

## The Impact of Health Intervention and Programs on Mortality - A Case of Early Age Mortality in Nepal

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### Abstract

*Neonatal mortality rate (NNR) has declined slowly in Nepal. Between 2001 and 2011, post-neonatal (PNN) mortality fell by 50% (26 to 13), whereas the neonatal mortality was reduced by only 15% (39 to 33). During the last 5-year period (2006-2010) NNR didn't decline while PNN declined by 13%. Hence, an increasing proportion of child deaths are in the neonatal period; 61% of all deaths in children under 5 took place in the neonatal period. Nepal Government with technical and financial support from the private sector, NGOs and External Development Partners has attempted to reduce NNR by piloting CB-NCP in 10 districts in 2009 and 2010. Analysis of Nepal Demographic and Health Survey (NDHS) 2011 data shows that Community-Based Newborn Care Program (CB-NCP) has worked as the newborn care practices have improved and NNR in intervention areas is about half (20 per 1000 live births) the level than that of the remaining areas (39) of Nepal although nationally no decline was observed in 2011 compared to 2006 (33).*

**Background:** Until the mid 1990s, exact data of the number of child deaths occurring during the neonatal period were not available. The availability of vast and accurate data on neonatal mortality in 1995 and 2000 has made it possible to analyze the scale of the neonatal problem around the world. The latest evidence is that 4 million babies die each year in their first month of life, and up to half of these die in the first 24 hours – a child is about 500 times more likely to die the first day s/he is alive than at one month of age. Moreover, nearly all (99 percent) deaths occur in low and middle-income countries (WHO 2005).

The fourth Millennium Development Goal (MDG-4) calls for the international community to reduce mortality in children younger than five years old by two-thirds between 1990 and 2015. Between 1960 and 1990, the risk of dying in the first five years of life was halved – a major achievement in child survival (Ahmad, Lopez, Inoue 2000). However, achieving MDG-4 will depend on a decrease in mortality even greater in percentage than those already achieved (Lawn et al. 2005). A decade before the target date of 2015, many have already predicted that the goal will not be met (Travis, Bennett, Haines et al. 2004). One of the main challenges identified by various research studies is that the pace of decline of neonatal mortality is slow. Between 1980 and 2000, child mortality after the first month of life – i.e., from two months to five years – fell by a third, whereas the neonatal mortality rate (NNR) was reduced by only about a quarter. Hence, an increasing proportion of child deaths now occurs during the neonatal period; data from 2000 showed that 38 percent of all deaths in children younger than age five happened in the first month of life (Zupan and Aahman 2005). To meet MDG-4, a substantial reduction in NNR is needed and reducing deaths in the first week of life is imperative.

The most recent survey of Nepal in 2011, estimated the neonatal mortality to be 33 deaths per 1,000 live births (MOHP, New ERA and ICF International 2012) declining from 50 deaths per 1,000 live births during the period 1991-1995 (Pradhan et al. 1997). However, during the most recent period (2006-2010) NNR did not decline at all from the 33 found for the previous period of 2001-2005 (MOHP, New ERA and Macro International 2007). Other childhood mortality indicators did, however, decline during the same period. For instance, during the 15-year period (1996-2010) the under-five mortality rate declined by 41 percent from 91 deaths per 1,000 live births to 54 deaths. The stagnant neonatal mortality rate during the 2001-2010 period calls for special attention to address the situation in Nepal.

Neonatal mortality is associated with the socioeconomic and demographic characteristics of mothers. Neonatal mortality is consistently lower in urban areas than in rural areas. For instance, for the period 2006-2010, NNR in urban areas was 25 deaths per 1,000 live births compared with 36 deaths per 1000

live births in rural areas. Wide differentials in NNR are observed for ecological zones with NNR ranging from a low of 33 deaths per 1000 live births in the hills to 35 neonatal deaths in the Terai to a high of 46 deaths per 1000 live births in the mountains. As expected, a mother's education is inversely related to a child's risk of dying. The NNR among children born to mothers with no education (46 per 1000 live births) is nearly two times higher than that of children born to mothers with SLC<sup>1</sup> and higher level of education (20 per 1000 live births). Babies weighing small or very small at birth were found nearly twice more likely to die than their counterparts weighing the average or greater birth weight<sup>2</sup>.

Due to the high mortality rate of infants and young children - particularly the high neonatal mortality rate and the fact that 81 percent of home deliveries occurring without the assistance of skilled birth attendant (SBA) and only 23 percent of newborns delivered at home receive post-natal care (MOHP, New ERA and Macro International 2007), the Ministry of Health and Population envisioned a Community-Based Newborn Care Program specifically for low and medium socioeconomic populations. The strategic objectives of the program are to spread awareness and bring about household behavioural changes to achieve healthy newborn practices, to promote the utilization of available newborn services, and to strengthen the quality of the preventative, diagnostic, and medical care services within the community and health facilities.

The Child Health Division (CHD) has prepared a set of manuals and guidelines to train district-level health facility and community-level health care providers and volunteers. Program preparation, training planning, and training at various levels - from the district to the community level - takes about a year. District-level health care providers and community-level volunteers, especially Female Community Health Volunteers (FCHVs), are engaged in several training programs. Training/ orientation is given and responsibilities are delegated to health care providers, volunteers, and community leaders in a district at five levels, namely 1) District Public Health Officer (DPHO) and the leader at the district level, 2) Health Management Committee at the community level, 3) Health care providers at different health facilities, 4) Community Health Workers/Auxiliary Nurse Midwives (ANMs) and 5) FCHVs (MOHP 2009).

A pilot program was launched in 10 districts<sup>3</sup> in 2009. As of mid June 2011 when data collection for the Nepal Demographic and Health Survey (NDHS) was complete, the Ministry of Health and Population (MOHP) had already implemented the Community-Based Newborn Care Program (CB-NCP) in the pilot districts. In the Doti district, CARE/Nepal had implemented CB-NCP; in Bardiya, Save the Children had implemented it. With financial support from UNICEF, Population, Health and Development (PHD) Group had implemented it in Chitwan district while Integrated Rural Health Development Training Centre (IRHDTC) had implemented it in Dang and Kavre districts. Plan Nepal implemented it in Sunsari and Parsa districts and the Ministry of Health and Population implemented it in Morang, Dhankuta and Palpa districts.

The assumptions of the program are that this effort will bring positive change in the lives of the newborn, mother, family and community. Following the pilot implementation of the program, the government intends to scale it up to the national level covering all 75 districts. Hopefully, the CB-NCP can contribute substantially to reducing NNR to achieve the MDG of 17 per 1,000 live births by 2015. The CB-NCP program trains health service providers of a variety of skill and professional levels and Female Community Health Volunteers (FCHVs) in program districts to enhance their skills relating to integrated case management of newborn health problems in both the community level and in the more formalized health facility environment. The case management process includes the assessment of the newborns, the classification of illness, treatment identification, counselling of the mother, and the provision of follow-up care. FCHVs conduct orientation programs on neonatal health

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<sup>1</sup> SLC stands for School Leaving Certificate

<sup>2</sup> Birth weights relate to the five-year period before the survey (MOHP, New ERA and ICF International, 2012)

<sup>3</sup> Doti, Bardiya, Dang, Palpa, Chitwan, Kavre, Parsa, Sunsari, Morang and Dhankuta





*FCHVs in CB-NCP Chitwan district supported by UNICEF and implemented by CHD, MOHP and PHD Group*

and care for Mothers' Groups in villages, and they are given financial incentives based on the number of newborns registered in their community.



*FCHV conducting Mothers' Group meeting in a remote Chepang village in Chitwan district, Nepal*

**Data:** This study draws from the 2011 Nepal Demographic and Health Survey (NDHS), which collected information from a representative sample of 12,674 women aged 15-49 and 4,121 men aged 15-59 (MOHP, New ERA and ICF International 2012). The NDHS contains information about a wide range of topics, including mass media exposure, fertility, family planning, infant and child health and mortality, maternal health, and HIV/AIDS related knowledge and behaviour.

The survey was conducted using a two-stage sample design. In the first stage, 289 primary sampling units (95 in urban areas and 194 in rural areas) were selected using systematic sampling with probability proportional to size. A complete household listing was conducted in all the selected primary sampling units (PSUs), which provided the sampling frame for the second stage. At the second stage, samples of an average of 35 households per PSU in urban areas and an average of about 40 households in rural areas were selected in all the regions. However, because the percentage of the urban population was too small, it was necessary to over sample the urban areas. Therefore the final sample was weighted to provide estimates for different domains.

**Methods:** For this analysis, the study population is defined as non-institutional most recent live births in the two years preceding the survey, as this was the period during which CB-NCP was already being implemented in ten pilot districts. The outcome measures included in the analysis are: (a) first post-natal check up of the newborn on the day of birth (b) breastfeeding within the first hour of birth (c) placing the newborn on belly/breast before placenta was delivered (d) instrument from a clean home delivery kit used to cut the umbilical cord (e) use of new boiled blade (f) wiping the newborn before the placenta was delivered (g) wrapping the baby in cloth before placenta was delivered and (h) bathing the baby only after 24 hours of birth. The “uncertain or don’t know” responses, if any, were included in the “no” category of the corresponding variables. Each outcome measure, thus, had a binary outcome (yes or no).

Five independent variables used in the analysis are: caste/ethnicity, mother's education, CB-NCP intervention districts or not, household wealth quintile, and urban–rural residence. Ecologically, the country is divided into 3 belts—Mountain, Hill, and the Terai (southern, subtropical belt adjoining India). Half of the total population of 26.5 million lives in the Terai belt, seven percent of the total population lives in the Mountain belt, and the rest (43%) lives in the Hill belt. The three belts are further divided into five vertical development regions, and each region consists of several districts. About 17 percent of the total population lives in the urban areas of the country (CBS 2012).

Not only is education a mechanism for transmitting and acquiring knowledge, but it is also responsible for turning knowledge into practice (Martin and Juarez 1995). The variable CB-NCP intervention districts are particularly important in this analysis in order to look at the effects of the health intervention on neonatal health. The household wealth quintile or index is a composite measure of the cumulative living standard of a household (including assets such as the type of material used for flooring, water, and sanitation facilities and the possession of televisions). The construction of the index, based on principal component analysis, is described in detail elsewhere (Rutstein and Johnson 2004). In this paper, bivariate analysis was first carried out followed by a multivariate analysis. For the latter, logistic regression was used since each outcome is binary (Retherford and Choe 1993). Sample weights were applied for all estimates (means, percentages, and regression coefficients).

**Results:** In order to save the lives of newborns and keep them healthy, it is important to promote newborn care practices. The focus of CB-NCP has been on the use of safe delivery kits (in case of a home delivery), cord care, prevention and management of hypothermia, drying and bathing the newborn, and other health care services. The CB-NCP recommends the following practices to promote newborn care: (1) wiping the newborn with a soft, dry cloth immediately after birth; (2) putting the newborn on the mother’s chest and initiating skin-to-skin contact; (3) providing advice on early (within the first hour) initiation of breastfeeding and exclusive breastfeeding for up to six months; (4) not applying anything on the cord stump; and (5) bathing the newborn only after 24 hours (Karki et al. 2010).

The CB-NCP program also promotes the health of the mothers, particularly for pregnant women. After a local Female Community Health Volunteer identifies a woman as being pregnant, she counsels the woman on birth preparedness and keeps track of her until she gives birth. Regular antenatal care is helpful in identifying and preventing adverse pregnancy outcomes. WHO recommends that a woman should have at least four ANC visits because, during these visits, health problems associated with pregnancy can be detected. In the event of any complications, more frequent



visits are advised and admission to a health facility may be necessary.

Table 1 presents information on the number of antenatal visits attended by the study population for its most recent births in the five years preceding the surveys of 2006 and 2011. The 2011 data show that 50 percent of pregnant women make four or more antenatal care visits during their entire pregnancy, which was only 29 percent in 2006<sup>4</sup>. The NDHS 2011 also shows women in ten CB-NCP districts are more likely (55%) to have had four or more antenatal visits than women from non-CB-NCP districts (49%). This pattern was the same in 2006 too, but the gap between the CB-NCP district and the non-CB-NCP districts has widened in 2011.

In CB-NCP pilot districts, the FCHV tracks the condition of the baby born at home on the day of the birth, the 3rd day after the birth, the 7th day and, finally, on the 28th day following the birth. The FCHV has to complete information on essential newborn care, the resuscitation procedure if carried out, birth weight, and she closes the baby's form on 29th day following its birth. The NDHS 2011 asked a series of questions to mothers about newborn care practices, including whether or not they gave birth outside a health care institution for their most recent delivery in the two years preceding the survey.

The CB-NCP promotes institutional delivery and the NDHS 2011 data, overall, shows an increase in institutional deliveries (35.3%) in 2011 compared to 2006 (17.7%), but this increase is significantly higher (44.5%) in intervention districts than in the rest of the country (33.1%, Table 2).

Newborn care is essential to reduce neonatal problems and death. To identify, manage, and prevent complications, the government of Nepal recommends at least three postnatal checkups for the newborn within seven days of delivery, which is considered a critical time period for neonates and mothers.

Table 3 shows the percent distribution of last births in the two years preceding the survey by timing of the first postnatal check-up after

Table 1 Percent distribution of women who had a live birth in the five years preceding the survey by number of ante natal care (ANC) visits for the most recent live birth according to whether districts are CB-NCP or not, Nepal 2006 and 2011

Survey and number of ANC visits	Type of districts		Total %
	CB-NCP pilot districts	Non-CB-NCP districts	
NDHS 2006 ***			
None	19.1	27.8	26.2
1	10.9	8.0	8.5
2	15.3	16.1	16.0
3	21.9	19.4	19.8
4+	32.9	28.7	29.4
Total %	100.1	100.0	99.9
Total n	727	3,339	4,066
NDHS 2011 ***			
None	11.1	16.2	15.2
1	4.7	6.5	6.2
2	10.7	12.7	12.3
3	18.2	15.9	16.4
4+	55.3	48.7	50.0
Total %	100.0	100.0	100.1
Total n	826	3,320	4,146

Significant at \*\*\*p<0.001.

Table 2 Percent distribution of live births in the five years preceding the survey by place of delivery according to whether districts are CB-NCP or not, Nepal 2006 and 2011

Survey and districts	Place of delivery		Total %	Total n
	Institutional	Non-institutional		
NDHS 2006 ***				
CB-NCP pilot districts	21.3	78.7	100	994
Non-CB-NCP districts	16.9	83.1	100	4,551
Total	17.7	82.3	100	5,545
NDHS 2011 ***				
CB-NCP pilot districts	44.5	55.5	100	1,052
Non-CB-NCP districts	33.1	66.9	100	4,339
Total	35.3	64.7	100	5,391

Significant at \*\*\*p<0.001.

<sup>4</sup> It must be noted that during the five years preceding the NDHS 2006 there was no CB-NCP program but because the purpose is to compare 10 districts with the rest of the country in 2006 and in 2011 they are labeled as CB-NCP districts even in 2006.

birth, along with the percentage of births with a postnatal check-up in the first week after birth according to background characteristics.

Twenty-eight percent of newborns were taken for their first postnatal check-up within 24 hours after birth. Four percent of babies had a postnatal check-up within one to six days after being born (Table 3). The proportion of postnatal checkups within 24 hours after birth is highest among mothers with higher education (48%). Similarly, the proportion is higher among women from urban areas (46.0%), CB-NCP pilot districts (34.6%), middle income or higher level quintiles, and the Bahun caste - known as the highest caste group.

The majority of newborns (68%) did not receive a postnatal check-up, and four percent received postnatal checkups between one to six days after birth. Newborns delivered in non-CB-NCP pilot districts were less likely to receive a postnatal check-up within the first week after being born (30%) than newborns delivered in CB-NCP pilot districts (41%, Table 3).

Table 3 Percent distribution of last births in the two years preceding the survey by time after birth of first postnatal check up, and the percentage of births with a post natal check up in the first week after birth, according to background characteristics, Nepal 2011

Background Characteristics	Time after birth of newborn's first post natal check up				Number of births
	On the day of birth	1 to 6 days	No PNC <sup>1</sup>	Total	
<b>Residence***</b>					
Urban	46.0	6.3	47.6	100.0	189
Rural	25.9	3.9	70.2	100.0	1,841
<b>Mother's education***</b>					
No education	17.1	3.5	79.5	100.0	862
Primary	27.5	2.3	70.2	100.0	393
Some secondary	33.4	5.8	60.7	100.0	428
SLC and above	47.6	5.8	46.7	100.0	347
<b>Wealth quintile***</b>					
Poorest	10.6	2.5	86.9	100.0	489
Poorer	21.0	5.1	73.8	100.0	428
Middle	29.4	2.8	67.8	100.0	469
Richer	38.0	6.2	55.8	100.0	371
Richest	52.0	5.1	42.9	100.0	273
<b>Type of programme area***</b>					
CB-NCP pilot districts	34.6	6.0	59.3	100.0	381
Non-CB-NCP districts	26.1	3.7	70.2	100.0	1,649
<b>Caste/ethnicity ***</b>					
Chhetri/Thakuri	29.0	4.9	66.1	100.0	369
Bahun	42.7	5.8	51.5	100.0	206
Janjati	25.2	4.4	70.3	100.0	698
Terai Middle Castes	24.7	2.9	72.4	100.0	239
Dalit	22.5	4.1	73.4	100.0	364
Muslim	33.1	0.6	66.2	100.0	154
<b>Total</b>	27.7	4.1	68.1	100.0	2,030

Significant at \*\* p<0.01; \*\*\*p<0.001

<sup>1</sup> Includes "don't know" cases

Table 4 presents the percent distribution of last births in the two years preceding the survey by types of provider of newborn care during the first two days after delivery, according to background characteristics. The table shows that 25 percent of newborns received postnatal care in the two days following birth from a doctor, nurse, or midwife. An additional four percent of newborns received care from a health assistant, AHW, MCHW, or VHW. About two percent received care from an FCHV, but significantly more (3.1%) newborns received care from an FCHV in CB-NCP pilot districts than in the non-CB-NCP districts (1.2%). In CB-NCP pilot districts, FCHVs are likely to play a more active role in taking care of newborns than in other districts.

In CB-NCP pilot districts significantly higher proportions of newborns were checked by Doctor, Nurse/ Midwife, Health Assistant/AHW and MCHW/VHW than in non-CB-NCP districts (Table 4). Under the CB-NCP program all health facility-level health care providers are trained in providing neonatal services. At the grass roots level FCHVs are given basic training and orientation on pregnancy care and neonatal care immediately after delivery. In addition, community leaders are also given orientations on the importance of neonatal and pregnancy care so that they refer or inform nearby health care providers about pregnant women and deliveries.

Table 4 Percent distribution of last births in the two years preceding the survey by type of provider of the newborn's first postnatal health check, during the two days after the last live birth, according to background characteristics, Nepal 2011

Background Characteristics	Type of health provider of newborn's first postnatal check up						Total	Number of births
	Doctor	Nurse, midwife	Health assistant / AHW	MCHW /VHW	FCH V	No PNC in 1st 2 days after birth		
<b>Residence***</b>								
Urban	28.2	20.2	1.1	0.5	0.0	50.0	100.0	188
Rural	8.1	14.2	2.4	1.6	1.7	71.9	100.0	1,842
<b>Mother's education***</b>								
No education	4.3	8.7	2.6	1.4	1.5	81.5	100.0	861
Primary	5.6	15.3	2.8	2.0	3.1	71.1	100.0	391
Some secondary	12.6	20.0	1.6	1.6	1.4	62.8	100.0	430
SLC and above	25.9	22.4	1.7	0.9	0.3	48.9	100.0	348
<b>Wealth quintile***</b>								
Poorest	0.8	6.3	2.2	0.8	1.4	88.4	100.0	490
Poorer	3.7	13.3	1.9	1.2	4.0	75.9	100.0	427
Middle	8.1	14.5	3.6	3.4	1.3	69.0	100.0	468
Richer	15.9	21.4	1.9	0.8	0.8	59.2	100.0	370
Richest	30.5	23.3	1.1	1.1	0.0	44.0	100.0	275
<b>Type of programme area***</b>								
CB-NCP pilot districts	11.5	19.9	2.4	1.6	3.1	61.4	100.0	381
Non-CB-NCP districts	9.6	13.5	2.3	1.5	1.2	71.9	100.0	1,649
<b>Caste/ethnicity ***</b>								
Chhetri/Thakuri	10.6	16.1	0.8	1.4	2.2	68.9	100.0	367
Bahun	21.8	19.9	1.5	2.9	1.9	51.9	100.0	206
Janjati	8.2	12.8	2.1	2.4	2.1	72.5	100.1	698
Terai Middle Castes	12.9	10.0	3.3	0.0	0.4	73.3	100.0	240
Dalit	3.8	15.4	2.7	0.8	1.1	76.1	100.0	364
Muslim	10.3	19.4	4.5	0.0	0.0	65.8	100.0	155
<b>Total</b>	10.0	14.7	2.3	1.5	1.6	70.0	100.0	2,030

Significant at \*\* p<0.01; \*\*\*p<0.001

**Newborn care practices:** One important newborn care practice is care of the umbilical cord. The NDHS 2011 data shows that a new/boiled blade was used to cut the umbilical cord in 68 percent of non-institutional births in the two years preceding the survey, while instruments from a clean home delivery kit were used in 14 percent of births. In the CB-NCP intervention areas, a clean home delivery kit (CDK) was used in 23 percent of births compared to only 13 percent of births in non-CB-NCP areas (Table 5). Similarly women with higher education and belonging to richer wealth quintiles used instruments from a clean home delivery kit. Women from higher castes, such as Bahun and Chhetri/Thakuri, used instruments from a clean home delivery kit, while fewer women from the traditionally disadvantaged groups, namely Janjati and Dalit, used CDKs.

The 2011 NDHS data indicates that 59 percent of newborns were wiped and about 60 percent were wrapped in cloth regardless of whether they were born in CB-NCP districts or not, while a higher proportion (13%) of newborns were placed on the belly or breast of the mother in the CB-NCP districts than in the non CB-NCP districts (10%) before the placenta was delivered. As hypothermia

Table 5 Percent distribution of non-institutional last live births in the two years preceding the survey, by type of instrument used to cut the umbilical cord, and percentage who had something placed on stump after the umbilical cord was cut, according to background characteristics, Nepal 2011

Background characteristic	Instrument used to cut the umbilical cord					Total	Placed something on stump after cutting umbilical cord	Number of births
	Instrument from a clean home delivery kit	New boiled blade	Used blade	Other <sup>1</sup>	Don't know			
<b>Residence</b>								
Urban	18.4	73.7	0.0	5.3	2.6	100.0	46.2	39
Rural	13.9	68.0	3.7	14.1	0.3	100.0	41.0	1,103
<b>Education</b> ****								
No education	8.9	69.9	4.8	15.9	0.5	100.0	47.6	628
Primary	15.5	67.8	4.2	12.1	0.4	100.0	35.7	239
Some secondary	25.1	61.5	1.1	11.8	0.5	100.0	30.6	187
SLC and above	22.2	68.9	0.0	8.9	0.0	100.0	32.6	90
<b>Wealth index</b> ****								
Poorest	8.2	59.3	6.3	26.0	0.2	100.0	37.0	415
Poorer	13.0	68.7	3.9	13.4	1.1	100.0	40.6	284
Middle	18.9	76.8	0.8	3.5	0.0	100.0	49.4	259
Richer	20.7	76.7	0.0	2.7	0.0	100.0	37.1	150
Richest	29.4	67.6	2.9	0.0	0.0	100.0	54.5	34
<b>Caste/Ethnicity</b> ***								
Chhetri/Thakuri	18.1	51.0	4.9	26.0	0.0	100.0	30.9	204
Bahun	24.2	71.0	0.0	4.8	0.0	100.0	25.8	61
Janjati	15.8	63.0	2.3	18.1	0.7	100.0	33.3	429
Terai Middle Castes	3.0	92.5	3.0	0.0	1.5	100.0	55.6	134
Dalit	13.2	69.2	7.3	10.3	0.0	100.0	52.1	233
Muslim	8.5	89.0	0.0	2.4	0.0	100.0	64.6	82
<b>Type of programme area</b>								
CB-NCP pilot districts	23.4	62.9	4.6	8.6	0.6	100.0	40.5	175
Non CB-NCP districts	12.5	68.9	3.4	14.9	0.3	100.0	41.3	968
<b>Total</b>	14.1	68.0	3.6	13.9	0.4	100.0	41.2	1,143

among newborns is one of the principal causes of neonatal death, these practices should be more common. Immediate wiping, skin-to-skin contact, and wrapping are more frequent among urban women and among those in the CB-NCP districts (Table 6).

Nationally 73 percent of newborns are bathed within an hour of birth, a practice that is not recommended. However, the practice of first bathing has improved among mothers from urban areas, with education, and higher wealth quintiles (Table 6). Only 17 percent of mothers from the Terai middle castes bathed their babies after 24 hours. Among the Dalit, 22 percent of women report bathing newborns 24 hours after birth. Among the Janjati and Muslim women, this practice is better, but still over two in three women bathed their babies within 24 hours. In the CB-NCP pilot districts, a higher proportion (30%) of newborns are bathed only 24 hours post-birth compared with 26 percent in the non CB-NCP districts.

Early initiation of breastfeeding is important for both the mother and the child. The first liquid to come from the breast, known as colostrums, is produced in the first few days after delivery. Colostrums is highly nutritious and contains antibodies that provide natural immunity to the infant. It is recommended that children be fed colostrums immediately after birth (within one hour).



Table 6 Percentage of non-institutional last live births in the two years preceding the survey that were wiped before the placenta was delivered; the percentage placed on the mother's belly/breast before the placenta was delivered; the percentage wrapped in cloth before the placenta was delivered; and the percent distribution by timing of first bath, according to background characteristics, Nepal 2011

Background characteristic	Wiped	Placed on belly/breast	Wrapped in cloth	Timing of first bath			Total	Number of births
				Within 24 hours	After 24 hours	Don't know		
<b>Residence *</b>								
Urban	76.9	25.6	79.5	69.2	28.2	2.6	100.0	39
Rural	58.7	9.9	61.7	72.6	26.1	1.4	100.0	1,103
<b>Education**</b>								
No education	57.9	10.4	60.6	76.4	22.3	1.3	100.0	628
Primary	56.5	10.9	57.7	73.5	25.6	0.8	100.0	239
Some secondary	61.5	11.8	67.9	65.8	33.7	0.5	100.0	187
SLC and above	71.1	7.8	71.9	56.2	39.3	4.5	100.0	90
<b>Wealth index</b>								
Poorest	54.3	7.7	57.6	84.6	15.4	0.0	100.0	415
Poorer	55.6	8.1	58.3	70.7	27.6	1.8	100.0	284
Middle	60.0	12.0	62.5	63.8	33.3	3.1	100.0	259
Richer	68.9	15.8	73.0	61.2	36.8	2.0	100.0	150
Richest	97.1	23.5	97.1	55.9	44.1	0.0	100.0	34
<b>Caste/Ethnicity ***</b>								
Chhetri/Thakuri	64.7	11.3	71.4	77.3	22.2	0.5	100.0	204
Bahun	72.1	11.5	70.5	66.1	27.4	6.5	100.0	61
Janjati	57.3	10.3	59.4	67.8	31.0	1.2	100.0	429
Terai Middle Castes	56.7	9.0	52.6	82.1	17.2	0.7	100.0	134
Dalit	59.5	7.3	64.8	75.5	22.3	2.1	100.0	233
Muslim	50.6	18.3	55.4	65.1	34.9	0.0	100.0	82
<b>Type of programme area</b>								
CBNCP districts	58.6	12.6	57.5	70.3	29.7	0.0	100.0	175
Other districts	59.4	10.0	63.1	72.8	25.5	1.7	100.0	968
<b>Total</b>	<b>59.3</b>	<b>10.4</b>	<b>62.2</b>	<b>72.5</b>	<b>26.1</b>	<b>1.4</b>	<b>100.0</b>	<b>1,143</b>

Table 7 shows the percentage of most recently born children in the two years preceding the survey according to whether they were ever breastfed and when they began breastfeeding. Ninety-eight percent of children have been breastfed at some time, with negligible differences based on socio-demographic characteristics.

In slightly over one in three non-institutional deliveries (36 percent), babies are breastfed within one hour of birth. The majority (62 percent) of non-institutionally delivered babies are breastfed within one day of birth. Initiation of breastfeeding within one hour and within one day of birth varies by socio-demographic characteristics. A significantly higher proportion (39%) of newborns was breastfed within the first hour of birth in the CB-NCP intervention districts compared to the non intervention districts (36%, Table 7).

Table 7 Among last-born non-institutional live births who were born in the two years preceding the survey, the percentage who were ever breastfed and the percentages who started breastfeeding within one hour and after one hour of birth, by background characteristics, Nepal 2011

Background characteristic	Among last-born children born in the past two years			
	Ever breastfed	Started breastfeeding within one hour	Started breastfeeding after one hour of birth	Number of last-born children
<b>Residence</b>				
Urban	95.0	42.5	52.5	39
Rural	97.9	35.6	62.3	1,104
<b>Education ****</b>				
No education	97.9	29.3	68.6	628
Primary	98.7	35.3	63.4	238
Some secondary	98.9	52.4	46.5	187
SLC and above	92.2	48.9	43.3	90
<b>Wealth index **</b>				
Poorest	99.3	35.8	63.2	416
Poorer	98.2	34.9	63.4	284
Middle	95.3	33.3	62.0	258
Richer	97.4	39.5	57.9	152
Richest	100.0	45.5	54.5	33
<b>Caste/Ethnicity ****</b>				
Chhetri/Thakuri	99.0	40.9	58.1	204
Bahun	96.7	36.1	60.7	61
Janjati	98.6	41.6	57.0	429
Terai Middle Castes	97.0	19.4	77.6	134
Dalit	96.1	32.3	63.8	233
Muslim	100.0	30.5	69.5	82
<b>Type of programme area</b>				
CBNCP pilot districts*	100.0	38.5	61.5	175
Non CBNCP districts*	97.5	35.5	62.0	968
<b>Total</b>	<b>97.8</b>	<b>35.9</b>	<b>62.0</b>	<b>1,143</b>

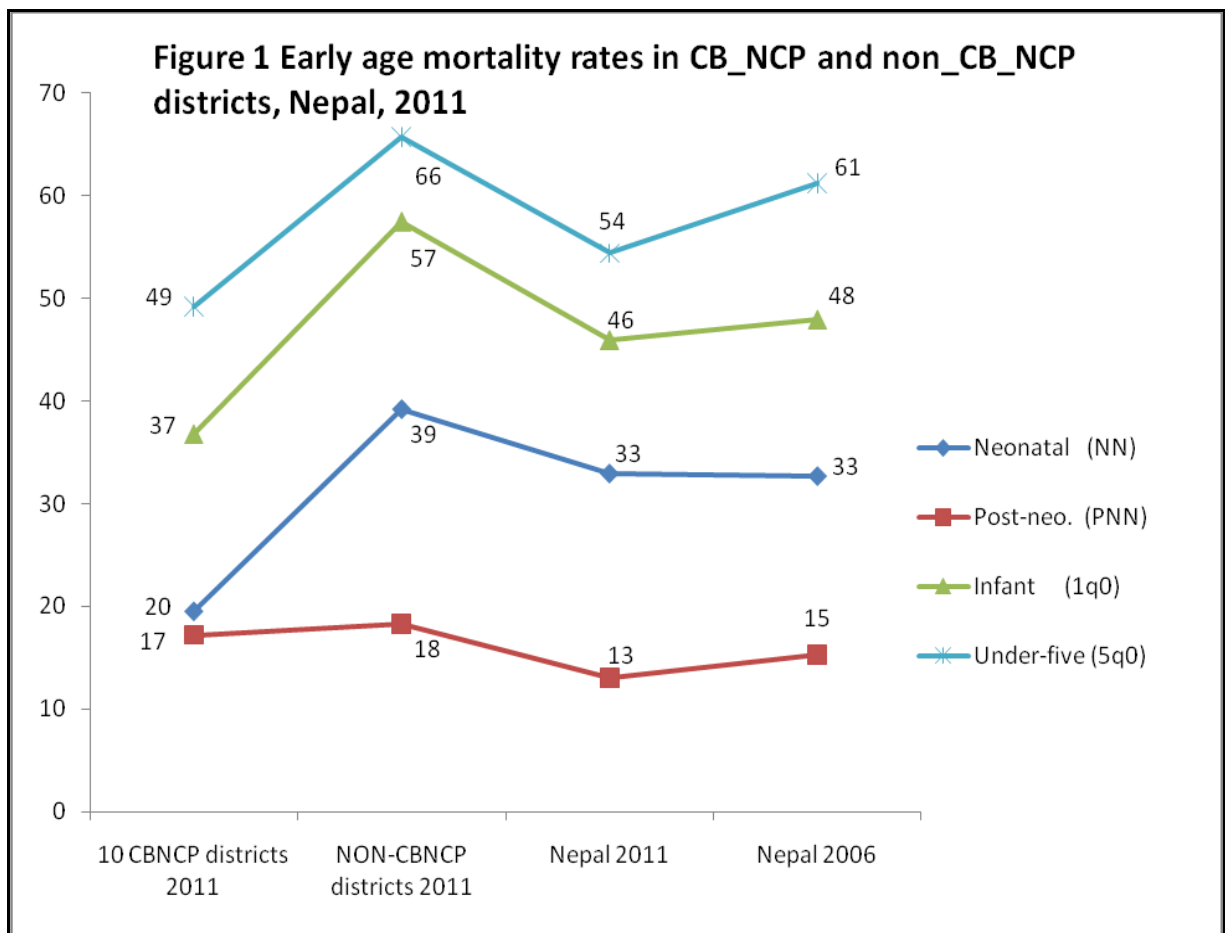
Significant at \*p≤0.10; \*\*p≤0.05; \*\*\*p≤0.01; \*\*\*\*p≤0.001.

**Multivariate analysis:** The multivariate regression analyses show several socio-demographic factors exercising important independent effects on women's behaviour relating to newborn care practices. More educated mothers were significantly more likely than others to breastfeed within one hour of birth and use CDK when the delivery is in non-institutional setting. Babies whose births had taken place in CB-NCP intervention areas were more likely to have received their first postnatal check up on the day of birth, have their umbilical cords cut using instruments from CDK, have breastfed within the first hour of birth, have been placed on mother's belly/breast, and to have been wiped and wrapped in cloth soon after birth (Table 8).

Table 8 Odds ratios from logistic regression models measuring effects of socio-demographic characteristics and community based newborn care programme on non-institutional last live births in the two years preceding the survey with respect to first post natal check up of newborn, breastfeeding, placing baby on belly/breast, CDK use, new blade use, wiping the baby, wrapping baby in cloth and bathing baby, Nepal, 2011

Characteristics	First post natal check up of newborn on the day of birth	Breastfed within one hour of birth	CDK use	New blade use	Wiped the baby soon after birth	Placed baby on belly/breast soon after birth	Wrapped baby in cloth soon after birth	Bathed the baby after 24 hours
<b>Caste/ethnic group</b>								
Chhetri/Thakuri (r')	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Bahun	2.0	0.7	1.0	1.8	1.2	1.6	0.8	0.8
Janjati	1.3	1.3	1.0	1.1	1.0	1.5	0.8	1.4
Terai Middle Castes	1.0	0.5*	0.1***	7.5***	0.7	0.9	0.4	0.4**
Dalit	1.0	1.0	1.0	1.7**	1.0	0.9	1.0	1.0
Muslim	0.8	1.1	0.4*	5.1***	0.6	2.4	0.6	1.2
<b>Education</b>								
No education (r')	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Primary	1.3	1.2	1.4	1.1	0.8	1.1	0.8	1.0
Secondary	0.9	2.4***	2.2**	0.7	0.7	0.9	0.9	1.2
Higher	0.8	2.3***	1.9	0.9	1.1	0.5	1.1	1.5
<b>Programme areas</b>								
Non-CB-NCP areas (r')	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
CB-NCP areas	2.1**	1.2	2.4***	0.6**	1.0	0.8	0.8	1.0
<b>Wealth index</b>								
Poorest (r')	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Poorer	2.3**	0.9	2.1**	1.1	1.3	1.2	1.3	2.0***
Middle	6.0**	1.0	4.4***	1.4	1.8***	2.1*	1.9**	2.8***
Richer	3.2**	1.3	4.5***	1.3	2.8***	2.7**	3.4***	3.8***
Richest	4.6**	1.3	6.3***	0.8	41.5***	4.5**	54.1**	6.1***
<b>Residence</b>								
Urban (r')	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Rural	2.5	0.9	1.3	0.9	0.7	0.5	0.8	1.6
<b>Constant</b>	0.0**	0.4*	0.0***	1.8	1.5	0.1***	1.9	0.1***
<b>Model summary</b>								
-2 Log likelihood	578	1,407	798	1,289	1,453	711	1,413	1,229
Cox & Snell R Sq	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.1
Nagelkerke R Sq	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1
<b>Number</b>	1,143	1,143	1,143	1,143	1,143	1,143	1,143	1,143

**Impact of CB-NCP on neonatal mortality:** In examining the effect of CB-NCP on early age mortality using the NDHS 2011 data, it was found that in CB-NCP intervention areas, the neonatal mortality was almost half that estimated for the non-intervention areas. In the ten districts combined where CB-NCP has been implemented, the neonatal mortality rate was 20 deaths per 1000 live births; whereas, in the remaining non-intervention areas it was 39 deaths per 1000 live births (Figure 1).



**Conclusions:** The analysis of neonatal data from NDHS 2011 indicates that the CB-NCP approach to address neonatal problems prevailing in the country are yielding positive results. Further research is needed to identify the effectiveness of the different interventions on neonatal mortality. CB-NCP is a two-pronged approach according to which community members such as FCHVs, Mothers' Group members and community leaders are mobilized and at the same time health service facilities are made capable to provide newborn care practices. Data shows that in CB-NCP districts ANC, PNC and skilled birth attendant (SBA) services are significantly higher than in the non-pilot areas. The Government of Nepal has improved service facilities in most areas of the country but community mobilization for newborn care has not been implemented simultaneously. Demand creation as well as increase in access to service utilization together may be the possible explanation for the reduction in neonatal mortality in the pilot districts.

**Keywords:** neonatal deaths, Nepal, newborn, intervention, community, care



## References

- Ahmad OB, Lopez AD, Inoue. 2000. *The decline in child mortality: a reappraisal*. Bull World Health Organ 2000; 78: 1175-91.
- Central Bureau of Statistics (CBS). 2012. *National Population and Housing Census 2011 (National Report)*. Government of Nepal. National Planning Commission Secretariat. Kathmandu. November.
- Karki, Yagya .B., P.L. Joshi, P.B. Karki, and K.B. Karki. 2010. *Midterm survey of community based newborn care program, Bardiya district*. Kathmandu, Nepal: Save the Children/CB-NCP TWG Secretariat, Child Health Division, Ministry of Health and Population, and The Population, Health and Development (PHD) Group.
- Lawn JE, Causens SN, Wilczynska K. 2005. *Estimating the causes of four million neonatal deaths in the year 2000: statistical annex – the world health report 2005*. Geneva: World Health Organization.
- Martin TC, Juarez F. 1995. *The impact of women's education on fertility in Latin America: searching for explanations*. Int Fam Plan Perspect. 1995;21:52-57.
- Ministry of Health and Population (MOHP). 2012. *Nepal Demographic and Health Survey 2011*. New ERA and ICF International, Calverton Maryland, USA. March.
- Ministry of Health and Population (MOHP). 2007. *Nepal Demographic and Health Survey 2006*. New ERA and Macro International Inc.
- MOHP. 2009. *CB-NCP*. Department of Health Services. Kathmandu, Nepal (in Nepali).
- Pradhan, A, Aryal, R. H., Regmi, G., Ban, B. and Govindasamy, P. 1997. *Nepal Family Health Survey 1996*. Kathmandu Nepal and Calverton, Maryland. USA.
- Retherford RD and Choe MK. 1993. *Statistical Models for Causal Analysis*. New York, NY: John Wiley.
- Rutstein SO, Johnson K. 2004. *The DHS Wealth Index. DHS Comparative Reports No 6*. Calverton, MD: ORC MACRO.
- Travis P, Bennett S, Haines A, et al. 2004. *Overcoming health-systems constraints to achieve the Millennium Development Goals*. Lancet 2004;364: 900-06.
- WHO. 2005. *The World Health Report 2005: Make Every Mother and Child Count*. WHO. Geneva.
- Zupan J. and Elizabeth Aahman. 2005. *Perinatal mortality for the year 2000: estimates developed by WHP*. WHO. Geneva.