


Part II

Maternal Mortality

Reproductive Age Mortality Study

RAMOS

Georgia 2008

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Part II: Maternal Mortality

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Chapter 1

Introduction

Worldwide, pregnancy-related mortality is the second most common cause of death of women of reproductive age. Each year more than 500,000 women die of complications of pregnancy and childbirth and an additional 15–20 million women suffer debilitating consequences of pregnancy. Almost all (99%) of these deaths occur in developing countries. Progress toward reducing maternal mortality and morbidity, particularly in the places where the situation is the worst, cannot be adequately measured with the current level of existing routine statistic systems.

High quality data on maternal mortality is the only way to ensure that its reduction remains a public health priority. With the launching of the Safe Motherhood initiative in late 1980s, the International Conference on Population and Development (ICPD) Program of Action in the mid-1990s and the 75% reduction target set forth by the Millennium Development Goals, interest in measuring maternal mortality has greatly increased. The maternal mortality rate, one of the most important indicators of social and health development, is the measurement with the largest disparity between developed and developing countries (Hill et al., 2001). It is also the most difficult reproductive health indicator to measure in less developed countries, due to extensive death underreporting and misclassification of the cause of death.

Improvements of maternal death measurement in countries with incomplete death registration and inaccurate ascertainment of causes of death can be achieved both through strengthening the health information system and vital statistics and implementation of special studies. Periodic population-based studies—Reproductive Age Mortality Studies (RAMOS) or census-based mortality studies—are valid alternatives to measure maternal mortality and can be a source of more detailed information about the circumstances of maternal deaths. This report summarizes the results from RAMOS Georgia, the first national RAMOS study ever conducted in Eastern Europe and the Commonwealth of Independent States. This is the first national RAMOS study in Europe that employed a full investigation of all deaths to women of reproductive age (15–49 years of age) rather than a sample-based data collection.

1.1 Background on Reproductive Health in Georgia

Since the dissolution of the Soviet Union, Georgia has faced more than a decade of socioeconomic and political transition. The government has attempted to implement major reforms in various sectors, including a health sector reform initiated in 1995. However, the ongoing civil war with the separatist regions of Abkhazia and South Ossetia, the country's economic collapse after the loss of Moscow's financial support, and the crumbling infrastructure have made progress uneven.

Healthcare expenditures comprise a decreasing portion of public expenditures (3.6% of total expenditures in 2004), resulting in the underfunding of medical facilities, including family planning and reproductive health services (Georgian European Policy and Legal Advice Centre, 2004). Once the main source of reproductive health research and policy development for the entire Soviet Union, Georgia now has poorer maternal and infant health indicators than it did during the Soviet regime (Tsuladze et al., 2007). Reform of the primary health care system supported by various international donors in the past few years have only recently increased women's access to modern contraceptives and other reproductive health methods. Abortion has long been legal, readily available, affordable (less than $15 per procedure), and widely practiced in Georgia. In contrast, the availability of high-quality contraceptive methods has been limited until recently. Currently, Georgia does not have a national family planning program and neither state nor private health insurance packages include family planning provisions. All family planning activities are maintained with donor support, primarily from the United States Agency for International Development and United Nations Population Fund.

Most of the information about the reproductive health situation in Georgia comes from two nationwide reproductive health surveys of women of childbearing age conducted in 1999 and 2005 (Serbanescu et al., 2001 and 2007). Surveys have shown that the majority of Georgian women marry early (median age at first marriage was 21.6 years in 2005) and overwhelmingly report having their first sexual experience after marriage (Table 1.1). Most women complete childbearing at an early age—the median age at first birth was 23 years—and reach peak fertility levels between 20 to 29 years of age. Total fertility rates are below replacement, similar to most of Eastern European countries. Unintended pregnancy rates are among the highest in the region, despite an increase in the availability of highly effective and safe methods of reversible contraception.

Table 1.1
Selected Reproductive Behaviors
Reproductive Health Surveys: Georgia, 1999 and 2005

Sexual and Reproductive Behaviors	RHS, 1999	RHS, 2005	
Median Age at First Intercourse	21.5	21.3	
Median Age at First Union	21.6	21.6	
Median Age at First Birth	23.0	23.2	
First Sexual Experience (women 15-24 years who had intercourse)			
Premarital	3.0	2.5	
Marital	97.0	98.5	
% of married women who want no more children	55.2	55.0	
% of unintended pregnancies*†	63.1	62.4	
% of unintended pregnancies ending in abortion*†	95.8	96.2	
Total Fertility Rate (births per woman)*	1.8	1.6	**
Total Induced Abortion Rate (abortions per woman)*	3.7	3.1	**
Current use of any contraceptive methods (%)	24.7	28.4	**
currently married	40.5	47.3	**
previously married	2.7	4.8	
never married	0.0	0.2	
Current use of modern contraceptive methods (%)	12.1	16.1	**
currently married	19.8	26.6	**
previously married	2.7	4.8	
never married	0.0	0.2	
Unmet need for modern contraception (%)	27.1	22.3	**
currently married	44.1	37.0	**
previously married	4.3	7.2	
never married	0.1	0.0	

* November 1994–October 1999 and March 2000–February 2005.
† All pregnancies (births, abortions, miscarriages) during a 60-month period.
** Significant change between 1999 and 2005, using 95% CIs for the standard error of the difference in rates.

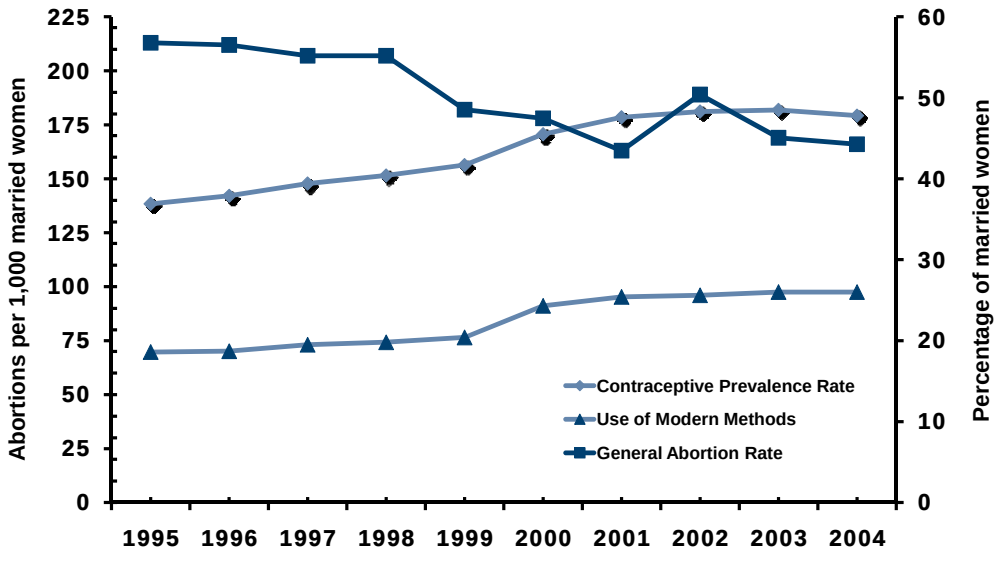
In the five years prior to each survey, almost two-thirds of all pregnancies in Georgia were unintended (62–63%). Nearly all of unintended pregnancies (96%) and more than one-half of all pregnancies in Georgia end in abortion. Consequently, the abortion rates are twice as high as the fertility rates and among the highest in the world. For more than a decade, Georgia continues to have the world's highest documented total abortion rate.

The use of modern contraceptive methods is relatively low (27%), despite a 20% increase between 1999 and 2005. Specifically, the use of intrauterine devices (IUDs) increased from 10% in 1999 to 12% in 2005, the use of condoms increased from 6 to 9%, and the use of oral contraceptives increased from 1 to 3%. The use of traditional methods, mainly

withdrawal and the rhythm method, remained essentially unchanged at 21%. Almost all contraceptive users are married; use among previously married and never-married women is almost nonexistent. Despite increased use of modern contraceptives, 37% of married women continue to be at risk of unplanned pregnancy because they do not use effective contraceptive methods. The unmet contraceptive need for limiting births among married couples is three times higher than for spacing births (12% vs. 4%) and this ratio did not change since 1999.

Both surveys provided a month-by-month calendar in which women recorded their pregnancies, marital status, periods of contraceptive use and reasons for discontinuing contraceptive use during the five years preceding the interview. These data are used to estimate yearly rates of abortion and contraceptive use. Changes in contraceptive use and abortion rates over a 10-year period are illustrated in Figure 1. Before 1999 the abortion rate was relatively stable at approximately 200 abortions per 1,000 married women, and approximately 19% of married women used modern methods of birth control. After 1999, the use of modern contraceptive methods increased, and the abortion rate began to decline.

Figure 1.1 General Abortion Rate and Contraceptive Use among Married Women, Georgia 1995–2004



A number of factors can have a considerable impact on the health of a woman, the health of her baby, and the outcome of her pregnancy, such as the use of health care services related to pregnancy, the place and type of assistance at delivery, and postpartum behaviors.

Under the Soviet regime, women's access to perinatal care was free of charge and consisted of three components: prenatal care, intrapartum care, and postnatal care (US DHHS, 1999). Changes in the health care systems and health financing in the post-Soviet era have significantly affected some perinatal care services. The State United Social Insurance Fund of Georgia (SUSIF), through its basic-benefit package for obstetric care, covers four free-of-charge prenatal visits per pregnancy (at 13, 20–22, 30–32 and 36 weeks of pregnancy) and delivery costs, but postpartum care is not included under this program.

Although the use of any prenatal care is very high (95%), only 71% of pregnant women initiate prenatal care early (in the first trimester) and 75% receive at least 4 prenatal care visits. About one in twelve births (8%) are delivered at home, the majority without skilled attendance. Azeri women, who represent only 5% of the women of childbearing age, consistently have the highest home delivery rate, 26% in 1999 to 40% in 2005. The proportion of births delivered by C-section has doubled (from 6% in 1999 to 13% in 2005), with one in five of these surgeries reportedly performed at the patients' request. Despite a recent increase, from 11% in 1999 to 22% in 2005, the use of postpartum care remains low and fewer women report receiving comprehensive counseling (breastfeeding, nutrition, child care, immunization and methods of family planning).

1.2 Maternal Mortality in Georgia

In countries with well-developed health statistics, the conventional source of information about maternal mortality levels and trends is the civil registration system, which records deaths by cause on a continuous basis. Studies have shown that even when the death-reporting systems are relatively complete, maternal deaths are under-recorded due to misclassification of the cause of death, and the level of under-reporting ranges from 25% to 90% of maternal deaths (Deneux-Tharaux C et al., 2003). In countries lacking reliable health statistics, the under-reporting of all deaths is an additional source of error. The WHO estimates that the majority of maternal deaths occur in countries with inadequate vital registration systems, due to various degrees of omissions in counting all deaths and

deficiencies in cause-identification, including maternal causes. In these countries, population-based studies are often used as an alternative to civil registration data.

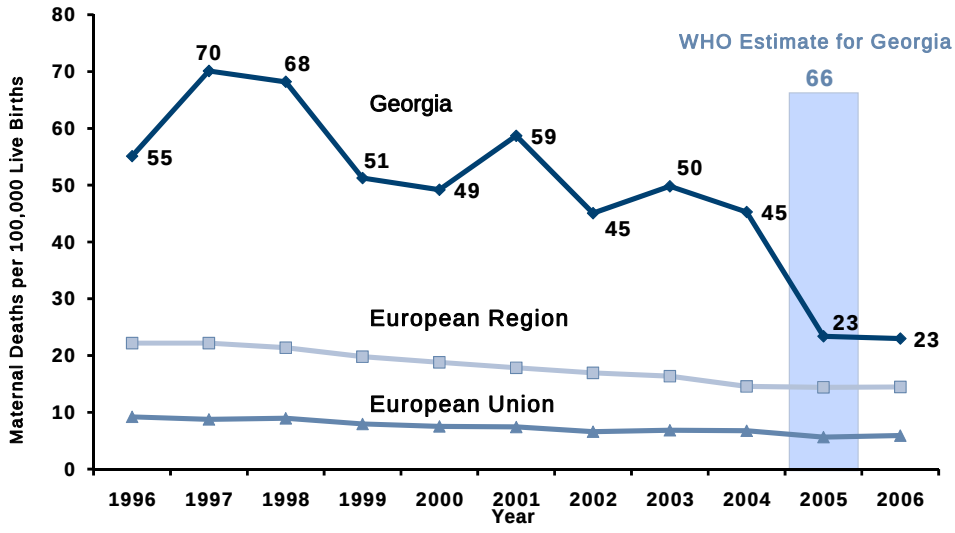
According to WHO, countries are divided into 8 groups, A through H, determined by the completeness and quality of country-specific data available to measure or estimate maternal mortality. Group A includes countries with the most complete death reporting and cause-of-death ascertainment. Group-H countries, consisting of 61 out of 171 countries evaluated, lack both the ability to count all deaths (over 10% of deaths go unreported) and the appropriate data to correctly classify the cause of death, including maternal deaths. They also lack survey-based or census-based estimates of maternal mortality. For these countries, Georgia included, the WHO projects the maternal mortality levels based on statistical modeling (WHO, 2007). It is widely recognized, however, that statistical model-based estimates are too imprecise to be used for tracking changes over time; further, the underlying assumptions these estimates are built upon are not country-specific.

The civil registration system is the basic source of data for continuous monitoring of births and deaths in Georgia. According to the official data, the maternal mortality ratio (MMR) between 1996–2006 has fluctuated around 50 maternal deaths per 100,000 live births and dropped recently to 23 maternal deaths per 100,000 live births (WHO, Health for All online database, 2009). Despite the recent decline, the reported maternal mortality in Georgia continues to be four times as high as the European Union[1] (EU) average and almost twice as high as the European Region[2] average.

[1] European Union includes 27 Member States: Austria, Belgium, Bulgaria, Czech Republic, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovenia, Slovakia, Spain, Sweden and the United Kingdom.

[2] The WHO European Region has 53 Member States: Albania, Andorra, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Malta, Monaco, Montenegro, the Netherlands, Norway, Poland, Portugal, the Republic of Moldova, Romania, the Russian Federation, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, the former Yugoslav Republic of Macedonia, Turkey, Turkmenistan, Ukraine, the United Kingdom and Uzbekistan.

Figure 1.2 Trends in Maternal Mortality 1995–2006
Georgia, European Region, and EU Countries



Source: WHO, European Health for All online database (http://data.euro.int.hfadb/)

However, little confidence is placed in the precision of the official figures because of known failures in issuance of birth and death certificates, poor completion of causes of death, and lack of quality control measures (WHO and CMSI, 2003; Aleshina and Redmond, 2005). Consequently, the WHO-estimated MMR for Georgia for 2005 of 66 maternal deaths per 100,000 live births (range of uncertainty between 18 and 230 deaths per 100,000) is 3 times higher than the official reports and 12 times higher than the EU average (WHO, Health for All online database, 2009; WHO, UNICEF, UNFPA and World Bank, 2007) (Figure 1.2).

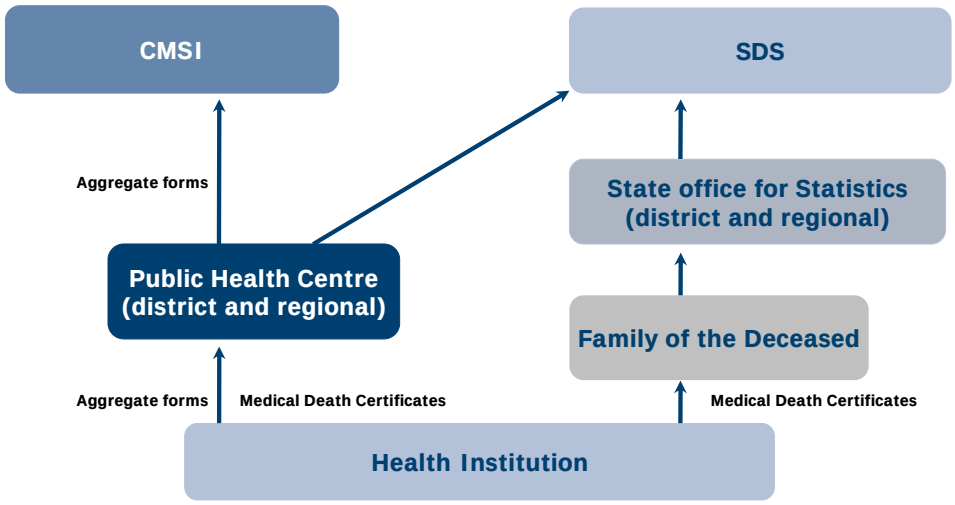
1.3 Certification of Death

The civil registration of deaths in Georgia relies primarily on a hand-delivery system. When a death occurs, the relatives of the deceased ask a physician to certify the event and

record the date and cause on a medical death certificate. In the case of an unnatural death, a medical examiner (coroner) should additionally testify and sign the certificate. The medical notification of death and the identification documents of the deceased person (identity card, passport, or birth certificate) are taken by the family to the State Office for Statistics (district or regional levels), where the death is recorded in a civil registry logbook and a legal certification of death is issued. The signature and identification profile of one witness, usually a relative of the deceased, along with the registrar's signature and stamp, are needed to make the death certificate a legal document. The registrar submits the certificate to the State Department of Statistics (SDS) in the Ministry of Economic Development of Georgia for filing under the national civil registration system. In parallel, aggregate health information, including births and deaths registered by health institutions, are sent to the Center for Medical Statistics and Information (CMSI), under the Ministry of Labor, Health and Social Affairs of Georgia (MoLHSA).

In 2000 the Georgia government, in collaboration with UNFPA and other international donors, launched a new initiative to improve the vital registration system (WHO and CMSI, 2003). The MoLHSA issued a new format of the Medical Death Certificate and introduced instructions on completing and issuing the certificate (Order No. 141 of Oct. 2000 and No 94/0 of Dec. 2000). A presidential decree—Decree 31 of December 10, 2002—was issued to adopt new rules for birth and death registration (Government of Georgia, 2002). Training for both health providers involved in certifying of births and deaths and the SDS coders, responsible for assigning ICD-10 codes, was instituted throughout the country. With the new system, the health institutions send a second copy of the medical notification of birth or death to the Public Health Centers (district and regional levels), who in turn send it on to the SDS (Figure 1.3).

Figure 1.3 Pathways of Data Collection on Mortality in Georgia



Adapted from "Comparison of Completeness of Data Collected by Two Systems in Georgia" (WHO and CMSI, 2003)

A comparison of the new and old civil registration systems was conducted in 2003 by Mesle, Vallin, and Badurashvili (Mesle et al., 2003). They found a 21.4% underreporting of births, 12% underreporting of deaths, and a 67.5% underreporting of infant deaths in the old system, but some records found in the old system did not show up in the new system. Although the dual system was discontinued in 2008, it was fully functional in 2006, the year under study for this RAMOS investigation.

The Georgian Medical Death Certificate (MDC) follows the format recommended by the World Health Organization in the International Classification of Diseases (ICD). It requires listing the immediate cause of death on the top line followed by antecedent causes in proper sequence. The form is designed to facilitate collection of the underlying cause of death (UCOD), that is, the disease or injury which initiated the chain of morbid events leading directly to death or the circumstances of the accident or violence that caused the fatal injury. Underlying cause is the item most commonly used in the analysis and statistical tabulations of mortality data.

1.4 Organizational Participation and Objectives

The Government of Georgia is committed to improve maternal and child health in the country and meet the targets set forth by the Millennium Development Goals (United Nations, 2000). This policy intention requires accurate information on the levels and causes of reproductive age mortality. Improving maternal health globally is also one of the priority areas for the US Agency for International Development (USAID) and the Division of Reproductive Health of the Centers for Disease Control and Prevention (DRH/CDC), who both provided funding for the RAMOS study.

Much of USAID's assistance in Georgia has supported program restructuring; infrastructure development; management capacity in national and local governments; decentralized procurement and delivery systems for medical supplies; and evidence-based, client-centered practices (USAID, 2009). Specific activities include designing client-centered family planning and reproductive health policies and programs, training physicians and other medical professionals, organizing public information campaigns, and developing a nationwide system for delivery of contraceptive supplies. Recent efforts included integration of reproductive health services at the primary health care level. Most of these activities were carried out under the Healthy Women in Georgia (HWG) program, a five-year "demonstration project" implemented by John Snow Research and Training Institute, Inc. (JSI). To obtain valid data for program monitoring in reproductive health is another USAID priority. Two nationwide Reproductive Health Surveys (RHS), conducted in Georgia in 1999 and 2005, enhanced the USAID's ability to design, implement, and monitor its programs and respond to the reproductive health needs of the population. In line with this approach, USAID continues to support efforts that document the barriers women and families may face in getting routine and emergency maternal health care and the role that these barriers play in poor maternal health outcomes.

Improving maternal health is also one of the CDC priority areas. While there is much work to be done in the United States to identify and prevent pregnancy-related mortality and morbidity, many of the lessons learned from domestic activities can help save women's lives around the world. Most of the CDC's work in this area is based on developing tools and systems that can assess the magnitude and determinants of maternal deaths, measure progress, and evaluate program efforts. For example, in 1987 the DRH/CDC established

the Pregnancy Mortality Surveillance System (PMSS) for the United States (Ellerbrock et al., 1988). This system provides ongoing surveillance of all pregnancy-related deaths and increased precision in measuring pregnancy-related mortality and identifying the groups at greater risk of death than systems relying on vital statistics data alone (Chang et al., 2003).

In 2007, the Georgian MoLHSA requested USAID and CDC assistance in organizing a comprehensive study of reproductive age mortality to identify both the mortality rates among women aged 15–49 and the levels and causes of pregnancy-related deaths. The USAID office in Tbilisi supported the study through the Healthy Women in Georgia project. The MoLHSA, through its National Centers for Disease Control (NCDC), John Snow Inc. (JSI), and DRH/CDC, worked jointly to design and execute the 2008 reproductive age mortality study (RAMOS). The Ministry of Economic Development, Department for Statistics, provided an electronic database of all deaths to women 15–49 years in 2006.

The main study objectives were:

- To determine the main causes of death among women of reproductive age and the pregnancy-related mortality fraction;
- To document maternal mortality levels measured as rates, ratios and the lifetime risk of dying of a pregnancy-related cause;
- To assess barriers to adequate and timely health care for all women, including those with recent pregnancies;
- To determine the population groups at high risks of maternal mortality;
- To evaluate existing recording and reporting systems, with particular focus on the certification of the cause of death; and
- To recommend evidence-based approaches that can improve the maternal health situation and its measurement Georgia.

Correct measurement of mortality levels is essential to promote evidence-based policy-making and evaluate the impact of public health programs. The investigation of main causes of death can be used to estimate cause-specific mortality rates and the magnitude and causes of pregnancy-related deaths. The documentation of barriers to quality health care can be used in designing interventions for mortality reduction at the individual, community and facility levels. The identification of gaps in vital registration procedures can be used to improving the quality of death recording and coding in general, and of

maternal deaths in particular. The data gathered from this study will help Georgian policy makers to monitor how successful safe motherhood efforts, particularly mortality reduction interventions are in Georgia.

Chapter 2

Methods

2.1 Research Design

The RAMOS methodology involves first identifying all deaths to women of reproductive age (using multiple sources of information) and then determining which of those decedents died during pregnancy or in the year after pregnancy. Generally, only deaths to recently pregnant women are investigated using detailed interviews with the family and/or community members, including health care providers. When available, these interviews are complemented by medical records and autopsy reports.

Cause-of-death data are essential to public health because they have multiple uses including: surveillance, research, design of public health and medical interventions, and funding decisions. Recognizing the public health importance of accurate measurement of cause-specific mortality, the RAMOS methodology in Georgia was expanded to include interviews with the families and/or caregivers of all women of reproductive age who died in 2006, irrespective of their cause of death and pregnancy status. The year 2006 was selected as the most recent year for which full and error-checked databases were available at the time of the initiation of the study.

All deaths to women of reproductive age were investigated by performing household visits and completing detailed verbal autopsies (VAs) with relatives of the deceased women. The VA is a questionnaire specifically designed to be administered to the caregivers or family members of the deceased (WHO, 2000). Generally, the VA is used to determine the underlying cause of death in areas where medical certification is unavailable or unreliable. This mortality information can then be aggregated at the population level to calculate several public health indicators, most importantly mortality rates by age, sex, and specific causes of death and access to care in the period prior to death. This information is crucial to guide decisions about public health programs, but generally is not available from any other source.

Deaths to women during pregnancy or one year after pregnancy were further investigated by conducting interviews and record review at the last medical facility that provided heath care for the fatal illness or condition. Information collected at the household level was used to identify the last place of health care and conduct the facility phase of the study.

2.2 Case Identification

The target population for the RAMOS study included all women ages 15 to 49 with a permanent residence in Georgia who died in 2006. Five sources of data were used for the identification of deaths to women of reproductive age:

- the vital registry database;
- medical death certificates;
- regional statistics (provided by regional governors);
- the cancer deaths registry; and
- community informants contacted during the field investigation of known death cases.

Briefly, the process of identifying women of reproductive age who died in 2006 included the following steps:

- First, an electronic subset of death records from the State Department of Statistics (SDS) vital registry database was reviewed by JSI and CDC. The review found that the electronic database included information on 1,070 deaths to women of reproductive age in 2006; the cause of death variable was provided as an ICD-10 (3 digits) coded variable, but in most cases only the immediate cause of death was recorded. The database provided a limited number of variables that could help identify the families of the deceased so that family interviews could be conducted. Further, only the address of the person who declared the death, which was not necessarily the same as the last address of the deceased, was included. Information about the temporal association between pregnancy and death was also missing, despite the presence of a pregnancy check-box on the medical death certificate.

- Next, a manual review of the medical death certificates issued in 2006 was used to verify and complement the information for records already included in the electronic database; This process also identified 119 additional deaths to women of reproductive age that did not appear to have been included in the electronic database.

- Next, the MoLHSA issued a request for assistance from the regional governors, who usually maintain summaries of mortality data or could obtain them from key community informants; after excluding cases already identified, 123 additional deaths were retained in the study group.

- Next, a review of the national cancer registry yielded another 35 potential eligible deaths;

- Eight more deaths to women of reproductive age, one of them a maternal death, were found in the course of the field work investigation. Trained interviewers were given instructions to record any additional eligible deaths they might come across during the data collection.

Overall, 1,347 deaths were originally identified as meeting the eligibility criteria through vital records and registry reviews and 8 deaths were identified during household visits to conduct scheduled verbal autopsies.

Some of the most common errors noticed in reviewing the information included on the medical death certificates were:

- Missing information on demographic variables: although sex, marital status, age and year of death were present on most certificates, detailed date of birth was missing in the majority of the certificates;

- Absence of information about the cause of death;

- Cause of death certification using only the terminal events (e.g. cardiac or respiratory failure), which are unlikely to constitute underlying causes of death;

- Listing of causes in incorrect or illogical order; or listing of more than one disease or condition on the same line;

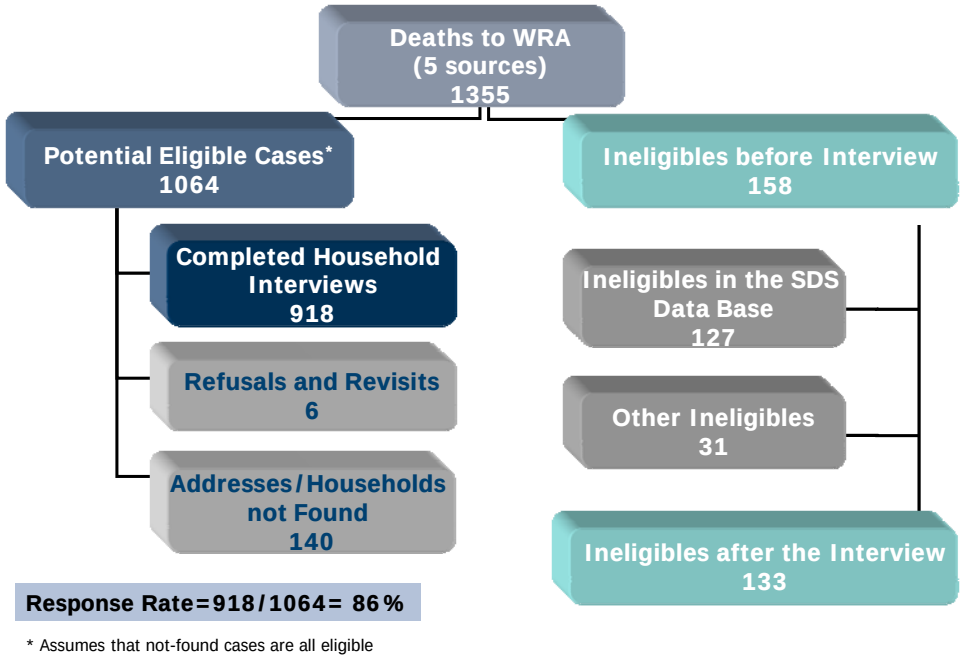
- Absence of information about the pregnancy or postpartum status at death.

A closer examination of the information included in the vital records and death registries found that 158 deaths—127 identified through the SDS data base and 31 identified through other sources—did not meet the case definition (i.e. death of any cause to a woman aged 15–49 during the year 2006) and were excluded prior to the field work. These deaths were to women older than 49 years or younger than 15 years, women who had died in 2005, eligible women who were entered more than once in the database (mostly duplicates but one triplicate was also found), and males of reproductive age. It is worth noting that the source of most of the cases excluded (127 deaths) was the vital statistics electronic database and thus had been included in the official cause-specific age-specific mortality data for 2006.

Of the remaining 1,197 deaths, 133 (11%) were classified as ineligible during the field work and 924 were confirmed as eligible. Verbal autopsies were completed for 918 deaths; only two families refused to be interviewed and four families could not be found at home after four visits. One hundred forty deaths had incomplete or inaccurate information about the address of the deceased or had families that had moved since the information on the death certificate were recorded. This category includes families living in South Ossetia, where the interviewers could not travel due to the recent Russian occupation.

It is likely that some of the 140 deaths whose families could not be found would have been classified as ineligible, had the interviewers been able to reach a relative. Conservatively, we assumed that all these deaths, already included in various official mortality sources, were eligible cases; this approach yields a response rate of 86% (918/1,064 deaths to women aged 15–49 years in 2006) (Figure 2.2.1).

Figure 2.2.1 RAMOS Response Rate



* Assumes that not-found cases are all eligible

Figure 2.2.2 Case Identification of Eligible Deaths by Source of Mortality Data

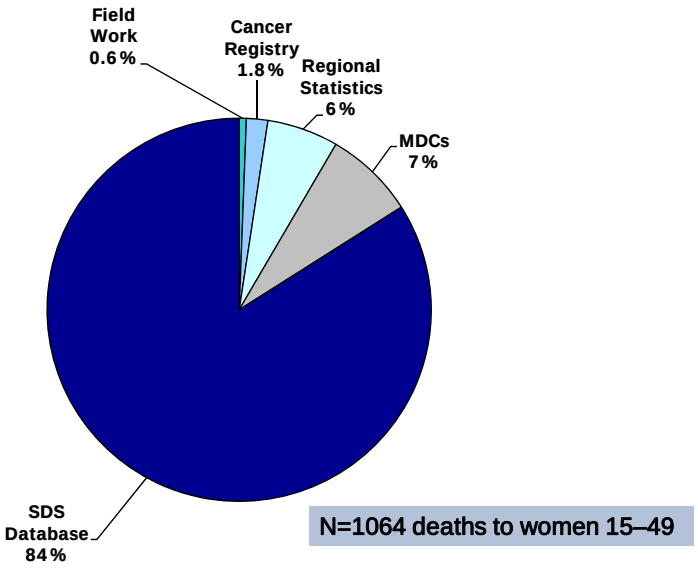


Figure 2.2.2 shows the distribution of the 1,064 eligible deaths (women of reproductive age who died in 2006), by source of data used for case identification. The vast majority of eligible cases (84%) were identified through the review of the vital statistics electronic database. An additional 7.6% of deaths were identified through the manual review of medical death certificates (MDC) and 6% through information received from the regional public health departments. Only 1.8% of deaths were identified through the review of the national cancer registry and less than 1% was found during the field work investigations. This indicates that 16% of all eligible deaths were unaccounted for in the vital registration system and the official mortality statistics for women of reproductive age, which use vital registration, are underreported.

The completion of family interviews for eligible deaths varied slightly by the source used for case identification, from 85% for the deaths identified through the SDS electronic database, to 87% for deaths identified through the cancer registry deaths, 89% for deaths identified by regional sources, 90% for deaths found through manual review of medical death certificates; and 100% for field identified deaths (data not shown). This is likely influenced by the quality of data provided by various sources and the accuracy of information needed to identify where the decedents' relatives reside.

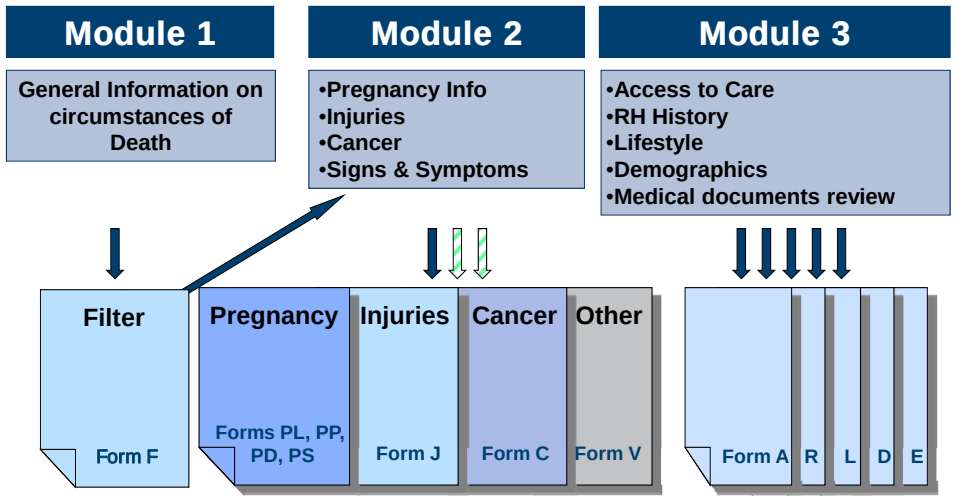
2.3 Study Questionnaire

A new and unique study questionnaire for collecting data related to circumstances of death, regardless of its cause, was developed and pilot tested. The RAMOS questionnaire has 3 components, as shown in Figure 2.3, and aims to explore circumstances that may have led to death among women aged 15–49 years, including cancer and other chronic diseases, intentional or unintentional injuries, and conditions related to or aggravated by pregnancy and its management. The instrument was developed based on questionnaires used in pregnancy mortality studies and surveillance systems conducted by CDC/DRH in the United States and Latin America combined with elements from the WHO's verbal autopsy (an approach used to obtain cause of death by interviewing lay respondents on the signs and symptoms experienced by the deceased before death) used in Sample Vital Registration with Verbal Autopsy (SAVVY) studies. A comprehensive history of use of health care services prior to death had been added to capture barriers to appropriate and timely care. Questions on access to health care services were designed to address the

3-delay model, a conceptual framework widely used in maternal mortality and morbidity prevention programs to explain individual- and system-level barriers to health care (Thaddeus and Maine, 1994).

The questionnaire was organized in three modules, each containing from one to five sections (Figure 2.3). Briefly, the questionnaire content included:

Figure 2.3 The Family Questionnaire: Structure and Content



Module 1: Consisted of a filter used to: screen out deaths that may have been misclassified in the sources used for case identification (i.e. deaths to males; deaths that did not occur in 2006, deaths to women younger than 15 or older than 49 years); identify the most knowledgeable respondent(s); assess the pregnancy status during the last 12 months prior to death; and establish if the death was due to accident/injury or to cancer.

Module 2: Consisted of a set of forms organized by main groups of causes of death:

Four forms for pregnancy-related causes that were administered to all death to women while pregnant or during 1 year postpartum and included information on: last pregnancy outcome, duration, intendedness and use of contraception at the time of

getting pregnant; timing of death in relationship to pregnancy; prenatal care (place, source, onset and number of visits, presence of pregnancy complications, hospitalizations and treatment) delivery or abortion care; postpartum/ postabortion complications, signs and symptoms of obstetric complications or other causes of death.

A form for deaths due to injuries and accidents including: Cause and effect for any injury/accident that led to death; detailed circumstances related to fatal motor-vehicle accidents.

A form for deaths due to cancer including: presence of any cancer at the time of death; primary cancer location; duration, stage, spread, diagnostic and treatment of primary cancer; detailed description of genital cancers (breast, cervix, corpus uteri, ovary).

A form for other diseases and medical conditions including: lifetime experience of selected diseases and medical conditions; signs and symptoms related to or associated with the last illness.

Module 3: Consisted of a set of forms exploring access to health care services prior to death and socioeconomic, behavioral, and reproductive health risk factors:

A form that collected information about access-to-care including: health seeking behaviors during the last illness; history of receiving care for the last illness, and characteristics of health care.

A form for reproductive history including: age at menarche and menopause; number of children born alive and child mortality; history of all pregnancy outcomes.

A form that collected information about behavioral risk factors including: tobacco and alcohol use; exposure to second-hand smoking; physical activity and diet; exposure to toxic agents; and family history of cancer.

A form for background and demographic characteristics: ethnicity, education, marital status; employment; living conditions; household amenities and goods.

A review of any potential medical documents related to death (e.g. hospital discharge documents, copy of the medical certificate, outpatient records, or an autopsy report) and kept by the family of the deceased.

A special set of questions at the end of the questionnaire was aimed at capturing respondent's feed-back and the family's consent for review of medical records of the decedent, if needed.

In addition, a separate health facility questionnaire was designed to capture information on the admission and care received in the health facilities accessed by women who died while pregnant or within 1 year postpartum.

The questionnaires were tested extensively, both before and during the pretest and before beginning of the field work. Testing included interviews with families of women of reproductive age who died in 2007 in Tbilisi and simulated interviews conducted by both CDC and NCDC staff. The questionnaires were translated into Georgian and Russian and back-translated into English.

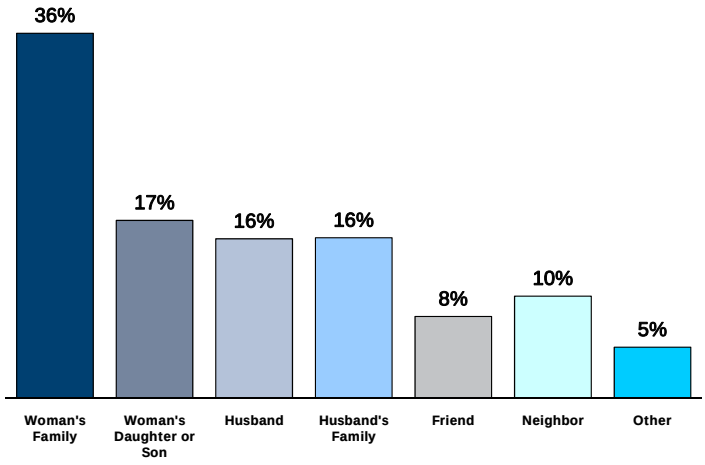
2.4 Data Collection and Management

The field work was conducted by 12 female interviewers specially trained in interview techniques, field work procedures, and questionnaire content before the beginning of fieldwork. Interviewers were also trained in procedures related to record reviews in health facilities. Interviewer training took place at the NCDC headquarters just before data collection. Field work supervision was performed by the NCDC staff.

All deaths to women of reproductive age were investigated by performing household visits and completing detailed interviews with relatives of the deceased women. Family questionnaires were completed primarily by interviewing the woman's family, including her adult children (53%), followed by the husband and/or his relatives (32%) (Figure 2.4). In some interviews, the main source of information for the verbal autopsy consisted of several family members and even friends and neighbors.

Deaths that occurred during pregnancy or 1 year of pregnancy were further investigated by conducting interviews and record review at the last medical facility that provided heath care for the fatal illness or condition. Information collected at the household level was used to identify the last place of health care and conduct the facility phase of the study. Field work was conducted between October 15, 2008 and March 30, 2009, for the verbal autopsies, and April–May 2009 for the facility records review.

Figure 2.4 Main Source of Information for Completed Verbal Autopsies



Note: The sum exceeds 100% because some interviews were conducted with two or more main sources.

Data collected during the field work were reviewed by local medical experts who established the most probable cause of each death. Because it is not always possible to make a precise determination of interacting diseases or conditions or to make a judgment as to the chain of events leading to death, each questionnaire was reviewed by two physicians, who completed independently (blinded) the cause of death certification, using the WHO standard death certificate form, shown in the Annex A (WHO, 2005). Discordant certifications were renegotiated to obtain agreement. An expert coder assigned ICD codes to all immediate and antecedent causes of death. Deaths to women while pregnant or within one year from the pregnancy termination were reviewed by a group of researchers at the DRH/CDC with experience in classification of pregnancy-related causes of death.

Both data collected during the field work and the causes of death assigned by the panels of experts were entered in a CSPro data-entry application designed by DRH/CDC. Legal ranges, pre-coded variables, consistency checks, and skips were programmed into the data entry software. The data collected during facility visits were abstracted and used in determination of cause of death of women who died during pregnancy or after pregnancy.

Chapter 3

Deaths to All Women of Reproductive Age

3.1 Distribution of Deaths by Characteristics

Table 3.1 shows the percent distribution of deaths to women 15–49 years in Georgia in 2006 by selected geographic and socioeconomic characteristics. Approximately 60% of deaths occurred to women who lived in urban areas, including 29.7% among women who lived in Tbilisi. As expected, deaths are concentrated at older ages; ten times more deaths occurred among women aged 45–49 than among women aged 15–19. Almost two-thirds of deaths occurred among married women. Slightly more than one-half of deaths (54.2%) were among women with post-secondary education. One in six deaths (18.3%) was among women belonging to a minority ethnic group.

The distribution of women aged 15–44 who died in 2006 by most individual characteristics is comparable with the distribution of the population of women of reproductive age as a whole (data not shown). However, just as there was a concentration of deaths at older ages, most of the deaths in 2006 were among women in a marital relationship.

Figure 3.1.1 summarizes the marital status at death by age groups. Similar to the findings in the general population of women of reproductive age, the vast majority of women who died after age 30 had been married or previously married at the time of death. It is worth noting, however, that among deceased women aged 35–39 years and 40–44 years, the proportion who had never been married was almost twice as high as among the women of similar ages documented in the 2005 Georgia Reproductive Health Survey. Deaths to minority ethnic groups were disproportionately represented when compared to all women of reproductive age (Figure 3.1.2).

Table 3.1
Percent Distribution of Women Aged 15–49 Years Who Died in 2006 by Selected Characteristics
Reproductive Age Mortality Study: Georgia, 2008

Characteristic	%
Residence	
Urban	59.8
Rural	40.2
Region	
Tbilisi	30.1
Ajara AR	9.3
Guria	2.6
Imereti	13.3
Kakheti	8.6
Mtskheta-Mtianeti	2.6
Ratcha-Lechkhumi/Kvemo-Svaneti	0.7
Samegrelo/Zemo-Svaneti	9.4
Samtskhe-Javakheti	4.2
Kvemo-Kartli	12.1
Shida-Kartli	6.5
Other	0.6
Age at last birthday	
15–19	2.9
20–24	5.0
25–29	7.1
30–34	10.5
35–39	14.3
40–44	24.9
45–49	35.3
Marital status	
Married	60.1
Previously married	19.6
Never married	19.7
Unknown	0.5
Education	
Secondary incomplete or less	19.5
Secondary Complete	25.9
Technicum	27.9
University/postgraduate	26.3
Unknown	0.4
Ethnic Group	
Georgian	81.7
Azeri	6.6
Armenian	5.8
Russian	2.5
Other	3.4
Total	100.0
No. of deaths	918

Figure 3.1.1 Marital Status at the Time of Death by Age
Women Aged 15–49 Years Who Died in 2006

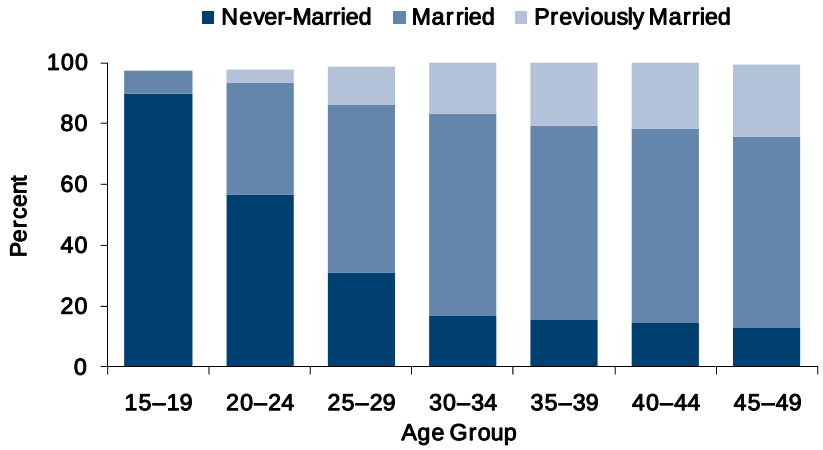
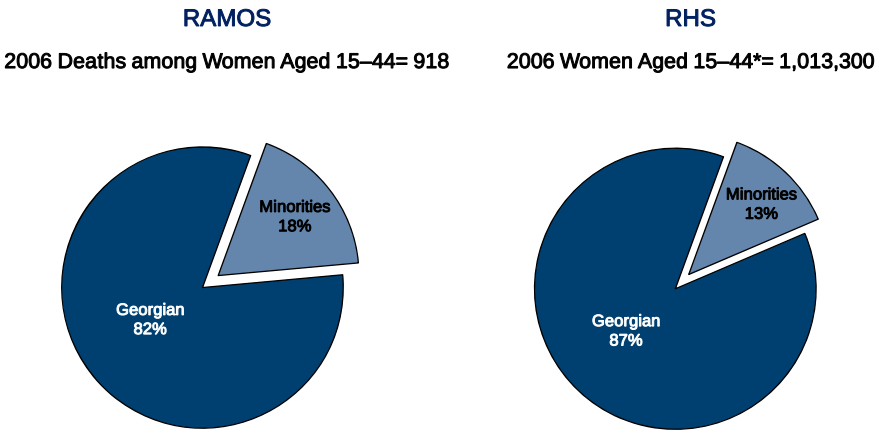


Figure 3.1.2 Representation of Minorities among Women
Aged 15–44 Years Who Died in 2006
and among All Women Aged 15–44 Years



* Based on the 2006 Demographic Yearbook of Georgia (Tsuladze et al., 2007) and 2005 Reproductive Health Survey (Serbanescu et al., 2007)

3.2 Cause-Specific Mortality Fractions among Women 15–49

As identified by the verbal autopsy, neoplasms were by far the most common cause of death for women 15–49 in Georgia in 2006 (Table 3.2.1). After grouping the underlying cause of death by ICD–10 chapter codes (WHO, 2007), neoplasms accounted for 45.4% of all eligible deaths. External causes were the second-most common underlying cause of death (15.9%), followed by diseases of the circulatory system (11.6%). Infectious diseases accounted for approximately 4.1% of deaths and pregnancy-related conditions represented 3.3% of mortality among women of childbearing age in 2006.

Table 3.2.1
Underlying Cause of Death Coded by the ICD–10 Chapter
Deaths in 2006 to Women Aged 15–49 Years
Reproductive Age Mortality Study: Georgia, 2008

ICD–10 Chapter	Deaths to Women Aged 15–49	
	N	%
II. Neoplasms	417	45.4
XX. External causes of morbidity and mortality	146	15.9
IX. Diseases of the circulatory system	106	11.6
XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	66	7.2
I. Certain infectious and parasitic diseases	38	4.1
XV. Pregnancy, childbirth and the puerperium	30	3.3
XI. Diseases of the digestive system	29	3.2
VI. Diseases of the nervous system	19	2.1
All other classified*	67	7.3
Total	918	100.0

*Includes one death by suicide during pregnancy, which is analyzed as an indirect maternal death in Chapter 4.

Table 3.2.2 shows percent distributions of deaths by cause within 5-year age groups of the deceased. As expected, deaths due to neoplasms and diseases of the circulatory system increased with age, whereas pregnancy-related deaths and deaths due to external causes decreased with age. Age specific mortality rates for the main causes of death are shown in Figure 3.2 and Table 3.2.3.

Table 3.2.2
Cause–specific Mortality Fractions by Age Group by the ICD–10 Chapter
Deaths in 2006 to Women Aged 15–49 Years
Reproductive Age Mortality Study: Georgia, 2008

ICD–10 Chapter	Age Group						
	15–19	20–24	25–29	30–34	35–39	40–44	45–49
I. Certain infectious and parasitic diseases	7.4	4.3	9.2	9.4	5.3	1.7	2.5
II. Neoplasms	25.9	17.4	29.2	32.3	50.4	52.4	51.2
IX. Diseases of the circulatory system	7.4	4.3	3.1	7.3	6.9	13.1	16.7
XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	3.7	4.3	6.2	8.3	5.3	7.4	8.3
XX. External causes of morbidity and mortality	44.4	41.3	30.8	20.8	13.0	11.4	9.9
All other classified	11.2	28.4	21.5	21.9	19.1	14.0	11.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
No. of cases	27	46	65	96	131	229	324

Figure 3.2 Age-Specific Mortality Rates for the Main Causes of Death among Women Aged 15–49 Years

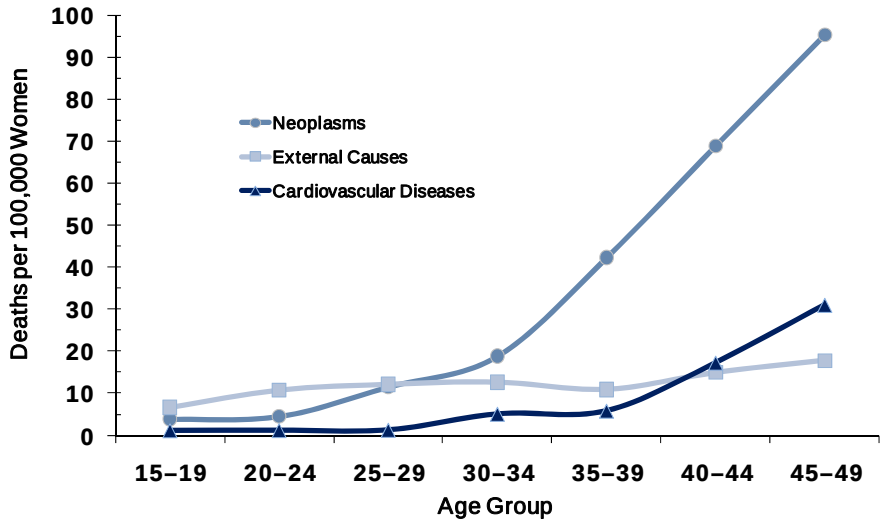


Table 3.2.3
Age–specific Cause–specific Mortality Rates per 100,000 Women Aged 15–49 by the ICD–10 Chapter
Deaths to Women Aged 15–49 Years in 2006
Reproductive Age Mortality Study: Georgia, 2008

ICD–10 Chapter	Age-specific Cause-specific Mortality Rates (5-year Age Groups)*						
	15–19	20–24	25–29	30–34	35–39	40–44	45–49
I. Certain infectious and parasitic diseases	1.1	1.1	3.6	5.7	4.5	2.3	4.6
II. Neoplasms	3.8	4.5	11.5	19.5	42.3	68.9	95.3
III. Diseases of the blood and blood–forming organs and certain disorders involving the immune mechanism	0.0	0.0	0.0	0.0	0.6	0.6	0.0
IX. Diseases of the circulatory system	1.1	1.1	1.2	4.4	5.8	17.2	31.0
XI. Diseases of the digestive system	0.0	1.1	0.0	1.3	2.6	8.0	4.0
XVIII. Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	0.5	1.1	2.4	5.0	4.5	9.8	15.5
XX. External causes of morbidity and mortality	6.6	10.7	12.1	12.6	10.9	14.9	18.4
All other classified	1.6	6.2	8.5	11.9	12.8	9.8	17.2
Crude Mortality Rate	14.8	26.0	39.5	60.3	83.9	131.5	186.0

* Per 100,000 women aged 15–49 using the mid-year population for 2006 (Source: Tsuladze et al., 2007: 2006 Demographic Yearbook of Georgia).

The underlying cause of death identified from the verbal autopsy was further categorized using the WHO 103-cause Condensed Adult Mortality List, which provides more detail than using the broad ICD chapter codes. Table 3.2.4 shows the number of deaths, percent distributions, and unadjusted mortality rates for the most common causes of death for the study population using the Condensed List. The all-cause crude mortality rate was 77.3 per 100,000 women aged 15–49 years. This is a conservative estimate, since the RAMOS response rate was 86%. Assuming a similar mortality profile among deceased women whose deaths were not investigated, the crude mortality rate could be as high as 89.9/100,000. Proportionally, breast cancer was the largest killer (14.6%) of women of reproductive age. About one in 7 deaths (134 deaths) in the study population were due to breast cancer. Transport accidents caused 8.5% of deaths, followed by cerebrovascular diseases (6.2%) and cervical cancer (5.7%). Twenty-four suicides were reported among women 15–49 in Georgia in 2006.

Table 3.2.4
Leading Underlying Causes of Death: Women 15–49 Years (Percent Distribution) and Crude Cause-specific Mortality Rates
Tabulated to WHO Adult Condensed Tabulation List
Reproductive Age Mortality Study: Georgia, 2008

Underlying Cause of Death according to WHO Adult Condensed Tabulation List	Deaths to Women Aged 15–49 years		Crude Cause-Specific Mortality Rate*
	N	%	(per 100,000)
Malignant neoplasm of breast	134	14.6	11.3
Transport accidents	78	8.5	6.6
Symptoms, signs and abnormal clinical and laboratory findings not elsewhere classified	66	7.2	5.6
Cerebrovascular diseases	57	6.2	4.8
Malignant neoplasm of cervix uteri	52	5.7	4.4
Remainder of malignant neoplasms	34	3.7	2.9
Malignant neoplasm of other and unspecified parts of uterus	33	3.6	2.8
Malignant neoplasm of ovary	32	3.5	2.7
Malignant neoplasm of meninges, brain and other parts of central nervous system	25	2.7	2.1
Intentional self-harm	24	2.6	2.0
Respiratory tuberculosis	24	2.6	2.0
Leukaemia	21	2.3	1.8
Other heart diseases	20	2.2	1.7
Malignant neoplasm of stomach	19	2.1	1.6
Malignant neoplasm of trachea, bronchus and lung	18	2.0	1.5
All other external causes	16	1.7	1.3
Diseases of the liver	16	1.7	1.3
Remainder of diseases of the nervous system	16	1.7	1.3
Ischaemic heart diseases	15	1.6	1.3
Assault	13	1.4	1.1
Diabetes mellitus	13	1.4	1.1
Remainder of diseases of the digestive system	12	1.3	1.0
Non-Hodgkin's lymphoma	11	1.2	0.9
Remainder of diseases of the genitourinary system	11	1.2	0.9
Remainder of pregnancy, childbirth and the puerperium	11	1.2	0.9
Malignant neoplasm of colon, rectum and anus	10	1.1	0.8
All other classified	137	14.9	11.5
Total	918	100.0	77.3

* per 100,000 women aged 15–49 using the mid-year population for 2006 (Tsuladze et al., 2007: The 2006 Demographic Yearbook of Georgia).

The underlying cause of death could not be determined for 7.2% of deaths, which is considered within a reasonable range when using retrospective verbal autopsy methodologies.

3.3 Cause-Specific Mortality Rates among Women 15–44 Years

Given that the RAMOS methodology collects information for women aged 15–49, crude mortality rates in Georgia should only be compared to published mortality estimates for women of the same age groups. One of the most commonly referenced international mortality data sources is the WHO Global Burden of Disease estimations, which produces regional, cause-specific estimates for women ages 15–44 years.

Table 3.3
Comparison of Cause-specific Mortality Rates (CSMR) per 100,000 Women Aged 15–44 Years for Leading Underlying Causes of Deaths
Georgia RAMOS, 2008; Georgia SDS Official Reports, 2007, and the WHO Global Burden of Disease (GBD) Estimates for Europe, 2008

Underlying Cause of Death According to WHO Adult Condensed Tabulation List	RAMOS: 2006 Deaths to Women Aged 15–44		RAMOS: 2006 CSMR (per 100,000)*	SDS: 2006 CSMR (per 100,000)†	GBD Europe: 2004 CSMR (per 100,000)‡
	N	%			
All-cause mortality	594	100.0	68.2	71.4	101.1
All malignancies	251	42.3	24.8	22.3	22.5
Malignant neoplasm of breast	80	13.5	7.9	N/A	5.4
Malignant neoplasm of cervix uteri	30	5.1	3.0	N/A	2.4
Transport accidents	62	10.4	6.1	N/A	7.1

* Per 100,000 women aged 15–44 using the mid-year population for 2006 (Tsuladze et al., 2007); all-cause mortality adjusted for non-response.

† Per 100,000 women aged 15–44 (Tsuladze et al., 2007: The 2006 Demographic Yearbook of Georgia).

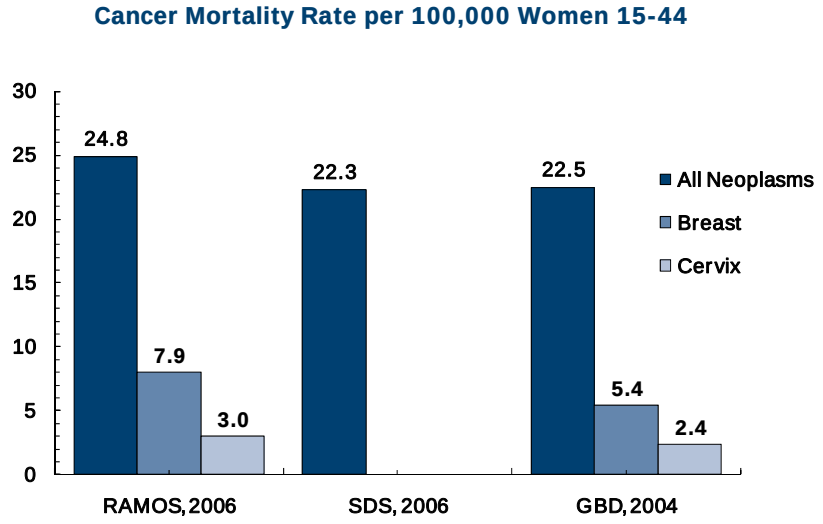
‡ Per 100,000 women aged 15–44 (WHO, 2008).

Table 3.3 compares key crude age-specific Global Burden of Disease 2004 mortality estimates for the European region with the estimates calculated with the 2006 RAMOS data for women aged 15–44. Population denominators have been taken from Georgian official statistical estimates for 2006 (GBD, 2004 and Tsuladze et al., 2007). All-cause and

malignancy mortality data, published in the 2006 Georgia Demographic Yearbook, are also presented in Table 3.3. The all-cause (overall) RAMOS mortality rates have been adjusted for non-contact, that is, when the caregivers of a woman known to be deceased could not be contacted nor a verbal autopsy performed.

Adjusting overall mortality for non-contact, which slightly increases the all-cause mortality estimates, assumes that mortality rates of the women whose families could not be contacted do not differ from those for whom verbal autopsies and cause of death determination were performed. However, this assumption is less valid in adjusting cause-specific mortality rates for non-contact. Case ascertainment for certain deaths may be more likely for some causes of death, but less likely for others. To be conservative, the cause-specific RAMOS mortality rates for malignancies and transport accidents in Table 3.3 have not been adjusted for non-contact.

Figure 3.3 Crude Cancer-specific Mortality Rates
Women Aged 15–44 Years
RAMOS, Official Sources, and Global Burden of Disease for Europe



Comparing all-cause mortality, GBD estimates a crude mortality rate for women aged 15–44 in Europe of 101.1 per 100,000 population, while the RAMOS methodology yields an adjusted rate of only 68.2/100,000 for the same age group. GBD estimates mortality rates for malignancies at 22.5/100,000, which is slightly lower than the RAMOS estimate of 24.8/100,000 (Figure 3.3). For breast cancer, GBD estimates the mortality rate in the

study population at 5.4/100,000 but the RAMOS rate is slightly higher, at 7.9/100,000. Transport accidents, which account for the second-highest number of deaths among the study population, have a similar rate in the two data sources: 7.1/100,000 from GBD, and 6.1 in RAMOS.

3.4 Place of Death

Table 3.4
Place of Death by Cause of Death According to the ICD–10 Chapter
Deaths to Women Aged 15–49 Years in 2006
Reproductive Age Mortality Study: Georgia, 2008

ICD–10 Chapter		Place of Death					Total	No of Cases
		Home	Medical facility	Road, street, or highway	In transit to medical care	Other		
II	Neoplasms	88.0	10.8	0.0	1.2	0.0	100.0	417
XX	External causes of morbidity and mortality	21.2	30.1	36.3	3.4	8.9	100.0	146
IX	Diseases of the circulatory system	58.5	35.8	0.9	3.8	0.9	100.0	106
XVIII	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	74.2	18.2	1.5	3.0	3.0	100.0	66
I	Certain infectious and parasitic diseases	63.2	36.8	0.0	0.0	0.0	100.0	38
XV	Pregnancy, childbirth and the puerperium	26.7	66.7	0.0	6.7	0.0	100.0	30
XI	Diseases of the digestive system	62.1	37.9	0.0	0.0	0.0	100.0	29
VI	Diseases of the nervous system	73.7	15.8	5.3	0.0	5.3	100.0	19
IV	Endocrine, nutritional and metabolic diseases	76.5	23.5	0.0	0.0	0.0	100.0	17
X	Diseases of the respiratory system	68.8	31.3	0.0	0.0	0.0	100.0	16
XIV	Diseases of the genitourinary system	25.0	75.0	0.0	0.0	0.0	100.0	12
XVII	Congenital malformations, deformations and chromosomal abnormalities	77.8	11.1	0.0	11.1	0.0	100.0	9
V	Mental and behavioral disorders	85.7	14.3	0.0	0.0	0.0	100.0	7
XIII	Diseases of the musculoskeletal system and connective tissue	33.3	66.7	0.0	0.0	0.0	100.0	3
III	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	50.0	50.0	0.0	0.0	0.0	100.0	2
XII	Diseases of the skin and subcutaneous tissue	0.0	100.0	0.0	0.0	0.0	100.0	1
All deaths		67.0	23.0	6.1	2.1	1.9	100.0	918

Table 3.4 indicates that 67.0% of deaths of women in the study population occurred at home, with 23.0% of deaths occurring in a medical facility. As expected, women who

suffered from chronic conditions tended to die at home, while those suffering from unexpected acute conditions and external causes were more likely to die in medical facilities or in transit. However, 66.7% of pregnancy-related deaths occurred in medical facilities and another 6.7% on the road or in transit.

3.5 Health Service Use in the Period Leading to Death

Table 3.5 shows that in the period directly before death, only 57.7% of women who died were known to have received medical care.

Table 3.5
Receipt of Health Care in the Period before Death and Place of Last Care by ICD–10 Chapter
Deaths to Women Aged 15–49 Years in 2006
Reproductive Age Mortality Study: Georgia, 2008

ICD–10 Chapter		Receipt of Any Care		Place of Last Health Care Received			
		%	N	Facility	Non-Facility	Total	N
II	Neoplasms	61.9	417	27.9	72.1	100.0	257
XX	External causes of morbidity and mortality	39.0	146	59.2	40.8	100.0	72
IX	Diseases of the circulatory system	67.0	106	78.9	21.1	100.0	55
XVIII	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	30.3	66	63.0	37.0	100.0	28
I	Certain infectious and parasitic diseases	71.1	38	72.0	28.0	100.0	26
XV	Pregnancy, childbirth and the puerperium	83.3	30	54.5	45.5	100.0	22
XI	Diseases of the digestive system	75.9	30	65.0	35.0	100.0	20
VI	Diseases of the nervous system	52.6	19	53.8	46.2	100.0	13
IV	Endocrine, nutritional and metabolic diseases	47.1	17	40.0	60.0	100.0	10
X	Diseases of the respiratory system	81.3	16	90.0	10.0	100.0	10
XIV	Diseases of the genitourinary system	83.3	12	50.0	50.0	100.0	8
XVII	Congenital malformations, deformations and chromosomal abnormalities	22.2	9	66.7	33.3	100.0	3
V	Mental and behavioral disorders	14.3	7	50.0	50.0	100.0	2
XIII	Diseases of the musculoskeletal system and connective tissue	100.0	3	50.0	50.0	100.0	2
III	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	100.0	2	100.0	0.0	100.0	1
XII	Diseases of the skin and subcutaneous tissue	100.0	1	100.0	0.0	100.0	1
All deaths		**57.7**	**918**	**47.0**	**53.0**	**100.0**	**530**

This is not a direct reflection of access to health care services, since women aged 15–49 years in 2006 who were ill but survived were not included in the study population. Table 3.5 also shows the last type of care received by the deceased, among those who received care. Considering deaths by all causes, about half of women who eventually died received care in a medical facility.

Chapter 4

Deaths to Women While Pregnant and Postpartum

Between January and December 2006, the RAMOS study identified 49 women who died while pregnant or within one year from their last pregnancy. These deaths were investigated in household interviews with the family members and with facility-based record review and summary forms completed for health services that provided care immediately prior to death. As a result, 31 deaths were classified as directly or indirectly caused by pregnancy while 18 were deemed as unrelated to pregnancy. Since different terminologies and definitions are used in maternal mortality measurements, the definitions used in the RAMOS study are presented below.

4.1 Definition of Terms

The World Health Organization defines maternal death as: the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.

The cut-off point for the definition of a maternal death, at 42 days postpartum, has been criticized as being chosen on religious and cultural grounds rather than on research studies of the timing of maternal deaths (Fortney JA, 1990, Hoij L et al., 2003, Lewis G et al., 2008). The ICD–10 revision of disease classification system introduced the concept of *late maternal death*, in recognition of the advancements in medical technologies and the ability of life-support systems to prolong life beyond 42 days postpartum. A late maternal death is a maternal death that occurs more than 42 days but less than 1 year after the pregnancy ended (WHO, 2004a).

Maternal deaths are further classified into two categories:

> *Direct obstetric deaths* are those resulting from obstetric complications of the pregnant state (pregnancy, labour and the puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above.
>
> *Indirect obstetric deaths* are those resulting from previous existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes, but was aggravated by physiologic effects of pregnancy.

In addition, the CDC and American College of Obstetricians and Gynecologists (ACOG) has introduced the definition of "pregnancy-associated death" as one that includes all deaths of women while pregnant or within 1 year of termination of pregnancy, from any cause, duration or site of the pregnancy (Wilcox LS and Marks JS, 1995). This definition is also used in the US Pregnancy Mortality Surveillance System (PMSS), implemented by CDC and ACOG, because it increases the case ascertainment of direct and indirect maternal deaths. With improving technologies and treatment advancements, fewer deaths occur at the time or soon after pregnancy termination and more deaths occur during late postpartum. Changing the definition of maternal mortality to include deaths due to direct and indirect obstetric causes up to 1 year after delivery provides more focus on postpartum care and encourage efforts to detect and treat pregnancy complications during puerperium. The RAMOS data were analyzed to present both the maternal deaths and pregnancy-associated deaths statistics.

4.2 Background Characteristics of Women Who Died during Pregnancy or within 1 Year of Pregnancy

The characteristics of women who died while pregnant or postpartum and those who died due to maternal causes are shown in Table 4.2. Most deaths occurred among women aged 25–34 years of age, reflecting the high age-specific fertility rates experienced by these women. More women with pregnancy associated death and with maternal deaths were living in rural areas than in urban areas and the vast majority were married or in a consensual unions at the time of death.

Table 4.2
Deaths in 2006 to Currently or Recently Pregnant Women Aged 15–49 Years
and Maternal Mortality Ratios (MMR) per 100,000 Live Births among Women Aged 15–44 Years
by Selected Characteristics
Georgia RAMOS, 2008 and Georgia RHS, 2005

Characteristic	RAMOS Deaths to Currently or Recently Pregnant Women		RAMOS Maternal Deaths*		RHS No. of Livebirths†	MMR (per 100,000 Livebirths)‡
	%	N	%	N		
Age group						
15–24	20.4	10	22.6	7	5473	27.5
25–34	59.2	29	51.6	16	8289	87.5
35–44	20.4	10	25.8	8	3497	228.8
45+	0.0	0	0.0	0	§	0.0
Residence						
Urban	44.9	22	41.9	13	3440	55.5
Rural	55.1	27	58.1	18	3819	75.6
Marital status (at conception)						
Married or in union	93.9	46	90.3	28	5463	61.6
Not married or in union	6.1	3	9.7	3	1796	167.1
Education level						
Secondary incomplete or less	8.2	4	9.7	4	6191	64.6
Secondary complete	42.9	21	41.9	12	15076	79.6
Technicum and university	49.0	24	48.4	15	25992	57.7
Socioeconomic status						
Low	36.7	18	35.5	11	17,864	61.6
Medium	46.9	23	58.1	18	20,841	86.4
High	16.3	8	6.5	2	8,507	23.5
Ethnic group						
Georgian	79.6	39	77.4	24	38,941	61.6
Other	20.4	10	22.6	7	8,318	84.2
No of pregnancies						
No completed pregnancy	6.1	3	3.2	1	20,652	4.8
1	18.4	9	29.0	9	11,295	79.7
2	28.6	14	32.3	10	5,246	190.6
3+	46.9	23	35.5	11	10,066	109.3
Total	100.0		100.0		100.0	65.6
No. of cases	49		31		47,259	31

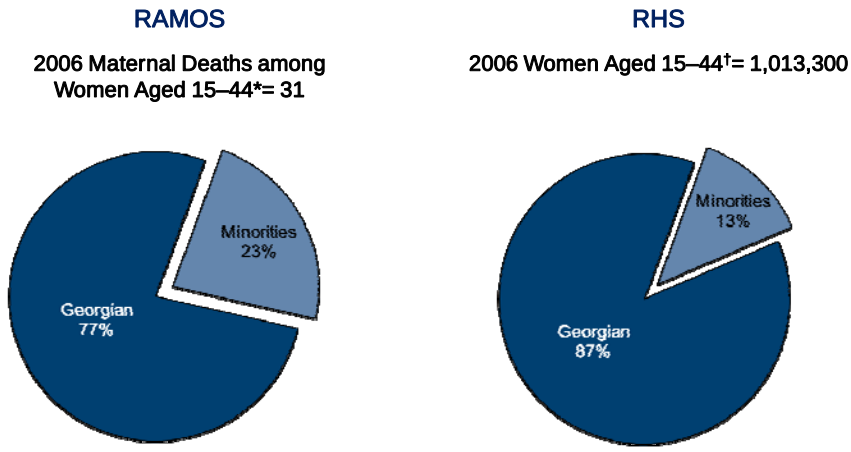
* Includes early and late maternal deaths.

† According to the percent distribution of live births reported by women aged 15–44 in the 2005 Georgia RHS (Serbanescu et al., 2007) and the total number of live births officially reported for 2006.

‡ Reported here for women aged 15–44 years.

§ Data on live births to women aged 45–49 not available in the 2005 Georgia RHS.

Figure 4.2 Representation of Minorities among Women Aged 15–44 Who Died in 2006 of a Maternal Cause and among All Women Aged 15–44 Years



* According to the RAMOS classification

† Based on the 2006 Demographic Yearbook of Georgia (Tsuladze et al., 2007) and 2005 Reproductive Health Survey (Serbanescu et al., 2007)

Although most pregnancy associated deaths and maternal deaths were among women of Georgian ethnic background, one in five deaths occurred among women of other ethnic backgrounds (Azeri, Armenian or Russian) (Figure 4.2). Maternal death differences by ethnic background are likely the result of multiple and interrelated factors, including socio-economic disparities, high pregnancy rates among minorities—both fertility and abortion rates—and differential access to maternal and other health care services.

The number of maternal deaths identified in the RAMOS study, the 2005 Georgia Reproductive Health Survey data, and the 2006 number of live births reported in the official statistics were used to calculate maternal mortality ratios (MMR) for each demographic subgroup (Serbanescu et al., 2007 and 2006 Demographic Yearbook of Georgia). The numerator is the number of maternal deaths in each category reported in the RAMOS study and the denominator is the number of live births among the same population subgroups of women. Denominators were estimated by using the distribution of live-births in 2005 by maternal background characteristics—data obtained from the 2005 Georgia Reproductive Health Survey—and the 2006 number of live births reported in the official statistics. The resulting ratios were multiplied by 100,000 live births to yield maternal deaths per 100,000 live births.

Conservatively, the overall maternal mortality ratio for 2006 was estimated at 65.6 deaths per 100,000 live births (Table 4.2, right panel). Older women, particularly women aged greater than or equal to 35 years, were at increased risk for maternal death. MMR for urban areas was 55.5 deaths per 100,000 and the ratio for rural areas was 75.6 per 100,000. Socioeconomic status was strongly associated with the risk for maternal death; maternal mortality ratios among women with low and middle socioeconomic status were 2.5 and 3.5 times higher than the MMR of the most affluent women (61.6 and 86.4 deaths per 100,000 vs. 23.5 deaths per 100,000). The maternal death ratio for unmarried women was 3 times higher than for married women (165.6 deaths per 100,000 vs. 58.9 deaths per 100,000). Maternal mortality ratios were 2.5 and 1.5 times higher among women with 2 and 3 completed pregnancies than among those with only one pregnancy.

These ratios were computed without adjusting for non-response. As shown in Chapter 2, the RAMOS study did not obtain information about 14% of the deaths to women of reproductive age in 2006; assuming a similar distribution of pregnancy-associated deaths among the unfound cases, the MMR presented here constitute the lowest estimate for 2006.

4.3 Type of Death and Time Interval between Pregnancy and Death

Table 4.3 shows the distribution of deaths to women while pregnant or postpartum by the time interval between pregnancy and death. Combining maternal and late maternal deaths as defined by the World Health Organization (WHO), we redefined maternal mortality as deaths among women of reproductive age (15–49 years) from any cause related to pregnancy or its management within 1 year of pregnancy outcome, irrespective of the duration or site of the pregnancy, but not from accidental or incidental causes.

Deaths resulting from obstetric complications during pregnancy, labour, or the puerperium from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above were classified as *direct obstetric* deaths. This category includes deaths due to obstetric hemorrhage—placenta praevia (2 cases), retained placenta (1 case), ruptured ectopic pregnancy (1 case), uterine rupture (1 case), and abruptio

placentae (1 case)—puerperal or post-abortion sepsis (4 cases), pregnancy induced hypertension (PIH) (4 cases), and pulmonary embolism (3 cases).

Deaths resulting from previously existing diseases or diseases that developed during pregnancy and were not directly related to pregnancy but were aggravated by the physiological effects of pregnancy were classified as *indirect obstetric* deaths. Most indirect deaths were due to aggravation of previous diseases or conditions during pregnancy or after delivery, such as congenital cardiac diseases (2), tuberculosis (2 cases), lupus (1 case), scleroderma (1 case), and epilepsy (1 case). Two indirect deaths were due to cerebrovascular accidents during the early postpartum period. The indirect death category also includes 3 deaths due to neoplasms—diagnosed during the pregnancy and not treated until after delivery or pregnancy termination—and 1 suicide in a 4-month pregnant woman. Deaths that were linked to pregnancy only by a temporal association (i.e. they occurred during pregnancy or within 1 year after the pregnancy had ended) were classified as *incidental* deaths.

Table 4.3
Main Cause of Death by the Time of Death in Relation to Pregnancy Termination Deaths in 2006 to Currently or Recently Pregnant Women Aged 15–49 Years Reproductive Age Mortality Study: Georgia, 2008

	Total		Time of Death in Relation to Pregnancy Termination				
	All Deaths	Early Deaths	During	During	After Pregnancy Had Ended		
RAMOS Classification	0–365 days	0–42 days	Pregnancy	Delivery	0–7 days	8–42 days	43–365 days
Direct obstetric death*	18 (100.0)	14 (77.8)	3 (16.7)	3 (16.7)	2 (11.1)	6 (33.3)	4 (22.2)
Indirect obstetric death†	12 (100.0)	6 (50.0)	1 (8.3)	0	1 (8.3)	4 (33.3)	6 (50.0)
Possible indirect (suicide)	1 (100.0)	1 (100.0)	1 (100.0)	0	0	0	0
Total maternal deaths	31 (100.0)	21(67.8)	5 (16.1)	3 (9.7)	3 (9.7)	10 (32.3)	10 (32.3)
Incidental death‡	18 (100.0)	5 (27.8)	2 (11.1)	0	0	3 (16.7)	13 (72.2)
All deaths to currently or recently pregnant Women	49 (100.0)	26 (53.0)	7 (14.3)	3 (6.1)	7 (14.3)	13 (26.5)	23 (46.9)

* The death of a woman resulting from obstetric complications of the pregnant state (pregnancy, labour and the puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above.

† The death of a woman resulting from previous existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes, but was aggravated by physiologic effects of pregnancy.

‡ The death of a woman while pregnant or within one year of termination of pregnancy due to a cause unrelated to pregnancy.

Of the 49 deaths to women while pregnant or within 1 year from the end of pregnancy, 26 (53%) occurred during pregnancy or within the first 42 days after pregnancy (Table 4.3). Thirty-one maternal deaths were due to direct or indirect obstetric causes, including one due to suicide during pregnancy; the other 18 pregnancy-associated deaths were due to incidental causes (i.e. causes unrelated to pregnancy). Of the 31 maternal deaths, 21 deaths (68%) were early maternal deaths and 10 (32%) were late maternal deaths (occurred between 43–365 days after the end of pregnancy), including 4 deaths to women who died of direct obstetric causes. One third of maternal deaths (32%) occurred during the time interval of 8–42 days after the end of pregnancy; 19% occurred either during delivery or the first week after delivery; another 16% occurred while women were pregnant.

4.4 Maternal Death and Pregnancy Outcomes

Table 4.4 shows the distribution of deaths to women while pregnant or postpartum and maternal deaths by the outcome of pregnancy. Of the 49 deaths to women while pregnant or within 1 year from the end of pregnancy, one-half (25 cases) occurred after delivery of live born babies. Eight deaths followed induced abortions, including two women who underwent medical abortions prior to the onset of chemotherapy for associated malignancies. Seven women died before giving birth or having the pregnancy otherwise terminated.

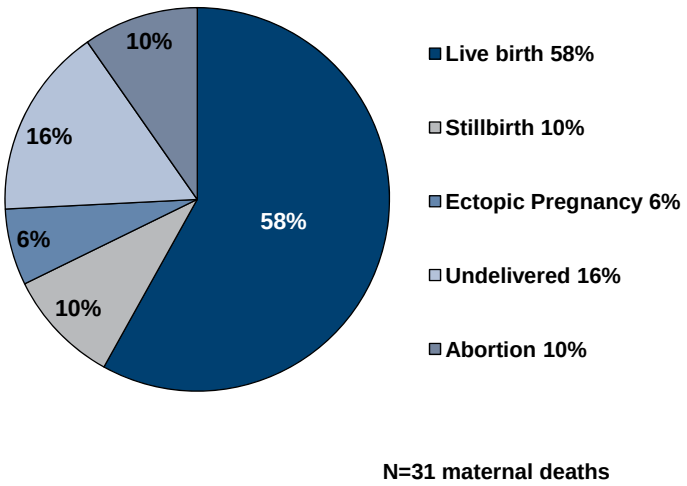
Overall, 58% of maternal deaths (18 cases) followed the delivery of a live birth and 9.7% (3 cases) followed a stillbirth delivery (Figure 4.4). Sixteen percent of women (5 cases) who died of obstetric causes were undelivered at the time of death. Three women died after induced abortions and two after ruptured ectopic pregnancies. It should be noted that the proportion of maternal death due to abortion in the RAMOS study was lower than the worldwide average of 13% of maternal deaths but higher than the United States and Western Europe average, where only about 4% of maternal deaths were abortion-related (Chang et al., 2003; WHO, 2004b).

Table 4.4
Pregnancy-associated Deaths and Maternal Deaths by Outcome of Pregnancy
Deaths in 2006 to Currently or Recently Pregnant Women Aged 15–49 Years
Reproductive Age Mortality Study: Georgia, 2008

RAMOS Classification	Total	Outcome of Pregnancy				
		Live Birth	Stillbirth	Induced Abortion	Other Fetal Loss*	Undelivered
Maternal deaths	31	18	3	3	2	5
Direct obstetric death	18	7	3	3	2	3
Indirect obstetric death	12	11	0	0	0	1
Possible indirect (suicide)	1	0	0	0	0	1
Incidental deaths	18	7	0	5	5	2
All Pregnancy-associated deaths	49	25	3	8	7	7

* Ectopic pregnancy or miscarriage.

Figure 4.4 Maternal Deaths by the Outcome of Pregnancy (Percent distribution)



4.5 Main Causes of Maternal Death

Overall, direct obstetric causes accounted for 58% of maternal deaths and 67% of the maternal deaths that occurred 0–42 days postpartum (i.e. early maternal deaths). The most common direct obstetric causes were haemorrhage in the antepartum, intrapartum, or postpartum period (6 cases), sepsis (4 cases), severe pregnancy-induced hypertension (4 cases), and pulmonary embolism (2 cases). Other direct causes of death were post-abortion renal failure (1 case) and sudden death (1 case) (Table 4.5.1). Most of the early maternal deaths were due to direct obstetric causes, whereas most deaths that occurred after 42 days postpartum were due to indirect causes.

The distribution of the causes of death differed depending on the pregnancy outcome; for women who died following a live birth (18 maternal deaths), the leading direct obstetric causes were infection, hemorrhage, and pregnancy-induced hypertension; however, more women died of indirect obstetric deaths after delivery (61%) than of direct causes (Table 4.5.2). Deaths that occurred after a pregnancy termination procedure were due to infection, pulmonary embolism, and acute renal failure; none of these deaths were due to indirect causes. Deaths during pregnancy (undelivered) were mostly the result of severe PIH (40%) or indirect causes (40%).

Table 4.5.1
Causes of Maternal Deaths by the Time of Death in Relation to Pregnancy Termination
Reproductive Age Mortality Study: Georgia, 2008

	All Maternal Deaths		Early Maternal Deaths (0–42 days)		Late Maternal Deaths (43–365 days)	
Cause of Death	% (N=31)	MMR	% (N=21)	MMR	% (N=10)	MMR
Hemorrhage	19.4	12.7	23.8	10.6	10.0	2.1
Infection	12.9	8.5	14.3	6.3	10.0	2.1
PIH	12.9	8.5	19.0	8.5	0.0	0.0
Embolism	6.5	4.2	4.8	2.1	10.0	2.1
Other direct	6.5	4.2	4.8	2.1	10.0	2.1
Indirect causes	41.9	27.5	33.3	14.8	60.0	12.7
Total	100.0	65.6	100.0	44.4	100.0	21.2

Table 4.5.2
Causes of Maternal Deaths by Outcome of Pregnancy
Reproductive Age Mortality Study: Georgia, 2008

Cause of Death	All Maternal Deaths %	All Maternal Deaths MMR	Outcome of Pregnancy: Live Birth (N=18)	Induced Abortion (N=3)	Other Fetal Loss* (N=5)	Undelivered (N=5)
Hemorrhage	19.4	12.7	16.7	0.0	60.0	0.0
Infection	12.9	8.5	16.7	33.3	0.0	0.0
PIH	12.9	8.5	5.6	0.0	20.0	40.0
Embolism	6.5	4.2	0.0	33.3	20.0	0.0
Other direct	6.5	4.2	0.0	33.3	0.0	20.0
Indirect causes	41.9	27.5	61.1	0.0	0.0	40.0
Total	100.0	65.6	100.0	100.0	100.0	100.0

* Stillbirth or ectopic pregnancy.

4.6 Reproductive History of Women Who Died of Maternal Deaths Compared to All Women Aged 15–44

According to the family reports collected by the RAMOS study, most women (68%) who died in 2006 of maternal death causes had been intentionally pregnant. Only 16% of women died following an unintended pregnancy (Table 4.6). This contrasts with 60% of pregnancies being unintended among women aged 15–44 who had been recently pregnant, as documented by the 2005 Georgia RHS (Serbanescu et al., 2007). The fact that most maternal deaths followed intended conceptions while most conceptions to women of reproductive age were unintended may be a reflection of the disparity in reproductive goals and reproductive life stages. As previously shown, most maternal deaths followed deliveries of live births while most women of reproductive age experience pregnancies that end in induced abortions rather than live births. Since the majority of births in Georgia follow intended conceptions and virtually all abortions follow unintended pregnancies, the difference in pregnancy outcome alone may explain why maternal deaths were more likely to occur after intended conceptions.

Table 4.6
Reproductive History of Currently or Recently Pregnant Women Aged 15–44 Years Who Died in 2006 of a Maternal Cause
Georgia RAMOS, 2008 and Georgia RHS, 2005

Reproductive History	RAMOS Maternal Deaths (N=31)* %	RHS Women Aged 15–44 (N=1,217)† %
Pregnancy intendedness		
Intended	67.7	39.5
Unintended	16.1	60.0
Unknown	12.9	0.5
Prenatal care‡		
Early (first 12 weeks)	41.9	71.9
Late	12.9	24.1
No care	25.8	4.1
Unknown	16.1	0.0
Type of delivery‡		
Assisted Vaginal Delivery	47.6	85.6
C-section	47.6	14.4
Unassisted	4.8	3.6

* Includes early and late maternal deaths.

† Women aged 15–44 who were pregnant or had at least one pregnancy within the past 12 months (2005 Georgia RHS).

‡21 deaths among women who gave birth (18 live births and 3 stillbirths).

Underreporting of abortion-related deaths by the families of the deceased may also contribute to the lower level of unintended conceptions among women who died of maternal causes. It is likely that some early pregnancies that were unintended went unnoticed by families or caregivers or were intentionally omitted or misreported. Lastly, information on pregnancy intendedness is less reliable if not provided by the woman who experienced it. In the 2005 Georgia RHS, the pregnancy intendedness was established based on women's accounts, while in the RAMOS study it was based on information from relatives of the deceased women.

Information concerning prenatal care was limited to women who delivered a live-born infant or a stillbirth because no comparative data on prenatal care for all women of reproductive age who had other pregnancy outcomes were collected in the Georgia RHS. Information about skilled assistance at delivery also refers to women who experienced live births and stillbirths. Of all the women who died of a maternal cause following delivery,

only 42% had started prenatal care during the first 12 weeks of pregnancy; 26% had not received any prenatal care and 13% had received only late prenatal care. For one eighth of these women, the family could not give any information about the use of prenatal care. By comparison, only 4% of women aged 15–44 years who gave birth in the 12 months preceding the 2005 Georgia RHS reported no prenatal care and 72% reported early care.

Of all deceased women in 2006 whose pregnancies resulted in a live birth or stillbirth, 48% delivered by Cesarean section, 48% had assisted vaginal deliveries and 5% delivered without skilled assistance. Additional data on circumstances of maternal death after deliveries were collected from the patients' records reviewed by trained physicians. According to these data, 40% of C-sections were performed for preexistent maternal conditions, 30% for intrapartum hemorrhage, and 20% for pregnancy-induced hypertension. One section was performed for prolonged labor. Most C-sections were emergency interventions performed on the same day the women initially presented for care. One section was performed perimortem (while the mother was in a coma as a result of severe pregnancy induced hypertension). Only one section was scheduled in advance. In contrast, the C-section rate for women who gave birth in 2005 was 14.4% (Serbanescu et al., 2007). The C-section rate among women who died of maternal causes in 2006 should be interpreted with caution. Most sections were emergency procedures performed largely to save the woman's life; in three cases the fetus was already confirmed dead. According to the record review data, one half of C-sections were followed by post-surgery infections that had further compromised an already critical health status.

4.7 Access to Health Care in the Period Leading to Maternal Death

Women with pregnancy complications may face numerous barriers to receiving adequate obstetric care. During the early 1990s, researchers from Columbia University argued that not getting adequate care in time is the overwhelming factor leading to maternal deaths in developing countries. They linked the factors that contribute to lack of care with three main delays: (1) a delay in making the decision to seek care when experiencing an obstetric emergency; (2) a delay in reaching an appropriate obstetric facility once the decision has been made to seek help; and (3) a delay in receiving adequate and appropriate care once the facility has been reached. They further proposed the use the 3-delays model

for the evaluation of emergency obstetric care services (EmOC) to help identify gaps and implement targeted interventions to avoid maternal deaths (Thaddeus S, Maine D, 1994).

Table 4.7
Patterns of Access to Care and Maternal Deaths That Received Hospital Care by Selected Characteristics
Reproductive Age Mortality Study: Georgia, 2008

Characteristic	Early Care Seeking*		Last Care in a Hospital		Death Occurred in a Hospital		Mean Number of Facilities Visited†	
	%	N	%	N	%	N	%	N
Total	54.8	31	71.0	31	67.7	31	1.8	24
Age group								
15-24	57.1	7	57.1	7	42.9	7	1.2	5
25-34	68.8	16	81.3	16	81.3	16	2.1	14
35-44	25.0	8	62.5	8	62.5	8	1.8	5
45+	0.0	0	0.0	0	0.0	0	0.0	0
Residence								
Urban	46.2	13	76.9	13	76.9	13	1.8	10
Rural	61.1	18	66.7	18	61.1	18	1.9	14
Marital status (at conception)								
Married or in union	50.0	28	67.9	28	64.3	28	1.9	21
Not married or in union	100.	3	100.	3	100.	3	1.3	3
Education level								
Secondary incomplete or less	33.3	4	33.3	4	33.3	4	1.5	2
Secondary complete	53.8	12	61.5	12	53.8	12	1.8	11
Technicum	50.0	6	83.3	6	83.3	6	1.6	5
University and postgraduate	66.7	9	88.9	9	88.9	9	2.2	6
Socioeconomic status								
Low	63.6	11	63.6	11	63.6	11	1.8	9
Medium	50.0	18	77.8	18	72.2	18	1.8	13
High	50.0	2	50.0	2	50.0	2	2.0	2
Ethnic group								
Georgian	58.3	24	79.2	24	79.2	24	2.0	19
Azeri	33.3	3	33.3	3	0.0	3	2.0	1
Other	50.0	4	50.0	4	50.0	4	1.0	4
No of living children								
0	80.0	5	80.0	5	80.0	5	2.3	4
1	55.6	9	66.7	9	66.7	9	1.6	7
2	36.4	11	72.7	11	63.6	11	1.9	7
3+	66.7	6	66.7	6	66.7	6	1.8	6

* Defined as seeking care within 24 hours from the onset of the signs or symptoms that preceded death.

† Excludes 7 women who did not seek care prior to their death.

The timely decision to seek care (by the woman or her family) is the first step that must occur if a woman with a complication is to receive EmOC. This decision implies that the risk of a life-threatening complication is recognized; awareness about where appropriate care is located exists; and beliefs that quality services are available prevail. Distance to the health facility, availability of transportation, and cost of health care and transport may also affect the decision to seek care.

4.8 Comparison with Official Statistics

Not all deaths included in the RAMOS investigation were officially reported in the vital registration system (Table 4.8, left panel). Overall, 42 (86%) of the RAMOS deaths to women while pregnant or within 1 year of pregnancy were reported in the official sources while 7 deaths (14%) were identified by manual review of medical death certificates, review of the cancer and regional death registries, and other sources. Among those, two deaths were early maternal and another two were late maternal deaths.

The underreporting in the official statistics is likely to be differential by age, gender, place and cause of death. Because deaths to women of reproductive age may be better reported than other deaths, the 86% completeness of reporting of pregnancy associated deaths may be an overestimate of the true level of mortality reporting in the official statistics. Further, since the RAMOS study could not reach all families or caregivers to women aged 15–49 years who died in 2006, it is likely that the completeness of reporting might be actually lower even for pregnancy associated deaths.

Even when they were officially reported, not all deaths to women while pregnant or within 1 year of pregnancy had the pregnancy status specified, despite the fact that certification of death requires the completion of the pregnancy check-box on the medical death certificate. Because almost no medical death certificates to women of reproductive age had the pregnancy check-box completed, any inference about the temporal association between death and pregnancy in the official reports would be solely based on the ICD-coding of the underlying cause of death. Only 11 deaths (10 early and one late maternal death) reported by the vital registration system had ICD codes suggestive of the pregnancy or postpartum status at death. Two additional pregnancy-associated deaths were reported by the maternal mortality surveillance, maintained by the MoLHSA, but no corroborative evidence of pregnancy could be found when interviews with the family members and

reviews of the hospital records were conducted in the RAMOS study. The remaining 31 deaths officially reported deaths to women while pregnant or within 1 year of pregnancy were classified in other ICD–10 chapters, including 16 deaths for which the RAMOS investigation revealed a direct or indirect maternal cause of death. It is worth noting that one postabortion death included in the official sources was not initially identified through the RAMOS verbal autopsy but was confirmed after interviews with the facility staff that provided terminal care.

Table 4.8
Death Reported in the RAMOS Study and the Official Maternal Mortality Statistics
Deaths to Currently or Recently Pregnant Women Aged 15–49 in 2006
Reproductive Age Mortality Study: Georgia, 2008

	Pregnancy-associated Deaths			Maternal Deaths		
RAMOS Classification	RAMOS	Official Statistics	% Officially Reported	RAMOS	Official Statistics	% Officially Reported
	N	N		N	N	
Total	49*	42	85.7	31	11	35.5
Early deaths (0–42 days)	26	13	50.0	21	10	47.6
Direct obstetric deaths	14	8	57.1	14	8	57.1
Indirect obstetric deaths	7	2	28.6	7	2	28.6
Incidental deaths	5	3†	60.0	‡	‡	‡
Late deaths (43–365)	23	13	56.5	10	1	10.0
Direct obstetric deaths	4	1	25.0	4	1	25.0
Indirect obstetric deaths	6	0	0.0	6	0	0.0
Incidental deaths	13	12†	92.3	‡	‡	‡
Other§	0	16	‡	‡	‡	‡

* Includes 7 deaths identified by the RAMOS study from other sources.

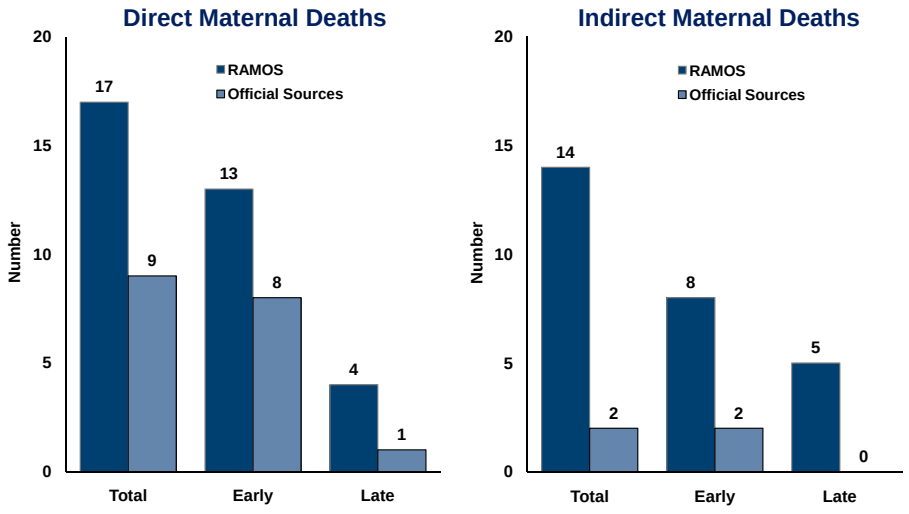
† Virtually all death certificates to women of reproductive age do not have the information on pregnancy status completed (empty pregnancy check-box); deaths attributed to non-obstetric causes in the official statistics cannot be identified as being coincidental to pregnancy.

‡ Not applicable.

§ Deaths to women aged 15-49 officially reported as due to other causes that correspond to obstetric deaths in the RAMOS classification.

Among the 20 additional maternal deaths to women while pregnant or within 1 year of pregnancy found in the RAMOS study, 11 deaths occurred during the first 42 days postpartum and 9 occurred during 43–365 days after delivery (Table 4.8, right panel). Thus, only one in three (36%) maternal deaths documented in the RAMOS study was classified as maternal in the official sources. That is, for each official maternal death, there were two other mothers whose deaths were either misclassified as non-maternal or went unreported by the official sources. For the maternal deaths identified in the RAMOS study to have occurred up to 42 days postpartum, only 48% were officially reported (one of two deaths).

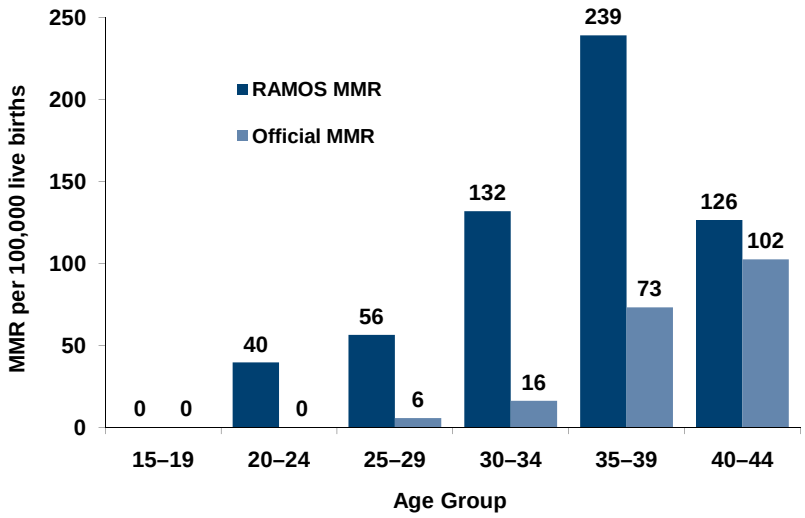
Figure 4.8.1 Direct and Indirect Maternal Deaths According to RAMOS and the Official Sources



Examination of the number of direct and indirect maternal deaths in the RAMOS classification and the official sources revealed different levels of concordance in reporting. (Table 4.8, right panel and Figure 4.8.1). While 57% of direct maternal deaths were correctly identified in the official sources, only 28% of the indirect maternal deaths were officially reported. Six women who died of early direct obstetric causes, 5 who died of early indirect causes and virtually all those who died of direct and indirect cause after 42 days were not identified as deaths related to pregnancy in the official statistics.

Figure 4.8.2 shows a comparison of age-specific maternal mortality ratios in the RAMOS study and the official statistics. Because fertility after age 44 years is negligible in Georgia and there were no maternal deaths in this age group, the figure shows only age specific mortality ratios for women aged 15–44 years. The omissions of maternal deaths in the official statistics affect all age-specific MMRs, but much more so those estimated for the younger age groups. The official sources failed to report any maternal deaths to women aged 20–24 and underreported the MMRs to women aged 25–29 by a factor of 9; these are the age groups with the highest fertility rates in Georgia.

Figure 4.8.2 Age-Specific Maternal Mortality Ratios (MMR)
Official and RAMOS Reports of Maternal Deaths in 2006



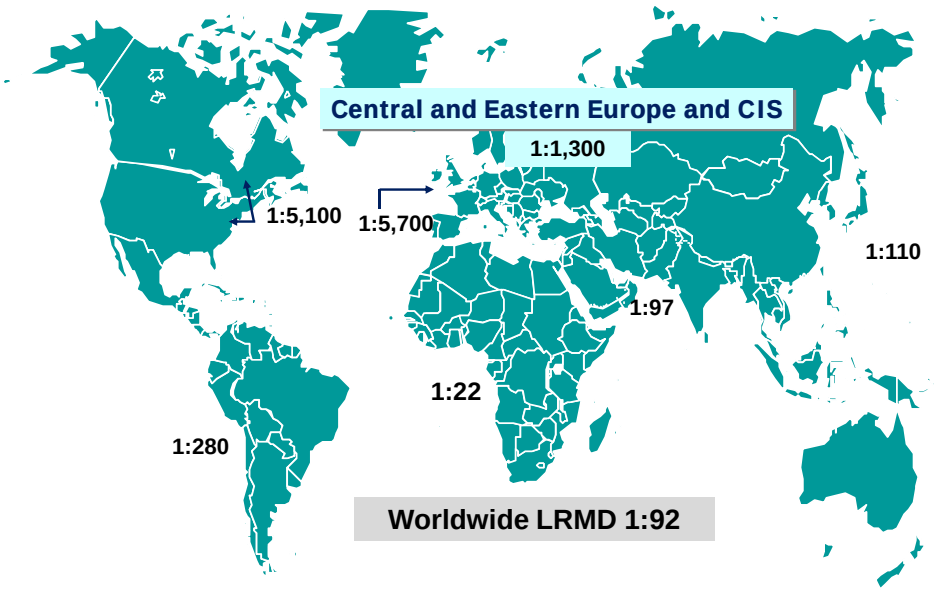
4.9 Lifetime Risk of Maternal Death

Women who were 30 years of age and older had a higher risk dying of a maternal cause than younger women (Table 4.9). Specifically, women aged 35–39 years had the highest risk for death (239 deaths per 100,000 live births) combined with very low age specific fertility rate. The lifetime risk of maternal death is a cumulative measure of female lives lost due to direct or indirect obstetric causes over the reproductive age years. It is

recommended to compute the lifetime risk of maternal death by using age-specific maternal mortality data, preferably age-specific mortality rates (Wilmoth J, 2009).

Overall, the lifetime risk of dying from a maternal cause during pregnancy or within 365 days after the end of pregnancy was .092%, based on the age-specific maternal mortality rates. This translates into one out of 1,053 women whose reproductive age life was interrupted due to maternal death. Similarly, the probability of dying of an early maternal death was .065%, translating into one in 1,538 women who died due to an early maternal death. This figure is comparable with the WHO estimates for Central and Eastern Europe and the Commonwealth of Independent states (1:1,300) but reflects a risk of maternal death for Georgian women 4 times higher than the corresponding risk among women in Western Europe (WHO, 2007) (Figure 4.9).

Figure 4.9 Lifetime Risk of Maternal Death (LRMD) by Region, 2005



Source: WHO, *Maternal Mortality in 2005: Estimates Developed by WHO, UNICEF, UNFPA and the World Bank*, 2007.

Table 4.9
Age-Specific Maternal Mortality Measurements and Lifetime Risk of Maternal Death Based on Age-Specific Mortality Data
Reproductive Age Mortality Study: Georgia, 2008

Age Group (in years)	No. of Women (in thous.)	Maternal Deaths		Maternal Mortality Rate (per 1,000)		Live Births	Age-Specific Fertility Rate	Maternal Mortality Ratio (per 100,000)		Lifetime Risk of Maternal Death	
		Early	All	Early	All			Early	All	Early	All
15–19	182.2	0	0	0.000	0.000	6,633	0.036	0.0	0.0	0	0
20–24	176.9	4	7	0.023	0.040	17,666	0.100	22.6	39.6	0.00011	0.00020
25–29	164.7	4	7	0.024	0.043	12,409	0.075	32.2	56.4	0.00012	0.00021
30–34	159.2	8	9	0.050	0.057	6,831	0.043	117.1	131.8	0.00025	0.00028
35–39	156.1	5	7	0.032	0.045	2,929	0.019	170.7	239.0	0.00016	0.00022
40–44	174.2	0	1	0.000	0.006	791	0.005	0.0	126.4	0.00000	0.00003
45+	174.2	0	0	0.000	0.000	120	0.001	0.0	0.0	0.00000	0.00000
15–44	1013.3	21	31	0.0207	0.0306	47,259	1.395	44.4	65.6	0.00065 (1/1,538 women)	0.00095 (1/1,053 women)

Chapter 5

Public Health Implications

The reduction of maternal mortality is a core global health priority, represented prominently among the Millennium Development Goals. Around the world, governments strive to improve maternal and child health care services, because investing in the health of mothers and their children has enormous socioeconomic and developmental benefits. However, in many countries, progress toward reducing maternal mortality and morbidity cannot be adequately measured with the current level of existing statistics. Despite numerous measurement options and opportunities, there are no standardized methods that can be universally applied and sustained in measuring maternal mortality. Therefore, comparisons between countries or even within countries at different points in time are difficult and often based exclusively on statistical inferences issued every 5 years by the WHO.

Despite a long tradition of vital registration in Eastern Europe, the completeness of data officially reported had been repeatedly scrutinized and, at least for some indicators, including maternal mortality, had been proven inadequate. In the absence of complete death registration and good attribution of causes of death, several techniques have been proposed to enhance the reporting of maternal deaths. The reproductive age mortality study (RAMOS) using multiple sources to identify deaths is considered one of the most complete and timely investigation of maternal death, a "gold standard" in maternal mortality research. It had been implemented both in countries with good and poor vital registration.

The Georgia RAMOS provided measurements for all maternal mortality indicators needed to monitor progress and evaluate the overall effectiveness of the maternal health care systems: maternal mortality ratio (66 deaths per 100,000 live births); maternal mortality rate (30.6 deaths per 1,000 women 15–44 years); maternal mortality fraction (3.3% of deaths), which indicates the contribution of maternal deaths to the general mortality of women of reproductive age; and life-time risk of maternal death (1:1,053 women), which represents the probability of dying from a maternal cause during the reproductive age years. Since it included the investigation of all deaths, the study in Georgia helped identify other main causes of death for women of reproductive age (i.e.

cancer, injuries, and cardiovascular diseases) and priorities for prevention and health system strengthening. Additionally, Georgia RAMOS collected information on a wide array of risk factors and behaviors that may have contributed to death and identified main barriers to accessing quality health care services. Because it documented differentials in maternal mortality among various demographic groups including the geographical distribution of mortality, the study could be used to design and implement targeted interventions. Lastly, the study provided direct evidence of the degree of underreporting in vital records and the need for strengthening vital registration systems. The RAMOS-based maternal mortality ratio of 66 deaths per 100,000 live births in 2006 was almost 3 times as high as the MMR of 23/100,000 officially reported for the same year.

Results of the RAMOS study can serve as a baseline for efforts aimed at enhanced mortality reporting, particularly maternal death reporting. They can complement other maternal mortality assessments or can be adapted to start up an active surveillance system of maternal mortality. Acting upon the RAMOS findings will ultimately result in improvements in the standards of care, promotion of integrated services, and the development of a new research agenda in safe motherhood in Georgia.

5.1 Measuring Maternal Mortality

Greater investment of resources is needed to improve the vital registration and the routine information system in Georgia. Since a high proportion of deaths occur in or have been in contact with the health system, investments in its ability to report maternal deaths are warranted. Without being supplemented with additional information, the vital statistics civil registration system cannot be used in its current form for surveillance of maternal deaths. The RAMOS study had shown both underreporting and misclassification of causes of death in the vital registration system. Seven deaths (14%) to women who died during pregnancy or within 1 year of pregnancy in 2006 were never reported in the vital registration (including 4 women who died of maternal causes); an additional 16 deaths due to maternal causes were classified as non-maternal by the vital registration system.

Omissions and misclassifications of maternal deaths follow a differential pattern (e.g. deaths to women of peak fertility ages were more underreported than others) and imply that mortality analyses and official data are not generalizable. Given the hand-carry nature of the vital registration of birth and death events in Georgia, failure to report deaths is

probably contributed by the decedents' families (who may have failed to submit medical death certificates issued by facilities to the civil registries), the physicians who were supposed to certify the death, and the civil registries in charge with issuance of the official death documents. Lack of appreciation of the public health importance of death certification may be at the root of the under-certification of deaths. Educational campaigns at the national and local levels may improve awareness among the general public on the importance of an accurate system of vital records death reporting in general. The involvement of community-based health professionals, specifically in high mortality geographic areas may further increase reporting of maternal deaths in particular.

In parallel, basic training regarding concepts of death certification practices in medical school and postgraduate training curricula need to be institutionalized. The design of user-friendly forms with easy to follow instructions and introduction of quality control measures for the vital registration personnel may further improve death certification.

The RAMOS study has found that even when certified, a large proportion of deaths lacked documentation of the underlying cause of death and virtually all had no useful information to establish the temporal association between pregnancy and death. Since completion of cause-of-death data and the pregnancy check-box are generally provided by the physician responsible for the decedent's medical care, targeted training workshops for the health providers need to be designed. Of the 31 maternal deaths identified in the study only one had reportedly been followed by an autopsy, although the pathology report was not included in the medical record. The practice of post-mortem examinations in Georgia needs to be improved, to help physicians determine the primary and underlying causes of death.

Availability of credible information is important for planning and implementing quality programs and achieving a public health impact. In addition to information routinely provided by health information systems and periodic special studies, such as the RAMOS study, the WHO recommends specific methodologies for reviewing maternal deaths (WHO, 2004c). Development of an infrastructure for ongoing identification of all cases of maternal mortality and for collecting data for action at all levels is critically needed.

The adoption of an active **maternal mortality surveillance** can provide essential information on circumstances of maternal death during pregnancy, delivery and postpartum and can be coupled with verbal autopsies from the families and community health workers. In the US, active surveillance is done using multiple sources to improve

the completeness of death reporting and accuracy of case ascertainment. The system is designed to collect information from death certificates, matching birth or fetal death records, autopsy reports, hospital records of women and newborns, case summaries, active notification by individual practitioners and maternal mortality committees, and newspaper reports (Ellerbrock et al., 1988; Chang et al., 2003). In the UK, the system relies exclusively on health professionals— including midwives, obstetricians and general practitioners—who report any possible maternal death to a confidential enquiry assessor (Lewis, 2007). Policy makers, program managers, and health care providers at the local, regional, and national level could use these data to introduce targeted interventions that could result in significant reduction in maternal mortality.

Maternal Mortality Review processes can further monitor quality of care and ensure that pregnant women receive timely adequate care from the most qualified health providers in well equipped facilities. They are performed by multidisciplinary committees of experts at the hospital, community, or national level. Maternal mortality committees should include all types of health care providers involved in providing care to pregnant women (physicians, nurses, health educators, social workers) as well as members of the community. Their experience and insight can help policy makers in understanding why the patient, her family, or the health care system failed to prevent each maternal death. The review's role is to assess and identify the underlying factors that led to each maternal death, establish the preventability of the death, and develop recommendations for health sector and community action based on the lessons learned. Methodologies include facility-based and community-based reviews and confidential enquires into maternal deaths. In addition to community- and facility-based reviews, confidential inquiries into maternal deaths (CEMD) provide a scientific basis for improving standards of care and intervention programs. Periodic criterion-based audit studies could directly evaluate medical practices and could improve timely and appropriate care for severe maternal morbidities (near-miss cases) and prevent future maternal deaths (WHO, 2004c). These new techniques for capturing deaths during pregnancy and childbirth at national and sub-national levels need to be adapted and tested for Georgia. Future follow-up national or sub-national investigations of maternal deaths need to be planned and use the RAMOS findings as a baseline.

5.2 Prevention Practices

The reduction of maternal deaths is a key target of the Millennium Development Goals. Most of the interventions needed to achieve this target involve birth planning, access to and availability of quality obstetric care services and early awareness and identification of the warning signs. This is an area where collection and use of reliable information can make a real impact.

The RAMOS study found that the mothers who had died in 2006 were less likely to attend prenatal care during the first trimester of pregnancy and almost 3 times more likely to have no prenatal care (11% vs. 4%) compared to women who had given birth and survived. Health providers should ensure that antenatal services are accessible to all women and the first visit is completed during the first 12 weeks of pregnancy. Antenatal care services should provide evidence-based quality care—including promotion of health behaviors, adequate nutrition, and screening and treatment of pre-eclampsia, syphilis, tuberculosis, and asymptomatic bacteriuria—and insure timely referral for complications. There is a clear need for improving these services in Georgia. Health education and promotion materials prepared for all ethnic groups should emphasize the warning signs of pregnancy complications and importance of seeking antenatal care early in pregnancy. When women are not well informed about the danger signs during the pregnancy they delay seeking qualified care in case of complications. Therefore, antenatal care should provide and re-enforce evidence-based information for the patient and family members.

The study has shown that almost one-half of mothers who died in 2006 had failed to recognize early the severity of a pregnancy complication or the aggravation of a preexisting condition as a result of pregnancy. Delayed health-care seeking by the mother or her family by 24 hours or more was likely an important factor contributing to the maternal death for these women. Increased awareness of the warning signs of pregnancy complications through doctor/patient interactions is a proven strategy to motivate women to seek care in the event that such complications occur. Hemorrhage, particularly post-partum hemorrhage is the leading direct obstetric cause of death in Georgia. Information about prevention, knowledge of warning signs, and rapid access appropriate care is key particularly in reducing deaths due to obstetric hemorrhage.

Despite recent declines, abortion rates in Georgia are the highest documented in the world and the use of modern family planning methods continues to be low. Information, education, family awareness on the benefits of modern methods, including temporary and

long-term methods, are proven interventions that can save mothers' lives. Special attention needs to be given to the needs of young, sexually active women, who want to postpone childbearing, and to older women, who want no more children. Although primary prevention of unintended pregnancy is optimal, among women who choose to terminate their pregnancies, increased access to quality abortion services, including post-abortion counseling, may ensure that abortions are performed in appropriate conditions and the risk of unintended future pregnancies is lowered. The relatively low proportion of maternal deaths that was abortion-related (10%) suggests that most pregnancy terminations in Georgia are performed in safe conditions; however, abortion mortality should be interpreted with caution, since early pregnancies, especially those ended in induced abortion, are particularly prone to underreporting by relatives and often by the health information systems. In the absence of routine autopsy, the abortion-related mortality should be viewed as a conservative estimate.

The RAMOS study has identified that one-third of early maternal deaths and 60% of late maternal deaths in 2006 were primarily caused by pre-existing diseases or conditions (i.e. congenital or acquired cardiovascular diseases, auto-immune diseases, tuberculosis, epilepsy) that had been aggravated by pregnancy. Preconception counseling, health advice, screening during early prenatal care and closed monitoring, should be provided routinely for women of child-bearing age with pre-existing serious medical or mental health conditions. In Georgia, preconception counseling is largely non-existent and gynecologic routine health care visits (outside pregnancy) are rare. Women with serious pre-existent diseases need to be counsel about the risk of pregnancy and the availability of appropriate family planning methods. Once pregnant, they should be monitored by multidisciplinary teams, and should have delivery plans in well-equipped maternity units. They should be followed-up in the early puerperium through postnatal care and kept under observation preferably beyond 42 days postpartum.

Strategies for improving the overall health of women are also important. Nutritional advice before, during, and after pregnancy, iron and vitamin A supplementation before and during pregnancy to prevent anemia, pregnancy spacing, blood pressure screening, primary prevention of chronic diseases, such as cardiovascular diseases, diabetes, and cancers, are a public health priority. Chronic diseases are very important causes of death among Georgian women of reproductive age. Increased awareness about these conditions and early detection and management may improve the access to and utilization of preventive services.

5.3 Clinical Care

Availability and quality of comprehensive emergency obstetric care services play an important role in maternal mortality reduction. Barriers to health-care access are well known and greater efforts are needed to promote interventions that benefit the poor, less privileged women, especially in remote rural areas. Long distances to the closest health facility with comprehensive emergency obstetric care are not acceptable. In Georgia there is no shortage of comprehensive obstetric care, but its ability to function 24/7 and have adequate staffing might not be optimal. Of the 31 women who died of maternal causes, 5 did not access health services at all; 14 were transferred at least once prior to their death, suggesting that the infrastructure or the level of skills at the first point of contact may not have been adequate. Strengthening emergency obstetric care can improve the availability of adequate services to reduce the number of deaths from obstetric complications.

Despite the adequate number of EmOC facilities in Georgia, further improvements of the referral system is needed. This includes defining levels of care, roles and responsibilities for all levels of care to ensure effective operation of referrals. Also, referral system must include adequate and timely feedback to the original referring point. This will foster reflective practice and strengthen continuity and quality of care. Furthermore, key to a good referral system is timeliness, speed and the ability of all women to be able to access effective referrals, regardless of their socio-economic status. Efforts should be focused on improving skills of health care professionals to provide quality life-saving care, particularly in emergency obstetric care. Continuous training of obstetric care personnel in evidence-based emergency obstetric care should go hand in hand with setting and re-enforcement of clinical practice guidelines and protocols.

The main causes of direct obstetric deaths documented in the RAMOS study were hemorrhage, sepsis and pregnancy-induced hypertension. The risk of obstetric hemorrhage is often known prior to delivery. Women known to be at high risk of bleeding should be delivered in facilities were adequate intensive care, C-section, and blood banking are available; delivery plans should be made in advance for the management of women with bleeding during pregnancy. Active management of the third stage of labor should be performed routinely. The use of new technologies, such as anti-shock garments to stabilize the blood pressure after obstetric hemorrhage, should be considered.

The risk of sepsis is increased after prolonged rupture of membranes and rapid clinical deterioration occurs in the absence of adequate treatment. Compliance with standards and protocols for long-established infection control procedures needs to be ensured and detailed guidelines for the management of sepsis in pregnancy and postpartum need to be (re)issued. Training for health personnel about the risk factors, signs and symptoms, and treatment of sepsis and early administration of broad-spectrum antibiotics is critical to lower the risk of puerperal sepsis. Surgical site infection rate in Georgia is high while low or inappropriate use of antibiotic prophylaxis and treatment is common, as documented by a large prevalence study conducted between 2000 and 2002 in Tbilisi (Brown et al., 2007). Among the Caesarean sections investigated by the 2006 RAMOS study, half were complicated by infection, suggesting that improvements of antibiotic prophylaxis and postoperative treatment (timing, duration and agent) are still needed.

Available technologies can improve the prevention, diagnosis and management of pregnancy-induced hypertension. Recent Cochrane reviews of published clinical trials suggest several therapeutic approaches for women with pre-eclampsia. Calcium supplementation during pregnancy (at least 1 g daily) appears to be a safe and cost-effective means of reducing the risk of pre-eclampsia and associated morbidity and mortality in women at increased risk and those with low calcium intake (Hofmeyr et al., 2010). Antiplatelet agents, largely low-dose aspirin, have moderate benefits when used for prevention of pre-eclampsia and its consequences (Duley et al., 2007). The use of magnesium sulfate for pre-eclamptic women reduces by more than one half the risk of eclampsia and lowers the risk of placental abruption (Duley et al., 2003). Professional groups, especially obstetricians and midwives should discuss, review and adopt current guidelines for the improved use of these technologies.

Nationwide RAMOS studies provide accurate maternal mortality measurements, documentation of barriers to quality maternal health services, and allow identification of ways to improve quality of vital registration and coding. Improvements of maternal death measurement where death registration is incomplete and cause-of-death ascertainment inaccurate can be achieved through strengthening vital statistics and implementation of special studies. National leadership is needed to initiate active surveillance, examine trends and risk factors, formulate policy, and improve the identification and reporting of maternal deaths.

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Annex A: Certifier's Form

	Cause of Death	ICD-10 CODE	Approximate Interval between onset and death
PART I Disease or condition directly leading to death* *Antecedent causes* Morbid conditions, if any, giving rise to the above cause, stating the underlying condition last	a) _____ due to (or as a consequence of) b) _____ due to (or as a consequence of) c) _____ due to (or as a consequence of) d) _____	_____ _____ _____ _____	_____ _____ _____ _____
PART II Other significant conditions contributing to the death, but not related to the disease or condition causing it	_____	_____	_____
* This does not mean the mode of dying e.g. heart failure, respiratory failure. It means the disease, injury, or condition that caused death.			

Annex B: Institutional Participation

Institutional Participation	Persons Involved
National Center for Disease Control and Medical Statistics (NCDC)	Paata Imnadze, Director Manana Tsintsadze, Deputy Director Marina Shakhnazarova, Head of Data Analysis Department Khatuna Zakhashvili, Head of Surveillance and Prevention Department Konstantin Kazanjian, Mainframe Manager
Georgia Ministry of Labor, Health, and Social Affairs (MoLHSA)	Vera Baziari, MCH Advisor
Ministry of Economic Development, Department for Statistics	Joseph Archvadze, Deputy Chair
Georgian Association of Obstetricians and Gynecologists	Tengiz Asatiani, Vice President
rogram / itute, Inc	Mariella Teft, RAMOS Principal Investigator Nino Lomia, Monitoring and Evaluation Advisor Nino Berdzuli, Senior Technical Advisor for Reproductive Health Kahtuna Kuparadze, JSI Consultant Tamara Sirbiladze, Senior Health Advisor
Centers for Disease Control and Prevention, Division of Reproductive Health (CDC/DRH), Atlanta	Florina Serbanescu, RAMOS Principal Investigator Cynthia Berg, Medical Epidemiologist Dan Williams, Sociologist Fernando Carlosama, System Programmer (SAIC) Alicia Ruiz, System Programmer (SAIC) Vasili Egnadashvili, MPH Student, Emory School of Public Health