related complications was 15.39% in the Coastal Region compared to 23.81% in the Delta Region where two cases were due post-abortion tetanus.

The leading cause of maternal death at national level was found to be Postpartum Haemorrhage (31%). Eclampsia and Hypertensive Disease of pregnancy ranked second (17%). Abortion related deaths constituted a little less than 10%. Puerperal Sepsis (7%) continued to occur due to harmful practices. Pregnancy with Antepartum Haemorrhage constituted 9.52% of maternal deaths in the Delta Region and 3.23% in the Central Plains.



Case study-1 A case of PPH

A woman from Central Plains had her second pregnancy. She gave birth to her first child 2 years ago without complications.

In this pregnancy, she received antenatal care from a local midwife. She had malaria, weakness, anaemia and jaundice during pregnancy. She intended to give birth at home. There was a Sub-Rural Health Centre in her village within walking distance. Early in the morning the woman had watery discharge and her mother was called in. The mother, who came to see her daughter, thought that she was not in labour. Before going back to her home, her mother told her that she would call the midwife, if her daughter had come into labour. Her mother was 43-year old and illiterate. The next day, when a neighbour came in, she asked the neighbour to attend her daughter's delivery. When the mother came, at 7.00 a.m. the next day she found her daughter in a pool of blood and a stillborn baby, who was already delivered. The mother sent for the midwife, who gave intramuscular injection twice and referred her to the Township Hospital. The Township Hospital was situated 9 miles away and could be reached within two hours. She traveled by boat at a cost of 10000 kyats and died on the way. She was 25 years old at the time of death. Cause of death was PPH. Delay in seeking health care and late referral led the woman to her death.

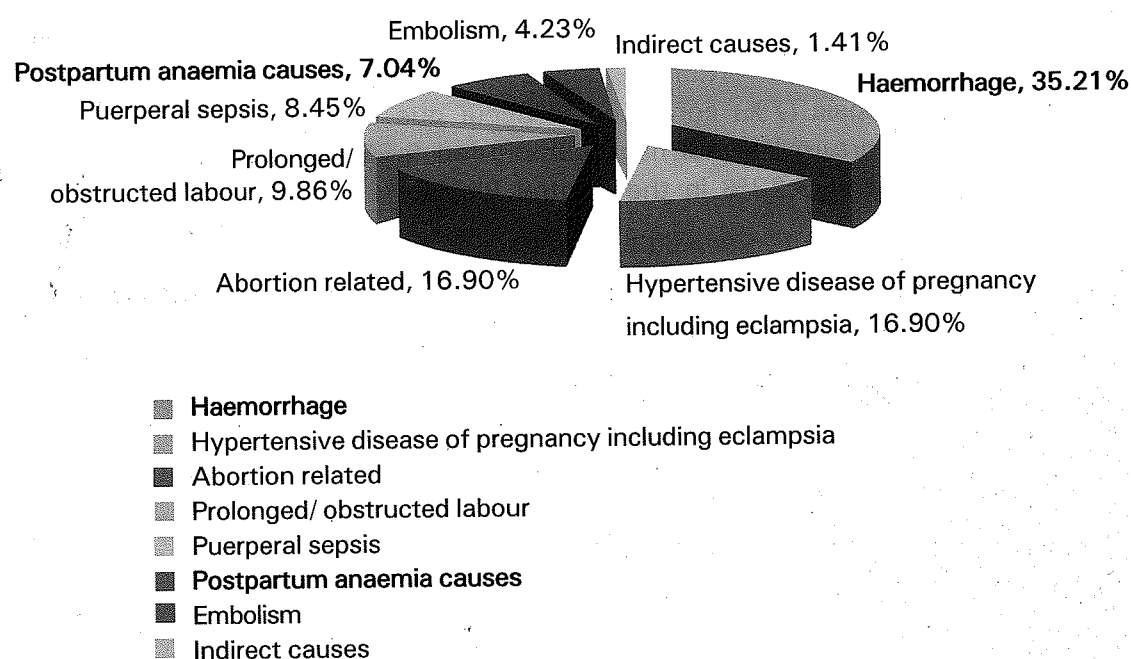


Figure3. Causes of Maternal Death (n = 71)

Case Study-2 A case of Prolonged Labour with PPH

A thirty-five-year old lady from Central Plains had been pregnant for the first time. She had antenatal care with a MW for four times. She had hypertension during pregnancy and treated with antihypertensives by the midwife at RHC since she was 24 weeks pregnant. She came into labour during the evening and a MW was called in the next day for prolonged labour. The MW referred her to the Township Hospital 7 miles away. The sister of deceased was an AMW, who arranged a bullock cart for transferring the patient and accompanied her to the hospital. After 3 hours, she delivered a baby girl alive on the bullock cart, with the assistance of her sister (the AMW in attendance). They turned back the bullock cart and traveled home. She had moderate amount of bleeding on the way back, soaking her longyi (clothing) and no treatment was given for PPH. Four days later, she collapsed and died. Failure to book for hospital delivery with hypertensive disease of pregnancy for proceeding to EmOC, failure after delivery on the way and unawareness of AMW about the danger signs, led to the untimely death of this lady. Cause of death was prolonged labour with PPH.

Hypertensive diseases of pregnancy, pre-eclampsia and eclampsia collectively posed a threat to child bearing women .17% of maternal deaths were due to Pre-eclampsia and Eclampsia .Early onset of eclampsia and delay in referral led to the death of woman in spite of energetic treatment at health care facilities.

Case study-3 A case of Eclampsia

A twenty-four-year old lady with her first pregnancy had antenatal care with AMW when she was 24 weeks pregnant. She also visited the local midwife once. The antenatal care was unsatisfactory. The respondents did neither know about her blood pressure nor of her plan. She developed acute epigastric pain and fits when she was 32 weeks pregnant.

She was seen by a midwife, had intramuscular injection to control fits and referred to Divisional Hospital (which was 18 miles away) by car. She was diagnosed as a case of eclampsia and had operative delivery (caesarean section). She had a stillborn baby and continued to have convulsions after delivery. She received two units of blood after operation. She became unconscious and died on the fifth postoperative day.

The cause of death was eclampsia and there was delay in seeking medical advice. She and her family were unaware of the danger signs of the preclampsia.

Two tragic cases encountered during the survey period in the Delta Region were described as case studies 4 and 5. These two tragic incidents happened in the adjacent villages and the same person was responsible for misconduct. These were the examples of unawareness about dangers of septic induced abortion. The delay in seeking medical advice due to fright and having treatment for very serious condition with unqualified local practitioner led to the untimely deaths of young women.

Cause study-4 A case of Septic Abortion

A twenty-two-year old lady had normal delivery, one year and 5 months before the time of household interview. She conceived her second pregnancy, while taking oral contraceptive pill. She attempted to induce abortion by the help of a TBA. The TBA inserted bamboo stick and feather into the vagina.

She stayed at home for 4 days and could not open her month. So she called in the midwife and midwife referred her to the Station Hospital, which was situated 6 miles away, and could be reached by Htawlargyi, (motorized vehicle). She developed convulsions at the hospital. She was treated for tetanus and died two days later.

Case study-5 A case of Septic Abortion

A twenty-four-year old lady from the Delta Region, conceived for the second time. The duration of her 2nd pregnancy was 2 months. She had one child alive; her age was one year and five months at the time of household interview.

She did not use any form of contraception and conceived. She induced abortion with the help of a TBA and continued taking treatment with an unqualified practitioner for two days. She went to a Station Hospital from which she was referred again to the Township Hospital. She was treated at the hospital as a case of tetanus following septic abortion. She had locked jaw, developed repeated fits, and died 3 days later. Cause of death was tetanus following induced abortion.

Information on maternal deaths classified by cause and by urban-rural residence is given in Table 4.8.

Table 4.8

Maternal Deaths by Cause and by Urban-Rural Residence (Percent)

Causes	Urban		Rural		Union	
	Number	Percent	Number	Percent	Number	Percent
1. Postpartum Haemorrhage	4	50.00	18	28.57	22	30.98
2. Eclampsia	-	-	8	12.71	8	11.27
3. Abortion related	1	12.50	6	9.52	7	9.86
4. Puerperal Sepsis	-	-	5	7.94	5	7.04
5. Hypertensive disease	-	-	4	6.35	4	5.63
6. Prolonged/Obstructed labour	-	-	6	9.51	6	8.46
7. Antepartum Haemorrhage	2	25.00	1	1.59	3	4.23
8. Ruptured uterus	-	-	3	4.76	3	4.23
9. Embolism	-	-	1	1.59	1	1.41
10. Indirect causes	1	12.50	11	17.46	12	16.90
Total	8	100.00	63	100.00	71	100.00

Postpartum haemorrhage was the most common cause of maternal death in both urban as well as in rural areas; whereas antepartum haemorrhage was responsible for 25% of urban maternal deaths. In rural areas, 17.5% of maternal deaths were due to indirect causes including malaria, beri beri, heart failure, and tuberculosis. Hypertensive diseases of pregnancy including eclampsia were the causes of 19% of rural maternal deaths. 5% of maternal deaths in rural areas were due to ruptured uterus following mismanagement and delay in referral to Emergency Obstetric Care (EmOC) facilities.

Timing of Maternal Death

The timing of the death was considered in Table 4.9 in relation to abortion, ante-partum, intra-partum, and post-partum.

Table 4.9

Timing of Maternal Deaths by Age (Percent)

Age (years)	Timing of Maternal Deaths				Total n=71
	Abortion n=7	Ante partum n=18	Intra partum n=30	Post partum n=16	
15 - 19	-	11.11	3.33	-	4.22
20 - 24	42.86	5.56	13.33	12.50	14.08
25 - 29	14.29	16.67	20.00	18.75	18.31
30 - 34	-	11.11	30.00	18.75	19.72
35 - 39	14.29	38.89	20.00	37.50	28.17
40 - 44	28.57	11.11	13.33	6.25	12.68
45 - 49	-	5.56	-	6.25	2.82
Total	100.00	100.00	100.00	100.00	100.00

43.67% of maternal deaths occurred to women aged 35 years and above. In the Hilly Region, 50% of maternal deaths occurred between ages 35 and 45 years. One woman with ruptured uterus and another with stroke died on the way to healthcare facility., one woman died during delivery of her 8th child, and one died of postpartum haemorrhage within half an hour after delivery. In the Coastal Region, five cases of elderly maternal deaths occurred; out of which three were due to obstetric haemorrhage, one due to septic induced abortion, and one due to cerebro-vascular accident.

All women with postpartum haemorrhage reached healthcare facilities within 1-4 hours and died at the hospital within 24 hours due to late arrival. In the Dealta Region, there were 7 deaths of elderly women; 3 due to obstetric haemorrhage, 2 due to abortion related complications, and 2 due to indirect causes (tuberculosis and heart failure).

In the Central Plains 7 maternal deaths occurred to women aged over 35 years; 3 due to postpartum haemorrhage, one due to puerperal sepsis, and three due to indirect causes (cardiomyopathy in two and cerebral malaria in one case). Information on maternal deaths by parity is given in Table 4.10.

Table 4.10
Maternal Deaths by Parity

Parity	Number	Percent
0	12	16.90
1	12	16.90
2	10	14.08
3	10	14.08
4	8	11.27
5	8	11.27
6	4	5.64
7+	7	9.86
Total	71	100.00

Among observed 71 maternal deaths in the present survey, (34%) of woman died while giving birth to their first child and half of them dies before the body was born and half of them died before delivery of the baby. Almost 10% of mothers were grandmultiparae, who had 7 to 11 children. In contrast to other countries, where teenage pregnancy carried high morbidity and mortality, elderly Myanmar women with high parity carried high mortality during the survey period.

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Details on the timing of maternal death by region are given in Table 4.11.

Table 4.11
Timing of Maternal Deaths by Region (Percent)

Timing	Hilly n=6	Coastal n=13	Delta n=21	Central Plains n=31	Union n=71
Abortion related	-	15.38	23.81	-	9.86
Antepartum	33.33	30.77	28.57	19.35	25.35
Intrapartum	33.33	38.46	23.81	58.07	42.25
Postpartum	33.33	15.38	23.81	22.58	22.54
Total	100.00	100.00	100.00	100.00	100.00

Abortion related deaths constituted less than 10%. About 67.8% of maternal deaths occurred during labour process and more than 40% were due to complication of 3rd stage and post partum haemorrhage. Figure 4 shows the maturity of pregnancy at the time of maternal death.

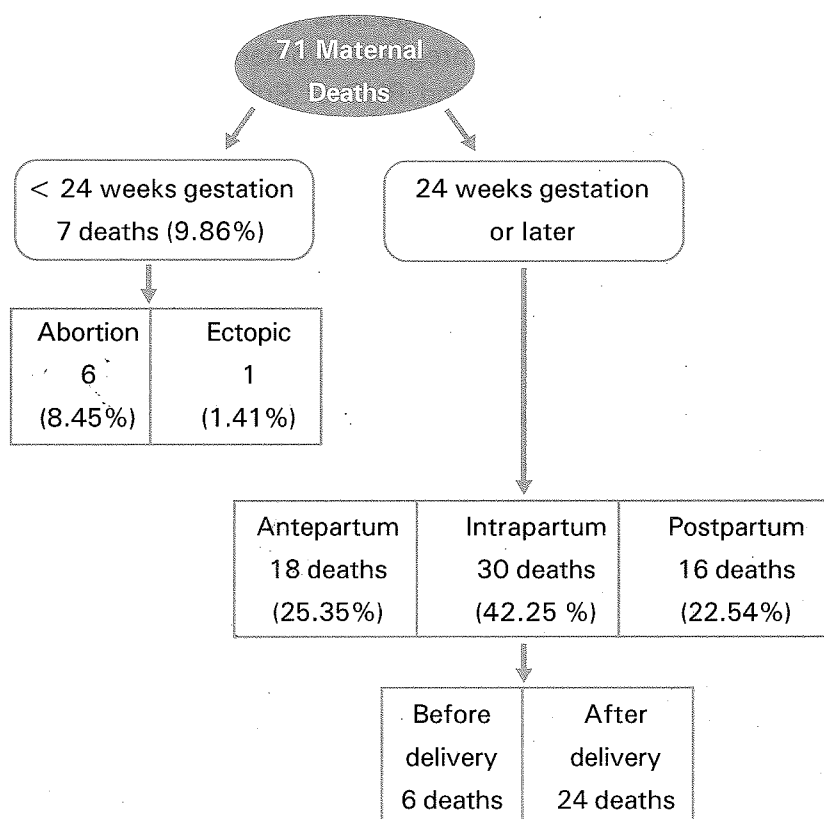


Figure 4. Maturity of Pregnancy at the Time of Maternal Death

Out of 30 deaths occurred during intrapartum, 6 cases (8.44%) died during the 1st stage of labour before the baby was born, and 24 cases (33.81%) died after the baby was born. There were 16 deaths (22.54%) occurred during the puerperium. The place of delivery of 40 women who died during labour was shown in Table 4.17. Abortion related deaths occurred mostly in 20-24 year age group (42.86%) and 40-44 year age group (28.57%). All of them were multiparous women who had two or more children.

4.3 Antenatal Care

Routine recommended antenatal care for Myanmar pregnant women included at least four visits- one visit as early as possible, 2nd visit around the 18-20 weeks of pregnancy, 3rd visit at 28-34 weeks and fourth visit if the woman goes beyond term pregnancy are the appropriate time for antenatal visits with midwifery skilled personnel, who included midwife, midwife-nurse and doctors.

At least two doses of tetanus toxoid injections, 6 weeks apart, last dose should be given two weeks before the expected date of delivery to pregnant woman to prevent neonatal tetanus had been the routine practice for years under the expanded programme of immunization and newly introduced women health development strategy to women of reproductive age. (15-45 years) Measuring height, weighing, haemoglobin estimation, urinalysis for protein and sugar were the very basic minimal accessible investigations to every pregnant women. Iron and folic acid were given to every pregnant woman free of charge from secondary health centre in urban areas and RHC or Sub-RHC in rural areas. Information on the source of antenatal care by region is given in Table 4.12

Table 4.12

Maternal Deaths by Antenatal Care Seeking Pattern (Percent)

Source of Antenatal Care	Union = 71
No Antenatal Care	33.80
Traditional Birth Attendants	4.23
Auxiliary Midwives	5.63
Midwives	43.66
Doctor	4.23
Unknown/ Missing	8.45
Total	100.00

In the present survey, 48% of pregnant woman sought antenatal care from skilled providers at least once during the pregnancy period. The number of antenatal visits ranged from one to seven times but the visits were inconsistent. Less than 5% of women sought antenatal care from more than one health care provider and visits were insistent not according to the scheduled visits. Although 43.66 percents of deceased women were delivered by midwives more than half of them tried to deliver at home alone or with traditional birth attendants and health care personal were called for help as last resort.

Nearly 43 % of deceased women never saw skilled birth attendants for antenatal care. Information on antenatal advice received by the deceased women is given in Table in 4.13. At the time of delivery, the first person who had seen the woman with obstetric problem was not the skilled person with whom they had antenatal care.

Only a little more than 4 % of women who died had birth plan during their fatal pregnancy. When there was emergency obstetric problem like APH, or retained placenta, they called the person who was available. These cases delivered eventually by doctors were referred late to the health care facility. Late referral was due to delay in decision making with the hope of getting better with traditional methods and treatment from the untrained, unqualified practitioners.

Table 4.13
Antenatal Advice received by Deceased Women

Antenatal Advice	Union = 71
No advice	45.07
Medication (Iron & vitamins)	8.45
Counseling	7.04
Birth plan	4.23
Follow up	35.21
Total	100.00

About 45% of respondents mentioned that the deceased women did not get any advice, 93% had no knowledge of counselling advice about breast feeding, personal hygiene and nutrition, and 95% had no birth plan. There were only six maternal deaths encountered during the survey in the Hilly Region. 50% of respondents did not know about the antenatal care or the birth plan. The same trend was observed in the other regions.

Information on tetanus toxoid coverage of pregnant women by urban-rural residence is given in Table 4.14.

Table 4.14

Tetanus Toxoid Vaccination Coverage of
Deceased Women during Pregnancy by Urban-Rural Residence

Tetanus Toxoid Vaccination during Pregnancy	Urban		Rural		Union	
	Number	Percent	Number	Percent	Number	Percent
Yes	7	87.5	41	65.1	48	67.6
No	1	12.5	11	7.4	12	16.9
D.K	0	0	8	12.7	8	11.3
Missing	0	0	3	4.8	3	4.2
Total	8	100.0	63	100.0	71	100.0

Tetanus Toxoid immunization was included in the Extended Program of Immunization to prevent neonatal tetanus and another women Health programme to cover women of reproductive age from 15-45 years of age. However, 67.6% of deceased women had tetanus immunization during pregnancy. 11.3% of respondents did not have any knowledge about the need to immunize against tetanus.

Teenage mothers did not have the knowledge to take tetanus immunization, so also women above 45 years of age. There was no obstetric death due to tetanus but there were two deaths following induced abortion with tetanus where both of them were not immunized.

4.4 Delivery Care

Proper medical attention and hygienic conditions during delivery are the two components that could reduce the risk of complications arising from childbirth. Information on health care seeking pattern at the time of delivery by region is given in Table 4.15.

Table 4.15

Maternal Deaths by Health Care Seeking Pattern
at the Time of Delivery (Percent)

Birth Attendant	Union	
	Number	Percent
TBA/ TTBA	24	52.17
AMW	6	13.04
MW	10	21.75
Doctor	6	13.04
Total	46	100.00

Although 48 % of deceased women saw the skilled health care provider once during the pregnancy (Table 4.17), only 22.5% of women were actually delivered by skilled health care providers. TBA/TTBA was first approached by the relatives of deceased women for delivery in 33.8% of cases. Information on intra-partum mode of delivery is given in Table 4.16.

Table 4.16

Maternal Deaths by Mode of Delivery (Intra-partum)

Mode of delivery	Maternal Deaths	
	Number	Percent
Normal labour	18	75.00
Vaginal delivery (malpresentation)	2	8.33
Forceps	1	4.17
Vacuum	1	4.17
Caesarean	2	8.33
Total	24	100.00

Out of 24, 18 women (75%) delivered by spontaneous vaginal delivery at home and later referred to hospital after delivery due to postpartum haemorrhage, retained placenta with or without haemorrhage and postpartum eclampsia.

Two malpresentation cases were delivered at home: one case of twins pregnancy was delivered by AMW and another case of breech presentation by TBA. Both women died of post partum haemorrhage at home. Forceps delivery was done at a private hospital and when severe PPH occurred (suspected genital tract injury), the patient was referred to a station hospital but relatives brought her back home and she died of irreversible shock.

Vacuum delivery of a woman with heart disease was done at Divisional Hospital and died soon after birth with suspected amniotic fluid embolism. Two operative deliveries were done at hospital; one for eclampsia and another for ante partum haemorrhage. Both of them died during perioperative period. Information on the place of delivery of 40 deceased women was shown in Table 4.17

Table 4.17

Maternal Deaths by Place of Delivery (Percent)

Place of delivery	Unionn = 40
Home	87.50
Transit	2.50
Hospital	10.00
Total	100.00

There were 30 intrapartum deaths, out of which 6 cases (8.44%) died during 1st stage of labour before the baby was born, 24 cases (33.81%) died after the baby was born. There were 16 deaths (22.54%) occurred during the puerperium.

Information on maternal deaths by caregiver at time of delivery and final illness is given in Table 4.18

Table 4.18

Maternal Deaths by Caregiver at the Time of Delivery and Final Illness (multiple response) (Percent)

Type of caregiver	Number	Percent
1. During Pregnancy	18	25.35
·Unattended	9	12.35
·Unqualified Practitioner	8	11.27
·Doctor	1	1.41
2. During Labour before delivery of baby	6	8.45
·TBA	3	4.23
·M.W	1	1.41
·M.W + Doctor	2	2.82
3. After delivery of baby/ abortion	47	66.20
·Self	5	7.04
·TBA/ TTBA	20	28.17
·AMW	5	7.04
·MW	8	11.27
·Doctor	6	8.45
·TBA + AMW	1	1.41
·TBA + MW	1	1.41
·AMW + MW	1	1.41
Total	71	100.00

Health care seeking behaviour at the time of pregnancy, at the time of delivery, at the time of obstetric emergencies and at the time of final illness was found to be inconsistent. During antenatal period, 32% of deceased women had seen TBA/TTBA, 26.76% by TBA and 5.63% by TTBA.

Although training for TBA had been stopped years ago, the rural community was using their services, and TBAs were still practicing midwifery. At the time of delivery, 33% of deceased women were delivered by them; only when faced with such complications as prolonged labour, retained placenta or postpartum haemorrhage, AMW or MW were called in for help.

11.27% of deceased women were delivered by AMWs and 12.68% by AWs. 12% of those in labour had time to transfer to health care facility. Out of which, 2% delivered on the way and only 10% reached the health care facility. Out of those who reached the health care facility, two perioperative deaths occurred after caesarean section; one was due to eclampsia and the other due to irreversible shock.

One patient was delivered by vacuum extraction at the hospital following admission of woman with prolonged labour. She died 10 minutes after giving birth to a stillborn baby due to suspected amniotic fluid embolism. The Divisional Hospital was only 8 miles away from home and transport by car cost 10,000 Kyats. Delay in decision making and delay in referral to health care facility, lack of proper monitoring in labour are considered as confounding factors.

Information on maternal death by cause, and by distance travelled to get emergency obstetric care is given in Table 4.19

Table 4.19
Maternal Deaths by Cause and
by Distance to Emergency Obstetric Care Facility

Distance Travelled (miles)	Cause of Death						Total
	Obstetric Haemorrhage (APH + PPH) n=25	Hypertensive disease with or without Fits n=13	Abortion related n=7	Prolong/ Obstructed labour n=6	Puerperal Sepsis n=5	Others n=15	
Less than							
3 miles	28.00	15.38	14.29	33.33	40.00	26.67	25.35
3-6 miles	32.00	15.38	28.57	33.33	20.00	6.67	22.54
6-9 miles	8.00	15.38	28.57	16.67	40.00	26.67	18.31
9 miles +	24.00	53.85	14.29	16.67	-	40.00	29.58
Unknown	8.00	-	14.29	-	-	-	4.22
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

24% of women with postpartum haemorrhage had to travel more than 9 miles from home to health care facility. 60% of deceased women lived in the area within 6 miles from the health care facility and had to travel for less than 2 hours.

Information on maternal death by cause and by place of death is given in Table 4.20

Table 4.20

Maternal Deaths by Cause and by Place of Death

Place of Death	Obstetric	Hypertensive	Prolong/				Total
	Haemorrhage (APH + PPH)	disease with or without Fits	Abortion related	Obstructed labour	Sepsis	Others	
	n = 25	n = 13	n = 7	n = 6	n = 5	n = 15	n = 71
Home	56.00	61.54	57.14	33.33	20.00	100.00	61.97
Transit	16.00	30.77	14.29	16.67	-	-	14.09
Hospital	28.00	7.69	28.57	50.00	80.00	-	23.94
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

The most common cause of maternal death during survey period was obstetric haemorrhage (APH, PPH, including two cases of excessive bleeding due to rupture uterus: 35.21%) ante partum 3 cases and postpartum 22 cases. 56% of the cases died at home within few hours and had no time for referral. 44% of the cases were referred to healthcare facility, 16% died on the way and 28% died at the hospital.

In the case of Eclampsia, 61.54% died at home and 33.77% died on the way without having proper medical treatment. 7.69% who reached the hospital had energetic treatment but half of them died within 24 hours and the other half died after few days due to late arrival.

In the case of abortion, the referral to hospital was late because, they sought treatment, at first, from unqualified practitioners for three to 10 days after abortion. Only one out of 7 cases had operation for drainage of pelvic abscess following septic induced abortion.

4.5 Accessibility to EmOC Facility

Information on different types of vehicle used for transporting patients to EmOC is given in Table 4.21. The most common means of transport was found to be *htawlargyi*, a kind of motorized vehicle (35.21%), and bullock cart (18.31%) in rural areas. People from the Coastal and Delta areas used boats/sampans 25.35%).

Table 4.21

Type of Transport to nearest Emergency Obstetric Care Facility

Means of Transport	Maternal Deaths	
	Number	Percentage
Walking/ Stretcher	8	11.27
Bullock cart	13	18.31
Boat/sampan	18	25.35
Htawlargyi/ motorized vehicle	25	35.21
Bicycle/Trishaw/motor cycle	5	7.04
Local train	1	1.41
Don't know	1	1.41
Total	71	100.00

The cost of travel incurred in 73.23% of emergencies to the nearest EmOC was less than 10,000 Kyats. The respondents, however, described that the charges were subject to variation depending on the circumstances under which the vehicle were hired i.e. day time or night time.

Information on cost of travel is given in Table 4.22

Table 4.22

Cost of Travel to the nearest Emergency Obstetric Care Facility

Money Spent for travelling(kyats)	Maternal Deaths	
	Number	Percentage
Less than 2,500	23	32.39
2,500 – 5,000	17	23.94
5,000 – 10,000	12	16.90
10,000 – 15,000	7	9.86
15,000 – 20,000	2	2.82
20,000 – 25,000	1	1.41
25,000 – 30,000	1	1.41
30,000 – 35,000	1	1.41
35,000 – 40,000	1	1.41
Don't know	6	8.45
Total	71	100.00

Maternal deaths occurred at home, in transit to healthcare facilities, or in hospital.

62% of maternal deaths occurred at home within 24 hours. 38% of women who needed emergency obstetric care were referred to the nearest EmOC facility; only 24% reached the hospital for proper management and 14% died on the way due to late referral and primary delay.

Information on maternal deaths by indirect causes classified by region is given in Table 4.23

Table 4.23
Maternal Deaths by Indirect Cause

Causes	Union	
	Number	Percentage
1. Heart disease	5	45.45
2. Malaria	4	36.36
3. Tuberculosis	1	9.09
4. Chronic obstructive airway disease	1	9.09
Total	11	100.00

Indirect Causes of maternal deaths included Heart Disease, Malaria, Tuberculosis and Chronic Obstructive Airway Disease. The cause of 45.45% of indirect deaths was, as described by respondents, heart disease, but the symptoms were suggestive of anaemia, and cardiomyopathy was also present.

36.36% of indirect maternal deaths that occurred during the survey period was due to malaria and had history of treatment for malaria by healthcare providers.

During the survey, the respondents mentioned about the history or signs and symptoms of medical diseases such as malaria, tuberculosis and HIV/AIDS were present in the deceased women, who died of obstetric complications. These medical conditions predisposed or aggravated the pregnancy complications as compounding factors.

Heart Disease

Commonest cause of indirect maternal deaths was found to be heart disease. The causes of 45.45% of maternal deaths were described by respondents as heart disease or heart failure. But, on analyzing the narration and answers of the questionnaire, the symptoms and signs described were very much suggestive of cardiomyopathy and Beriberi following superstitious dietary habits and harmful practices. In only 40% of cardiac deaths in the present survey had documents or description of organic heart disease. Signs and symptoms suggestive of Beriberi was found in 12 out of 83 (14.45%) in pregnancy related deaths including late maternal.

2 cases i.e. (11%) died during pregnancy; 6 cases i.e. (13%) died during puerperium and 4 cases i.e. (9%) died aft puerperium but within one year of delivery.

Malaria

Two cases out of 12 indirect maternal deaths (17%) were due to diagnosed malaria infection; one woman died of post transfusion malaria following APH, and another woman died of cerebral malaria. Further analysis of direct obstetric deaths also revealed that 7 out of 59 women (11.86%) had signs and symptoms (as described by respondents) suggestive of having malaria infection.

Tuberculosis

One indirect death was due to pulmonary tuberculosis with haemoptysis on medical treatment. Six out of 59 deceased women who died of direct obstetric causes also gave history similar to tuberculosis.

HIV/AIDS

During the survey period, there were two proven cases of HIV infection. One woman died on Day 3 of puerperium with Sepsis, both she and her husband were seropositive for HIV on voluntary testing at the hospital.

Another woman died of AIDS, 62 days after delivery of her 4th child. She developed oral thrush, diarrhoea, pulmonary tuberculosis and was excluded from calculating MMR.



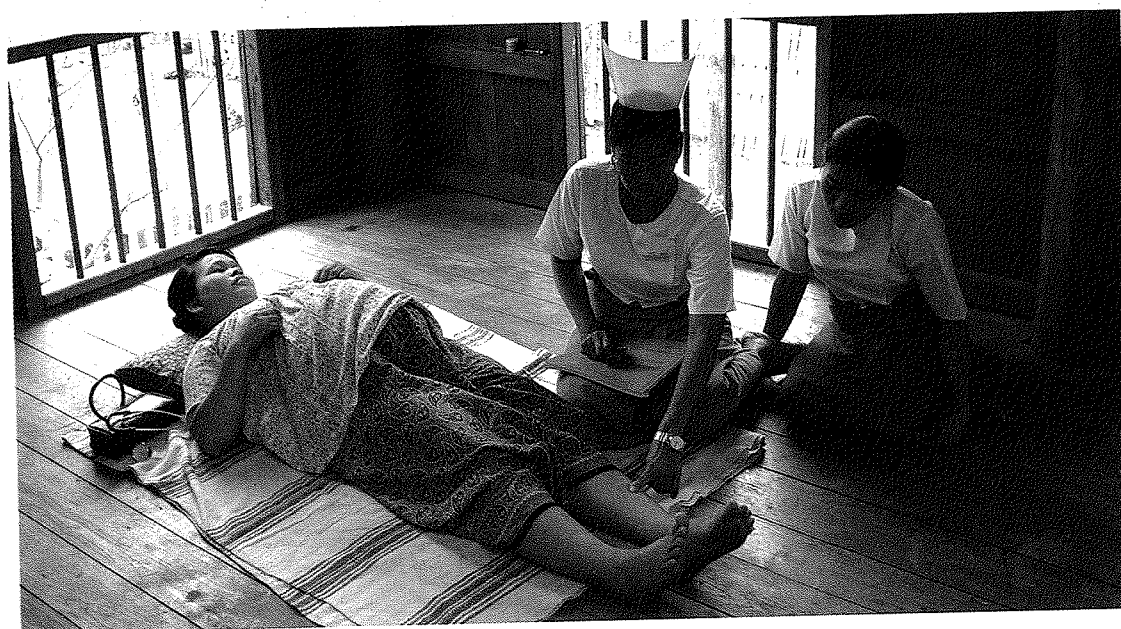
Late Maternal Death

Information on late maternal deaths by timing and by cause is given in Table 4.24.

Table 4.24
Timing of Late Maternal Deaths (n = 11)

Timing (in days)	Causes of Death
44	Cerebro vascular accident
62	HIV/ AIDS
69	Bronchial asthma
98	Poisoning (suicide)
119	Renal failure
151	Heart failure
220	Heart failure
222	Head injury (Motorcycle accident)
281	Heart failure
290	Carbuncle (operatives)
321	Epilepsy

All of the eleven women had uneventful pregnancies and deliveries. There were three cases of heart failure leading to the death of mothers following 3-9 months after normal spontaneous deliveries. Poverty and superstition led them to eat unbalanced diet. Anemia, possibly beriberi, rather than organic heart disease led to heart failure of the mother. One woman had diabetes mellitus and had carbuncle on the back operated at a private clinic and died of septicemia.



5. Discussion

Maternal mortality is a global tragedy more so in the developing countries including Myanmar. In Millennium Development Goals of the United Nations the task is to reduce maternal mortality by three-quarters by the year 2015. None of the methodologies currently available for measuring maternal mortality/morbidity in resource limited settings can provide a precise value because all are subject to wide margins of error.

Research on maternal mortality among women of reproductive age has confirmed the importance of maternal mortality in developing countries. Studies have investigated the causes and timing of maternal deaths as well as the barriers to timely and appropriate care that increase the likelihood of a woman dying after she develops an obstetric complication, and women whose health already is compromised by poor nutrition.

MMR, as estimated by WHO / UNICEF for Myanmar in 1990, was 580 maternal deaths per 100,000 live births. In the previous studies carried out in Myanmar, most studies were facility-based and denominators were hospital obstetric admissions. Thus, the figures rarely reflected the events of community setting. MMR estimates might differ from one study to another. The 1994 Maternal Mortality Survey conducted by MMCWA covered 85,500 households in 54 townships produced an MMR estimate for 1994 was 232 maternal deaths per 100,000 live births. Official data generated through vital registration, which covered about 70 percent of the total population of the country, suggested MMR values for 2001 as 100 in urban areas and 180 in rural areas.

Health in Myanmar 2005, published by the Ministry of Health, gives estimated values of MMR in 1999 as 180 for urban areas, and 280 for rural areas. An alternative estimate of MMR in 1999 for the whole country was 255. (1999 *National Mortality Survey*, CSO 2000)

The current survey, covering 251,000 households in 120 sample townships, nationwide, produced an estimated value of MMR for the whole country as 316 maternal deaths per 100,000 live births during the 12-month reference period, from April 1, 2004 to March 31, 2005. The estimated value of MMR was 132 for the Hilly Region, 264 for the Coastal Region, 337 for the Delta Region, and 449 for the Central Plains; the Hilly Region had the lowest ratio while the Central Plains the highest. An urban-rural differential was found to exist in the level of maternal mortality, urban MMR being 140 against rural MMR 363.

The risk of death and disability for a woman each time she becomes pregnant is 1 in 48 in all developing countries as opposed to 1 in 1,800 in all developed countries. This survey is carried out to know the specific situation in Myanmar, in terms of how many women die, where are they dying and of what are women dying. MMR is not simply an indication of health status, but is also related to reproductive patterns, and the quality, availability accessibility of health care facilities. Often a maternal death is accompanied by the death of an infant, and in many cases the prevention of a maternal death could also save the lives of one or more older children left without a mother. In the present survey, one third of children born to deceased women were still alive at the time of the household survey.

A central focus of many safe motherhood efforts is the importance of skilled attendance at deliveries but midwives (no matter how skilled) can seldom save lives with their bare hands. They need appropriate tools as well as an enabling medical and social environment. Conversely, technologies (no matter how indigenous) are effective only if there are skilled and knowledgeable users, communities practicing appropriate health promoting and care seeking behaviours, and functioning health care system.

Regarding the proportion of births attended by skilled health personnel, Health Management Information System reported as 40.1 % in 2001, and 60.0% in 2004. As of December 2003, 8,527 midwives (MW) and 28,872 Auxiliary Midwives (AMW) were providing maternal care throughout the country. At present, the ratio of midwifery skilled personnel including midwives, nurse-midwives, and auxiliary midwives to villages is 2:1, while the national target is at least one midwifery skilled person to every village. In the present survey, the term *a midwifery skilled healthcare provider* refers exclusively to health professionals viz. midwives, nurse-midwives and doctors. An about one-in-two woman (50.80%) was attended by skilled attendants at the time of delivery, whereas over 56.34% of women had antenatal care from skilled providers in Myanmar.

A comparison of the maternal mortality ratio derived from the current survey with those of other sources indicates that the survey produced reliable estimates of maternal mortality.

Regarding specific causes of maternal mortality, the verbal autopsy analysis shows that haemorrhage (antepartum and postpartum—more in postpartum period) is the leading cause of death (30.98%), Hypertension diseases of pregnancy ranked second (16.90%) with or without fits, and eclampsia alone constituted 11.27%. In contrasts to previous studies, abortion related deaths were accounted for 9.86%.

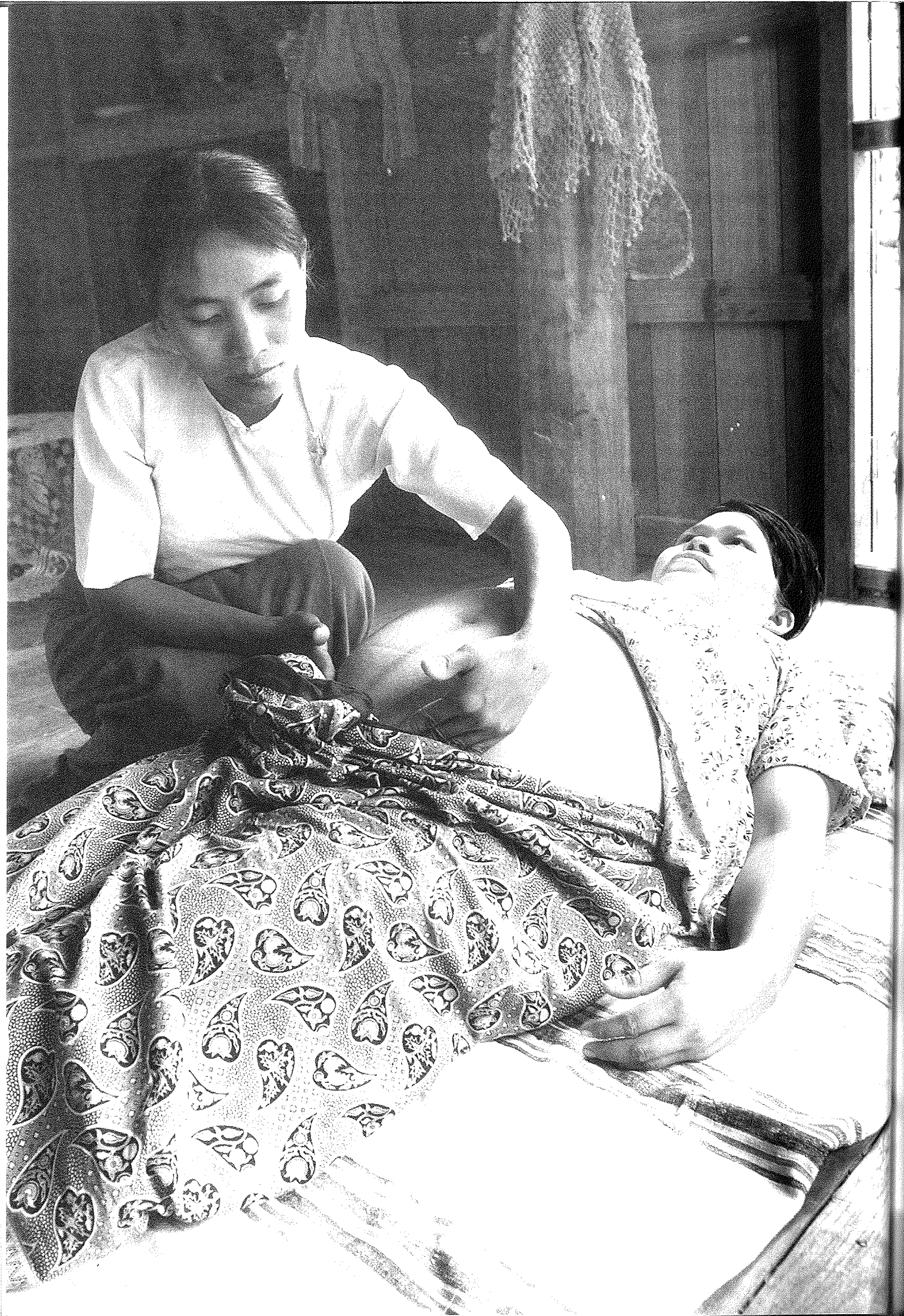
In the present survey, a higher proportion of deliveries occurred at home. 88% died at home, 2% died on the way to healthcare facility, and 10% received emergency care at the facility. Those arrived at the health facility were in such

an ill state that even emergency operation and blood transfusion could not save their lives.

The maternal deaths occurred either at the doorsteps of healthcare facility emergency treatment rooms or within 24 hours of admission. In the present survey, 21% of women delivered at home unattended, 20% were delivered by skilled birth attendants (Doctors and Midwives), 11% were delivered by AMWs and 32% by TBAs/TTBAs. The training for TBA had been stopped in Myanmar for many years, the rural community in Myanmar still utilizes their services and re-education of TTBA may improve their midwifery care, especially in domiciliary deliveries in areas where harmful practices still widespread.

Utilization of health care facilities and health care providers seems to be poor. Although the relatives brought the very ill women in labour or in fatal illness to the health care facility, there were delays in decision making, transport problem, financial constraint, etc. The women were in a state beyond help and they usually died within a time span of a few hours to a few days.





6. Conclusion and Recommendation

Every Member State of the United Nations has pledged to ensure 75 percent reduction in maternal deaths during childbirth by 2015 from the base-line year of 1990 in agreement to fulfill the Millennium Development Goals. As in the other member countries, Myanmar has drawn up health plans and is implementing programs to reduce the maternal mortality. The indicator, Maternal Mortality Ratio (MMR), is used to determine the level of maternal deaths. Repeated measurements of this indicator, in theory, over time could be used to monitor trends in maternal mortality. However, measuring maternal mortality is extremely difficult and costly. Maternal deaths in reality are rare and infrequent if it is compared to general deaths. Under-reporting and/or misclassification of deaths related to pregnancy and childbirth affect the number of maternal deaths. Deaths in remote areas seldom take place in health facilities and they occur mostly at home or on the way to hospital. Since 1952, births and deaths are required by Statistical Act to be reported to and recorded by Vital Registration Sections at the offices of the Township Medical Officer. A new registration system was introduced in 1962, and it was modified in 2000. The drive of these initiatives was to achieve completeness of death reporting.

If the death of a pregnant woman is happened to be the outcome of illegal abortion, the death might go unreported for legal action could be taken against those who performed the abortion, and against the woman who received the abortion. Sometimes, a few abortion-related deaths might have been concealed with the intention of protecting the reputation of the woman and that of her family.

The survey produces point estimates of MMR for Myanmar in 2004-05 at two levels: national and sub-national. MMR is 316 for the whole country, and it is 132 for the Hilly Region, 264 for the Coastal Region, 337 for the Delta Region, and 449 for the Central Plains. An urban-rural differential is found in MMR; the level of maternal mortality in rural areas is about 2.5 times that of in urban areas; Urban MMR being 140 against Rural MMR 363.

Estimates, derived from the current survey for the Hilly Region and the Coastal Region are relatively less precise compared to those for the Delta Region and the Central Plains. Difficult terrain, poor means of communication and transportation, smaller sample size, and the sensitive nature of the variable under investigation could be held responsible for the less precise, but acceptable estimates obtained from the current exercise. With the experience gained from

this exercise, further attempts should be made in future with larger samples capable of representing remote areas in the rugged, mountainous, border region.

In order to achieve the targets set in the Millennium Development Goals and based on the findings of Nation-wide, Cause-specific Maternal Mortality Survey (2004 – 2005), the following interventions have been recommended.

1. Individual and family level

- 1.1. To provide counseling and health education to promote health seeking behaviour (healthy life style adoption, planned pregnancy, early booking for antenatal care, regular AN visits, use of skilled delivery attendance, importance of postnatal care, family planning) and to recognize warning signs of complications during antenatal care, safe delivery and postnatal care via behavioural change communication approach.
- 1.2. To encourage pregnancy care by skilled health care providers (midwife, LHV and doctors) covering antenatal, delivery and postnatal periods.
- 1.3. To improve antenatal supplementation to prevent nutritional deficiencies of iron, iodine, folic acid, vitamin B and A among pregnant women
- 1.4. To increase the awareness of risk of medical diseases (heart disease, anaemia, diabetes mellitus and hypertension) in pregnancy care leading to indirect obstetric cause of maternal death
- 1.5. To encourage institutional delivery for women with hypertension and proper use of magnesium sulphate for control of eclamptic fits.
- 1.6. To plan institutional delivery for women with high risk complications and medical diseases
- 1.7. To encourage the use of safe and clean delivery practices in domiciliary delivery.

2. Community level

- 2.1 To advocate and educate the community about the importance of antenatal care, safe delivery and awareness of danger signs of pregnancy and childbirth.
Educate the community about the importance of safe delivery and awareness of danger signs of pregnancy and delivery.

- 2.2 To promote the community awareness on maternal death and encourage formation of local health group to expedite the referral process.
- 2.3 To upgrade general health status, living standard and transport system by community participation especially to reduce the delay in reaching the health care facilities.
- 2.4 To promote community participation and involvement of national and international NGOs.
- 2.5 To organize community support group for safe blood donors, transport arrangement to assist prompt referral to health facility, home-based care and support, breastfeeding support and peer educators for behavior change communication.

3. Provider level

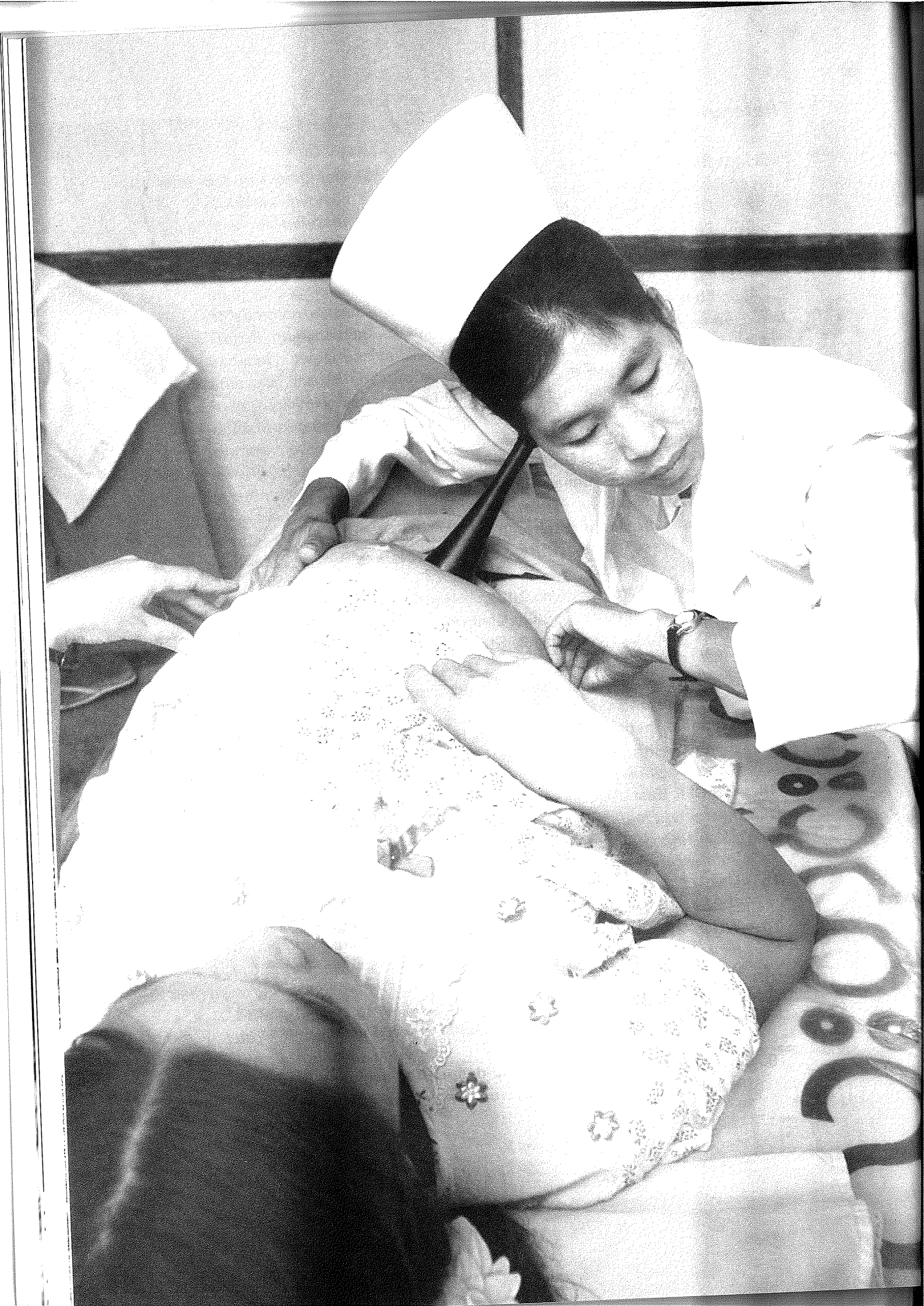
- 3.1 To ensure the skill of health care providers to manage emergency obstetric care both in domiciliary and institutional delivery.
- 3.2 To encourage routine use of partograph in every labouring woman to facilitate early detection and safe referral to prevent sequelae of prolonged and obstructed labour.
- 3.3 To train, and drill for the management of emergency obstetrics problems such as retained placenta and postpartum haemorrhage for those involved in domiciliary as well as institutional delivery with emphasis on the rational use of oxytocin and misopristol for prevention and control of post partum haemorrhage.
- 3.4 Recruit, train and deploy more midwives; organize refresher training courses for voluntary workers such as AMWs and TTBA's who are practising midwifery.
- 3.5 To conduct regular refresher training courses to healthcare providers with more emphasis on skill in antenatal care, intra-partum care and post-natal and post-abortion care.
- 3.6 To train skilled delivery attendants to be able to detect antenatal, intranatal and postnatal complications as early as possible ensuring prompt treatment and timely referral.
- 3.7 To redistribute the responsibility of midwives among the other basic health staffs to reduce their work load so that they can concentrate more on pregnancy care and safe delivery.

4. National level

- 4.1 Support programs for capacity building especially to those healthcare providers involved in domiciliary deliveries and provision of adequate clean delivery kit.
- 4.2 To update the health facility to a standard level of service provision in basic and comprehensive essential obstetric care (equipments, medications, laboratory, operative theatre) (emphasis on management of common causes of maternal death – Postpartum haemorrhage (active management of third stage, oxytocin, misoprostol, safe blood service) , hypertensive disorders of pregnancy and eclampsia (regular check-up on BP and proteinuria, magnesium sulphate, anti-hypertensives), sepsis including septic abortion (aseptic precautions, antibiotics use, evacuation of septic focus) , obstructed labour and ruptured uterus (avoidance of abuses of oxytocin and misoprostol, partograph recording of labour), etc)
- 4.3 Give midwifery training to auxiliary midwives with better-educated, motivated and willing to work in their native places or in other places for which they are trained.
- 4.4 Review the quality and performance of existing Station Hospitals, Rural Health Centres and Sub-centres for strengthening health services in the light of evidence based decisions.
- 4.5 Organize donor banks for safe blood transfusion at emergency obstetric care facilities.
- 4.6 Strengthen referral services such as transportation, and provision of flying squads.
- 4.7 To implement health education distribution to the public through the mass media such as television, radio, film shows and news papers.
- 4.8 Record and analysis of maternal health problems and maternal mortality, near miss and morbidity to search for better solutions.
- 4.9 Promote research on reproductive health care.
- 4.10 Strengthening of health projects in combination with socio-economic development programs in rural areas where the maternal mortality rate is found to be higher..
- 4.11 To keep health facility ready to manage life support and emergency obstetric care.

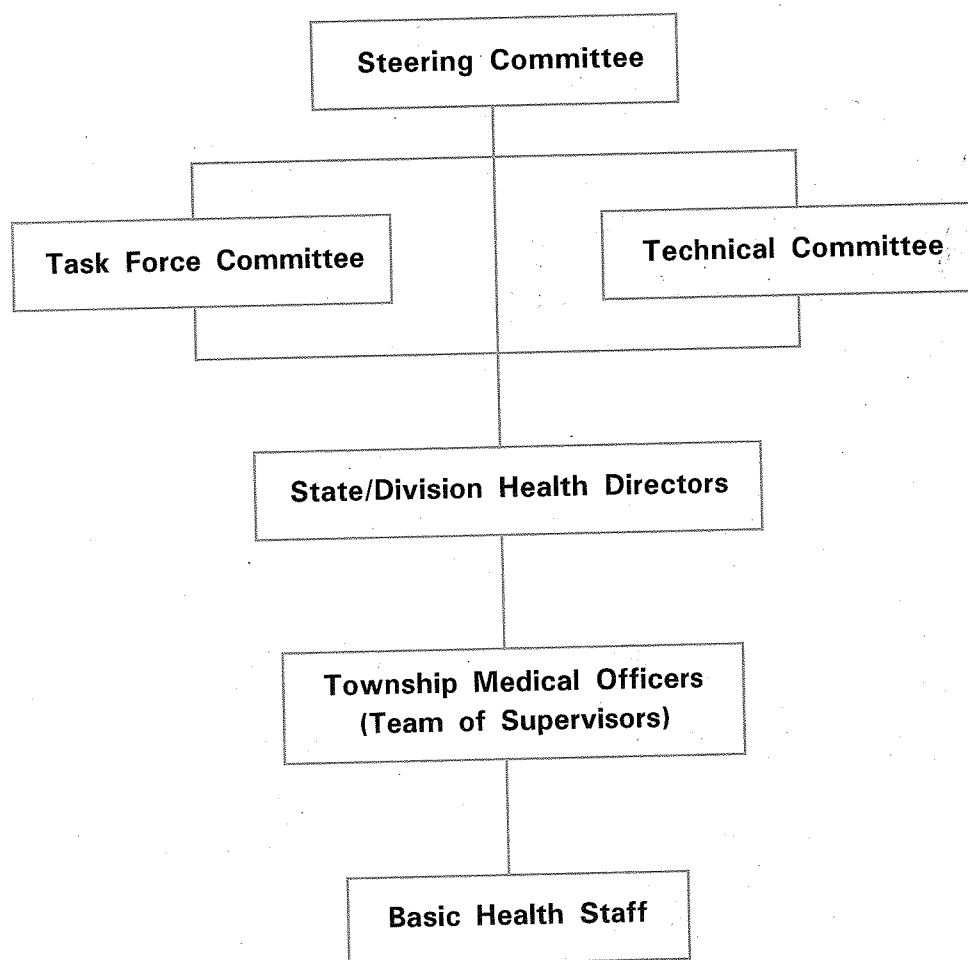
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Annex A

Organization Chart for Nationwide Cause Specific Maternal Mortality Survey, 2004-2005





Annex B

List of Focal Persons Members of Steering Committee

Sr.	Name	Designation
1.	Dr. U Tin Win Maung	DG, DOH
2.	Dr. U Ye Myint	DY. DG, (Retd)
3.	U Aung Kyaing	DG, DHP
4.	Dr. U Sann Shway Wynn	Dy. DG (Public Health)
5.	Dr. U Kyaw Nyunt Sein	Dy. DG (Disease Control), DOH
6.	Dr. U Tin Min	Dy.DG (Medical Care), DOH
7.	Dr. U Win Myint	Director (Administration), DOH
8.	Dr. Daw Nilar Tin	Director (Planning), DOH
9.	Prof Dr. U Thein Aung	Professor / Head, Department of Child Health (Retd.), UM (1)
10.	Dr. U Than Htun Sein	Director, DMR (Lower Myanmar)
11.	Dr. U Soe Myint	Dy. DG (Research and Develop ment)
12.	Dr. Daw Tin Linn Myint	Dy. DG, DHP
13.	Prof. Dr. Daw Than Than Tin	Professor/Head, Department of Obstetrics and Gynaecology, UM (1)
14.	Prof/Head Dr. Daw Khin Saw Hla	Professor/Head, Department of Obstetrics and Gynaecology, UM (2) (Retd)
15.	Prof Dr. Daw Tracy Sein	Professor/Head, Department of Preventive and Social Medicine, UM (1),Yangon
16.	Prof. Dr. Daw Sann Sann Myint Aung	Professor/Head, Department of Preventive and Social Medicine, UM (2),Yangon

Task Force Committee

Sr.	Name	Designation
1.	Dr. U Hla Kyi	Project Manager (Nutrition), National Nutrition Center, DOH
2.	Dr. U Saw Lwin	Deputy Director (Diseases Control), DOH
3.	Dr. U Soe Lwin Nyein	Deputy Director (Epidemiology), DOH
4.	Dr. U Min Thwe	Deputy Director (HIV/AIDS), DOH
5.	Dr. Daw Thein Thein Htay	Director (Public Health), DOH
6.	Dr. Daw Nyo Nyo Kyaing	Deputy Director (Basic Health), DOH
7.	Dr. Daw Khin Mar Aye	Assistant Project Manager, WCHD, DOH
8.	U Ngwe Thein	Director (Statistics), CSO
9.	U George Paw Tun	Deputy Director (E-Health), DHP
10.	Daw Tin Tin Myint	Deputy Director, DOP
11.	Dr. Daw Myint Myint Than	Dy. Director, WCHD, DOH
12.	Dr. Daw Theingi Myint	Dy. Director (MCH), DOH
13.	Dr. U Myint Lwin	Consultant Paediatrician, WCHD, DOH

Technical Team

Sr.	Name	Designation
1.	Prof Dr. Daw Khin Thein Oo	National Consultant, UNICEF, Myanmar
2.	Prof Dr. U Soe Aung	Clinical Professor, (Retd) UM(1)
3.	Prof Dr. Daw Win Win Mya	Senior Consultant, Associate Professor, Department of Obstetrics and Gynaecology, University of Medicine,(2)
4.	Dr. Daw Yin Yin Soe	Associate Professor/Senior Consultant Department of Obstetrics and Gynaecology, University of Medicine,(2)
5.	U Aung Myint Thein	Dy DG (Retd), Central Statistical Organization
6.	Prof Dr. U Thet Lwin	Professor / Head (Retd), Statistics Department, Institute of Economics
7.	U Nyan Linn	Statistician / IT Specialist,
8.	Dr. U Kyaw Thin	Assistant Programme Officer, (Health and Nutrition), UNICEF
9.	U Khin Kyu	Project officer, (Planning) UNICEF
10.	U Thein Tun	Dy Director (Retd), Central Statistical Organization
11.	U Htay Aung	Assistant Director, (E-Health) DHP

Resource Persons from States / Divisions

Sr.	Name	Designation
1.	Dr. U Maung Maung Myint	Head, State Health Kachin State Department
2.	Dr. U Min Nwe Soe	Head, State Health Kayah State Department
3.	Dr. U Htay Naung	Head, State Health Kayin State Department
4.	Dr. Daw Khin Saw Mu	Acting Head, State Health Chin State Department
5.	Dr. U Kyaw Shein	Head, Divisional Health Sagaing Division Department
6.	Dr. U Swe Win	Head, Divisional Health Tanintharyi Div. Department
7.	Dr. U Htay Aung	Head, Divisional Health Bago Division (E) Department
8.	Dr. U Aye Nyein	Additional Head Bago Division (W) Divisional Health Department
9.	Dr. U Kyaw Hla Myint	Head, Divisional Health Magway Division Department
10.	Dr. U Khin Maung Htun	Head, Divisional Health Mandalay Div. Department
11.	Dr. U Tin Win Kyaw	Head, State Health Mon State Department
12.	Dr. U Khin Aung Cho	Head, State Health Rakhine State Department
13.	Dr. U Hla Myint	Head, Divisional Health Yangon Division Department
14.	Dr. U Sai Kham Hlaing	Head, State Health Shan State (S) Department
15.	Dr. U Aung Win	Additional Head, State Shan State (N) Health Department
16.	Dr. U Myint Aung	Additional Head, State Shan State (E) Health Department
17.	Dr. U Than Aung	Head, Divisional Health Dept. Ayeyarwady Division.



Annex C

List of Sample Townships

Region 1 (Hilly)

Sub-sample No.	Sr. No	State/Division	Township
A	1	Shan (South)	Taunggyi (1)
	2	Shan (East)	Kengtung
	3	Kachin	Hpakant
	4	Shan (North)	Nankham
	5	Shan (South)	Pindara
	6	Shan (South)	Phekhn
	7	Shan (South)	Moenai
B	1	Chin	Paletwa
	2	Chin	Htantalan
	3	Shan (East)	Tachilek
	4	Shan (North)	Lashio
	5	Kachin	Myitkyina
	6	Shan (South)	Pinlaung
	7	Shan (South)	Kalaw
C	1	Shan (North)	Naungkhio
	2	Kayin	Pa-an (2)
	3	Shan (East)	Monghsat
	4	Shan (South)	Laikha
	5	Kayin	Pa-an(1)
	6	Kayin	Kawkareik
	7	Shan (North)	Kutkai
D	1	Kayin	Hlainebwe
	2	Kachin	Mohnyin
	3	Sagaing (Upper)	Homalin
	4	Shan (South)	Yatsauk
	5	Kayah	Demawsoe
	6	Shan (North)	Kyaukme
	7	Shan (East)	Mongphyet

E	1	Shan (South)	Hopong
	2	Kachin	Shwegu
	3	Kayah	Loikaw
	4	Shan (South)	Taunggyi
	5	Kayin	Kyarinseikkyi
	6	Shan (South)	Nyaungshwe
	7	Shan (North)	Hsipaw

Region 2 (Coastal)

Sub-sample	Sr. No.	State/Division	Township
A	1	Ayewarwady	Pathein
	2	Mon	Paung
	3	Rakhine	Kyauktaw
	4	Rakhine	Kyaukphyu
B	1	Mon	Mawlamyaing
	2	Ayewarwady	Pyarpon
	3	Rakhine	Minpya
	4	Tanintharyi	Pulaw
C	1	Yangon	Thonegwa
	2	Rakhine	Taungup
	3	Ayewarwady	Bokalay
	4	Mon	Mudon
D	1	Ayewarwady	Dedaye
	2	Mon	Chaungson
	3	Tanintharyi	Kyunsu
	4	Ayewarwady	Laputta
E	1	Ayewarwady	Ngaputaw
	2	Rakhine	Sittway
	3	Ayewarwady	Tharbaung
	4	Tanintharyi	Tanintharyi

Region 3 (Delta)

Sub-sample	Sr. No.	State/Division	Township
A	1	Bago (W)	Letpadan
	2	Ayeyarwady	Kyaungone
	3	Bago (W)	Tharyarwady
	4	Yangon	Seikkyi-kanaung-to
	5	Ayeyarwady	Mawlamyainggyun
	6	Bago (E)	Toungoo
B	1	Yangon	Hlaingthaya
	2	Bago (E)	Oktwin
	3	Yangon	Kamayut
	4	Yangon	North-okkalapa
	5	Yangon	Thingangyun
	6	Bago (E)	Kawa
C	1	Ayeyarwady	Wakema
	2	Ayeyarwady	Kyonepyaw
	3	Yangon	Taikkyi
	4	Ayeyarwady	Kyaiklat
	5	Bago (W)	Paungde
	6	Yangon	Shwepyithar
D	1	Bago (W)	Minhla
	2	Yangon	Sanchaung
	3	Ayeyarwady	Maubin
	4	Ayeyarwady	Ingapu
	5	Bago (E)	Daik-U
	6	Yangon	Mayangone
E	1	Ayeyarwady	Myaungmya
	2	Bago (E)	Phyu
	3	Ayeyarwady	Zalun
	4	Bago (E)	Yetarshay
	5	Yangon	Hmawby
	6	Yangon	Kyimyindaing

Region 4 (Central Plains)

Sub-sample	Sr. No.	State/Division	Township
A	1	Sagaing(L)	Kani
	2	Mandalay	Thabeikkyin
	3	Mandalay	Kyaukpadaung
	4	Magway	Salin
	5	Magway	Chauk
	6	Mandalay	Mahlaing
	7	Sagaing(L)	Taze
B	1	Magway	Pwintphyu
	2	Sagaing(L)	Salingyi
	3	Sagaing(L)	Banmauk
	4	Sagaing(L)	Monywa
	5	Magway	Taungdwingyi
	6	Magway	Natmauk
	7	Magway	Yenanchaung
C	1	Mandalay	Nahtogyi
	2	Mandalay	Mahaaung myay
	3	Sagaing(L)	Khin-U
	4	Sagaing(L)	Mingin
	5	Magway	Magway
	6	Sagaing(L)	Sagaing
	7	Mandalay	Lewe
D	1	Mandalay	Taung tha
	2	Mandalay	Tatkon
	3	Sagaing(L)	Ayartaw
	4	Sagaing(L)	Pale
	5	Magway	Thayet
	6	Magway	Pakokku
	7	Sagaing(L)	Shwebo
E	1	Mandalay	Meikhtila
	2	Magway	Myaing
	3	Mandalay	Nyaung-U
	4	Mandalay	Wundwin
	5	Magway	Pauk
	6	Sagaing(L)	Yinmabin
	7	Sagaing(L)	Intaw

Annex D

Estimation Procedure

A. Interpenetrating sub-samples

The use of interpenetrating or replicated sub-samples¹ provides a quick way to calculate the sampling variance for a complex composite design without additional substantial computing.

If a sample is selected in the form of two or more sub-samples drawn according to the same sampling scheme such that each sub-sample provides a valid estimate of the parameter under consideration; the sub-samples are called interpenetrating sub-samples. If $t_1, t_2, \dots, t_k$ are unbiased estimates of the parameter θ based on k independent sub-samples, an unbiased estimator of θ based on the sub-samples is given by the mean of the sub-sample estimates, namely,

$$\tilde{\theta} = \bar{t} = \frac{1}{k} \sum_{i=1}^k t_i$$

with a simple unbiased estimator of $V(t?)$ provided by

$$\tilde{V}(t) = \frac{1}{k(k-1)} \sum_{i=1}^k (t_i - \bar{t})^2$$

The interpenetrating sub-samples used in Indian sample surveys are called replicated samples which have been used extensively in business surveys for obtaining quick estimates of sampling variance in USA.²

¹ M. N. Murthy (1967). Sampling Theory and methods; Statistical Publishing Society, India

² W.E. Deming (1960). Sample design in Business research; Wiley

B. Estimation – Probabilities and Weighting

The nationwide cause specific Maternal Mortality survey is designed to cover 4 geographic regions (strata) and no weighting is necessary for stratum level estimates, because the sample is self-weighting within the stratum. However, for national estimates, it takes account of the differential weights when combining the stratum estimates. In the modified design, nTs townships will be selected in the form of 5 interpenetrating sub-samples using balanced PPS systematic selection method, that is, instead of selecting a random start, 5 random starts will be selected from 1 to N_s and 5 balanced PPS systematic sub-samples will be selected. The selection procedures in the second stage will be the same with that of wards/VTs in place of townships. The selection probabilities for stratum's' are as follows:

(1) Probability of selecting a township

$$P_1 = \frac{N_{s_i}}{N_s}$$

Where N_{s_i} = number of households in the i^{th} township
 N_s = number of households in the region

(2) Probability of selecting a ward or village tract

$$P_2 = \frac{nCs N_{s_{ij}}}{N_{s_i}}$$

Where nCs = number of wards/VTs selected in each township in region 's'
 $N_{s_{ij}}$ = number of households selected in j^{th} ward/VT in i^{th} township in region's'

(3) Probability of selecting households

$$P_3 = \frac{100}{N_{s_{ij}}}$$

Where number of households selected in each ward/VT is 100.

Overall probability of selection

$$\begin{aligned}
 P &= P_1 \cdot P_2 \cdot P_3 \\
 &= \frac{N_{si}}{N_s} \cdot \frac{nCs \cdot N_{sij}}{N_{si}} \cdot \frac{100}{N_{sij}} \\
 &= \frac{100 \cdot nCs}{N_s}
 \end{aligned}
 \tag{1}$$

Note 100. nCs corresponds to the number of households selected in each township. The weight is the reciprocal of probability of selection viz.

$$\frac{N_s}{100 \cdot nCs}$$

which is constant so that the survey is self-weighting within the stratum.

C. Estimate of Mortality Ratio and Sampling Variance

Y_s = Total number of maternal deaths in s^{th} stratum

X_s = total number of births in s^{th} stratum

The unbiased estimate for Y based on t^{th} sub-sample in s^{th} stratum is

$$\tilde{Y}_{st} = \frac{N_s}{100 \cdot nCs \cdot nts} \sum_{1}^{nts} \sum_{1}^{nCs} \sum_{1}^{100} y_{ijk}$$

where $nts = nTs / 5$, and a sub-sample consists of nts sample townships.

The unbiased estimate for Y_s based on 5 sub-samples in s^{th} stratum is

$$\tilde{Y}_s = \frac{N_s}{100 \cdot nCs \cdot nTs} \sum_{1}^{nTs} \sum_{1}^{nCs} \sum_{1}^{100} y_{ijk}$$

(2)

with estimated sampling variance

$$\tilde{V}(\tilde{Y}_s) = \frac{1}{(5) \cdot (4)} \sum_{s=1}^5 (\tilde{Y}_{st} - \tilde{Y}_{st})^2$$

(3)

Note the 5 sub-samples will consist of nTs sample townships.

The unbiased estimate for X based on 5 sub-samples in sth stratum is

$$\tilde{X}_s = \frac{N_s}{100 \cdot nCs \cdot nTs} \sum_{t=1}^{nTs} \sum_{j=1}^{nCs} \sum_{k=1}^{100} X_{ijk}$$

(4)

with estimated sampling variance

$$\tilde{V}(\tilde{X}_s) = \frac{1}{(5) \cdot (4)} \sum_{t=1}^5 (\tilde{X}_{st} - \tilde{X}_{st})^2$$

(5)

Hence, the MMR estimate for sth stratum is

$$\tilde{R}_s = \frac{\tilde{Y}_s}{\tilde{X}_s} = \frac{\sum_{t=1}^{nTs} \sum_{j=1}^{nCs} \sum_{k=1}^{100} y_{ijk}}{\sum_{t=1}^{nTs} \sum_{j=1}^{nCs} \sum_{k=1}^{100} X_{ijk}}$$

(Ratio Estimate)

(6)

with estimated sampling variance

$$\begin{aligned} \tilde{V}(\tilde{R}_s) &\approx \frac{1}{\tilde{X}_s^2} [\tilde{V}(\tilde{Y}_s) - 2\tilde{R}_s \text{Cov}(\tilde{X}_s, \tilde{Y}_s) + \tilde{R}_s^2 \tilde{V}(\tilde{X}_s)] \\ &\approx \frac{1}{\tilde{X}_s^2} \frac{1}{(5) \cdot (4)} \sum_{t=1}^5 (\tilde{Y}_{st} - \tilde{R}_s \tilde{X}_{st})^2 \end{aligned}$$

(7)

The national estimate for MMR is obtained by combining the 4 strata estimates as

$$\tilde{R} = \sum_{i=1}^4 \tilde{W}_i \tilde{R}_i$$

(8)

with estimated sampling variance

$$\tilde{V}(\tilde{R}) = \sum_{i=1}^4 \tilde{W}_i \tilde{V}(\tilde{R}_i)$$

(9)

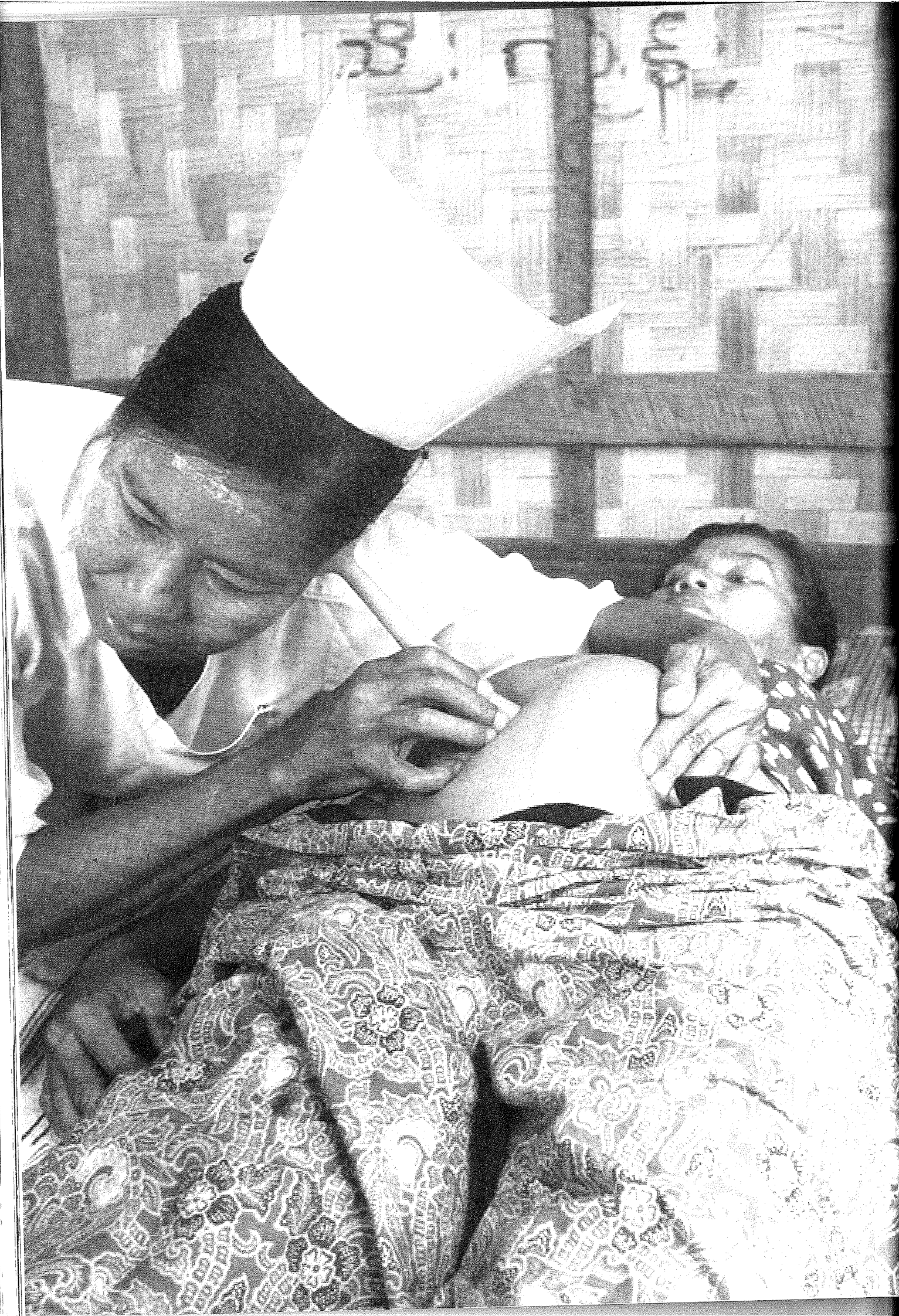
The coefficient of variation for $\tilde{R}$ is

$$CV(\tilde{R}) = \frac{\sqrt{\tilde{V}(\tilde{R})}}{\tilde{R}} \cdot 100$$

(10)

The stratum weights $\tilde{W}_i$, are the relative size of the respective stratum or region.





Annex E

Sample Live Births and Maternal Deaths observed by State / Division 2004-2005

Sr	State/Division	No. of Sample Townships	No. of Sample Live Births	No. of Sample Maternal Deaths
1.	Kachin State	4	703	-
2.	Kayah State	2	299	2
3.	Kayin State	5	601	-
4.	Chin State	2	320	1
5.	Sagaing Division	14	3272	19
6.	Tanintharyi Division	3	890	2
7.	Bago Division	10	2137	11
	1. Bago (East)	6	1470	5
	2. Bago (West)	4	703	6
8.	Magway Division	11	1839	5
9.	Mandalay Division	11	2055	8
10.	Mon State	4	855	-
11.	Rakhine State	5	1160	2
12.	Yangon Division	12	2071	6
13.	Shan State	21	2402	2
	1. Shan (South)	11	1145	2
	2. Shan (North)	6	774	-
	3. Shan (East)	4	483	-
14.	Ayeyarwady Division	16	3838	13
	Total	120	22478	71



Annex F

GLOSSARY

Emergency Obstetric Care

Basic Emergency Obstetric Care: Basic emergency obstetric care, in UNFPA discussions, includes the following functions:

- Parenteral (intravenous or intramuscular) antibiotics
- Parenteral oxytocics
(drugs that induce uterine contractions to stop bleeding)
- Parenteral sedatives or anticonvulsant drugs
- Manual removal of the placenta
(to stop haemorrhage)
- Removal of retained products
(to prevent bleeding and infection)
- Assisted vaginal delivery with forceps or vacuum extractor
(to alleviate prolonged labour)

Comprehensive Emergency Obstetric Care: Includes all of the functions listed above, as well as the ability to perform caesarean sections and blood transfusions, and the other capabilities, such as administering anaesthesia, that those functions imply.

EOC: Essential Obstetric Care: A basic Essential Obstetric Care facility is one that can provide parenteral antibiotics, oxytocic drugs, and anticonvulsants for pre-eclampsia, manual removal of placenta; removal of retained products via manual vacuum aspiration, and perform assisted vaginal delivery. A comprehensive EOC facility must be able to administer all of the basic services and perform surgery (i.e., caesarian section and blood transfusions).

Late Maternal Deaths: deaths from direct or indirect obstetric causes more than 42 days but less than one year after the termination of pregnancy.

Pregnancy-related Deaths: deaths while pregnant or within 42 days of the termination of pregnancy, irrespective of the causes.

Maternal Death is "death while pregnant or within 42 days of the termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes." ICPD-9 definition.

Maternal Morbidity: Refers to serious disease, disability or physical damage such as fistula, caused by pregnancy-related complications. Maternal morbidity is widespread, but not accurately reported.

MMR Maternal Mortality Ratio: The risk associated with each pregnancy, i.e., the obstetric risk. It is calculated as the number of maternal deaths during a given year per 100,000 live births during the same period.

OFA Obstetric First Aid: Care that can be administered by qualified birth attendants at home or in facilities with minimal equipment. It includes uterine massage or bi-manual compression to reduce or stop bleeding, and the administration of antibiotics and antipyretics orally as a temporary measure if transport to more extensive facilities takes more than a few hours.

Obstetric Deaths

Direct Obstetric Deaths those resulting from obstetric complications of the pregnant state (pregnancy, labour, and the puerperium), from interventions, omissions, or incorrect treatment, or from a chain of events resulting from any of the above.

Indirect Obstetric Deaths those resulting from previous existing disease or disease that developed during pregnancy and that was not due to direct obstetric causes but was aggravated by the physiological effects of pregnancy.

TBA: Traditional Birth Attendant. This study distinguishes between TTBAAs and TBAs - untrained TBAs, (i.e. those who have no formal medical training except what is traditionally passed down verbally) and trained TBAs, (i.e. those who have participated in a formal training program either with the World Health Organization or with a medical NGO). The skill level of trained TBAs is typically less extensive than that of midwives. For example, trained TBAs are not trained to handle complicated pregnancies or deliveries and under such circumstances are expected to refer women to hospitals and/or clinics with essential obstetric care.

Skilled Birth Attendant: A nurse, midwife, doctor or other practitioner with professional training in obstetric care.

Annex G

Abbreviations

AMW	=	Auxiliary Midwife
APH	=	Antepartum Haemorrhage
BHS	=	Basic Health Staff
CBR	=	Crude Birth Rate
CS	=	Chief Supervisor
CSO	=	Central Statistical Organization
CV	=	Coefficient of Variation
DHP	=	Department of Health Planning
DK	=	Don't Know
DMR	=	Department of Medical Research
DOH	=	Department of Health
DOP	=	Department of Population
EmOC	=	Emergency Obstetric Care
EPI	=	Extended Program of Immunization
HA	=	Health Assistant
HMIS	=	Health Management Information System
IMMCI	=	Integrated Management of Maternal and Childhood Illness
MDG	=	Millennium Development Goals
MMA	=	Myanmar Medical Association
MMR	=	Maternal Mortality Ratio
MOH	=	Ministry of Health
MW	=	Midwife
NGO	=	Non-Governmental Organization
PC	=	Personal Computer
PEC	=	Post Enumeration Check
PPH	=	Post partum Haemorrhage
PPS	=	Probability Proportionate to Size
SPDC	=	State Peace and Development Council
TB	=	Tuberculosis
TBA	=	Traditional Birth Attendant
TTBA	=	Trained Traditional Birth Attendant

TMO	=	Township Medical Officer
TOT	=	Training of Trainer
TS	=	Township level Supervisor
UNICEF	=	United Nations Infant and Children Emergency Fund
U5MR	=	Under Five Mortality Rate
WCHD	=	Women and Child Health Development

