

## Case 6

# Saving Mothers' Lives in Sri Lanka

**Geographic area:** Sri Lanka

**Health condition:** In the 1950s, the maternal mortality ratio in Sri Lanka was estimated at between 500 and 600 per 100,000 live births.

**Global importance of the health condition today:** Pregnancy-related complications annually claim the lives of 585,000 women. Some 99 percent of these deaths take place in developing countries, where women have a 1 in 8 chance of dying in their lifetime due to pregnancy-related causes, compared with the 1 in 4,800 chance in Western Europe.

**Intervention or program:** Beginning in the 1950s, the government of Sri Lanka made special efforts to extend health services, including critical elements of maternal health care, through a widespread rural health network. Sri Lanka's success in reducing maternal deaths is attributed to broad access to maternal health care, which is built upon a strong health system that provides free services to the entire population, including in rural areas; the professionalization of midwives; the systematic use of health information to identify problems and guide decision making; and targeted quality improvements to vulnerable groups.

**Cost and cost-effectiveness:** Sri Lanka has spent less on health—and achieved far more—than most countries at similar income levels. In India, for example, the maternal mortality ratio is more than 400 per 100,000 live births, and spending on health constitutes over 5 percent of GNP. In Sri Lanka, the ratio is less than one quarter of that, and the country spends only 3 percent of GNP on health.

**Impact:** Sri Lanka has halved maternal deaths (relative to the number of live births) at least every 12 years since 1935. This has meant a decline in the maternal mortality ratio from between 500 and 600 maternal deaths per 100,000 live births in 1950 to 60 per 100,000 today. In Sri Lanka today, skilled practitioners attend to 97 percent of the births, compared with 30 percent in 1940.

**T**he reduction in deaths during pregnancy and delivery has long been held out as a major international public health goal, but many countries have had difficulties making progress toward it. Most observers now agree that there are no quick fixes, and that the solution will come with the strengthening of now-failing health systems in many poor countries, building up the training of professional and paraprofessional health workers, improving access to both basic and higher-level services, and ensuring the availability of basic medical supplies and medications to deal with obstetric problems. The case of Sri Lanka dem-

onstrates how rapidly progress can occur when those fundamental building blocks are in place.

## Mothers Shouldn't Die in Childbirth

Pregnancy and childbirth are natural events and typically require little or no medical intervention for either mother or baby. But in about 15 percent of all pregnancies, a severe complication affects the woman—for example, maternal diabetes or dangerously high blood pressure sets in, excessive bleeding occurs during childbirth, or the mother suffers from a serious postpartum

infection. In about 1 to 2 percent of the cases, women often require major surgery and may die without effective treatment of these complications.

Over and above the baseline risk of pregnancy, women are in danger of dying during pregnancy and childbirth if their general health is poor. Malnutrition, malaria, immune system deficiency, tuberculosis, and heart disease all contribute to maternal mortality. In addition, use of unsafe abortion services is a major risk factor for maternal death.

Maternal mortality,<sup>a</sup> the death of a woman while pregnant or within about two months after the end of the pregnancy, echoes through families for many generations. Women who die are in the prime of their lives and are likely to be leaving behind one or more children—a loss that places at risk those children’s social development, health, education, and future life chances. The death of a woman in childbirth is highly correlated with the survival of the child she is bearing; the risk of a child dying before age 5 is doubled if the mother dies in childbirth. At least one fifth of the burden of disease for children under 5 is associated with poor maternal health.<sup>1</sup> Because poor women are far more likely to die than better-off women, maternal mortality is one of the factors contributing to the transmission of poverty from one generation to the next.

Interventions to detect pregnancy-related health problems before they become life threatening, and to manage major complications when they do occur, are well known and require relatively little in the way of advanced technology. What is required, however, is a health system that is organized and accessible—physically, financially, and culturally—so that women deliver in hygienic circumstances, those who are at particularly high risk for complications are identified early, and help is available to respond to emergencies when they occur. Although some maternal deaths are unavoidable even under the most favorable circumstances, the vast major-

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a The official definition of the maternal mortality ratio is the number of maternal deaths for every 100,000 live births. “Maternal” death refers to a death during pregnancy or within 42 days after the end of the pregnancy from a cause related to the pregnancy or its management. Thus, the death of a pregnant woman from an accident or an infectious disease not specifically related to the pregnancy would not count in the numerator.

ity can be prevented through systematic and sustained efforts.

Because of overall high health risks and weak health systems, almost all maternal deaths take place in developing countries. Ninety-nine percent of the 585,000 maternal deaths each year occur in poor nations.

The extremes tell the story: Women in the poorest sub-Saharan countries have a 1 in 8 chance of dying during their lifetime because of pregnancy; Western European women have a risk of 1 in 4,800. And in the developing world, maternal death is very much the tip of the iceberg: For each maternal death, somewhere between 30 and 50 other women experience serious injury or infection because of pregnancy and childbirth. In developing countries, more than 40 percent of pregnancies lead to complications, illness, or permanent disability in the mother or child.<sup>2</sup>

During the past several decades, as child health indicators have generally improved in the developing world and even as fertility rates have fallen, the WHO estimates that maternal mortality has remained relatively unchanged at a high level. Some countries, however, have been able to make significant and sustained progress toward making pregnancy safer for women, even beyond what would be expected with general improvements in living conditions and female health. The lessons from those settings are now informing the approaches international agencies promote.

## Sri Lanka’s Public Health Traditions

Sri Lanka, an ethnically diverse country of almost 20 million people living on a densely populated island in South Asia, has a storied history of public-sector commitment to human development. Although it is (and always has been) a poor country, with a current average annual per capita income of \$740, the development of social services even before independence in 1948 has far exceeded the gains made in countries at similar economic levels. Access to public education was rapidly expanded during the first half of the 1900s, and schooling of girls has long been much more common in Sri Lanka than in neighboring countries in the region. As a result, 89 percent of Sri Lankan adult women are literate, compared with a South Asian average of 43 percent.<sup>3</sup>

Health services, too, have benefited from strong public-sector leadership. Going back to the 1930s, the government focused on expanding free health services in rural areas, with attention given to preventive services and especially control of major communicable diseases. Financing for this effort was derived largely from income taxes. Currently, life expectancy in Sri Lanka is 71 years for men and 76 for women, compared with 57 for men and 58 for women on average in low-income countries.<sup>3</sup>

One unusual asset to which Sri Lanka lays claim is a good civil registration system, which has been in place since 1867. This system, which first started recording maternal deaths around 1900, has provided valuable information for planning and monitoring progress. So, unlike in most poor countries where maternal mortality estimates are based on very imperfect sources and methods, Sri Lanka benefits from relatively good data and a tradition within the public administration of using it.

## Elements of Success

Sri Lanka's success in reducing maternal deaths is attributed to widespread access to maternal health care, which is built upon a strong health system that provides free services to the entire population, the professionalization and broad use of midwives, the systematic use of health information to identify problems and guide decision making, and targeted quality improvements. These elements have been introduced in steps, with emphasis first on improving overall (and particularly rural) access to both lower- and higher-level facilities, then on reaching particularly vulnerable populations, and later on quality improvements.<sup>b</sup>

### Access

The first challenge in this country that is largely rural was access. The creation of a basic health service infrastructure, starting in the 1930s, extended access across rural areas to a range of preventive and curative services, enabling initial improvements in maternal health. At the lowest level, the infrastructure consisted of health units staffed by a medical officer, who was responsible for serving the population within a given area. Within

each of these health areas, public health midwives provided care for all pregnant women.

A viable referral system for both pregnancy-related and other health problems was established from the early days. The health units were—and continue to be—supported by cottage hospitals designed to offer very basic services; rural hospitals and maternity homes at a primary level; district hospitals and peripheral units at the secondary level; and tertiary provincial hospitals with specialist services, teaching hospitals, and specialist maternity hospitals.

At both the lower and higher levels, the number of facilities was expanded rapidly, increasing from 112 government hospitals in 1930 (about 182 beds per 100,000 people) to 247 hospitals in 1948 (close to 250 beds per 100,000). The secondary and tertiary institutions also underwent expansion in the 1950s.

No referral system works without accessible transportation—a need that was identified relatively early in Sri Lanka's health system development. Between 1948 and 1950, the national ambulance fleet was increased from 12 to 67 ambulances. All provincial hospitals had between three and five ambulances each, as did major district hospitals and those in more remote areas.<sup>4</sup>

### Professionalization of Midwifery

While the basic health infrastructure was being developed, specific attention was paid to the problem of who would deliver what type of services and, in particular, how maternal health services would be delivered. The path chosen was to depend on a large number of clinically qualified midwives. This strategy has proved successful both in Sri Lanka and elsewhere (see Box 6–1).

From early days, public health midwives have underpinned the health unit network. Each midwife serves a population of 3,000 to 5,000 and lives within the local area. Midwives' duties include visiting pregnant women at home, registering them for care, encouraging them to attend antenatal clinics, and working with the doctor who runs those clinics. The midwives are considered to be one of the most important elements in the excellent health performance of the country. Supervision and a referral network back up midwives, who undergo an 18-month training program. They report to supervisors,

<sup>b</sup> Our understanding of the pace and causes for decline in maternal mortality is due to a study by Pathmanathan and colleagues (2003), which sheds light on the main factors of success. Unless otherwise noted, information in this case study is drawn from that source.

## Box 6-1

### The Midwife Approach

The relationship between low maternal mortality and extensive use of professional midwives to deliver antenatal, birthing, and postpartum services, which is seen in the developing world today, has been observed historically in the industrialized world. In countries where doctors predominantly assisted births in the period around 1920, such as the United States, New Zealand, and Scotland, the maternal mortality ratio was 600 or more per 100,000 live births. During the same period, in countries where doctors and midwives equally attended births, including France, Ireland, Australia, and England, maternal mortality was lower, averaging around 500 per 100,000 live births. And strikingly, during the same period, in countries where midwives attended most births—Norway, Sweden, the Netherlands, and Denmark—the maternal mortality ratio was very low, between 200 and 300 per 100,000 live births.

Professional midwives have special training to acquire clinical competence, are licensed or registered by public authorities and are given support, in the form of regular supplies as well as supervision. They also are linked to a functional referral system, so they know precisely where higher-level care can be obtained when women face obstetric emergencies.

Midwives are trusted frontline workers who have the distinct advantage of being close to where births are taking place—within the community—and thus even if they are not called in for each normal birth, they are available when the unexpected occurs.

Moreover, because midwives can be trained and supported at relatively low cost, and have salaries that are far lower than medical doctors, the effective use of this cadre of health workers is one of the keys to saving mothers' lives within a modest budget.

typically nurse-midwives, who have nursing training in addition to the basic midwife preparation; the supervisors then report to the medical officer. Established procedures for service delivery and supervision, along with frequent in-service training, help midwives stay current and deliver high-quality services.

Importantly, public health midwives are part of both the health system and their local communities and thus provide a valuable link between the women and the health units. Even when a midwife does not attend a birth, the family knows how to find her in the event of a problem. It is widely maintained that the public health midwives are key to sustaining the population's confidence in and satisfaction with the public maternal health care services.

The growth in the number of midwives was rapid, while at the same time fertility was falling. As a result, while in 1935 there were 219 live births per government midwife on average, by 1960 the ratio had fallen to 143 live births

per midwife and by 1995 to 51 live births per midwife (see Table 6-1).

Largely because of the focus on midwifery—combined with access to higher-level services—more than in many other countries, women in Sri Lanka rapidly became accustomed to the notion of attended births and, increasingly, births in hospitals. Up until 1940, skilled attendants assisted only about 30 percent of the births. By 1950, after the implementation of policies to introduce and expand the cadre of public health midwives, this percentage had doubled. Concurrently, the proportion of babies delivered in government health care facilities increased from 6 percent in 1940 to 33 percent 10 years later. Currently, skilled practitioners attend to 97 percent of the births, and the majority are in hospitals.

#### Information and Organization

Effective management, including the use of information for monitoring and planning, reinforced the two

early building blocks of Sri Lanka's success in reducing maternal deaths—access to basic health services and professional midwifery. In the 1950s, the health education division was formed within the Ministry of Health, and medical officers of maternal and child health were designated to coordinate maternal and child health services in each district.

### Quality Improvements, Including Targeting of Vulnerable Groups

In part because of the information and close monitoring provided, in the 1960s and 1970s the government identified several ways to improve the system. The Ministry of Health systematically used maternal death inquiries to identify problems in the delivery of care—for example, the reason a problematic delivery was not detected in time to save a life. The Ministry of Health would then circulate information about how to prevent similar problems.

The government's program to reach women on the tea estates—farming operations that contracted South Asian

labor in large numbers—provides another example of a targeted effort to ensure good quality services for all. Women on the large, privately owned tea estates were particularly isolated, socially and physically. Once the estates were nationalized in the 1970s, the government assumed responsibility for health services, and medical officers (with transport) and public health nurses established a network of polyclinics to provide integrated maternal and child health services, including family planning services, to the tea estates. Estate management gave the women paid leave to attend the monthly polyclinics.

Bringing these women into the public health system paid off. Between 1986 and 1997, the number of women from the estates delivering in hospitals increased dramatically, from 20 percent to 63 percent.

### Steady, Impressive Declines

While the maternal mortality ratio (the number of deaths during pregnancy or immediately afterward

**Table 6–1**

## Development of Government-Employed Birth Attendants, Sri Lanka, 1930–1995

Year	Live Births per Government Midwife	Population per 1,000 Government Doctors	Government Nurses per Government Doctor	Specialist Obstetricians in Government Hospitals per 100,000 Live Births
1930	405	15.4	n.a.	n.a.
1935	219	n.a.	n.a.	n.a.
1940	n.a.	14.8	n.a.	n.a.
1945	186	n.a.	n.a.	n.a.
1950	163	11.4	1.7	n.a.
1955	157	9.2	2.3	n.a.
1960	143	8.4	2.8	n.a.
1965	n.a.	7.5	2.4	n.a.
1970	n.a.	6.5	2.9	n.a.
1975	n.a.	6.4	2.7	n.a.
1980	125	7.2	3.3	14.0
1985	85	7.4	3.8	15.0
1990	68	7.0	2.7	20.0
1995	51	4.0	2.9	23.0

Note: n.a. = not available

Source: Pathmanathan, Liljestrand, Martins, et al. (2003).

divided by the number of births) has persisted at high levels in many poor countries, Sri Lanka has been able to halve the maternal deaths (relative to the number of live births) every six to 12 years since 1935.

In the 1930s, the maternal mortality ratio in Sri Lanka was estimated to be over 2,000 per 100,000 live births. By the 1950s, the rate had declined to less than 500 per 100,000. Although data limitations prevent a full explanation of the source of these improvements, it is widely believed that successful efforts to combat malaria and the introduction of modern medical practices deserve much of the credit during this phase.

The steep decline in the maternal mortality ratio that was observed from the 1930s to the early 1950s has been attributed largely to the all-out war on malaria.<sup>5</sup> DDT spraying commenced in 1945 and led to a rapid decline in malaria incidence within a few years. In addition to the highly successful malaria control program, control of hookworm infection and general improvements in sanitation might also have contributed to improvements in maternal health before 1950.<sup>6</sup> Moreover, the rapid decline in maternal mortality during the early 1950s could be attributed to the introduction of modern medical treatment, such as antibiotics, through a health service network established in the pre-1950s era and having considerable reach in rural areas.

The maternal mortality ratio was halved again during the following 13 years, up until 1963, when the government made special efforts to extend health services, including critical elements of maternal health care, through a widespread rural health network. In the decades that followed, the public sector systematically applied stepwise strategies to improve organizational and clinical management, reducing the maternal mortality ratio by 50 percent every 6 to 12 years. And among women working on tea estates, the maternal mortality ratio declined from 120 in 1985 to 90 in 1997 as the polyclinic system was developed.

In total, this has meant a decline in the maternal mortality ratio from between 500 and 600 maternal deaths per 100,000 live births in 1950 to 60 per 100,000 today.<sup>7</sup>

## Did Targeted Efforts Make the Difference?

The declines in maternal mortality are clear, as is information about efforts the government made to build the overall health system and to address the problem of maternal deaths in particular. A reasonable question to ask, then, is whether the system changes caused the health improvements, or just happened at the same time. Tackling this question—using data that span some 60 years—requires piecing together several types of epidemiologic evidence. And doing so yields a convincing answer.

One way to answer the question of whether system changes caused declines in maternal deaths is to compare the overall decline in female deaths with deaths due to maternal causes. Such a comparison is enlightening because overall female mortality can be assumed to be related, in large measure, to improvements in living conditions and in the general health system. In 1950, maternal deaths accounted for 19 percent of deaths among women aged 15 to 49 years. By 1996, while both maternal and all female deaths declined, maternal causes accounted for only 1.2 percent of all female deaths in the reproductive age range.

Another way to understand the cause-effect relationship is to look at the changes in maternal deaths due to individual causes known to be associated with specific health care delivery strategies. So, for example, deaths due to hypertensive disease and sepsis—two causes that are associated throughout the world with lack of access to skilled attendance—declined dramatically during the 1940s, when emphasis was being placed on increasing the availability of midwives and skilled attendants at birth. In contrast, hemorrhage did not decline significantly during the early years studied (1930–1950), when the major approaches the government took were the overall development of an accessible health care system, the control of malaria, and decreasing the proportion of home births. But between 1950 and 1970, as the government emphasized blood transfusion services and other strategies to address the problem, maternal deaths due to hemorrhage decreased from 113 to 45 per 100,000.

## Box 6–2

### The Honduran Experience

In Honduras, one of the poorest countries in the Western Hemisphere, the maternal mortality ratio declined by 38 percent between 1990 and 1997, from 182 to 108 maternal deaths per 100,000 live births. This remarkable achievement, which surprised many observers, was the result of a concerted effort by government officials and development agencies to address maternal mortality.

Although expanding access to essential health services had been a government priority since the 1980s, a study of maternal health in the early 1990s that revealed a serious problem of maternal mortality served as a “rude awakening” to the Ministry of Health, according to Dr. Isabella Danel, US Centers for Disease Control and Prevention expert on maternal health, now posted at the World Bank. This study stimulated a new focus on safe motherhood programs and the inclusion of specific maternal health priorities in the national health policy. Importantly, the government used information about differentials among geographic areas to target its efforts.

By the mid-1990s, a three-part strategy was well into implementation. The first part of the strategy was a reorganization of health services, intended to increase access to skilled care for pregnant women. This included the inauguration of community health clinics, with traditional birth attendants supervised by auxiliary nurses; the construction of maternity waiting homes attached to public hospitals; the establishment of birthing centers supervised by nurse midwives in rural areas; and the expansion of the basic health center and hospital infrastructure.

As a result of these efforts, between 1990 and 1997, Honduras’ health infrastructure was expanded by 7 new area hospitals, 13 birthing centers, 36 health centers, 266 rural health centers, and 5 maternity waiting homes.

The second dimension of the strategy was the training of health workers in specific areas: Traditional birth attendants and public health system staff were trained to recognize high-risk pregnancies and deal with both routine births and obstetric emergencies. Traditional birth attendants were encouraged to accompany women with emergencies to the hospital. The final part of the strategy was community participation, in which local communities were provided with the opportunity to describe and identify solutions to their own health problems and, through newly implemented decentralization policies, were given more decision-making authority. Although this was very much a government strategy, resources from a variety of donors were channeled into its support.

Between 1990 and 1997, maternal mortality across Honduras declined, with the biggest reductions in some of the poorest and most remote areas. So while overall skilled birth attendance changed little during the period, the number of maternal deaths declined from 381 in 1990 to 258 in 1997 due to better referral of women with complications before, during, and after delivery.

The experience of Honduras, like that of Sri Lanka, challenges the notion that little can be done to act on the problem of poor maternal health in poor countries. Success depends neither on major technological innovation nor on high levels of spending, but rather on a combination of three factors: government commitment, which is often spurred by quantifying the problem; targeted actions to improve referrals and emergency services in hospitals; and expanded access to well-trained birth attendants within the community, supported by higher levels of care.<sup>10</sup>

The main conclusion from this type of analysis is that the actions of the health system, rather than improvements in general living conditions, led to a large share of the improvements in maternal health that occurred over 60 years in Sri Lanka. The finding is reinforced by a parallel analysis of a similar trajectory of maternal mortality decline in Malaysia, which was similarly successful in achieving a sustained, long-term reduction in maternal deaths over several decades (although starting from a lower initial level). In the case of Malaysia,<sup>8</sup> public health researchers have drawn the link between overall and cause-specific changes in maternal mortality and implementation of a similar set of strategies: professionalizing midwifery, expanding access, mobilizing women and communities, and improving management and the ability to reach the poorest.

In Sri Lanka, the story of improvement in maternal health goes far beyond the health system itself. Mothers' health significantly benefited from effective public investment in basic health services, in improving basic living standards, and in high levels of female education. But the Sri Lankan case, like a very different experience in Honduras (see Box 6–2), reveals ways in which specific strategies to address the problem of maternal deaths greatly augmented the health benefits that would have resulted solely from broad improvements in welfare.

## Relatively Low Cost

Sri Lanka has achieved much better health status and steeper declines in maternal mortality than countries at comparable income and economic growth levels—and it has done so while spending relatively little on health services, compared with those same countries. In India, for example, the maternal mortality ratio is more than 400 per 100,000 live births, and spending on health constitutes over 5 percent of GNP. In Sri Lanka, the maternal mortality ratio is less than one quarter of that, and the country spends only 3 percent of GNP on health.

Major expenditures, aside from the health infrastructure that served a variety of purposes other than maternal care, are on skilled labor. In Sri Lanka, as in other poor countries, labor is relatively cheap, and in fact, salaries for civil servants have been declining in relative terms. The country could afford widespread access to maternal

health care by using a mix of health personnel: Most of the maternal health workers are well-trained but low-cost midwives and who are described as extremely dedicated. They are closely supervised by nurse-midwives, who in turn are supported by a small number of medical doctors.

Most remarkably, Sri Lanka's success has been achieved on a decreasing budget. Between 1950 and 1999, the proportion of the national budget spent on maternal health services has steadily fallen, from 0.28 percent of GDP in the 1950s to 0.16 percent in the 1990s. Originally, this was due to efficiency gains made in the 1950s and 1960s. More recently, because salaries of government health staff have been falling, overall expenditures have declined. In addition, expenditures on private services have become relatively more important in the health sector as a whole: In 1953, an estimated 38 percent of total expenditures were private; by 1996, about half of the total spending was from private sources.<sup>9</sup>

## Major Lessons

Sri Lanka's achievements in reducing the toll of pregnancy have been impressive and correspond to a setting where the public sector has for many decades placed priority on the population's health and education. But others can take inspiration from the country's record: In the late 1950s, when the first efforts were made to address the problem of maternal deaths, the GNP of Sri Lanka was equivalent, in constant dollars, to the national income of Bangladesh, Uganda, and Mali today and far lower than that of Pakistan, Egypt, or the Philippines. In relative terms, Sri Lanka has spent less on health—and achieved far more—than any of these countries.

The gains that Sri Lanka made were reinforced in many ways by good education, an emphasis on gender equity, and broad health system development—but the specific actions that were taken to solve the problem of maternal deaths had a separate and identifiable positive impact. In Sri Lanka, the basic health system served as an essential platform from which to work but did not itself generate the impressive results. Those were due to a step-by-step strategy to provide broad access to specific clinical services, to encourage utilization of those services, and to systematically improve quality.

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