Newborn survival in Nepal: a decade of change and future implications

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Nepal is on target to meet the Millennium Development Goals for maternal and child health despite high levels of poverty, poor infrastructure, difficult terrain and recent conflict. Each year, nearly 35 000 Nepali children die before their fifth birthday, with almost two-thirds of these deaths occurring in the first month of life, the neonatal period. As part of a multi-country analysis, we examined changes for newborn survival between 2000 and 2010 in terms of mortality, coverage and health system indicators as well as national and donor funding. Over the decade, Nepal's neonatal mortality rate reduced by 3.6% per year, which is faster than the regional average (2.0%) but slower than national annual progress for mortality of children aged 1–59 months (7.7%) and maternal mortality (7.5%). A dramatic reduction in the total fertility rate, improvements in female education and increasing change in skilled birth attendance, as well as increased coverage of community-based child health interventions, are likely to have contributed to these mortality declines. Political commitment and support for newborn survival has been generated through strategic use of global and national data and effective partnerships using primarily a selective newborn-focused approach for advocacy and planning. Nepal was the first low-income country to have a national newborn strategy, influencing similar strategies in other countries. The Community-Based Newborn Care Package is delivered through the nationally available Female Community Health Volunteers and was piloted in 10 of 75 districts, with plans to increase to 35 districts in mid-2013. Innovation and scale up, especially of community-based packages, and public health interventions and commodities appear to move relatively rapidly in Nepal compared with some other countries. Much remains to be done to achieve high rates of effective coverage of community care, and especially to improve the quality of facility-based care given the rapid shift to births in facilities.

Keywords Nepal, newborn, neonatal mortality, maternal, newborn and child health, Millennium Development Goals, epidemiology, health systems research, implementation

KEY MESSAGES

- Nepal is on track to meet Millennium Development Goal 4 for child survival. From 2000 to 2010, neonatal mortality declined by 30%, though recent data indicate stagnation. This decline is greater than the average for Southern Asia but less than the national reductions in maternal and child mortality after the first month. Neonatal deaths now account for over 60% of under-five deaths.

- Increased attention and priority for newborn survival facilitated changes in policies, programmes, information systems and communication platforms, mainly in a newborn-selective way but with the intent to then integrate these with maternal and child health services and the wider health systems.

- The Government of Nepal used global and local evidence to inform a national newborn health strategy and to design the Community-Based Newborn Care Package, which was implemented initially in 10 of 75 districts with plans to expand to 35 districts by mid-2013.

- Rapid expansion of community care combined with an increase in facility births offer potential for scale up and accelerated impact, but facility quality of care is a critical priority for improving both maternal and neonatal health.

Box 1 Nepal at a glance

Total population (2011)	30 500 000
Mothers, babies and children	
Annual live births (2010)	724 000
Maternal mortality ratio per 100 000 live births (2010)	170
Annual number of maternal deaths	1200
Stillbirth rate per 1000 total births (2009)	23
Annual number of stillbirths	17 500
Neonatal mortality rate per 1000 live births (2010)	28
Annual number of newborn deaths	20 000
Mortality for children 1–59 months per 1000 live births (2010)	20
Annual number of deaths for children 1–59 months	14 000
Under-five mortality rate per 1000 live births (2010)	50
Annual number of child deaths under-five	35 000
Health system	
Health worker density per 10 000 population (2004)	6.7
Percentage of births that take place in a facility (2011)	28%
Context	
Emerging from 11 years of civil war	
Transitional phase has impacted ability to implement programmes	
Lowest GNI per capita in the Southern Asia region (US$480 per capita)	

Data sources: Population estimates (UNFPA 2011); maternal mortality estimates (WHO *et al*. 2012); annual live births, neonatal, and under-five mortality (UNICEF *et al*. 2011) with new analysis of mortality trends by age of death; stillbirth estimates (Cousens *et al*. 2011); health worker density (WHO 2011a); facility births (MOHP [Nepal] *et al*. 2011); GNI per capita (current USD atlas method) (World Bank 2011). Note that mortality rates and numbers are for most recent year.

Introduction

Meeting the global Millennium Development Goal (MDG) 4 for child survival will be increasingly determined by national success in reducing newborn deaths, especially for countries in Southern Asia where over half of under-five deaths occur in the neonatal period (first 28 days of life) (Oestergaard *et al*. 2011). In the last decade, newborn survival has moved from being an invisible problem with no solution, to a recognized problem for which effective interventions exist and are afford-able in low resource settings (Lawn *et al*. 2005; Shiffman 2010). Within Southern Asia, some countries have made remarkable progress in reducing newborn deaths and others have made little or no progress. An understanding of why and how this progress has been made can help inform and hopefully accelerate progress in other countries, as well as advance a future agenda for newborn health.

Nepal, a small landlocked country in Southern Asia, has made great progress for maternal, newborn and child health (MNCH) despite high levels of poverty, poor infrastructure, difficult terrain and recent conflict (Box 1). The country is currently on target for meeting the MDGs for maternal (MDG 5) and child health (MDG 4) (Government of Nepal and United Nations Country Team of Nepal 2010; Malla *et al*. 2011). If Nepal is to continue to accelerate progress beyond 2015, improving newborn survival and also health will be critical (Government of Nepal and United Nations Country Team of Nepal 2010).

A recent socio-political analysis of newborn health in Nepal found that political priority for newborn survival has risen on the political agenda. This was attributed to the strong champions within the government and other stakeholders but also to use of evidence to influence policy (Smith and Neupane 2010). In Nepal, the entry point around the year 2000 for attention to newborn survival has been described as newborn-selective as compared with other countries, raising the question: what can be learned from this approach, and how has this accelerated or possibly limited sustainable change for newborn survival in Nepal? Has this approach changed over time?

This paper is the fourth in a seven-paper supplement to evaluate change for newborn survival between 2000 and 2010. In this paper, we examine newborn survival in Nepal, applying a common results framework and standardized analyses and tools in order to better understand what has or has not progressed and why, in terms of neonatal survival, coverage of care, funding, health systems, policies and programmes, as well as for the national context. By examining these data and the linked narrative, we aim to identify factors that facilitate or constrain efforts to further reduce neonatal mortality.

Methods

Evaluation framework and overview

This evaluation is structured according to a standard results evaluation framework beginning at the goal level (reduction in neonatal mortality), moving to strategic objective level (increase in healthy behaviours and coverage of key high-impact practices and services), while also considering changes in context and certain social determinants of health. At the intermediate results level, we examined policy change and events over time, as well as a specific set of elements that are considered necessary, but not sufficient, to scale up newborn health interventions (Lawn et al. 2012; Moran et al. 2012).

Data collection methods

We conducted an extensive review of national reports, assessments, guidelines and programme reviews as well as peer-reviewed literature. Standard methods and tools (Lawn et al. 2012) were used to collect and enter data into a database and cross-checked for quality.

A national expert team, the Nepal Newborn Change and Future Analysis Group, was convened to undertake these analyses and review the findings (group members listed at end of article). Members included representatives from the Ministry of Health and Population (MoHP), professional organizations, non-governmental organizations, academics and development partners. This team met several times in 2010 and 2011, convened by the MoHP, and also communicated by conference calls and email.

Data analysis methods

To analyse changes in national neonatal mortality, causes of neonatal death and changes in coverage of health interventions between 2000 and 2010, we abstracted data from national household surveys, United Nations (UN) databases, Institute for Health Metrics and Evaluation (IHME) publications, and Child Health Epidemiology Reference Group databases on

neonatal cause of death (Pradhan et al. 1997; MoH [Nepal] et al. 2002; MoHP [Nepal] et al. 2007; Lozano et al. 2011; MoHP [Nepal] et al. 2011; Oestergaard et al. 2011; UNICEF et al. 2011; Liu et al. 2012). Descriptions of mortality estimates are given in Supplementary Data Web Annex A. To assess change over time, the average annual rate of reduction for neonatal mortality rate (NMR) is compared with regional and global rates as well as with under-five and maternal mortality (UNICEF et al. 2011; WHO et al. 2012). We also considered a national review of the equity of health care utilization and outcomes (RTI International 2008).

To evaluate quantitative factors that may have contributed to mortality change, we examined associations of inter-sectoral indicators with change in NMR, such as Gross National Income (GNI) per capita, female literacy and total fertility rates (World Bank 2011). We also used the Lives Saved Tool (LiST) to estimate the mortality impact of MNCH interventions between 2000 and 2010 using the most recent available rates and causes of neonatal deaths (Johns Hopkins Bloomberg School of Public Health 2010). Details of these analyses are available in Supplementary Data Web Annexes B and C, respectively.

We applied two standard tools to assess change in national newborn policy and programmes. First, a Policy and Programme Timeline identified critical events and changes for policies, programmes, advocacy and research that could have had an impact on newborn health programmes (Supplementary Data Web Annex D) (Lawn et al. 2012). Second, 27 selected Scale-up Readiness Benchmarks determined whether each marker was in place (achieved), not in place (not achieved) or in progress (partially achieved) for three time points (2000, 2005, 2010) (Supplementary Data Web Annex E). The socio-political analysis of newborn health in Nepal was also considered (Smith and Neupane 2010).

To determine availability and access to newborn health services, quality of these services and demand for newborn care, literature reviews were conducted and relevant literature considered. Some standard measurements across the country case studies were employed, such as the World Health Organization (WHO) human resource density recommendation and tracking geographic reach of training for newborn health programmes (WHO 2011a; Lawn et al. 2012). We assessed changes in financial resources for health by obtaining national health expenditure data from the WHO National Health Accounts from 2000 to 2009 (WHO 2011b) and data on official development assistance (ODA) specifically for MNCH as tracked for Countdown to 2015 (Pitt et al. 2010) with a special analysis for newborn funding as described elsewhere (Lawn et al. 2012). All government and donor funding values are in constant 2008 USD.

Results and discussion

Neonatal mortality reduction (goal level)

Neonatal mortality has consistently decreased since 1990; however, the Nepal Demographic and Health Survey 2011 reported NMR having stagnated (Figures 1a and 1b) (MoHP [Nepal] et al. 2011). According to UN estimates, from 1990 to 2010, neonatal mortality decreased from 54 (49–57) to 28 (25–29) deaths per 1000 live births with an average annual
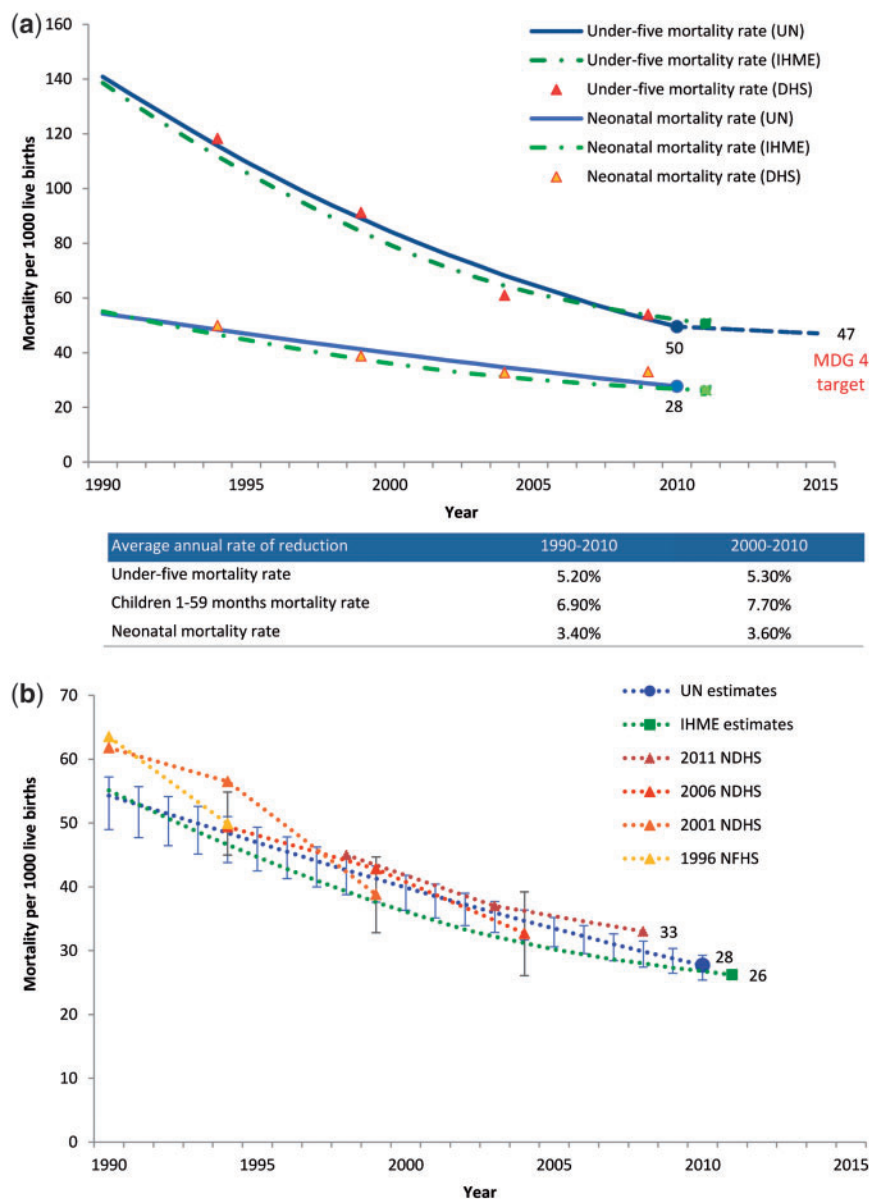
Figure 1 (**a**) National progress towards Millennium Development Goal 4 for newborn and child survival from 1990   *Data sources*: Nepal Family Health Survey 1996 (Pradhan *et al*. 1997), Nepal Demographic Surveys 2001, 2006 and 2011 preliminary (MoH [Nepal] *et al*. 2002; MoHP [Nepal] *et al*. 2007; MoHP [Nepal] *et al*. 2011), UN estimates (UNICEF *et al*. 2011) with new analysis of mortality trends by age of death, IHME estimates (Lozano *et al*. 2011). *Note*: Survey point estimates are centred 2 years prior to survey date. MDG 4 target from Countdown to 2015 decade report reflecting a 2/3 reduction from 1990 U5MR. (**b**) Neonatal mortality trends from 1990   *Data sources*: Nepal Family Health Survey (FHS) 1996 (Pradhan *et al*. 1997), Nepal Demographic Surveys (DHS) 2001, 2006 and 2011 preliminary (MoH [Nepal] *et al*. 2002; MoHP [Nepal] *et al*. 2007; MoHP [Nepal] *et al*. 2011), UN estimates (UNICEF *et al*. 2011), IHME estimates (Lozano *et al*. 2011). *Note*: Survey point estimates from household surveys are centred 2 years prior to survey date. Uncertainty bounds are provided for UN estimates and 95% confidence intervals for data from national household surveys, where available.

decline of 3.4% (Figure 1a). From 2000 to 2010, the pace of reduction did not accelerate much (3.6% per year) and continued to remain slower than the annual decline in maternal mortality (7.5%), under-five mortality (5.3%) and mortality for children aged 1–59 months (7.7%) (WHO *et al*. 2012; UNICEF *et al*. 2011). Nevertheless, neonatal mortality reduced at greater speed than the Southern Asia regional (2.0%) and global (2.1%) averages of decline in the past decade

(Hill *et al*. 2012). UN estimates indicate the proportion of under-five deaths occurring in the neonatal period increased 9 percentage points over the decade from 47% to 56% (UNICEF *et al*. 2011), whereas national survey data suggested neonatal deaths now constitute 61% of under-five deaths (MoHP [Nepal] *et al*. 2011) up from 43% in 2001 (MoH [Nepal] *et al*. 2002).

The NMR was nearly double in rural areas and mountainous zones of Nepal, and the poorest quintile was 65% higher than

the wealthiest quintile (MoHP [Nepal] *et al.* 2007). Between 1996 and 2006, there was documented increased inequity of NMR between advantaged and disadvantaged caste/ethnic groups (RTI International 2008).

The three main causes of neonatal mortality—complications of preterm birth, severe infections and intrapartum-related (asphyxia)—account for 90% of all newborn deaths (Figure 2). The relative proportions of these causes have not changed significantly over the past decade although infections appear to be decreasing (Liu *et al.* 2012). Nepal achieved maternal and newborn tetanus elimination status in 2005 (WHO 2006), partly due to a national campaign providing supplemental tetanus

toxoid immunizations from 2000 to 2004 (Vandelaer *et al.* 2009).

Healthy behaviours and equitable use of effective health services (strategic objective level)

Between 2000 and 2010, coverage of most interventions relevant to newborn survival increased: antenatal care by 30 percentage points; facility deliveries by 19 percentage points; skilled birth attendance by 25 percentage points; and tetanus toxoid immunization by 32 percentage points (Figure 3) (Pradhan *et al.* 1997; MoH [Nepal] *et al.* 2002; MoHP [Nepal] *et al.* 2007; MoHP [Nepal] *et al.* 2011). The contraceptive prevalence rate (any modern method) changed 8 percentage points, largely due to increasing use among cohabiting couples. The total fertility rate and the unmet need for family planning among married women continued to decline over the decade. The caesarean section rate tripled over the decade with most increases in rural areas. Many high-impact neonatal-specific interventions—for example, neonatal resuscitation—do not have national coverage data.

The increased use of pre-pregnancy and pregnancy interventions, such as modern contraception and antenatal care, are partly due to the expanded reach of community-based care (MoHP [Nepal] *et al.* 2011). By 2011, over a third of women delivered with a skilled attendant at the time of birth (38%) and around a fifth of women received postnatal care within 2 days of delivery (22%) (MoHP [Nepal] *et al.* 2007; MoHP [Nepal] *et al.* 2011). Disparities between castes, ethnicities and wealth quintiles actually increased over the decade for newborn-related health indicators, whereas inequity decreased for child health interventions (RTI International 2008). For example, between 1996 and 2006 the difference between the poorest and richest quintiles for skilled attendance at birth grew from 32% to 53%, whereas the disparity for fully
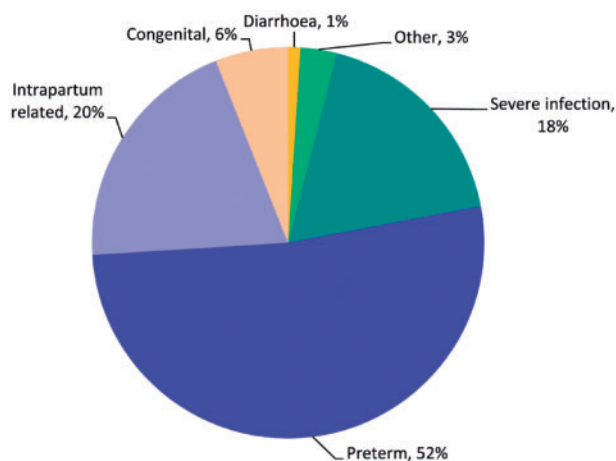

Figure 2 Estimated causes of mortality around the year 2010 for 20 000 neonatal deaths   *Data sources*: Nepal-specific mortality estimates (Liu *et al.* 2012). *Note*: Severe infection include sepsis, meningitis, pneumonia and tetanus. Percentages have been rounded.
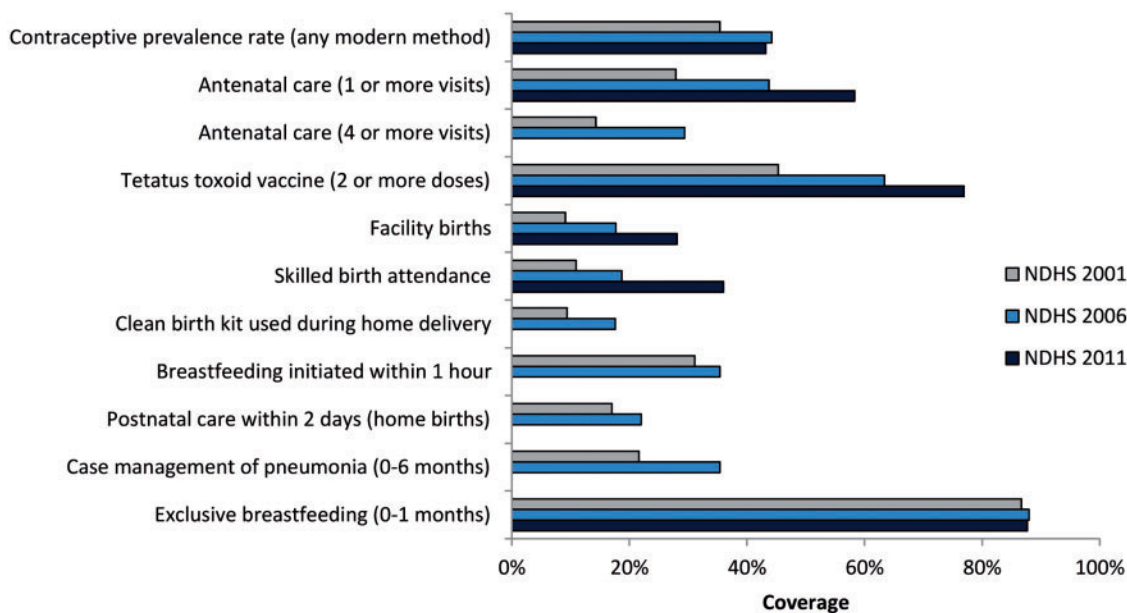

Figure 3 Trends in coverage data for newborn-related interventions and packages (2000–2011)   *Data sources*: Nepal Demographic and Health Surveys 2001, 2006 and 2011 preliminary (NDHS) (MoH [Nepal] *et al.* 2002; MoHP [Nepal] *et al.* 2007; MoHP [Nepal] *et al.* 2011).
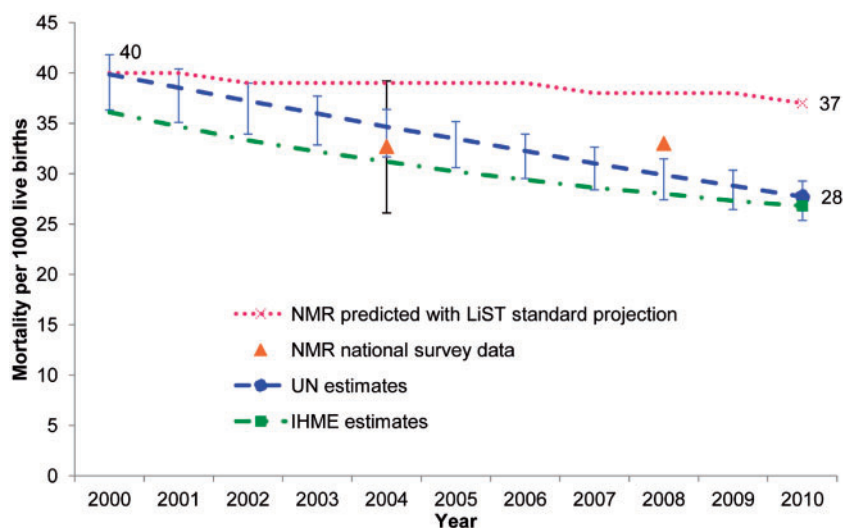
Figure 4 Results of predicted neonatal mortality reduction through changes in coverage (2000–2010)   *Data sources*: Nepal Family Health Survey 1996 (Pradhan *et al*. 1997), Nepal Demographic and Health Surveys 2001, 2006 and 2011 preliminary (MoH [Nepal] *et al*. 2002; MoHP [Nepal] *et al*. 2007; MoHP [Nepal] *et al*. 2011), UN estimates (UNICEF *et al*. 2011), IHME estimates (Lozano *et al*. 2011), and LiST analysis. *Note*: Survey point estimates from household surveys are centred 2 years prior to survey date. Uncertainty bounds are provided for UN estimates and 95% confidence intervals for data from national household surveys, where available. See Supplementary Data Web Annex C for details on the LiST analysis and inputs.

immunized children decreased from 43% to 28% (RTI International 2008).

Evaluation of associations with neonatal mortality change

Retrospective LiST modelling was undertaken to consider if changes in intervention coverage could account for neonatal mortality reduction. Coverage changes in LiST predicted little of the change in NMR over the decade, whereas in some other countries, coverage change was a good predictor of NMR change, such as Malawi (Figure 4 and Supplementary Data Web Annex C) (Zimba *et al*. 2012). There are a number of possible explanations. Firstly, many neonatal-specific interventions lack coverage data and so cannot be included (Lawn *et al*. 2012). Secondly, it is plausible that the major decrease in total fertility accounts for some of the NMR reduction as has been suggested for the decline of maternal mortality (Hussein *et al*. 2011). The LiST model does take into account fewer deaths due to fewer births, but does not include differing risk for lower fertility. Thirdly, it is likely that other contextual changes had influence but cannot be captured in LiST, such as increasing GNI, female literacy and the ending of the Maoist conflict.

National changes in some socio-economic factors between 2000 and 2010 were significant: GNI per capita increased from US$220 to US$480 (constant 2010 USD), female literacy rate from 33% to 47%, and there was a drop in the total fertility rate from 4 births per woman to 2.8 (World Bank 2011). The analysis for 144 countries in the first paper in this series identifies fertility change as a predictor of change in neonatal mortality (Lawn *et al*. 2012). Unfortunately, a country-specific multivariate analysis would not be able to quantify further the possible contribution of contextual and coverage factors to the observed change in NMR due to data limitations (see Supplementary Data Web Annex B for more details).

Programme change at scale in health systems (intermediate results level)

Policy and programme change at scale in health systems

Nepal experienced rapid political change after emerging in 2006 from a decade-long civil war. While the conflict and transitions in government may have hindered some government programmes, most health indicators continued to improve over this time (Devkota and van Teijlingen 2010). Since 2000, there has been increasing policy progress for newborn survival in Nepal (Supplementary Data Web Annex D). Achievement of the Scale-up Readiness Benchmarks reflected this steady progress over time (Figure 5). By 2010, 22 of the 27 benchmarks had been achieved, with three more partially achieved, one not achieved and one with missing data. Of the nine countries assessed in our multi-country benchmark analysis, Nepal had achieved the most benchmarks by the end of the decade together with Bolivia and Pakistan (Moran *et al*. 2012). The Nepal Newborn Change and Future Analysis Group underlined the situation analysis in 2001 as well as the national newborn health strategy and plan in 2004 that fed into the Second Long Term Health Plan (1997–2017) as key events of the decade; this is consistent with the review by Smith and Neupane (2010).

Political attention for newborn survival was influenced by the national commitment to reaching the MDGs followed by a series of key events including the launch of the Save the Children USA's Saving Newborn Lives programme in 2001 (Smith and Neupane 2010) and the global publication *State of the World's Newborns* (Saving Newborn Lives 2001), which catalysed the development of a national situation analysis in 2002, *State of the World's Newborns: Nepal* (Saving Newborn Lives 2002). This report was launched by the Prime Minister and received significant media and public attention, providing the basis for increased focus and action.
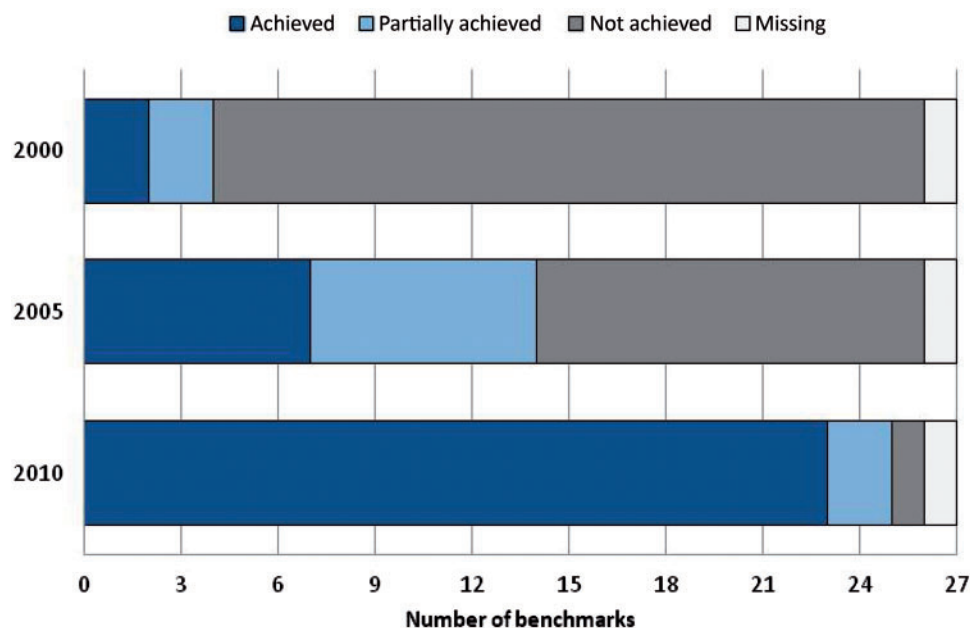
Figure 5 Progress towards Scale-up Readiness Benchmarks for newborn care. *Note*: Details on this analysis can be found in the second paper of this supplement (Moran *et al*. 2012). Full results and documents reviewed can be found in Supplementary Data Web Annex E. The missing benchmark relates to financial commitments and does not have data.

Subsequently, the *National Neonatal Health Strategy* (NNHS) was published and endorsed by the MoHP in 2004, providing authority and direction for implementing and testing newborn survival programmes (Box 2) (Department of Health Services *et al*. 2007). The *Nepal Safe Motherhood and Neonatal Long Term Plan 2006–2017* provided guidance for integration of the newborn component (MoHP [Nepal] 2006). The strategy and plan were led by the MoHP with support from development partners and were developed in line with wider health sector policy documents, e.g. the Second Health Long Term Plan (1997–2017) and the Nepal Health Sector Programme Implementation Plan (Department of Health Services *et al*. 2007). Both the Family Health Division and Child Health Division of the MoHP were then mandated to address newborn health.

Increasing advocacy was paired with the initiation of community-based projects and research trials to generate local evidence on solutions to improve newborn survival. In-country research experience—such as home treatment of neonatal sepsis, community-based management of low birth-weight babies, behaviour change and communication activities for newborn health, and postnatal care visits by volunteers (McPherson *et al*. 2006; Wade *et al*. 2006; Tielsch *et al*. 2007)—was powerful in shaping policy and programmes. Regional projects, such as the home-based neonatal care programme developed by the Society for Education, Action and Research in Community Health (SEARCH) in Gadchiroli, India (Bang *et al*. 1999), also provided information for designing effectiveness studies and influenced the testing of community-based initiatives for newborn survival through the Morang Innovative Neonatal Intervention (MINI) project.

Given the low levels of coverage for facility-based births, newborn care services were integrated into the existing community health system (Department of Health Services *et al*. 2007; KC *et al* 2011a; Pradhan *et al*. 2011). Nepali health services are delivered through facility and outreach services provided by sub-health posts, health posts, primary health care centres and district public health offices (DPHOs). At community and household level many maternal and child health interventions are provided through the Female Community Health Volunteer (FCHV) programme.

Launched in 1988, the FCHV programme expanded in the 1990s to include distribution of vitamin A supplements, treatment for childhood pneumonia and diarrhoea, and later support to the community-based integrated management of childhood illness (IMCI) programme. Following the NNHS, revisions to the community-based IMCI protocol mandated FCHV to also assess and manage sick newborns from the first day of life, and make referrals if necessary (USAID 2012). Sub-national programmes also had success in engaging the FCHVs in improving maternal and neonatal careseeking and household practices (Hodgins *et al*. 2010). Thus, the existing health system platform had years of successful implementation at scale of maternal and child health intervention packages and only required moderate expansion to include additional antenatal, birth and postnatal care services (Pradhan *et al*. 2011).

The MoHP and partners developed and implemented a Community-Based Newborn Care Package (CB-NCP) initially in 10 pilot districts (Box 3 and Figure 6) (Pradhan *et al*. 2011). This programme engages the FCHVs, and other frontline health workers, in the delivery of a community-based package of newborn care interventions. This innovative initiative was intended to comprehensively assess all aspects of implementation to determine the performance of individual components, effectiveness, resources and effort required, and scalability.

Box 2 Development of National Neonatal Health Strategy in Nepal, 2004

Rationale

Nepal's newborn situation analysis in 2002 emphasized the growing proportion of child deaths occurring in the neonatal period and portrayed neonatal mortality as a tractable problem with solutions. The Government of Nepal determined that a national strategy specifically for newborn health was required to ensure adequate attention.

Process

The Family Health Division of the Ministry of Health and Population (MoHP) established a Technical Working Group to write a series of position papers, which together with the newborn situation analysis, informed the *National Neonatal Health Strategy (NNHS)*. The group included representatives from a wide group of stakeholders, including the Safe Motherhood Taskforce, leading academics and development partners, facilitating strong ownership. The strategy outlined the level of newborn care and services to be provided from household level to tertiary hospitals, and particularly emphasized interventions that could be delivered in communities where most births occurred.

Results

Nepal was the first low-income country to develop a national newborn-specific strategy, which identified and prioritized cost-effective, evidence-based interventions while considering the capacity of the community and other levels of the health system. The NNHS was endorsed by the MoHP in 2004 and cemented national commitment to newborn survival. A National Neonatal Technical Advisory Group, later called the Safe Motherhood Neonatal Sub-committee, was formed in 2004 to ensure that all newborn health programmes in the country reflected the NNHS (Department of Health Services *et al*. 2007). The strategy was followed by a national plan for implementation in 2005 and was later integrated into wider health sector strategies and plans, such as the National Safe Motherhood and Newborn Long-Term Plan 2006. Other countries, including Bangladesh, used this plan to inform their national strategies (Rubayet *et al*. 2012). Nepal's national plan also influenced *The Lancet* Neonatal Series' call for action for each country to have a specific plan either as a standalone or integrated with other national plans (Martines *et al*. 2005).

The NNHS provided a platform for newborn survival to move from attention towards institutionalization and also uptake of innovations. Between 2005 and 2010, a number of community-based interventions were piloted, as directed by the NNHS. In 2007, a comprehensive community-based package for newborn health was developed and is being tested (see Box 3).

During the pilot phase, the training and monitoring for CB-NCP remained separate to maternal and child health components of the FCHV programme. However, once CB-NCP has been evaluated in pilot districts, the expectation is that the package and approach will be adjusted, and appropriately integrated within the continuum of primary health care services, including maternal and child health programmes (MoHP [Nepal] 2010; KC *et al*. 2011c; Pradhan *et al*. 2011).

Availability and access to newborn care services

The *National Policy for Skilled Birth Attendants* was established with a 5-year operational plan in 2006. This cemented policy commitments for increasing the number of skilled birth attendants and their role in maternal and newborn survival (Family Health Division 2006a; Department of Health Services *et al*. 2007; MoHP [Nepal] 2009a). However, human resource shortages and a weak human resource data system present a challenge for Nepal achieving its skilled birth attendance coverage target of 60% by 2015 (RTI International 2009). The health worker density of 6.7 per 10 000 population is far lower than the WHO benchmark of 23 (WHO 2011a). Community-based service provision has progressed more rapidly, with training of FCHVs and a more reliable supply of drugs and equipment now providing services to communities and families that previously had few options for newborn care (MoHP [Nepal] 2010). Yet, referral levels for facility care are far from

sufficient in most districts (Peri-natal Society of Nepal *et al*. 2009).

Quality of newborn care services

Throughout the decade, newborn care interventions have been incorporated into national standards, treatment protocols, health worker curricula and supply lists. For example, there were three revisions to the National Medical Standards for Reproductive Health updating the evidence-based protocols for management of sick mothers or newborns (MoHP [Nepal] 2009b). Medical supplies required for newborn care in facilities were included in the National Essential Maternal and Neonatal Health Care Package in 2006. The Expanded Child Health Protocol also incorporated key neonatal interventions. The Family Health Division developed a needs assessment tool-kit for district and primary health care maternal and neonatal health to assess the quality of facility-based care and improve service delivery, equity and access to services (Family Health Division 2006b).

Essential Newborn Care was added to the pre-service medical and nursing education curricula in the early part of the decade and then later incorporated into curricula for health assistants, auxiliary nurse midwives and community health workers (Robb-McCord *et al*. 2009). The skilled birth attendant curriculum was revised in 2010 to include essential newborn care, and in-service training curricula for the FCHVs also added CB-NCP. Revisions to the skilled birth attendant training package,

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Box 3 Community-Based Newborn Care Package: development and roll out of the national programme, 2007 onwards

Rationale

With an overwhelming majority of home deliveries (82% at the time), community-based interventions were considered critical for maternal and newborn survival in Nepal. In 2007, a rapid assessment of newborn health programmes highlighted an urgent need to address the high burden of newborn deaths through operationalization of the 2004 *National Neonatal Health Strategy*. There was no agreed national package at the community level even though various community-based projects were tested in the early part of the decade, including a birth preparedness package, postnatal home visits and community-based infection management. Thus, the Ministry of Health and Planning (MoHP) initiated the development of the Community-Based Newborn Care Package (CB-NCP) (Department of Health Services *et al*. 2007).

Process

A working group was formed from the MoHP, United Nations and donor agencies, professional associations and other development partners, with a rotating secretariat between UNICEF and Save the Children. The working group reviewed available evidence (global and local) and developed consensus on a community-based neonatal package suitable for the Nepali context (KC *et al*. 2011a). *The Lancet* Neonatal Survival Series and local evidence and context guided the selection of the interventions and centred on training the Female Community Health Volunteers (FCHVs) to provide a broader range of newborn care services in their communities as well as strengthening linkages with first-level health facilities. The package was finalized and endorsed by the MoHP in December 2007 and training and behaviour change materials developed in 2008 (KC *et al*. 2011a).

Results

Implementation of CB-NCP began in 10 pilot districts in 2009 with seven components: (1) behaviour change and communication to increase home health behaviours; (2) promotion of institutional delivery and clean delivery practices for home deliveries; (3) early postnatal care home visits; (4) identification and management of newborn infection; (5) extra home visits for care of low birth-weight newborns; (6) prevention and management of hypothermia; and (7) recognition of the non-breathing baby, initial stimulation and resuscitation. Preliminary findings from pilot areas are encouraging. In Bardiya district, skilled attendance at last delivery increased from 30% at baseline (2008) to 75% in 2011, although a number of health system changes have occurred over the same time (Prahdan *et al*. 2011). Nearly all mothers received counselling from a FCHV during pregnancy (97%) and reported receiving a postnatal check for their baby within 2 days of delivery (96%) (Prahdan *et al*. 2011).

Challenges and future strategies

The Government of Nepal is scaling up CB-NCP with expansion to an additional 35 districts by 2013 (Figure 6). Simultaneously, a process has been initiated to integrate the package into existing MCH programmes and to revisit the package content in light of recent findings regarding chlorhexidine for umbilical cord cleansing. Thus far, experience from the pilot districts highlights challenges in ensuring the consistency of implementation quality across districts, strengthening referrals of sick newborns and improving quality of care at facilities to keep up with the increasing demand for services. Forthcoming challenges include incorporating relevant aspects of the CB-NCP monitoring system within the national health management system, monitoring the quality and effectiveness of scale up, and addressing post-integration implementation issues for the newborn components (e.g. FCHV workload, loss of quality).

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including management of neonatal sepsis and linking with community-based programmes, aim to strengthen the referral system between the district health team and other health workers, such as the health assistants, auxiliary nurse midwives and community health workers (MoHP [Nepal] 2007).

Demand for newborn care

The government and partners developed a number of policy changes to increase demand for and access to facility care. The Safe Delivery Incentive Programme, with the UK Department for International Development (DFID) as a major funder, started in 2005, providing conditional cash transfers to women, incentives to health providers for each delivery attended, and free health care to women in the 25 least developed districts. From 2006 to 2009, incremental changes in policy led to the Aama Suraksha Programme in 2009 removing all user fees for delivery in public and some private facilities (including caesarean deliveries) (Witter *et al*. 2011).

The Birth-Preparedness Package (BPP), a community-based programme promoting preparation and decision-making for births and quality improvement of maternal health services at sub health posts, was developed as part of the Safe Motherhood programme. Essential newborn messages were incorporated in the original BPP materials with a field trial in Siraha District between 2002 and 2004 finding improvements in essential newborn care practices (McPherson *et al*. 2006). The BPP was rapidly scaled up nationally by MOHP and partners in 2003 with more newborn messages incorporated by 2009.

Behaviour-change communication messages and materials used by the FCHVs also included newborn care services and practices as emphasized in the *National Health Communication Strategy for Family Planning, Maternal and Child Health*, released in 2005 (MoHP [Nepal] 2005).
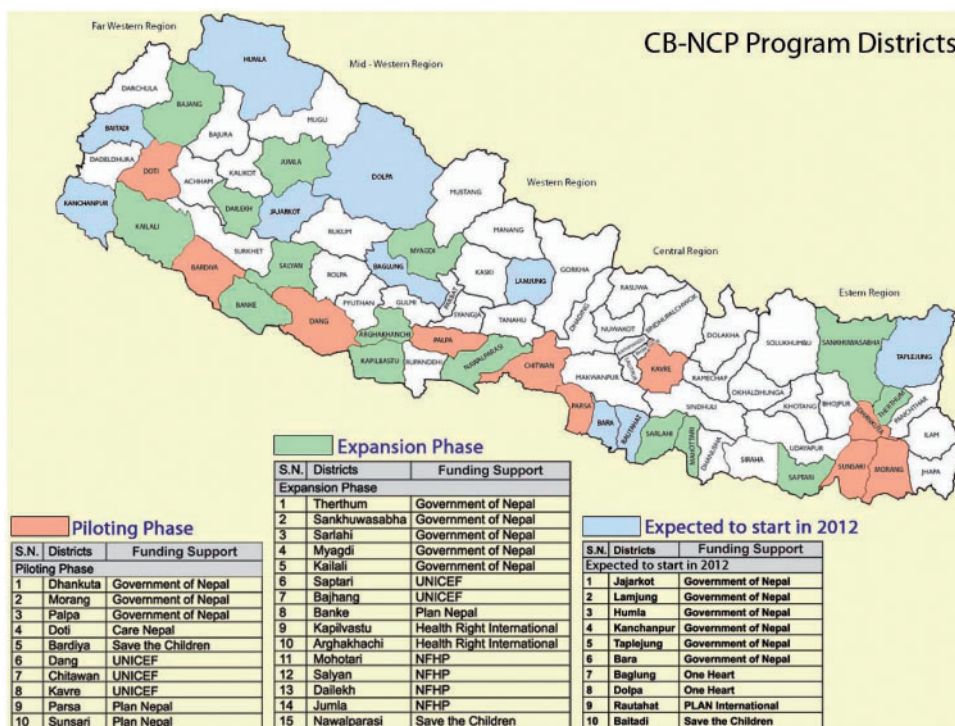
Figure 6 National scale up for Community-Based Newborn Care Package   *Data source*: Save the Children training tracker 2011.

Financial resources for health

Total health expenditure in Nepal increased over 150% between 2000 and 2009 from US$299 million to US$766 million (Figure 7a) (WHO 2011b). Private out-of-pocket spending accounted for about half of the total health expenditure and the proportion attributable to the government went from 25% in 2000 to 35% in 2009. Per capita total health expenditure increased from US$12 to US$26; yet this still remains less than the Commission on Macroeconomics and Health recommendation of US$35 per person per year ($53 at constant 2008 USD) (WHO 2001) and four times lower than the average for Countdown to 2015 priority countries (Lawn *et al*. 2012). Government health expenditure per capita tripled from US$3 to US$9 with government spending for the health sector averaging about 9% of total government spending (WHO 2011b).
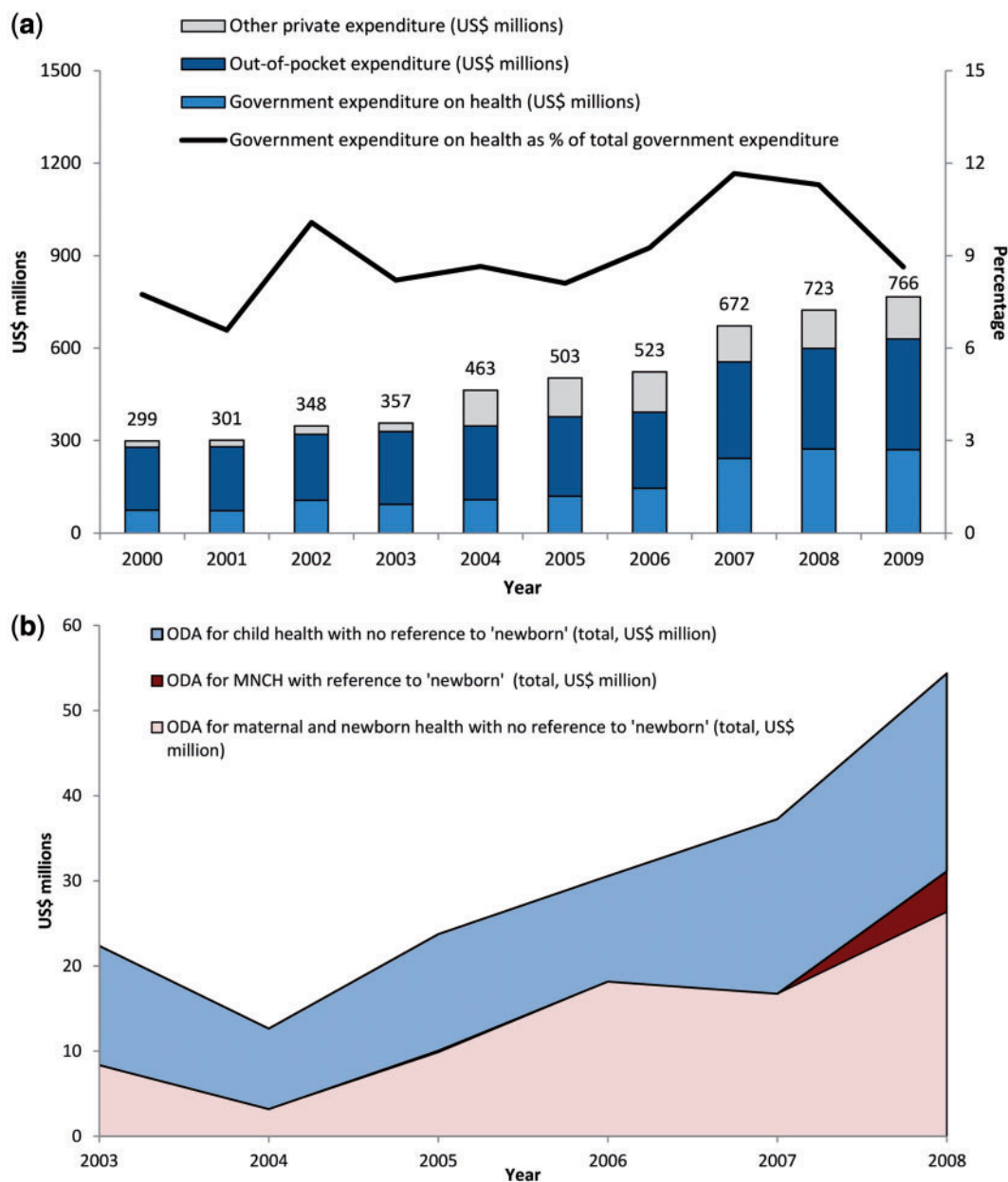
MNCH funding from development partners increased from 2003 to 2008 (Figure 7b). ODA for health disbursements increased from US$70 million to US$116 million while ODA specifically for MNCH went from US$22 million to US$54 million (Pitt *et al*. 2010). Disbursement of ODA for maternal and newborn health tripled and ODA for child health nearly doubled. Compared with other countries, Nepal received above average ODA per target population for maternal and newborn health but below average for child health and overall health. Only 8% of the US$54 million in donor funding for MNCH mentioned newborns, and there was no disbursement of projects that exclusively benefit newborns from development partners, though this analysis is limited by the nature of donor reporting to OECD (Lawn *et al*. 2012).

According to document reviews by the working group, explicit newborn content was increasingly included in developing partner workplans, projects and policy documents, notably by DFID, USAID and UNICEF, signifying more attention and possible funding.

Implications

Our findings from this standardized analysis of change for newborn survival, policy and programmes suggest that Nepal's remarkable progress for MDGs 4 and 5 has been strongly influenced through large-scale community-based maternal and child health programmes and public health services, such as family planning and immunization despite low, but increasing, utilization of facility-based services. Improvements in female education and GNI likely influenced mortality outcomes as well. The high level of attention on newborn survival was facilitated by the formation of a network of champions, including representatives from government and their partners who made the issue a priority and moved quickly to implement evidence-based solutions.

The standardized multi-country quantitative tools used in our analysis found similar conclusions as Smith and Neupane (2010), and also showed more progress further down the pathway from attention and policy change to implementation at scale. Nepal's emphasis on newborn health started before many other low-income countries and has been associated with extensive and detailed policy change, with almost all the 27 Scale-Up Readiness Benchmarks for newborn survival completed during the last decade. Commensurate with the

(a)

Legend:
- Other private expenditure (US$ millions)
- Out-of-pocket expenditure (US$ millions)
- Government expenditure on health (US$ millions)
- Government expenditure on health as % of total government expenditure

(b)

Legend:
- ODA for child health with no reference to 'newborn' (total, US$ million)
- ODA for MNCH with reference to 'newborn' (total, US$ million)
- ODA for maternal and newborn health with no reference to 'newborn' (total, US$ million)

Comparison with Countdown to 2015 (68 countries)	Nepal		Countdown country averages	
Comparison of MNCH donor funding	**2003**	**2008**	**2003**	**2008**
ODA for health per capita	$2.68	$4.02	$4.30	$9.50
ODA for child health per child	$3.83	$7.22	$5.80	$15.90
ODA for maternal and newborn health per live birth	$10.66	$39.04	$14.00	$31.00
Comparison of donor funding for newborn health	**2003**	**2008**	**2003**	**2008**
Value of ODA for MNCH which mentions 'newborn' (US$ millions)	$0.00	$4.78	$0.38	$3.51
Value of ODA for MNCH that specifically benefits newborns (US$ millions)	$0.00	$0.00	$0.00	$0.07

Figure 7 Health funding changes in Nepal. (**a**) Total health expenditure by government, out-of-pocket and other private expenditure, and percentage of government expenditure on health as compared with total government expenditure (2000–2009) *Data sources*: Analysis of WHO National Health Accounts (WHO 2011b). *Note*: All values in constant 2008 USD. (**b**) Changes in newborn-related official development assistance for MNCH from 2003 showing comparison with averages (unweighted) for Countdown to 2015 priority countries *Data source*: Pitt *et al*. (2010) with special analysis done by C. Pitt. *Note*: All values are in constant 2008 USD. MNCH donor projects with reference to 'newborn' include MNCH donor disbursements that mention the word 'newborn' or relevant search terms in titles or project descriptions. The OECD database does not systematically capture funding from emerging donor states, foundations, non-governmental organizations or faith-based groups.

early global level focus for newborn care around the time of *The Lancet* Neonatal Series, and also with the national norm at the time of home births, there was strong emphasis on increasing facility deliveries throughout the decade. This focus, accompanied by community-level approaches, such as the BPP and more recently CB-NCP, has led to a wider health systems emphasis on newborn survival, which mirrors the global shift.

Advocacy, partnerships and convening mechanisms

The Government of Nepal, and in particular the MoHP, provided leadership for newborn survival at a high level and was effective in partner co-ordination. This strong and sustained management from the MoHP facilitated harmonization and co-ordination of programmes, financing and partner activities. The Nepal Safe Motherhood Network provided an advocacy platform to help raise awareness of newborn health among high-level decision makers and move the agenda forward. The technical working group and sub-committees formed by the MoHP under the Safe Motherhood Programme informed policies and plans and created an environment conducive to solidifying partnerships. Professional organizations (e.g. the Nepal Society of Obstetricians & Gynaecologists, Nepal Paediatric Society and Perinatal Society of Nepal) actively engaged in sustaining the momentum to advance the newborn agenda through participating in national level forums and contributing to policy changes and programme design. Strong leadership, along with purposeful engagement of local implementers and stakeholders, both government and civil society, have been identified as key components of successful scale up (Simmons and Shiffman 2007; Yamey 2011). Challenges remain for ensuring consistency and optimum implementation, especially when multiple partners with different capacities are responsible for implementation of a programme.

The dual ownership of newborn care services by both Family and Child Health Divisions played a role in advancing, but also sometimes hindering newborn health policies and programmes. The Family Health Division has emphasized both facility improvements and the BPP in community settings, whereas the Child Health Division has mostly focused on community-based interventions (Smith and Neupane 2010). Nevertheless, these separate Divisions have made substantial progress in working together to advance programmes to improve newborn survival.

Evidence and data to inform scale up

Global and local evidence and data highly informed policy and programme development and implementation. The global report *State of the World's Newborns*, in 2001, catalysed a national version for Nepal leading to the development of the *National Neonatal Health Strategy* (Box 2). Perhaps the most important effect of the strategy was the consensus building process, which helped prioritize newborn survival in policy formulation, programming, research, curricula and behaviour change communication efforts. Global evidence for cost-effectiveness to prevent neonatal death was also considered (Darmstadt *et al.* 2005; Haws and Darmstadt 2007).

Importantly, local evidence has been used to influence policy and programmes nationally. The long history of community research for MNCH in Nepal, such as treatment of pneumonia (Pandey *et al.* 1991), has fostered close engagement between researchers, government and medical professionals, setting up greater uptake of local evidence relating to newborn health. The field trial of the BPP showed benefit to newborn care (McPherson *et al.* 2006), and this was later scaled up nationally (Robb-McCord *et al.* 2009). Chlorhexidine in preventing omphalitis is now being considered for inclusion in national programmes based on results from a community-based randomized control trial (Mullany *et al.* 2006; Tielsch *et al.* 2007) followed by formative research and another randomized control trial on efficacy (Hodgins *et al.* 2010). The development of CB-NCP included the results from the MINI project, which tested the capabilities of the FCHVs and other frontline health workers to identify and manage neonatal illness (Khanal *et al.* 2011). Thus, engagement of policy makers and other partners in generating evidence has helped ensure the early adoption of these interventions (Simmons and Shiffman 2007).

Indeed, Nepal's MoHP appears to be open to rapid uptake of innovations and new technologies for newborn health especially at community level, as evidenced by fast policy change for clean birth kits, chlorhexidine, community-based management of pneumonia and now community-based neonatal sepsis case management. It is of note that there has not been major effort as yet to introduce, pilot or study Kangaroo Mother Care (KMC) in facilities; but there has been somewhat greater effort to develop evidence for community-based KMC and to introduce this as one component in the CB-NCP package. Some studies conducted in Nepal relating to newborn health, such as the Mother and Infant Research Activities (MIRA) project testing community mobilization strategies, have had major influence on global thinking about community-based approaches to improve newborn survival, but this pioneering intervention has not influenced the Nepali health system to date (Manandhar *et al.* 2004; Rhee *et al.* 2008; Sharma *et al.* 2008; Thatte *et al.* 2009; KC *et al* 2011b).

Globally, the lack of coverage data for newborn-specific health interventions hinders assessing progress for newborn survival. In Nepal, the Health Management Information System (HMIS) expanded their list of core indicators to include early postnatal care, skilled birth attendance among home deliveries, and early initiation of breastfeeding (MoHP [Nepal] 2010). Newborn health champions within Nepal have been successful in adding questions to the national Demographic and Health Surveys, such as on clean cord care practices and drying and wrapping of babies at birth (MoHP [Nepal] *et al.* 2007).

Seizing opportunities and implementation realities

The public health system was already implementing several programmes at scale prior to 2000, providing a platform, primarily through the Safe Motherhood Programme, for newborn health. The newborn-specific national plan and streams of newborn-specific projects provided momentum for further inclusion of newborn care into this programme. With changes to policies and curricula, health workers of various cadres increasingly were trained to deliver newborn care as part of their routine activity from district hospital to peripheral health facility and in communities through FCHVs.

The greater focus on community-based newborn survival strategies reflects the current national approach to maternal and child health, though none of these strategies have applied the community action cycle as an integral component of the programming (KC *et al*. 2011b). An increase in facility-based deliveries through the provision of financial incentives and increased access to skilled birth attendants has the potential to improve coverage of newborn care; however, data to monitor coverage and quality remains limited (Bhusal *et al*. 2011). The increasing inequity among newborn-related health interventions is a growing challenge.

Institutionalization of newborn survival and the future agenda

If every mother and baby in Nepal were to receive the essential care that is now in policy and has started to be scaled up, what would be the effect? Modelling with LiST, we estimate that universal coverage of evidence-based newborn-related health interventions would save over 16 000 newborn lives in 2015 and prevent at least 8000 stillbirths. If all facility births had access to quality care and emergency obstetrical care, more than 3600 newborn lives would be saved in 2015. Moderate increases in outreach interventions such as antenatal care and postnatal care could save 5000 newborn lives in 2015 (see Supplementary Data Web Annex C).

Saving these lives is within reach, yet challenges remain. The increasing institutionalization of newborn health interventions into existing health systems (e.g. training and HMIS), delivery platforms and programmes suggests that newborn health is a priority for the government. The scale up of CB-NCP, especially the increased proportion of districts where the government is implementing without direct partner support, underlines this commitment (Figure 6). Yet, MNCH programmes have largely remained vertical, and there is a need to establish an integrated approach across the continuum of care (KC *et al*. 2011c). For example, harmonized training for FCHVs from various programmes will strengthen scale up advances. Also, the government must consider adjustments to health programmes based on results and recommendations from pilot districts, such as CB-NCP when the evaluation is final, and work to ensure that quality is not diminished with increasing coverage.

Resources, both human and financial, remain extremely limited in a diverse and geographically challenging country. Financing, specifically for newborn health, remains low and nearly half of total health expenditure is out-of-pocket (Figure 7a) (WHO 2011b). The rising funds from development partners as well as government commitment to the national free delivery policy and CB-NCP are encouraging, but progress especially for newborn survival is still vulnerable.

Conclusion

Nepal is recognized as a leader for newborn survival having developed a national newborn health strategy very early in the decade, scaling up the BPP and developing and piloting a package of community-based newborn health interventions. Global and local evidence helped build commitment and inform programmatic design, informing stakeholders who increasingly recognized newborn survival as an urgent priority in order to remain on track to achieve MDG 4. Openness for early adoption of innovation, especially community-based, has been a factor in the rapid changes seen for maternal and child survival as well as for neonatal survival. This rise of political attention for newborn survival started around the year 2000, and while initially this appeared to be newborn-selective, it is linked to ongoing maternal and child health strategies within the national health system platform. The approach in Nepal was to highlight newborn needs specifically and test and evaluate newborn-focused interventions and approaches. Future plans are to more fully integrate the newborn health package, including CB-NCP, into maternal and child health programme training and management. The leadership of MoHP with a network of champions has enabled partner harmonization and implementation of scaling up packages to reach every family and newborn. Despite Nepal's progress on community interventions and improvements in providing skilled care at birth, the recent dramatic increase in facility-based births requires more attention to the quality of care in facilities. Using evidence to inform implementation, and building upon existing systems and delivery platforms, Nepal is positioned to change the future for the 724 000 Nepali babies born each year.

Supplementary Data

Supplementary data are available at *Health Policy and Planning* Online.

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Conflict of interest

None declared.

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