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Build the cradle later:

An examination of perinatal care and mortality in village Nepal

David Osrin

Thesis submitted for the degree of

Doctor of Philosophy

University of London

Centre for International Child Health

Institute of Child Health

University College London

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Abstract

Background: As perinatal and neonatal mortality move to the foreground of the debate on how best to improve child survival in poor countries, there appears a pressing need to test potential interventions. Implicit in testing is the ability to document birth and neonatal outcomes in rural communities. The thesis sets perinatal events in the context of the child survival literature and critically examines current knowledge about practices, outcomes and interventions. This knowledge is found to be limited, particularly in terms of practices and outcomes in rural settings in developing countries.

Methods: Two methods are described to document perinatal events in villages in Makwanpur district, Nepal. (1) a census of women of reproductive age, collecting information about previous pregnancies and most recent live births; (2) a prospective system of registration that tracked women through childbirth and infants through the neonatal period. Both methods yielded information on pregnancies, birth outcomes, care practices and health care seeking patterns.

Results: The census collected information from 12,170 women, of whom 4867 had given birth in the preceding two years. The prospective surveillance collected information on 3522 pregnancies over two years. The thesis presents results under two broad themes: (1) a description of the birth experience of women in rural Makwanpur, its outcomes, practices and care seeking patterns; (2) a comparison of the two methods of data collection.

Poverty was the norm in rural Makwanpur and only a quarter of participants were literate. 30% of pregnant women had any antenatal care, which tended to be both late and limited, and 95% gave birth at home. Three percent of women were helped by trained health workers and there were compromises in hygiene and warmth at the time of delivery. Breastfeeding rates were high. The prospective registration process suggested a neonatal mortality rate of 37 per thousand live births, a figure higher than that from the census (27 per thousand), and thus higher than would be estimated by existing methodologies.

Discussion: Antenatal, delivery, postnatal and neonatal care practices and care seeking are compared with existing knowledge from other studies. Their implications for programmatic intervention are considered. The issue of recall-based data collection is discussed as it bears upon the evaluation of public health interventions. The feasibility of registration systems is assessed and recommendations made for increasing reliability, expansion and replication, and reducing system costs.

386 words

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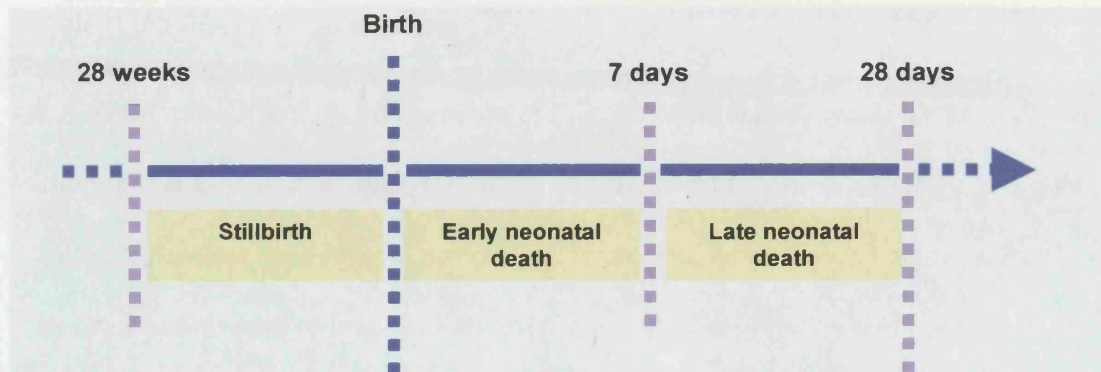
Abbreviations used in the thesis

ANC	Antenatal care
APH	Antepartum haemorrhage
ARI	Acute respiratory infection programme
BCG	Bacille Calmette-Guerin
BEOC	Basic emergency obstetric care
BMI	Body mass index in kg/m ²
CBR	Crude birth rate per thousand population
CDD	Control of diarrhoeal diseases programme
CEOC	Comprehensive emergency obstetric care
CI	Confidence interval
CRC	United Nations convention on the rights of the child
DALY	Disability adjusted life year
DDC	District development committee
DHS	Demographic and health survey
DPHO	District public health office
ENC	Essential newborn care
ENMR	Early neonatal mortality rate
EPI	WHO expanded programme on immunisation
FCHV	Female community health volunteer
FFF	Food supplementation, family planning, female education (Unicef)
FIGO	International Federation of Gynecology and Obstetrics
GDP	Gross domestic product
GIGO	Garbage in, garbage out
GOBI	Growth monitoring, oral rehydration, breastfeeding, immunisation (Unicef)
G8	Group of eight nations (France, US, Britain, Germany, Italy, Japan, Canada, Russia)
HIV/AIDS	Human immunodeficiency virus/acquired immune deficiency syndrome
ICD	International classification of diseases (suffixed by revision number)
IEC	Information, education and communication
IMR	Infant mortality rate per thousand live births
LBW	Low birth weight
LMP	(First day of) last menstrual period
LNMR	Late neonatal mortality rate per thousand live births
MCHW	Maternal and child health worker
MDGs	Millennium development goals
MIRA	Mother and Infant Research Activities
MIS	Management information system
MMR	Maternal mortality ratio per hundred thousand live births
MNPI	Maternal and neonatal programme effort index
MRS	Model registration system of India
MUAC	Mid-upper arm circumference in cm
NFHS	Nepal family health survey
NID	National immunisation day
NMIS	Nepal multiple indicator surveillance
NMR	Neonatal mortality rate per thousand live births
NNIPS	Nepal Nutrition Intervention Project, Sarlahi
PIH	Pregnancy induced hypertension
PMR	Perinatal mortality rate per thousand births
PMTCT	Prevention of mother-to-child transmission of HIV/AIDS
PNMR	Post-neonatal mortality rate per thousand live births
PPH	Post-partum haemorrhage
PPP	Purchasing power parity
PPS	Probability proportional to size
PPV	Positive predictive value
PRA	Participatory rural appraisal
RDBMS	Relational database management system
SBR	Stillbirth rate per thousand births
SRS	Sample registration scheme of India
TFR	Total fertility rate per woman over her reproductive years
U5MR	Under-five mortality rate per thousand live births
UN	United Nations
UNFPA	United Nations Fund for Population Activities
UNICEF	United Nations Children's Fund
USD	United States dollars
VDC	Village development committee
WHO	World Health Organisation

* This is the starting point which adopted for the study, which is 2001, with 11.1% in view of the fact that newborn babies of lower gestations rarely survive in industrialised countries, the definition has been revised to K7-10 in all subsequent weeks for all complete weeks.

Definitions used in the thesis

Schematic representation of relevant mortality periods



Important definitions

Stillbirth^a <i>Death of a fetus after 28 complete weeks of gestation and before delivery</i>	Stillbirth rate <i>Stillbirths per 1000 births live and still</i>	SBR
Early neonatal death <i>Death of a live-born infant within 7 complete days post-partum</i>	Early neonatal mortality rate <i>Early neonatal deaths per 1000 live births</i>	ENMR
Late neonatal death <i>Death of a live-born infant between 7 and 28 complete days post-partum</i>	Late neonatal mortality rate <i>Late neonatal deaths per 1000 live births</i>	LNMR
Perinatal death <i>Stillbirth or early neonatal death</i>	Perinatal mortality rate <i>Stillbirths and early neonatal deaths per 1000 births live and still</i>	PMR
Neonatal death <i>Early or late neonatal death</i>	Neonatal mortality rate <i>Early and late neonatal deaths per 1000 live births</i>	NMR
Post-neonatal death <i>Death of a live-born infant between 28 days and 12 complete months post-partum</i>	Post-neonatal mortality rate <i>Post-neonatal deaths per 1000 live births</i>	PNMR
Infant death <i>Neonatal or post-neonatal death</i>	Infant mortality rate <i>Infant deaths per 1000 live births</i>	IMR
Under-five death <i>Death of a live-born infant within 5 complete years post-partum</i>	Under-five mortality rate <i>Under-five deaths per 1000 live births</i>	U5MR

^a This is the working definition adopted for the study, which accords with ICD-9. In view of the fact that newborn infants of lower gestations now routinely survive in industrialised countries, the definition has been revised in ICD-10 to include gestations as low as 22 complete weeks.¹

Chapter 1 Introduction

1.1 Scope of the thesis

The thesis describes work carried out between 1998 and 2004 in Malwanpur district, Nepal.

It is a remarkable fact that the amount of infant mortality in England far exceeds any thing of the kind in any other part of the civilized world. How is it that we, a highly refined, humane, and enlightened people, in this respect fall so far below, not only less cultivated races of mankind, but even some species of the animal creation? ...In order the better to answer that question, it might be interesting and instructive to enquire how far the present constitution and requirements of "society" militate against the development of the domestic virtues, especially against the exercise of the maternal affections.

Baines M. Excessive infant-mortality: how can it be stayed? 1862²

1.2 Scope of the study

The scope of the study is defined as being a body of knowledge that is only new in as much as it is detailed. Although my ideological commitment is to the implementation of projects through team work (which has implications for capacity building), it may be helpful to summarise my inputs. As a technical adviser on research design, I was based in Nepal from 1997 to 2004 and was involved in all phases of the MIRA Malwanpur study³. I was responsible for what might be described as the academic aspects of quantitative data collection: literature review, conceptual frameworks, cluster selection, definition of areas of enquiry, data collection methods, questionnaire tools, data quality management, database design, data extraction and analysis. Many people contributed to individual components, but

1.1 Scope of the thesis

The thesis describes work carried out between 1998 and 2004 in Makwanpur district, Nepal. Over roughly the same period, the importance of neonatal survival to global child survival has been registered, as has the existence of a knowledge gap. Efforts are now being made to conduct trials of interventions to improve perinatal and neonatal outcomes for infants in poor communities. However, at the beginning of the fieldwork the subject of birth in rural communities in developing countries was relatively unexplored. The thesis therefore describes a process that begins with a review of existing knowledge, goes on to the design and findings of a survey of birth practices and outcomes, and then describes the process of designing, implementing and reviewing the findings of a prospective registration system.

Two challenges are addressed: the requirement for data on birth outcomes, care practices and health care seeking behaviour, and the design and implementation of systems appropriate for measuring them. Initially, the evaluation of a rural public health intervention in terms of mortality rates collected through a prospective registration system was something of a gamble, and the thesis documents the conceptual and design choices that improved the odds.

1.2 Role of the investigator

The scope of the thesis material is broad, as befits a body of knowledge that is only now moving from the superficial to the detailed. Although my ideological commitment is to the implementation of projects through teamwork (which has implications for capacity building), it may be helpful to itemise my inputs. As a technical advisor on research design, I was based in Nepal from 1997 to 2004 and was involved in all phases of the MIRA Makwanpur study. I was responsible for what might be described as the academic aspects of quantitative data collection: literature review, conceptual frameworks, cluster selection, definition of areas of enquiry, data collection methods, questionnaire tools, data quality management, database design, data extraction and analysis. Many people contributed to individual components, but

I was the final conduit for quantitative field systems, the synthesis of ideas and presentation of outputs.

1.3 Structure of the thesis

The thesis begins with a literature review which locates the fieldwork within the broader remit of global child survival. Because public health initiatives are rooted in experience and, inescapably, advocacy, the historical development of programmes is emphasised. The review proceeds to an examination of the challenges for measurement of neonatal outcomes, and then to a summary of such outcomes as are available, with particular attention to the Nepalese situation. This in turn leads on to a discussion of potential strategies for intervention and sets them in the context of differing advocacy agendas and an incomplete knowledge base.

Chapter three introduces the reader to Nepal, with a focus on demographic, economic and health service information. Chapter four summarises the aims and objectives of the fieldwork and a systematic framework for approaching it through a series of tasks. The framework serves as a template for the description of methods in the same chapter and the presentation of results in chapters five and six. Chapter five covers information about households, the cohort of married women of reproductive age, and perinatal and newborn care practices. Chapter six summarises mortality figures. Both chapters present findings from both a recall-based census and a prospective registration system.

The structure of the discussion reflects this sequence. Chapter seven discusses care practices, weaknesses of the methods used to provide the data, and the position of the findings in comparison with other studies. Chapter eight expands on the comparison of recall-based surveys with prospective registration. It goes into some depth on the issue of recall as it applies to child morbidity and mortality, bringing together disparate strands of the literature from paediatrics, demographic surveys and other sectors in which recall information is collected.

The final chapter attempts to draw three types of conclusion: about perinatal care practices, about the design of evaluation systems, and about optimising recall. The thesis ends with an outline of plans to improve and implement systems in other studies.

Chapter 2 Perinatal and neonatal survival in developing countries

2.1 The bounds of the literature

2.1.1 An emergent literature

When the state of the sick infant poor is examined, the melancholy fact will appear, that a great mortality prevails in that class of society, through the want of timely medical assistance, the inadequacy of existing medical institutions, and the impossibility of there being a select treatment of any particular class of patients in such establishments, to the exclusion of others. How can it be otherwise? If we look at the case in its more favorable point of view -- if we suppose the medical aid afforded in them, at once in respect of skill, to be always unexceptionable, is that aid given in due time when it is indispensably called for in the hour of danger?

Bunnell Davis J. A cursory inquiry into some of the principal causes of mortality among children. 1817³

2.1 The bounds of the literature

2.1.1 An emergent discourse

The Global Burden of Disease initiative estimated that 32% of global deaths occur in children under five.⁴ The dominant causes of death in high-mortality populations are communicable diseases, maternal, nutritional, and perinatal disorders. Of the 10.8 million under-five deaths estimated to occur annually, about five million occur in newborn infants.⁵ Add to this the fact that 98% of child deaths occur in developing countries, and you have a powerful case for addressing the burden of neonatal mortality. However, the literature on perinatal and neonatal survival in developing countries is currently a platform for advocacy rather than a coherent evidence base. It makes the case for an under-researched area, but is best seen as an emergent discourse that is only now maturing into a consideration of what can be done. This is both understandable and laudable. In a single decade, the burden of perinatal and neonatal mortality has moved from obscurity to the foreground of debate, to a point at which it is affecting national and global policy. Two forces have brought about this shift. The first is a rise in the relative importance of neonatal deaths to international development indicators such as child mortality. The second is the effect of advocacy and beacon projects undertaken by a surprisingly small number of investigators.

The development of the literature follows a trajectory characteristic of public health issues. To begin with, a locus of ill health exists outside the public and professional gaze, although its importance is reflected in a web of socio-cultural meanings, practices and norms. The issue moves into view through a combination of advocacy and epidemiological transition. At this point, there is a period of descriptive work - a needs assessment explosion - as it becomes clear how little is known about either the issue itself or what to do about it. Two approaches to investigation are adopted: the first is mechanistic, in which the premium is on understanding causal pathways; the second is interventional, in which the premium is on implementing programmes. The approaches are complementary, but there is usually a

tension between them, particularly as regards funding for research. Although the next development is likely to be roll-out of public health initiatives, the discussion of perinatal and neonatal survival has not yet gone this far.

2.1.2 Child survival and primary health care

The contemporary history of child health begins with an international conference on primary health care in the former Soviet Union, in September 1978. The Declaration of Alma-Ata is cited ubiquitously for its description of health as “a state of complete physical, mental and social wellbeing, and not merely the absence of disease or infirmity”,⁶ a statement reflecting the belief and optimism that surrounded its drafting. What has been forgotten - fortuitously in many cases - is just what a radical agenda the declaration proposes. It has ten sections. Section I affirms the definition of health; Section II finds existing health inequities unacceptable; Section III calls for a new international economic order to reduce the gap between rich and poor; Section IV says that people's participation in health care is a right and a duty; Section V charges governments with the responsibility for health for all by 2000; Section VI describes primary health care as "... essential health care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community and country can afford to maintain at every stage of their development in the spirit of self-reliance and self-determination"; Section VII goes into more detail on what primary health care will be about; Section VIII enjoins governments to formulate integrated primary health care strategies; Section IX calls for cooperation between countries; and Section X advocates independence, peace, détente and disarmament.

Whatever one's opinion of developments over the last 25 years, what does come across from a rereading of the declaration is its spirit of optimism. This derives in part from the post-war economic boom, the liberation of former colonies, and substantial improvements in health. The shadow of the cold war, though sobering, presented possibilities for emerging nations to draw on competing sources of development support. Childhood mortality had begun to

decline shortly after the end of the Second World War, and the rates of decline were substantial enough to engender the feeling that the mortality gap between rich and poor countries might close by the end of the century.⁷ Given that steep falls were being seen in relatively poor countries,^{8,9} the prospect of an end to inequity was giddy.

The optimism of the 1960s and 1970s did not last. Fillips such as the eradication of smallpox are now seen as something of a lucky break, the political consensus from which the Alma-Ata declaration arose dissolved, rates of mortality decline began to fall, and resource constraints triggered a piecemeal approach to public health. Moreover, the sentiments of the declaration were seen as vague. The debate has been characterised as a tension between primary health care (the crisis of the cold war, Halfdan Mahler's leadership of the WHO, the utopian goal of "Health for All," and an unspecific methodology) and selective primary health care (emergent neo-liberal ideologies, James Grant's leadership of UNICEF, the more modest goal of a "children's revolution").¹⁰

Surprisingly hard on the heels of the primary health care ideology came a move toward what Claeson & Waldman call disease-specific, technologically dependent strategies aimed at rapid effects.¹¹ The emphasis on *selective primary health care* emerged from a Unicef-Johns Hopkins University thinktank (to use a period word),^{12 13} and was the first initiative to define and target diseases that were felt to be the most important contributors to child mortality. The approach would be more focused and more feasible, and was ushered in by the *Expanded Programme on Immunisation* and the *Control of Diarrhoeal Diseases* programmes of the WHO, followed by Unicef's GOBI initiative (Growth monitoring, Oral rehydration, Breastfeeding, and Immunisation), in turn followed by GOBI-FFF (Food supplementation, Family planning, Female education). This was the *child survival revolution*. In 1989, the General Assembly of the United Nations adopted the Convention on the Rights of the Child, article 24 of which obliges ratifying parties to "... take appropriate measures... to diminish infant and child mortality".¹⁴ The World Summit for Children of

1990 drew on the impetus of the CRC and called for a reduction in IMR and U5MR to 50 and 70 per 1000 live births respectively by 2000.¹⁵

2.1.3 A loss of impetus and the problem of multifactorial determinance

Sadly, the initial mortality declines were not sustained and the child survival movement began to lose focus. In a summary based on six reviews by Unicef, the UN and the World Bank, Ahmad and colleagues showed that all UN regions experienced steep reductions in U5MR between 1970 and 1994.⁷ Median U5MR had fallen from 150 per 1000 live births in the 1950s to 40 per 1000 in the 1990s. The decline had, however, flattened off over the 1990s. This had been expected in situations in which mortality was bottoming out asymptotically, but there was concern that the slowdown was actually occurring in places with low life expectancies.

The reasons for the plateau in child mortality vary with the ideology of the commentator. Unequivocal contributors include suboptimal economic development and the impact of the HIV/AIDS epidemic. Several authors point to the reliance on a limited set of technology-driven interventions.^{16 17} This emphasis on magic bullets led to the commitments of the World Summit for Children, but paradoxically allowed the urgency of the child survival agenda to wane.¹⁸ A shift in priorities away from child health was consolidated by the belt-tightening consequent on policies of structural adjustment, duly followed by the health sector reform agenda.¹⁹ A further paradox is that the widespread acknowledgment of the multidimensional influences on health has blurred the boundaries of potential interventions and – to some degree – reduced the burden of responsibility. The World Bank's life-cycle approach to health, for example, has four principles: first, health interventions have a cumulative impact, such that their costs and benefits later in life partially depend on earlier costs and benefits; second, improved outcomes at any stage of the life cycle depend on intervention at several stages; third, intervention in one generation can influence outcomes in later generations; fourth, identifying the stages of the life cycle facilitates the identification of risks for both individuals and families.

2.1.4 *Reinvigoration through goal setting?*

Amid this lucid confusion, it has been left to individual advocates to bring the focus back to child health, a task that has been met by a combination of back-to-basics primary health care advocacy (community participation, combinations of technological and behavioural interventions) and contemporary concerns such as public-private partnerships.¹¹ The most recent development for child survival has been the Millennium Development Project. The Millennium Development Goals were agreed at a UN general assembly in 2001, and are based on the International Development Goals agreed by the G7 in 2000:^{20 21} thus are health and economics intimately linked. Both sets of goals are summarised in **box 2.1**. There are eight MDGs, of which numbers four and five are most allied with neonatal survival,^{22 23} but all the goals are bound to the health of children.²⁴ It is unlikely that the MDGs for child health will be achieved,^{23 25} although the World Bank suggests that on the basis of annual per capita income growth South Asia could achieve the infant and child mortality reduction.²⁶ Whilst one may argue about the usefulness of a set of largely unattainable goals,²⁵ it is striking how the arguments themselves reiterate those made for Health for All 2000.¹⁰

Box 2.1. International Development Goals and Millennium Development Goals

G7 International Development Goals		Millennium Development Goals	
1	Reduce the proportion of people living in extreme poverty (less than US \$1 a day) by 2015	Goal 1	Eradicate extreme poverty and hunger
		Target 1	Halve, between 1990 and 2015, the proportion of people whose income is less than US \$1 a day
		Target 2	Halve, between 1990 and 2015, the proportion of people who suffer from hunger
2	Enrol all children in primary school by 2015	Goal 2	Achieve universal primary education
		Target 3	Ensure that, by 2015, all boys and girls complete a full course of primary education
3	Eliminate gender disparities in primary and secondary education by 2005	Goal 3	Promote gender equality and empower women
		Target 4	Eliminate gender disparity in primary and secondary education preferably by 2005 and at all levels of education no later than 2015
4	Reduce infant and child (under-5) mortality rates by two-thirds between 1990 and 2015	Goal 4	Reduce child mortality
		Target 5	Reduce by two-thirds, between 1990 and 2015, the under-5 mortality rate
5	Reduce maternal mortality ratios by three-quarters between 1990 and 2015	Goal 5	Improve maternal health
		Target 6	Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio
6	Provide access for all who need reproductive health services by 2015	Goal 6	Combat HIV/AIDS, malaria and other diseases
		Target 7	Have halted by 2015, and begun to reverse, the spread of HIV/AIDS
		Target 8	Have halted by 2015, and begun to reverse, the incidence of malaria and other major diseases
7	Implement national strategies for sustainable development by 2005 so as to reverse the loss of environmental resources by 2015	Goal 7	Ensure environmental sustainability
		Target 9	Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources
		Target 10	Halve, by 2015, the proportion of people without sustainable access to safe drinking water
		Target 11	By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers

Goal 8	Develop a global partnership for development
Target 12	Develop further an open trading and financial system that is rule-based, predictable and non-discriminatory. Includes a commitment to good governance, development and poverty reduction – nationally and internationally
Target 13	Address the least developed countries' special needs. This includes tariff- and quota-free access for their exports; enhanced debt relief for heavily indebted poor countries; cancellation of official bilateral debt; and more generous official development assistance for countries committed to poverty reduction
Target 14	Address the special needs of landlocked and small island developing states
Target 15	Deal comprehensively with developing countries' debt problems through national and international measures to make debt sustainable in the long term
Target 16	In cooperation with the developing countries, develop decent and productive work for youth
Target 17	In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries
Target 18	In cooperation with the private sector, make available the benefits of new technologies – especially information and communications technologies

Sources: ^{21 23 27}

A recent attempt to reinvigorate the child survival agenda arose from an expert meeting in Bellagio, Italy.^{5 28-31} In the first of a series of position papers published in *The Lancet*,⁵ the group acknowledged the fall in rates of decline of U5MR from a peak of 2.3% per annum prior to 1990 to 1.1% subsequently.⁷ They estimated that 10.8 million under-five deaths had occurred in 2000, of which 41% were in sub-Saharan Africa and 34% in south Asia, and that 3.9 million of these deaths were neonatal. They noted that most deaths were rural, and went on to model the most important risk factors: unsafe drinking water and sanitation; inadequate birth spacing; lack of breastfeeding and non-exclusive breastfeeding. Finally, they underlined the paucity of information about the direct causes of neonatal deaths in low-income communities. **Table 2.1** summarises the presumptive major killers of children under five, using data from WHO records and a predictive model developed by the Bellagio group. Neonatal deaths occupy the number one position.

Table 2.1. Major causes of global under-five deaths

	Proportion of deaths (%)	
	WHO database	Cause of death model
Neonatal problems	47.9	52.6
Diarrhoeal disease	17.5	14.1
Respiratory infections	10.4	8.2
HIV/AIDS	0.1	0.3
Miscellaneous	24.1	24.7

Adapted from ⁵

known about the characteristics of delivery strategies capable of achieving and maintaining high coverage for specific interventions in various epidemiological, health system, and cultural contexts.³⁹ This kind of underachievement characterises the history of primary health care. It is usually followed, at a later date, by an intervention along the lines that a systematic programme of research to answer questions about how best to deliver child survival interventions is urgently needed.⁴⁰

The fourth paper considers the inequalities that underpin the existing differences in child mortality,⁴¹ and the final paper is effectively a call to action that highlights the need for leadership, strong health systems, adequate and targeted resources, awareness and a commitment to action.⁴² The WHO responded to the series with a commitment to reinstate its focus on mother and child health and to reach more mothers and children. This might be achieved by increasing the efficiency of integrated health systems and putting in place mechanisms to better engage and support families and communities in preventing disease and caring for sick children.⁴³

The central conviction of child health survival remains as knotty as ever: although there is good evidence that health itself can affect a country's development⁴⁴ – a subject that has recently been developed by health economists⁴⁵ – greater effects on health are exerted by social factors. Thus, if 34% of child deaths occur in south Asia and the region has almost two thirds of the global burden of malnutrition,⁴⁶ much of the root of the problem lies with women's status, poverty, illiteracy and inequality, a situation that Bhutta and colleagues

In a consideration of potential interventions, the second paper in the series noted that neonatal deaths had only recently been identified as a global priority and that there was an urgent need for further research, but wondered if, "amid the plethora of new and newly validated interventions, there are signs that the child survival effort has lost its focus".²⁸ In considering the public health delivery aspects of the issue, the series' third paper identified a key problem: separating interventions from delivery strategies. The authors made the somewhat ingenuous point that "although research on interventions is plentiful, little is known about the characteristics of delivery strategies capable of achieving and maintaining high coverage for specific interventions in various epidemiological, health system, and cultural contexts."²⁹ This kind of understatement characterises the history of primary health care. It is usually followed, as in this case, by an asseveration along the lines that a "...systematic programme of research to answer questions about how best to deliver child survival interventions is urgently needed."²⁹

The fourth paper considers the inequities that underpin the existing differences in child mortality,³⁰ and the final paper is effectively a call to action that highlights the need for leadership, strong health systems, adequate and targeted resources, awareness and a commitment to action.³¹ The WHO responded to the series with a commitment to reinstate the focus on mother and child health and to reach more mothers and children. This might be achieved by increasing the efficiency of integrated health systems and putting in place mechanisms to better engage and support families and communities in preventing disease and caring for sick children.³²

The central conundrum of child health survival remains as knotty as ever: although there is good evidence that health itself can affect a country's development³³ – a subject that has recently been developed by health economists³⁴ - greater effects on health are exerted by social factors. Thus, if 34% of child deaths occur in south Asia and the region has almost two thirds of the global burden of malnutrition,⁵ much of the root of the problem lies with women's status, poverty, illiteracy and inequity, a situation that Bhutta and colleagues

describe as the feminisation of poverty³⁵ and that the World Bank glosses in its life cycle approach. The child survival revolution, in the opinion of some, never occurred.³⁵ It remains a fact that, of the 4.4 billion people living in developing countries, 60% lack access to sanitation, 33% lack clean water, 20% have no health care, and 20% do not get enough dietary energy and protein. This on a background of persistent poverty, inequity, debt and economic stagnation. More than twice the global projected cost of scaling up child survival programmes to adequate levels is spent annually in the US and Europe on pet food.³⁶ Bhutta makes a compelling case for addressing corruption and conflict, for not losing the benefits of fertility reduction, for integration of maternal and child health such that the neonatal period ceases to fall between two stools, and for the need for charismatic champions for child health.³⁵ A recent review of progress suggests that the development model adopted by the world's more powerful nations "...incorporates a powerful presumption against substantial international redistribution of resources...".²¹

2.2 The problem of measurement

2.2.1 Child deaths

We do not have good data on the numbers and causes of child deaths in developing countries, particularly at the younger end of the scale. In an ideal world, certification of death would provide the basis for monitoring mortality patterns and documenting leading causes of death, the results being used to inform health policy and improve interventional strategies.³⁷ For most developing countries, however, vital registration systems are unavailable and data are collected through sentinel registration or sample surveys. The commonest survey technique for child mortality involves retrospective quantification of births and deaths. Although indirect estimates have been used, direct estimates based on maternity histories are now favoured, usually through protocols employing the Demographic and Health Survey methodology.³⁸ Expanded DHS (*DHS-plus*) surveys have been carried out in 47 countries since 1996. For the five-year recall periods covered in these studies, neonatal

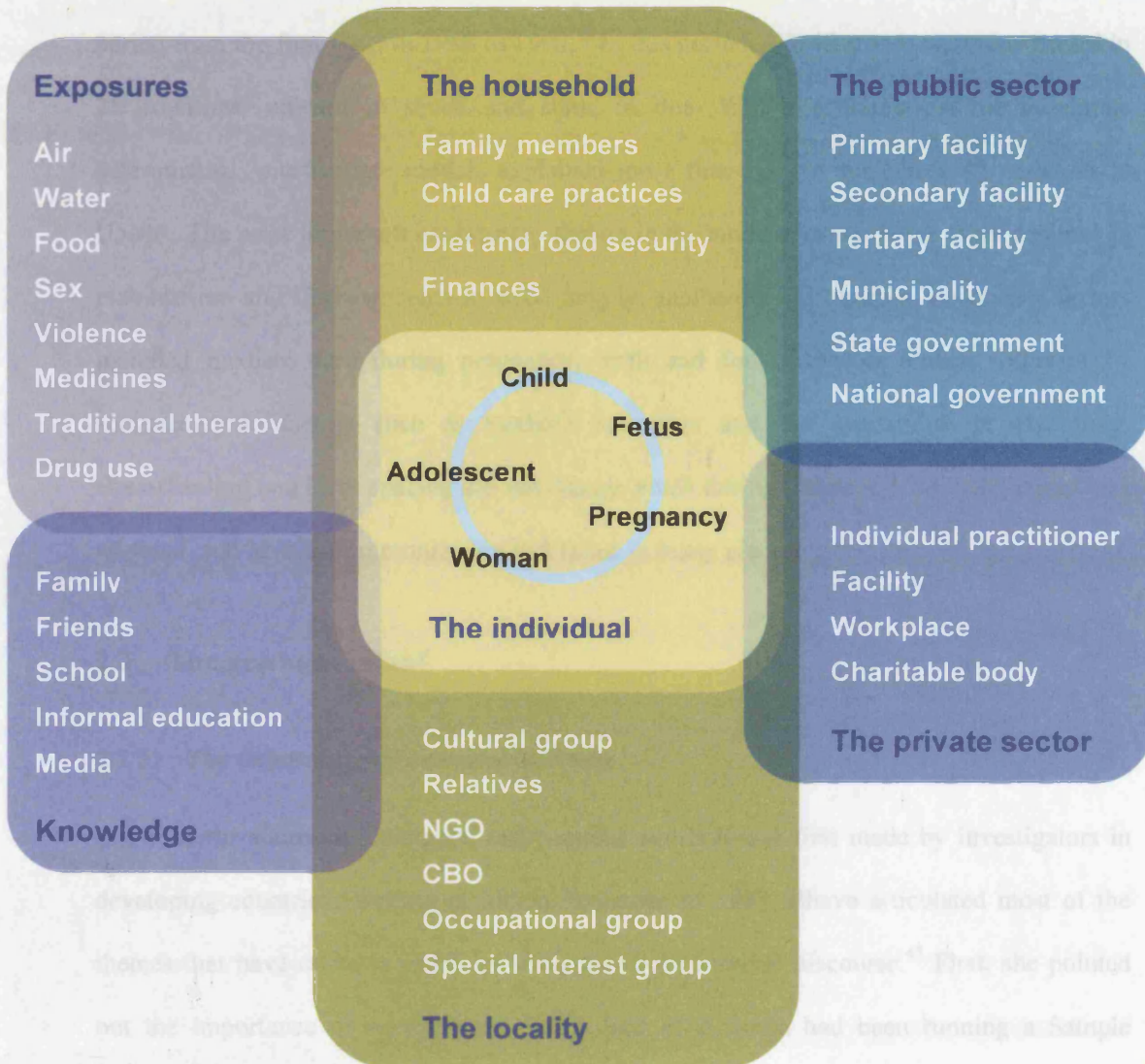
mortality rates range, for sub-Saharan Africa, from 19.8 per thousand live births (South Africa) to 62.2 (Cote d'Ivoire); for south and southeast Asia, from 17.8 (Philippines) to 48.4 (Bangladesh); and for Latin America and the Caribbean, from 14.1 (Dominican Republic) to 33.8 (Bolivia).³⁸

2.2.2 *Causality*

An influential framework for the discussion of child mortality was published in the early 1980s by Mosley and Chen.³⁹ They suggested that there were two types of research. In one, which they called a social science approach, the measured outcome was usually mortality and the causal linkages leading up to it were usually not analysed. In the other, a medical approach, the measured outcome was usually morbidity. They attempted to reconcile the approaches by (a) defining a single outcome that reflected both mortality and morbidity, and (b) drawing causal pathways between risk factors and outcomes. They chose the single outcome of weight-for-age, based on the Gomez classification in use at the time,⁴⁰ the idea being that growth faltering was a multifactorial indicator of health status. This idea was not taken up to any substantial degree in later work,⁴¹ and emerged from a conception of child survival that was predominantly post-neonatal.

However, Mosley and Chen's linkages between proximate and distal determinants of child health proved more durable. 14 proximate determinants were divided into five categories: maternal factors (age, parity, birth interval); environmental contamination (air, food/water/fingers, skin/soil/inanimate objects, insect vectors); nutrient deficiency (calories, protein, vitamins and minerals); injury (accidental, intentional); and personal illness control (personal preventive measures, medical treatment). In the World Bank's *pathway to survival*, these determinants are augmented by policy formulation, health systems interventions and the promotion of appropriate household and community behaviours as intermediate steps between policy and outcome.⁴² I prefer to see causality in terms of a non-linear pattern of overlapping influences, tentatively summarised in **figure 2.1**

Figure 2.1 Influences on child health



An examination of DHS findings on a background of proximate determinants has been attempted. Rutstein examined data from 89 DHS surveys in 56 countries, covering a 12 year period from the first DHS in 1986 to 1998.¹⁸ In this period, U5MR trends were downward in 25 countries, upward in seven and static in one. Within a framework of proximate determinants, multivariate models explained more than half of the observed variation in U5MR. The most important explanatory factors in the models for the 1990s were declines in malnutrition and improvements in water supply, sanitation and housing. Secondary factors included medical care during pregnancy, birth and for childhood illness, followed by socioeconomic factors such as mother's education and the availability of electricity. Breastfeeding and birth spacing did not change much during the period, so their impact was minimal, and levels of immunization had fallen in many places.

2.3 The newborn infant

2.3.1 The importance of neonatal mortality

The case for addressing perinatal and neonatal survival was first made by investigators in developing countries. Writing in *Indian Pediatrics* in 1989, Bhave articulated most of the themes that have come to characterise the newborn survival discourse.⁴³ First, she pointed out the importance of surveillance, or the lack of it. India had been running a Sample Registration Scheme in rural areas since 1964, in which data from 150 villages per state were analysed by the Registrar General. She pointed out the importance of vital registration, strengthened by a Model Registration System in which medical and paramedical personnel recorded causes of deaths at primary health centres and sub-centres. She pointed out that the decline in infant mortality seen to that point in India had been due mostly to a fall in post-neonatal mortality consequent on initiatives such as EPI and CDD. Neonatal mortality had remained static, such that it currently exceeded post-neonatal mortality in both rural and urban areas. She pointed out that the reported causes of perinatal mortality varied depending on whether the source was community or hospital. In urban hospitals, stillbirths and early

neonatal deaths were equally common, and the major causes of neonatal death were birth asphyxia and trauma, low birth weight and bacterial infections. In rural areas, the major causes of stillbirth were asphyxia, preterm, and small for gestational age. Major causes of neonatal death were low birth weight, feeding problems, asphyxia, and infections.

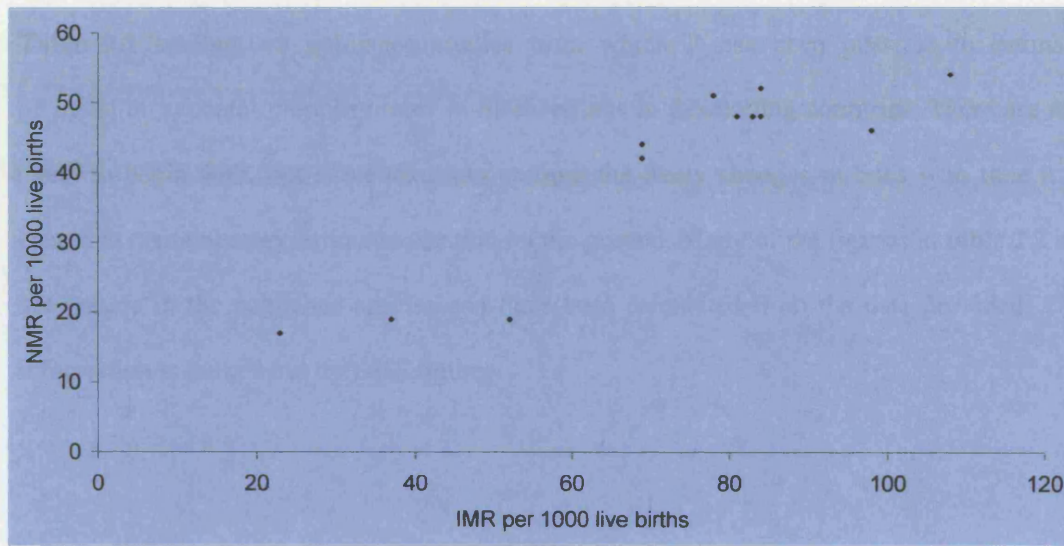
Examining similar figures from India, Claeson confirmed the slowing of the decline in U5MR on the basis of National Family Health Surveys and SRS data.⁴⁴ Like Bhawe, she felt that this reflected a plateau after the earlier declines in post-neonatal mortality, with a rise in the relative contribution of the neonatal period to the summary statistics of neonatal and infant mortality. Claeson also underlined the contribution of maternal characteristics and gender differentials in education, nutrition, and use of health services. Girls were systematically more vulnerable than boys. In the event of illness, they were taken to health facilities at more advanced stages of illness, and then to less qualified doctors where less money was spent on treatment.^{45 46} Expenditure on health care in the first two years of life was at least twice as high for sons as for daughters.⁴⁷

By 2000 it was clear that progress had slowed and that targets set at the World Summit for Children would not be met.⁴⁸ Further, it was clear that the contribution of the neonatal period to infant and under-five mortality was crucial, static, and mandated intervention.^{49 50} A population-based cluster survey of almost 55,000 households in Pakistan's Northwest Frontier Province and Balochistan considered 1141 infant deaths, of which 649 occurred in the neonatal period.⁵¹ Neonatal mortality was responsible for 67% of the IMR of 100 per thousand live births and 70% of it occurred in the early neonatal period. Findings such as these supported the call for a shift in child survival initiatives towards maternal and neonatal health. Though published in 2002, the study was based on work carried out in the early 1990s, which serves to underline the lack of primary data.

In a systematic review of the impact of neonatal mortality in south Asia and sub-Saharan Africa, Hyder and colleagues suggested that previous attempts to quantify the burden of disease had not disaggregated neonatal deaths from infant deaths.⁵² Their approach to the

issue was, however, conflicted: they reviewed secondary data only, confirmed the paucity of population-based studies and a bias towards studies conducted in hospitals with small sample sizes and poor generaliseability, and fell back on DHS figures. They then explained that the main goal of their paper was to emphasise the lack of valid data on neonatal mortality. **Figure 2.2** attempts to disaggregate NMRs from IMRs from available south Asian data. It confirms the idea that NMR is 50-60% of IMR, although – if we believe the figures and accept the small number of data points – there is an impression of a plateau in NMR when IMR is over about 60 per thousand.

Figure 2.2. Relationship between IMR and NMR in studies from south Asia



Data represent a combination of community studies and DHS figures. Chart adapted from ⁵²

2.3.2 Available information on neonatal mortality

Table 2.2 summarises published studies from which it has been possible to estimate perinatal or neonatal mortality rates in rural settings in developing countries. There are not many to begin with, but if we take into account the likely changes in rates with time it is clear that contemporary estimates are thin on the ground. Many of the figures in **table 2.2** do not feature in the published articles and have been calculated from the data provided. The information is bulked out by DHS figures.

Table 2.2. Published estimates of rural PMR and NMR in developing countries, excluding Nepal

Site and date	Sample frame	Population	N	SBR	ENMR	LNMR	PMR	NMR
Pune, India 1977-9 ^{53 54}	Community	Village	3173 births	28.4	26.6	12.7	54.2	39.2
Lahore, Pakistan 1984-8 ^{55 56}	Community	Village	1476 live births		47.0	35.0		82.0
		Periurban slum						
		Urban slum						
		Urban middle class						
Matlab, Bangladesh 1979-86 ⁵⁷	Community	Village	60,050 births	36.9	37.9		74.7	
Matlab, Bangladesh 1986-7 ⁵⁸	Community	Village	7681 live births					53.9
Matlab, Bangladesh 1989-90 ⁵⁷	Community	Village	7856 live births					44.3
Maharashtra, India 1995-6 ⁵⁹	Community	Village	763 live births		30.1	22.3		52.4
Lungwena, Malawi 1998 ⁶⁰	Community	Village	796 births	45.2	21.1	15.9	65.3	37.0
Hararyana, India 1994-9 ⁶¹	Hospital	Out-born admissions	385 births					70.0
Kilifi, Kenya 1996-7 ⁶²	Hospital	In-born infants	910 births				118.0	
Eastern China 1999 ⁶³	Community	Family planning surveillance	3697 pregnancies 3092 live births	24.0	45.9		68.8	
Selected results of DHS carried out in last 5 years, giving results for preceding 0-4 years³⁸								
Sub-Saharan Africa								
Benin 2001	National clusters							38.4
Burkina Faso 1998/9	National clusters							40.8
Ethiopia 2000	National clusters							48.7
Gabon 2000	National clusters							30.1
Guinea 1999	National clusters							48.4
Malawi 2000	National clusters						40.8	41.8
Mali 2001	National clusters						50.2	57.1
Nigeria 1999	National clusters							36.9
Rwanda 2000	National clusters							43.9
Tanzania 1999	National clusters							40.4
Uganda 2000/1	National clusters						39.2	33.1
Zambia 2001/2	National clusters							36.7
Zimbabwe 1999	National clusters						35.5	28.9
Central Asia								
Kazakhstan 1999	National clusters							33.6
Turkmenistan 2000	National clusters						35.1	33.8
South & Southeast Asia								
Bangladesh 1999/2000	National clusters							42.0
Cambodia 2000	National clusters							37.3
India 1998/9	National clusters							43.4
Nepal 2001	National clusters							38.8

Information on stillbirths is scanty. Estimated SBRs range from 28 to 45 per thousand births, which compares reasonably with data from hospitals. A rule of thumb has developed, in which the stillbirth rate and the early neonatal mortality rate are approximately equal in a given setting. This rule is, however, circular, since it is based on our limited information. ENMRs range from 26 to 47 per thousand live births. There is a consensus that ENMR is usually about twice LNMR. It is difficult to comment on the plausibility of the information in this regard, other than to say that one might expect that in populations with higher NMRs there would be a larger contribution of post-neonatal mortality (largely infectious), so that the twofold rule might not apply: this might be the case in the Lahore study.^{55 56}

The generalisations are that in many settings NMRs lie somewhere between 25 and 50 per thousand live births; that the burden of stillbirth is at least as great as that of early neonatal mortality, and remains largely hidden; and that most of neonatal mortality occurs in the first week (the Pune study documented 40% of neonatal deaths in the first 24 hours).⁵³ The caveats are that hospital-based studies should be assumed to be biased; and that misclassification and omission of perinatal and neonatal deaths are important, especially when figures are based on interview recall (for a discussion of this issue, see later).

2.3.3 Calls to action in perinatal and neonatal health

Recent initiatives to examine neonatal mortality in developing countries include Save the Children's Saving Newborn Lives,⁶⁴ and WHO efforts to quantify mortality by cause (<http://www.who.int/evidence>). The case for intervention has been made in a number of publications,⁶⁴⁻⁶⁶ which also highlight the lack of primary data. The mostly commonly articulated theme in advocacy documents has been the importance of neonatal mortality for infant mortality, and that its relative contribution rises as IMR falls. **Figure 2.3** illustrates this concept with data from 42 surveys.

Figure 2.3. Proportion of U5MR attributable to NMR.

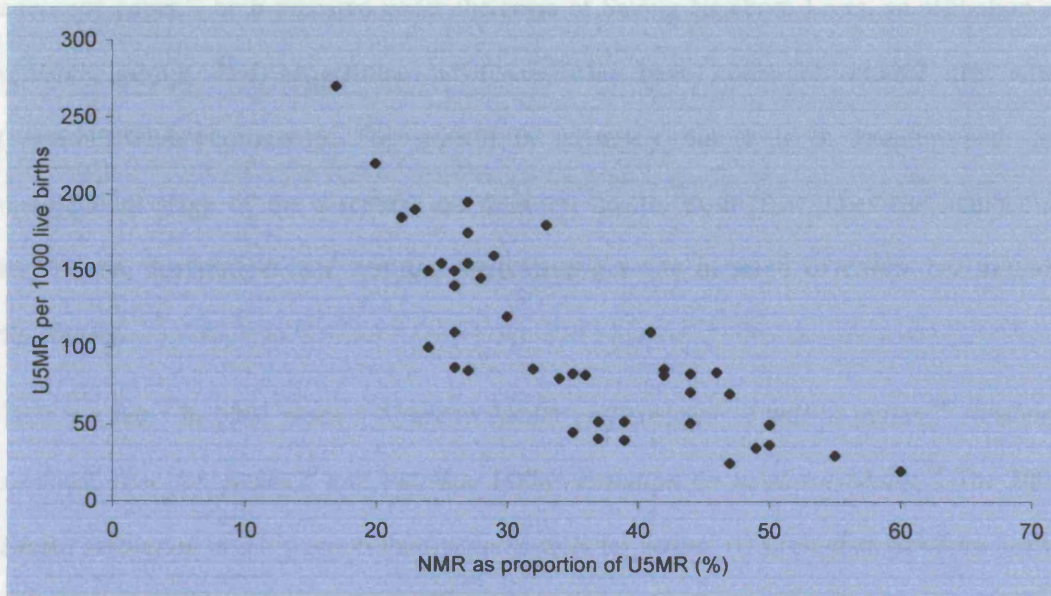


Chart adapted from ⁵

provision of skilled care for delivery of all pregnant women, as well as appropriate provision of newborn care at home; (iii) promotes high quality care by adopting and implementing agreed global guidelines for clinical care through both pre- and in-service competency-based training; (iv) urges the international community to commit and mobilize substantial global resources to reduce neonatal deaths, which are crucial to achieving the Millennium Development Goal for child survival by the year 2015; (v) strengthens efforts to eliminate neonatal tetanus by the year 2005 through promotion of high coverage of tetanus toxoid immunization and clean delivery practices; (vi) pursue comprehensive efforts to address inequities in newborn health based on gender, geography or economic status, including incorporating maternal and newborn health in Poverty Reduction Strategy Papers; (vii) strengthen strategic alliances and sustained partnerships between governments, civil society, political and community leaders, UN and international agencies, bilateral agencies, NGOs and professional bodies for mainstreaming newborn health and survival; (viii) augment national efforts to improve female education and employment opportunities, delay the age at marriage, and provide contraceptive services.⁷¹

There are calls to integrate essential newborn care into countries' policies and to implement

The clearest position statements come from the State of the World's Newborns⁶⁴ and an advocacy paper,⁶⁷ both prepared under the aegis of Saving Newborn Lives, an affiliation of research groups and programme advocates who have coalesced around the issue (www.healthynewborns.org). The growth in advocacy output is in keeping with the maturational stage of the discourse on newborn health, even if at times the number of resolutions, declarations and position statements put one in mind of coffee bar mission statements.

Thus we see - in 2002 alone - *Newborn health and survival: a call to action*,⁶⁸ *Newborn survival: time for action*,⁶⁹ and the *New Delhi resolution on newborn health*.⁷⁰ The 2003 *Dhaka resolution* is fairly representative in its calls for action: (i) strengthen newborn health care in safe motherhood and child health programmes; (ii) build national capacity to ensure access to skilled birth care for delivery of all pregnant women, as well as appropriate provision of newborn care at home; (iii) promote high quality care by adapting and implementing agreed global guidelines for clinical care through both pre- and in-service competency-based training; (iv) urge the international community to commit and mobilize substantial global resources to reduce neonatal deaths, which are critical to achieving the Millennium Development Goal for child survival by the year 2015; (v) strengthen efforts to eliminate neonatal tetanus by the year 2005 through promotion of high coverage of tetanus toxoid immunization and clean delivery practices; (vi) pursue comprehensive efforts to address inequities in newborn health based on gender, geography or economic status, including incorporating maternal and newborn health in Poverty Reduction Strategy Papers; (vii) strengthen strategic alliances and sustained partnerships between governments, civil society, political and community leaders, UN and international agencies, bilateral agencies, NGOs and professional bodies for mainstreaming newborn health and survival; (viii) augment national efforts to improve female education and employment opportunities, delay the age at marriage, and provide contraceptive services.⁷¹

There are calls to integrate essential newborn care into countries' policies and programmes.⁷²

The 2004 *Addis Ababa declaration* aims to reduce the global burden of neonatal deaths by 50% between 2000 and 2015; to include NMR as an indicator of progress towards achieving the child survival MDG; to allocate adequate resources for maternal and newborn health with particular attention to poor populations; and to coordinate efforts to support countries in programme development and implementation to improve maternal, newborn, and child health.⁷³ The most recent statement again points to a major gap in information to support action, and calls for a discussion of newborn infant survival along the lines of the Bellagio series.⁷⁴

2.3.4 *Perinatal and neonatal mortality in Nepal*

Studies of neonatal and perinatal mortality rates from Nepal are summarised in **table 2.3**. Of the eight sources of data, four are hospital-based and are included here in the interests of completeness and to give an impression of the level of perinatal care available in Nepal's better hospitals. Perinatal audit is now well established in these facilities, with monthly joint meetings and comparison of statistics. In-hospital SBRs range from 15 to 89 per thousand births, reflecting both differing qualities of care and different client populations. Because of limited antenatal care and perinatal history taking, stillbirths in all the studies were defined on the basis of the WHO-FIGO cut-off of 1000 g.¹ ENMRs range from 9 to 55 per thousand live births. This is a reasonable benchmark range that shows the spectrum from the poor case scenario to what is achievable. These hospital-based studies also illustrate two important considerations of global data. First, ENMRs are underestimated because discharge is early and outcomes are unknown at a week of age. Second, and for the same reason, NMRs cannot be estimated unless on the basis of proportionate models.

The two community-based studies, along with two of the hospital-based studies, actually constitute a single multi-centre evaluation initiated by the late Richard Johanson.⁷⁵ Their results do not inspire confidence. Neither survey provides much information on methodology - important in complex community studies - and both suggest that stillbirths were under-reported. Further, Jumla is a relatively deprived area of Nepal compared to Lalitpur, and it is

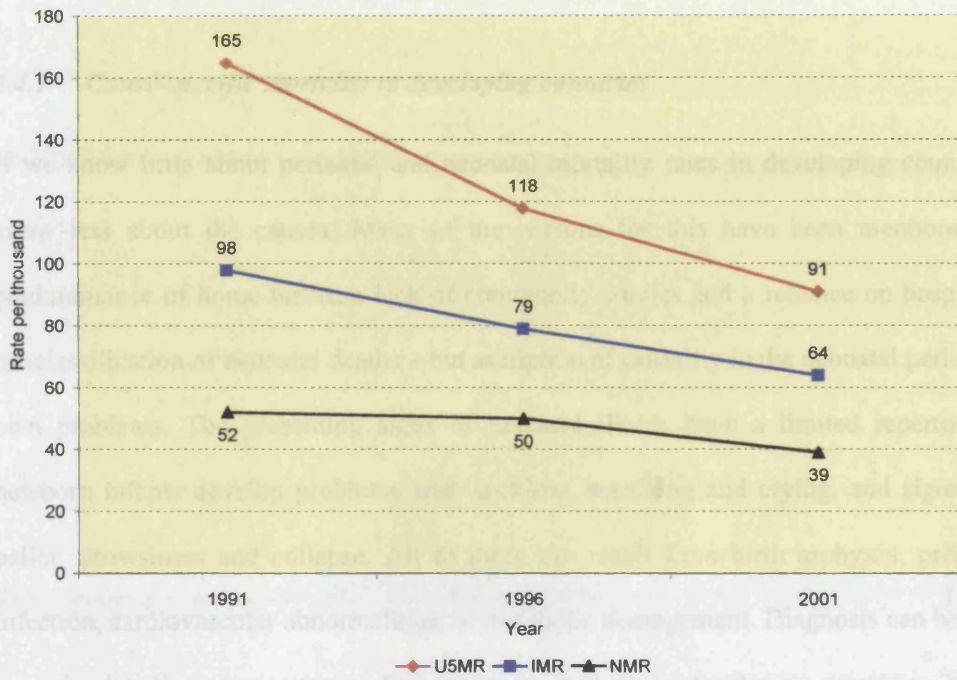
likely that the Jumla findings, in particular, are serious underestimates. The best existing estimates of mortality indicators at national level probably come from the serial DHS. The most recent quotes a PMR of 47 per thousand births and a NMR of 39 per thousand live births, based on recall of pregnancies in the five years preceding 2001.⁷⁶

Table 2.3. Published studies of neonatal and perinatal mortality rates in Nepal

Site and date	Sample frame	Population	N	SBR	ENMR	PMR	NMR
Kathmandu 1995 ⁷⁵	Hospital	In-born infants	10,436 births	28.6	20.0	48.0	
Patan Hospital 1995 ⁷⁵	Hospital	In-born infants	2783 births	15.1	8.8	23.7	
Bheri Zonal Hospital 1997 ⁷⁷	Hospital	In-born infants	900 births	88.9	54.9	138.9	
Tansen Hospital 1997 ⁷⁸	Hospital	In-born infants	745 births	73.8	18.8	91.3	
Jumla 1995 ⁷⁵	Community	Village	470 births	23.4	32.7	55.3	
Lalitpur 1995 ⁷⁵	Community	Village	1278 births	34.4	64.0	96.2	
Countrywide 1996 ⁷⁹	National survey	DHS methods	4375 births			57	50
Countrywide 2001 ⁷⁶	National survey	DHS methods	8726 women aged 15-49			47.4	38.8

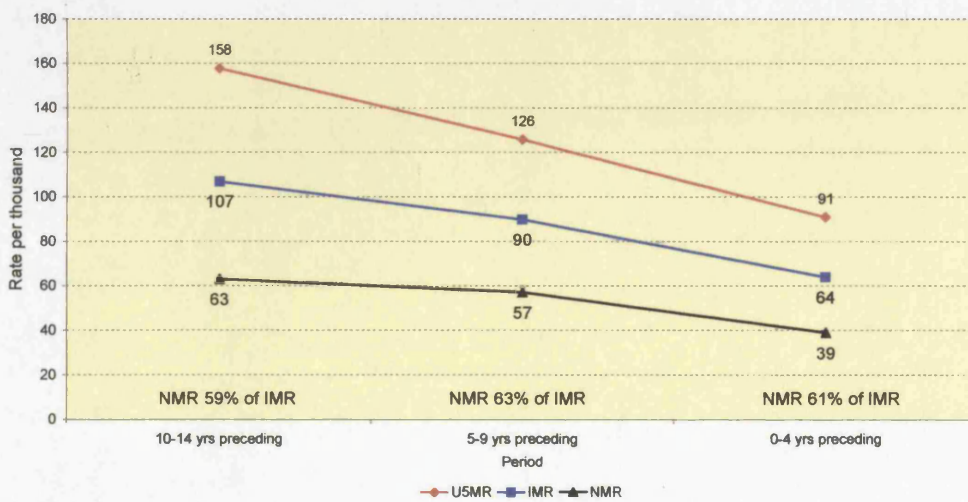
It is instructive to look in more depth at the data from the larger surveys. **Figure 2.4** presents trends in mortality indices on the basis of three discrete studies: the Nepal fertility, family planning and health status survey report of 1991, the Nepal Family Health Survey of 1996 and the DHS of 2001.^{76 79 80} **Figure 2.5** presents analogous figures on the basis of retrospective analysis of a single survey. Both figures give the impression of a telescoping of the three mortality rates on the background of a steady decline. There is no impression, however, of a flattening in the rate of decline in either U5MR or IMR. Neither is there evidence that Nepal's NMR is static, or that it is contributing to a higher proportion of IMR.

Figure 2.4. Mortality indices from three surveys



All rates expressed per 1000 live births. Data extracted from ^{76 79 80}

Figure 2.5. Mortality indices from one survey



All rates expressed per 1000 live births. Data extracted from ⁷⁶

2.4 Cause-specific mortality

2.4.1 *Cause-specific mortality in developing countries*

If we know little about perinatal and neonatal mortality rates in developing countries, we know less about the causes. Many of the reasons for this have been mentioned – the predominance of home births, a lack of community studies and a reliance on hospital data, misclassification of neonatal deaths – but ascription of causality in the neonatal period has its own problems. The presenting signs of neonatal illness have a limited repertoire. Sick newborn infants develop problems with suckling, breathing and crying, and signs such as pallor, drowsiness and collapse. All of these can result from birth asphyxia, prematurity, infection, cardiovascular abnormalities, or metabolic derangement. Diagnosis can be difficult in optimal tertiary care settings. In community settings in developing countries, it may be considered impossible. **Figure 2.6** presents a best-guess summary of causes, based on WHO data and published in the State of the World's Newborns.⁶⁴ The three major contributors are presumptive birth asphyxia, infections (bacteraemia, meningitis, pneumonia, tetanus and diarrhoea), and complications of preterm birth.

Figure 2.6. Causes of global neonatal mortality

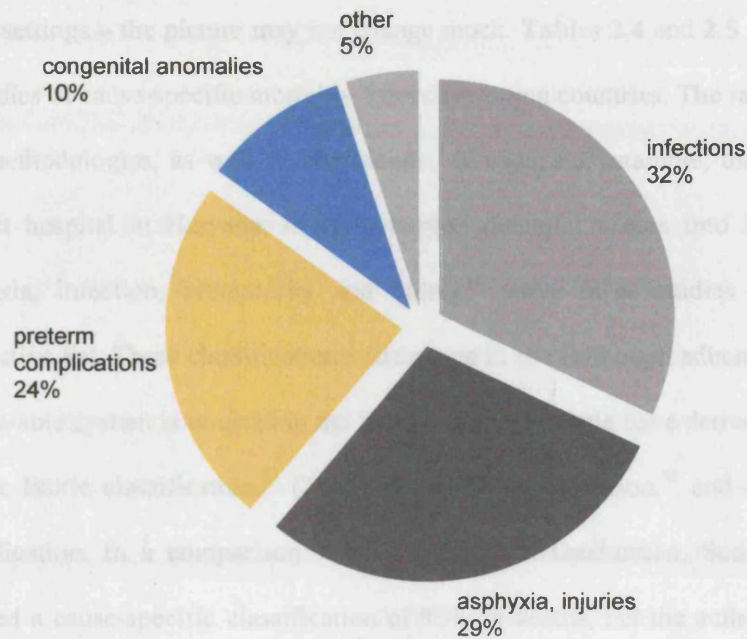


Figure produced using WHO database 1999⁶⁴

The Nigerian study in tables 2.4 and 2.5 highlights the problems of hospital-based studies. Recruitment of hospital-based studies leads to the inclusion of more preterm infants, more urban families, families of higher socioeconomic status, and more male infants. If babies are in-born, there is a tendency to miss early neonatal deaths that do not occur in the first few days, while infants are either ill or mothers are staying in hospital. Post-discharge deaths will be systematically under-recorded. If babies are out-born, there is a tendency to miss the opposite – early neonatal deaths – since infants will have died quickly and at home. These two biases will lead, in the first case, to overrepresentation of preterm and birth asphyxia as causes of early neonatal mortality, and, in the second, to underrepresentation of preterm and birth asphyxia and overrepresentation of neonatal infections.

In the Nigerian study, the PMR was 77 per thousand births.⁶⁴ Stillbirths and early neonatal deaths were examined together and classified with the Wigglesworth system.⁶⁵ The SBR was double the BMR. This leads one to expect a heavy burden of birth asphyxia, which is manifest in the cause-specific breakdown. The Pune study classified neonatal deaths on the

The poverty of the data that inform it is not obvious from the diagram, and more information is needed. However, one ventures to suggest that – once we have data on causes in rural home settings – the picture may not change much. **Tables 2.4** and **2.5** summarise the results of studies of cause-specific mortality from developing countries. The range of sample frames and methodologies, as well as motivations, is wide. For example, the studies from a sub-district hospital in Haryana, India, collapsed potential causes into four categories (birth asphyxia, infection, prematurity and other),⁶¹ while other studies allowed for a more exhaustive list. Three classification systems are in use (although adherence to any externally comparable system is unusual in the literature: most people have derived their own). (1) The Nordic Baltic classification,⁸¹ (2) the Aberdeen classification,⁸² and (3) the Wigglesworth classification. In a comparison from a hospital in Omdurman, Sudan, all three systems allowed a cause-specific classification of 85% of deaths, but the authors found the Nordic-Baltic the easiest to use.⁸³

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basis of the opinion of a medical officer after family interview. As mentioned above, 40% of deaths occurred in the first 24 hours after birth.^{53 54} The Pakistan studies looked at village, peri-urban and urban communities, and recorded deaths from birth to 2 years of age on the basis of monthly home visits. Cause of death was ascribed on the basis of verbal autopsy conducted by doctors. Recalculation of the published figures suggests that over half of infant deaths occurred in the first month, one third in the first week, and 15% on the first day of life. It was possible to break the data down further. 92% of deaths that occurred in the first three days were associated with birth asphyxia or trauma. Beyond this period, the major killer was infection. The authors noted that, although the incidence of killers like diarrhoea and pneumonia remained high in the six to 24 month age group, deaths from these causes were rarer. The point being that this group was the target of child health programmes such as CDD and ARI, and that the vulnerable group – neonates and younger infants – was being missed. A similar study from Lungwena, Malawi, attempted to model risk factors for mortality on the basis of 796 births, 36 stillbirths and 28 neonatal deaths.⁶⁰ Preterm birth accounted for 65% of perinatal and 68% of neonatal mortality. The other major risk was of ‘abnormal delivery’.

The series from Matlab is interesting as an example of the vast output of information that long term surveillance of a rural population can produce.⁵⁷ In the period 1986-1990, neonatal deaths accounted for over half of infant deaths and a third of under-five deaths. The series also suggested that previous position statements had tended to overestimate the burden of neonatal tetanus. The information from Bangladesh is compromised by the bluntness of the classification system. Almost half of neonatal deaths were attributed to “early perinatal” causes, and we are left to surmise what these might be.^{86 87} The Harayana findings were collected at a sub-district hospital which probably reflected community patterns better than do tertiary centres, but also allowed comparison of in-born and out-born neonates.⁶¹ This confirms the suppositions mentioned above: preterm plays a larger part as a cause of death in in-born infants, while infection places a greater part in out-born infants who tend to present

later in the neonatal period. Finally, the classification from the highlands of Papua New Guinea is remarkable for the – hopefully local – burden of congenital syphilis.⁸⁸

Table 2.4. Studies of cause-specific mortality in developing countries, excluding Nepal

Site and date	Sample frame	Population	n
Ilesa, Nigeria 1996-2000 ⁸⁴	Tertiary hospital	In-born infants	389 perinatal deaths 5050 births
Pune, India 1977-9 ^{53 54}	Community	22 villages	3172 births
Lahore, Pakistan 1984-8 ^{55 56}	Community	Village Periurban slum Urban slum Urban middle class	1476 live births
Mattlab, Bangladesh 1986 ⁵⁷	Community	Villages	210 early neonatal deaths
Sirur, rural Maharashtra, India ⁴³	Community	villages	
Bangladesh 1993-4 ⁸⁶	National survey	DHS methods	300 neonatal deaths
Bangladesh 1996-7 ⁸⁷	National survey	DHS methods	287 neonatal deaths
Harayana, India 1994-9 ⁶¹	Hospital	In-borns	56 neonatal deaths
Harayana, India 1994-9 ⁶¹	Hospital	Out-born admissions	70 neonatal deaths
Goroka, Papua New Guinea 1988-2000 ⁸⁸	Hospital	In-borns and out-borns	126 neonatal deaths
Kilifi, Kenya 1996-7 ⁶²	Hospital	In-borns	108 perinatal deaths

Table 2.5. Causes of perinatal and neonatal mortality in developing countries, excluding Nepal**Stillbirth**

Ilesa, Nigeria ⁸⁴	Sirur, India ⁴³
Asphyxia 55%	Asphyxia 53%
Immaturity 23%	Unexplained 17%
Macerated stillbirth 18%	Preterm 15%
Congenital anomaly 3%	IUGR 5%
Other 1%	Congenital anomalies 5%
	Other 5%

Early neonatal death

Pune, India ^{53 54}	Lahore, Pakistan ^{55 56}	Matlab, Bangladesh ⁵⁷	Sirur, India ⁴³
Low birth weight 50%	Birth asphyxia 47%	Very small size 54%	Low birth weight 50%
Feeding problems 15%	Septicaemia 16%	Birth asphyxia or trauma 26%	Feeding problem 14%
Birth asphyxia 8%	Respiratory infection 9%	Neonatal tetanus 8%	Asphyxia 9%
Birth trauma 7%	Neonatal tetanus 7%	Respiratory infection 2%	Injury 9%
Infection 5%	Diarrhoea 4%	Congenital anomalies 2%	Infections 5%
Congenital anomalies 5%	Meningitis 2%	Other 3%	Congenital anomalies 5%
Other respiratory problems 4%	Birth trauma 4%	Unclassified 4%	Others 10%
Other 6%	Jaundice 4%		
	Other non-infectious 7%		

Neonatal death

Matlab, Bangladesh ⁵⁷	Bangladesh ⁸⁶	Bangladesh ⁸⁷	Harayana, India ⁶¹	Harayana, India ⁶¹	Goroka, Papua New Guinea ⁶⁸
Very small size 45%	"Early perinatal" 48%	"Early perinatal" 49%	In-borns 15%	Out-borns 71%	New Guinea ⁶⁸
Birth asphyxia or trauma 11%	Neonatal tetanus 15%	Neonatal tetanus 17%	Prematurity 46%	Infection 71%	VLBW 51%
Neonatal tetanus 8%	Respiratory infection 12%	Respiratory infection 11%	Birth asphyxia 37%	Birth asphyxia 9%	Septicaemia 43%
Respiratory infection 8%	Diarrhoea 2%	Diarrhoea 1%	Infection 13%	Prematurity 7%	Birth asphyxia 24%
Diarrhoea 1%	Malnutrition 2%	Unclassified 22%	Other 4%	Other 13%	Congenital syphilis 13.5%
Other infections 6%	Congenital anomalies 1%				Respiratory infection 11%
Other 5%	Unclassified 15%				Malnutrition 1.6%
Unclassified 16%					Meningitis 1.6%
					Diarrhoea 1.6%
					Congenital anomalies 9%
					Necrotizing enterocolitis 8%
					Congenital heart disease 7%
					Anaemia 6%
					Meconium aspiration 5%
					Pulmonary hypertension 5%
					SIDS 3%
					Down syndrome 1%

2.4.2 Cause-specific mortality in Nepal

It is encouraging to see a number of studies from Nepal, summarised in **tables 2.6** and **2.7**, even if four sites were included in one study. Only the studies from Bheri and Tansen, mission hospitals in the hill belt, differentiated stillbirths from early neonatal deaths, using a cut-off of 28 weeks for the definition^{77 78} The abiding theme is one of birth asphyxia as an end result of a number of conditions. This is not surprising, since fresh stillbirths are generally assumed to follow an asphyxial event, and macerated stillbirths tend to be resistant to causal attribution. For early neonatal deaths, the Bheri study confirms the pattern of the world literature. Birth asphyxia accounts for about a third of mortality, and complications of preterm for something under a third. The Tansen study attributed very few neonatal deaths to birth asphyxia, partly because of the routine use of partograms,⁸⁹ but possibly because of a disaggregation of causes that others might have collapsed into the category of asphyxia (prolonged labour, breech, prolapsed fetal parts or cord). The authors suggested that partography should be introduced at peripheral facilities in Nepal. This is obviously an excellent recommendation, but as a strategy it might do less to improve outcomes than one would imagine: in 41% of cases in the stillbirth series, the fetus had already died by the time of presentation at the hospital.

The results from Kathmandu, Patan, Jumla and Lalitpur represent arms of the perinatal study mentioned above.⁷⁵ Stillbirths and early neonatal deaths were aggregated and classified as perinatal deaths, with stillbirths defined as having a birth weight of 1000 g or more. Two classifications were used: a fetal clinicopathological classification and the Aberdeen obstetric classification. The first identified asphyxia as the major cause of death (around 45% if antepartum asphyxia is not included), with preterm as the next most common. The Aberdeen classification failed to classify about 35% of deaths across studies. Reading between the lines, conditions leading to presumptive asphyxia dominated. The differences between urban (Kathmandu and Patan) and rural (Jumla and Lalitpur) findings may reflect the true picture. However, the methodologies for the rural community studies were not

explained clearly, classification was based on verbal autopsy, and the authors felt that stillbirths were underreported. "The problems of undertaking community research were illustrated by the lack of baseline data, the small numbers of babies involved and the inherent weaknesses of the verbal autopsy."⁷⁵

This section began by emphasising the lack of data on cause-specific mortality, then reviewed both global and local data. Again, it is worth noting that a lack of information does not mean that our guesswork is wrong. The patchy data do not argue against the available estimations from WHO and other working groups. Of newborn deaths, then, birth asphyxia probably contributes about 30%, infections about 30%, complications of preterm about 25%, congenital anomalies about 10%, and other causes about 5%.

Table 2.6. Studies of cause-specific mortality in Nepal

Site and date	Sample frame	Population	N
Bheri Zonal Hospital 1997 ⁷⁷	Hospital	In-borns	80 stillbirths 45 ENNDs
Tansen Hospital 1997 ⁷⁸	Hospital	In-borns	55 stillbirths 13 ENNDs
Kathmandu 1995 ⁷⁵	Hospital	In-borns	298 stillbirths 203 NNDs
Patan Hospital 1995 ⁷⁵	Hospital	In-borns	42 stillbirths 24 NNDs
Jumla 1995 ⁷⁵	Community	Village	11 stillbirths 15 NNDs
Lalitpur 1995 ⁷⁵	Community	Village	44 stillbirths 79 NNDs

Table 2.7. causes of perinatal and early neonatal mortality in Nepal

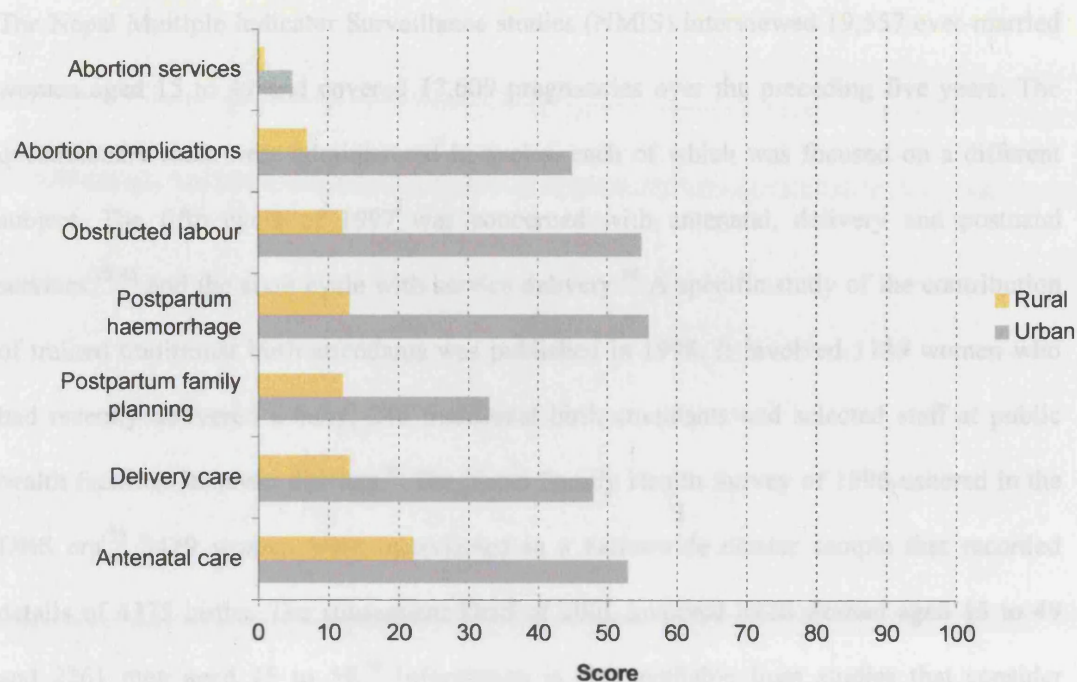
	Tansen Hospital 1997 ⁷⁸	Kathmandu 1995 ⁷⁵	Patan Hospital 1995 ⁷⁵	Jumla 1995 ⁷⁵	Lalitpur 1995 ⁷⁵
Perinatal death					
Bheri Zonal Hospital ⁷⁷					
Preterm rupture of membranes 27%	Maternal complications and perinatal death:	Congenital anomaly 8%	Congenital anomaly 16%	Congenital anomaly 5%	Congenital anomaly 4%
Fetal distress 22%	Abruption 7%	Antepartum asphyxia 22%	Antepartum asphyxia 27%	Antepartum asphyxia 8%	Antepartum asphyxia 12%
Malpresentation 10%	Eclampsia 4%	Intra-partum asphyxia 44%	Intra-partum asphyxia 35%	Intra-partum asphyxia 45%	Intra-partum asphyxia 48%
Eclampsia 8%	Infection 4%	Preterm 18%	Preterm 14%	Preterm 30%	Preterm 20%
Congenital anomaly 8%		Infection 5%	Infection 5%	Infection 9%	Infection 16%
Obstructed labour 4%		Isoimmunisation <1%	Isoimmunisation 0%	Isoimmunisation 0%	Isoimmunisation 0%
APH 4%		Miscellaneous 2%	Miscellaneous 5%	Miscellaneous 1%	Miscellaneous 0%
Ruptured uterus 1%		Unclassified >1%	Unclassified 0%	Unclassified 2%	Unclassified 0%
Trauma 1%					
Unknown 15%					
Early neonatal death					
Bheri Zonal Hospital ⁷⁷	Tansen Hospital 1997 ⁷⁸	Kathmandu 1995 ⁷⁵	Patan Hospital 1995 ⁷⁵	Jumla 1995 ⁷⁵	Lalitpur 1995 ⁷⁵
Birth asphyxia 36%	Preterm 31%	Preeclampsia 7%	Preeclampsia 6%	Preeclampsia 0%	Preeclampsia 4%
Hyaline membrane disease 31%	Prolonged labour 9%	APH 12%	APH 10%	APH 4%	APH 4%
Presumed intrauterine fetal distress 11%	Meconium aspiration & birth asphyxia 4%	Congenital anomaly 6%	Congenital anomaly 16%	Congenital anomaly 5%	Congenital anomaly 4%
Meconium aspiration 9%	Cord prolapse 4%	Mechanical... 3%	Mechanical... 9%	Mechanical... 1%	Mechanical... 4%
Congenital anomalies 4%	Breech 7%	Cord prolapse 6%	Cord prolapse 9%	Cord prolapse 1%	Cord prolapse 4%
Cord around neck 2%	Prolapsed fetal parts 21%	Face presentation 3%	Face presentation 2%	Face presentation 9%	Face presentation 12%
Septicaemia 2%	Cord prolapse 4%	Breech 8%	Breech 5%	Breech 11%	Breech 0%
	Prolonged rupture of membranes 4%	Oblique 5%	Oblique 0%	Oblique 2%	Oblique 0%
	Ruptured uterus 3%	Compound 1%	Compound 0%	Compound 0%	Compound 0%
	Congenital anomaly 6%	Uterine rupture 2%	Uterine rupture 2%	Uterine rupture 2%	Uterine rupture 0%
		Maternal disorder... 1%	Maternal disorder... 2%	Maternal disorder... 0%	Maternal disorder... 0%
		Maternal hypertensive disease 1%	Maternal hypertensive disease 2%	Maternal hypertensive disease 0%	Maternal hypertensive disease 4%
		Other maternal disease 3%	Other maternal disease 2%	Other maternal disease 0%	Other maternal disease 0%
		Maternal infection 3%	Maternal infection 2%	Maternal infection 11%	Maternal infection 28%
		Miscellaneous... 4%	Miscellaneous... 5%	Miscellaneous... 9%	Miscellaneous... 8%
		Neonatal infection <1%	Neonatal infection 0%	Neonatal infection 0%	Neonatal infection 0%
		Isoimmunisation <1%	Isoimmunisation 0%	Isoimmunisation 0%	Isoimmunisation 0%
		Other neonatal disease <1%	Other neonatal disease 0%	Other neonatal disease 0%	Other neonatal disease 0%
		Postmaturity 1%	Postmaturity 5%	Postmaturity 1%	Postmaturity 0%
		Specific fetal eg twin-twin transfusion 2%	Specific fetal eg twin-twin transfusion 2%	Specific fetal eg twin-twin transfusion 1%	Specific fetal eg twin-twin transfusion 0%
		Twins 3%	Twins 2%	Twins 7%	Twins 0%
		Unexplained... >=2.5kg 9%	Unexplained... >=2.5kg 15%	Unexplained 37% (birth weight not known)	Unexplained 32% (birth weight not known)
		< 2.5kg 22%	< 2.5kg 20%		
		Unclassifiable 0%	Unclassifiable 0%	Unclassifiable 3%	Unclassifiable 3%

2.5 Potential strategies for improving newborn infant outcomes

2.5.1 Linking maternal and neonatal programmes

A recent attempt to systematise and compare the priorities and achievements of maternal and newborn health interventions has been the development of a Maternal and Neonatal Programme Effort Index.⁹⁰ The MNPI was developed on the basis of the opinions of 750 reproductive health experts tasked with evaluating maternal and neonatal health services in 49 countries. Subsequently, groups of country-based experts rated 81 aspects of maternal and neonatal health services to generate inter-country comparisons on the same scales. The resulting tool has five sectors, often illustrated on a spider diagram: service capacity, access, care received, family planning, and support functions. A summary of MNPI scores for access to services in general, **figure 2.7** prefaces this discussion of strategies and the case of Nepal. Access to abortion services is minimal (termination of pregnancy is currently in the process of legalisation). Management of complications of abortion - spontaneous and induced - is largely the preserve of urban centres which provide facilities for manual vacuum aspiration of products of conception. Access to all types of service is at least twice as great in urban areas, and the maximum coverage is about 50% for management of complications such as post-partum haemorrhage and obstructed labour, as well as for routine antenatal care and institutional delivery.

Figure 2.7. Nepal MNPI scores for access to services



MNPI: Maternal and Neonatal Programme Effort Index. Adapted from⁹¹

2.3.2 Antenatal care

Most women in the world have some sort of antenatal care during pregnancy. South Asia has the lowest uptake, but even so 54% of women make at least one visit.⁹² Uptake of antenatal care rose steadily during the 1990s and in many countries most women make the recommended four visits. Urban women are more likely to report antenatal care, this differential being greatest in countries where overall rates of uptake are low. Educated women are more likely to report visits, as are the more wealthy, and in most countries women expecting their first child are more likely to attend. Poor, rural, uneducated, multiparous women are, therefore, the least likely to have antenatal care.

There are, however, problems inherent in the wholesale adoption of antenatal care for its own sake. In their review of the benefits of routine antenatal care, Villar and Bergsjö commented on its somewhat ritualistic nature and support the hypothesis that similar outcomes might be achieved with simpler models.⁹³ This position – with explicit reference to

Information about pregnancy and childbirth in Nepal is available from four main sources. The Nepal Multiple Indicator Surveillance studies (NMIS) interviewed 19,557 ever-married women aged 15 to 49 and covered 17,609 pregnancies over the preceding five years. The questionnaire tools were administered in cycles, each of which was focused on a different subject. The fifth cycle of 1997 was concerned with antenatal, delivery and postnatal services,^{92 93} and the sixth cycle with service delivery.⁹⁴ A specific study of the contribution of trained traditional birth attendants was published in 1998. It involved 1139 women who had recently delivered a baby, 240 traditional birth attendants and selected staff at public health facilities in seven districts.⁹⁵ The Nepal Family Health Survey of 1996 ushered in the DHS era.⁷⁹ 8429 women were interviewed in a nationwide cluster sample that recorded details of 4375 births. The subsequent DHS of 2001 involved 8726 women aged 15 to 49 and 2261 men aged 15 to 59.⁷⁶ Information is also available from studies that consider maternal mortality and the safe motherhood initiative, particularly work on process indicators designed to help with programme monitoring.⁹⁶

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developing countries - was also taken by the WHO programme to map the best reproductive health practices.⁹⁹ All health systems face budgetary constraint, but the question of efficacy looms particularly large in developing countries who have often "... adopted the antenatal programs of developed countries with only minor adjustments... " ⁹⁸. Packages that involve fewer visits, clearer care and referral guidelines, and higher quality are probably adequate. This is tentatively supported by a study of a programme of four visits involving over 15,000 Zimbabwean women. The study was not, however, cluster-randomised and lacked sufficient power to demonstrate plausible effects on perinatal mortality rates.¹⁰⁰ A Cochrane review of the clinical and psychosocial effectiveness of antenatal care programmes for low-risk women identified four randomised controlled trials, one of them in a developing country. The review recommended more attention to goal-oriented activities, and did not find an association with postulated negative perinatal outcomes if visit number was moderately reduced. It also noted that management by midwives and general practitioners appeared as effective as management by obstetricians.¹⁰¹

Quality is harder to assess than quantity. Guidelines have been drafted for obstetric care at the hospital level,¹⁰² but the pursuit of quality is complex. In a recent discussion, Pittrof and colleagues attempted to define in the international context what is meant by quality in maternity care.¹⁰³ They point out that maternity care is unusual in that (a) its users are well and one must resist over-medicalisation of a healthy state, (b) some users will require a higher level of care, but this is unpredictable, (c) there are two recipients (mother and baby), and (d) the area of childbirth is culturally and emotionally sensitive. Their suggested definition is that high quality of care involves providing a minimum level of care to all pregnant women and their newborn babies and a higher level of care for those who need it. This should be done while obtaining the best possible medical outcome, and while providing care that satisfies women and their families and care providers. Such care should maintain sound managerial and financial performance and develop existing services in order to raise the standards of care provided to all women.¹⁰³

A hospital record based case-control study from Mexico City examined 1837 births and scored the quality of antenatal care on the basis of recorded blood pressure, height, weight, pelvic examination, and urine and blood samples. Higher scores were associated with lower rates of preterm delivery, but not with the birth of small for gestational age babies.¹⁰⁴ Generalisation of this study is difficult, since both antenatal care uptake (89% made one visit or more) and institutional delivery rates (87%) were high.

Adopting an evidence based approach (which relies on the results of randomised controlled trials, a reliance that admittedly excludes much of the work done in low income countries), Villar and Bergsjö's review examined the potential benefits of specific antenatal care activities. Previous childbearing problems should trigger referral. Detection of anaemia and subsequent supplementation with iron and folic acid are probably beneficial. Regular blood pressure measurement and at least one test for proteinuria are likely to be beneficial, although prediction of hypertensive disease of pregnancy is difficult and screening must be followed by appropriate referral. Urine culture and syphilis screening are recommended at first visit. Maternal height and regular symphysis-fundal height are recommended as screens for potential obstructed labour. Symphysis-fundal height may also help to identify fetuses at risk of intrauterine growth retardation. Suspected breech presentation after 37 weeks requires referral for external cephalic version. Since acute vaginal bleeding seldom coincides with routine visits and requires emergency consultation, counselling about this and other danger signs is important.⁹⁸ There are no unified recommendations for screening for conditions such as haemoglobinopathy, Down's syndrome, and intrauterine infections. However, Rhesus grouping and administration of anti-D immunoglobulin to Rhesus negative women in the early post-partum period is advised. Tetanus toxoid should be administered according to local schedules. Prevention of preterm labour remains a subject of discussion: the benefits of elective treatment of bacterial vaginosis are uncertain. Finally, the principle of using antenatal care visits to identify women at risk is important but somewhat problematic, since the positive and negative predictive values of most formal risk scoring systems have been found to be poor.^{99 105}

In addition to screening and management, however, might antenatal care be worthwhile for other reasons, such as the encouragement of skilled attendance at delivery? A cluster-sampled study from Uttar Pradesh, India assessed quality through a composite measure with 20 components. Although only 300 urban women were involved, the study found broad variation in antenatal care quality, but suggested that quality care might be associated with subsequent attendance at delivery by doctors, nurses or midwives, and delivery at a health care facility.¹⁰⁶

2.5.3 Antenatal care in Nepal

Table 2.8 summarises the findings of three studies and **figure 2.8** presents expert ratings from the MNPI initiative. Antenatal care uptake is increasing. Almost half of pregnant women now attend, registration tends to be late but falling, but the number of visits is limited and four visits are rare. The commonest site of antenatal care is the district hospital, and doctors are almost as often the providers as primary care workers. This is somewhat at odds with the distribution of health care cadres and the avowed emphasis on primary care. In the 2001 DHS, 48% of women reported that they were told about danger signs in pregnancy, 47% had their weight measured, 14% had their height measured, 60% had their blood pressure taken, 29% had a urine sample taken, and 28% had a blood sample taken.⁷⁶

Although all the surveys were cross-sectional and retrospective, some informative responses to open questions were recorded. About 86% of women recalled no antenatal problems. The commonest reported problems were abdominal pain, weakness, nausea, dizziness and fever.^{92 93} In the event of a problem, 69% of women did not seek medical care. The preferred site of care for those who did seek it was the district hospital. Health posts, outreach workers and traditional birth attendants were rarely consulted during the antenatal period, and private clinics were the choice of about 20%. Reasons for not consulting health care providers in the event of illness were (in order of reporting frequency) that there was no perceived need to do so, that consultation was not inherent in local traditions, that women were unaware of the existence of services, and that consultation would be costly. Less common concerns were

that women had no time, that services were poor, and that families did not permit them to go.^{92 93}

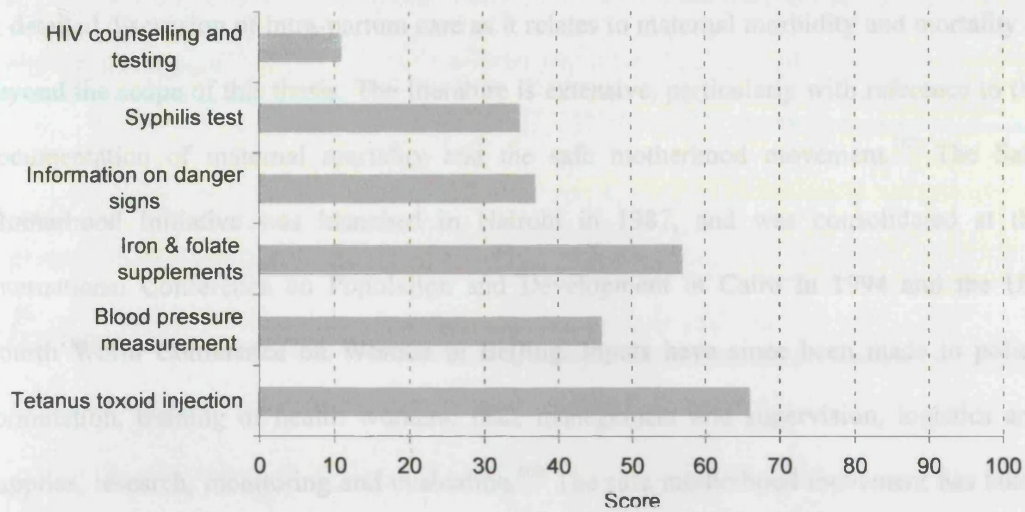
When asked specifically about the weaknesses of antenatal care services, women responded that they were not available or too far away, that either there were no staff to provide them or that staff had a bad attitude to clients, that female staff were unavailable, that medicines or equipment were unavailable, that costs were high, that waiting times were long, and that facilities were poor.^{93 94}

Table 2.8 Antenatal care in Nepal antenatal care services

	NFHS 1996 ⁷⁹	NMIS 5th cycle ⁹²	NMIS further analysis ⁹³	DHS 2001 ⁷⁶
Any antenatal care (%)	44	24	20	49
First visit in 1st or 2nd trimester (%)	25	10		46
Number of visits				
4 or more (%)	9	8		0
Site of antenatal care (%)				
Hospital/Primary health centre	27		11	
Health post/Sub-health post	10		5	
Private clinic	2		2	
Other	5		2	
Antenatal care giver (%)				
Doctor	13	12	1	17
Nurse or midwife	11	9	<1	11
Primary facility health worker	14	3	13	21
Traditional birth attendant	1	<1	6	<1
Tetanus toxoid once or more (%)	46	50	42	54

Figures extracted from original publications, regrouped for comparison and rounded to integers.

Figure 2.8. Nepal MNPI scores for antenatal care services



MNPI: Maternal and Neonatal Programme Effort Index. Adapted from⁹¹

(3) clean and safe delivery, and (4) essential obstetric care.

Strategies for reducing maternal and, by extension, neonatal mortality have moved from a "specialist" risk approach¹¹² to a focus on strengthening of obstetric services,¹¹³ anchored in the concepts of Basic and Comprehensive Emergency Obstetric Care.^{114,115} BEmOC includes administration of antibiotics, oxytocics and anticonvulsants, manual removal of retained placenta, removal of retained products following miscarriage or abortion, and assisted vaginal delivery with forceps or vacuum extractor. CEOC comprises these activities with the addition of caesarean section and safe blood transfusion.

The success of an institutional focus will vary with baseline levels of service provision and uptake, but the argument tends to be that it will not be possible to reduce MNMIs without a primary focus on institutional capacity.¹¹⁶ "The technical interventions needed to prevent maternal deaths are well understood. Traditional maternal and child health interventions, such as providing antenatal care and training traditional birth attendants, have failed."¹¹⁷ However, less than 30% of the world's births are attended by a trained person,¹¹⁸ and the focus has shifted recently to ensuring that a trained or skilled attendant is present at birth.¹¹⁹

"The goal is for every delivery to be assisted by a skilled birth attendant such as a midwife,

2.5.4 *Intra-partum care*

A detailed discussion of intra-partum care as it relates to maternal morbidity and mortality is beyond the scope of this thesis. The literature is extensive, particularly with reference to the documentation of maternal mortality and the safe motherhood movement.¹⁰⁷ The Safe Motherhood Initiative was launched in Nairobi in 1987, and was consolidated at the International Conference on Population and Development in Cairo in 1994 and the UN Fourth World Conference on Women in Beijing. Inputs have since been made to policy formulation, training of health workers, IEC, management and supervision, logistics and supplies, research, monitoring and evaluation.¹⁰⁸ The safe motherhood movement has taken some care to simplify and clarify its messages. The principles of the current Mother-Baby Package – the *four pillars of safe motherhood* – are (1) family planning, (2) antenatal care, (3) clean and safe delivery, and (4) essential obstetric care.^{109 110}

Strategies for reducing maternal and, by extension, perinatal mortality have moved from a risk approach¹¹¹ to a focus on strengthening of obstetric services,¹¹² enshrined in the concepts of Basic and Comprehensive Emergency Obstetric Care.^{113 114} BEOC includes administration of antibiotics, oxytocics and anticonvulsants, manual removal of retained placenta, removal of retained products following miscarriage or abortion, and assisted vaginal delivery with forceps or vacuum extractor. CEOC comprises these activities with the addition of caesarean section and safe blood transfusion.

The success of an institutional focus will vary with baseline levels of service provision and uptake, but the argument tends to be that it will not be possible to reduce MMRs without a primary focus on institutional capacity.¹¹⁵ “The technical interventions needed to prevent maternal deaths are well understood. Traditional maternal and child health interventions, such as providing antenatal care and training traditional birth attendants, have failed.”^{113 116} However, less than 50% of the world’s births are attended by a trained person,¹¹⁷ and the focus has shifted recently to ensuring that a trained or skilled attendant is present at birth.¹¹⁸ “The goal is for every delivery to be assisted by a skilled birth attendant such as a midwife,

physician, or nurse... As well as providing a clean and safe delivery, a trained birth attendant recognizes complications such as preterm birth, preterm or prolonged rupture of membranes, and prolonged or obstructed labor and can promptly refer the patient to a health facility with essential obstetric and neonatal care”.⁶⁶ The presumptions behind this are impressive: that the attendant will provide a clean and safe delivery; that she will recognize complications; that she will refer the client; that the client will go; that the client will reach a health facility; and that the facility will be able to provide essential obstetric and neonatal care.

It has been suggested that, if MMRs are high, community-based initiatives might bring them down substantially and at lower cost than a purely institutional focus.¹¹⁹ This is hardly controversial, but raises a problem that has dogged the history of primary health care, IMCI, and now maternal and newborn care: although it is clear that community-based strategies are important, it remains unclear what such strategies might be. A characteristic of health programmes – safe motherhood being a good example – is that they have community components which receive less attention than their other components. The drawback is that it often turns out that the institutional components do not have effects as large as expected. For example, a study from South Africa attempted to predict the reduction in perinatal mortality that could occur if midwives in rural areas acted to reduce avoidable causes of death. A reduction of 22% might be possible, but only with “complete patient cooperation within an optimally functioning health system”.¹²⁰

In the early 1990s, the MotherCare project supported and evaluated a range of interventions in both communities and health systems. The evaluation highlighted the importance of (a) ensuring that referral facilities provided good quality obstetric care, which led to a *moderate* increase in uptake of services, and (b) involving women and their families in the identification of problems and mobilisation for referral.¹⁰⁸

The ‘purest’ community-based interventions were seen in the Warmi project, which ran from 1990 to 1993 in Inquisivi, Bolivia.¹²¹ The high Andean villages involved were a 6-8 hour bus trip from a referral hospital. There were no TBAs and husbands usually attended births.

Attention to the newborn infant was deferred until delivery of the placenta and breastfeeding was delayed. The baseline PMR was 103 per thousand births. The intervention involved the formation of women's groups in 50 communities, conducting action research, developing action protocols for a new cadre of birth attendant, training of the cadre, women and husbands in safe birthing practices, strengthening of referral linkages with the hospital, family planning education, and collaboration with NGOs for delivery of family planning services. Over the two-year course of the project, antenatal attendance increased from 45% to 77%, birth attendance by TBAs increased from 13% to 57%, family planning use increased from 0% to 27%, and PMR fell from 105 to 38 per 1000. Because of its important results, the Warmi project was the starting point for the MIRA Makwanpur study.

Guatemala's Quetzaltenango maternal and neonatal health project covered a population of 150,000 in the central highlands.¹²² Most births occurred at home, 80% attended by TBAs, and the nearby referral hospital was underused, probably because of perceived staff attitudes. An intervention aimed at improving the skills of 400 TBAs in recognising and referring maternal and neonatal complications, with concomitant sensitisation of other health care providers, succeeded in increasing the number of referrals to the hospital.

The Tanjungsari regionalization project was implemented from 1989 to 1993 in a population in West Java with 80% home births and high rates of TBA attendance.¹²³ Although the intervention involved the training of nurse-midwives for rural postings, and improvement of communication and transport links from village to hospital, it invested heavily in setting up community birthing homes. Subsequent uptake of the service was unimpressive.

At the other end of the community-institution spectrum was the example of Nigeria's intervention in Oyo and Bauchi states in the early 1990s. In this setting, the context was one of high service availability, with overcrowding of labour wards in the cities but a predominance of home births in rural areas. The intervention centred on training midwives in life-saving skills and all providers in interpersonal communication skills. This was augmented by improvements in equipment and supplies at first level referral facilities,

revolving drug funds on labour wards, introduction of partography and active management of the third stage of labour. The effect of all this appeared to be a fall in rates of complications at specialist centres.¹⁰⁸

A community-based approach to safe motherhood has also been evaluated in Tanzania.¹²⁴ Along with upgrading of health centres and hospitals through training and supply equipment, the project worked with community leaders, village health workers, facility-based providers and TBAs through a number of visits by master trainers. The minimum community mobilisation input was one visit, the maximum eight visits. The evaluation suggested that inputs had led to community-level plans for transportation during health emergencies, more social support for health workers, and more participation by women in community meetings. There was also evidence of increased knowledge of danger signs and birth planning, as well as some evidence for more timely referrals and transport. Most of these evaluations did not include comparison with a control area, and none of them involved multiple intervention and control areas.

2.5.5 *Intra-partum care in Nepal*

Table 2.9 summarises the findings of the NFHS, NMIS and DHS, and **Figure 2.9** presents MNPI scores. Over 90% of deliveries were home births, around 10% were attended by a health service professional and about a quarter were attended by a TBA. The commonest problems recalled by respondents in the NMIS were excessive post-partum vaginal bleeding, obstructed labour, weakness and malpresentation, although only three or four percent reported a problem. Of those who did, 21-31% said that they had sought help at a hospital, 17-20% at a private clinic, 9-11% with a traditional healer and 6% with a TBA. The time from symptom to getting help was reported but there were many missing data and the figures are questionable. A report from five safe motherhood programme districts (1997-1998) looked at information from six hospitals, available figures from national surveys, and a community-based study of 132 maternal deaths.⁹⁶ Taking a minimum acceptable level of one CEOC and four BEOC facilities for 500,000 population, none of the five districts achieved

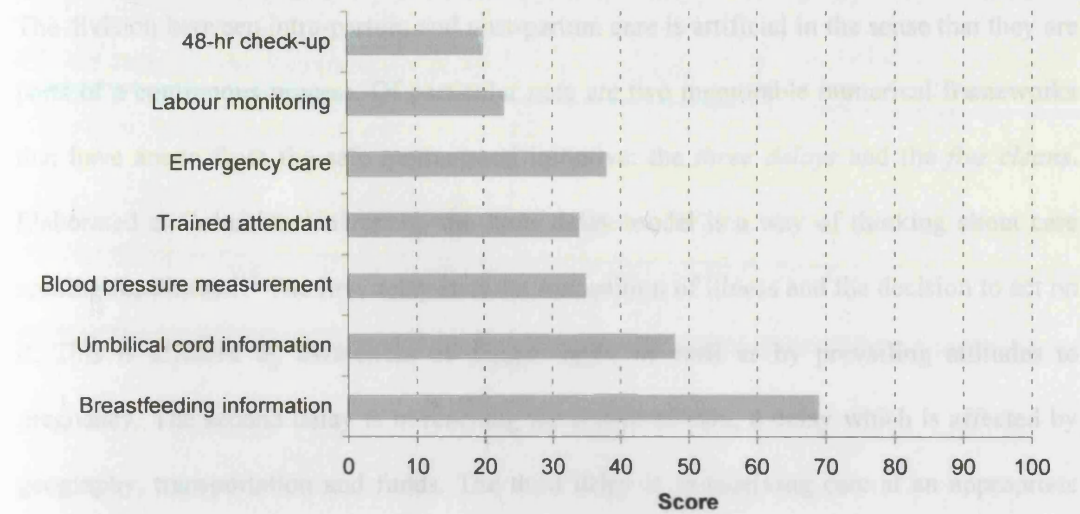
the target. The average travel time to an existing CEOC institution was 4.5 hours. All 43 deaths due to post-partum haemorrhage occurred at home. Taking a minimum acceptable level of 15% for the proportion of births in an EOC facility, one district achieved 22%, but the four others had coverages of less than five percent. The unmet need for treatment of obstetric complications was estimated at over 90% in these districts.

Table 2.9. Intra-partum care in Nepal

	NFHS 1996 ⁷⁹	NMIS 5th cycle ⁹²	NMIS further analysis ⁹³	DHS 2001 ⁷⁶
Birth place (%)				
Home	92	91	92	89
Health facility	8	9	8	9
Birth attendant (%)				
Doctor	6			8
Nurse/midwife	3		5	3
Other health worker	1			2
Traditional birth attendant	23	6	23	23
Relative or friend	56		72	55
Nobody	11			9
Used clean home delivery kit (%)	2	3	3	9

Figures extracted from original publications, regrouped for comparison and rounded to integers.

Figure 2.9 Nepal MNPI scores for delivery care services



MNPI: Maternal and Neonatal Programme Effort Index. Adapted from⁹¹

The loss of essential newborn care came in the early 1990s along with the realization of the neglect of the neonatal period. Its themes were articulated, however, as far back as 1965 in Klavin's advice on the nursing responsibilities, warmth, early and frequent breastfeeding, keeping mother and baby together, attention to hygiene, and prompt identification and treatment of illness.¹²⁰ The first contemporary guidelines were drafted by WHO in 1996.¹²¹ They are reproduced in Box 2.3, and cover cleanliness, thermal protection, initiation of breastfeeding, and eye care, as well as particular considerations for small infants, prematuration and other neonatal problems. The guidelines do not extend to implementation and programmes.

Subsequently, newborn care guidelines have been included in WHO's Integrated Management of Pregnancy and Childbirth,¹²²⁻¹²⁴ and the issue of essential newborn care has been examined in more detail. We now have a situation where ENC is a 'comprehensive strategy designed to improve the health of newborns through interventions before conception, during pregnancy, at and soon after birth, and in the postnatal period.'¹²⁵ Box 2.4

2.5.6 *Post-partum care and essential newborn care*

The division between intra-partum and post-partum care is artificial in the sense that they are parts of a continuous process. Of particular note are two memorable numerical frameworks that have arisen from the safe motherhood initiative: the *three delays* and the *five cleans*. Elaborated at Columbia University, the three delay model is a way of thinking about care seeking for illness.¹¹³ The first delay is in the recognition of illness and the decision to act on it. This is affected by awareness of danger signs, as well as by prevailing attitudes to pregnancy. The second delay is in reaching the source of care, a delay which is affected by geography, transportation and funds. The third delay is in receiving care at an appropriate facility. This is primarily affected by institutional factors. The five cleans make the presumptive connection between hygiene and improved outcomes: clean hands, clean perineum, clean delivery surface, clean instruments or delivery kit, and clean care of the umbilical cord.

The idea of *essential newborn care* arose in the early 1990s along with the realisation of the neglect of the neonatal period. Its themes were articulated, however, as far back as 1905 in Budin's advice on the *nursling*: resuscitation, warmth, early and frequent breastfeeding, keeping mother and baby together, attention to hygiene, and prompt identification and treatment of illness.¹²⁵ The first contemporary guidelines were drafted by WHO in 1996.¹²⁶ They are summarised in **box 2.3**, and cover cleanliness, thermal protection, initiation of breathing, breastfeeding and eye care, as well as particular considerations for small infants, immunization and other neonatal problems. The guidelines do not extend to implementation and programmes.

Subsequently, newborn care guidelines have been included in WHO's Integrated Management of Pregnancy and Childbirth,^{127 128} and the issue of essential newborn care has been examined in more detail. We now have a situation where ENC is a "comprehensive strategy designed to improve the health of newborns through interventions before conception, during pregnancy, at and soon after birth, and in the postnatal period."¹²⁹ **Box 2.4**

summarises current advice. It is obvious that ENC has been transformed from a limited rubric of practices to something altogether more ambitious. Unfortunately, if unsurprisingly, it is not clear how to implement the strategy in poor communities: "In general, it is easier to select ENC interventions to implement... than to operationalize them..."¹²⁹

Box 2.2. WHO guidelines for essential newborn care

Strategy	At birth	At conceptual discharge ^a	Home care advice	Danger signs for consultation	Management at health facility
Cleanliness	Clean delivery Hands Perineum Surface Cord cutting and tying Nothing applied to cord stump	Cord stump Clean and dry Tie tight with no bleeding Nothing applied	Cord stump dry and clean Sterile dry gauze) Nothing applied	Umbilicus red or draining pus Redness extends to skin	Give first dose of antibiotics Refer to hospital
Thermal protection	Warm place of birth Dry infant with warm cloth Skin-to-skin Warm wrapping Delayed bathing	Warm to touch	Warm wrapping If cold to touch, rewarm If too warm, undress	Cold to touch despite rewarming Hot to touch despite undressing Suckling or crying weakly	Measure body temperature If no danger signs and mild hypothermia, rewarm Otherwise refer
Initiation of breathing	If no cry at birth Check breathing If no breathing start resuscitation Aspiration of mouth and nose Bag and mask at health facility Mouth to mouth at home	Good cry No breathing difficulty		Difficulty breathing	Count breathing rate Look for retractions Look and listen for grunting If present refer
Breastfeeding	Early breastfeeding in first hr No prelacteal feeds No other fluids No pacifiers	Good suckling	Frequent early breastfeeding Day and night No food but breastmilk	Suckling weakly Does not wake for feeding	Observe suckling Check mouth for thrush If yes treat and reassess
Eye care	Clean eyes after birth Apply eye drops or ointment		No applications to eyes	Eyes swollen or draining pus	Red swollen eyes Draining pus Clean eyes Give parenteral antibiotic/refer
Low birth weight Preterm	Weigh baby or use surrogate Determine gestational age If weak and not suckling well, express breast milk into mouth	No breathing difficulty No feeding difficulty Warm	Frequent breast-feeding If not suckling well feed expressed breastmilk by cup and spoon Keep warm Visit for next immunization	Difficulty breathing Poor suckling Not pink	Difficulty breathing Not able to feed Lethargy Jaundice on palms and feet Refer
Immunization		Immunize as per policy			
Other problems				Pustules Jaundice on palms and feet Abnormal movements Convulsions, lethargy	Refer
Congenital anomalies Investigation of deaths	Registration of birth Reporting of death	Advice on treatment	Normal care	As for other newborn infants	Reporting of death Investigation of death

Adapted from [unclear]

^a Conceptual discharge means the time when the birth attendant leaves the mother and the baby or hands the responsibility over to a different care provider, often 2 to 24 hours after birth, adapted from¹²⁶.

Box 2.3. Recent essential newborn care guidelines from the BASICS II project

Before conception

Adequate care of the female child
Nutrition
Education
Health care
Immunization
Including tetanus toxoid
Birth spacing
Folate supplementation
Prevention of sexually transmitted infections
Avoidance of substance abuse: smoking and alcohol

Antenatal period

At least four visits with an emphasis on goal-oriented or focused antenatal care
Tetanus toxoid
Iron and folate
Adequate nutritious diet
Extra rest
Consumption of iodized salt by the family
In areas where malaria is endemic:
Mother (later with the baby) sleeps under an insecticide-treated bednet
Mother takes intermittent presumptive therapy
Detection and treatment of STIs
Interventions for HIV/AIDS, including voluntary counseling and testing
Birth preparedness:
Determination of place of delivery with the health care provider;
If home delivery
Adequate linen, washed and sun-dried
at least 5 pieces of cloth for delivery (may include a plastic sheet for the mother)
Clean new blade kept in its wrapper until the moment of use
Clean cord ties
All these items should be kept in a clean container
Setting aside or arranging money to pay for facility care for planned delivery or emergency
Identification of facility and transportation to be used in case of an emergency
Early detection of problems or emergencies
Appropriate referral to and care-seeking at suitable facility
Treatment of maternal problems

At and soon after birth (up to about 6 h)

Skilled birth attendant
Following clean delivery practices
Supported by an enabling environment
Skills, supplies, and suitable referral facilities
Application of principles of prevention of PMTCT
Detection of problems and emergencies and appropriate referral and care-seeking
Treatment of maternal problems
Essential preventive care for the baby:
Cleanliness and prevention of infection
Temperature maintenance
Eye care
Cord care
Early initiation of breastfeeding
Within one hour
Without prelacteal feeds
Advice on subsequent, frequent exclusive breastfeeding on demand day and night
Extra care for the low birth weight infant
Resuscitation at site of infants who do not breathe properly at birth
Detection, referral and appropriate care-seeking for infants with danger signs

Postnatal period

Consultation with mother and infant
Early in the first week, at least once before day 3, and followed up as required
Continued essential preventive newborn care
Continued application of inputs for PMTCT activities:
Feeding, antiretroviral therapy, counseling, nutrition
Postnatal vitamin A for the mother
Continued use of iron and folate
Intermittent therapy where malaria is endemic
Counseling on nutrition, family planning, prevention and treatment of STIs
Detection of danger signs and appropriate referral and care-seeking
Poor sucking or not sucking
Inactivity or lethargy - often denoted by families as "loose-limbed"
Fever or hypothermia
Respiratory distress
Convulsions
Vomiting
Abdominal distension
Severe umbilical infection (redness or swelling surrounding cord base or foul smell)
Jaundice reaching the palms and soles
Extensive pustules or skin infection
Swollen eyelids with pus discharge
Detection of minor problems, local treatment where necessary, follow-up, referral if needed:
Conjunctivitis
Minor umbilical infection
Pyoderma or skin infection
Thrush
Jaundice

Adapted from ¹²⁹

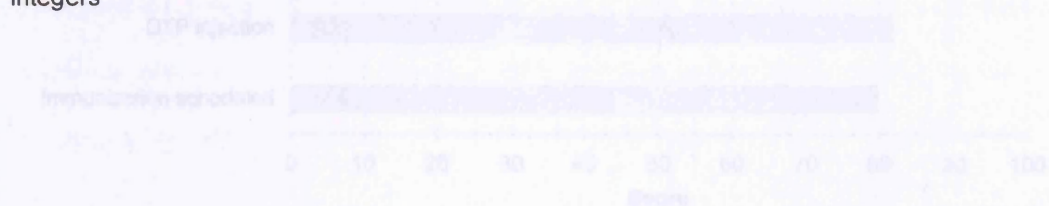
2.5.7 Post-partum and newborn care in Nepal

Table 2.10 summarises the findings of the NMIS and **Figure 2.10** presents MNPI scores. Little information has been collected on newborn care practices. What exists presents a more positive picture than one might expect, with about 60% of respondents recalling the use of a clean blade to cut the umbilical cord, and about 40% applying nothing to the cord stump. 10% of mothers recalled postnatal problems in either themselves or their infants. Common problems for mothers were fever, retained placenta, excessive bleeding and weakness. Common problems for infants were fever, weakness and breathing difficulties. About three-quarters of problems led to consultation, about a third of which were at a district hospital and another third at a private clinic.⁹²⁻⁹⁴ The NFHS of 1996 reported a figure of 18% for breastfeeding within the first hour of birth;⁷⁹ the NMIS figure was 16%, with 60% breastfeeding within the first three hours.⁹⁴ The MNPI figures support 60% clean cord cutting. It is interesting that mouth clearing earns a place in the score system, since it is a practice with a limited evidence base. Likewise, the concept of scheduling immunizations is abstract. Nepal's EPI is fairly successful, but only BCG vaccine would constitute an element of newborn care. The recommendation of eye prophylaxis with 1% silver nitrate or tetracycline has figured in ENC guidelines for the last ten years, but has not achieved either emphasis or adoption in Nepal.

Table 2.10. Post-partum and newborn care in Nepal

	NMIS 5th cycle ⁹²	NMIS further analysis ⁹³
Cord cutting implement (%)		
New or boiled blade	59	59
Cord dressing (%)		
No dressing	37	48
Antiseptic	6	6
Ash, ghee, turmeric, oil, dung, other	57	46

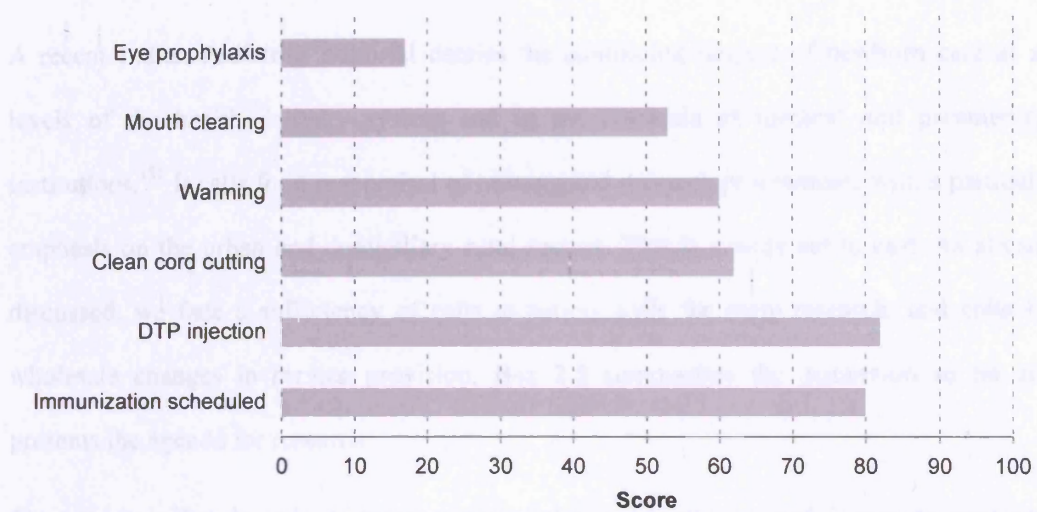
Figures extracted from original publications, regrouped for comparison and rounded to integers



MNPI: Maternal and Newborn Programme Efficacy Index. Adapted from [1]

Figure 2.10. Nepal MNPI scores for postnatal care services

2.6 Summary of knowledge and gaps to be filled



MNPI: Maternal and Neonatal Programme Effort Index. Adapted from⁹¹

2.6 Summary of knowledge and gaps to be filled

A recent Indian Pediatrics editorial decries the continuing neglect of newborn care at all levels of the health delivery system and in the curricula of medical and paramedical institutions.¹³⁰ It calls for a reappraisal of training and research programmes with a particular emphasis on the urban and domiciliary rural sectors. This is a wide net to cast. As already discussed, we face a sufficiency of calls to action, calls for more research, and calls for wholesale changes in service provision. **Box 2.5** summarises the discussion so far and presents the agenda for research.

The trouble is that, in order to improve perinatal and neonatal survival, it may be necessary to work across as wide a range of sectors as the various calls suggest. Although studies show that the burden of risk for perinatal mortality lies mainly with complications of labour,⁶² this does not mean that intervention in hospitals alone will suffice. In a study from highland Papua New Guinea, neonatal deaths were classified through physician-led case discussion.⁸⁸ Avoidable deaths in the community occurred as a result of lack of antenatal care in high-risk pregnancy, high-risk home delivery, prolonged rupture of membranes and subsequent neonatal sepsis, prolonged labour with delayed presentation, delayed presentation, informal adoption or abandonment leading to malnutrition, septicaemia as a result of traditional remedies, and haemorrhage from a poorly tied umbilical cord. Avoidable failures in preventive health services included lack of immunisation and lack of screening for maternal syphilis. Failures in primary curative health services were common: closure of facilities, lack of standard drugs, client default because of inadequate care. Failures at the level of referral hospital included delayed or inappropriate antibiotic use, mismanagement of obstructed labour, long outpatient waiting times for sick children, and inappropriate early labour ward discharge. Where in this long list do we begin?

Box 2.4. A catechism for neonatal survival in developing countries

Scope of the problem

10.8 million children under five die each year
4-5 million newborn infants die each year
4-5 million infants are stillborn each year
The rates of fall in U5MR and IMR are slowing
The falls in U5MR and IMR have been driven by reductions in post-neonatal mortality
NMRs have remained relatively static
As U5MR and IMR fall, the relative contribution of NMR rises
In many countries, NMR now represents two-thirds of IMR and half of U5MR
Early neonatal mortality represents two-thirds of neonatal mortality
We cannot achieve child survival goals unless we focus on the late fetal and neonatal periods
Stillbirths are underreported and neonatal deaths are probably underreported
Early neonatal deaths are often misclassified as stillbirths
Hospital studies are unrepresentative and community data are scarce

Programme priorities

Regions which drive global figures: south Asia and sub-Saharan Africa
Home births and community interventions
Birth asphyxia, preterm, infections and low birth weight
The first week after birth, especially the first 24 hours
Rectifying delays in care-seeking and access to care
Participatory communication with local ownership of programmes
Linkage between maternal, neonatal and child survival programmes

Information gaps and suggested research

Magnitude and causes of perinatal morbidity and mortality
Evaluation of knowledge, attitudes and beliefs about perinatal health in family, TBAs and community health workers
Evaluation of health care seeking behaviour for perinatal illnesses
Design of appropriate packages of interventions
Community-based studies to determine existing obstetric practices and neonatal care
Community-based studies of intervention effectiveness
Design and evaluation of a package of simple practices for the routine post-partum care of neonates born in the community
Identification of principal risk factors for morbidity and mortality from neonatal infection
Identification of principal bacterial and viral agents of neonatal infections in the community
Determination of antimicrobial resistance profiles in community and hospital settings
Evaluation of simple diagnostic schemes for neonatal infection
Development and evaluation of training curricula and continuing medical education for health workers
Design of strategies to improve access to emergency obstetric care
Studies of methods to increase referral rates for complicated pregnancies
Testing of quality assurance mechanisms for care at the levels of community, health centre and referral hospital
Evaluation of program effectiveness and impact

Extracted from ^{64 65 67 131-133 74}

Chapter 3 An introduction to Nepal

3.1 Geography

Nepal occupies a rectangle covering about 147,000 square kilometres in the lap of the

Bachha paaune kahile kahile

Kokro banaaune ahile

Wait until the baby is born before you build the cradle

Nepalese proverb, translated by the author and quoted in ¹³⁴

population.¹³² Transport and communication are fairly easy, particularly through the use of the East-West highway. Climate is interesting and very diverse. On the background of a monsoonal weather pattern, mountainous highland areas vary between below zero and 20°C, hill belt between 3° and 31°, and plain belt between 5° and 31°C.¹³⁶

3.2 Administration

Nepal is divided administratively into five development regions, 14 zones, 75 districts, 59 municipalities and 3914 Village Development Committees. Each district is administratively made up of a municipality and a number of VDCs. Since the development of the country, Nepal has been a constitutional monarchy with a parliamentary democratic form of government. The royal court has a ceremonial role. The 1990 Constitution of Nepal was promulgated after the 1990 elections. The 1990 Constitution was promulgated after the 1990 elections, which was replaced by a monarchy in 1971. The 1990 Constitution was replaced by a democratically elected government after the revolution of 1990-1991. At that time, the government was elected through a House of Representatives, a structure which included 200 representatives.

Subsequently, a policy of decentralisation which would help to improve and improve local self-governing institutions. Even governance institutions were strengthened by the

3.1 Geography

Nepal occupies a rectangle covering about 147,000 square kilometres in the lap of the Himalaya. It is bordered to the North by the Tibetan Autonomous Region of the People's Republic of China, and to the East, South and West by India (**figure 3.1**). It tiers down to the gangetic plain through three ecological zones: mountains (*himal*), hills (*pahaad*) and plains (*terai*). The harsh terrain of the mountain belt is home to about seven percent of the population and communications are limited. The hill belt is more densely populated and hosts about 44% of the population. Between the hills lie fertile valleys, such as that of Kathmandu, and communication is easier. The southern plain belt is flat, densely populated and fertile. Although it occupies a quarter of Nepal's land area, it is home to half the population.¹³⁵ Transport and communication are fairly easy, particularly through the artery of the East-West highway. Climatic conditions vary with altitude. On the background of a monsoonal weather pattern, mountain belt temperatures vary between below zero and 30°C, hill belt between 3° and 41°, and plain belt between 5° and 41°C.¹³⁶

3.2 Administration

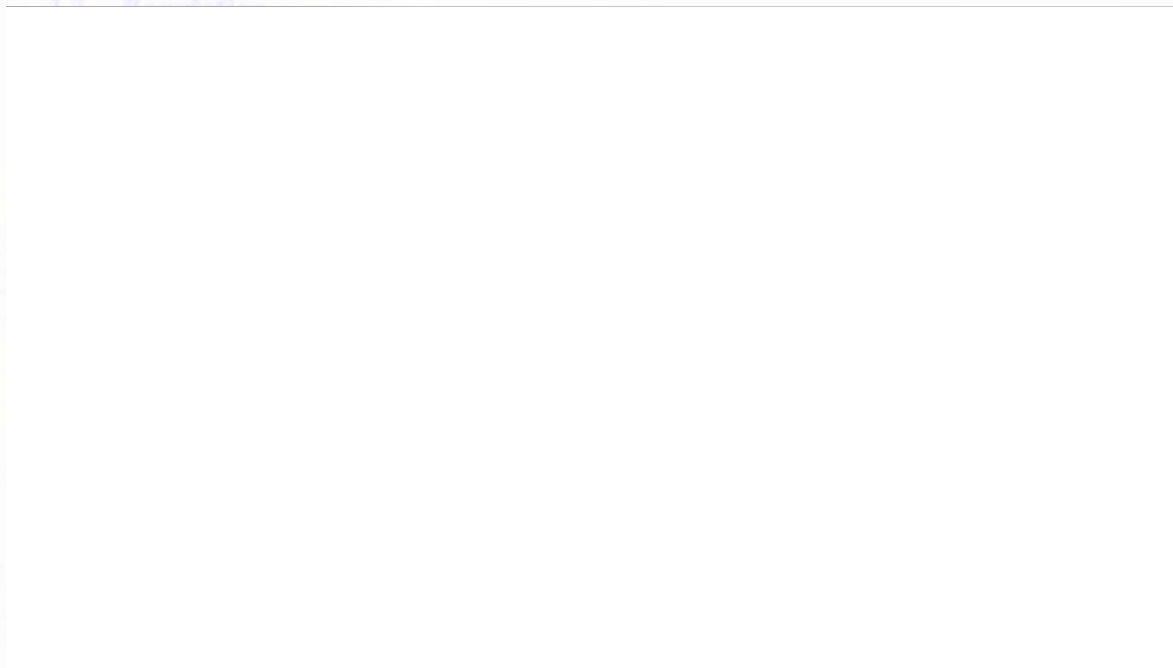
Nepal is divided administratively into five development regions, 14 zones, 75 districts, 58 municipalities and 3914 Village Development Committees. Each district is characteristically made up of a municipality and a number of VDCs, which are themselves subdivided into wards. Nepal has been a constitutional monarchy with a parliamentary democracy since 1991. The legislature has a two-tier system with upper and lower houses. Historically, feudal states were subsumed under the oligarchy of the Rana Prime Ministers, which was in turn replaced by a monarchy in 1951. Power has been vested in a democratically elected government since the revolution of 1990-1991. At district level, administration is conducted through a District Development Committee which includes VDC representatives.

Unfortunately, a policy of decentralisation which would lead to decision making at local level (reflecting somewhat donor-driven governance trends) has been compromised by the

exigencies of the seven-year Maoist insurrection and the dissolution of DDCs. Almost all aspects of life have been affected by the insurrection. Aside from the direct effects of violence, food security and health service delivery have been compromised, travel has been limited and there have been concerns for the health and development of child soldiers.

exigencies of the seven-year Maoist insurrection and the dissolution of DDCs. Almost all aspects of life have been affected by the insurrection. Aside from the direct effects of violence, food security and health service delivery have been compromised, travel has been limited and there have been concerns for the health and development of child soldiers.

Figure 3.1. Nepal map



3.3 Population

Nepal has a population of 23.2 million, 86% of whom live in rural areas.¹³⁵ **Table 3.1** shows examples of serial figures that reflect a gradual decrease in the proportion of the population in childhood, an increase in population density and a tendency (albeit less than in some other Asian countries) towards urbanisation.

Table 3.1. Selected population indicators for Nepal

3.4 Ethnicity

	1991 ¹³⁷	2001 ¹³⁵
Population	Millions (%)	Millions (%)
0-4 years	2.9 (15.9)	3.5 (15.2)
5-9 years	2.6 (13.9)	3.2 (13.7)
10-14 years	2.3 (12.5)	2.8 (12.1)
15-19 years	1.9 (10.3)	2.4 (10.2)
Total	18.5 (100.0)	23.2 (100.0)
Intercensal growth rate %	2.1	2.2
Density per km ²	126	157
Urban population %	9.2	14.2

language or dialect. Nepali – the official language – is the mother tongue of about 80% of the population. Although Nepali is the world's only Hindu state and over 80% of the population identify themselves as Hindu, there is a large Buddhist minority (10.7%)¹³⁸ and other statistics vary with census methods.

3.5 Economy

The estimated per capita gross domestic product for 2000-2001 was USD 240, at a growth rate of 5.8%.¹³⁹ Although the proportion of people below the poverty line fell from 42% to 38% between 1996 and 2001, poverty reduction remains a major challenge. 70% of the population continues to rely on agriculture for their livelihoods, and fragmentation of land ownership, slow adoption of technologies and poor road accessibility have hindered growth. The non-agricultural sector – and particularly the urban service sector – is now the primary driver of economic growth, whose contribution to gross domestic product has risen from 10 to 20% over the last 20 years.¹⁴⁰ The last decade has also seen an increase in rural-to-urban migration, accelerated by the insurgency.

3.6 Education

Literacy rates doubled in the 20 years between 1981 and 2001 (Figure 3.1). Particularly heartening is the increase in female literacy. Primary school enrollment rates have risen to 100%, but there is significant drop-out (25%) in the first few years.^{141, 142}

3.4 Ethnicity

The 2001 Census identified 103 castes, ethnic groups and subgroups. Groups making up more than five percent of the total were: Chhetri (15.3%), Brahmin (12.7%), Magar (7.1%), Tharu (6.8%), Kami (5.7%), Tamang (5.6%) and Newar (5.5%).¹³⁵ The ethnic distribution originated from two major groups: Indo-Aryans, who constitute about 80% of the population, and Tibeto-Burmans, who constitute about 17%.¹³⁷ There are 92 prevalent languages or dialects. Nepali - the official language - is the mother tongue of about half the population. Although Nepal is the world's only Hindu state and over 80% of the population identify themselves as Hindu, there is a large Buddhist minority (10.7%)¹³⁵ and official statistics vary with census methods.

3.5 Economy

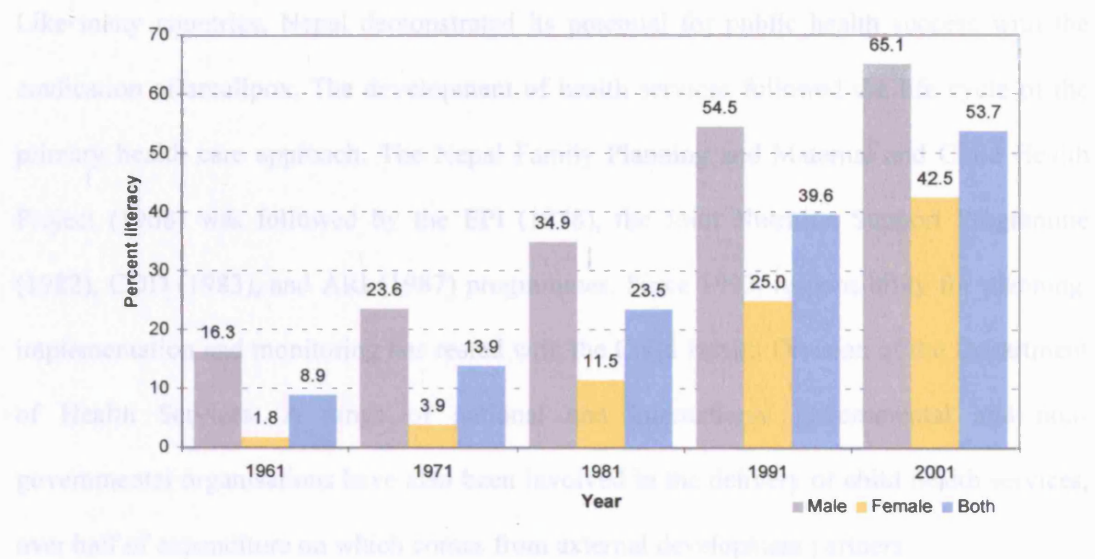
The estimated per capita gross domestic product for 2000-2001 was USD 240, at a growth rate of 8.6%.¹³⁸ Although the proportion of people below the poverty line fell from 42% to 38% between 1996 and 2001, poverty reduction remains a major challenge. 80% of the population continue to rely on agriculture for their livelihoods, and fragmentation of land ownership, slow adoption of technologies and poor rural accessibility have limited growth. The non-agricultural sector - and particularly the urban service sector - is now the primary driver of economic growth, whose contribution to gross domestic product has risen from 40 to 60% over the last 20 years.¹³⁹ The last decade has also seen an increase in external migration, accelerated by the insurgency.

3.6 Education

Literacy rates doubled in the 20 years between 1981 and 2001 (**figure 3.2**). Particularly heartening is the increase in female literacy. Primary school enrollment rates now approach 100%, but there is significant dropout (3.5%) in the first few years.^{140 141}

Figure 3.2. Literacy rates

3.7 Health service planning



Sources: ^{137 142}

... year plans have been developed, from the first plan of (1961-67) to the tenth plan of 2002-2007, behind which two long term health plans and a national health policy have provided continuity of purpose. The year of the plans has altered with the development of health services and with international changes in strategy. From the intensive emphasis in the first plan, subsequent plans have emphasised preventive care, the rural population, the integration of vertical projects, the primary health care approach, mothers' basic health needs, and a *Shree-Sangathan* partnership approach. The second long term health plan (1967-2017) noted that in 1968 Nepal had lost 7.7 million DALYs and that 51% of the loss was in the under-five age group. The plan particularly addresses disparities in care and equitable access.¹³⁷

The tenth five-year plan of 2002-2007 emphasises poverty reduction, public-private partnership, and decentralisation. Its major child health objectives include the reduction in mortality summarised in table 3.2. Other targets of relevance to neonatal health include the elimination of neonatal tetanus, reductions in morbidity and mortality from acute respiratory infection and diarrhoeal disease, the virtual elimination of vitamin A deficiency and reductions in the prevalences of protein-energy malnutrition and low birth weight. Specific among strategies planned to meet these objectives are an emphasis on curricula

3.7 Health service planning

Like many countries, Nepal demonstrated its potential for public health success with the eradication of smallpox. The development of health services followed the life cycle of the primary health care approach. The Nepal Family Planning and Maternal and Child Health Project (1968) was followed by the EPI (1978), the Joint Nutrition Support Programme (1982), CDD (1983), and ARI (1987) programmes. Since 1993, responsibility for planning, implementation and monitoring has rested with the Child Health Division of the Department of Health Services. A range of national and international governmental and non-governmental organisations have also been involved in the delivery of child health services, over half of expenditure on which comes from external development partners.

Ten five year plans have been developed, from the first plan of 1956-1961 to the tenth plan of 2002-2007, behind which two long term health plans and a national health policy have provided continuity of purpose. The tenor of the plans has altered with the development of health services and with international changes in strategy. From the curative emphasis of the first plan, subsequent plans have emphasised preventive care, the rural population, the integration of vertical projects, the primary health care approach, minimum basic health needs, and a donor-governmental partnership approach. The second long term health plan (1997-2017) noted that in 1996 Nepal had lost 7.7 million DALYs and that 51% of the loss was in the under-five age group. The plan particularly addresses disparities in care and equitable access.¹⁴³

The tenth five year plan of 2002-2007 emphasises poverty reduction, public-private partnership, and decentralisation. Its major child health objectives include the reductions in mortality summarised in **table 3.2**. Other targets of relevance to neonatal health include the elimination of neonatal tetanus, reductions in morbidity and mortality from acute respiratory infection and diarrhoeal disease, the virtual elimination of vitamin A deficiency and reductions in the prevalences of protein-energy malnutrition and low birth weight. Notable among strategies planned to meet these objectives are an emphasis on community

participation, the consolidation of a community based combined child health package, intersectoral coordination and collaboration and the introduction of a policy on neonatal care.

Table 3.2. Summary of recent targets relevant to perinatal and neonatal health

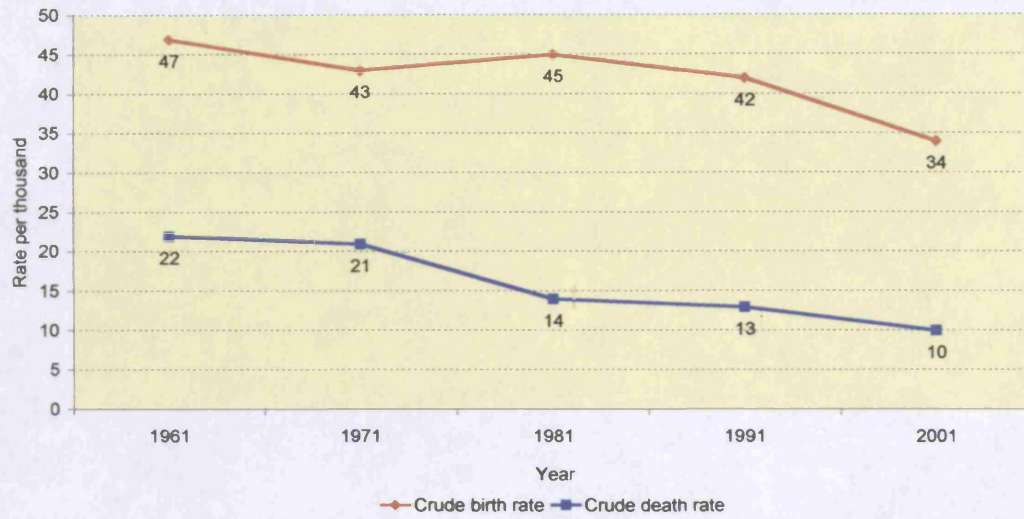
3.3 Progress in health indicators

Target	9th Five Year Plan 1997-2001 ¹⁴⁴	10th Five Year Plan 2002-2007 ¹⁴⁵	2nd Long Term Health Plan 1997-2017 ¹⁴³	Current estimated level
Reduce IMR to per 1000	61.5	45	34.4	64.4 ⁷⁶
Reduce U5MR to per 1000	102.3	72	62.5	91.2 ⁷⁶
Reduce NMR to per 1000		32		38.8 ⁷⁶
Reduce MMR to per 100,000	400	400	250	539 ⁷⁹
Reduce CBR to per 1000	33.1	30	26.6	Urban 20.6 Rural 34.9 Total 33.5 ⁷⁶
Reduce TFR to per woman		3.5	3.05	Urban 2.1 Rural 4.4 Total 4.1 ⁷⁶
Increase deliveries attended by trained health workers to %	50		95	13 ⁷⁶
Reduce low birth weight prevalence to %	23			27 ¹⁴⁶

3.8 Progress in health indicators

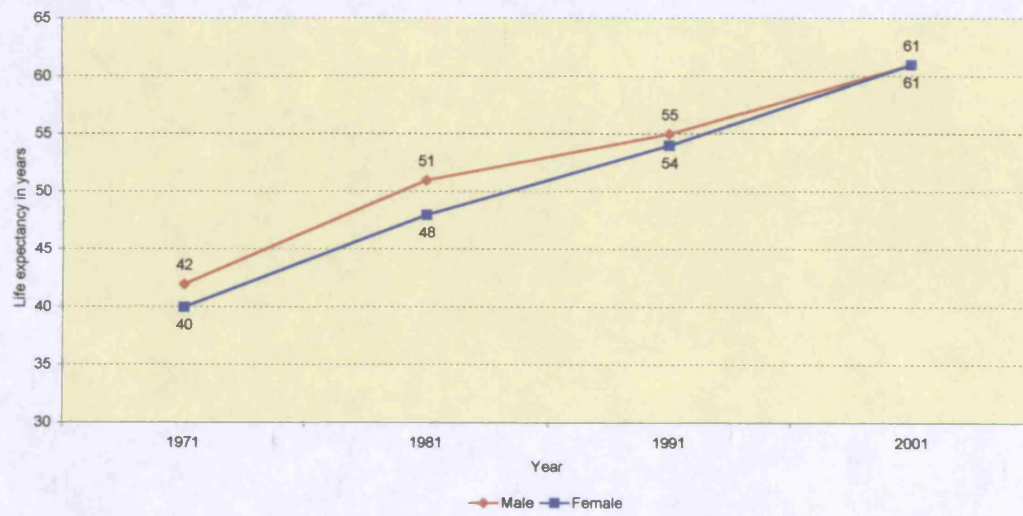
Steady improvements have been seen in health indicators over the last 30 years. **Figures 3.3** and **3.4** present crude birth and death rates and life expectancies. The crude death rate halved between 1977 and 2001, from 22 to 10 per thousand, and the gap between crude birth and death rates widened. Life expectancy has seen a steady increase. Importantly, the life expectancy of females is now equal to that of males (although one might hope for it to be longer). This removes the oft-quoted gender disparity due to an excess of maternal mortality. Maternal mortality ratios fell from 850 per hundred thousand live births in 1991 to 539 in 1996, although such estimates suffer from sample size imprecision. The median age at first marriage for women had risen from 16.2 years in 1996⁷⁹ to 16.6 years in 2001.⁷⁶ The age at first birth is reported to be 19.8 years.⁷⁹ This seems rather high, and one would imagine that first conception would take place sooner after marriage. The median inter-pregnancy interval is around 32 months,^{76 79} and is estimated to be less than two years in 22.8% of cases.⁷⁶

Figure 3.3. Crude birth and death rates



Data from 137 147

Figure 3.4. Life expectancy by gender



Data from 137 147

Chapter 4 Objectives and methods

The deaths occurring during the first year of life are very unevenly distributed. This applies to all countries, and all statistics that I have been able to find prove this absolutely. The greatest percentage of deaths occurs in the first three months of life, and I believe that this percentage is increasing and not decreasing.

Graham EE. Infant mortality. 1908¹⁴⁸

4.1 Statement of objectives

The thesis considers the documentation of care practices, stillbirths and neonatal deaths in rural communities in rural Nepal. It describes a programme of work to answer the following questions.

- What are the patterns of antenatal, delivery and neonatal care practices?
- Is it possible to design and implement a vital registration system to identify pregnancies, births and neonatal outcomes?
- If the system is operable, what are the stillbirth rates, perinatal mortality rates and neonatal mortality rates?
- How credible and reliable is the system?
- How might the system be modified to make it simpler, cheaper and more accurate?

4.2 Tasks for achieving the objectives

In order to answer the thesis questions, a hierarchy of tasks were fulfilled.

- Conduct a cross-sectional census of antenatal, delivery and neonatal care practices.
- Design and implement a surveillance system for pregnancies, births and neonatal outcomes.
- Document care practices prospectively.
- Document neonatal outcomes prospectively.

The thesis presents the methods according to this hierarchy, and the results and discussion according to the foregoing objectives. Fieldwork was carried out from 1998 to 2004, in the context of the design and implementation of a cluster-randomised controlled trial of the effect on birth outcomes of a participatory intervention with women's groups. The MIRA Makwanpur study had three advantages in terms of the thesis questions: it was community-

based, the communities were rural, and the investigator was involved in the design process from its initiation.

4.3 Methods

4.3.1 Setting

Makwanpur District lies to the south of Kathmandu in the Narayani Zone of the Central Development Region. **Figure 4.1** locates the study site and **table 4.1** presents descriptive indices for the district. Makwanpur's Human Development Index of 0.309 falls about halfway between the highest and the lowest in Nepal. Its Gender Sensitive Development Index was 0.231 in 1999^a. Topographically, Makwanpur includes both hill and plain areas and has two main motorable roads. The district is divided administratively into 43 village development committees and a municipality, and its population subsists mainly on agriculture. The municipality of Hetauda is the site of the MIRA Study office. Its 24-bed district hospital has facilities for antenatal care and delivery, although operative delivery was not available during the study period. Perinatal health care is provided by personnel from 40 sub-health posts or health posts at village development committee level, as well as by four primary health centres and the district hospital. TBAs are available in all localities.

^a Human Development Index: a multifactorial index derived from life expectancy at birth, adult literacy rate, gross enrolment ratio, and GDP per capita (PPP US\$). Gender-related Development Index: a multifactorial index derived from female compared with male life expectancy at birth, female compared with male adult literacy rate, female compared with male gross enrolment ratio, and female compared with male estimated earned income.

Table 4.1. Makwanpur District: descriptive indices from the 2001 census

Human Development Index	0.309
Area (km ²)	2426
Village Development Committees	43
Households	71,112
Mean household size	5.5
Households with access to toilets (%)	67
Households with access to safe drinking water (%)	62
Population	
Total (% of total)	392,604 (100)
0-4 years (%)	48,221 (12)
5-9 years (%)	56,684 (14)
10-14 years (%)	55,326 (14)
Sex ratio (males/females)	1.03
Population per doctor	35,691
Population per hospital bed	7852
Literacy	
Overall (%)	63
Male (%)	72
Female (%)	54
Net enrollment ratio	
Primary (%)	88
Lower secondary (%)	27
Secondary (%)	14

Data from¹⁴⁹. Figures rounded to integers

4.3.2 *The MIRA Makwanpur study*

The MIRA Makwanpur study provided the background for the thesis. It is summarised in **box 4.1**. More detail is available in two publications, included as **annexes A and B**.^{150 151} The aims of the fieldwork, summarised in the previous chapter, arose out of the need to measure mortality rates and to describe perinatal behaviour in order to address the outcomes of the trial. Evaluation activities covered all 48 VDCs involved in the cluster randomised trial, both intervention and control. It was important that there should be no difference between control and intervention areas from the standpoint of the monitoring activities. However, the analysis presented here covers *control areas only*, since I am examining recall-based and prospective data rather than the effects of an intervention.

Box 4.1. The trial frame within which the thesis sits

The MIRA Makwanpur study

A cluster randomised, controlled trial of a community-based participatory intervention to improve the health of pregnant mothers and their newborn infants. The study aimed to examine the potential of community action cycles to bring about improvements in health outcomes. This has policy implications for most developing countries, especially where institutional birth is a limited option. The trial tested a large scale intervention, employing facilitators to work with women's groups in a population of 170,000 covering 1600 square km. A cluster design was chosen because the intervention was structured around communities rather than individuals.

Objectives

We hypothesised that a community-based participatory intervention could reduce neonatal mortality rates from 60 to 40 per thousand live births.

Outcomes

The primary outcome was neonatal mortality rate. Secondary measures included changes in patterns of home care, health seeking and referral.

Design

The cluster randomised, controlled design was predicated on neonatal mortality rates as the primary outcome and the VDC as the cluster unit of randomisation. The 42 rural VDCs of the district were matched into 21 pairs on the basis of geography, population and ethnicity. 12 pairs were then randomly selected. Finally, one VDC per pair was randomly allocated to receive the intervention and one to act as a control. Sample size was estimated using existing estimates of neonatal mortality rates and expected pregnancies, with a k value (design effect) set at a range of values around 0.2.¹⁵²

The intervention

The key elements of the intervention were the activities of 12 local female facilitators. Each facilitator worked in one VDC, covering an average population of 7000. The facilitator - a literate, locally resident woman - convened one women's group meeting per month in each of 9 wards. Some groups convened by local female community health volunteers already existed, but their activity was sporadic. The role of the facilitator was to activate and strengthen groups and support them through an action research cycle. Although it was important that none of the facilitators had a health background, they were given brief training in perinatal health issues.

The first step was to explore issues around childbirth and care behaviours in the community. This allowed the facilitators to develop participatory learning skills, and generated a body of information on pregnancy and childbirth covering beliefs and practices in both uncomplicated and complicated maternities. The facilitators then supported the women's groups through monthly meetings. The groups identified important local maternal and neonatal problems, discussed them and formulated strategies to address them. They then shared their work at meetings with the wider community. This phase of ten meetings lasted almost a year. In the next steps, the women's groups implemented and evaluated their strategies. One result of the process was that women sought more information about perinatal health. This was provided through the iterative design and playing of a picture card game that addressed prevention, treatment and consultation for common problems in mothers and babies.

The form and content of discussions within women's groups varied, as did levels of involvement and potential strategies. Some common strategies were community-generated funds for maternal or infant care, stretcher schemes, production and distribution of clean delivery kits, home visits by group members to newly pregnant mothers, and awareness raising using a locally made film to create a forum for discussion.

Other inputs: Institutional perinatal health care strengthening

A baseline service audit identified weaknesses in the provision of antenatal, delivery and newborn care. Because the study aimed to test solely the effects of the women's group intervention, health service strengthening activities were carried out in both intervention and control areas. We decided to do this on ethical grounds because we hoped that it would benefit control areas, and on theoretical grounds because we felt that a degree of improvement in services would be necessary for the success of the trial intervention. We therefore ensured that primary health centres in the study area were equipped with locally-made resuscitaires, phototherapy units, warm cots and neonatal resuscitation equipment. We remedied some shortfalls in essential neonatal drugs once only and discussed strategies for resupply with local health service managers. In partnership with the District Public Health Office, we organised training in essential newborn care for all cadres of government health staff, as well as for female community health volunteers and traditional birth attendants.

4.3.3 Ethical agreement and consent

The study was registered as an International Standard Randomised Controlled Trial, number ISRCTN31137309 (<http://www.controlled-trials.com/isrctn/trial/0/31137309.html>), conformed with the declaration of Helsinki,¹⁵³ and was published in accordance with the CONSORT guidelines.¹⁵⁴ It was approved by the Nepal Health Research Council and the ethical committee of the Institute of Child Health and Great Ormond Street Hospital for Children, and was conducted in collaboration with His Majesty's Government Ministry of Health, Nepal. We discussed the aims and design of the trial at a national meeting in 1998. There followed a series of meetings with members of the Makwanpur District Development Committee, the Chief District Officer and local stakeholders. In early 2000, the chairpersons of all VDCs involved in the study gave signed consent on behalf of their communities.

Women who chose to participate in the study gave verbal consent and were free to decline to be interviewed at any time. Benefits to the control communities were improvements in equipment and training provided at all levels of the health care system. All community-based members of the study team were recruited locally and carried out their activities in their home areas. When the surveillance team noted minor illness in mothers or infants, they encouraged attendance at an appropriate health facility. In the event of severe illness, team members had an ethical responsibility to assist with rapid and appropriate transport and treatment, regardless of allocation. All information provided by participants remained confidential. Access to information was limited to interviewers, supervisors, data auditors and officers, and research staff at the analytical level. No analyses or outputs included the names of participants.

4.3.4 A conceptual framework for rural perinatal care

The preparatory work for the trial intervention involved extensive study of the ethnography of childbirth in rural Makwanpur. This work was largely qualitative and is not presented in the thesis. Because of its importance and potential interest for the reader, however, a publication is included in **annex C**.¹³⁴

4.3.5 Training of health care workers

A second important area was our understanding of relevant care issues. Although the intervention under trial was not based on a blueprint for successful childbirth – it did not have a series of specific messages to put across to beneficiaries – it could not take place in a vacuum. At the least, the health system strengthening activities required an understanding of which aspects of perinatal and neonatal care would be relevant and useful for health care workers. We used a synthesis of available recommendations (see, for example, **box 2.4**) to develop training materials for workers at all levels from TBA to hospital doctor. A summary of the content of training modules is shown in **table 4.2**. Like the evaluation tools, the training model took a chronological (*autobiographical*: see below) approach, beginning with pregnancy and following potential activities through to the neonatal period. The guidelines focused on advice and planning rather than instrumental intervention. Two specific instrumental issues were emphasised: delivery of the placenta, a subject which reinforced any previous training from the obstetric angle, and resuscitation of the asphyxiated infant. All of the content was in agreement with models developed by bodies such as the National Neonatology Forum of India.

Table 4.2. Summary of content of training for health workers

Pregnancy	Delivery	Essential newborn care
Advice on...	Plan for delivery	Preparation
Adequate rest	Clean place for delivery	Establish breathing
Smoking and alcohol	Clean delivery	Clean cord cutting and cord care
Nutrition	Help with delivery	Keep the baby warm
Personal hygiene	Normal labour	Early and exclusive breastfeeding
Breast care and feeding	Delivering the placenta	Start immunisation schedule
Iron and folate supplements		
Tetanus toxoid		
Plans for...		
Antenatal visits		
Birth attendant		
Delivery		
Clean delivery place		
Clean delivery		
Referral and transport		
Family planning		

4.3.6 *Parameters for a lay model of perinatal care*

There was an obvious overlap between the content of professional and lay models of perinatal care. For example, the signs by which health workers and mothers might identify illness would be expected to be identical unless their elicitation required training. Warning signs that should trigger referral by health workers are largely the same as those that should alert families to the existence of a serious illness. **Table 4.3** – again synthesising many sources – attempts to summarise warning signs. The evident problem is the number of such signs, and the need to judge the situation on its merits. Likewise, there are issues of degree: most researchers in this area are aware of the lack of specificity inherent in concepts such as foul smelling vaginal discharge, headache and the colour of liquor.

Table 4.3. Summary of warning signs for maternal and newborn illness

Pregnancy	Delivery	Newborn
<p><i>Serious illness</i> Pale and sweaty Anxious, confused, restless Rapid breathing Drowsy or unconscious Convulsion</p> <p><i>Abortion and fetal death</i> Baby stops moving Vaginal bleeding Worsening stomach pain Fever Offensive vaginal discharge</p> <p><i>Eclampsia</i> Pregnant more than 5 m Headache Swollen legs Blurred vision or seeing spots Restless Nausea and vomiting Not passing much urine Difficulty in breathing Convulsion</p> <p><i>Malpresentation</i> Belly wider than usual Womb low for gestation Baby lying crossways Breech delivery</p> <p><i>Antepartum Haemorrhage</i> Any bleeding from vagina</p> <p><i>Premature labour</i> Labour before expected Sudden gush of fluid Constant leakage of fluid Stomach pain Fever</p>	<p><i>Prolonged labour</i> Strong pains for 12 h or more Baby seems to be stuck Waters brown Similar problem before</p> <p><i>Retained placenta</i> Placenta not out in half an hour Only a piece of placenta out Vaginal bleeding</p> <p><i>Post-partum Haemorrhage</i> Vaginal bleeding soaks floor Vaginal bleeding does not stop</p> <p><i>Sepsis</i> Fever and chills Anything put into the vagina Foul smelling vaginal discharge Tender belly Any later vaginal bleeding</p>	<p><i>Serious illness</i> Unable to breastfeed Vomits everything Convulsion Lethargic or unconscious</p> <p><i>Hypothermia</i> Head, chest and belly cold Not dried and wrapped at birth</p> <p><i>Birth asphyxia</i> No cry at birth Abnormal breathing Very drowsy at birth Bruises or very squashed head Not moving arm or leg Long labour or difficult delivery Convulsion</p> <p><i>Low birth weight</i> Looks small Born earlier than expected</p> <p><i>Infection</i> No tetanus toxoid given Maternal fever before birth Waters broken over 24 h Waters smelled offensive Stiff and arching back Spasms Red ring around umbilicus Stools like water Hot or cold even if wrapped Cord cut with unclean object Difficulty breathing Cannot open mouth Convulsions Pustules on skin</p> <p><i>Feeding problem</i> Not feeding well and often Not growing Mother's milk insufficient</p>

The challenge was to disaggregate this vocabulary of maternal and infant signs, and the content of health worker activities, in order to (a) be clear about what was likely to be beneficial and (b) be able to convey this to people in the community. The result of the process is the scheme shown in **figure 4.2**. The scheme tries to itemise the specific influences that could be brought to bear on survival at community level.

In **Figure 4.2**, blue boxes represent activities thought to be beneficial for maternal and neonatal health, yellow boxes represent clinical entities, and red boxes represent warning signs that might be visible to families. The maternal signs - pallor, a swollen face and vaginal bleeding during pregnancy - are not exclusive. The choice of these three signs was based on specificity rather than sensitivity. It is notoriously difficult to identify and classify pregnancy-induced hypertension in the absence of convulsions. Choosing swollen legs or headache as key signs would lead to a heavy burden of care-seeking. The same goes for fever, weakness, abdominal pain and fatigue. One might argue that this would be a good thing, since it might lead to increased service uptake (after all, pregnant women who feel tired in the UK can access antenatal guidance). This is not the purpose of the framework, which is primarily focused on translating beneficial actions into improvements in clinical signs.

The framework can be read in two directions: from red to blue and from blue to red. Reading from red to blue gives an idea of the clinical entities that produce warning signs and the remedial actions possible. For example, vaginal bleeding may be an antepartum haemorrhage, and antepartum haemorrhage may be prevented by antenatal care. If bleeding is post-partum, it may be associated with retained placenta. In both cases, the presence of a trained birth attendant would be beneficial, since she could deliver the placenta, rub up uterine contraction, and give injectable medication. Reading from blue to red gives us an idea of the results of potentially beneficial actions: if one takes iron and folate supplements, anaemia will be reduced and a woman might appear less pale. Obviously, there will be

effects on fatigue, weakness and breathlessness, but pallor is the (less subjective?) sign chosen for the framework.

For the infant, small size, poor cry, breathing difficulty, poor suck and yellow skin were chosen. As has been discussed, diverse infant illnesses tend to manifest non-specifically. The diagram illustrates this with the number of conditions – low birth weight, tetanus, sepsis, jaundice and asphyxia – that might manifest as poor cry, breathing difficulty and poor suckling. Let us follow an example of how the diagram was used. The presence of a skilled birth attendant at delivery is recommended. What effects would a skilled attendant actually have? Looking at the diagram, we see that she could manage a retained placenta and thus post-partum haemorrhage. Her presence at the delivery would improve general cleanliness and cord care, which might reduce the incidence of tetanus, sepsis and jaundice. She could identify – and possibly manage – malpresentation and prolonged labour, which would putatively reduce the incidence of birth asphyxia. The reductions in tetanus, sepsis, jaundice and asphyxia leveraged by the presence of a skilled attendant would mean that the baby would be more likely to cry, breathe and suckle normally.

I designed the modules of the questionnaire tools to include questions on each of the areas shown in the scheme. At the same time as I was developing this framework, other groups were approaching the problem from a more health-service oriented perspective.¹⁵⁵

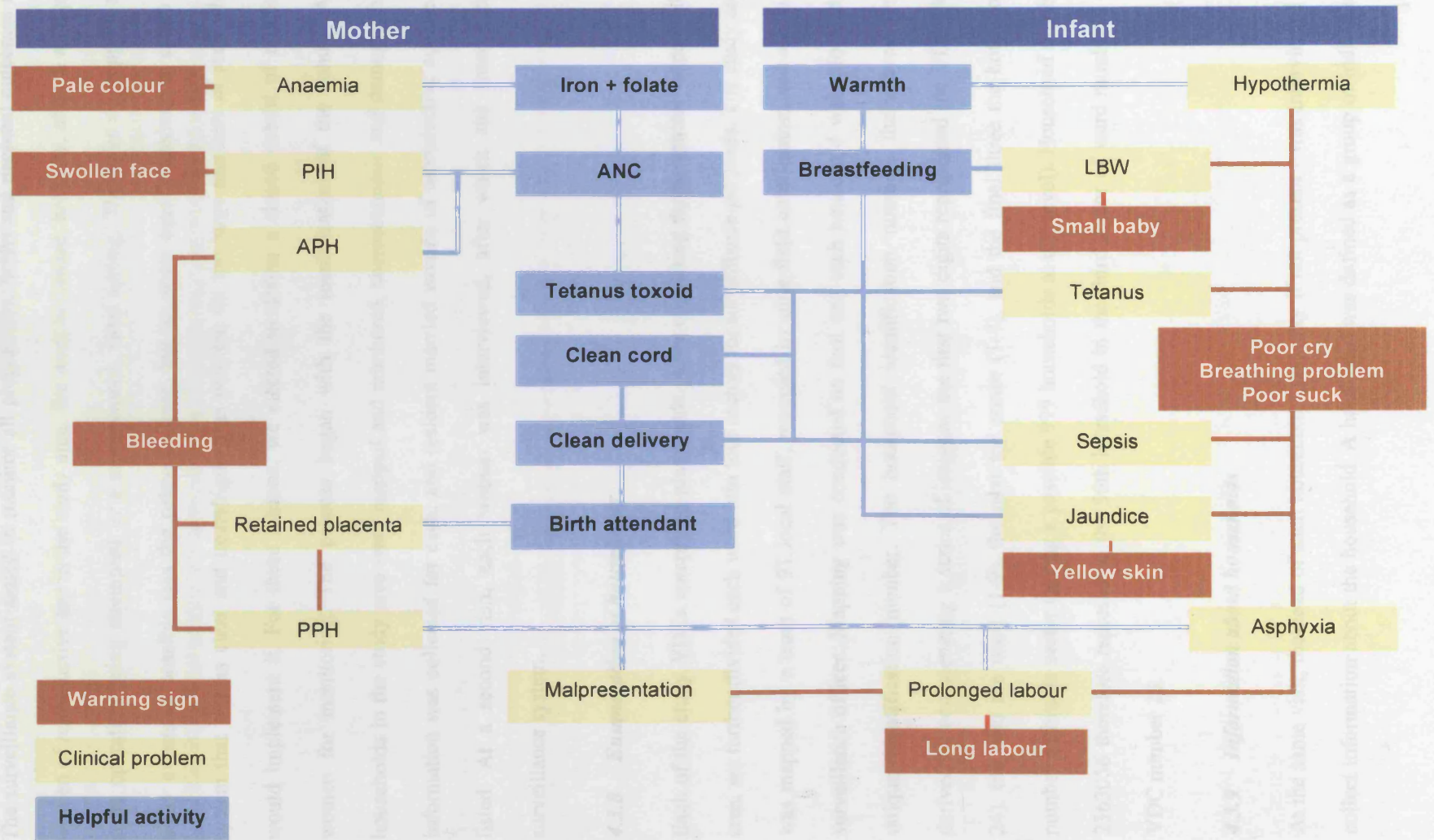


Figure 4.2. Conceptual framework for interventions to improve newborn survival

4.3.7 *The cross-sectional census*

The surveillance system aimed to monitor all pregnancies, births and neonatal outcomes in women of reproductive age in the study area. We were not aware, however, of such a large-scale operation being attempted in a mountainous, rural setting. The issue of trapping as many events as possible was the prime concern, but we were equally anxious to create a system that was as clear and unambiguous as possible for the large numbers of staff who would implement it. For these reasons, we elected to define a closed cohort of married women for monitoring. The process began with the identification of the cohort. All households in the study area were mapped and numbered, socioeconomic and demographic information was collected for each, and resident married women of reproductive age were listed. At a second visit, each woman was interviewed, after which she entered the surveillance system.

4.3.8 *Enumeration of households*

Each of the study VDCs comprised nine wards. After consulting topographical maps of the area, we further divided each ward into four sectors for surveillance purposes. The study area was mapped by a team of 91 local staff, managed by nine field coordinators and a senior surveillance officer. Mapping was conducted on foot and each household was allocated a unique identification number. The household identification numbers themselves were derived by concatenating a series of integers: the first two digits represented the VDC (01-24), the next the ward (1-9), the next the sector (1-4), and the final three the household number within its sector (giving a possible 999 households at this level). Household number 2363056 therefore represented the 56th household in the third sector of ward number 6 of VDC number 23.

4.3.9 *Information about households*

At the same visit, the head of each household - or proxy if not present - was interviewed to collect information about the household. A household was defined as a group of individuals

sharing one kitchen. The design of the baseline questionnaire was carried out between September 1999 and June 2000. In the light of studies conducted in Nepal and elsewhere, we aimed to develop a questionnaire that included indicators of socioeconomic status that were both robust and useful in the context of rural Makwanpur. The initial step was to compile a framework of questions from as many sources as possible. For example, all relevant questions from the NFHS 1996 were included;⁷⁹ questions about water supply were derived after consultation with Nepal Water for Health; and questions about household appliances were derived from a successful WHO SEARO study.¹⁵⁶ A form incorporating all the possible questions was produced and circulated. At this stage, questions which were felt to be inappropriate to the local context, or of clearly limited utility, were removed after discussion. Examples of these include explicit questions about income, which were likely to be poorly received in the study communities.

The resulting draft questionnaire was translated into Nepali, back-translated for checking, formatted and pre-piloted during the early training of the surveillance team. At this stage, the questionnaire contained 21 fields and a number of subfields. Half of the fields were in the form of predefined responses, as either mutually exclusive bullets or multiple answer boxes. The remaining half were left as text fields in order to use the responses to derive predefined fields in the final questionnaire. The pre-piloting phase revealed several inconsistencies that were amended prior to piloting.

The questionnaire was then piloted in four VDCs in May 2000. Sampling was purposive: two intervention and two control VDCs were chosen, and questionnaires were delivered in blocks to representative samples of the ethnic groups within the study area. 325 questionnaires were successfully completed. Debriefing and discussion sessions were conducted after the piloting to locate problems and plan modifications. Present at these sessions were the entire interviewing team, senior programme officers, project manager, technical advisors and Nepalese principal investigators.

The data were entered into a database programmed in Microsoft Access (Microsoft Corporation, USA), using a visual basic front end that mimicked the appearance of the printed forms. This gave the database design team an opportunity to address future issues of presentation and programming, and the data entry team an opportunity to familiarise themselves with the entry process, particularly with the appearance of the user interface. The data were subsequently exported to Intercooled Stata 5 (Stata Corporation, USA) for analysis.

Text responses were grouped and recoded as categorical options. Multiple field questions were collapsed into single categorical variables. Categorical variables were assessed by frequency tabulation to look at the spread of responses, continuous variables by measures of central tendency. Correlation matrices were generated for groups of variables, with further linear and logistic regression analysis to look at mutual interrelations. On the basis of the experiences of the interviewers and the results of the analysis, certain variables were dropped. These included the composition of the household floor and roof, water source, sanitation and cooking fuel. The final household questionnaire is presented in **annex D**.

4.3.10 Enumeration of married women of reproductive age

The first visit was also an opportunity to identify the married women of reproductive age living in each household. All female residents of each household were noted. Married women of reproductive age were identified later, using a series of steps that can be seen in the household questionnaire presented in **annex D**. We defined a married woman of reproductive age as a married woman aged between 15 and 49 completed years, whose husband was alive at enrolment and either lived with her or made visits that allowed for the possibility of conception within the study period. The term *possibility of conception* did not at this stage preclude the use of temporary or permanent family planning methods, or the state of menopause. The enumeration process was piloted simultaneously with the household questionnaire. The main issues thrown up by piloting involved the residence or non-residence of husbands. These were resolved in group discussion and the form adapted. It was

felt that a successful interview depended on a natural flow of questions during the contact. As a result of discussion, the enumeration was inserted into the household questionnaire at a natural point, after initial introductions and before questions about socioeconomic status. Information was double-entered through a visual basic interface into a relational database management system in Microsoft SQL Server 7.0 (Microsoft Corporation, USA). The system performed range, intra-table and inter-table checks.

4.3.11 Information about married women of reproductive age

The enumeration allowed us to allocate a unique identification number to each married woman of reproductive age. Each woman's number was derived by concatenation with the household number. Woman number 23630562 therefore represents the second woman in descending order of age in the 56th house in the third sector of ward number 6 of VDC number 23. We used the RDBMS to generate a list of households and married women of reproductive age. This list was subdivided by VDC and bound as a series of master volumes which identified the closed cohort. The surveillance team were then able to visit the entire cohort individually. These individual visits allowed completion of a woman-specific questionnaire.

The woman-specific questionnaire covered a range of topics. It is presented in full in **Annex E**. The first section described age, marriage, education, work, and choice of family planning. Subsequent sections summarised the number of previous abortions, stillbirths and live births, and the outcomes for her last four live births. Other sections described activities during her last pregnancy (if she had had one): antenatal care, problems and health care seeking behaviour, problems during her last delivery and aspects of newborn care and breastfeeding. The questionnaire went through 11 drafts between the start of its design in September 1999 and its administration. Each draft went through a cycle of preparation, pilot administration, review and redrafting. All content was in Nepali from the first cycle onward. Questions were initially left open in order to take in the full range of possible responses, which were post-coded after piloting. Concurrently with the administration of the questionnaire, the field team

measured each woman's height, weight and mid-upper arm circumference. Height was measured in centimetres to the nearest millimetre using a Leicester stadiometer. Weight was measured to the nearest 100 g using an electronic scale. Mid-upper arm circumference was measured to the nearest millimetre using a plastic tape.

Data collection for the second contact was carried out between March and November 2001 by a team of 44 interviewers, supported by nine field coordinators and one senior surveillance officer. Ten percent of interviews were observed by supervisory team members.

4.4 The prospective registration system

4.4.1 Expectations of the surveillance system

In order to examine differences in perinatal and neonatal mortality, we needed to identify pregnancies, births and their outcomes prospectively. Many of the procedures that underpin the surveillance system were developed after consultation with the Nepal Nutrition Intervention Project, Sarlahi (NNIPS), who had been carrying out community surveillance in a plain area of Nepal for over a decade.¹⁵⁷ The surveillance system was required to fulfil a number of expectations, summarised in **box 4.2**. The most obvious obstacles to meeting expectations were the difficulty of the terrain, the lack of infrastructure, and the low levels of attendance at health facilities during pregnancy.

Box 4.2. Requirements of the surveillance system

Expectations of the system

- Identify all households in the study area
- Identify all married women of reproductive age in the study area
- Locate each woman by household
- Identify pregnancies as they arise
- Interview each woman during pregnancy
- Determine the outcome of pregnancy for both mother and infant
- Identify neonatal deaths
- Interview mothers or their close relatives in the postnatal period

Activities required to meet expectations

- Map and number all households within the study area
- Identify and allocate an identity number to each married woman of reproductive age
- Visit each woman regularly to assess the possibility of pregnancy
- Record each pregnancy as it arises
- Achieve a contact with and interview each woman at a defined point in her pregnancy
- Achieve a contact with and interview each woman at a defined point after her delivery
- Monitor all information for accuracy and completeness
- Enter all information into an electronic database
- Store all information in a retrievable and flexible form

Each ward supervisor was a local woman whose role was solely to register pregnant women in married women of reproductive age in her ward. The system of surveillance is illustrated in figure 4.3. In one week, a ward supervisor visited all married women of reproductive age in one of the four sectors of her ward, each sector, and that each woman was then visited once per month. At each visit, a woman was asked about her menstrual status. The supervisor recorded the responses on a pre-printed chart on which the names and numbers of her allocated sector appeared. The chart was then scrutinised by the VDC supervisor in a weekly meeting. A married woman of reproductive age who had not responded for three visits (three months) was presumed to be pregnant, unless other information suggested that she was not. A memo to this effect was written on a standardised form, which was in turn transmitted to the central office.

4.4.2 *The cohort*

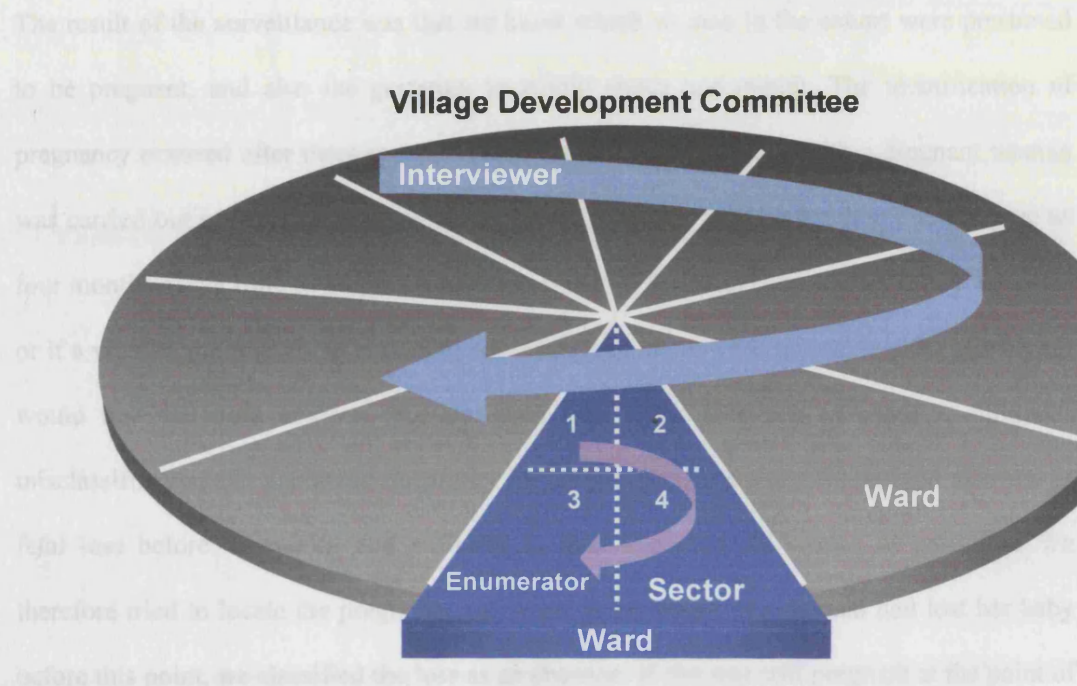
The prospective surveillance system was instituted after completion of the first two cross-sectional phases of the study. By the end of these, we had located and numbered every household in the study area, identified and allocated a number to every married woman of reproductive age, collected socioeconomic information at the household level, collected information on education at the individual level, and collected information on women's last pregnancies. The list of all the women in the cohort was broken down by VDC, ward and sector. Each VDC list was kept by one of 24 VDC interviewers. The interviewer was in turn responsible for supervising nine ward enumerators, one for each ward.

4.4.3 *Registration of pregnancy*

Each ward enumerator was a local woman whose role was solely to monitor menstrual status in married women of reproductive age in her ward. The system is summarised schematically in **figure 4.3**. In one week, a ward enumerator visited all married women of reproductive age in one of the four sectors of her ward. Each sector - and thus each woman - was therefore visited once per month. At each visit, a woman was asked about her menstrual status. The enumerator recorded the response on a pre-printed chart on which the names and numbers of her allotted cohort appeared. The chart was then scrutinised by the VDC interviewer at a weekly meeting. A married woman of reproductive age who had not menstruated for three visits (three months) was presumed to be pregnant, unless other information suggested that she was not. A memo to this effect was written on a standardised form, which was in turn transmitted to the central office.

Figure 4.3. Schematic summary of the surveillance system

4.4.4 Documentation of case practices: overview of survey results



One Village Development Committee is covered by one Interviewer. Each Village Development Committee is divided into nine wards. One ward is covered by one Enumerator. Each ward is divided into four sectors, which are visited in rotation.

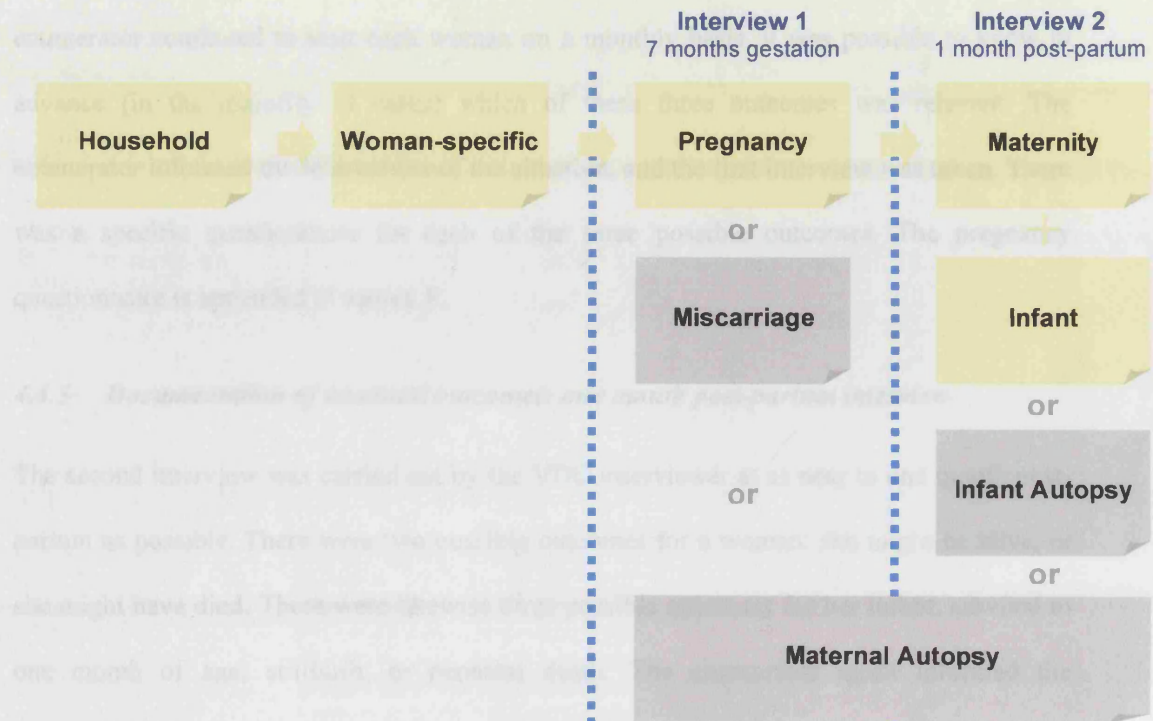
The questionnaires and database were designed in an iterative manner over 12 months. The first step was to identify the nature of the information required by the study. The second step was to categorise this information in the form of questions, which would fit into discrete fields in the database; the third step was to generate other categories or targets for answers to the questions (and thus the fields). Questionnaires were formulated in Nepali, back-translated into English, piloted by the field team and amended by group consensus.

4.4.4 Documentation of care practices: interview at seven months

The result of the surveillance was that we knew which women in the cohort were presumed to be pregnant, and also the gestation to within about one month. The identification of pregnancy occurred after three months. However, the first interview with a pregnant woman was carried out at seven months gestation. There were two reasons for this. First, it gave us four months of lag time to prepare for the interview. If the team were unsure of a pregnancy, or if a woman was shy about revealing her pregnancy, there were several months in which it would become more obvious. We designed the system like this in order to minimise misclassification and maximise sensitivity for pregnancies. Secondly, we defined abortion as fetal loss before 28 weeks, and stillbirth as fetal loss after 28 weeks, of gestation. We therefore tried to locate the pregnancy interview at 28 weeks. If a woman had lost her baby before this point, we classified the loss as an abortion. If she was still pregnant at the point of interview, we knew that any loss before the second interview could be classified as a stillbirth. This represented an attempt to trap earlier stillbirths, which are notoriously difficult to identify. The choice of questionnaire for the first interview is summarised in **figure 4.4**.

The questionnaires and database were designed in an iterative sequence over 12 drafts. The first step was to identify the nature of the information required by the study; the second step was to categorise this information in the form of questions, which would in turn become fields in the database; the third step was to generate either categories or ranges for answers to the questions (and thus the fields). Questionnaires were formatted in Nepali, back-translated into English, piloted by the field team and amended by group consensus.

Figure 4.4. Schematic summary of the questionnaires delivered at the two contacts



4.5 Summary of information available for analysis

The range and combination of questionnaires provided information in modular blocks. The contents of the modules and the questionnaires in which they were collected are summarised in table 4.3.

There were three possible outcomes with which the VDC interviewer would have to deal at the first interview: the woman might be pregnant, she might have aborted or she might have died. Clearly, the first of these outcomes was by far the most likely. Since the ward enumerator continued to visit each woman on a monthly basis, it was possible to know in advance (in the majority of cases) which of these three outcomes was relevant. The enumerator informed the interviewer of the situation, and the first interview was taken. There was a specific questionnaire for each of the three possible outcomes. The pregnancy questionnaire is appended in **annex F**.

4.4.5 Documentation of neonatal outcomes: one month post-partum interview

The second interview was carried out by the VDC interviewer at as near to one month post-partum as possible. There were two possible outcomes for a woman: she might be alive, or she might have died. There were likewise three possible outcomes for her infant: survival to one month of age, stillbirth, or neonatal death. The enumerator again informed the interviewer of the situation, and the second interview was taken. There was a specific questionnaire for each of the two possible maternal and each of the three possible infant outcomes (see **figure 4.4**). The maternity and live infant questionnaires are appended in **annexes G and H**.

4.5 Summary of information available for analysis

The range and combination of questionnaires provided information in modular blocks. The contents of the modules and the questionnaires in which they were collected are summarised in **table 4.4**.

Table 4.4. Modular topics covered by the questionnaires

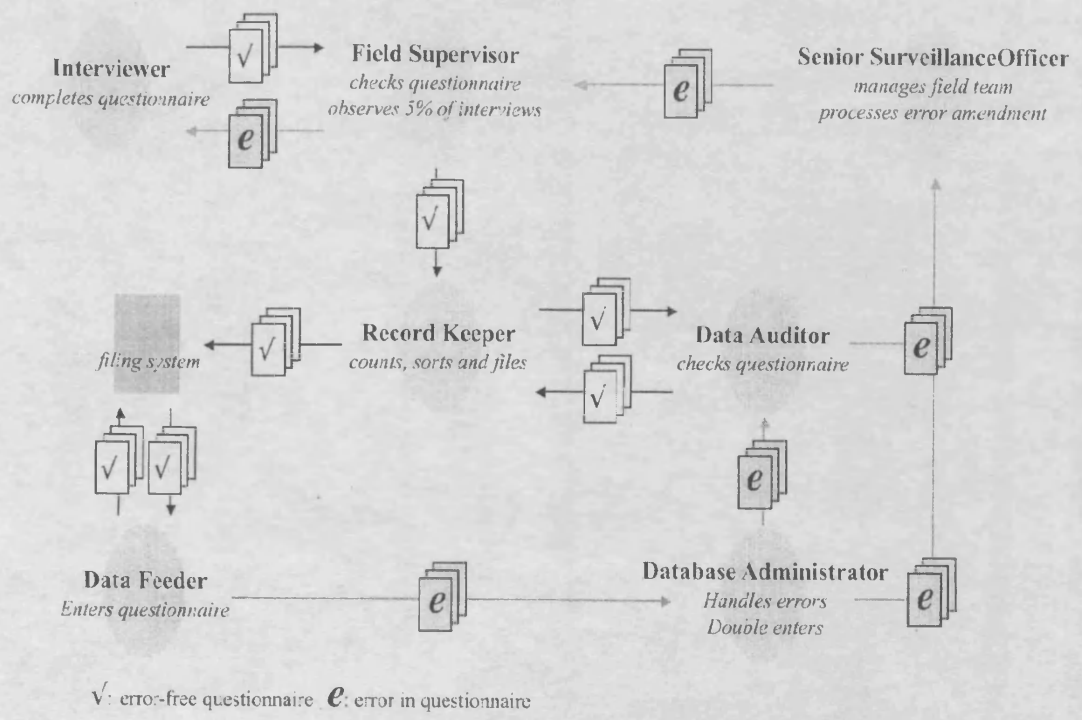
Topic module	Questionnaire contributing module	Annex
Cross-sectional, retrospective		
<i>Background</i>		
Ethnicity and religion	Household	D
Family numbers	Household	D
Socioeconomic status	Household	D
<i>Participant information</i>		
Age	Woman-specific	E
Education	Woman-specific	E
Family planning	Woman-specific	E
Maternity history	Woman-specific	E
Preceding pregnancy	Woman-specific	E
Antenatal care	Woman-specific	E
Delivery care	Woman-specific	E
Newborn care	Woman-specific	E
Morbidity	Woman-specific	E
Health care seeking	Woman-specific	E
Breastfeeding	Woman-specific	E
Prospective		
<i>Maternal information</i>		
Maternal morbidity		
Early pregnancy	Pregnancy or Miscarriage	F
Late pregnancy	Maternity or Maternal Autopsy	G
Delivery	Maternity or Maternal Autopsy	G
Post-partum	Maternity or Maternal Autopsy	G
Antenatal care	Maternity or Maternal Autopsy	G
Delivery care	Maternity or Maternal Autopsy	G
Health care seeking	Maternity or Miscarriage or Maternal Autopsy	G
Pre-existing illness	Maternal Autopsy	Not appended
Cause of death	Maternal Autopsy	Not appended
<i>Infant information</i>		
Newborn care	Infant or Infant Autopsy	H
Breastfeeding	Infant or Infant Autopsy	H
Infant morbidity	Infant or Infant Autopsy	H
Health care seeking	Infant or Infant Autopsy	H
Cause of death	Infant Autopsy	Not appended

4.5.1 Questionnaire processing

After completion, each questionnaire passed through a checking process, a schematic view of which is presented in **figure 4.5**. The completed questionnaire was reviewed by a field coordinator, who checked it on site and arranged for corrections to be made immediately. The coordinator also observed at least five percent of interviews on site. The questionnaire was then transferred to the central office, where it was received by a record keeper. Questionnaires were counted, logged, filed and then manually checked for missing data and errors by a data auditor. If errors were correctable at this point, they were logged and corrected on site. Otherwise, the auditor informed the field team of the error and the questionnaire was transmitted back to the field for correction.

Figure 4.5. Audit process for maintenance of data quality

Figure 2 Error checking system



4.6 Data management

4.6.1 *The relational database management system*

Error-free questionnaires were transferred to the data entry office, where entry was carried out by two data feeders. The MIRA Makwanpur study was large and the data were challenging in terms of size and complexity. Since the combination of specific questionnaires that each woman received was to be different, and since there were a large number of areas that might be missing in each case (for example, if a woman had not attended for antenatal care, all subsequent questions about antenatal care would be blank), the need for flexibility was evident.

A solution was to create a database in which questionnaires themselves were not the primary units of data storage. Instead, each questionnaire was divided into coherent blocks of information, and each block entered into its own table. Taking the above example, information about antenatal care was stored in an antenatal care table. The tables were then interlinked in the RDBMS so that for each woman her total of relevant tables could be retrieved.

Recent advances in software sophistication made it possible to dispense with the traditional intermediate step of hard copy data coding. Possible answers to a given question were pre-coded internally and the code was invisible at the user interface. The traffic of data from a point in a questionnaire to a field in a table – several tables being filled by one questionnaire, and several questionnaires filling one table – also took place internally. What appeared on the computer screen was a facsimile of the questionnaire: the data feeder simply pointed and clicked on the appropriate response or entered numbers into the appropriate box. Although the programming was carried out in English, all the interfaces for data entry were presented in Nepali.

During data entry, the system ran the following checks. Within fields: values of continuous variables lying outside specified ranges were queried and null entries were disallowed where

unacceptable. Between fields: the answers to two questions might be contingent one on the other. Between tables: some tables were mutually exclusive and the existence of some tables was contingent on the existence of other, more primary, tables (for example, one could not enter details of an infant's illness without the prior existence of an infant identification table. Likewise, one could not enter late antenatal details if a miscarriage had occurred). All questionnaires were double entered.

The electronic system communicated with the field operations through a system of memoranda. Weekly reports on the identification of pregnancy were sent from the field to the central office. These reports were acted upon by the database administrator, who converted the *state* of relevant married women of reproductive age within the RDBMS to *pregnant*. This and other changes in state triggered the initiation of a scheduler, which timed the pregnancy and generated lists of questionnaires that were due at a given date. This allowed the data team to produce a backup list of overdue questionnaires that could be communicated to the field team. The state coding system allowed the team to identify sections of the dataset that were incomplete (through omission or delay), to attempt to rectify the omissions, and to deal with the omissions during the analysis phase.

4.6.2 System specifications

The system hardware comprised a Dell P1300 series server with a Pentium III 700MHz processor, 256 MB RAM and a 9GB hard disc (Dell Computer Corporation). The server was networked with four workstations, running via a dedicated online 3KVA uninterrupted power supply affording at least three hours of runtime in the event of outage (Guraya Stabiline, Nepal). The workstations were dedicated for data feeding, password protected and not externally networked. Administration and modification were restricted to the database administrator. Backup was performed daily onto a compartmentalised hard disc, weekly onto a 250MB Zip disc (Iomega Corporation), and monthly onto a compact disc that was transferred to Kathmandu and copied onto an identical server. The RDBMS was created in Microsoft SQL Server 7.0. The operating system was Windows NT 4.0 and the data entry

interface was programmed in Visual Basic 6.0. Questionnaires were developed in Microsoft Word 98 (all the foregoing: Microsoft Corporation) and formatted for printing in Adobe PageMaker 6.5 (Adobe Systems Incorporated).

4.6.3 Analysis

Data were analysed in two ways. Frequency values for many of the outcomes of the study were available through direct SQL queries in the RDBMS. For more complex analysis, data were exported with tailored SQL queries, cleaned in Microsoft Excel and manipulated in Stata 7. Most of the results are presented as frequencies and percentages. Continuous variables were either described in terms of measures of central tendency and spread, with confidence intervals, or by subdivision into categorical variables. Extracts from the textual sections of verbal autopsies are used as frontispieces to the following chapters. The design, construction and analysis of both infant and maternal autopsies are not treated in the thesis since they constitute a separate, and large, body of work.

4.6.4 Presentation of the findings

The thesis describes maternal and newborn care practices in a specific setting. It aims to give a picture of the prevailing situation, but does not aim to make specific comparisons. The trial itself did seek to do so, and statistical differences between groups and times are presented in the relevant publications. Data have been presented in the thesis in a simple manner (frequencies and percentages) so that a judgement of their importance depends more on whether the reader feels that they have public health significance than on whether they demonstrate statistical significance. In making this decision, I have been aware of a tendency to depend on statistical significance as an arbiter of importance. The sample involved in the thesis work was large. All differences between groups that appear to be substantial achieve statistical significance at the five percent level. However, since even small differences achieve significance there is a tendency to suspend critical judgement of their implications, and I do not believe that this adds to our understanding. The reader may assume that any

finding judged to be important has a high degree of precision. Where statistical testing adds to understanding it has been presented (for example, confidence intervals for estimates of NMR).

Chapter 5 Results: care practices

Everything was fine until six months. The baby was fine and moving. The health post staff gave me iron tablets and I took them for one month. In the seventh month I felt that the baby had stopped moving. My husband was out of the house so I didn't say anything to my family members. I had mild abdominal pain, but when I was eight months pregnant, one day I had strong abdominal pain and a little pain in the vagina. Then the labor pain started and I had a lot of bleeding. I gave birth to the baby. She was inside the water bag. My family members cut the membrane and brought out the baby. She was dead. There was pus on her legs and hands. The baby seemed to be decaying. I didn't go to the health post for a check up after the baby stopped moving. It was my fault, although I didn't carry a heavy load and didn't eat foods I should have avoided.

Makwanpur verbal autopsy, infant 22630041

5.1 Information about households

The census provided data on maternity history for all women interviewed. The analysis of the surveillance data covers two years, from November 2001 to end-October 2003. Results are summarised in **table 5.1**. A number of sample frames were available for analysis, and the results are presented from four groups of households, each of which is a subset of the preceding. Firstly, the mapping process and administration of the cross-sectional questionnaire to all heads of household in the study area resulted in information on 28,376 households, covering trial intervention and control areas. For the purposes of the thesis I have chosen to limit analysis to the study control areas only. This means that data are available for 13,497 control area households, in which resided 83,072 people at the time of the survey. Within these households, individualised data are available for 12,170 married women of reproductive age. A maternity history was collected for each woman. 4867 women had had a live birth in the two years prior to the survey. Of these, 2084 went on to become pregnant again within the prospective surveillance of pregnancies. This cohort omits women who went on to have primigravid pregnancies. However, it allows a comparison of recent pregnancy based on maternity history with prospectively documented pregnancy.

Table 5.1. Information about households

	All households in control area	All women cohort members	Cohort members who had given birth in the 2 y preceding the census	Cohort members who had given birth in the 2 y preceding the census, and who subsequently had a pregnancy in 2 y of prospective follow-up
Individuals	83072	12170	4867	2084
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
Households	13497 (100)	10660 (100)	4644 (100)	1920 (100)
<i>Ethnicity and religion</i>				
<i>Ethnic group</i>				
Tamang	7929 (59)	7285 (60)	3303 (68)	1473 (71)
Brahmin-Chhetri	2716 (20)	2307 (19)	648 (13)	239 (11)
Magar	599 (4)	504 (4)	150 (3)	49 (2)
Newar	408 (3)	389 (3)	115 (2)	32 (2)
Other	1845 (14)	1685 (14)	651 (14)	291 (14)
<i>Religion</i>				
Buddhist	7712 (57)	7097 (58)	3229 (66)	1444 (69)
Hindu	5640 (42)	4957 (41)	1596 (33)	620 (30)
Other	145 (1)	116 (1)	42 (1)	20 (1)
<i>Poverty</i>				
<i>Occupation</i>				
Agriculture	12440 (92)	11359 (93)	4618 (95)	2011 (96)
Waged labour	552 (4)	424 (3)	165 (3)	52 (2)
Salaried	257 (2)	199 (2)	41 (1)	11 (1)
Small business	248 (2)	188 (2)	43 (1)	10 (1)
<i>Asset score *</i>				
0	7505 (56)	6233 (51)	2790 (57)	1198 (58)
1	4577 (34)	4476 (37)	1678 (35)	724 (35)
2	798 (6)	837 (7)	258 (5)	111 (5)
3	617 (4)	624 (5)	141 (3)	51 (2)
<i>Food security</i>				
0 - 3 months	253 (2)	204 (2)	99 (2)	37 (2)
3 - 6 months	2573 (19)	2302 (19)	987 (20)	421 (20)
6 - 9 months	2947 (22)	2684 (22)	1163 (24)	494 (24)
9 - 12 months	7724 (57)	6980 (57)	2618 (54)	1132 (54)

* **Asset score codes:** (3) The household owned a bus, truck or motor tractor, a motorcycle, a television, or a refrigerator; (2) the household owned a hand tractor, a sewing machine, a camera, a cassette player, or a fan; (1) the household owned a wall clock, a radio, an iron, or a bicycle; (0) the household owned none of the foregoing.

The largest ethnic block was Tamang. Inspection of the telescoping of the primary dataset across **table 5.1** suggests that the Tamang proportion of the cohort who went on to have a pregnancy tends to rise. The major ethnic groups of Makwanpur district are summarised in **box 5.1** for the reader's interest. Considerations of ethnicity in Nepal are confused by the superimposition of caste. Apart from the Indo-Aryan, Hindu bloc so exhaustively considered in the literature on caste,¹⁵⁸ traditional notions of caste do not generally apply. However, in enumerating ethnic groups, classifications usually consider caste groups as separate entities.¹⁵⁹ For example, Brahmins and artisanal Hindu castes are subgroups of the same ethnic group.

The design of dwellings and their construction differed across the study area and was found to depend more on ethnicity and local availability of materials than on socioeconomic status. The main materials included a mixture of cement and brick, mud and brick, mud and stone, planks, branches and thatch.

The vast majority of people in Nepal practise subsistence agriculture. This is reflected in the finding that over 90% of households in the study area described their main occupation as farming. We modified an asset score variable that had been developed for a WHO/SEARO study,¹⁶⁰ amended it after piloting in the study area and undertook further validation through factor analysis. The impression is one of general poverty, with over half of households falling into the poorest category. Respondents were asked, "for how many months in each year do you feel that there is enough food in the house to feed the household?". About a fifth of households felt that they had an annual food sufficiency of six months or less.

Box 5.1. Ethnic groups of Makwanpur district

Tamang

The largest group in Makwanpur, Tamangs are hill dwellers living mostly around the Kathmandu Valley.¹⁶¹ They are said to have originated in Tibet, possibly as horse traders. Tamangs tend to live at higher, drier elevations, in compact settlements which are self sufficient for food. Most are owner-cultivators of land. Traditionally, a clan system (*kipat*) distributed land rights to areas of settlement and cultivation, but this is no longer the case. Tamangs are in general poor, and when outside traditional territory have often taken up work as porters, servants and animal handlers in larger conurbations. Tamangs are lamaistic Buddhists. However, illness is characteristically addressed through a *jhankri* system of traditional healers (*bombos*).

Tamang communities are divided into patrilineal subgroups and marriage is subgroup exogamous and monogamous.¹⁶² Most marriages are not arranged and are by mutual agreement, and it is said that unmarried women's love affairs do not inherently prejudice subsequent marriage. This is one reason for commentators to view Tamang society as more egalitarian than that of some other groups.¹⁶³ Married women are not definitively relocated from their natal homes to those of their affines, and there is a trend toward the nuclear family.^{164 165}

Brahmin-Chhetri

Although Brahmins and Chhetris are not the most numerous group in the district, the Brahmin-Chhetri population has played a dominant role in the political development of Nepal as a Hindu kingdom, with simultaneous effects on religious and social norms.^{166 167} The Shah royal family is Chhetri, as were the Ranas, who were hereditary prime ministers from 1846 to 1951. Important positions in government, the army and police have traditionally been filled from this group. The resulting social structure has led to a widespread Hinduisation of the country. This may be seen as socioeconomically and politically expedient, both for the state in its quest for unity and for individuals and groups in search of improvements in the wellbeing of their families. A great challenge has been to superimpose an Indo-Aryan system - the *vama* system articulated in the *manu smriti* - onto a range of ethnic groups who have their own self-consistent status and function systems.¹⁶⁸ A subsidiary challenge, and a testament to the dynamism of cultural norms, has been the need to enshrine ruling cadres within the system in a manner that legitimises their power. In this sense, the dominant oligarchs have benefitted from the traditional concept of the Brahman as cerebral, authoritative and high, the *Kshatriya* (root of the word *Chhetri*) as warrior, administrator and leader, and both groups as wearers of the sacred thread. Though densely concentrated in the western hills, Brahmin-Chhetris are the most widely distributed group in Nepal. Nepali is their mother tongue. Apocrypha suggest that the Brahmins - the highest *vama* caste - migrated into the western hills of Nepal during the fourteenth century as a result of the Mughal invasions of India. It is then suggested that they intermingled with the indigenous Khas group, whence arose Nepal's Brahmins.¹⁶⁹ Although the *manu smriti* saw the Khas as *Sudras* (fourth on the scale of major castes), the embedding resulted in an upgrading of Khas descendants to the *Kshatriya* level. The distribution of Brahmin-Chhetris means that there is a great diversity of socioeconomic standards, although all are united by their caste Hinduism. Main occupations have been farming and government, military and police services, as well as the more traditional one of the priesthood. In the hills, including those of Makwanpur, Brahmin-Chhetri houses are scattered at middle elevations.

Caste and ethnic group endogamy is the norm and marriage is monogamous with exogamy at village level. Marriages have traditionally been arranged. Sons are important insurance for parents' old age. They conduct funeral rites and take their fathers across the *preta* (spirit of the dead) to *swarga* (heaven). Traditionally, marriage in the sixth year of life was seen as most auspicious for Brahmin girls, conferring a great deal of merit (*punya*) on the parents. Early marriage has become steadily less common with secular changes throughout society, but higher age and lapses in sexual morality are particularly harmful for unmarried women in this caste group. At menarche, a girl is taken to another house and confined for a fortnight, during which she cannot see male relatives and is untouchable by other women.¹⁶⁹ A woman acquires her full caste status after marriage, and a daughter has been likened to *one held in custody for another* until this point. Daughters have traditionally not been entitled to a share in parental property. A new bride enters her husband's home where she is under the command of her mother-in-law.¹⁷⁰ Pollution is observed for the first four days of menstruation, after which a woman washes herself and her clothes. Mothers and newborn infants are untouchable until the eleventh day, at which purification and naming are carried out (*nwaran*). The next key ceremony celebrates weaning (*pasni*) at five months for girls and six months for boys.

Magar

Magars are a Tibeto-Burman group which has had close contact with Indo-Aryans and has been extensively Hinduised. They originate in western Nepal but are widely spread. The spread was both triggered by a search for better arable land and facilitated by land grants to Magar soldiers. Although subsistence agriculture is the traditional mainstay of the Magar economy, trades associated with building have long been important, as has soldiering; Magars are key members of Gurkha regiments. Marriage is ethnic group endogamous, but is little restricted in communities. Marriage itself has taken on many of the characteristics of Brahmin-Chhetri tradition, and tends to be officiated by a Brahman priest. Hindu Magars observe birth pollution for ten days, with name giving on the eleventh day.

Newar

There has been a great deal of debate about the origins of the Newars. Suffice it to say that they have been the indigenous inhabitants of the Kathmandu valley for over two millennia.¹⁷¹ The Newar tendency to quasi-urban living has been described as a surviving prototype for the urban Buddhist communities of pre-Mughal India. Fitting the Newar community, which is both diverse and has its own status levels, into the prevailing *vama*-based caste system has exercised both political actors and anthropologists for many years. The Newars were basically a nation until they merged into wider Nepal during the eighteenth century. This merger was dominated by the influx of Brahmin-Chhetris from outside the Kathmandu Valley, a unification of greater Nepal begun by Prithvi Narayan Shah from a base in Gorkha.

The spread of Newars has been wide and predicated on their specialisation in trade and business, which explains to a large extent their concentration in towns and bazaars. Newar religion covers a spectrum from Hindu to Buddhist, with a large degree of overlap. The Hinduisation seen in other ethnic groups probably applies equally, with higher Hindu Newar castes occupying important positions in government.

Newar marriage is ethnically endogamous and monogamous. There is a general conception that it is not seen as as sacred as in some other groups. A Newar bride moves to her husband's home, but her potential for authority may be greater than that found in some other ethnic groups. She may, for example, initiate divorce.

5.2 Information about the cohort

Table 5.2 presents information from three of the four datasets discussed above. 63% of women who had a pregnancy during prospective surveillance fell into the age group 20-29 years. The predominance of this age group reflects the fact that the data were collected from parous women who had had a live birth in the preceding two years. The distribution of age as a continuous variable was, as usual in such studies, positively skewed. This reflects both the tendency to marriage at the lower end of the scale and the fact that there is a reasonably well defined lower limit. Over half of cohort members had married in adolescence.

Over 80% of cohort members had received no formal schooling and attendance beyond primary school was uncommon in the remainder. Literacy was assessed by presenting each woman with a standard passage and grading her reading performance in one of three categories. The effect of non-formal literacy programmes is witnessed by the finding that some women were literate despite not having attended school. Nevertheless, more than three-quarters of cohort members could not read. The concentration of pregnancies in the younger age groups - who are slightly more likely to have attended school - is shown by the small improvement in the figures across **table 5.2**.

Anthropometric information was collected for as many women as possible. There were a number of refusals, some of which arose from the belief that the electronic scales were in some way photographing people, particularly from their feet upwards. Mean weight was low in the cohort and mean height, though not as markedly as for weight, was also low. About 15% of cohort members were underweight on the basis of a body mass index of less than 18.5 kg/m².

Table 5.2. Information about the cohort

	All women cohort members	Cohort members who had given birth in the 2 y preceding the census	Cohort members who had given birth in the 2 y preceding the census, and who subsequently had a pregnancy in 2 y of prospective follow-up
	Frequency (%)	Frequency (%)	Frequency (%)
Individuals	12170 (100)	4867 (100)	2084 (100)
<i>Age and marriage</i>			
<i>Age</i>			
Up to 19 years	973 (8)	329 (7)	183 (9)
20-29 years	4758 (39)	2756 (57)	1324 (63)
30-39 years	3782 (31)	1412 (29)	500 (24)
40 years and over	2657 (22)	370 (7)	77 (4)
<i>Age at marriage</i>			
Up to 15 years	4083 (33)	1443 (30)	598 (29)
16-19 years	6433 (53)	2741 (56)	1221 (58)
20 years and over	1654 (14)	683 (14)	265 (13)
<i>Education</i>			
<i>Schooling</i>			
None	10741 (88)	4165 (85)	1766 (85)
Primary	957 (8)	468 (10)	213 (10)
Secondary	456 (4)	229 (5)	104 (5)
Higher	16 (<1)	5 (<1)	1 (<1)
<i>Reading</i>			
Cannot read	9664 (80)	3800 (78)	1605 (77)
Read with difficulty	1256 (10)	474 (10)	210 (10)
Read with ease	1250 (10)	593 (12)	269 (13)
<i>Anthropometry</i>			
Weight in kg, mean (n, sd)	46.58 (12070, 6.03)	46.39 (4816, 5.46)	46.13 (2053, 5.22)
< 45 kg	4995 (41.38)	2005 (41.63)	883 (43.01)
Height in cm, mean (n, sd)	149.65 (12165, 5.02)	149.71 (4864, 5.21)	149.75 (2083, 5.33)
<145 cm	2042 (16.79)	814 (16.74)	353 (16.95)
BMI in kg/m ² , mean (n, sd)	20.78 (12067, 2.36)	20.68 (4814, 2.11)	20.57 (2052, 2.02)
<18.5 kg/m ²	1853 (15.36)	686 (14.25)	283 (13.79)

5.3 Antenatal, delivery and neonatal care practices

5.3.1 Antenatal care

Table 5.3 presents two types of data: retrospective and prospective. Retrospective data come from (a) cohort members who had had a live birth in the two years preceding interview, and (b) a subgroup of these cohort members who went on to have a pregnancy in two years of prospective follow-up. The prospective data come from (c) the same subgroup as (b), and (d) all cohort members who went on to have a pregnancy in two years of prospective follow-up. This means that group (c) includes only parous women, while group (d) includes both primiparous and multiparous women.

Of the 12,170 women in the cohort, 4867 recalled a live birth in the two years preceding the start of the study, of whom 2084 went on to have a pregnancy in two years of prospective follow-up. Adding this figure to the pregnancies that occurred to cohort members who did not recall a preceding pregnancy, 3522 pregnancies were documented prospectively over two years.

About 20% of cohort members recalled making an antenatal care visit during the previous pregnancy. This figure was higher in subsequent pregnancies documented prospectively (28-30%). Of those who did avail themselves of antenatal care, most began in the second trimester of pregnancy and few made four visits or more (4-6%). The figures describing facility usage for antenatal care are not mutually exclusive: a woman who made one visit to hospital and another to a health post would be credited for both sites. There are some differences between the retrospective and prospective findings on facility usage. It appears that, retrospectively, women recalled attending for antenatal care primarily at hospitals, health posts and sub-health posts, whereas prospectively they attended primary health centres, health posts and sub-health posts. This difference may be real, or may reflect uncertainty in the minds of cohort members about the classification of specific health care facilities (primary health centres were often referred to as hospitals). If we collapse primary

health centres, health posts, sub-health posts and outreach clinics under the heading *primary health care facility*, most women who attended for antenatal care appeared to have made use of such facilities. The caregiver seen at a given facility was primarily a function of the facility grade. Hence, many women in the prospective group met with an auxiliary nurse midwife. Auxiliary nurse midwives are based at primary health centres, and this finding gives some support to the classification of sites discussed above. A notable finding was the limited provision of antenatal care by traditional birth attendants (<1%).

The reasons for attendance have been collapsed from their raw classification because of limited applicability. Most women who attended for antenatal care did so as a matter of routine. Secondary reasons related to common problems such as abdominal pain, weakness and nausea. It was notable that problems in previous pregnancies or deliveries, and concerns about fetal malposition or movements, were vanishingly rare triggers for attendance.

Only a third of cohort members recalled receiving a tetanus toxoid injection in the previous pregnancy, but half received one when observed prospectively. Both figures exceed the figures for antenatal care attendance, implying that administration of tetanus toxoid took place at least to some degree outside the ambit of antenatal care. The same was not true of iron and folic acid supplementation, but few women (2-3%) received supplement tablets for longer than three months. Figures for both tetanus toxoid administration and supplement provision were higher prospectively than retrospectively. Any differences between the two prospective datasets (c and d) are likely to be the result of the inclusion of primigravid women in group (d). This group are younger and are more likely to seek care both during pregnancy and during delivery. However, as regards antenatal care the differences are so subtle as to be unimportant.

Table 5.3. Antenatal care

Variable	Recall data		Prospective data	
	2 y preceding census	2 y preceding census, and subsequent pregnancy	2 y preceding census, and subsequent pregnancy	All pregnancies
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
Events	4867 live births (100)	2084 live births (100)	2084 live births (100)	3522 pregnancies (100)
Any antenatal care	963 (20)	377 (18)	578 (28)	1049 (30)
Timing of first visit				
First trimester	167 (3)	50 (2)	65 (3)	134 (4)
Second trimester	625 (13)	252 (12)	354 (17)	628 (18)
Third trimester	171 (4)	75 (4)	158 (8)	286 (8)
Number of visits				
1	260 (5)	108 (5)	213 (10)	360 (10)
2	242 (5)	92 (4)	135 (7)	256 (8)
3	288 (6)	99 (5)	126 (6)	227 (6)
4 or more	173 (4)	78 (4)	104 (5)	206 (6)
Place of antenatal care				
Hospital	261 (5)	92 (4)	57 (3)	124 (4)
Primary Health Centre	86 (2)	38 (2)	170 (8)	289 (8)
Health Post	338 (7)	128 (6)	124 (6)	237 (7)
Sub-Health Post	231 (5)	102 (5)	203 (10)	359 (10)
Outreach clinic	46 (1)	22 (1)	28 (1)	45 (1)
Any primary care facility	683 (14)	278 (13)	518 (25)	934 (26)
Private clinic	54 (1)	22 (1)	20 (<1)	48 (1)
Other	2 (<1)	1 (<1)	5 (<1)	18 (<1)
Antenatal caregiver				
Doctor	167 (3)	57 (3)	41 (2)	78 (2)
Nurse	283 (6)	109 (5)	50 (2)	111 (3)
Auxiliary Nurse	98 (2)	41 (2)	233 (11)	421 (12)
Midwife				
Health Assistant or similar	253 (5)	100 (5)	81 (4)	163 (5)
Maternal & Child Worker	271 (6)	117 (6)	237 (11)	414 (12)
Village Health Worker	49 (1)	10 (<1)	9 (<1)	10 (<1)
Traditional Birth Attendant	2 (<1)	3 (<1)	3 (<1)	4 (<1)
Female Community Volunteer	2 (<1)	1 (<1)	1 (<1)	4 (<1)
Other	15 (<1)	7 (<1)	5 (<1)	7 (<1)
Reasons for antenatal care				
Routine	662 (14)	270 (13)	399 (19)	739 (21)
Abdominal pain	166 (3)	53 (3)	106 (5)	184 (5)
Headache, weakness, faints, dizziness	44 (1)	21 (1)	21 (1)	39 (1)
Nausea, off food	34 (<1)	12 (<1)	3 (<1)	8 (<1)
Vaginal bleeding	12 (<1)	6 (<1)	20 (1)	29 (<1)
Swelling	12 (<1)	4 (<1)	5 (<1)	10 (<1)
Other	33 (<1)	3 (<1)	24 (1)	21 (<1)
Tetanus toxoid given	1689 (35)	679 (33)	1101 (53)	1881 (53)
Months of supplements taken				
Up to a month	365 (8)	147 (7)	349 (17)	615 (17)
1 - 3 months	148 (3)	65 (3)	114 (5)	228 (6)
4 - 6 months	53 (1)	19 (<1)	42 (2)	84 (3)
More than 6 months	22 (<1)	9 (<1)	4 (<1)	11 (<1)

5.3.2 Delivery and newborn care

The conduct of a delivery shades into the care of the newborn infant, so these two areas are covered in one section.

5.3.2.1 Attendance at delivery

Of the 12,170 women in the cohort, 4867 recalled a live birth in the two years preceding the start of the study, of whom 2084 went on to have a pregnancy in two years of prospective follow-up. Of the 3522 pregnancies followed prospectively, 3263 resulted in delivery. In the subgroup of 2084 pregnancies to women with a documented live birth in the preceding two years, 1958 resulted in delivery.

Table 5.4 summarises the findings. 95% of women gave birth at home, with minimal differences between retrospective and prospective data. Less than 2% of cohort members delivered in a hospital, and institutional deliveries in either government primary health care facilities or private clinics were rare. The ubiquity of home birth was barely mitigated by attendance at delivery by health workers. The figures describing birth attendance are not mutually exclusive: a woman who was attended by both her mother-in-law and an auxiliary nurse midwife would be credited for both. Over 10% of women gave birth completely alone. When accompanied, the commonest birth attendants were mothers-in-law, family members and neighbours. The activities of traditional birth attendants were limited to attendance at 3-4% of births. Even so, this represented a higher coverage than that of health workers: if we include any cadre of salaried government health worker, coverage reached about 3% of deliveries. Moreover, if we classify an obstetrically trained health worker as a doctor, nurse or auxiliary nurse midwife, the coverage of trained attendants was about 2%. There was little difference in this respect between retrospective and prospective datasets. As with antenatal care, there were no differences between the parous and combined prospective cohorts.

Table 5.4. Attendance at delivery

	Recall data		Prospective data	
	2 y preceding census	2 y preceding census, and subsequent pregnancy	2 y preceding census, and subsequent pregnancy	All pregnancies
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
Deliveries	4867 (100)	2084 (100)	1958 (100)	3263 (100)
Place of birth				
Home	4631 (95)	1993 (96)	1871 (96)	3092 (95)
Field or workplace	92 (2)	42 (2)	53 (3)	81 (2)
Hospital	94 (2)	31 (1)	18 (1)	62 (2)
Private clinic	5 (<1)	3 (<1)	2 (<1)	4 (<1)
Other	45 (<1)	15 (<1)	14 (<1)	24 (<1)
Birth attendant				
Doctor	34 (<1)	10 (<1)	5 (<1)	24 (<1)
Nurse	90 (2)	34 (2)	18 (<1)	56 (2)
Auxiliary Nurse Midwife	14 (<1)	4 (<1)	4 (<1)	14 (<1)
Trained attendant	108 (2)	39 (2)	21 (1)	71 (2)
Health Assistant (or comparable)	12 (<1)	4 (<1)	10 (<1)	24 (<1)
Maternal and Child Health Worker	18 (<1)	4 (<1)	6 (<1)	16 (<1)
Village Health Worker	6 (<1)	4 (<1)	0 (0)	2 (<1)
Any government health worker	136 (3)	48 (2)	34 (2)	106 (3)
Female Community Health Volunteer	26 (<1)	8 (<1)	16 (<1)	34 (1)
Traditional Birth Attendant	186 (4)	86 (4)	74 (4)	127 (4)
Mother-in-law	1946 (40)	889 (43)	698 (36)	1152 (35)
Other family member	2395 (49)	1058 (51)	924 (47)	1531 (47)
Neighbour	1350 (28)	560 (27)	520 (27)	883 (27)
No attendant	489 (10)	208 (10)	258 (13)	394 (12)
Other	295 (6)	128 (6)	152 (8)	260 (8)

5.3.2.2 *Perinatal hygiene*

The figures for recalled live births remain the same as in the previous section. Of the 3263 deliveries followed prospectively, 3219 resulted in live birth. In the subgroup of 2084 pregnancies to women with a documented live birth in the preceding two years, 1926 resulted in live birth.

30-50% of cohort members recalled seeing primary birth attendants wash their hands (**table 5.5**). In about a quarter of instances, the cohort member or attendant used a new or boiled blade to cut the umbilical cord. The commonest implement was a sickle or woodknife. Use of clean delivery kits for home births, or clean instruments for hospital births, was uncommon (5%). However, over 70% of umbilical stumps were either left uncovered without a dressing or covered with a piece of cloth. The use of traditional dressings, much alluded to in the literature, was uncommon. Again, the differences between parous and primigravid women were minimal, although there is an impression that handwashing and the use of clean blades might have been more common in primigravid deliveries.

Table 5.5. Perinatal hygiene

	Recall data		Prospective data	
	2 y preceding census	2 y preceding census, and subsequent pregnancy	2 y preceding census, and subsequent pregnancy	All pregnancies
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
Live births	4867 (100)	2084 (100)	1926 (100)	3219 (100)
Attendant washed hands	2310 (47)	908 (44)	587 (30)	1027 (32)
Umbilical cord cutting instrument				
New or boiled blade	1124 (23)	409 (20)	461 (24)	821 (26)
Sickle or woodknife	2180 (45)	1052 (50)	838 (43)	1335 (41)
Old unboiled blade	1116 (23)	432 (21)	450 (23)	757 (24)
Household knife	364 (7)	151 (7)	157 (8)	265 (8)
Other	83 (2)	40 (2)	20 (1)	41 (1)
Used clean delivery kit	257 (5)	102 (5)	66 (3)	154 (5)
Dressing applied to umbilical stump				
Nothing or cloth	3501 (72)	1530 (73)	1412 (73)	2320 (72)
Oil	1029 (21)	433 (21)	467 (24)	789 (25)
Disinfectant or powder	51 (1)	22 (1)	5 (<1)	25 (<1)
Turmeric	8 (<1)	2 (<1)	2 (<1)	2 (<1)
Mud	16 (<1)	4 (<1)	7 (<1)	15 (<1)
Other or unsure	262 (5)	93 (4)	33 (2)	68 (2)

5.3.2.3 *Maintenance of the perinatal warm chain*

The figures for recalled and prospective live births remain the same as in the previous section and the findings are summarised in **table 5.6**. About two-thirds of birth rooms were heated during or after delivery. However, there was a tendency for infants to remain unwrapped for up to an hour after birth. More infants were wrapped early in prospective than in recalled instances. The frequency of delayed wrapping was probably a function of the tendency to early bathing of newborn infants. Over 90% of infants had been bathed within an hour of birth, and the figures for bathing times are similar to those for wrapping times. The differences between parous and primigravid women were minimal.

Table 5.6. Maintenance of the perinatal warm chain.

	Recall data		Prospective data	
	2 y preceding census	2 y preceding census, and subsequent pregnancy	2 y preceding census, and subsequent pregnancy	All pregnancies
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
Live births	4867 (100)	2084 (100)	1926 (100)	3219 (100)
Heating of birthplace after delivery	3358 (69)	1393 (67)	1324 (69)	2152 (67)
Time to wrapping of the baby				
Within 15 minutes	919 (19)	423 (20)	582 (30)	982 (31)
16-30 minutes	2024 (42)	878 (42)	752 (39)	1269 (39)
30-60 minutes	1545 (32)	621 (30)	538 (28)	879 (27)
Over 60 minutes	379 (8)	162 (8)	54 (3)	89 (3)
Time to bathing of the baby				
Within 15 minutes	1385 (29)	634 (30)	634 (33)	1020 (32)
16-30 minutes	2147 (44)	884 (42)	796 (41)	1353 (42)
30-60 minutes	1013 (21)	427 (20)	325 (17)	524 (16)
Over 60 minutes	322 (7)	139 (7)	171 (9)	322 (10)

5.3.2.4 *The first feed*

The figures for recalled and prospective live births remain the same as in the previous section, and the findings are summarised in **table 5.7**. Despite the common assertion that infants tend not to receive breast milk as their first feed, 90% of newborn infants in our study did so. The feeding of ghee-, sugar- and honey-based mixtures, an ostensibly common phenomenon described as making the baby's life sweet, was uncommon and more marked in Brahmin-Chhetri ethnic groups (stratified data not presented). Formula feeding was extremely uncommon in this rural population. A second important finding was that infants were breastfed fairly soon after birth, over half of them within the first hour and over 90% within six hours. Between 40% and 50% of cohort members described discarding colostrum before feeding their infants.

Table 5.7. The first feed

	Recall data		Prospective data	
	2 y preceding census	2 y preceding census, and subsequent pregnancy	2 y preceding census, and subsequent pregnancy	All pregnancies
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
Live births	4867 (100)	2084 (100)	1926 (100)	3219 (100)
Infant's first feed				
Mother's milk	4352 (89)	1871 (90)	1777 (92)	2954 (92)
Ghee/sugar/honey	431 (9)	172 (8)	103 (5)	184 (6)
Other woman's milk	26 (<1)	12 (<1)	6 (<1)	14 (<1)
Cow or buffalo milk	11 (<1)	3 (<1)	8 (<1)	13 (<1)
Formula	3 (<1)	1 (<1)	8 (<1)	4 (<1)
Oil	10 (<1)	9 (<1)	3 (<1)	4 (<1)
Other or don't know	34 (<1)	16 (<1)	29 (1)	46 (1)
Time to first breastfeed				
Within 15 min	98 (2)	35 (2)	18 (1)	33 (1)
Within 15-30 min	543 (11)	233 (11)	241 (13)	416 (13)
Within 30 min-1 h	2472 (51)	1082 (52)	756 (39)	1264 (39)
Within 1-6 h	1469 (30)	625 (30)	702 (36)	1207 (38)
Within 6-12 h	93 (2)	37 (2)	37 (2)	124 (4)
Within 12-24 h	68 (1)	26 (1)	71 (4)	56 (2)
After 24 h or never	87 (2)	28 (1)	77 (4)	119 (4)
Mother discarded colostrum	2285/4830 (47)	1032/2066 (50)	790/1902 (42)	1342/3174 (42)

Chapter 6 Results: mortality rates

6.1 Comparison of recall-based and prospective data

The baby was born upside down. The legs came out first, then the body, but the head would not come out and the baby was hanging there. The baby was moving up to half an hour old. I could not deliver the baby. My relatives were far away from the house. All my neighbours are upper caste people and they don't touch us.

Makwanpur verbal autopsy, infant 18920101

6.1 Comparison of recall-based and prospective data

I used two datasets to examine stillbirths and neonatal outcomes. First, data from the maternity histories collected from cohort members at the initial interview; second, data from the prospective surveillance. In order to compare the findings, I set a transition date between the retrospective and prospective exercises: 23rd March 2001. The first preceding retrospective annual block therefore ran from 23rd March 2000 to 22nd March 2001, and the prospective data ran forward from 22nd March 2001.

The maternity history dataset was modelled on the DHS format. It was collected by recall, starting with the most recent pregnancy. The instruction to the participant was “starting from your last delivery, can you tell me about all your sons and daughters born alive, even if they have died”. We recorded the child’s name, day, month and year of birth (or month and year if day was not recalled), sex, single or multiple pregnancy status, and current vital status. If the child had died, we recorded day, month and year of death (or month and year if day was not recalled). The tool is presented in **annex E**. In our desire to emulate a DHS module, the tool did not record stillbirths.

As in the foregoing sections, the analysis is limited to the MIRA Makwanpur study control clusters, since we are trying to examine two methods of recording vital events in a population in which event rates remain reasonably stable. **Table 6.1** summarises the cohort of 12,170 women. Only eight percent of respondents were adolescents, a finding which is explained by the necessity for women to be married to be included. This incidentally testifies to a secular increase in mean age at marriage in Nepal. According to the maternity history, and with a cut-off date of 23rd March 2001, 12,132 live infants had been born to 7540 of these women in the preceding five year period. 52% of women had given birth to two or more live infants in this period.

Table 6.1. Maternity history sample

	Frequency (%)
Women interviewed	12170 (100)
Under 20 y	973 (8)
20-29 y	4758 (39)
30-39 y	3782 (31)
40 y and over	2657 (22)
Live births to these women in preceding 5 y 23/3/1996-22/3/2001	12132
Women who had a livebirth in preceding 5 y	7540 (100)
Under 20 y	546 (7)
20-29 y	4001 (53)
30-39 y	2274 (30)
40 y and over	719 (10)
Women with 1 livebirth in preceding 5 y	3639 (48)
Women with 2 live births in preceding 5 y	3243(43)
Women with 3 live births in preceding 5 y	625 (8)
Women with 4 live births in preceding 5 y	33 (<1)

Although the prospective follow-up of pregnancies began on 22nd March 2001, there was a lag before the first infants were born. For the purposes of this analysis, the two-year surveillance period was defined as lasting from 1st November 2001 to 31st October 2003. **Table 6.2** summarises the data available: 3344 members of the cohort became pregnant, and information is available on 3226 live born infants.

Table 6.2. Prospective vital registration sample

	Frequency
Women who became pregnant	3344
1 pregnancy in surveillance period	3166
2 pregnancies in surveillance period	176
3 pregnancies in surveillance period	2
Pregnancies	3524
Maternal death in first 7 m of pregnancy	1
Moved out of study area	52
Miscarriage before 7 m	77
Declined to be interviewed	1
Incomplete data	123
Deliveries	3270
Twin pairs	33
Infants born	3303
Stillbirths	77
Live births	3226

Table 6.3 presents data on outcomes for both maternity history and prospective datasets. The maternity history findings are stratified by sequential years of recall to allow assessment of bias. In each preceding year, about 2500 live births were recalled by the cohort. The prospective surveillance documented 3226 live births over two years. The male/female ratio in live born infants was expected to reflect an excess of male births. This was the case, with a retrospective aggregate ratio of 103% and a prospective ratio of 111%. The male/female ratio in infants who died in the neonatal period was also expected to reflect an excess of male deaths, but this excess was expected to be greater and to some degree to mitigate the excess of male births. The retrospective aggregate ratio in this case was 120% and the prospective ratio was 170%. The composite outcome of these imbalances was that the male/female ratio for infants who survived the neonatal period, was 6002/5826 (103%) retrospectively and 1621/1486 (109%) prospectively.

The rules of thumb for neonatal statistics have been discussed. Early neonatal deaths were expected to constitute *roughly* two-thirds of neonatal deaths. The retrospective aggregate figure was 67% and the prospective figure 59%. Likewise, neonatal deaths were expected to constitute over half of infant deaths. In this case, only retrospective figures were available and the figure was 55%.

Table 6.3. Retrospective and prospective outcome frequencies

Maternity history	Live births				Deaths								
	All	M	F	m/f	Neonatal				E/N	Infant	N/I		
					All	m	f	m/f				Early	Late
0-1y preceding	2599	1340	1259	106%	72	42	30	140%	49	23	68%	114	63%
1-2y preceding	2253	1134	1119	101%	58	37	21	176%	39	19	67%	100	58%
2-3y preceding	2369	1195	1174	101%	59	27	32	84%	42	17	71%	117	50%
3-4y preceding	2486	1259	1227	103%	55	30	25	120%	36	19	65%	110	50%
4-5y preceding	2425	1240	1185	105%	60	30	30	100%	39	21	65%	113	53%
0-5y preceding	12132	6168	5964	103%	304	166	138	120%	205	99	67%	554	55%
Surveillance													
2 y live births	3226	1696	1530	111%	119	75	44	170%	70	49	59%		

m: male. f: female. m/f: males/females. E/N: early neonatal deaths as a proportion of neonatal deaths. N/I: neonatal deaths as a proportion of infant deaths.

Table 6.4 recasts the frequency findings as mortality rates. The striking finding is the discrepancy between retrospective and prospective neonatal mortality rates: 25.1 compared with 36.9 per thousand live births respectively. The 95% confidence intervals for these two estimates do not overlap. Similar discrepancies are seen for early and late neonatal mortality rates, although their relative contributions are maintained. Stillbirth figures are available for the prospective dataset. There were 77 stillbirths in 3303 births, giving a prospective stillbirth rate of 23.3 per thousand births. Combining these with early neonatal deaths yields a perinatal mortality rate of 44.5 per thousand births.

Table 6.4. Retrospective and prospective mortality rates

	NMR	95% CI	ENMR	LNMR
Retrospective				
0-1 y preceding	27.7	21.7-34.8	18.8	8.8
1-2 y preceding	25.7	19.6-33.1	17.3	8.4
2-3 y preceding	24.9	19.0-32.0	17.7	7.2
3-4 y preceding	22.1	16.7-28.7	14.5	7.6
4-5 y preceding	24.7	18.9-31.7	16.1	8.7
0-5y preceding	25.1	22.3-28.0	16.9	8.2
Prospective				
2 y live births	36.9	30.7-44.0	21.7	15.2

Chapter 7 Discussion: care practices

The baby was born in the eighth month. He was very small. He cried two or three times with a small voice. He didn't cry properly as though something was stuck in his throat. It was like a buzzing sound. He could not suck milk from the beginning. He did not even close his lips. The baby died on the day after birth. He was very cold at birth, like snow. I bathed him fifteen minutes after birth. Then I wrapped him. I asked the traditional healer to come but he could not. I did not call a traditional birth attendant and watched the sick baby for a whole night. After he was born I did not think he would survive. What could I have done?

Makwanpur verbal autopsy, infant 21940161

7.1 Information about households

7.1.1 Ethnicity and religion

The comparison of a number of subsets of the original household dataset allows us to make some inferences about the cohort who went on to become pregnant. The higher proportion of Tamang women among the prospectively followed pregnant cohort members is plausible on the basis of the relative poverty of this ethnic group, which is likely to have been accompanied by a higher fertility rate. The high proportion of Tamang households is also reflected in the number of household heads who described themselves as Buddhist, a figure far higher than Nepal's national average. Previous statistics have put the proportion of Buddhists in Nepal at around ten percent. The means of classification has been criticised as being politically partisan, and there have been moves toward reclassification, some of them motivated by ethnic nationalism on the part of certain ethnic groups. The DHS of 2001 puts the number of Buddhists at around 20 percent.⁷⁶

7.1.2 Poverty

With few exceptions, the inhabitants of the study area were poor subsistence farmers. An interesting point arising from this is that an occupational classification was not useful as an indicator of relative socioeconomic status. Over half of households did not own any of the items falling into the lowest category of asset score. The asset score itself allowed us to define categorical degrees of poverty and has backing from the economic literature.¹⁷² It is possible that, in order to discriminate more accurately, it might be better to use qualitative techniques emerging from the corpus on participatory rural appraisal, such as wealth ranking. The problem with this approach is that it reduces the capacity to compare findings between communities. While ranking will yield a more precise gradation of members' socioeconomic status, the ends of the spectrum will differ between communities. The other possibility would be to use standardised comparative indices. Although we attempted to do this, basing our asset score on published data,¹⁶⁰ investigators have been addressing this issue

contemporaneously with the study.^{173 174} One current idea is to run principal component analyses on data available in routine DHS modules to produce asset scores, an approach used by the World Bank to describe poverty in a number of countries, including Nepal. Initially continuous variables, the composite asset scores are characteristically broken into quintiles to express socioeconomic status. The scores themselves include information on: household electricity, radio, television, bicycle, and telephone; work on household agricultural land; the principal source of drinking water; the principal type of toilet facility; and the number of residents per household sleeping room.¹⁷⁵ Unfortunately, some of these data were not available in our household survey. We have included them in work for the next phase of the surveillance with a view to generating comparable scores and conducting similar quintile-based analyses.

7.2 Information about the cohort

Less than a quarter of cohort members were literate when given a simple passage to read. This is less than half of the most recent reported national female literacy rate of 43%.⁷⁶ I can see two reasons why this discrepancy might be plausible, and do not feel that it necessarily implies survey inaccuracies. First, our survey omitted the district municipality in which literacy rates would certainly be higher. Second, DHS methods use a sampling frame based on probability proportional to size which ensures adequate representation of Nepal's growing urban areas. The anthropometric findings support the consensus that stunting is common in Nepal, albeit often in the presence of appropriate weight for height.

7.3 Patterns of antenatal, delivery and neonatal care practices

7.3.1 Antenatal care

Uptake of antenatal care in the study area was low: 20-30%. Large-scale studies put attendance figures at between 24% and 49%.^{76 79 92 93} A recent government health service estimate for Makwanpur district itself is 41%, higher than our figure but probably leveraged

by the inclusion of the municipality.¹⁷⁶ When visits were made, they usually began in mid-pregnancy and were limited to less than the four visits recommended in WHO protocols.¹²⁷ The figures accord with the findings of the 2001 DHS⁷⁶ and the Nepal Family Health Survey of 1996⁷⁹. As was the case for the other findings – and perhaps surprisingly – there was little evidence that consultation rates were higher for primigravid women. This may reflect the limited possibilities for change in the rural context where service provision is patchy and there is little motivation for attendance.

In Nepal, antenatal care should be provided by several cadres of health worker, including doctors, nurses, auxiliary nurse midwives, health assistants, village health workers, and maternal and child health workers. Official roles and reporting systems for antenatal care are clearly defined and guidelines produced for each cadre. All cadres should be able to diagnose pregnancy, distribute client-based record cards and provide regular antenatal care at least four times during pregnancy. Routine activities include screening for risk factors through history and examination, discouraging and providing alternatives to unsafe abortion, and recognition of danger signs. Client counselling should focus on danger signs, nutrition, the location and cleanliness of delivery, and appropriate care-seeking for problems. Tetanus toxoid should be administered and iron and folic acid supplements provided. In the event of emergency, health workers should provide obstetric first aid and arrange referral and transport.¹⁷⁷

In terms of place of care, our findings present a more positive picture of the primary health care system than do those of other surveys. Three-quarters of women who had accessed antenatal care had done so at community level. The district hospital was considerably less dominant than the 50-60% estimated previously.^{92 93} Presumably because of the rural setting, private sector care was a minority option (1%) far less common than the 10-15% described elsewhere.^{92 93} Traditional birth attendants did not appear to have a role before the onset of labour.

Two-thirds of pregnant women did not receive tetanus toxoid, higher than the half described in other studies.^{76 79 92 93} This finding may not be as disappointing as it looks. The current international recommendations for tetanus toxoid immunisation for women of childbearing age are confusing and - coupled with the low observed uptake of antenatal care - difficult to achieve in rural Nepal. Over the last decade, there has been a move to take the administration of tetanus toxoid out of the confines of antenatal care and cover all young women in cycles of mass immunisation similar to the national immunisation days that have been successful in the case of polio. This means that antenatal administration becomes less of a core and more of an opportunistic function.

Iron and folate supplementation was clearly problematic, with 12-27% of women consuming any supplements, less than one percent for more than six months. These figures represent about half of previous estimates.⁹³

7.3.2 Delivery and newborn care

7.3.2.1 Attendance at delivery

Our results support those of previous work with regard to the extreme proportion of home births and the limited use of other birth sites. 95% of women gave birth at home, a finding that accords with the results of two national studies.^{79 92} When deliveries took place at a health care facility, the key choice appeared to be between home and the district hospital, rather than home and another primary care facility.

Attendance by trained service providers was extremely limited for both trained government cadres (2%) and traditional birth attendants (3-4%), which again supports previous findings.^{79 93 95 178} The fact that 10% of women gave birth alone echoes previous findings,⁷⁹ highlights the gender inequity that underpins many discussions of health, and may imply that childbirth is of limited urgency within a range of family concerns.

With the current emphasis on skilled attendance at delivery, either in the home or at a facility, this finding gives pause for thought. More worryingly, the maternal and child health

worker, identified by policymakers as a potential 'semiskilled' attendant, was present at less than one percent of births. The task of increasing the coverage and uptake of her services can fairly be described as a mountain to climb. Likewise, the small proportion of births attended by a traditional birth attendant is an indicator of how assumptions about indigenous practices may be optimistic. Efforts to work with mothers-in-law and other family members may yield higher dividends in the short-term. In the longer term, efforts to strengthen outreach midwifery services should be a priority for policymakers, but this will require a quantum change in investment for reproductive health services. Given the existing low levels of attendance by skilled cadres, it would require many years of investment to reduce population attributable risk arising from a lack of a skilled attendant.

Most maternal and neonatal deaths take place at home, beyond the reach of health facilities. Current international policy emphasises the provision of skilled birth attendants and improved obstetric services in health facilities as key interventions to reduce neonatal and maternal mortality.¹¹⁵ As has been mentioned, the Averting Maternal Death and Disability programme goes further in arguing for a primary focus on the development of emergency obstetric care at district hospitals.¹⁷⁹ Such policies are essential to achieve what should be a basic right for every woman. But skilled attendance and institutional delivery alone is not a credible strategy for reducing mortality in populations where most mothers deliver at home. In a dissenting appendix to a recent global review, Abhay Bang questioned an approach based on skilled attendance and institutional delivery, suggesting that the inference that training traditional birth attendants did not succeed was a "half-truth," and that community neonatal care was more cost effective than institutional care.⁶⁶ Bang and colleagues showed a 62% reduction in neonatal mortality in rural India through a community based approach that included training of traditional birth attendants and local women to treat sick newborn infants at home.¹⁸⁰

Our findings complement those of a study conducted in Banke, a midwestern district.¹⁸¹ The study collected data from routine statistics, structured observation and interviews with health

workers and clients, assessing maternity services using the well-known Donabedian framework of structure, process and outcome.¹⁸² 67% of primary care institutions offered antenatal care services, 38% provided skilled assistance at home deliveries, but none catered for facility-based deliveries. Antenatal care coverage was 24% for rural pregnancies. Visits lasted an average 10 minutes, with one minute for education and counselling. Communication "... was mainly unidirectional and paid little attention to interpersonal aspects", and 65% of users felt that they had not been given the opportunity to ask questions. Nine percent of pregnant women ended up with a prescription for iron tablets, of which about two-thirds got the tablets. Five percent of pregnant women took supplements continuously for at least a month. At antenatal visits, blood pressure was measured in 90% of cases, but no biochemical tests were done. 16% of deliveries involved health workers (ten percent institutional and six percent home deliveries). Finally, the study highlighted the hit-and-miss nature of consultation: 86% of institutional deliveries were self-referred and the vast majority of high risk pregnancies were not covered by obstetric care.

Case studies from countries that have achieved low maternal mortality have shown that delivery care can be organized in a number of ways, from home births with a briefly trained non-professional to institutional deliveries with trained professionals.¹¹⁵ Approaches based on home births are, however, rare. As part of the MotherCare initiative, a programme in Indonesia trained and deployed professional midwives in villages of three districts of Kalimantan. The package included in-service training of midwives, peer review visits by trained midwives, and training in interpersonal counselling and communications, as well as IEC for pregnant and post-partum women and key decision makers in the community, and seed money for community emergency funds.¹⁸³ The evaluators felt that although the ultimate programme goal was to reduce maternal and perinatal mortality, directly measuring these outcomes was not feasible.¹⁸³⁻¹⁸⁵, and used a combination of before-after random community surveys, censuses of village midwives, routine hospital data, knowledge and skill tests, observation of interactions between midwives and clients, and monitoring of IEC materials. The combination of strategies was associated with an increase in skilled birth

attendance, from 37% to 59% between 1996 and 1999. The largest increase was in home deliveries with a village midwife present. The rate of home delivery did not change, remaining at 88%. In effect, although these changes were impressive, access to life saving care for emergencies did not rise, despite upgrading of hospitals to provide appropriate care. It was also difficult to distinguish the effects of the components of the programme from government activities. The effects of the IEC campaign were less than desired, when measured in terms of target groups reached and knowledge of danger signs.

7.3.2.2 *Perinatal hygiene*

The likelihood that infection accounts for 30-40% of neonatal mortality means that it is a focus for potential intervention strategies.⁵⁹ Infections in mothers and infants are intimately linked. Points of concern are a clean place for delivery, a clean surface on which to deliver, cleanliness of the hands of attendants, clean cord tying, cutting and dressing, and clean and dry wrapping of the baby (also a factor in avoidance of hypothermia). 30-50% of attendants were recalled as having washed their hands. Clean delivery kits were only used by a small number (five percent, similar to previous estimates⁹³). The tendency to use new or boiled blades to cut the cord is a positive step, as is the finding that 70% of umbilical stumps were not dressed (again, somewhat higher than previously estimated⁹³).

It may be that the means of cutting the cord is not as important a risk factor for infection as the means of dressing.¹⁸⁶ Care of the umbilical cord stump remains a confused issue.¹⁸⁷ While in principle it should be left dry and uncovered, the importance of neonatal tetanus means that there is a body of literature on the subject. Most work has involved case-control studies looking for risk factors, of which the most clearly identified has been the application of clarified butter (*ghee*).¹⁸⁶ It is possible that even this is dependent on cow dung used in the fire for preparing it.¹⁸⁸ Although the recommendation that the cord stump should be left uncovered and undressed is sensible, it is by no means certain how strongly it should be advocated. Little evidence exists of harm from disinfectants and topical antimicrobials,¹⁸⁹ and some investigators have suggested that they may reduce the risk of neonatal tetanus

further.¹⁹⁰ Risk factors other than cord dressings may also play a part in the aetiology of neonatal tetanus, one of these being the wrapping materials used to bundle or swaddle newborn infants in certain settings.¹⁹¹

7.3.2.3 *Maintenance of the perinatal warm chain*

Neonatal hypothermia has been described in a hospital setting in Nepal,¹⁹² and its prevention is a focus of essential newborn care. WHO emphasises the importance of maintenance of the warm chain after birth and has developed training materials for midwives and birth attendants.¹⁹³ Hospital based studies may not, however, paint a true picture of the situation at home. The local identification of pregnancy as a *hot* state and the post-partum period as a *cold* one seems to us to be reasonably generalisable, both in our study area and in the wider Nepalese context.¹⁹⁴⁻¹⁹⁶ It brings with it food prescriptions, a stated need for warm surroundings in the puerperium and a tendency to clothe mothers and their newborn infants thoroughly.¹⁹⁷ This need was reflected by our finding that two-thirds of rooms were heated either throughout or after the labour. On the other hand, the cold state of both mother and baby is offset by delayed wrapping and early bathing. Unless precautions are taken to limit heat losses immediately after birth, temperature may fall by two-to-three degrees celsius during the first half hour, the drop in temperature being greatest in low birth weight infants.¹⁹⁸ There are two issues here. First, there is a tendency to delay cutting of the umbilical cord and wrapping of the baby until the placenta is delivered.¹⁹⁶ In normal situations this may be appropriate, but it could lead to severe heat loss if there is delay in delivery of the placenta. Second, bathing appears to be a priority, with almost all babies bathed in the first 24 hours, and over 90% bathed in the first hour.

7.3.2.4 *The first feed*

One area where traditional practices appeared healthy was breastfeeding. Almost all mothers breastfed their infants and use of formula was minimal. Further, over half of infants had been fed in the first hour, considerably more than the 16% described in another study,⁹³ and

despite reports that breastfeeding is invariably delayed for up to 24 hours in rural south Asia.^{199 200} This positive finding has implications for nutrition, prevention of infection and thermal control.

The use of prelacteal feeds and the discarding of colostrum has also come in for attention. In the communities in which the study was conducted, prelacteals were given in less than ten percent of cases. More to the point, our qualitative work suggested that the usual practice was to give a taste of non-breastmilk food on the end of a finger, and only once. About half of women who breastfed said that they discarded colostrum before the first feed. Intuitively, this did not agree with the high rates of early breastfeeding, since one imagines that true omission of colostrum feeding would last at least a day. It may be that this practice does not justify intervention in rural Nepal, though there may be substantial variation in practice prevalence in other south Asian communities.

7.3.3 External validity

Two factors might limit the interpretation and generalisability of these findings: ethnic group variation and recall bias. I repeated the analysis after categorising for ethnic group. The general findings were similar, and most of the differences were explicable on the basis of socioeconomic status, occupation, education and geographical location rather than on explicitly ethnic differences. Tamang people are likely to be poorer, to be engaged in agriculture and to live further away from amenities. This is witnessed by the finding that they were more likely to give birth outdoors and to cut the cord with a sickle, and less likely to be attended by a service provider. Newar and Brahmin-Chhetri groups tend to be concentrated in town and village centres and to be better off. They were more likely to deliver at the hospital, to be attended by health service providers and to use clean home delivery kits and clean blades. They were less likely to give birth alone. There were some ethnic differences, however, that were striking: Brahmin-Chhetris were much more likely to give a taste of sweet food as the first feed, while Tamangs and artisanal castes were more likely to discard first colostrum and subsequent foremilk.

Confusion may also arise in health promotion campaigns from the discordance between the community and expert models of hygiene. Two clear examples are: the expert emphasis on hygienic handling of the baby, yet discouragement of bathing in the first 24 hours; and the emphasis on the use of a plastic sheet (provided in the clean home delivery kit) as a delivery surface, when in practice this quickly becomes dirty and may not, in truth, offer any hygienic advantage over traditional materials like textiles or straw.

The question of recall is considerably more vexed. To optimise accuracy, I limited the analysis to pregnancies which had occurred in the previous three years. The findings also compared favourably with those of the qualitative research which we had carried out in the same population.^{134 196} However, recall in itself is worth examining in detail.

Chapter 8 Discussion: Retrospective and prospective evaluation

8.1 Retrospective

8.1.1 Prospective evaluation cases were higher than retrospective

The labour pain started early in the morning at around three o'clock. I called my mother-in-law's elder sister at ten o'clock in the morning. The baby was born at two o'clock in the afternoon. I cut the umbilical cord with a blade and did not tie it with a thread. Blood came out from the umbilical stump and wet two or three pieces of cloth. The baby turned white. He was alive for five or six hours after the cord was cut. Just before death, his breathing became laboured. I had lost two babies before this. They also died just after they were born. I did know that I should tie the cord, but my mother-in-law's sister had stopped me. I gave birth to the baby in the back of the house which is a very dark place and there could have been a ghost there. Sometimes I think the ghost may have got angry and killed my baby.

Makwanpur verbal autopsy, infant 06410221

8.1.2 Infants and deaths overlaid on a map

The second project is that of the Institute of Health Services, which is a project of mortality. It deals with strategies to reach the communities and to provide services based on mortality histories with the aim of reducing the mortality by the indirect entomological techniques. It also, however, uses the direct entomological techniques around a gold standard of entomological techniques. The project is to study the situation under discussion (I would argue that it is a very good example of the use of entomology) simply put, mortality histories are given by the communities and because they tell us when infants were born. Just entomological methods a number of births to a woman but do not locate them in time. This means that we have to apply life tables and mathematical models that take account of the age structure and density of the population.

8.1 Mortality rates

8.1.1 *Prospective mortality rates were higher than recall-based*

I have already argued that the data on perinatal and neonatal health in developing countries are sparse. Where they exist, they have been collected from either hospitals or from cluster surveys, and the literature is dominated by advocacy pieces based on secondary sources. I have discussed the limitations of hospital data above, and turn now to survey data.

The Makwanpur study gave us an opportunity to compare recall in two situations. First, the common situation in which a respondent was asked questions about events in the past; second, an interview in which a respondent was asked the same questions about events in the preceding month, in the case of a documented birth. NMRs estimated through prospective vital registration were higher than those based on maternity history by about 12 per thousand live births (see **table 6.4**), which suggests that the maternity history survey underestimated the burden of neonatal deaths by over 30%. This comes as no surprise, since it is commonly assumed that recall-based surveys tend to underestimate child mortality. Concrete examples of underestimation are thin on the ground, however.

8.1.2 *Indirect and direct methods of estimation*

The second problem is that the bulk of the literature compares indirect with direct estimates of mortality. It deals with situations in which vital registration is not possible, in which surveys based on maternity histories *might* be possible, and in which the solution is to use indirect demographic techniques. It aims, therefore, to assess the utility of indirect techniques against a gold standard of maternity history. In this it is one step removed from the situation under discussion (I would argue that it aims to reconcile the guesstimate with the underestimate). Simply put, maternity histories allow *direct* estimation of mortality rates because they tell us when infants were born. *Indirect* techniques ascribe a number of births to a woman but do not locate them in time. This means that we have to apply life tables and mathematical models that take account of the age structure and fertility of the population.

The techniques do not usually allow for estimates of neonatal mortality: if we wanted to make them, they would have to be based on an estimated proportion of an estimated infant mortality rate.

There is an extensive demographic literature comparing direct estimates with those based on indirect techniques,²⁰¹ such as the life-table methodology developed by Brass²⁰² and the preceding birth technique,^{203 204} but much less on the validity of direct methods themselves. Very few studies have compared estimates of mortality from maternity histories with estimates from vital registration.

8.2 Types of error in surveys

8.2.1 Knowledge, attitudes and behaviour

There is also a literature on the design of large studies to describe population knowledge, attitudes and practices. Discussions of community-based surveys often hinge on considerations of content and sample representativeness. For example, it is notoriously difficult to evaluate knowledge and attitudes with one-off quantitative surveys. Attitudes are probably better described through qualitative studies and the link between knowledge and practice is a black box. Likewise, reports of quality of care – or even content of care – are difficult to interpret. In an assessment of client recall of health behaviour advice during outpatient visits, 2670 primary care consultations in Ohio, USA, were observed directly and their content was compared with client recall. About 50% of discussions about diet, smoking and exercise were recalled. Recall was variable, was more likely if the advice was predictably associated with issues that concerned clients, and if the duration of the advice was longer.²⁰⁵ This is one reason why the DHS does not include questions on quality of care.²⁰⁶

8.2.2 *Sampling and non-sampling error*

Any survey faces a generic range of sources of error, the importance of each of which will depend on the situation. The types of error are summarised in **box 8.1**. Most discussions are limited to sampling errors and the well-described ways to reduce their likelihood: increased sample size, random sampling, stratification. The important facet of sampling error as regards the present discussion is that it can be estimated. Indeed, the estimation is inherent in statistical analysis and should be presented clearly to a reader of the results. In the Makwanpur study, we have the luxury of a census-based recall dataset and a cohort for the prospective dataset. This means that the burden of sampling error is largely eliminated.^a Non-sampling errors arise because of "variations between the response given by interviewees and the true answer".²⁰⁷ I think that there are three reasons why such errors - the subject of this discussion - are more problematic. (1) They are not estimable with statistical models; (2) there is limited discussion of them in the biomedical literature; (3) the way that they occur is poorly understood. The reader who has done any fieldwork or analysis will be familiar with the acronym *GIGO*: *garbage in, garbage out*. It is non-sampling error that makes garbage look like valid information. The problem is that we do not see this happening and - with apologies for stretching the metaphor - we do not have a label to tell us that we are dealing with a garbage bag.

Let us assume that we are trying to measure events and actions, since it is actions and events which we want to influence. The first considerations will be the design of the study and the interview tool. The design of the study will generally be seen as a problem of survey-or-census and then a problem of representative sampling, which will be solved with either a random cluster sample or PPS. Discussions of the tool will centre on interpretability of questions, sequencing and the potential knowledge of the respondent. At some point, the

^a There are, however, two ways in which residual sampling error operates in the datasets. First, the closed cohort of women in the prospective study may systematically exclude higher-risk pregnancies. This is discussed elsewhere in the thesis. Second, the external validity of the findings may be limited by the conduct of the study in rural Makwanpur. This is not usually thought of as an example of sampling error, but I think that it is: any study could be seen as involving a single cluster selected from a sampling frame of 'the world'. That this is a cogent argument is witnessed by the growing calls for global multi-centre studies.

issue of recall will be raised. Will the respondent be able to recall an event accurately? Will she be able to date it or sequence it? Will she omit to describe events?

Box 8.1. Types of error in recall surveys

Type	Example
Sampling error	
Selection bias	Selecting survey areas for ease of access Skipping households Selectively excluding the more vulnerable
Non-sampling error	
Recall bias	Wilful omission or commission Overestimation or underestimation depending on duration of recall ^{208 209} Mistiming of events Overestimation or underestimation depending on perceived seriousness of event ^{210 211} Overestimation of common events Overestimation or underestimation depending on actions taken ^{208 209}
Response error	Differences in the way a question is interpreted Differential results of prompting by interviewer
Proxy reporting error	Parents reporting on behalf of their children Family members reporting on behalf of others ^{208 209}

8.2.3 *The idea of recall bias*

*"... Although little is actually known about biased recall (or reporting), expressions of concern about its possible effects are not difficult to find in the literature... Yet, despite calls for investigations of the nature and importance of the phenomenon..., little experimental evidence exists to support or refute any of the warnings and concerns about recall bias."*²¹²

A potential for recall bias exists whenever historical self-report information is elicited from respondents.²¹³ It is not unusual for statements to be made along the lines of "if it's over six months, the respondent won't remember", but they tend to be made on the basis of gut feeling rather than cognitive psychology. This lacuna in our knowledge has been revealed by work on MTCT of HIV. Since there may be a difference in the likelihood of transmission depending on whether breastfeeding is exclusive or mixed, it is important to evaluate breastfeeding patterns.²¹⁴ This necessitates recall and description by mothers. Unfortunately, it has become evident that accuracy and reliability are real problems in this context, and a number of studies have been conducted specifically to look at the best timing for recall evaluations.^{215 216}

It is likely that people who have suffered an adverse life event will be more likely to recall potentially contributory events. The classic example of recall bias is from Stott's study of 1958, in which the mothers of children with Down syndrome reported having experienced more shocks during pregnancy than control mothers (the study was conducted before the aetiology of Down syndrome was confirmed).²¹⁷ Conversely, people who have not met with a problem may be less likely to recall an exposure.

8.2.4 Examination of the mortality datasets for non-sampling error

Box 8.1 provides a framework for comparing the recall-based mortality data with the data from prospective surveillance. In order to do this, the findings have been summarised in **table 8.1**.

8.2.4.1 Selection bias: omission of births from the closed cohort

There were less births in the prospective surveillance period than one might have expected. The maternity history data documented about 2500 births per calendar year (see **table 6.3**), the prospective surveillance about 1600. It is possible to calculate crude birth rates on the basis of these figures. In a population of 83,072, the estimated CBRs were 30 per thousand for the retrospective and 20 per thousand for the prospective study. This compares with an urban estimate of 21 and a rural estimate of 35 from the most recent DHS.⁷⁶ There are three possible explanations for the discrepancy. First, the surveillance system may have missed pregnancies and births. Second, the crude birth rate in the study area may actually have been low. Third, the cohort may not have included all pregnancies in the area. There is anecdotal evidence of reduced fertility in the study area: use of temporary and permanent contraceptive methods was common, and mini-laparotomy sterilisation was actively promoted in the district throughout the period of the study. Our opinion is that birth rates might be lower than expected on the basis of a rural estimate. I do not, however, feel that this explains much of the discrepancy: the estimates based on maternity history are plausible in comparison with DHS estimates. Likewise, we do not have evidence that births may have been missed. Since each cohort member was visited monthly, it seems unlikely that infants could be born and not be noted by either ward enumerators or by family members and neighbours.

The most compelling explanation of the crude birth rate is that the cohort systematically excluded women who were unmarried at the time of enrolment. A group of adolescents grew older, were married and conceived in the two years of surveillance but were not monitored

by the surveillance system. A corollary of this is that it is this group – young primigravid women - who might have been subject to higher risk of adverse neonatal outcomes.

8.2.4.2 Recall bias: wilful omission or commission

This is exemplified by a failure to report deceased infants. In the comparison of maternity history and vital registration data, this is likely to be the largest single source of error. Maternity history mortality rates were systematically lower than prospective rates, and it would be hard to argue against the idea of selective failure to report deaths. There are many reasons for this to happen. In traditional communities, where perinatal death may be ascribed to malign influences and may signify vulnerability, families may be reluctant to report it. In Thailand, 100% of stillbirths and 45% of infant deaths were under-reported when official statistics were compared with a retrospective survey.²¹⁸ In Senegal, although only four percent of deaths were omitted by health workers when estimates of mortality rates from maternity histories were compared with longitudinal surveillance, there were differences in age-specific mortality.²¹⁹ A reluctance to report neonatal deaths also has implications for bureaucracy. Births and deaths usually need to be registered, and a nonexistent stillbirth or infant death does not require forms to be filled in and government offices to be attended.

8.2.4.3 Recall bias: overestimation or underestimation depending on duration of recall

This type of bias would manifest as failure to report births and deaths as the period of recall lengthens. If this was the case, we would expect the number of recalled live births to fall as the period of recall increases. This would be offset to an unknown degree by the likelihood that, through changes in fertility, the true number of births has fallen over the period of recall. Assuming the latter possibility, **table 8.1** suggests that there may have been a reduction in recalled live births as the recall period extended from one to two years, but this is not supported for longer periods of recall. What may be more important is an elevation in recalled live births in the one year prior to the survey. It is possible that births in the 1-2 years preceding the survey could have been elevated into the last year of recall.

8.2.4.4 *Recall bias: Mistiming of events*

A common suggestion from the literature is that neonatal deaths might be misclassified as infant deaths. If this was the case, we would expect neonatal deaths to contribute a lower proportion to infant deaths (N/I in **table 8.1**). The contribution based on maternity history was 57%. This finding roughly accords with other estimates,⁶⁴ and there is a suggestion that the proportion falls as the period of recall lengthens, but we do not yet have the infant mortality rate for the prospective cohort. Overall, I suggest that this type of error may have occurred.

The second possibility is that early neonatal deaths could be misclassified as stillbirths. If this was the case, we would expect to see lower retrospective neonatal mortality rates, lower early neonatal mortality rates, and lower contributions of early neonatal mortality to neonatal mortality (E/N in **table 8.1**). Although the first two expectations are met, the last is not. In fact, we see higher contributions in the retrospective than in the prospective data. The prospective finding of equal stillbirth and early neonatal mortality rates is reassuring.

This finding is interesting because, if any source of error was likely to be operating, one would have imagined that it would be this. There are many reasons for this assumption. First, we are dealing with a setting in which the newborn infant occupies a liminal position between two worlds. It is characteristic of Nepalese culture – as well as cultures throughout Asia – that babies are not named until they have survived the early neonatal period.¹⁹⁶ The infant who cries or moves at birth and subsequently dies may not seem any different from the infant who is stillborn. Indeed, the need to explain to health workers worldwide that any infant who moves at all, or even breathes for a moment, should be classified as having been born alive is evidence of the blurring of the two periods. Secondly, a baby classified as having been stillborn brings with her perhaps less sense of guilt on the part of a birth attendant who did not attempt to – or manage to – resuscitate her. Thirdly, as mentioned above, family responsibilities may be greater in the event of neonatal death than stillbirth.

8.2.4.5 Recall bias: duration of recall combined with mistiming of events

It has been observed that respondents tend to move problematic events out of the frame of recall where possible. For example, if one were to ask a woman to recall the births of all babies in the last five years, and if a perinatal death had occurred over four years previously, there might be a tendency to mentally move the event out of the five-year frame. This is unlikely to have been a major source of error in the study, since there was no defined period of interest at the time of interview. If it was, we would also expect to see neonatal mortality rates fall as the period of recall becomes closer to the five year cut-off point. We do not see this.

8.2.4.6 Recall bias: overestimation or underestimation depending on perceived seriousness of event

In settings with a preference for sons, it is possible that deceased female infants may be selectively omitted from recall data. If this source of error was important, we would expect to see inflated male/female gender ratios for live births. In fact, we see higher ratios in the prospective surveillance data.

In summary, although other misclassification errors may play a part, I feel that the most likely explanation for the discrepancy is a failure to recall deceased infants, a tendency that may increase with the length of recall.

Table 8.1. Retrospective and prospective outcome frequencies

	Live births				Deaths						E/N (%)	Infant	N/I (%)	
	All	m	F	m/f (%)	Neonatal				Early	Late				
	All	m	F	m/f (%)	All	m	F	m/f (%)						
<i>Maternity history</i>														
0-1y preceding	4885	2520	2365	106.5	145	80	65	123.1	102	43	70.3	217	66.8	
1-2y preceding	4310	2216	2094	105.8	100	60	40	150.0	70	30	70.0	174	57.5	
2-3y preceding	4570	2372	2198	107.9	112	58	54	107.4	80	32	71.4	208	53.8	
3-4y preceding	4901	2475	2426	102.0	106	61	45	135.6	67	39	63.2	216	49.1	
4-5y preceding	4881	2486	2395	103.8	131	66	65	101.5	92	39	70.2	234	56.0	
0-5y preceding ¹	23547	12069	11478	105.1	594	325	269	120.8	411	183	69.2	1049	56.6	
<i>Vital registration</i>														
2 year figure ²	2576	1339	1237	108.2	103	61	42	145.2	64	39	62.1			

m: male; f: female; m/f: ratio of male to female; E/N: ratio of early neonatal to neonatal deaths; N/I: ratio of neonatal to infant deaths.

¹ 23 March 1996 - 22 March 2001.

² 23 March 2001 - 22 March 2003. The first deliveries occurred about nine months into this period of pregnancy registration.

8.2.5 Comparison with Demographic and Health Survey

8.2.5.1 Maternal recall in the DHS

The obvious context for discussing maternal recall is the DHS methodology. The DHS programme began in 1984 as a successor to the World Fertility Survey. The respondents are generally women of childbearing age, but men have been included. Mortality estimates are based on maternity histories from women aged 15-49 years, covering all children born alive and working backwards from the most recent. There are also questions on antenatal care (caregiver, number of visits, timing of first visit, receipt of tetanus toxoid), place of delivery, birth attendant, complications, breastfeeding and supplementary feeding. The DHS initiative has been helpful in tracking fertility and child mortality across and within countries, providing coverage data for key health service indicators, and improvements in health survey technique. DHS modules are limited to health indicators which can be measured with relatively few questions, and their main weaknesses are assumed to be in reporting and recall bias and misclassification of illness.²⁰⁶ This is supported by studies from Benin and adjacent countries,²²⁰ in which DHS results were compared with those of a multi-round survey (in other words, one-off recall-based findings were compared with sequential recall-based findings), and Senegal.²²¹ Both studies considered child mortality and suggested that recall of births was generally reliable, although there were differences in age patterns that might affect estimates of neonatal mortality.²¹⁹

8.2.5.2 Nepal DHS 2001

Nepal's latest DHS was carried out in the first half of 2001.⁷⁶ The survey interviewed ever-married women aged 15-49 years and direct computation of neonatal mortality rates was carried out on the basis of full maternity histories. For the Central Development Region (within which Makwanpur District lies), the sample included 2362 births in the five year period preceding the survey. The stillbirth rate in this area and period was 22.0 per thousand births, the neonatal mortality rate 48.4 per thousand live births, the early neonatal mortality

rate 24.6 per thousand live births, the late neonatal mortality rate 23.8 per thousand live births, and the infant mortality rate 77.4 per thousand live births. The contribution of early neonatal mortality to neonatal mortality was 50.8%, and the contribution of neonatal mortality to infant mortality was 62.5%. The commonest non-sampling errors were misreporting of date of birth, misreporting of age at death, and underreporting of births. The executing team found evidence that deceased children's birth dates were shifted out of the five-year recall period, but did not confirm underreporting of early neonatal deaths. They shared our opinion that underreporting of the births of deceased children is a major source of error.

Why are the estimated neonatal mortality rates in our study lower than those from the 2001 DHS? There are four possibilities. First, neonatal mortality rates in Makwanpur may be lower than the mean values estimated for the whole Central Development Region. I regard this as likely. Second, our maternity histories may have been of lower quality than those of the DHS. While accepting this possibility, I find it difficult to believe that a survey whose focus was on perinatal and neonatal events, carried out after extensive planning and training, by cadres who had been involved in the design process and were working in their own home areas, would be likely to be less accurate than a smaller, more diffused survey carried out by contractors. Third, the DHS may have overestimated neonatal deaths. This is unlikely to have been the case. Finally, the effect of a closed cohort may have been to select for pregnancies at lower risk. I regard this as likely.

8.3 Recall and child health

8.3.1 *Maternal recall in paediatric practice*

Long before demographic and health surveys were planned, the issue of maternal recall was important for paediatric practice. For a large part of childhood, it is upon a mother's description of events that the paediatrician bases a diagnosis. There are two dimensions to this: (1) the mother is a proxy respondent for the child, and (2) the mother often has to recall perinatal events which may have had a bearing on her child's future. To my knowledge, the first considerations of these issues were published in the 1930s in the USA.²²² JW Macfarlane described the process of recall in a group of Californian mothers at an average 21 months after delivery:

*The retrospective account was so unreliable that we have had to disregard it... Weight at birth was reliably reported. The use of instruments was unreliably reported – only two-thirds of the mothers delivered with instruments reported this fact. The duration of labor showed an average discrepancy of 3.5 hours, exact agreement occurring in only 10% of the cases... Illnesses, unless outstanding, were frequently forgotten.*²²³ (quoted in ²²⁴).

Such early reports perhaps say more about the attitudes of physicians than about women's capacity to recall events. This underlines the fact that recall is not the only factor: the will to transmit the information to the interviewer is also important. Nevertheless, several things in the quotation are both striking and reiterated in subsequent work.

- The unreliability of self-reported morbidity. This appears to hold in a variety of situations.
- The reliability of reports of birth weight in affluent populations in which birth weight is always measured. This is probably reinforced by the cultural importance of communicating the weight of one's baby.

- The unreliability of reports of instrumental delivery. At first glance, this is striking. How is it possible that – even during the pain and stress of delivery – a woman would either not notice or not recall the use of forceps? Part of the answer lies in the context: it is conceivable that in 1930s Berkeley a combination of analgesia and lack of communication could mean that a woman might actually not realise that she had had an instrumental delivery.
- The unreliability of reports of labour duration. This is not at all surprising. One might even ask whether a couple of hours here and there is clinically important in the absence of fetal distress, which begs questions about discrimination between the first and second stages of labour.

8.3.2 *What is recall?*

Cognitive psychology has given us some insights into individual recall of events. In an important paper, Bradburn and colleagues examined what we mean by recall as it applies to survey questions requiring quantitative answers: when, how long ago, how often, how much?²²⁵ They suggested that recall is fragmented and relies on a combination of retrieval and inference.

8.3.2.1 *Retrieval*

Retrieval from autobiographical memory is not always predictable. One study selected life events which seemed critical at the time of occurrence on the basis that they would *certainly* be remembered. 20% of these critical details were not recalled one year later.²²⁶ Temporal organisation for personal facts is complex. Autobiographical memory has a discrete temporal structure in which connected groups of events are recalled as *autobiographical sequences*. Recalls tend to cluster around well defined events. Likewise, people often date major global events by fitting them in with a personal event: “it was when I was living in Nepal...” For this reason, it may be better to take respondents through autobiographical sequences rather than to ask them to recall discrete events.

8.3.2.2 *Inference*

One might assume that quantitative survey questions require memory retrieval alone. This would lead to two types of error: omission due to forgetting or unwillingness to respond, and commission due to reporting events that actually occurred outside the reference period. It seems that this model rarely applies. In studies, respondents manifest three strategies for answering quantitative recall questions.

- (a) *Decomposing*: when asked how many times she has eaten green leafy vegetables in the last month, a respondent might determine a rate for the last few days and then multiply it to estimate for the period. At the same time, the respondent might decompose green leafy vegetables into specific categories, estimate rates for them, multiply them and add them. This is clearly a complex process, but may be fairly accurate since it is essentially generating an average response that is similar to what a researcher might do.
- (b) *Availability heuristic*: the more the respondent can recall, and the easier the recall, the more frequent she is likely to estimate an event's occurrence. This has been shown for causes of death.²²⁷ it is also related to *telescoping* in questionnaire responses. People tend to recall events as more recent if they can remember more details about them, and less recent if they remember less.
- (c) *Anchor and adjustment heuristic*: respondents often estimate quantity by interpolating between a largest and a smallest value, usually based on personal experience ("It takes a quarter of an hour to walk to the well, and an hour to walk to the road, so it must take about half an hour to get to the health post").

8.3.2.3 *Proxy reporting*

I have already pointed out that almost all questions about the health of young children involve proxy-reporting on the part of their mothers. Fortunately, apart from in the event of

maternal death, perinatal issues are usually reported by women themselves.^a In a review of the role of proxy respondents in epidemiological research, Nelson and colleagues made an exception for paediatric conditions. Usually, the proxy respondent is a fallible reporter in a situation where the individual in question would be less fallible. A proxy would be more likely to show non-response bias (not know the answers to questions about another individual) and to misclassify exposure status. This is what is known as the *proxy effect*. In the paediatric context, however, "... the proxy respondent is viewed as the best source of information regarding the child's history."²⁰⁸

The main error associated with proxy-reporting in the perinatal context is the *saliency principle*: the tendency to report more accurately those events which the proxy respondent considers more relevant. This was investigated in a UK study of disability and joint problems in which almost 22,000 postal questionnaires were completed.²²⁹ The investigators worked from two hypotheses: (a) since households with more than one person in them would involve proxy responses, the reported disability prevalence would be higher in those living alone than in those living with others; (b) a saliency effect would result in higher reported estimates than expected of the prevalence of severe problems compared to less severe ones. The results confirmed these expectations. People who lived alone were almost three times as likely to report disability, a finding which persisted after adjustment for age and sex (older women living alone are actually more likely to have disability). Further evidence for a proxy effect was that this discrepancy reduced when individual interviews were conducted in another phase of the study. The proxy effect was eradicated when individuals were reported as having severe disabilities, a finding which suggests that the saliency principle was in operation. Likewise, an examination of data on 2433 children from the Catalan Health Interview Survey – all of them reported by proxy respondents - found that fathers and male grandparents reported less morbidity in children than did mothers, and that people who cared

^a There is limited information on the accuracy of male recall of reproductive issues in spouses, and what there is – albeit quite supportive - comes from telephone interviews in the USA²²⁸.

for a child more than 12 hours a day reported more illness and accidents.²⁰⁹ Of course, this says nothing about the *validity* of the reports, but it does suggest a proxy effect.

8.3.3 *Studies of maternal recall*

The literature on maternal recall^a falls into three categories: (1) studies comparing maternal recall of perinatal events with a benchmark; (2) studies comparing maternal recall of childhood illness with a benchmark; (3) studies of maternal recall concerned particularly with public health surveys in developing countries. This ordering reflects both the chronology of the research and a sequence of focus from the clinical to the epidemiological.

8.3.3.1 *Studies comparing maternal recall of perinatal events with a benchmark*

Table 8.2 summarises the published studies. All were conducted in hospital settings in affluent societies, all but two of them in the USA. The wide variation in sample size (from 25 to over 1800) reflects the exploratory nature of most studies and a lack of certainty as to specific outcomes or statistical requirements to test hypotheses. It also reflects the practicalities of the evaluation. Maternal recall was documented by face-to-face interview,²²⁴ ²³⁰ ²³¹ by telephone interview,²³²⁻²³⁵ or by self-administered questionnaire,²³⁶ ²³⁷ activities with ascending requirements for person-time. The benchmark in all cases was medical records. One study also compared the results of an interview conducted during pregnancy with an interview conducted shortly after delivery.²³¹ Another examined reproducibility by delivering the same questionnaire twice.²³⁷ Only one study mentions the unreliability of medical records. As any reader who has had to appear in court will know, these are potentially fallible as a gold standard. The study found that both medical records and women's reports were subject to variation, and the authors felt that it could not be said that the women's reports were any less accurate than the records.²³³

^a We use the word *recall* here on the understanding that it is actually a composite of memory, retrieval and response. We could equally use the word *report*.

Table 8.2. Studies comparing maternal recall of perinatal events with a benchmark

Site and date	Sample frame	n	Recall period	Benchmark
USA, 1961 ²²⁴	Teaching hospital births	25	4-5 y	Medical records
USA, 1976 ²³²	Hospital births	59	9 m	Medical records
Australia, 1987 ²³³	Teaching hospital births	397	3 w	Medical records
Canada, 1989 ²³¹	Teaching hospital births	202	Post-partum	Medical records Interview in pregnancy
USA, 1992 ²³⁰	Hospital well child clinic	69	1 m	Medical records
USA, 1993 ²³⁴	Teaching hospital births	102	4-6 y	Medical records
USA, 1998 ²³⁶	Hospital births	338 preterm 661 term	10 y	Medical records
USA, 1999 ²³⁵	Teaching hospital clinic	1833	9-10 y	Medical records
USA, 1999 ²³⁷	Teaching hospital births	300	30 y	Medical records Previous identical questionnaire

A number of other studies have looked at the reliability of recall as a basis for ascribing epidemiological exposure to a potentially harmful agent. For example, a US study of diethylstilboestrol exposure found good agreement between recall of personal events but not of medical interventions ten years after exposure. About 30% of women who had taken diethylstilboestrol did not recall that they had done so.²³⁸ A Canadian case-control study enrolled mothers of 85 infants who had died in the perinatal period or had a serious malformation, 445 term healthy control infants, and 217 infants who had had minor perinatal illnesses.²¹² Women completed questionnaires about exposures in the first 20 weeks of pregnancy, and then again at one month after delivery. A US study enrolled mothers of 452 women with breast cancer, mothers of 58 women who had died of breast cancer, and mothers of 436 controls.²³⁹ Another US study enrolled 96 women in a study of perinatal events recalled at least 22 years after delivery.²⁴⁰

Although some authors concluded that recall was generally unreliable,²³² the balance of opinion was that it is reasonably reliable for major perinatal events.²³³⁻²³⁵ In the study that compared identical questionnaires, reproducibility appeared to be high.²³⁷ The period of validity remains unclear: we can assume that it holds for the first few months after a birth, and some authors advocate using recall of perinatal events over periods as long as six-to-ten years.^{234 237}

Comparison of studies is difficult. Methodologies, statistical analyses and reported variables differed, but – more importantly – authors' views differed on what constituted major and minor perinatal issues and on what they saw as acceptable and unacceptable levels of agreement between recall and record data. For example, one study included only infants born at 35-40 weeks gestation, and concluded that a discrepancy of a week between recalled and recorded gestation constituted poor agreement.²²⁴ These limitations notwithstanding, I have tried to draw some firm conclusions, particularly because this area of study seems to circle rather aimlessly and I have not been able to find guidelines for researchers on which variables should and should not be used in recall studies.

Briefly put, it seems appropriate to use recall to document parity²⁴⁰, preterm delivery^{230 236}, type of delivery^{230 236 240}, gestation at birth^{230 240}, and major perinatal complications.²³⁶ Studies from populations in which the measurement of birth weight is routine suggest that recalled birth weight is also reliable and valid,^{224 230 236 237 239} but it would almost certainly be inappropriate in a country like Nepal.

Two other candidates for inclusion are instrumentation during delivery and duration of labour. Although one study found recall of instrumentation to be unreliable, it was conducted in the early 1960s and perhaps confirms our feeling about Macfarlane's findings. The authors comment that they "... believe that a differentiation should be made between labor, during which the mother is generally conscious, and delivery, during which the mother is under the effect of drugs."²²⁴ It is worth noting that this group also found poor agreement for immediate post-partum infant difficulties, possibly because in the context of hospital births at the time, the newborn infant was removed and only given back to the mother when considered well. Duration of labour may be sufficiently accurately recalled to be used in studies. Counter-intuitively, it may tend to be under- rather than over-estimated.²²⁴

There are certainly large discrepancies between recalled and recorded maternal morbidity, a finding borne out in studies of self-reported morbidity related to safe motherhood. Questionnaire-based information may be "most useful for ascertaining perceived ill-health and only of limited use for the corresponding medically defined conditions".²⁴¹ There are, however, two veiled issues. First, the discrepancy resides more with transient, self-limiting illnesses, which tend to be under-reported.^{230 231 240} In the Canadian study with repeated questionnaires, many exposures, particularly transient ones, were reported less frequently on the second questionnaire than on the first. Although this probably implies diminished recall, there was no association of the discrepancies with the actual outcome group. Second is the issue of sensitivity versus specificity. In general, recall of clinical problems is insensitive (0-35%) but specific (80-100%),²³⁰ a finding which holds for maternal and infant morbidity and for re-hospitalisation of infants.^{235 241} This means that recall is a poor screening method, but can be a powerful means of case definition: "... If a

mother says her child was premature, the chances are that she is correct and also that she will probably report the time of prematurity correctly.”²²⁴

Some studies went on to examine influences on the agreement between recall and medical records, but their findings cannot be generalised. For example, there is contradictory evidence as to whether agreement is affected by a woman’s educational status.^{232 240 242} It does not appear to be affected in a systematic way by maternal age, ethnicity, sex of infant or birth order.²³² It is likely, however, that recall is influenced by the occurrence of problems either in the past²³⁴ or concurrently with the interview.²³⁵ A mother’s ability to recall perinatal information may be affected by pregnancy outcome.²¹¹ In case-control studies of disfiguring and disabling birth defects, adverse infant outcomes appeared to enhance maternal recall of exposure to drugs and possible toxins during pregnancy.²³⁶ As with many other issues, the importance of this potential bias is uncertain.

8.3.3.2 Studies comparing maternal recall of childhood morbidity with a benchmark

These studies fall into two categories: those that considered recall in the context of clinical settings in affluent countries, and those that were set in developing countries. The agendas are slightly different. For example, a study conducted in US ear, nose and throat clinics enrolled 157 children with chronic otitis media with effusion who were under regular review.²¹¹ In comparison with clinical records, parents who reported more episodes of morbidity were thought to overestimate the number, while those who reported fewer than six episodes were thought to have underestimated it. The authors felt that accuracy was influenced by both disease frequency and the duration of recall.

The agendas coincide when industrialised country studies are aimed at public health initiatives. A good example is an Australian study of parental report of measles vaccination status conducted in suburban medical centres, which suggested a sensitivity of 96%, a specificity of 48% and a positive predictive value of 84%.²⁴² Since parental report is usually used in assessments of immunisation status (apart from scar identification for BCG), the study has global relevance. Interestingly, the authors concluded that parental report was not

reliable. At this level of PPV one might disagree. In a large study that enrolled 2937 families in a US urban birth cohort, medical records were compared with telephone interviews about child morbidity at two-to-four and 30-33 months of recall. Agreement was high for hospital admissions, but lower for visits to emergency departments later in childhood, although this was less marked for the shorter recall period.²⁴³ Two issues of interest were that in many cases it was the medical records that were missing, and that large-scale surveys are not only relevant for developing countries: in the USA, reviewing medical records is often judged to be too expensive and time consuming compared to a survey.

A growing number of studies deal with the identification of childhood illness on the basis of maternal reports of symptoms and signs. This group has crystallised around diagnosis of ARI, diarrhoeal disease and the IMCI strategy, and particularly around attempts to generate algorithms for diagnosis and management of illness by primary and secondary health care workers.²⁴⁴ In 1987, Alonso and colleagues reported a study of 87 children admitted to a Gambian hospital with potentially fatal illnesses in both wet and dry seasons.²⁴⁵ Mothers were interviewed prospectively by workers with some health knowledge, without them seeing the children. Diagnoses were made through a classification system and compared with those made by physicians. 76% of diagnoses made during the illnesses matched, as did 88% of diagnoses made a month later. The suggestion was that a correct diagnosis for a serious illness could be made by interviewing mothers either at the time of illness or up to a month later.

Taking the example of ARI, a community case-control study (again in Gambia) enrolled 78 children with radiologically confirmed lower respiratory tract infection, 78 with upper respiratory tract infection, and 78 well children. Mothers' opinions of severity generally coincided with clinical and radiological diagnosis.²⁴⁶ A prospective observational study in Egypt enrolled 271 children at hospitals and health centres in the hope of developing a screening term with high sensitivity that could be followed by ARI programme activities.

Maternal interviews were compared with physician opinions, but no lay term had both high sensitivity and specificity for lower respiratory tract infection.²⁴⁷

Kalter and colleagues, who have done a lot of work in this area, reported a case-control study from an urban hospital in the Philippines, in which 204 children with measles, ARI or diarrhoea were compared with 56 children admitted with other illnesses.²⁴⁸ Proceeding from the premise that mothers were able to retrospectively report signs and symptoms of their children's recent illnesses with sufficient accuracy for interview-based diagnosis, they went on to develop diagnostic algorithms.

A connected body of work has developed around verbal autopsy for childhood deaths. Classification of cause of death again requires algorithms and a match between parental report and physician's opinion. In a study of 374 paediatric admissions to a district hospital in Tanzania and 489 in Kenya, parental verbal autopsy findings were compared with hospital records. The picture was variable: accurate recall of symptom complexes was possible for kwashiorkor, generalised convulsions and trauma, while neonatal tetanus was over-recalled. The key findings were that recall appeared not to change much over time, that syndromes were well recalled (apart from diarrhoea, which was not), but that signs such as stiff neck, pallor, intercostal recession and nasal flaring were not well recalled. The development of verbal autopsies for neonatal deaths is a current endeavour, and I have already suggested that it is beyond the scope of the thesis. Suffice it to say that the lack of specificity in neonatal symptoms and signs make classification difficult.

The diagnosis of childhood illness derived from interview of a mother or caretaker is complex. The interview attempts to elicit information on clusters of symptoms or signs which add up to a recognizable clinical syndrome. This means that "... the diseases amenable to interview diagnosis are those conditions with a characteristic clinical picture, in which the key pathognomonic features are recognizable to a lay observer."²⁴⁸ There are additional differences between a verbal autopsy and a morbidity survey. Death is a devastating emotional event that influences recall of symptoms and signs in ways which we

can only guess at. An example is that guilt may trigger variation in the account of care seeking.²⁴⁹ It is likely that illness reports from morbidity and mortality surveys will differ, and it may be inappropriate to compare them.²⁵⁰

8.3.3.3 *Community-based studies of maternal recall concerned with public health surveys in developing countries*

Given the dominance of recall-based information in national, regional and global reports, it is surprising how few studies of the methodology are available. Published studies are summarised in **table 8.3**.

The exceptions are diarrhoeal disease and ARI, which have received attention because of the need to quantify their incidences in communities as outcome measures for vertical programmes. For example, in the 1980s, Alam and colleagues recorded over 7000 episodes of childhood diarrhoea recalled at visits to rural households in Bangladesh.²⁵¹ This required weekly visits over three years, an intensive programme which aimed to answer two questions: (1) how long should the recall period be in diarrhoea surveys, and (2) what allowance should be made for omissions? The study suggested that if recall was longer than 48 hours reporting fell by a third. If one were to design a survey that looked at one week of recall, the authors felt that diarrhoea would be underreported by 22%. This study throws up an important issue in community-based research: the lack of a gold standard for morbidity. Since a period of 48 hours had been recommended as a suitable period for accurate recall,²⁵² the authors assumed that episodes of diarrhoea reported in the two days preceding the recall were *true*. The two-day incidence was then used as a reference for comparison with recalls of longer than two days. The problem is that this argument is circular: there is no gold standard for a diarrhoeal episode.²⁵³ One might even argue that a diarrhoeal illness that is recalled a day later and forgotten four days later is of questionable severity. The best way around the problem is to triangulate the findings of a number of surveys with different methodologies. This is possible given the interest in diarrhoeal disease surveys, an example

being an Indian study of 689 infants which suggested that reporting begins to fall off after three days of recall.²⁵⁴

The issue of validation and the lack of a gold standard has received some consideration. In attempting a validation study, one aims to determine the sensitivity and specificity of algorithms for cause-specific diagnosis. How might this be done? The first option is to compare the reports of signs and symptoms with an external standard such as clinical diagnosis made after appropriate tests. This option practically mandates a hospital setting, which itself skews the context of the illness. It also changes the pattern of recall: a carer who has been in a clinical setting, where diagnoses may have been discussed, will have a very different recall of events from one who has not. A second option is to compare the diagnosis with an expected epidemiological pattern of disease.²⁴⁴ This is essentially an exercise in plausibility. Although I believe that it is often the best method, it is based on a circular argument: epidemiological patterns are themselves derived from the very assumptions against which we are trying to guard.

In the case of ARI, the best study comes from Ghana. Nested in the Ghana VAST study of vitamin A supplementation, it involved community-based interviews with carers of 20,000 children. A recall questionnaire was administered after two and four weeks; a general question about ARI was compared with a series of prompts; and the results were compared with those of weekly interviews with carers for 1455 children in an adjacent population.²⁵⁵

The impression from the findings was that a recall period of two weeks was practical for ARI surveys, and that specific prompts for symptoms and signs were likely to lead to an overstatement of the true prevalence. Clearly, a recall of two weeks for ARI is different from a recall of two days for diarrhoea. What do we do if optimal recall periods are different for different entities? If we are concerned with a survey that covers a range of issues, we will have to compromise on quality. If, however, we are working within a system that allows for un-integrated, vertical programmes, we will be able to do the surveys separately for each entity: a specious but interesting justification for the vertical approach. In the most general

terms, some studies suggest a recall period of up to two weeks for morbidity surveys,^{256 257} others suggest that a month is probably tolerable,²⁴⁵ and severe illnesses may be recalled for much longer.²⁵⁷

One problem noted in the Ghana study was that respondents were familiar with the types of questions that they would be asked as a result of an ongoing study. The usual summary would allude to a Hawthorne effect, but a better analogy is with quantum mechanics: we can never describe the reality of illness in a community since any attempt to describe it will affect it. This implies both a Hawthorne effect (in which our observation would improve the situation) and a reporting effect (in which our observation would alter the likelihood of reporting).

In a study from Israel, 318 Bedouin Arab women were interviewed at six months after delivery and their responses were compared with the results of repeat interviews at 12 and 18 months.²⁵⁸ Accuracy of recall varied with the child's nutritional status at the time of a given interview, but did not vary with socioeconomic status. The authors felt that epidemiological studies could work in general with recall periods of up to 18 months. Some information remained internally valid (for example, times of cessation of breastfeeding and introduction of solids), while others became less reliable (for example, the degree of formula feeding).

Another study of breastfeeding recall was conducted in Brazil and involved the well-known Pelotas birth cohort. The cohort of 6011 hospital-born infants was recruited in 1982 and followed up at one, two and four years. The study in question looked at about 1500 children (less than 1300 by the third follow-up) and compared mothers' recalled duration of breastfeeding at the second and third visits compared with the first.²⁵⁹ Unsurprisingly, recall error increased with time, and there was little difference between socioeconomic or educational groups. What was interesting, however, was that the error was more likely to be an overestimate of breastfeeding duration and that more affluent women were more likely to make this error. The rich tended to recall breastfeeding their babies for longer than they actually did.

A case-control study, the Butajira project in Ethiopia, documented child morbidity and mortality in a rural area with a view to examining their associations. The study compared fortnightly recordings of illness with parental recall and revealed inconsistencies, even when the recall period was as short as two weeks.²⁶⁰ Nevertheless, the investigators felt that little advantage was gained over maternal recall by fortnightly visiting. The authors suggested that recall of morbidity was convenient, but should not be used as the single source of continuous information.

Three studies can be directly compared with the MIRA Makwanpur scenario. A study of dracunculiasis in Ghana compared a prospective registration system of bimonthly visits with a cross-sectional retrospective questionnaire.²⁶¹ Taking the registration as a gold standard, the questionnaire was 60% sensitive and 95% specific for Guinea worm infestation. At first glance, these figures seem to be typical of recall systems and sound much like some examples discussed above. However, dracunculiasis is a singular disease: it has characteristic features, is found in specific localities, and takes a long time to heal, making it a relatively unequivocal diagnosis. People know that they have had it and recall is likely to be good. What, then, explained the discrepancy between registration and recall figures? First, the chronicity of the disease may mean that a one-year recall limit was artificial. Second, it was possible that respondent fatigue set in: people were asked about symptoms of the illness every two months, and by the time they reached a one-year recall their answers were not reliable. The authors think that in this case it was the registration that was wrong and the recall that was accurate, and – alone in the literature – go so far as to suggest that registration may not be the optimal system for recording disease.

The study of Fabricant and Harpham is exceptional for the depth to which the authors go into the issue of recall, but limited by its short window. Respondents were asked an identical set of questions about life events on two occasions separated by a day.²⁰⁷ They divided the questions into those with high reliability (less than 10% case error), moderate reliability (10-20% case error) and low reliability (more than 20% case error). Highly reliable responses

described sex, household members who were ill in the recall period, actions taken in response to illness, receipt of injections, and sources of funds for treatment. We might describe these as instrumental. Moderately reliable responses described the ages of household members, the incidence of illness and estimates of health care expenditure. Unreliable responses described illness severity, the results of health care actions, reasons for choice of care and – interestingly – expenditure when it was reported as high. At this stage, what we can say about these findings is that they coincide with our intuitive expectations.

Finally, Rao and colleagues' account of maternity histories in rural Egypt appears to be the only published study in this field, striking given the inclusion of maternity histories in DHS and many tools used in developing countries. Maternity histories were collected from women aged 15-55 years in 20 villages. Prospective vital registration was then implemented, based on household visits every two weeks. The cohort provided a second maternity history after two years. The first round of maternity histories documented 6183 live births. The vital registration system identified 423 live births in the interim period. The expected result of the second round of maternity histories was thus 6606 live births. 6564 were documented, a shortfall of 42 live births. Nine more under-five deaths were reported than expected on the basis of the first census.

On balance, the authors felt that recall was good: "... despite the large number of births and deaths that women experience in rural Egypt and despite their lack of formal education, interviewing mothers is a simple and reliable method of determining numbers of births, stillbirths and child deaths." In two-thirds of discordant responses, the difference was one event only. The responses of younger women were less discordant than those of older women, but this could have been the result of parity, a suggestion that is supported by the finding that higher parity was associated with discordant recalls. As in most studies, socioeconomic status showed no association with discordance. An important point was that the authors were not able to say whether inconsistency was attributable to recall error,

intentional misreporting, data recording or data entry. Indeed, they felt that the presumptive omission of child deaths in the first round might have been due to deliberate misreporting.

The problem is that a *reliable* response may not necessarily be a *valid* response: "... consistency of response does not exclude the possibility that the original reply was biased or a deliberate fabrication". Likewise, a different answer to the same question in a second interview could mean that the respondent was not sure the first time and only guessed.

Table 8.3. Community-based studies of recall in developing countries

Site and date	Subject	Sample frame	Benchmark	Comparison	N	Recall period
Ethiopia, 1977 ²⁶⁰	Various	Rural	2 w visits	Maternal recall	Variable	2 w+
Bangladesh, 1989 ²⁵¹	Diarrhoea	Rural	48 h recall	Maternal recall	7380	1 w
Brazil, 1990 ²⁵⁹	Breastfeeding	Urban	1 y recall	Maternal recall	1274/1505	2-3 y
Israel, 1992 ²⁵⁸	Breastfeeding	Rural	6 m recall	Maternal recall	318	12-18 m
Sierra Leone, 1993 ²⁰⁷	Various	Rural	Baseline recall	Reinterview with same questions	173/1156 households	1 d
Ghana, 1994 ²⁵⁵	ARI	Rural	2 w recall questionnaire	Maternal recall	20,000 children	4 w
Ghana, 1995 ²⁶¹	Dracunculiasis	Rural	Prospective visits every 2 m	Cross-sectional questionnaire	353/362 households	1 y
India, 1998 ²⁵⁴	Diarrhoea	Rural	48 h recall	Maternal recall	689	1 w
Egypt, 2003 ²⁶²	Various	Rural	Vital registration visits every 2 w	Maternity history	1502 women	2 y

Chapter 9 Recommendations

In short, the principal aim in this point is, to keep the child's head and body neither too tight nor too slovenly, too hot nor too cold; that it may be warm, though not over-heated, and easy, though not too loose; that respiration may be full and large; that the brain may suffer no compression; and that, while the child is awake, the legs may be at liberty; to reject all unnecessary rollers, cross-cloths, neckcloths, and blankets; and to use as few pins as possible, and those that are absolutely necessary, with the utmost caution.

Smellie W. Of the management of new-born children, with the diseases to which they are subject. 1762²⁶³

9.1 Patterns of antenatal, delivery and neonatal care practices

In a rural setting characterised by subsistence farming, extreme poverty and limited literacy, antenatal care was attended by less than a third of pregnant women, few of whom received a package of timely benefits. Over 90% of women delivered their infants at home and less than ten percent were attended by someone with even minimal training. Hygiene was generally compromised, early bathing of infants was routinely practised, but breastfeeding was almost universal.

9.2 Is it possible to design and implement a perinatal registration system?

Experience suggests that the system for identifying pregnancies, births and neonatal outcomes was feasible. The purpose of the exercise was to provide outcomes for a randomised controlled trial conducted in rural community clusters. As such, its primary aim was to generate figures that could be compared between intervention and control clusters. One could argue that this obviated to some extent the need for absolute validity. Assuming that the outcome figures attained a reasonable level of validity, the randomised, controlled nature of the experiment would deal with many potential sources of error. The surveillance system was of high quality and incorporated a hierarchy of checks to optimise performance, and the results of the trial withstand scrutiny.¹⁵¹

9.3 If the system is operable, what are the observed mortality rates?

The prospective registration described a stillbirth rate of 23 per thousand births, a perinatal mortality rate of 45 per thousand births and a neonatal mortality rate of 37 per thousand live births. In contrast, the maternity history used in the census suggested a NMR of only 25 per thousand live births.

If the underestimation of neonatal mortality rates suggested by these findings is more widely applicable, and particularly if the likelihood of omitting neonatal deaths from maternity

histories is greater than the likelihood of omitting later infant and child deaths (a plausible hypothesis), then the neonatal period assumes even greater importance in public health considerations. Our figures suggest that neonatal mortality might account for half of all deaths under the age of five. These findings emphasise that, if millennium development goals for child mortality reduction are to be met, the neonatal period is most important for health interventions.

9.4 How credible and reliable is the system?

These issues have been discussed in detail. The findings beg a number of questions about replication and scaling up that are addressed below. In the context of the validity of recall-based findings, the foregoing review shows that our knowledge is patchy, but also that it is situational to a degree that makes generalisation difficult. For example, an eight-country comparison of DHS questions on diarrhoeal illness with the results of CDD surveys failed to find a common pattern.²⁵³ The results were sometimes consistent between countries, at other times inconsistent. This does not bode well for any attempt to draw usable conclusions from the literature. Ultimately, the question is whether cross-sectional household surveys are useful for programme evaluation, and whether the data quality is high enough to provide a stable basis for assessing programme impact. Most investigators think that recall data are useful. The options for assessing quality are either (a) to conduct prospective registration and compare it with cross-sectional survey results (which we have done), or (b) to conduct similar surveys in the same population, either concurrently or one after the other.²⁵³

9.5 How might the system be modified?

9.5.1 *Improving recall*

The likelihood of recall is increased by repeated questions and longer times to answer them. It is decreased if memory contains many similar incidents (Bradburn et al use recall of meetings during the Watergate hearings as an example).²²⁵ Recall is improved by cues about

locations and social occasions, but not particularly by dates. Some series are recalled better by moving backwards in time from the present, some by moving forwards from the beginning. While accepting the lack of clarity in the literature - which has led many authors to dwell on the specific - there is a pressing need to synthesise what is known as far as possible in order to come up with guidelines to help us in subsequent work. This I have attempted to do. The results are summarised in **box 9.1**, which deals with the issues developed in the foregoing chapter.

Box 9.1. Optimising recall of perinatal events

Theme	Future practice
<i>General</i>	
Ambience	Discuss context with field team Define introductory explanation of interview
Response time	Mandate warm-up period for interview Minimise questionnaire length Set comfortable workload for interviewer
Recall cues	Use local location cues Use social occasion cues
Chronology	Approach questions as chronological narrative
Decomposition	Pre-decompose questions
Anchoring	Provide anchors to set values for comparison
Morbidity	Use local concepts of disease Limit morbidity questions Avoid non-syndromic illness questions
<i>Source of error</i>	
Wilful omission	Emphasise the reasons for asking Avoid setting limits to recall period Ask specifically about miscarriages Ask specifically about stillbirths Ask specifically about neonatal deaths Ask specifically about daughters Discuss the difference between stillbirth and neonatal death Cross-check total births Probe for more pregnancies
Duration of recall	Avoid setting limits to recall period Limit recall of perinatal events to 2 months
Mistiming of event	Avoid dates where possible Avoid asking for timing without autobiographical sequence
Perceived seriousness of event (saliency)	Avoid mentioning severity Probe for all events Classify at analytical stage
Commonness of event	Avoid questions on common events where possible
Actions taken	Frame questions around autobiographical sequence of action
Interpretation of question	Develop questions with field team Discuss implications of question with interviewers Set format for asking question Set probes
Interviewer variability	Develop questions with field team Discuss implications of question with interviewer Set format for asking question Set probes
Proxy respondent	Use mother as respondent if possible Use multiple respondents for triangulation

9.5.2 *Modifying, expanding and replicating the surveillance system*

Two questions of particular interest are whether modification would be helpful in the current setting, and how the surveillance system might be adapted for use in other projects. This exercise is not academic, since registration systems are needed for a number of intervention studies: (1) an expansion of the Makwanpur surveillance to cover the entire district for the second phase of the trial, in which previous control areas will be receive the intervention and new control areas will be introduced; (2) a community trial in a larger population in Dhanusha district, southern Nepal; (3) a trial in Mchinji district, western Malawi; (4) an urban trial in slum communities of Mumbai, India.

9.5.3 *Modifications in the current setting*

The system, though successful, had a number of redundancies and problems. It began with a household census, followed by a baseline interview for every married woman of reproductive age. It required salaried enumerators at ward level to visit all cohort members monthly. It required participant interviews at seven months of gestation and one month post-partum. Beside its primary function as a vital registration system, the system collected a large amount of data on proximate outcomes such as health care seeking behaviour. Finally, the cohort was closed.

If it were possible to avoid a household census, a lot of time and money could be saved. Three possibilities suggest themselves: (a) to collect baseline socioeconomic and demographic data from a sample survey rather than a census. The drawback to this would be that the information would not be linked to individual participants, and it would mean that mapping – which was initially felt to be useful – would not be done; (b) to collect the household information concurrently with participant interviews. This would be a dynamic, prospective process. The drawback to this would be that information would not be available for households and women who were not interviewed; (c) to reduce the information collected in the household census and to combine it with initial participant interviews.

Likewise, reducing the burden of monthly visits would be economical. Reduction would also cut down the burden to participants and, perhaps, might mitigate potential Hawthorne effects. This would also be aided by a reduction in participant interviews from two to a single post-partum contact. The drawback to this would be that the distinction between abortion and stillbirth would be fuzzier, but an additional advantage would be that registration of pregnancy would not be necessary since births alone would be monitored.

Data collection could also be reduced by specifying more clearly the scale of activities necessary for particular information. The sample size was predicated on mortality outcomes, but information on care outcomes was collected from every participant. Useful though this was, it was not an absolute necessity. For example, in comparing uptake of antenatal care a difference of 20% in attendance between two arms of a trial would require less than 100 data points. If it were possible to (a) reduce the information collected from each participant, and (b) subsample for proximate indicators, the system could be simplified considerably.

The issue of the closed cohort is perhaps the greatest learning from the project. The reason for deciding on a closed cohort design initially was that such a surveillance system had never to our knowledge been implemented in such conditions. The precision of the system, in this and other areas, was therefore a response to what we saw as a huge challenge. Indeed, many commentators suggested that we would be unable to achieve our aims. Learning from the success of the programme, we feel that a slackening of precision would now be tolerable in the context of an experienced workforce. The closed cohort design has two particular and important limitations. Firstly, it shrinks. Over time, women pass beyond their childbearing span, women emigrate, and women die. Likewise, no new members join the cohort. Secondly, younger women, and particularly adolescent primigravidae, are at higher risk of pregnancy complications and their infants are at higher risk of neonatal death. Unfortunately, a closed cohort systematically excludes younger newlyweds from joining, and it is this group who might benefit particularly from interventions, and who might allow us to collect larger datasets for mortality comparisons.

On the basis of these arguments, we have redesigned the second phase surveillance system for Makwanpur district. The planned modifications are based on the outputs we plan to generate: (a) mortality rates (SBR, NMR, ENMR, LNMR, PMR, IMR, MMR), for which we need to collect numbers of pregnancies, births, stillbirths, early and late neonatal deaths, infant deaths and maternal deaths; (b) proximate indicators, key among which are care seeking behaviour, antenatal care, delivery practices and newborn care practices.

The modified surveillance system will identify pregnancies in an open cohort and interview mothers or family members at one month post-partum. The surveillance team's experience suggested that pregnancies could be identified without the use of a menstrual rota. However, they also felt that we would miss many pregnancies, particularly if they ended in stillbirth or early neonatal death, if ward enumerators did not regularly visit each household. For this reason, the preliminary census model was not rejected. All households will be mapped and numbered and all married women under 45 years of age will be listed, but the list will be dynamic to cope with immigration, ageing and marriage, and baseline socioeconomic and demographic data will not be collected. A master list of all households and married women will be given to interviewers and ward enumerators. Enumerators will visit each household every two months (rather than monthly). At the visit they will identify pregnancies, newlyweds, birth outcomes and outcomes at one year of age. They will meet with supervisory interviewers every two weeks (rather than weekly). Mothers or family members will be interviewed only at one month post-partum (the earlier interview will be dropped). Baseline outcomes and proximate indicators will be measured by running the surveillance prospectively for up to six months before the intervention begins.

The system is similar to the existing one, which has proved highly effective. However, it removes some redundancies: ward enumerator visits will be halved, meetings will be halved, interview load will be halved, and tools will be reduced (questionnaires and menstrual rotas). We estimate that the number of ward enumerators will be halved. There will be no baseline household or woman-specific questionnaires. These changes will reduce the cost, but will

also allow a quicker set-up of surveillance. The system will use a reduced set of tools, summarised in **box 9.2**.

Box 9.2 Tools for the modified Makwanpur surveillance system

Tool	Content
Ward enumerator summary sheet	Pregnancies LMP Newly married women Birth outcomes Infant outcomes
Post-partum one-month questionnaire	Household information Socioeconomic information Maternal age, literacy and schooling Maternity history Family planning choices Antenatal, perinatal and postnatal problems Care-seeking for problems Antenatal and delivery care Birth details Newborn care Infant problems Care-seeking for infant problems
Verbal autopsy for maternal death	Information for cause-specific classification Care seeking
Verbal autopsy for stillbirth, neonatal or infant death	Information for cause-specific classification Care seeking

9.5.4 Modifications for other settings

A schematic summary of planned systems is presented in **figure 9.1**

9.5.4.1 Dhanusha district, Nepal

The system will be similar to that of Makwanpur district. However, Dhanusha is a plains district with better communications and higher population density than Makwanpur, and it is likely that less human resources will be needed. Supervisory cadres, in particular, may be able to travel to more sub-areas.

9.5.4.2 Mchinji district, western Malawi

Although Mchinji is a rural district, it differs from Makwanpur in two important ways with respect to potential surveillance systems. First, villages are poorly defined and there is less geopolitical stringency of boundaries. This means that in order to define clusters it has been necessary to map the entire area and create artificial borders around areas of appropriate cluster size. Second, because communication is good, the possibility of intercluster contamination appears higher. In order to mitigate this, clusters have been defined to include central and peripheral zones. Although interventions will be implemented zonally, surveillance data will be collected only from central zones. As in Makwanpur, there will be a single participant interview at one month post-partum.

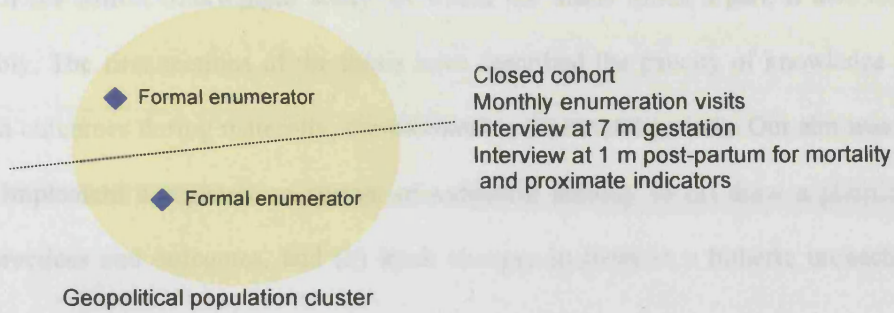
9.5.4.3 An urban slum programme in Mumbai, India.

The surveillance system in an urban setting with high density housing presents a number of contrasts with our existing models. The most notable of these is that the municipal corporation's existing MIS already collects data of reasonable quality on birth outcomes and infant mortality, particularly since registration of births and deaths is mandatory. The planned system, therefore, will systematically examine existing records in health posts, hospitals and government offices. We will triangulate this in the initial phase with independent monitoring of pregnancies through community-based enumerators. These

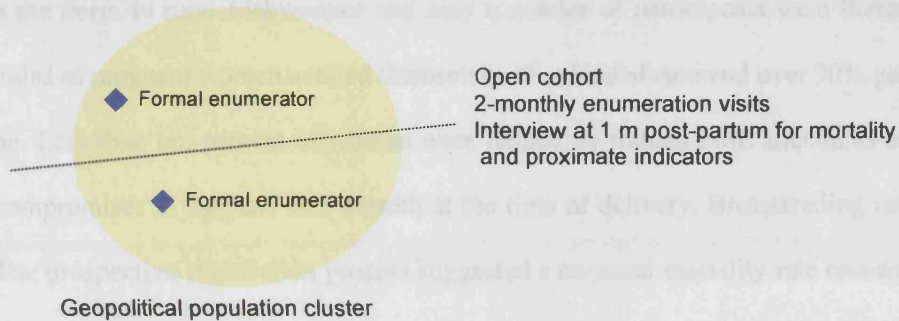
enumerators will differ from those in Makwanpur district in that they will be drawn from a range of existing roles (midwives, NGO workers, local elders) and will not function as a defined cadre. With this belt-and-braces – but more informal – model, we hope to achieve reliable vital registration. For proximate indicators, we will subsample and conduct interviews with a smaller number of pregnant and post-partum women.

Figure 9.1. Schematic representation of surveillance system designs at different sites

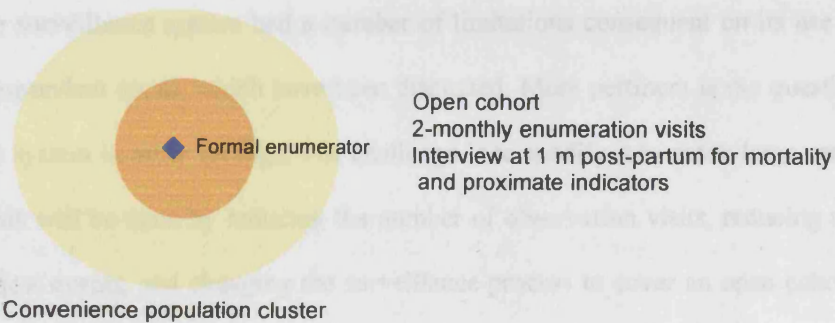
Makwanpur phase 1



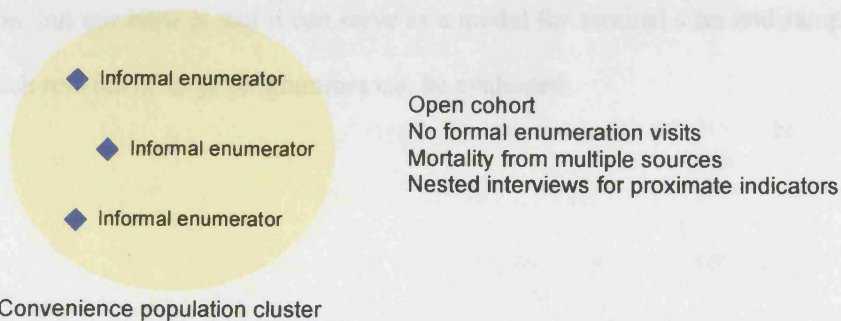
Makwanpur phase 2



Mchinji



Mumbai



Chapter 10 Conclusions

Maternity in rural Nepal takes place largely outside the sphere of the government health care system. Until the MIRA Makwanpur study, of which the thesis forms a part, it also took place invisibly. The first sections of the thesis have described the paucity of knowledge of practices and outcomes during maternity, the postnatal and neonatal periods. Our aim was to design and implement a registration system of sufficient solidity to (a) draw a plausible picture of practices and outcomes, and (b) track changes in them in a hitherto unreached population.

Poverty was the norm in rural Makwanpur and only a quarter of participants were literate. Less than a third of pregnant women availed themselves of antenatal care and over 90% gave birth at home. Less than ten percent of women were helped by trained birth attendants and there were compromises in hygiene and warmth at the time of delivery. Breastfeeding rates were high. The prospective registration process suggested a neonatal mortality rate one-and-a-half times as high as the methods used in previous surveys.

While robust, the surveillance system had a number of limitations consequent on its use of interviews and respondent recall, which have been discussed. More pertinent is the question of replicating the system in other settings. The challenge is to modify it to cover large areas economically. This will be done by reducing the number of observation visits, reducing the number of interview events, and changing the surveillance process to cover an open cohort. It is unlikely that the system will be adopted in programmatic settings which do not require detailed evaluation, but our hope is that it can serve as a model for sentinel sites and sample areas through which roll-out of large programmes can be evaluated.

Chronology of publications resulting from thesis fieldwork

1. Tamang S, Mesko N, Shrestha B, Osrin D, Manandhar M, Standing H, Shrestha JR, Manandhar DS, Costello AM de L. A qualitative description of perinatal care practices in Makwanpur District, Nepal. *Contrib Nepalese Stud* 2001;28:10-9.
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Reducing childhood mortality in poor countries

Implementing a community-based participatory intervention to improve essential newborn care in rural Nepal

David Osrin¹, Natasha Mesko¹, Bhim P. Shrestha², Deji Shrestha², Suresh Tamang², Sushma Thapa², Kirti M. Tumbahangphe², Jyoti R. Shrestha², Madan K. Manandhar³, Dharm S. Manandhar², Hilary Standing¹ and Anthony M. de L. Costello¹ ¹Centre for International Child Health, Institute of Child Health, London, WC1N 1EH, UK; ²Mother Infant Research Activities, Kathmandu and Hetauda, Nepal; ³Nepal Administrative Staff College, Kathmandu, Nepal

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Effect of a participatory intervention with women's groups on birth outcomes in Nepal: cluster-randomised controlled trial



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Articles









Annex C. Reference 134

Mesko N, Osrin D, Tamang S, Shrestha BP, Manandhar DS, Manandhar M, Standing H, Costello AM de L. Care for perinatal illness in rural Nepal: a descriptive study with cross-sectional and qualitative components. *BMC Int Health Hum Rights* 2003;3:3.

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Research article

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Care for perinatal illness in rural Nepal: a descriptive study with cross-sectional and qualitative components

Natasha Mesko¹, David Osrin¹, Suresh Tamang², Bhim P Shrestha², Dharma S Manandhar², Madan Manandhar², Hilary Standing³ and Anthony M de L Costello*¹

Address: ¹International Perinatal Care Unit, Institute of Child Health, University College, London, UK, ²Mother Infant Research Activities (MIRA), GPO Box 921, Kathmandu, Nepal and ³Institute of Development Studies, Falmer, Brighton, Sussex BN1 9RH, UK

Email: Natasha Mesko - n_mesko@hotmail.com; David Osrin - david.o@ucl.ac.uk; Suresh Tamang - mira@vianet.com.np; Bhim P Shrestha - mira@vianet.com.np; Dharma S Manandhar - dsan@icd.hncc.org.np; Madan Manandhar - m.manandhar@info.com.np; Hilary Standing - H.Standing@ids.ac.uk; Anthony M de L Costello* - a.costello@ich.ucl.ac.uk

* Corresponding author

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Abstract

Background: Maternal, perinatal and neonatal mortality rates remain high in rural areas of developing countries. Most deliveries take place at home and care-seeking behaviour is often delayed. We report on a combined quantitative and qualitative study of care seeking obstacles and practices relating to perinatal illness in rural Makwanpur district, Nepal, with particular emphasis on consultation strategies.

Methods: The analysis included a survey of 8798 women who reported a birth in the previous two years (of whom 3557 reported illness in their pregnancy), on 30 case studies of perinatal morbidity and mortality, and on 43 focus group discussions with mothers, other family members and health workers.

Results: Early pregnancy was often concealed, preparation for birth was minimal and trained attendance at birth was uncommon. Family members were favoured attendants, particularly mothers-in-law. The most common recalled maternal complications were prolonged labour, postpartum haemorrhage and retained placenta. Neonatal death, though less definable, was often associated with cessation of suckling and shortness of breath. Many home-based care practices for maternal and neonatal illness were described. Self-medication was common.

There were delays in recognising and acting on danger signs, and in seeking care beyond the household, in which the cultural requirement for maternal seclusion, and the perceived expense of care, played a part. Of the 760 women who sought care at a government facility, 70% took more than 12 hours from the decision to seek help to actual consultation. Consultation was primarily with traditional healers, who were key actors in the ascription of causation. Use of the government primary health care system was limited: the most common source of allopathic care was the district hospital.

Conclusions: Major obstacles to seeking care were: a limited capacity to recognise danger signs; the need to watch and wait; and an overwhelming preference to treat illness within the community. Safer motherhood and newborn care programmes in rural communities, must address both community and health facility care to have an impact on morbidity and mortality. The roles of community actors such as mothers-in-law, husbands, local healers and pharmacies, and increased access to properly trained birth attendants need to be addressed if delays in reaching health facilities are to be shortened.

Background

Bachha paune hahile kahile

Kokro banaaune ahile

Only build the cradle when the baby is born

For mothers and newborn infants in Nepal, perinatal illness usually begins and ends at home. The current perinatal mortality rate is 47 per thousand births and the neonatal mortality rate 39 per thousand live births [1]. About 90% of births take place at home [1,2], and the establishment of local health care facilities has not necessarily led to their usage [3]. Less than half of women receive any antenatal care, and less than 15% of births are attended by a trained service provider [1]. The reasons for this are economic, geographic, cultural and institutional [4-6]. Salient institutional problems include absenteeism, minimal staff support, lack of medicines and equipment, and deficiencies in the referral system.

Government health services are not, however, the whole story. When illness occurs, a range of local care providers is available. Choices are made within a network of traditional and allopathic options that also encompasses perceived costs, geographical and climatic constraints, the time of day, the type of illness, ethnic and religious concerns, and chance. We are currently conducting a study on the impact of a community-based participatory intervention to improve essential newborn care, working with women's groups [7]. The study is a cluster randomised trial involving 24 Village Development Committees [standard rural geopolitical units] of Makwanpur District, south-central Nepal.

Objectives

Germane to our intervention study is an understanding of community perceptions of illness during maternity, and responses to those perceptions. The objectives of the present study were as follows: to quantify perceived illness; to examine home care practices for illness; to quantify care seeking practices for illness; and to examine the choice of care.

Methods

Setting

Nepal is a nation of 23.2 million in which poverty is the norm. Per capita Gross Domestic Product [GDP] is 240 US dollars [8] and 14% of the population earn less than a dollar a day [9]. 38% of GDP comes from agriculture [8], a falling share given that 80% of the population are still primarily engaged in agricultural activities [10]. Over 100 castes, ethnic groups and subgroups inhabit a landscape covering three topographic belts: high Himalaya, middle hills and southern plains. Demographic indices reflect the attendant poverty, limited communications and infrastructure. Life expectancy is now 61 years [only recently has the female figure caught up with that of males], female adult literacy is 43% [11,12] and the total fertility rate is 4.1 [2.1 in urban areas and 4.4 in rural] [1].

Nepal introduced and integrated its primary health care programmes from the early 1980s. The model is familiar, with tertiary hospitals at the centre, zonal and district hospitals at nodal points in the periphery, and a hierarchy of primary health centres, health posts and sub-health posts reaching down into the community.

Makwanpur district covers about 2500 sq km to the south of Kathmandu. It has a population of almost 400 000, mostly engaged in subsistence agriculture. Makwanpur includes both hills and plains, has two main motorable roads and is divided into 47 Village Development Committees and a municipality. The largest ethnic bloc is Tamang, a Tibeto-Burman, predominantly Buddhist group [46%], followed by a Brahmin and Chhetri group of Indo-Aryan origin [25%], and then at least 15 other groups. A 24-bed district hospital in the municipality of Hetauda, four primary health centres and 40 health posts or sub-health posts serve the district. There are approximately 500 deliveries per year in the hospital, which provides facilities for blood transfusion but not for caesarian section.

Study design

The study had two components, quantitative and qualitative. The quantitative component employed a cross-sectional survey of recalled events during previous pregnancies. The qualitative component employed a

series of morbidity and mortality case studies based on semistructured interviews, and a series of community focus group discussions on the same issues. The survey and qualitative study were carried out concurrently but wholly independently. The survey was carried out in the 24 Village Development Committees – 12 intervention and 12 control – of the greater study. The case studies and focus group discussions were carried out in six Village Development Committees. For methodological reasons, transfer of information from the survey to the qualitative research team was not permitted.

Data collection and analysis

Survey questionnaire

We have described the collection of quantitative data elsewhere [13]. Briefly, all married women of reproductive age [15–49 years] residing in the study area were identified, invited to participate and interviewed via a structured questionnaire. A woman was classified as a married woman of reproductive age and entered into the closed cohort if her age was between 15 and 49 completed years on 15 June 2000, if her husband was alive at enrolment, and if her husband either lived with her or made visits that allowed for the possibility of conception within the study period.

The questionnaire was developed through 11 cycles of piloting, evaluation, and repeat piloting. The 44 field interviewers had been involved in questionnaire development for at least three cycles, and were permanent team members with eight months of training and experience. Data were collected between March and November 2001. Interviewers were supported by nine field coordinators, a senior officer and a data auditor, who checked questionnaires at source, at field centres and at the central office. A tenth of interviews were observed by supervisory team members.

We entered data into a relational database management system in Microsoft SQL server 7.0 [Microsoft Corporation, USA], which incorporated intrafield and interfield validation constraints. For this study, we examined questions about maternal illness and care seeking practices during the preceding pregnancy. We examined frequencies and outliers through structured queries in the database environment. We examined proportions in intercooled Stata 7.0 [Stata Corporation, USA]. We have rounded percentages to integers for presentation.

Case studies

From a sampling frame of the 12 intervention Village Development Committees in which our facilitation team were active, six were purposively sampled to be as heterogeneous as possible with respect to topography and demography. To begin with, facilitators active in these six

areas sought information on women who had experienced problems in pregnancies within the previous two months, particularly serious illness or death. Identification of such women over a two month period was followed by a series of case studies, conducted from May to July 2000. We already had information on normal pregnancy communicated through a series of 51 focus group discussions, 24 of these dealt with the language of pregnancy and the puerperium, and 27 with perinatal care practices [14]. Each case study developed from a meeting with a key informant, either a mother or a close relative if she had died as a result of her illness. In the latter case, respondents were chosen from close family members or friends who had had the most contact with a woman around the time of her death. If the key informant gave her permission, a semistructured interview was carried out. The interview began with a period in which the informant spoke her mind, followed by a series of probes that led to more discussion. The results of this primary interview guided the subsequent selection of other informants for the index case. Each case study comprised between two and four interviews. The illness case studies represented periods of illness in the past two months, neonatal/stillbirths in the past two years, and the period of recall for maternal deaths was five years, in order to capture enough cases [half of the maternal deaths were within two years].

Focus group discussions

The results of the case studies were fed into the design of a series of focus group discussions, carried out from August to October 2000. Issues that had arisen were raised in discussion and were used as triggers for further ideas. Focus groups were purposively sampled. Each group was made up of participants from a single ethnic bloc and a single gender. During the discussion, facilitators drew pictorial timelines to mark the stages of early and late pregnancy, birth and the postpartum period. The timelines were used to understand the sequential flow of perinatal events and as a focus for discussion. The focus group discussions aimed to generate a degree of community consensus about illness, consequent health care seeking behaviour and decision making.

Tools and methodology for the qualitative components of the study were locally developed and pretested in workshops and in the field. Data were recorded by note-taking and tape-recording, for which permission was given in all cases. Each team member also maintained a diary in which she recorded her personal observations and informal conversations. Raw data were given specific reference codes. A random sample was translated into English by an independent third party and the remaining data by the principal investigators. The data were broken into units

Table 1: Participants in the three components of the study, with selected demographic indicators

	Ethnic group						Total
	Tamang [%]	Brahmin-Chhetri [%]	Ashtawal group [%]	Newar [%]	Magar [%]	Gurung [%]	
Quantitative study							
Previous births	5982	1615	476	244	407	74	8798
Recalled significant illness at any time during maternity	24/6 [41]	640 [40]	208 [44]	65 [27]	134 [33]	34 [46]	3557 [40]
Case studies	15	9	3	1	1	1	30
Focus groups							
With women	4	4	5	4	3	3	23
With men	4	3	4	3	3	3	20
Selected demographic indicators							
Maternal age							
Under 20	708 [12]	257 [16]	91 [19]	35 [14]	45 [11]	10 [13]	1146 [13]
20-29	3254 [54]	1093 [68]	271 [57]	161 [66]	242 [59]	39 [53]	5058 [58]
30-39	1655 [28]	222 [14]	104 [22]	41 [17]	101 [25]	19 [26]	2142 [24]
40 and over	367 [6]	43 [2]	10 [2]	7 [3]	19 [5]	6 [8]	452 [5]
Schooling							
None	5371 [90]	768 [47]	387 [81]	154 [63]	301 [74]	54 [73]	7035 [80]
Up to class 5	504 [8]	415 [26]	68 [14]	48 [20]	71 [17]	17 [23]	1123 [13]
Above class 5	107 [2]	43 [2]	7 [1]	4 [2]	35 [9]	3 [4]	640 [7]
Appliance score							
0: None of the possessions below	3620 [61]	552 [34]	233 [49]	74 [30]	197 [48]	44 [60]	4720 [54]
1: Wall clock, radio, iron, bicycle	1862 [31]	602 [37]	163 [34]	82 [34]	127 [31]	24 [32]	2860 [32]
2: Hand tractor, sewing machine, camera, cassette player, fan	298 [5]	195 [12]	60 [13]	27 [11]	43 [11]	3 [4]	626 [7]
3: Any motor vehicle, television, refrigerator	202 [3]	266 [17]	20 [4]	61 [25]	40 [10]	3 [4]	592 [7]

for analysis and each unit was categorised. Finally, we sorted emergent patterns and processes into themes [15].

Ethical approval

The study received ethical clearance from the Nepal Health Research Council, His Majesty's Government Ministry of Health, Nepal and the Institute of Child Health and the Hospital for Sick Children, Great Ormond Street, London. Permission was granted by each Village Development Committee chairperson and informed verbal consent was obtained from all participants.

Results

Table 1 summarises the numbers involved in the study. 25 702 women received the survey questionnaire, of whom 24 295 had given birth at least once. Because of concerns about the validity of recall over longer periods, and because of the likelihood that practices have changed over time, we have limited our analysis to births within the two years before the start of the study [23rd March 1999 - 23rd March 2001]. For compatibility, we have included

only the ethnic groups involved in the qualitative study. The analysis is therefore based on the responses of 8798 women. There were 30 case studies and 43 focus group discussions. The case studies included eight maternal deaths, two instances of maternal illness, ten neonatal deaths, two instances of neonatal illness and eight stillbirths. Three of the stillbirths were described as macerated and the remaining five were fresh. Three of the neonatal deaths and one of the stillbirths occurred in association with maternal death. In both components of the study, similar patterns of care were described across ethnic groups.

Maternity care

Concealment of pregnancy, particularly in the first months, was the norm. Women tended to work until the first signs of labour began, and there were proscriptions on behaviour. Preparation for birth was limited. Specific foodstuffs might be collected and stored in advance, but extensive preparation was seen as tantamount to tempting fate. In respondents' view, events during pregnancy were

Table 2: Delivery care and consultation findings from the survey questionnaire

Delivery care	Frequency [%]
Place of delivery (n = 8798)	
Home	8238 [94]
Hospital	435 [5]
Birth attendant* (n=8798)	
Mother-in-law	3476 [40]
Doctor, nurse, auxiliary nurse midwife, health assistant	563 [6]
Traditional birth attendant	440 [5]
No attendant at all	1030 [12]
Consultation for recalled illness	
Place of consultation† (n = 3557)	
Traditional healer	2748 [77]
District hospital	353 [10]
Primary Health Centre	122 [4]
Health Post	176 [5]
Sub-Health Post	138 [4]
Any government primary health care institution	443 [12]
Any government health care institution	760 [21]
Private clinic	151 [4]
Medicine shop	115 [3]
Time from onset of illness to any treatment (n = 3557)	
> 6 hours	1108 [31]
> 24 hours	906 [25]
> 48 hours	706 [20]
Time from onset of illness to health facility consultation (n = 760)	
> 12 hours	531 [70]
> 24 hours	454 [60]
> 48 hours	361 [48]
Maternal medication (n = 3557)	
Allopathic	1087 [31]
Traditional	354 [10]
Allopathic and traditional	96 [3]

*These figures allow the possibility of multiple attendants or consultations, which means that they do not sum to the denominator. This has been taken into account in the presentation of grouped frequencies.

intimately connected with problems during delivery and the puerperium.

Table 2 summarises delivery care findings from the survey questionnaire. 94% of women gave birth at home or in the environs of the home. Only five percent delivered at a hospital, and none did so at a primary health care facility. A woman's commonest birth attendant was her mother-in-law [40%]. Six percent of women were assisted by a doctor, nurse, auxiliary nurse midwife, or health assistant. Traditional birth attendants assisted in only five percent of deliveries, and 12% of women gave birth entirely alone.

Table 3: Maternal illness findings from the survey questionnaire

Illness	Frequency [%] N = 8798 births within past two years [100%]
Recalled significant illness at any time during maternity	3557 [40]
Antenatal events	
Vaginal bleeding	
Any bleeding	445 [5]
Soaked clothes, bed or floor	382 [4]
Signs of pre-eclampsia	
Swollen legs + face	2587 [29]
Swollen face + blurred vision	2189 [25]
Swollen face + blurred vision + convulsion	999 [11]
Fever for more than one day	2018 [23]
Vaginal discharge for more than one day	1189 [14]
Intrapartum events	
Prolonged labour	
> 12 hours	3623 [41]
> 24 hours	1968 [22]
> 48 hours	1089 [12]
Retained placenta	
> 1 hour	718 [8]
> 6 hours	203 [2]
Placenta complete on delivery	8711 [99]
Postpartum events	
Vaginal bleeding which soaked clothes, bed or floor	2401 [27]
Fever for more than one day	1352 [15]
Vaginal discharge for more than one day	1155 [13]

The qualitative studies supported these findings. 'Traditional' birth attendants were not seen as having a traditional role in the locality, were rarely called to attend births and tended to be consulted only for emergencies.

Perceived illness

The survey questionnaire asked about illness in the following four categories: vaginal bleeding, signs of possible pre-eclampsia and eclampsia, fever, and vaginal discharge. 3557 women had experienced one of these in their last pregnancy [40%]. Responses are summarised in Table 3. Five percent of women recalled antepartum vaginal bleeding. Since blood pressure had not usually been measured, we attempted to describe hypertensive disease of pregnancy using a constellation of swollen legs, swollen face, blurred vision and convulsions. These are difficult to assess through recall, particularly where there are variations in perception of their definitions. Fever [23% antepartum and 15% postpartum] and vaginal discharge [14% antepartum and 13% postpartum] were commonly recalled. 22% of labours were recalled as having lasted longer than 24 hours and in eight percent the placenta

Table 4: Symptoms and signs recalled by respondents in case studies

Maternal deaths	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8
Retained placenta	✓	✓	✓	✓	✓			✓
Postpartum haemorrhage			✓	✓	✓			✓
Prolonged labour				✓	✓			
Fainting during pregnancy						✓		
Jaundice						✓		
Twin pregnancy							✓	
Neonatal deaths*	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8
Suckling stopped	✓	✓	✓		✓	✓	✓	✓
Shortness of breath	✓	✓	✓			✓	✓	
Yellow colour			✓					
Fever			✓					
No cry				✓				
Blue colour							✓	
Time of death	13 days	2 hours	12 days	5 mins	15 days	30 mins	14 days	5 days

* Two case studies of neonatal deaths have been omitted from this table, since they were felt to be exceptional. In one case, the baby died in hospital after operative delivery. In the other, preterm twins died shortly after birth.

had taken more than an hour to be delivered. A quarter of women recalled severe postpartum vaginal bleeding [27%].

The major illnesses discussed in the case studies are summarised in Table 4. The survey questionnaire did not examine neonatal death - we are addressing it prospectively - but the commonest symptoms associated with it in the case studies were cessation of suckling and shortness of breath. In general, however, we found it difficult to identify neonatal complications from key informant interviews because descriptions of symptoms were not clear. In the focus groups on newborn infant health, women described more problems than men. Key neonatal problems included a weak cry, breathing difficulties, poor feeding, feeling cold to the touch, looking very small, and looking yellow.

Home care practices for illness

The focus group discussions provided some examples of home care practices for specific problems, summarised in Tables 5 and 6. Specific aspects of home care for illness were, however, not prominent in the discussions. Care within the home was rarely provided by men, since menstruation and childbirth are considered female domains. In the few cases where a man was present he tended to be the husband within a nuclear family. For those practices that were discussed, physiological concepts were often explanatory. One example is a mother's avoidance of certain foods when an infant is feverish because of the relationship between her diet and the quality of her breastmilk [16]. A second is the belief in a linkage between the uterus, stomach and heart [17-19]. If the umbilical cord is cut before the placenta has been deliv-

ered, it may rise to the mother's heart and kill her. Hence the practice of weighting the cut cord by tying a spade to its end: in one case study the spade came loose and the cord disappeared inside the mother. Respondents believed that this was why she subsequently died.

Care seeking practices for illness

The survey questionnaire attempted to quantify care seeking practices outside the home [Table 2]. Three-quarters of women who recalled an illness consulted a traditional healer (Dhama Shankri or Bombo), a finding adequately supported by the qualitative information. A traditional healer was the first care provider outside the household in all the case studies of neonatal deaths. The healer characteristically identifies the causes of illness and so is rarely bypassed in the pursuit of a cure. A hierarchy of choice holds for traditional healers. A healer who is a friend or relative, and of one's own ethnic group, is called first to perform a ceremony. If the condition worsens, a specialist's services are solicited and a longer and more expensive ceremony may be performed. Different illnesses have different characteristics and are treated accordingly. The traditional healer may even suggest the day on which to seek help outside the community.

The situations in which a traditional birth attendant was called were directly related to difficulties in labour, an area in which her skills were seen as appropriate. Some respondents suggested that the perceived inadequacies of the original selection process for traditional birth attendants had knock-on effects in terms of their popularity. "We inform them of the birth but they don't come; this is because of politics...".

Table 3: Home care practices for maternal problems suggested in focus group discussions

Maternal problem	Dietary remedy	Other practices
Antepartum haemorrhage Prolonged labour	Meat, milk and eggs. Hot sugar water, hot milk and eggs.	Hot oil massage with hot compression to woman's lower back.
Retained placenta	Water from a winnowing mat. Eggs, milk and hot foots	Water or alcohol poured from one cup to another. Oil massage on woman's head and abdomen. Abdomen wrapped tightly with large cloth. A root tied around abdomen or put into cloth. Woman's hair thrust into her mouth to induce vomiting. Talisman placed around woman's neck. Train ticket bound to woman's abdomen. Cord cut and weighted with object such as spade. Woman must remain awake. Woman kept warm and hot compression applied.
Postpartum haemorrhage	Hot, spicy soup, oil and honey.	Branches of particular plant placed on top of embers of fire, then layer of old clothes. Mother lies on top of this, covered by quilt. She must sweat. She is dried and must stay in the sun. Oil massage and hot compression then performed.
Prepartum swelling of the body		Hot, spicy soup. For the baby: clarified butter to moisten the mouth; milk from livestock or tin; wet nursing; flour and water porridge.
Postpartum abdominal pain		Hot, spicy soup. For the baby: clarified butter to moisten the mouth; milk from livestock or tin; wet nursing; flour and water porridge.
Poor breast milk supply		Hot, spicy soup. For the baby: clarified butter to moisten the mouth; milk from livestock or tin; wet nursing; flour and water porridge.
Swollen breast		Breast heated by bathing in hot water and milk gandy squeezed out.

Table 4: Home care practices for neonatal problems suggested in focus group discussions

Neonatal problem	Dietary remedy	Other practices
Not crying		Cold water sprinkled on baby. Metal plates beaten close by. Baby held by hands or turned upside down and shaken. Umbilical cord milked from placenta towards baby.
Nix breastfeeding Cold	Ground nutmeg [warming properties].	
Not feeding	Ghee [clarified butter] until baby can breastfeed. Expressed breastmilk until baby can breastfeed.	
Fever	Cooked parsley and fenugreek.	Mother avoids spicy, salty and oily foods. Baby kept warm. Fynliner applied [fenugreek, mustard oil and camphor]. Warm mustard oil applied locally. Baby massaged with warm oil and ash. Yellow climbing plant placed on floor near baby. Same plant may be ground and fed to baby.
Eye infection Umbilical cord infection Diarrhoea Jaundice		
Chest problems, cough, breathing difficulties	Heated camphor, cow's milk, ghee and ginger. Ground nutmeg and groundnut mixed with breastmilk.	
Wounds	Ground groundnut, pumpkin and cucumber seed.	

The focus group discussions suggested that, once causality has been decided, and home or traditional remedies do not appear to be working, medicines are often purchased as the first form of allopathic treatment. However, in the survey questionnaire, only three percent of women recalled visiting such a shop. This was probably spurious because respondents did not usually view them as primary consulting facilities, or because they did not think that they represented an appropriate response to the question [31% of women recalled taking allopathic medicine for their problems]. The time from the onset of illness to initial treatment was more than six hours in 31% of cases.

12% of women had visited a government primary health care facility for their illnesses [primary health centre, health post, or sub-health post]. In non-emergency situations, such facilities were not a popular choice. Our informants felt that they could treat only minor ailments, that there was a lack of even basic medicines and that the quality of service was poor. People spoke of being made to wait for treatment if senior staff were present, whereas in their absence they would be seen immediately. In one of the 23 focus group discussions, however, women spoke of the good reputation of a local maternal and child health worker and were enthusiastic about visiting her during pregnancy.

10% of women had visited the district hospital, which was seen as a better option than a primary care facility, although attendance depended to a large degree on its proximity. Patterns of referral to the hospital, and from it to tertiary hospitals, were difficult to analyse because formal records were absent. In two case studies, women attending the district hospital were referred on to other hospitals before receiving treatment. Whether this was due to lack of trained staff, lack of medicines or equipment, or a "behaviour of referral" was not clear. Referral patterns also reflected the fact that, for most patients, hospitalisation was not a first choice but rather the outcome of an emergency.

Private clinics were a popular alternative to government services, at least conceptually. Although more expensive, care in the private sector was thought to be better. As a male participant put it: *"we go to Hatauda hospital first. If we go to the medical [private clinic] ... some say that it will cost a lot. So we go to the hospital as the cost will be less. But in the hospital the cost can also be high if they prescribe expensive medicines to buy from the medical shop in the bazaar. The only thing that is better in the hospital is that the checkup is free; there are no other facilities, except that in the hospital the sick people can sleep there"*

Choice of care

One of the key findings of the study is the degree of delay in consultation. Of the 760 women who did seek care at a government facility, half took more than 48 hours from the onset of illness to consultation. In all but one case study, an outside care was only called when the situation became critical, and most informants did not seek care beyond their immediate locality. This is reinforced by the period of seclusion after childbirth [sukteri], which ends with the naming and cleansing ceremony of *nuaran*. As a Tausan woman described: *"if we have fever after birth, we do not tell anyone for three or four days, then we tell our husband or mother in law to bring medicine from the bazaar. If we are not better, the nuaran ceremony may be performed earlier so that we can go to the primary health centre and if necessary to Hatauda Hospital"*.

Delays in recognition of illness on the part of women, their families and health carers were mentioned throughout the qualitative study. In several case studies, the traditional healer continued to perform his ceremony despite the severity of a newborn infant's condition. However, although traditional healers were the first option for treatment, and their practices might delay referral for allopathic care, the situation may be changing. One older man reported that, *"nowadays we still go to see the Dhani Jhankri first, but if a newborn baby does not get better we go to the health post two or three hours later. Previously, we had a stronger belief and we would wait for longer before going to the health post"*.

The preference for care within the immediate surroundings of the village, and the disinclination by families to act on referral advice, was raised repeatedly in focus groups. Several case studies documented not only resistance to seeking care outside the village on the part of the immediate family, but also advice not to do so from their neighbours. In times of emergency, the preference for care within the environs of the home was overwhelming. This is best illustrated by one of the case studies. A woman was experiencing problems during labour, characterised by the expulsion of parts of what might have been the placenta. After a series of home remedies, the traditional healer was called. About four hours later, with no improvement in the woman's condition, her mother in law sent for the auxiliary health worker from the health post. The health worker came and advised the family to go immediately to the district hospital. His advice was not, however, acted upon, and the woman's husband went to find the traditional birth attendant. She refused to come as by this time night had fallen and her eyesight was weak. An hour later a dead son was delivered.

The reasons for not acting on referral advice varied. In some cases, the severity of the illness militated against

moving the sick woman or baby, a situation that was exacerbated by the tendency to seek help only at a critical stage. Indeed, where the risk of death was high, respondents felt that it might be better to die at home than outside. In other cases in which illnesses were not critical, perceived expense played a large part in the decision. Men spoke of the need to borrow money for care outside the community and for this reason referral advice was not heeded. Experience of a previous problem did seem, however, to override cost issues and the lack of faith in government health institutions. Women who had had bad experiences in previous pregnancies appeared to be more likely to visit a health facility, in some cases regardless of whether or not they were currently experiencing problems.

Discussion

Our findings on the recognition of and care for perinatal illness in Nepal, the largest of its kind conducted in a developing country, have implications for the design of Safe Motherhood and newborn care programmes in rural communities. We should be cautious, though, about generalising from the case studies and focus group discussions. The nature of the household, ethnicity of its members, degree of maternal autonomy, economic status, workload and distance to care providers interact to form a matrix unique to each setting. This constitutes one limitation of the study. A second limitation is that it was based on either recall or on hypothesis, rather than on prospective observation of action. We hope to look at this in our prospective follow-up. A mitigating issue is that we were interested in perceived rather than clinical illness, and in community perceptions on the background of which health care behaviour is played out. Thirdly, most of our case studies describe pathways of illness leading to death [there were only four morbidity case studies] and so are not necessarily representative of pathways of illness when the patient recovers. And finally, some discrepancies between survey and qualitative findings, for example in the use of medicine shops, probably reflect a misunderstanding by interviewees of the survey question asked.

Maternity care: pregnancy and vulnerability

The qualitative findings were notable for a scarcity of information on illness during early pregnancy, related to the tendency to conceal pregnancy, or perhaps to the respondents' remembering more recent, or more major, events. The most common maternal complications in the case studies were prolonged or obstructed labour, postpartum haemorrhage and retained placenta. This is consistent with a national maternal mortality and morbidity study, in which postpartum haemorrhage was the leading cause of maternal death [20]. Likewise, the descriptions of neonatal symptoms and signs – though

relatively imprecise – accord with key danger signs identified for essential newborn care [21,22].

The fact that similar patterns of care were found across ethnic groups reflects the national picture [6,19,23]. Pregnancy is seen as a normal state, and women work until the onset of labour [24]. They are shy about birth and fear that wider knowledge of their state would bring shame on their husbands' households [25]. We have discussed the ethnography of normal pregnancy elsewhere [14]. Broadly, concealment of pregnancy falls within the ambit of shyness or shame [*laaj laagne*] [24,26]. Communicating problems during times of pollution, such as menstruation, pregnancy, birth and the postpartum period may compromise the household. During the *sukheri* period, mother and baby remain secluded for three to seven days, and it is not considered favourable to move them until *muwaran*. Seclusion during this liminal period of vulnerability to spirits and disease is not limited to Nepal [17,26], and has been likened – with particular reference to Brahmin and Chhetri women – to the seclusion undertaken at first menstruation [25].

Home care practices for illness: recognition of abnormality

The limited information volunteered on home care practices for illness may imply that they are not seen as *treatment*, which appears to involve a process of consultation [27]. For those practices that were discussed [presented in Tables 5 and 6], physiological concepts were often explanatory. When illness occurs, it often falls to a mother herself to recognise danger signs. However, her mother-in-law and husband are usually the bridge between care in the home and care seeking beyond. A mother-in-law's recognition of danger signs and the perceived need for action depend on her own past experience, and it is likely that the construction of normality – the degree of pain tolerable, for example – influences the process of recognition.

Care seeking practices for illness: the description of cause

Once illness is recognised, families prefer to consult a local informal care provider. Our informants spoke of the effort required to access the services of a traditional healer before a mother or her baby died. Discussions about difficulties of access usually refer to government health staff, and it is interesting to see that informal providers may be just as difficult to consult. The implication is that difficulty of access is not necessarily a bar to consultation.

The relationship between the cause of an illness and its symptoms is loose, but the potential for cure follows from a knowledge of causation. The curative process depends on the elimination of a range of possible causes, physical and spiritual, some of which may involve the entire family [27–29], and it is often the work of the traditional healer to tease them out. Some illnesses are well defined and

their response to allopathic treatment is well known. In such cases, families may bypass the traditional healer and seek allopathic treatment as a first step. It is also possible that an individual's illness has not arisen from transgression, but is simply a matter of fate.

Choice of care: locality and the first delay

Traditional birth attendants are not commonly called to deliver. Although a person who serves some of the functions of a birth attendant may be required to cut the umbilical cord in other parts of Nepal and south Asia [23], not one respondent in our study spoke of such a requirement. In rural Makwanpur, a traditional birth attendant has no perceived advantage over a relative. Even if she is called, there are a number of reasons why she may be reluctant to attend. Firstly, the situation has often become critical by the time she arrives and is likely to end in death, for which she might be held responsible. Secondly – and in contrast with a traditional healer – the traditional birth attendant plays no role in the attribution of causality. Thirdly, she has not always been selected for her role on the basis of an interest in fulfilling the it.

The purchase of medications is common and the medicine shop is said to be the usual destination after the traditional healer [30], although this was not confirmed by the survey questionnaire. Our focus group discussions confirmed findings from other studies that medicine shops, in contrast to government health facilities, keep more convenient hours, are found in more convenient locations, minimise waiting time and levy no consulting fees. The social gulf between staff and customers is also narrower [31,32]. The relationship between communities and health post staff has been described in detail elsewhere [33]. It is sufficient to note that the higher the level of health worker, the more likely he or she will be seen as a stranger, a social superior, and one whose otherness is magnified by differences in language, ethnicity and caste.

Referral to hospital is difficult in mountainous terrain and most women in the study area live at least three hours away. Nepal's district hospitals also tend to have a limited capacity to deal with complicated cases. The provision of basic emergency obstetric care in hospital settings has therefore become an important aim of the Safe Motherhood Initiative. The Safe Motherhood framework of *three delays* is also a useful way of looking at care seeking behaviour [34]. The first delay is in the recognition of illness and the decision to act on it. This is affected by awareness of danger signs, as well as by prevailing attitudes to pregnancy. The second delay is in reaching the source of care, a delay which is affected by geography, transportation and funds. The third delay is in receiving care at an appropriate facility. This is primarily affected by institutional factors.

What is striking about our findings is the importance of the *first delay*, which itself is made up of a series of significant delays. The decision to seek care outside the household may only be made after a process of elimination of causes, home remedies and observation being part of this process. Issues such as perceived normality, pollution and its transgressive corollaries, shame, the spirit world and multiple causality, affect household decisions. Unfortunately, this curative-diagnostic social process may increase the delay in seeking formal treatment and bring the individual closer to death.

A particular point of delay was the increased tendency to watch and wait in the *sukheri* period. The inhibiting effects of *sukheri* may extend to the activities of the traditional healer, who may not perform his full ceremony, and in rare cases may not even be called. One result of seclusion practices, whatever their wider implications, is that sick women and their babies face barriers to the recognition of illness and seeking of care outside the household. A range of health care providers is usually available in the community and there appears to be no significant conflict in terms of choice. Rather, the choice of care provider depends upon the nature and timing of the illness and the availability of a trusted informal practitioner.

Conclusions and policy implications

Our conclusion is that the major obstacles to seeking care are: a limited capacity to recognise danger signs; the need to watch and wait; the inertia of the *sukheri* period; and an overwhelming preference to treat illness within the community. All of these fall within the critical *first delay* in the care seeking model. The actual decision to seek care does not appear to be the pivotal issue. Once a problem has been recognised, senior family members often decide to seek treatment in a timely manner.

Factors influencing the preference for local care include peer pressure, *perceived cost* (a weighted perception, since visiting the traditional healer can also be costly), distance from a health facility, and reluctance to move a *sukheri* and her baby, particularly if they are already thought to be in severe danger and close to death. Traditional healers are more important actors than traditional birth attendants.

What are the policy implications of these findings? Safe Motherhood Programmes, to be successful, must address the three delays which lead to maternal and perinatal mortality. Only strengthening health facilities is unlikely to have an immediate impact on perinatal care practices and care seeking behaviour. Our finding that treatment within the community is considered of great importance strongly argues the case for bringing more trained attendants to community level. Once a problem has been recognised, senior family members often decide to seek

treatment in a timely manner – suggesting that it is whom care is sought from, which needs to be changed. The roles of the various key actors – mothers-in-law and husbands, village-based health staff, local healers, pharmacies – also need to be addressed if the first and second delays in reaching health facilities are to be shortened. Policymakers might choose one or more of three broad options to address these first delay issues. First, health care workers or volunteers might be trained to give health promotion messages to families. It seems to us that the complexity of the problem, and the limited evidence for the effectiveness of changing behaviour in this way [35] means that such a 'health sector' approach is very unlikely to succeed. Second, a more participatory approach might be developed using a non-health sector worker, such as a trained woman facilitator, to work with women's groups through a community action cycle. The purpose of our ongoing trial is to evaluate the cost-effectiveness of such an approach in changing family behaviour and health outcomes for mothers and newborn infants, and we hope to report the findings by 2004. A third approach might be to mobilise more direct political support for maternal health through specific policy edicts from the centre. Local political leaders could be held accountable for ensuring certain minimum standards in community participation and health service improvement with regards to care in pregnancy, childbirth and the newborn period, through some kind of national perinatal audit process. They could also assist with the development of emergency financing schemes to help families experiencing obstetric emergencies.

At present, maternal and newborn health remains some way down the policy agenda in Nepal. A huge challenge for health professionals and social scientists is to provide policymakers with options for maternal care which are implementable, scalable and evidence-based at community level. At the same time, programmes to strengthen hospital obstetric care, and to expand access to midwives and trained birth attendants are an urgent priority.

Competing interests

None of the authors have competing interests.

Authors' contributions

ST and NM designed the qualitative study, supervised the data collection process and carried out the analysis. DO and NM designed the quantitative study tools and carried out the analysis. NM and DO wrote the first draft of the paper. BS and MM contributed to the design and criticised later drafts of the paper. DM, HS and AC contributed to the design of the study and the supervision of the field programme, and criticised drafts of the paper. NM and AC will act as guarantors for the paper.

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Annex D . Household questionnaire

MIRA Makwanpur

मातृ तथा नवजात शिशु स्वाहार कार्यक्रम

घरधुरी प्रश्नावली

Household questionnaire

१. घरधुरी परिचय संख्या
Household ID no.

गा.नि.स.नं. वडा नं.

टोल

क्षेत्र नं. घरधुरी संख्या

अन्तर्वाता सिने व्यक्तिको नं.

अन्तर्वाता लिइएको मिति कुन हो ?

गते महिना साल
day month year

डाटा इन्ट्री गर्नेको परिचय संख्या

Data Entry Person no.

२. घरमूलीको नाम के हो ?
What is the name of the head of household?

३. घरमूली पुरुष वा महिला के हो ?
Is the head of household a man or a woman? पुरुष महिला
man woman

४. उत्तर दिने व्यक्ति घरको मूली हो ?
Is the respondent the head of household? हो होईन
yes no

(यदि उत्तर दिने व्यक्ति घरको मूली हो भने प्रश्न नं. ८ मा जानुहोस्)
(If the respondent is the head of household, go to question no. 8)

उत्तर दिने व्यक्ति
The respondent

५. तपाईंको नाम के हो ?
What is your name?

६. तपाईंको उमेर कति हो ? वर्ष
What is your age? years

७. तपाईंको घरमूलीसंग के नाता छ ?
What relation are you to the head of household?

धर्म र समुदाय
Religion and ethnicity

८. घरमूलीको धर्म कुन हो ? (कुनै एकमा चिन्ह लगाउनुहोस्)
What is the religion of the head of household? (Fill in one only)

हिन्दु बौद्ध मुसलमान क्रिश्चियन अन्य
Hindu Buddhist Muslim Christian Other

९. घरमूली कुन जात + समुदायको हो ? (कुनै एकमा चिन्ह लगाउनुहोस्)
What is the ethnic group/race of the head of household? (Fill in one only)

तामाङ बाहुन क्षेत्री नेवार मगर प्रजा
Tamang Bahun Chhetri Newar Magar Prja

घर्ती माझी कामी परियार सार्की सन्यासी
Gharti Majhi Kami Pariyar Sarki Sanyasi

दनवार गुरुङ ठकुरी अन्य
Danwar Gurung Thakuri Other

परिवार संख्या
Family number

१०. तपाईंको घरमा कतिजना बस्छन् ? जना
How many people live in your house? People

११. तपाईंको घरमा कतिजना पन्ध्र वर्ष वा सो भन्दा बढि उमेरका पुरुषहरु बस्छन् ? जना
How many males aged 15 years and above live in your house? People

१२. तपाईंको घरमा कतिजना पन्ध्र वर्ष भन्दा कम उमेरका पुरुषहरु बस्छन् ? जना
How many males below the age of 15 years live in your house? People

१३. तपाईंको घरमा कतिजना पन्ध्र वर्ष वा सो भन्दा बढि उमेरका महिलाहरु बस्छन् ? जना
How many females above the age of 15 years live in your house? People

१४. तपाईंको घरमा कतिजना पन्ध्र वर्ष भन्दा मुनिका छोरी मान्छेहरु बस्छन् ? जना
How many females below the age of 15 years live in your house? People

(प्रश्न नं. ११-१४ सम्मको उत्तर संख्या जोड्दा प्रश्न नं. १० को उत्तरसंग बराबर हुनुपर्दछ)
(The answers to questions 11-14 should add up to the same number as in question 10)

Ask only to women who are living apart from their husbands

If he does not live with you, does he come and go?

Is she married?
If not, go to the next page

Is she likely to still be living here next year?
If not, go to the next page

9.4. अब, मैं तपाइको घरमा बस्ने सबै महिलाहरुको बारेमा (त्योक महिलाको लागि तलका कुराहरु भन्नुहोस्।)
15 सोच्न जाइँछु । Now I am going to ask you about all the women who live in your household. For each woman fill in the details below

MWRA हो/नहोइन Is/Is not MWRA Data Team ले लेखे Data Team will verify	नाम Name	उमेर कति वर्ष र महिना भयो : Age in months and years? जन्मेको महिना र साल Month and year of birth	घरमूलीसार्को नाता Relation to head of household	प्रायतसो यहै घरमा बस्छु Generally lives in the house यदि बस्दैन भने अर्को नाममा जानुहोस् If not, go to the next page	अर्को रूप पनि त्यहि बस्नु हुन्छ होला ? यदि बस्दैन भने अर्को नाममा जानुहोस् If not, go to the next page	विवाहित हुनु ? यदि होइन भने अर्को नाममा जानुहोस् If not, go to the next page	श्रीमानसंग वस्तु हुन्छ ? Does she live with her husband?	श्रीमानसँग अलग भएर बस्ने महिलालाई मान रहेको छ वस्तु हुन्छ भने आउने जाने गर्नु हुन्छ ?	यदि MWRA हो र श्रीमान संग भेटघाट भइरहेको भने वक्तमा चिन्ह लगाउनुहोस् ।
		वर्ष महिना साल	महिला महिला साल	बस्छीन बस्दैन बस्छीन बस्दैन	बस्छीन बस्दैन बस्छीन बस्दैन	हो होइन हो होइन	बस्छीन बस्दैन बस्छीन बस्दैन	आउनु हुन्छ आउनु हुन्न आउनु हुन्छ आउनु हुन्न	यदि MWRA हो र श्रीमान संग भेटघाट भइरहेको भने वक्तमा चिन्ह लगाउनुहोस् । If she is a MWRA and she spends time with her husband, put a tick in the box
		वर्ष महिना साल	महिला महिला साल	बस्छीन बस्दैन बस्छीन बस्दैन	बस्छीन बस्दैन बस्छीन बस्दैन	हो होइन हो होइन	बस्छीन बस्दैन बस्छीन बस्दैन	आउनु हुन्छ आउनु हुन्न आउनु हुन्छ आउनु हुन्न	
		वर्ष महिना साल	महिला महिला साल	बस्छीन बस्दैन बस्छीन बस्दैन	बस्छीन बस्दैन बस्छीन बस्दैन	हो होइन हो होइन	बस्छीन बस्दैन बस्छीन बस्दैन	आउनु हुन्छ आउनु हुन्न आउनु हुन्छ आउनु हुन्न	
		वर्ष महिना साल	महिला महिला साल	बस्छीन बस्दैन बस्छीन बस्दैन	बस्छीन बस्दैन बस्छीन बस्दैन	हो होइन हो होइन	बस्छीन बस्दैन बस्छीन बस्दैन	आउनु हुन्छ आउनु हुन्न आउनु हुन्छ आउनु हुन्न	
		वर्ष महिना साल	महिला महिला साल	बस्छीन बस्दैन बस्छीन बस्दैन	बस्छीन बस्दैन बस्छीन बस्दैन	हो होइन हो होइन	बस्छीन बस्दैन बस्छीन बस्दैन	आउनु हुन्छ आउनु हुन्न आउनु हुन्छ आउनु हुन्न	
		वर्ष महिना साल	महिला महिला साल	बस्छीन बस्दैन बस्छीन बस्दैन	बस्छीन बस्दैन बस्छीन बस्दैन	हो होइन हो होइन	बस्छीन बस्दैन बस्छीन बस्दैन	आउनु हुन्छ आउनु हुन्न आउनु हुन्छ आउनु हुन्न	
		वर्ष महिना साल	महिला महिला साल	बस्छीन बस्दैन बस्छीन बस्दैन	बस्छीन बस्दैन बस्छीन बस्दैन	हो होइन हो होइन	बस्छीन बस्दैन बस्छीन बस्दैन	आउनु हुन्छ आउनु हुन्न आउनु हुन्छ आउनु हुन्न	
		वर्ष महिना साल	महिला महिला साल	बस्छीन बस्दैन बस्छीन बस्दैन	बस्छीन बस्दैन बस्छीन बस्दैन	हो होइन हो होइन	बस्छीन बस्दैन बस्छीन बस्दैन	आउनु हुन्छ आउनु हुन्न आउनु हुन्छ आउनु हुन्न	
		वर्ष महिना साल	महिला महिला साल	बस्छीन बस्दैन बस्छीन बस्दैन	बस्छीन बस्दैन बस्छीन बस्दैन	हो होइन हो होइन	बस्छीन बस्दैन बस्छीन बस्दैन	आउनु हुन्छ आउनु हुन्न आउनु हुन्छ आउनु हुन्न	
		वर्ष महिना साल	महिला महिला साल	बस्छीन बस्दैन बस्छीन बस्दैन	बस्छीन बस्दैन बस्छीन बस्दैन	हो होइन हो होइन	बस्छीन बस्दैन बस्छीन बस्दैन	आउनु हुन्छ आउनु हुन्न आउनु हुन्छ आउनु हुन्न	
		वर्ष महिना साल	महिला महिला साल	बस्छीन बस्दैन बस्छीन बस्दैन	बस्छीन बस्दैन बस्छीन बस्दैन	हो होइन हो होइन	बस्छीन बस्दैन बस्छीन बस्दैन	आउनु हुन्छ आउनु हुन्न आउनु हुन्छ आउनु हुन्न	

१६. या घर तपाईंको आफ्नो हो ? हो होइन

१७. घरमा बसेबापल पैसा तिर्नु हुन्छ वा अरु केही काम गरि दिनु हुन्छ ?
 थाडा स्वरुप पैसा तिर्ने थाडा स्वरुप काम दिने अन्य

१८. घर हेरेर घर केने बनेको छ तोकनुहोस्
 सिमन्ट र ईटा माटो र ईटा माटो र ढुंगा फुत्पाक स्पाउला घर
 अन्य

१९. तपाईंको घरमा कति तल्लाहरु छन् ? तल्ला

घर सम्पत्ति
 Household possessions

२०. तपाईंको घरमा कनकन सामानहरु छन् ?
 (घरमा भएका सामानहरु सकेवा चिन्ह लगाउनु होस्)
 बस वा ट्रक मोटरसाइकल टि.भी. मोटर दुयाक्टर फ्रिज सानो दुयाक्टर
 सिगाई सेपीन क्यासेट प्लेयर फूसा रेडियो क्यासेटा साइकल
 भित्ते घडी इस्ट्री माथिका कुनै पनि बस्तुहरु छैनन्

२१. तपाईंले घरमा गाईबस्तुहरु कति वटा पाल्नु भएको छ ?
 गोरु गाई रोगा भैँस खसी वा बाख्रा सुँगुर वा बगर खैरा
 माथिको मध्ये कुनै पनि छैन

जग्गा
 Landowner

२२. तपाईंको घरको मुख पेशा के हो ? (मुख काम तोकनुहोस्)
 कृषि ज्यालादारी तल्लो काम वा सरकारी काम सानोतिनो व्यवसाय
 अन्य

२३. तपाईंले एक भन्दा बढी काम गर्नुहुन्छ भने सहायक वा दोश्रो काम के हो ?
 (यदि कुनै सहायक काम छैन भने कसै गरिनमा चिन्ह लगाउनुहोस्)
 कृषि ज्यालादारी तल्लो काम वा सरकारी काम सानोतिनो व्यवसाय
 कसै गरिन

२४. यो घरले खति लगाउने गरेको छ ?
 खति लगाउने गरेको छ खति लगाउने गरेको छैन

२५. (यदि खति लगाउने गरेको छैन भने प्रश्न नं. २७ मा जानुहोस्)
 (यदि खति लगाउने गरेको छ भने) खति छैन भने प्रश्न (०) तोकनुहोस्।
 केति लगाउने जग्गा मध्ये घरको आफ्नै कति हो ? (यदि छैन भने प्रश्न (०) तोकनुहोस्।)

कुल Total	<input type="text"/>	कठुवा Kathua	<input type="text"/>	बाग Bag	<input type="text"/>	बिगाहा Bigha	<input type="text"/>	बाग Bag	<input type="text"/>	रोपनी Ropani	<input type="text"/>
बारी Bari	<input type="text"/>	कठुवा Kathua	<input type="text"/>	बाग Bag	<input type="text"/>	बिगाहा Bigha	<input type="text"/>	बाग Bag	<input type="text"/>	रोपनी Ropani	<input type="text"/>

२६. केति लगाउने जग्गा मध्ये अर्कोको कति हो ? (यदि छैन भने प्रश्न (०) तोकनुहोस्।)

खेत Khet	<input type="text"/>	कठुवा Kathua	<input type="text"/>	बाग Bag	<input type="text"/>	बिगाहा Bigha	<input type="text"/>	बाग Bag	<input type="text"/>	रोपनी Ropani	<input type="text"/>
बारी Bari	<input type="text"/>	कठुवा Kathua	<input type="text"/>	बाग Bag	<input type="text"/>	बिगाहा Bigha	<input type="text"/>	बाग Bag	<input type="text"/>	रोपनी Ropani	<input type="text"/>

आम्दानी र खर्च

Income and expenditure

२७. घरको आम्दानीले वर्षमा कति महिना खान पुग्छ ? महिना

27

For how many months of the year does the household have enough food?

(यदि १२ महिना सम्मलाई पुग्छ भने प्रश्न नं. २९ मा जानुहोस)

(If there is enough for 12 months, go to question 29)

२८. वाकी महिना कसरी गुजारा गर्नु हुन्छ ?

28

What do you do to cope during the months in which there is not enough?

२९. तपाईंहरूले गएको वर्ष तलका स्वास्थ्य सेवामा अन्दाजी कति रकम खर्च गर्नु भयो ?

29

Approximately, how much did the household spend on the following health services last year?

(यदि कुनैमा पनि खर्च भएन भने शून्य (०) लेख्नुहोस)

(If nothing at all, write '0')

सरकारी स्वास्थ्य सेवा (अस्पताल, प्र.स्वा.के., स्वा.के., उप स्वा.के.)

निजी स्वास्थ्य सेवा

औषधी पसल

Medicine shop

धामी भाँकी

Dhamsi bhanki

रु. रु. रु. रु. रु. रु.

अपांग

Disability

३०. तपाईंको घरमा २० वर्ष भन्दा मुनिका कुनै अपांग व्यक्ति हुनु हुन्छ ?

30

Does anyone under the age of 20 in your household have a disability?

 छ छैन

Yes No

(यदि छैन भने अन्तर्वार्ता रोक्नुहोस)

(If not, stop the interview)

(कस्तो किसिमको अपांग हो प्रत्येक व्यक्तिको बारेमा लेख्नुहोस)

(Write the type of disability for each person)

नाम Name	अपांगको किसिम Type of disability
पहिला व्यक्ति First person	
दोस्रो व्यक्ति Second person	
तेश्रो व्यक्ति Third person	

Annex E. Woman-specific questionnaire

मिरा मकवानपुर

मातृ तथा नवजात शिशु स्वास्थ्य कार्यक्रम

MWRA प्रश्नावली

घरघरी परिचय

Household ID no.

गा. वि. स. नं.

वडा नं.

टोल
To:

क्षेत्र नम्बर
Sector number

घरघरी संख्या
Household no.

अन्तर्वाता लिएको मिति

Interview date

गते
day

महिना
month

साल
year

अन्तर्वाता लिनेको परिचय संख्या
Interviewer no.

MWRA को नाम
MWRA name

.....

MWRA को परिचय संख्या
MWRA ID no.

१ व्यक्तिगत विवरण

तौल Kg

उचाई cm

MUAC cm

उमेर र विवाह

१.१ तपाईं आफ्नो गतको जन्म दिनमा कति वर्ष पुरा पुनु भयो ?
1.1 How many complete years did were you on your last birthday?

वर्ष
Years

१.२ तपाईं कन साल कन महिनामा जन्मनु भएको हो ?
1.2 In what year and which month were you born?

महिना
Month

साल
Year

१.३ तपाईंको विवाह हुँदा तपाईं कति वर्षको हुनु हुन्थ्यो ?
1.3 How old were you when you got married?

वर्ष
Years

१.४ तपाईं आफ्नो श्रीमानसँग सँगै बस्न शुरु गर्दा कति वर्षको हुनु हुन्थ्यो ?
1.4 How old were you when you first started living with your husband?

वर्ष
Years

शिक्षा

१.५ तपाईं कहिल्यै विद्यालय जानु भएको छ ?
1.5 Did you ever go to school?

छ
Yes

छैन
No

(यदि छैन भने प्रश्न नं. १.७ मा जानुहोस)
(If no, go to question no. 1.7)

१.६ कति कक्षा सम्मको पढाई पुरा गर्नु भएको छ ?
1.6 Up to which class did you attend?

कक्षा
Class

१.७ तपाईं यो वाक्य पढ्न सक्नु हुन्छ ? (पढ्नको लागि एउटा वाक्य देखाउनु होस)
1.7 Can you read this message? (Show her a passage to read)

सजिलै पढ्न सक्ने
Reads with ease

गाढो सँग पढ्न सक्ने
Reads with difficulty

पढ्न नसक्ने
Cannot read

काम

Education

१.८ घर भित्रको काम बाहेक अन्य केहि काम गर्नु हुन्छ ?
1.8 Apart from housework, do you do any other work?

गर्छु
Yes

गर्दिन
No

(यदि गर्दिन भने प्रश्न नं. १.१० मा जानुहोस)
(If no, go to question no. 1.10)

१.९ तपाईंको अन्य काम के हो ?
1.9 What is your other work?

कृषि
Agriculture

ज्यालादारी
Waged labour

तलबी काम वा सरकारी काम
Domestic or government work

सानोतिनो व्यवसाय
Small business

परिवार नियोजन

Family planning

१.१० हाल तपाईं वा तपाईंको श्रीमानले परिवार नियोजनको कुनै साधन प्रयोग गर्दै हुनुहुन्छ ?
1.10 Do you or your husband make use of any sort of family planning?

छ
Yes

छैन
No

(यदि छैन भने प्रश्न नं. १.१२ मा जानुहोस)
(If no, go to question no. 1.12)

१.११ कुन साधन-भारीक अपनाउनु भएको छ ?
1.11 Which method do you use?

स्थायी
Permanent

अस्थायी
Temporary

कन्डम
Condom

मिनील्याप
Ministry

डिपो
Diaphragm

अन्य
Other

भ्यासेक्टोमी
Vasectomy

नरप्लान्ट
Hysterectomy

अन्य
Other

अन्य
Other

पिल्ला-खाने चक्री
Pill

आर्द, यु. डी.
IUD

१.१२ तपाईं कहिल्यै गर्भवति हुनु भएको थियो ?
1.12 Have you ever been pregnant?

थियो
Yes

थिएन
No

(यदि थिएन भने अन्तर्वाता रोक्नुहोस)
(If no, skip the interview)

२ प्रसूतीपूर्वको हेरचाह

7 Antenatal Care

(यो पेजका प्रश्नहरू पछिल्लो गर्भावस्थाको लागि सोध्नुहोस)
(Ask the questions on this page about the last pregnancy)

२.१ पछिल्लो गर्भावस्थामा तपाईं जचाउनु जानु भयो ? गएँ गइन (यदि गइन भने प्रश्न नं. २.८ मा जानुहोस)
2.1 In your last pregnancy, did you go for a check-up? Yes No (If no, go to question no. 2.8)

२.२ गर्भावस्थामा जचाउनु कहाँ जानु भयो ?
2.2 Where did you go for the pregnancy check-up?
 अस्पताल Hospital
 प्रा. स्वा. के. PHC
 स्वास्थ्य चौ. Health centre
 उप-स्वा. चौ. Sub health centre
 गाउँघर क्लिनिक Mobile clinic
 परिवार नियोजन क्लिनिक Family planning clinic
 प्राइभेट क्लिनिक Private clinic
 अन्य Other

२.३ को सग जचाउनु भयो ?
2.3 Who did you see for the check-up?
 डाक्टर Doctor
 अ. न. मी. ANM
 तालीम प्राप्त सुडेनी Trained TBA
 मातृ शिशु स्वास्थ्य कार्यकर्ता MCHW
 महिला स्वास्थ्य स्वयं सेविका FCHV
 अन्य Other
 नर्स Nurse
 हे. अ. नसि. अ. हे. व. अ. हे. व. नसि. ए. म. ए. HAN/ASH/ASHW/NS/CSA
 तालीम नपाएको सुडेनी Untrained TBA
 ग्रामिण स्वास्थ्य कार्यकर्ता VHW
 थाहा छैन Don't know

२.४ कति महिनाको गर्भवती हुँदा पहिलो पटक जचाउनु जानुभयो ? महिना
2.4 How many months pregnant were you when you first went for a check-up? Months

२.५ कतिपटक जचाउनु भयो ? पटक
2.5 How many times did you go? Times

२.६ पहिलो पटक जचाउदा समस्या भएर जचाउनु भएको हो कि सबैकुटा ठिक छ कि छैन भनेर जान्नको लागी मात्र जचाउनु जानु भएको हो ?
2.6 The first time that you went for a check-up, was it because there was a problem, or just to check that everything was all right?
 समस्या भएर There was a problem
 समस्या नभई There was no problem
(यदि समस्या नभएमा प्रश्न नं. २.८ मा जानुहोस)
(If there was no problem, go to question no. 2.8)

२.७ के समस्या थियो ?
2.7 What was the problem?
(एउटा मात्र विशेष समस्यामा चिन्ह लगाउनुहोस) (Mark only one problem)
 योनीबाट रगत बगेको थियो Vaginal bleeding
 पेट दुख्ने Indigestion
 टाउको दुख्ने, कमजोरी, मुर्छा पर्ने, रिरङ्गा लाग्ने Headache, weakness, faints, dizziness
 हात, खुट्टा, मुख सुन्तीने Hand, leg or face swelling
 बान्ता हुने, खाना खान मन नलाग्ने Nausea, loss of food
 योनीबाट पानी बग्ने Vaginal discharge
 पहिलो हुने Jaundice
 बच्चाको अवस्था ठिक नभएर Baby's condition abnormal
 पछिल्लो गर्भ अवस्थाका समस्याको कारण Problems in the present pregnancy
 अन्य Other

टि. टि.

२.८ तपाईंले कहिल्यै टि. टि. सूई लिनु भएको छ ? छ छैन थाहा छैन
2.8 Did you ever have a TT injection? Yes No Don't know
(यदि छैन वा थाहा छैन भने प्रश्न नं. २.१० मा जानुहोस)
(If no, go to question no. 2.10)

२.९ पछिल्लो गर्भावस्थामा कति पटक लगाउनु भयो ? टि. टि.
2.9 How many times did you have it in the last pregnancy? TT

बोबधी

२.१० पछिल्लो गर्भावस्थामा भिटामीन र आइरन चकिक खानु भयो ? खाएँ खाइन थाहा छैन
2.10 In the last pregnancy, did you take vitamin and iron tablets? Yes No Don't know
(यदि खाइन वा थाहा छैन भने प्रश्न नं. २.९ जानुहोस)
(If no, go to question no. 2.9)

२.११ कति महिना सम्म खानु भयो ? हप्ता वा महिना
2.11 How many months did you take them for? Weeks or Months

३ पछिल्लो गर्भावस्थाका समस्याहरू

Problems in the last pregnancy
(यो पेजका प्रश्नहरू पछिल्लो गर्भावस्थाको लागि सोधनुहोस)
(Ask the questions on this page about the last pregnancy)

१. रगत बग्ने समस्या

- 1 Problems in the last pregnancy
3.1 कहिल्यै रगत बग्ने समस्या भयो ? भयो भएन (यदि भएन भने प्रश्न नं. ३.५ मा जानुहोस)
(If no, go to question no. 3.5)
3.2 यो भएको कहिले हो ? बच्चा लाग्नु भन्दा अगाडी बच्चा जन्मिसके पछि
(Before the baby was born) (After the baby was born)
3.3 के रगतले तपाईंको कपडा, ओछ्यान र भुईं भिज्यो ? भिज्यो भिजेन
(Did the bleeding soak your clothes, the mattress and the floor?)
3.4 रगत बग्दा पेट पनि दुखेको थियो ? थियो थिएन
(During the bleeding, did you have stomach pain?)

२. ब्लड प्रेसर

- 2 Blood pressure
3.5 के तपाईं वेहोस-काम्ने हुनु भयो ? भएँ भइन
(Did you have any fit/convulsions?)
3.6 के तपाईंको अनुहार सुन्निएको थियो ? थियो थिएन
(Was your face swollen?)
3.7 के तपाईंको खुट्टा सुन्निएको थियो ? थियो थिएन
(Were your legs swollen?)
3.8 के आँखा तिमिराउने भएको थियो ? थियो थिएन
(Did you have blurred vision?)
3.9 तपाईंले ब्लड प्रेसर नाप्नु भएको थियो ? थियो थिएन थाहा छैन
(Did you have your blood pressure measured?) (If no or don't know, go to question no. 3.11)
3.10 तपाईंलाई थाहा छ तपाईंको ब्लड प्रेसर कस्तो थियो ? कम ठिकै बढि थाहा छैन
(Do you know how your blood pressure was?) (Low) (Normal) (High) (Don't know)

३. ज्वरो

- 3 Fever
3.11 तपाईंलाई २४ घण्टा भन्दा बढि लगातार धेरै ज्वरो आएको थियो ? आयो आएन
(Did you have a fever continuously for over 24 hours?) (If no, go to question no. 3.14)
3.12 ज्वरो कहिले आएको थियो ? बच्चा जन्मनु भन्दा अगाडी बच्चा जन्मिसके पछि
(When did you have the fever?) (Before the baby was born) (After the baby was born)
3.13 कति दिन सम्म आयो ? दिन वा महिना
(How long did the fever last?) (Days) (or) (Months)

४. गन्हाउने पानी

- 4 Vaginal discharge
3.14 चौबिस घण्टा भन्दा बढि गन्हाउने पानी बग्यो ? बग्यो बगेन
(Did you have a vaginal discharge for over 24 hours?) (If no, go to question no. 3.17)
3.15 गन्हाउने पानी कहिले बगेको थियो ? बच्चा जन्मनु भन्दा अगाडी बच्चा जन्मिसके पछि
(When did you have the discharge?) (Before the baby was born) (After the baby was born)
3.16 कति दिन सम्म बग्यो ? दिन वा महिना
(How long did the discharge last?) (Days) (or) (Months)

५. रक्तअल्पता

- 5 Anaemia
3.17 घरको काम गर्दा तपाईंलाई बढि स्यां स्यां भएको थियो ? थियो थिएन
(Were you breathless when you did the housework?)
3.18 के तपाईं सेतो (रगतको कमि) हुनु भएको थियो ? थियो थिएन थाहा छैन
(Did you look pale (bloodless)?)
3.19 तपाईंलाई रातको समयमा हेर्नलाई कठिनाई भएको थियो ? थियो थिएन थाहा छैन
(Did you have trouble seeing at night?)

४ स्वास्थ्य उपचार Treatment

(पछिल्लो गर्भावस्था मध्ये कुनै पनि समस्या भएमा पछिल्लो समस्याको लागि तलका प्रश्नहरू सोच्नुहोस्)
(If there were any problems during the last pregnancy, ask the questions below about the last of them)
(यदि बिरामी गर्भमा प्रश्न नं. ४.१ मा जानुहोस्)
(If you had no illness, go on question 5.1)

धामी Disease

४.१ तपाईं वा तपाईंको परिवारले, बिरामी उपचार गर्नलाई धामी कहाँ जानु भयो ? गर्रै गइन
4.1 Did you or your family go to the Dhami for any treatment when you were ill? Yes No

स्वास्थ्य संस्था Health service

४.२ तपाईं वा तपाईंको परिवारले, बिरामी उपचार गर्नलाई स्वास्थ्य संस्थामा जानु भयो ? गर्रै गइन
4.2 Did you go to the health service for any treatment? Yes No
(यदि गर्रै भने प्रश्न नं. ४.७ जानुहोस्)
(If no, go to question 4.7)

४.३ कहाँ जचाउन जानु भएको थियो ?

4.3 Where did you go for the consultation?
 अस्पताल प्रा. स्ना. के. स्वा. चौ.
 उप-स्वा. चौ. गाउँघर क्लिनिक परिवार नियोजन क्लिनिक
 प्राइभेट क्लिनिक औषधी पसल अन्य

४.४ तपाईंले को सँग उपचार गराउनु भयो ?

4.4 Who did you get treatment from?
 डाक्टर नर्स अ. न. गी.
 हे. अ. + सि. अ. हे. व. + अ. हे. व. + सि. एम. ए. तालीम प्राप्त सुडेनी तालीम नपाएको सुडेनी
 मातृ शिक्षा स्वास्थ्य कार्यकर्ता ग्रामिण स्वास्थ्य कार्यकर्ता महिला स्वास्थ्य स्वयं सेवीका
 औषधी पसले धाहा छैन अन्य

४.५ कसरी त्यहाँ (पुगाइयो) पुगनु भयो ?

4.5 How did you get there?
 हिंडेर बोकेर गाडा/मा एम्बुलेन्स गाडी + टेम्पो + बस + रिक्सा
 वाहक कार अम्बुलेन्स कार्तेपोर/टिक्सा

४.६ बिरामी भएको कति समयपछि तपाईं त्यहाँ पुगनु भयो ? घण्टा पछि वा दिन पछि
4.6 How long after you became ill did you arrive there? Hours or Days after

उपचार Treatment

४.७ तपाईं बिरामी हुँदा कुनै प्रकारको उपचार लिनु भयो ? लिए लिइन लिएन भने प्रश्न नं. ५.१ मा जानुहोस्)
4.7 When you were ill did you take any sort of medicine? Yes No (If no, go to question no. 5.1)

४.८ के लिनु भयो ? औषधि घरेलु औषधि उपचार औषधि र घरेलु औषधि उपचार
4.8 What did you take? Allopathic medicine Traditional medicine Allopathic and traditional medicine
 अन्य

४.९ बिरामी भएको कति समय पछि उपचार पाउनु भयो ? घण्टा पछि वा दिन पछि वा हप्ता पछि
4.9 How long after you became ill did you take the medicine? Hours after or Days after or Weeks after

५ पछिल्लो गर्भावस्थाहरू Previous pregnancies

गर्भ खेर गएको Miscarriage

५.१ तपाईंको सात महीना भन्दा अगाडीको कुनै गर्भ खेर गएको थियो ? थियो थिएन
5.1 Have you ever had a miscarriage before 7 months of pregnancy? Yes No
(यदि थिएन भने प्रश्न नं. ५.३ मा जानुहोस्)
(If no, go to question no. 5.3)

५.२ कति पटक खेर गयो ? पटक
5.2 How many times have you had a miscarriage? Times

मरेको बच्चा Stillborn

५.३ तपाईंले जन्मनु भन्दा अगाडि नै मरेको बच्चा जन्माउनु भएको छ ? छ छैन
5.3 Have you ever given birth to a baby who had died before being born? Yes No
(यदि छैन भने प्रश्न नं. ५.५ मा जानुहोस्)
(If no, go to question no. 5.5)

५.४ यस्तो कति पटक भयो ? पटक
5.4 How many times has this happened? Times

जिवित बच्चा Living baby

५.५ तपाईंले जिवित बच्चा पाउनु भएको छ ? छ छैन
5.5 Have you ever given birth to a living baby? Yes No
(यदि जन्माएको छैन भने र प्रश्न नं. ५.३ मा पनि छैन भने अन्तर्वार्ता रोक्नुहोस्)
(If no, and if the answer to question no. 5.3 is also no, stop the interview)

६ सूक्तकेरी

Answers

- ६.१) यदि विजयें जन्मको बच्चा छ भने गर्भका प्रसवदर पछिल्लो विजयो बच्चाको लागि सोझो(स) / यदि विजयें जन्मको बच्चा छ भने गर्भका प्रसवदर पछिल्लो जन्मनु भन्दा अगाडि नै गरेको बच्चाको लागि सोझो(स)
- ६.२) तपाईंलाई कति समय सम्म व्यथा लाग्यो ? घण्टा सम्म वा दिन सम्म
- ६.३) के पानी धेरै गन्गाउने थियो ? धियो धिएन धाला छैन धियो धिएन धाला छैन
- ६.४) पानी कस्तो रंगको थियो ? सफा बैरो अन्य धाला छैन
- ६.५) सबभन्दा पहिला बच्चाको गुन अंग बाहिर निकियो ? पाङ्खुटा वा खुट्टा नाइटीको भाग धाला छैन
- ६.६) बच्चा कसरी बाहिर निकियो भन्नेको बारेमा कसरी थियो ? उल्टो टाउको टाउको टाउको
- ६.७) व्यथा लाग्दा भन्दा अगाडि बच्चा व्यथा लाग्दा कुनै औषधि प्रयोग गरिएको थियो ? थियो थिएन थियो थिएन
- ६.८) व्यथा लाग्दा अथवा व्यथा लाग्न भन्दा अगाडी कुनै घरतु औषधिले प्रयोग गरिएको थियो ? थियो थिएन थियो थिएन

७ नवजात शिशु स्वास्थ्य

Answers

- ७.१) यदि विजयें जन्मको बच्चा गर्भ प्रसवदर पछिल्लो जन्मनु भन्दा अगाडि नै गरेको बच्चाको लागि सोझो(स) / यदि विजयें जन्मको बच्चा गर्भ प्रसवदर पछिल्लो जन्मनु भन्दा अगाडि नै गरेको बच्चाको लागि सोझो(स)
- ७.२) तपाईंले बच्चा कहाँ जन्माउनु भयो ? घरमा गोटमा सेराभारी-जंगल अंगान, पिछि छत अरुतल
- ७.३) सूक्तकेरी हुँदा कस्तो सहयोग गर्नुभयो ? प्राइमेट किनिक अन्य नर्स अ. न. मी. तालीम नपाएको सुडेनी माइला स्वास्थ्य स्वयंसेविका परिवारका सदस्य सिस्केन्सारी
- ७.४) सहयोग गर्ने मानिसले हात धोएको थियो ? थियो थिएन धाला छैन
- ७.५) यो के हो ? विन्नु हुन्छ ? (सूक्तकेरी सामग्री देखाउने) विन्नु बिन्दन यदि विन्नेन भने प्रश्न नं. ७.७ मा जानुहोस।
- ७.६) सूक्तकेरी सामग्री प्रयोग गर्नु भयो ? गरे गरिन
- ७.७) बच्चा जन्मको कति समय पछि शाल भन्नुभयो ? १ घण्टा देखि ६ घण्टा सम्म १ घण्टा देखि ६ घण्टा सम्म १ घण्टा देखि ६ घण्टा सम्म
- ७.८) के साल एकचोटि निकियो कि टुक्रा टुक्रा भाएर निकियो ? जम्मै टुक्रा टुक्रा धाला छैन

नवभारत विद्या स्थापना

७९. नाल के ले काटनु भयो ?

- उमालको पतीले नउमालको पतीले चक्कु-सुरीले-कीच हसिया-सूपा बाँसले
 धारा छैन अरु पानी नदी

७१०. नाभी कति सके पछि के नगाउनु भयो?

- पुन केसर नगीएको कपडा वा कपास पोएको कपडा वा कपास
 शीथि-डेढेल पाउडर माटो नेत्रि नराबेको नेत्रि नराबेको

७११. बच्चालाई कस्तो कपडाले बेरिएको थियो?

- धाँदा छैन धाँदा नया कपडा पुरानो कपडा धारा छैन
 नया कपडा थियो थियो थियो थियो

७१३. बच्चा जन्मिएको कति बेर पछि बच्चालाई कपडाले बेरिएको थियो?

- मिनेट पछि वा घण्टा पछि घण्टा पछि वा दिन पछि
 मिनेट पछि वा घण्टा पछि घण्टा पछि वा दिन पछि

७१५. बच्चालाई पहिलो पटक के खान दिइयो?

- आमाको दुध अरु आमाको दुध गाई-शैसिको दुध ल्याक्टोजेन दुध खाना
 घ्यू घ्यू र चिनी घ्यू र गाँ चिनी चिनी शेर
 गुँल पात्रो छैन अरु अरु

७१६. बच्चा जन्मसकेपछि माइती जानुभयो ?

- गाँ गाइन गाँ गाइन
 पछिलो तराई १ हप्ता देखि १ महिना भित्र १ महिना पछि

७१८. कति समयसम्म त्नाई बनु भयो ?

- १ हप्ता सम्म १ हप्ता देखि १ महिना सम्म १ महिना भन्दा बढी
 १ हप्ता सम्म १ हप्ता देखि १ महिना सम्म १ महिना भन्दा बढी

८. आमाको दुध

८.१. तपाईंले आफ्नो बच्चालाई दूध खुवाउनु भयो?

- छुवाएँ खुवाइन
 भिनेट पछि वा घण्टा पछि वा दिन पछि
 भिनेट पछि वा घण्टा पछि वा दिन पछि

८.३. बच्चालाई पहिलो पटक दूध खुवाउनु भन्दा अगाडी दूध निकारेर फाल्नु भयो?

- फालेँ फालिन
 फालेँ फालिन

८.४. फलक पटक दूध खुवाउदा दूध निकारेर फाल्नु हुन्छ ?

- फाल्नु फालिन
 फाल्नु फालिन

८.७. कति तरा देखि बच्चालाई पानी खुवाउन थुरु गर्नु भयो ?

- १ २ ३ ४ ५
 १ २ ३ ४ ५

८.८. कति तरा पछि बच्चालाई पानी बाहेक अन्य फोसिलो खानेकुरा दिनु भयो ?

- १ २ ३ ४ ५
 १ २ ३ ४ ५

८.९. तपाईंले कति तरा पछि बच्चालाई अन्य ठोस खानेकुरा दिनु भयो ?

- १ २ ३ ४ ५
 १ २ ३ ४ ५

८.१०. बच्चालाई बोतलबाट केहि खानेकुरा खुवाइएको थियो ?

- थियो थियो
 थियो थियो

९ बिगतको जन्महरु

Previous birth

अब म तपाईं सँगै या अलगगै बस्ने बच्चाको बारेमा प्रश्न सोध्न जाँदछु ।

Now I am going to ask you some questions about your various children

छोरा

Sons

९.१ तपाईंले जन्माएका छोराहरु मध्ये अहिले तपाईंसँगै कति जना छन् ?
8.1 How many of your sons are now living with you?
(यदि बच्चा सँगै छैन भने कोष्ठ भित्र '००' लेख्नुहोस्) (If none, write '00' in the boxes)

छोराहरु घरमा छन्
Sons at home

९.२ आफूले पाएका (जन्माएका) छोराहरु मध्ये कतिजना अन्यत्रै बस्छन् ?
8.2 How many of your sons are now living elsewhere?
(यदि बच्चा अन्यत्रै बस्दैन भने कोष्ठ भित्र '००' लेख्नुहोस्) (If none, write '00' in the boxes)

छोराहरु अन्यत्र छन्
Sons elsewhere

९.३ त्यसो हो भने तपाईंका जम्मा जिवित छोराहरु छन्
8.3 That means that you have altogether... Living sons

छोरी

Daughters

९.४ तपाईंले जन्माएका छोरीहरु मध्ये कति जना अहिले तपाईंसँग घरमा छन् ?
9.4 How many of your daughters are now living with you?
(यदि बच्चा सँगै छैन भने कोष्ठ भित्र '००' लेख्नुहोस्) (If none, write '00' in the boxes)

छोरीहरु घरमा छन्
Daughters at home

९.५ तपाईंले जन्माएका छोरीहरु मध्ये कति जना अन्यत्रै बस्छन् ?
9.5 How many of your daughters are now living elsewhere?
(यदि बच्चा अन्यत्रै बस्दैन भने कोष्ठ भित्र '००' लेख्नुहोस्) (If none, write '00' in the boxes)

छोरीहरु अन्यत्र छन्
Daughters elsewhere

९.६ त्यसो हो भने तपाईंका जम्मा जिवित छोरीहरु छन्
9.6 That means that you have altogether... Living daughters

कहिलेकाही बच्चाहरु जन्मेर अलिकता चन्डन र मर्दछन् । जस्तै बच्चाले पाखुरा वा खुट्टा चलाउन सक्छ अथवा एकछिन सास फेरेको देख्न सक्नु हुन्छ । कहिलेकाही बच्चाहरु केहि घण्टा या केहि दिन बाँचेर मर्दछन् ।

छोरा

Sons

९.७ कति जना तपाईंका छोराहरु जन्मिएको सात दिन भित्र मरे ?
9.7 How many of your sons died within 7 days of birth?
(यदि बच्चा मरेको छैन भने कोष्ठ भित्र '००' लेख्नुहोस्) (If none, write '00' in the boxes)

छोराहरु
Sons

९.८ तपाईंका कति जना छोराहरु जन्मिएको एक हप्ता पछि मरे ?
9.8 How many of your sons died over a week after birth?
(यदि बच्चा मरेको छैन भने कोष्ठ भित्र '००' लेख्नुहोस्) (If none, write '00' in the boxes)

छोराहरु
Sons

९.९ यसको अर्थ तपाईंका जम्मा छोराहरु मरे
9.9 That means that you have altogether... Sons who died

छोरी

Daughters

९.१० कति जना तपाईंका छोरीहरु जन्मिएको सात दिन भित्र मरे ?
9.10 How many of your daughters died within 7 days of birth?
(यदि बच्चा मरेको छैन भने कोष्ठ भित्र '००' लेख्नुहोस्) (If none, write '00' in the boxes)

छोरीहरु
Daughters

९.११ तपाईंका कति जना छोरीहरु जन्मिएको एक हप्ता पछि मरे ?
9.11 How many of your daughters died over a week after birth?
(यदि बच्चा मरेको छैन भने कोष्ठ भित्र '००' लेख्नुहोस्) (If none, write '00' in the boxes)

छोरीहरु
Daughters

९.१२ यसको अर्थ तपाईंका जम्मा छोरीहरु मरे
9.12 That means that you have altogether... Daughters who died

१० विगतका बच्चाहरुको विस्तृत विवरण

10 Details of approved living
तपाईं आफ्नो पछिल्लो प्रसूती देखि शुरु गरेर जिवित जन्मेका सबै छोरा र छोरी (कोही अहिले मरिसकेका भएपनि)
Starting from your last delivery, can you tell me about all the boys and girls who have been born since then (if any have now died)

का वारेमा बताउन सक्नु हुन्छ ?

महिलाको अर्को बच्चा देखि शुरु गर्नुहोस् र प्रश्न सोध्नुहोस् । प्रत्येक बच्चाको लागि निम्न विधि अपनाउनु होस्

पछिल्लो बच्चा

10.1 अर्को बच्चाको नाम
Name of baby

10.2 जन्माएको गते, महिना र साल
Day, month and year of birth

10.3 लिंग
Sex
 पुरुष Male
 महिला Female

10.4 बच्चा जन्म्याहा मध्ये एक थियो ?
Was the baby one of twins?
 थियो Yes
 छ No

10.5 बच्चा अहिले जिवित छ ?
Is the baby now alive?
 गते Day
 महिना Month
 साल Year

10.6 कुन मितिमा मरेको हो ?
When was the child dead?
 गते Day
 महिना Month
 साल Year

(यदि बच्चा जिवित छ भने प्रश्न नं. १०.७ मा जानुहोस्)
(If the baby is alive, go to question no. 10.7)

अर्को बच्चा

10.7 बच्चाको नाम
Name of baby

10.8 जन्माएको गते, महिना र साल
Day, month and year of birth

10.9 लिंग
Sex
 पुरुष Male
 महिला Female

10.10 बच्चा जन्म्याहा मध्ये एक थियो ?
Was the baby one of twins?
 थियो Yes
 छ No

10.11 बच्चा अहिले जिवित छ ?
Is the baby now alive?
 गते Day
 महिना Month
 साल Year

10.12 कुन मितिमा मरेको हो ?
When was the child dead?
 गते Day
 महिना Month
 साल Year

(यदि बच्चा जिवित छ भने प्रश्न नं. १०.१३ मा जानुहोस्)
(If the baby is alive, go to question no. 10.13)

अर्को बच्चा

10.13 बच्चाको नाम
Name of baby

10.14 जन्माएको गते, महिना र साल
Day, month and year of birth

10.15 लिंग
Sex
 पुरुष Male
 महिला Female

10.16 बच्चा जन्म्याहा मध्ये एक थियो ?
Was the baby one of twins?
 थियो Yes
 छ No

10.17 बच्चा अहिले जिवित छ ?
Is the baby now alive?
 गते Day
 महिना Month
 साल Year

10.18 कुन मितिमा मरेको हो ?
When was the child dead?
 गते Day
 महिना Month
 साल Year

(यदि बच्चा जिवित छ भने प्रश्न नं. १०.१९ मा जानुहोस्)
(If the baby is alive, go to question no. 10.19)

अर्को बच्चा

10.19 बच्चाको नाम
Name of baby

10.20 जन्माएको गते, महिना र साल
Day, month and year of birth

10.21 लिंग
Sex
 पुरुष Male
 महिला Female

10.22 बच्चा जन्म्याहा मध्ये एक थियो ?
Was the baby one of twins?
 थियो Yes
 छ No

10.23 बच्चा अहिले जिवित छ ?
Is the baby now alive?
 गते Day
 महिना Month
 साल Year

10.24 कुन मितिमा मरेको हो ?
When was the child dead?
 गते Day
 महिना Month
 साल Year

(यदि बच्चा जिवित छ भने अन्ततर्फा रोक्नुहोस्)
(If the baby is alive, stop the interview)

Annex F . Pregnancy questionnaire

मिरा मकवानपुर

मातृ तथा नवजात शिशु स्वास्थ्य कार्यक्रम

गर्भवती प्रश्नावली

Pregnancy questionnaire

घरघुरी परिचय

Household ID no.

गा. वि. स. नं.

VDC no.

वडा नं.

Ward no.

टोल
Tel

क्षेत्र नम्बर

घरघुरी संख्या

Household no.

अन्तर्वार्ता लिएको मिति

Interview date

गते

महिना

साल

अन्तर्वार्ता लिनेको परिचय संख्या

Interviewer no.

MWRA को नाम

MWRA name

MWRA को परिचय संख्या

MWRA ID no.

१ शुरु गर्भावस्थाका बिरामहरू

1 Starts in early pregnancy

रगत बग्ने समस्या

Bleeding problems

१.१ तपाईंको रगत बग्ने समस्या छ ?

1.1 Have you had a bleeding problem?

 धियो

 धिएन

(यदि धिएन भने प्रश्न नं. १.४ मा जानुहोस)

(If no, go to question no. 1.4)

१.२ तपाईंको लुगा, ओछ्यान र भुइँ पनि भिजायो ?

1.2 Did the bleeding soak your clothes, the mattress and the floor?

 भिजायो

 भिजाएन

१.३ तपाईंलाई पेट पनि दुब्लेको थियो ?

1.3 Did you also have stomach pain?

 धियो

 धिएन

ज्वरो

१.४ तपाईंलाई २४ घण्टा भन्दा बढि लगातार धेरै ज्वरो आएको थियो ?

1.4 Have you had a fever for longer than 24 hours?

 धियो

 धिएन

(यदि धिएन भने प्रश्न नं. १.६ मा जानुहोस)

(If no, go to question no. 1.6)

१.५ कति दिनसम्म त्यस्तो ज्वरो आयो ?

1.5 For how many days did the fever last?

दिन

Days

गन्दाउने पानी

Foul vaginal discharge

१.६ गन्दाउने पानी आएको थियो ?

1.6 Have you had a foul vaginal discharge?

 धियो

 धिएन

(यदि धिएन भने प्रश्न नं. १.८ मा जानुहोस)

(If no, go to question no. 1.8)

१.७ कति दिन सम्म आयो ?

1.7 How long did it last?

दिन

Days

१.८ तपाईंको अन्य कुनै समस्या वा दुर्घटना भएको थियो ?

1.8 Have you had any other problem or accident?

 धियो

 धिएन

(यदि धिएन भने अन्तर्वार्ता रोक्नुहोस)

(If no, stop the interview)

१.९ वर्णन

1.9 Describe

.....
.....
.....
.....
.....

Annex G. Maternity questionnaire

मिरा मकवानपुर मातृ तथा नवजात शिशु स्याहार कार्यक्रम

प्रसूति

Maternity questionnaire

घरघुरी परिचय

Household ID no.

गा. वि. स. नं.

VDC no.

वडा नं.

Ward no.

टोल

Toll

क्षेत्र नम्बर

Sector no.

घरघुरी संख्या

Household no.

अन्तर्वार्ता लिएको मिति

Interview date

गते

day

महिना

month

साल

year

अन्तर्वार्ता लिनेको परिचय संख्या

Interviewer no.

MWRA को नाम

MWRA name

MWRA को परिचय संख्या

MWRA ID no.

१ प्रसूतीपूर्वको हेरचाह

Antenatal care

MWRA को तौल

MWRA weight

Kg

१.१ यो गर्भावस्थामा तपाईं जचाउन जान्नु भयो ?

1.1 Did you go for a check-up during the pregnancy?

गर्

Yes

गइन

No

(यदि गइन भने प्रश्न नं. १.८ मा जानुहोला)

(If no, go to question no. 1.8)

१.२ गर्भावस्थामा जचाउन कहाँ जान्नु भयो ?

1.2 Where did you go for the check-up?

अस्पताल

Hospital

प्रा. स्वा. के.

PHC

स्वा. चौ.

NC

उप रवा. चौ.

UP

गाउँघर क्लिनिक

Health clinic

परिवार नियोजन क्लिनिक

Family planning clinic

प्राइभेट क्लिनिक

Private clinic

अन्य

Other

१.३ को संग जचाउनु भयो ?

1.3 Who did you see for the check-up?

डाक्टर

Doctor

नर्स

Nurse

अ. न. मी.

ANG

हे. अ. भसि. अ. हे. व. + अ. हे. व. + सि. एम. ए.

HA/BA/BS/VA/BC/CA/EM/MA

तालीम प्राप्त रुडेनी

Trained TB

तालीम नपाएको रुडेनी

Untrained TB

मातृ शिशु स्वास्थ्य कार्यकर्ता

MCHW

ग्रामिण स्वास्थ्य कार्यकर्ता

VHW

महिला स्वास्थ्य स्वयं सेवीका

FCHV

थाहा छैन

Don't know

अन्य

Other

१.४ कति महिनाको गर्भवती हुँदा पहिलो पटक जचाउन जान्नुभयो ?

1.4 How many months pregnant were you when you first went for a check-up?

महिना

Months

१.५ कतिपटक जचाउनु भयो ?

1.5 How many times did you go for a check-up?

पटक

Times

१.६ पहिलो पटक किन जचाउन जान्नु भयो ?

1.6 Why did you go for a check-up the first time?

समस्या भए

For a problem

सबै कुरा ठिक छ कि छैन भनेर

Just for a check-up

(यदि समस्या नभएमा प्रश्न नं. १.७ मा जानुहोला)

(If no problem, go to question no. 1.7)

१.७ के समस्या थियो ?

1.7 What was the problem?

योनीबाट रगत बगेको थियो

Vaginal bleeding

योनीबाट पानी बग्ने

Vaginal discharge

पेट दुख्ने

Stomach pain

पहेंलो हुने

Jaundice

टाउको दुख्ने, कमजोरी, मुर्छा पने, रिङ्गटा लाग्ने

Headache, weakness, fainting, dizziness

बच्चाको अवस्था ठिक नभएर

Baby's condition abnormal

हात, खुट्टा, मुख सुन्तीने

Swollen hand, feet, or face

पहिल्लो गर्भ अबस्थाका समस्याको कारण

Problems in the previous pregnancy

बान्ता हुने, खाना खान मन नलाग्ने

Malnourished or not eating

अन्य

Other

टि. टि.

१.८ तपाईंले यरा गर्भावस्थामा टि. टि. रूई लिनु भएको छ ?

छ छैन थाहा छैन

(यदि छैन वा थाहा छैन भने प्रश्न नं. १.१० मा जानुहोस)

१.९ यस गर्भावस्थामा कति पटक लगाउनु भयो ?

टि. टि.

औषधी

१.१० यस गर्भावस्थामा मिटामीन र आइरन चकिक खानु भयो ?

खाए खाइन थाहा छैन

(यदि खाइन वा थाहा छैन भने प्रश्न नं. २.१ मा जानुहोस)

१.११ कति समय सम्म खानु भयो ?

हप्ता वा महिना

२ गर्भावस्थाका समस्या

प्रसव हुन भन्दा ७ दिन अगाडि

२.१ रगत बगेको थियो ?

थियो थिएन (यदि थिएन भने प्रश्न नं. २.६ जानुहोस)

२.२ रगतले लगा, ओछ्यान वा जमिन भिजेको थियो ?

थियो थिएन

२.३ तपाईंको पेट पनि दुखेको थियो ?

थियो थिएन

२.४ रगत बगेको बेला योनी जाँच गराउनु भएको थियो ?

थियो थिएन (यदि थिएन भने प्रश्न नं. २.६ जानुहोस)

२.५ योनी जाँच गरे पछि रगत ज्यादा बगेको थियो ?

थियो थिएन

२.६ तपाईंलाई कम्पनहरु आएको थियो ?

थियो थिएन

२.७ तपाईंलाई आधा दिन भन्दा बढी नराप्रोसंग कपाल दुखेको थियो ?

थियो थिएन

२.८ तपाईंको अनुहार सुन्निएको थियो ?

थियो थिएन

२.९ तपाईंको खुट्टाहरु सुन्निएको थियो ?

थियो थिएन

२.१० तपाईंको आँखा धमिलो भएको थियो ?

थियो थिएन

२.११ तपाईंले आफ्नो ब्लड प्रेसर जचाउनु भएको थियो ?

थियो थिएन (यदि थिएन भने प्रश्न नं. २.१३ जानुहोस)

२.१२ तपाईंलाई थाहा छ तपाईंको ब्लड प्रेसर कस्तो थियो ?

कम ठिक बढी थाहा छैन

२.१३ तपाईंलाई २४ घण्टा भन्दा बढी लगातार घेरै ज्वरो आएको थियो ?

थियो थिएन

२.१४ पिसाव पोलेको थियो ?

थियो थिएन

२.१५ २४ घण्टा भन्दा बढी गन्हाउने पानी बगेको थियो ?

थियो थिएन

२.१६ दैनिक घरायसी कार्य गर्दा तपाईंलाई स्याँ स्याँ हुने गरेको थियो ?

थियो थिएन

२.१७ तपाईं फुसो देखिनु भएको थियो ?

थियो थिएन थाहा छैन

२.१८ मैले सोधेका सबै कुराहरु बाहेक, तपाईं गर्भवती हुँदा कुनै सिकिस्त बिरामी वा दुर्घटनामा पर्नु भएको थियो ?

थियो थिएन (यदि थिएन भने प्रश्न नं. ३.१ जानुहोस)

२.१९ बर्णन

३ सुत्केरी

- ३.१ कति समय प्रसव व्याधा लागेको थियो ?
How long did your labour last?
 घण्टा hour वा दिन day
- ३.२ बच्चा जन्मनु भन्दा २४ घण्टा अगाडि सानो सुतक भएको थियो ?
Did the labour start (more than 24 hours before the baby was born)?
 थियो Yes भिएन No थाहा छैन Don't know
- ३.३ पानी गन्दाउने थियो ?
When the waters came?
 भियो Yes भिएन No थाहा छैन Don't know
- ३.४ पानीको रङ्ग कस्तो थियो ?
What colour were the waters?
 सफा Clear बैरो Dark blue थाहा छैन Don't know
- ३.५ सव भन्दा पहिला बच्चाको कुनचाँही अंग बाहिर निस्कीयो ?
When? Start of the labour came out first?
 टाउको Head चाक Shoulder हात-खुट्टा Hand/feet नाल Clot थाहा छैन Don't know
- ३.६ बच्चा कसरी बाहिर निस्कीयो-निकासियो ?
How was the baby delivered?
 आफै Child born हातले Manually औजार प्रयोग गरेर Operatively थियो Yes भियो No थाहा छैन Don't know
- ३.७ व्याधा लागेको बेला वा व्याधा लाग्नु भन्दा अगाडि कुनै औषधी बानु भएको थियो ?
Did you take any sort of medicine before or during the labour?
 थाहा छैन Don't know थियो Yes भियो No थाहा छैन Don't know
- ३.८ व्याधा लागेको बेला वा व्याधा लाग्नु भन्दा अगाडि कुनै बरलु औषधी बानु भएका थियो ?
Did you take any and/or traditional remedy before or during the labour?
 थाहा छैन Don't know थियो Yes भियो No थाहा छैन Don't know

४ प्रसवको बेलामा विरामी भएको

- ४.१ क्या सुत्केरीको बेला रात बगेको थियो ?
Was your labour during the night?
 थियो Yes भियो No थाहा छैन Don't know
- ४.२ रातले लगा, ओछ्यान वा जमिन भिजेको थियो ?
Did the blood soil your clothes, the mattress or the floor?
 थियो Yes भियो No थाहा छैन Don't know
- ४.३ रात बगेको बेलामा पेट दुबेको थियो ?
Did your abdomen hurt during the labour?
 थियो Yes भियो No थाहा छैन Don't know
- ४.४ रात बगेको बेलामा योनी जाँच गरेको थियो ?
Did you have a vaginal examination during the labour?
 थियो Yes भियो No थाहा छैन Don't know
- ४.५ योनी जाँच गरे पछि रात ज्यादा बगेको थियो ?
Did the labour progress faster or slower after?
 थियो Yes भियो No थाहा छैन Don't know
- ४.६ तपस्लाई कमतरह आएको थियो ?
Did you sweat a lot?
 थियो Yes भियो No थाहा छैन Don't know
- ४.७ व्याधा लाग्नु भन्दा ३ दिन अगाडि धेरै ज्वरो आएको थियो ?
Is the fever days before the labour did you have a high fever?
 थियो Yes भियो No थाहा छैन Don't know
- ४.८ व्याधा लाग्नु भन्दा ३ दिन अगाडि गन्दाउने पानी बगेको थियो ?
Is the time days before the labour did you have a vaginal discharge?
 थियो Yes भियो No थाहा छैन Don't know
- ४.९ बच्चा पाईसकेपछि रात बगेको थियो ?
After the baby was born, did you have vaginal bleeding?
 थियो Yes भियो No थाहा छैन Don't know
- ४.१० रातले सुगा, ओछ्यान वा जमिन भिजेको थियो ?
Did you stain your clothes, the mattress or the floor?
 थियो Yes भियो No थाहा छैन Don't know
- ४.११ बच्चा जन्मेको कति समय पछि साल भन्थ्यो ?
How long after the baby was born did the placenta come out?
 ३० मिनेट भित्र Within 30 minutes ३० मिनेट देखि १ घण्टा सम्म Between 30 minutes to 1 hour १ घण्टा देखि ६ घण्टा सम्म Between 1 to 6 hours १२ घण्टा देखि २४ घण्टा सम्म Between 12 to 24 hours
- ४.१२ के साल पूरै निस्केको थियो कि टुक्रा टुक्रा निस्केको थियो ?
Did the placenta come out whole or in pieces?
 पूरै Whole टुक्रा टुक्रा In pieces थाहा छैन Don't know
- ४.१३ मैले सोधेका सबै कुराहरु वाहेक, प्रसवको समयमा केहि गभरी समस्या भएको थियो ?
Apart from the questions that I have asked, did you have any other problems in the labour?
 थियो Yes भियो No थाहा छैन Don't know

४.१४ वर्णन
4.14 P.S. No.

५ बच्चा पाइसकेपछिको विरामी

How old the child is

५.१ २४ घण्टा भन्दा बढी लगातार धेरै ज्वरो आएको थियो ?

थियो थिएन

(If No, go to question no. 3.9) यदि थिएन भने प्रश्न नं. ५.३ मा जानुहोस्।

५.२ कति दिन सम्म आएको थियो ?

दिन

(If No, go to question no. 3.9)

५.३ २४ घण्टा भन्दा बढी गास्डाउने पानी नरोक्ने थियो ?

थियो थिएन

(If No, go to question no. 3.9)

५.४ कति दिन सम्म बगेको थियो ?

दिन

५.५ दैनिक घासपानी कार्य गर्दा तपाईंलाई साम फेर्न गाढो भएको थियो ?

थियो थिएन

५.६ तपाईं फर्सी देखिनु भएको थियो ?

थियो थिएन

५.७ तपाईंलाई रातको समयमा हेर्नलाई कठिनाई भएको थियो ?

थियो थिएन

५.८ मैले सोधेका सबै कुराहरू चाहेक, तपाईं गर्भवती भएको बेलामा धेरै विरामी वा दुर्घटनामा पर्नु भएको थियो ?

थियो थिएन

५.९ वर्णन

(If No, go to question no. 3.9)

६ स्वास्थ्य उपचार

Health service

(If the professional were hired in the above situation, ask the following questions about the level of service)

(यदि छैन भने अन्तर्वार्ता रोक्नुहोस्)

६.१ तपाईं विरामी उपचार गर्नलाई ग्रामी कहां जानु भयो ?

गाँ गाडन

स्वास्थ्य सेवा

Health service

६.२ तपाईं विरामी उपचार गर्नलाई स्वास्थ्य सस्था मा जानु भयो ?

(यदि जानुभएन भने प्रश्न नं. ६.७ जानुहोस्)

६.३ कहां जानाउन जानु भएको थियो ?

(यदि जानुभएन भने प्रश्न नं. ६.७ जानुहोस्)

अस्पताल

प्रा. स्वा. के.

उप-स्वा. चौ.

गाउँघर किमिक

प्राइभेट क्लिनिक

औषधी पसल

डाक्टर

नर्स

हे.अ. नर्स अ.हे.ब.न.अ.हे.ब.न.सि एम.ए.

तारीम प्राप्त सुडेनी

मान शिशु स्वास्थ्य कार्यकर्ता

ग्रामीण स्वास्थ्य कार्यकर्ता

औषधी पसल

धाहा, छैन

६.४ कसरी त्यहाँ (पुराइया) पुगनु भयो ?

गाडामा

एम्बुलेन्स

हिंडर

गाडामा

गाडी+टैम्पो+बस+रिक्सा

६.६ विरामी भएको कति समयपछि तपाईं त्यहाँ पुगनु भयो ?

घण्टा पछि

दिन पछि

६.७ तपाईं विरामी हुँदा कुनै प्रकारको उपचार लिनु भयो ? लिए लिइन (यदि लिइन भने अन्तर्वार्ता रोक्नुहोस्)

६.८ के लिनु भयो ? औषधि घरेलु औषधि उपचार औषधि र घरेलु औषधि उपचार

६.९ विरामी भएका कति समय पछि उपचार पाउनु भयो ? घण्टा पछि वा दिन पछि वा हप्ता पछि

Annex H. Infant questionnaire

मिरा मकवानपुर

मातृ तथा नवजात शिशु स्याहार कार्यक्रम

१ महिनाको शिशु

घरधुरी परिचय

Infant 1 month questionnaire

गा. वि. स. न.

वडा नं.

टोल

क्षेत्र नम्बर

घरधुरी संख्या

अन्तर्वार्ता लिएको मिति

गते महिना साल

अन्तर्वार्ता लिनेको परिचय संख्या

MWRA को नाम

MWRA को परिचय संख्या

शिशुको नाम

उत्तर दिने व्यक्तिको नाम

उत्तर दिने व्यक्तिको शिशु रागको रागबन्ध

आमा

बच्चा तर्फको परिवार

बाबा

छिमेकी

मामा तर्फको परिवार

अन्य

१ शिशु जन्मेको समयमा

बच्चाको तौल Kg

१.१ बच्चा कहिले जन्मेको थियो ?

गते महिना साल

१.२ बच्चा छोरा हो कि छोरी हो ?

छोरा छोरी

१.३ कति महिनाको गर्भवती हुँदा बच्चा जन्मियो ?

महिना

१.४ जन्मेको समयमा बच्चा हेर्दा करतो देखिन्थ्यो ?

सामान्य असामान्य

(यदि सामान्य थियो भने प्रश्न नं. १.६ मा जानुहोस)

१.५ असामान्य भए लेख्नुहोस

१.६ बच्चाको आकार कस्तो थियो ?

धेरै सानो

ठिक

धेरै ठूलो

१.७ के बच्चा जुम्ल्याहा हो ?

हो

होइन

(यदि होइन भने प्रश्न नं. १.९ मा जानुहोस)

१.८ यो बच्चा पहिला वा दोश्रो कहिले जन्मिएको थियो ?

पहिलो

दोश्रो

थाहा छैन

१.९ बच्चाको टाउको चेप्टो परेको थियो ?

थियो

थिएन

थाहा छैन

१.१० बच्चाको शरीरमा निला टाटाहरु थियो ?

थियो

थिएन

थाहा छैन

२ नवजात शिशु स्याहार

२.१ बच्चा कहाँ जन्मिएको थियो ?

घरमा

गोठमा

खेत+नारी+जंगल

आगन, पिँडि, छत

अस्पताल

प्राइभेट क्लिनिक

अन्य

२.२ सुत्केरी कोठालाई आगो+स्टोभ अथवा अन्य साधनले काहिले तताइएको थियो ?

बच्चा जन्मनु भन्दा अगाडि

बच्चा जन्मि सके पछि

बच्चा जन्मनु भन्दा अगाडि र पछि

थिएन

२.३ सुक्केरी हटा कस्ले सहयोग गर्थ्यो ?

- 2.3 Who helped with the activity?
- डाक्टर Doctor
 - हे.अ. भसि अ.हे.ब. +अ.हे.ब.+सि एम.ए. He.A. Bhasi A.He.B. +A.He.B.+Si Em.A.
 - मातु शिशु स्वास्थ्य कार्यकर्ता Mother-Child Health Worker
 - सासु Aunt
 - आफ्ने (कोही) पनि नभएको। None (Nobody/None)
 - नर्स Nurse
 - तालीम प्राप्त सुडेनी Trained TB
 - महिला स्वास्थ्य स्वयं सहायता समूह WOMSA
 - शिक्षिका:राशी Teacher:Rashi
 - अ. न. भी. Mr. N. Bhi.

(यदि कसैले महत्त्व गरेको शिपण भने प्रश्न नं. २.५ मा जानुहोस्।)
(If somebody helped, go to question no. 2.5)

२.४ सहयोग गर्ने मानिसले हात धोएको थियो ?

- 2.4 Did the person who helped wash their hands?
- थियो Yes
 - थाहा छैन Don't know
 - चिन्नु No

(यदि कसैले महत्त्व गरेको शिपण भने प्रश्न नं. २.७ मा जानुहोस्।)
(If somebody helped, go to question no. 2.7)

२.५ सुक्केरी सामग्री प्रयोग गर्नु भयो ?

- 2.5 Did you use the material?
- गरे Yes
 - गरिनु No
 - चिन्नु No

२.७ नाल के ले काट्नु भयो ?

- 2.7 What was the pipe cut with?
- उमाविको पत्तिले Umapati's leaf
 - बासले Bamboo
 - वेसार Turmeric
 - औषधि, डेटोल Medicine/Dettol
 - थाहा छैन Don't know
 - नउमाविको पत्तिले Not Umapati's leaf
 - थाहा छैन Don't know
 - अन्य Other
 - नयाँ कपडा New cloth
 - शिपण No
 - गरिनु No
 - चिन्नु No
 - नयाँ कपडा वा कपास New cloth or Cotton fabric
 - धोएको कपडा वा कपास Washed cloth or Cotton fabric
 - माटो Mud
 - केहि नराखेको Nothing
 - हसिया=सुर्पा Handmade paper

२.९ बच्चालाई कस्तो कपडाको वेरिएको थियो ?

- 2.9 What sort of cloth was the baby wrapped in?
- नयाँ कपडा New cloth
 - धोएको कपडा Washed cloth
 - थाहा छैन Don't know
 - शिपण No
 - गरिनु No
 - चिन्नु No
 - नयाँ कपडा वा कपास New cloth or Cotton fabric
 - धोएको कपडा वा कपास Washed cloth or Cotton fabric
 - माटो Mud
 - केहि नराखेको Nothing
 - हसिया=सुर्पा Handmade paper

२.१० बच्चालाई बेने कपडा धोएको थियो ?

- 2.10 Did the baby have washed?
- थियो Yes
 - गरिनु No
 - चिन्नु No

२.११ बच्चा जन्मिएको कति घेर पछि बच्चालाई कपडाले वेरिएको थियो ?

- 2.11 How long after birth was the baby wrapped up?
- मिनेट पछि वा Minutes after
 - घण्टा पछि Hours after
 - मिनेट पछि वा Minutes after
 - घण्टा पछि वा Hours after
 - रिन पछि Days after

२.१२ बच्चालाई पहिलो पटक के खान दिइयो ?

- 2.12 What was the first food given to the baby?
- आमाको दुध Breastmilk
 - दुध खाना Milk food
 - चिनी Sugar
 - अन्य Other
 - अरु आमाको दुध Other woman's milk
 - घ्यू Ghee
 - मह Milk
 - तेल Oil
 - गाई:गैरिाको दुध Cow/goat's milk
 - घ्यू र चिनी Ghee and sugar
 - तेल Oil
 - थाहा छैन Don't know
 - ल्याक्टोजेन Lactogen
 - घ्यू र मह Ghee and milk
 - थाहा छैन Don't know

२.१४ बच्चा जन्मिसकेपछि माइती जानुभयो ?

- 2.14 Did you go to your in-laws after the birth?
- गए Yes
 - गरिनु No
 - चिन्नु No

२.१५ जन्मेको कति पछि जिन्मिएको जन्मिएको थियो ?

- 2.15 How long after the birth did you go home?
- १ हप्ता देखि १ महिना भित्र Between 1 week and 1 month
 - १ हप्ता देखि १ महिना सम्म Between 1 week and 1 month
 - १ हप्ता देखि १ महिना सम्म Between 1 week and 1 month
 - घण्टा वा Hours
 - दिन Days
 - १ महिना पछि After 1 month
 - १ महिना भन्दा बढी Over 1 month

२.१७ त्यहाँ सम्म पुग्न कति समय लाग्यो ?

- 2.17 How long does it take to get there?
- घण्टा वा Hours
 - दिन Days
 - दिव्यो No
 - थाहा छैन Don't know

२.१८ तपाईंको बच्चालाई वि. सि. सि. सोप दिई सक्नु भयो ?

- 2.18 Did your baby use the SCS (antiseptic)?
- दिव्यो No
 - थाहा छैन Don't know

३ आमाको दूध

3 Breastfeeding

३.१ तपाईं आफ्नो बच्चालाई आमाको दूध खुवाउनु भयो ?

3.1 Have you breastfed your baby?

खुवाए खुवाइन

(यदि दूध नखुवाएको हो भने प्रश्न नं. ४.१ मा जानुहोस)
(If no, go to question no. 4.1)

३.२ बच्चा जन्मिएको कति बेर पछि आमाको दूध चुराउनु भयो ? मिनट पछि वा घण्टा पछि वा दिन पछि

3.2 How long after the birth did you first feed the baby?

३.३ बच्चालाई पहिलो पटक दूध खुवाउनु भन्दा अगाडी दुध निचोरेर फाल्नु भयो ?

3.3 Did you throw away any milk before the first time you fed the baby?

फाले फालिन

फाल्छु फालिदिन

३.४ प्रत्येक पटक दूध खुवाउदा दुध निचोरेर फाल्नु हुन्छ ?

3.4 Do you throw away any milk before each time you feed the baby?

३.५ आमाको दूध बाहेक पाउडरको दूध वा अन्य दूध बच्चालाई खुवाउने गर्नु भएको छ ?

3.5 Apart from breastmilk, have you given your baby powdered milk or another type of milk?

खुवाए खुवाएको छैन

(यदि खुवाएको छैन भने प्रश्न नं. ३.७ मा जानुहोस)
(If no, go to question no. 3.7)

३.६ जन्मेको कति हप्ता पछि खुवाउन शुरु गर्नु भएको थियो ?

3.6 How many weeks after the birth did you start?

हप्ता पछि

३.७ आमाको दूध बाहेक बच्चालाई दिनहुँ सादा पानी खुवाउने गर्नु भएको छ ?

3.7 Apart from breastmilk, have you given your baby water?

खुवाए खुवाएको छैन

(यदि खुवाएको छैन भने प्रश्न नं. ३.९ मा जानुहोस)
(If no, go to question no. 3.9)

३.८ जन्मेको कति हप्ता पछि खुवाउन शुरु गर्नु भएको थियो ?

3.8 How many weeks after the birth did you start?

हप्ता पछि

३.९ आमाको दूध बाहेक बच्चालाई दिनहुँ अरु कोल पदार्थ पनि खुवाउने गर्नु भएको छ ?

3.9 Apart from breastmilk, have you given your baby other liquids?

खुवाए खुवाएको छैन

(यदि खुवाएको छैन भने प्रश्न नं. ३.११ मा जानुहोस)
(If no, go to question no. 3.11)

३.१० जन्मेको कति हप्ता पछि खुवाउन शुरु गर्नु भएको थियो ?

3.10 How many weeks after the birth did you start?

हप्ता पछि

३.११ आमाको दूध बाहेक अरु कुनै ठोस वा नरम खाना पनि दिनहुँ खुवाउने गर्नु भएको छ ? () खुवाए () खुवाएको छैन

3.11 Apart from breastmilk, have you given your baby solids?

खुवाए खुवाएको छैन

(यदि खुवाएको छैन भने प्रश्न नं. ३.१३ मा जानुहोस)
(If no, go to question no. 3.13)

३.१२ जन्मेको कति हप्ता पछि खुवाउन शुरु गर्नु भएको थियो ?

3.12 How many weeks after the birth did you start?

हप्ता पछि

३.१३ बच्चालाई बोतलबाट केहि खानेकुरा खुवाएको थियो ?

3.13 Have you given any of these things from a bottle?

थियो थिएन

४ बच्चा बिरामी सम्बन्धमा

4 Issues in the child

४.१ बच्चालाई खोकी लागेको थियो ?

4.1 Has the baby had a cough?

थियो थिएन

(यदि थिएन भने प्रश्न नं. ४.६ मा जानुहोस)
(If no, go to question no. 4.6)

४.२ कति दिन सम्म लगातार खोकी लाग्यो ?

4.2 For how many days continuously did the cough last?

दिन

४.३ बच्चाले ६ घण्टा भन्दा बढी छिटो सास फेरेको थियो ?

4.3 Has the baby had fast breathing for more than 6 hours?

थियो थिएन

४.४ बच्चाको कोखा हानेको देख्नु भयो ?

4.4 Has the baby had chest recession?

देखे देखिन थाहा छैन

४.५ बच्चालाई दूध खान गाढो पच्यो ?

4.5 Has the baby had difficulty feeding?

पच्यो परेन

४.६ दिनको ३ पटक भन्दा बढि बच्चालाई पखाला लागेको थियो ?

4.6 Has the baby had diarrhoea more than 3 times a day?

थियो थिएन

(यदि थिएन भने प्रश्न नं. ४.१० मा जानुहोस)
(If no, go to question no. 4.10)

४.७ कति दिन सम्म पखाला लागेको थियो ?

4.7 For how many days did the diarrhoea last?

दिन

४.८ दिशामा आउं, पिप रगत देखिएको थियो ?

4.8 Was there mucus, pus or blood in the stool?

थियो थिएन थाहा छैन

४.९ बच्चाले बारम्बार बान्ता गरेको थियो ?

4.9 Has the baby been vomiting repeatedly?

थियो थिएन

४.१० बच्चालाई बढी ज्वरो आएको थियो ?

4.10 Has the baby had a high fever?

थियो थिएन (यदि थिएन भने प्रश्न नं. ४.११ मा जानुहोस)
(If no, go to question no. 4.11)

४.११ कति दिन सम्म

4.11 For how many days

दिन

(यदि माथिका प्रश्नहरूमा कुनै बिरामहरू छैन भने अन्तर्बर्ता रोक्नुहोस)
(If there were no marks in the above questions, stop the interview)

५ बच्चाको स्वास्थ्य स्याहार

Treatment of the baby

(यदि बच्चालाई खोकी, भाडा पखाला र ज्वरो आएको छ भने तलको प्रश्नहरू सोध्नुहोस्)
(If the baby had cough, diarrhoea or fever, ask the following questions)

धामी

Dreams

५.१ तपाईं वा परिवारका सदस्यहरूले बच्चा बिरामी हुँदा उपचार गर्नलाई धामी कहाँ देखाउन जानु भयो ?

5.1 When the baby was sick, did you or your family go to the Dreams for any treatment?

गए गइन
Yes No

स्वास्थ्य संस्थामा

Health services

५.२ तपाईं वा परिवारका सदस्यहरूले बच्चा बिरामी हुँदा उपचार गर्नलाई स्वास्थ्य संस्थामा लैजानु भयो ?

5.2 When the baby was sick, did you or your family go to the health services for any treatment?

लगे लगिन
Yes No

(यदि लगिन भने प्रश्न नं ५.७ मा जानुहोस्)
(If no, go to question 5.7)

५.३ कहाँ जचाउन जानु भएको थियो ?

5.3 Where did you go for the consultation?

- | | | |
|---|---|--|
| <input type="checkbox"/> अस्पताल
Hospital | <input type="checkbox"/> प्रा. स्वा. के.
Primary Health Centre | <input type="checkbox"/> स्वा. चौ.
Health Post |
| <input type="checkbox"/> उप-स्वा. चौ.
Sub Health Post | <input type="checkbox"/> गाउँघर क्लिनिक
Mobile clinic | <input type="checkbox"/> परिवार नियोजन क्लिनिक
Family Planning clinic |
| <input type="checkbox"/> प्राइभेट क्लिनिक
Private clinic | <input type="checkbox"/> औषधी पसल
Medicine shop | <input type="checkbox"/> अन्य |

५.४ को सँग उपचार गराउनु भयो ?

5.4 Who did you get treatment from?

- | | | |
|---|--|---|
| <input type="checkbox"/> डाक्टर
Doctor | <input type="checkbox"/> नर्स
Nurse | <input type="checkbox"/> अ. न. मी.
ANM |
| <input type="checkbox"/> हे.अ. न.सि.अ.हे.व. न.अ.हे.ब. न.सि.एम.ए.
HAS/ANM/ANM/CHA | <input type="checkbox"/> तालीम प्राप्त सुडेनी
Trained TBA | <input type="checkbox"/> तालीम नपाएको सुडेनी
Untrained TBA |
| <input type="checkbox"/> मातृ शिशु स्वास्थ्य कार्यकर्ता
MCHW | <input type="checkbox"/> ग्रामिण स्वास्थ्य कार्यकर्ता
VHW | <input type="checkbox"/> महिला स्वास्थ्य स्वयं सेविका
FCHV |
| <input type="checkbox"/> औषधी पसले
Medicine shopkeeper | <input type="checkbox"/> थाहा छैन
Don't know | <input type="checkbox"/> अन्य |

५.५ करारी त्यहाँ (पुगादयो) पुग्नु भयो ?

5.5 How did you get there?

- | | | | |
|---|---|--|--|
| <input type="checkbox"/> हिंडेर
Walked | <input type="checkbox"/> गाडामा
Cart | <input type="checkbox"/> एम्बुलेन्स
Ambulance | <input type="checkbox"/> गाडी-म्टेम्पो-नबस-नरिक्सा
Car/Tempo/bus/Chakra |
|---|---|--|--|

५.६ बिरामी भएको कति समयपछि त्यहाँ पुग्नु भयो ?

5.6 How long after the baby became ill did you arrive there?

घण्टा पछि वा दिन पछि
Hour Day after

उपचार

Treatment

५.७ बच्चा बिरामी हुँदा कुनै प्रकारको उपचार दिनु भएको थियो ?

5.7 When the baby was ill, did you give any sort of medicine?

थियो थिएन
Yes No

(यदि थिएन भने अन्तर्वाता रोकनुहोस्)
(If no, skip the question)

५.८ बच्चालाई के दिनु भएको थियो ?

5.8 What did you give?

- औषधि घरेलू औषधि उपचार औषधि र घरेलू औषधि उपचार
Allopathic medicine Traditional medicine Allopathic and traditional medicine
- अन्य

५.९ बिरामी भएको कति समय पछि उपचार गर्नु भएको थियो ?

5.9 How long after the baby became ill did you give the medicine?

घण्टा पछि वा दिन पछि वा हप्ता पछि
Hour after or Day after or Weeks after