

Early Impact of an Integrated MNCH Program on Newborn and Child Health Outcomes, Northern Nigeria, 2009 to 2011

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BACKGROUND

Of the seven million deaths of children under the age of five that occurred worldwide in 2011, at least two-thirds could have been prevented by low-cost, integrated newborn and child health (NCH) interventions.[1, 2] The majority of global childhood deaths, largely due to neonatal problems, pneumonia, diarrhea and malaria, occur without any contact with the formal health system. More simply put, most children die in their own homes.[3] Accordingly, recent evidence from the 2008 Lancet Alma-Ata series suggests that interventions centered on scaling up community and household care, in particular, have had a significant impact on newborn and child survival.[4] Such interventions have included promotion of early initiation of breastfeeding, early postnatal follow-up care of newborns, exclusive breastfeeding for at least six months, increasing recognition of danger signs of illness among caregivers, and case management of acute febrile illnesses during early childhood.[2, 3, 5, 6] As integrated maternal, newborn, and child health (MNCH) packages are now being delivered to-scale across many low-income countries, there has been an acceleration in the decline of global childhood mortality since 2000.

In Sub-Saharan Africa, where 1 in 9 children under five will die each year, reductions in childhood mortality have been slower than in the rest of the world, including Southern Asia.[1] While there are a number of contributory factors to this regional disparity (e.g., extreme poverty, low female education and autonomy, inadequate health system infrastructure), a major obstacle is the inaccessibility to human resources for health.[7] Countries with higher density of health professionals per capita have been found to have higher rates of infant and child survival. Sub-Saharan Africa has the lowest health worker density in the world at 2.3 per 1,000 population.[8] This association is also notable within countries between rural and urban areas, resulting in a geographic misdistribution where workers are most concentrated in urban regions.[9] In light of these obstacles to care, the use of community health workers (CHWs) has emerged as a solution with the strongest potential to strengthen primary healthcare delivery in sub-Saharan Africa.[10, 11] CHWs are described as “members of the communities where they work, should be selected by the communities, should be answerable to the communities for their activities, should be supported by the health system but not necessarily a part of its organization, and have shorter training than professional workers”.[12] The effective use of CHWs has the capacity to address the three major gaps in service delivery: coverage, equity and quality.[7] Limited data has suggested that this cadre of health worker is uniquely capable of reaching children most at risk, those from the poorest families and those living in remote areas.[4, 13]

In Nigeria, the most populous country in Africa and a country with the second highest burden of child deaths in the world, the need to improve child survival is paramount.[3] Further, within Nigeria there are marked differentials in child mortality rates, with rates in the northern states two to three times higher than in the southern states. [14] In response to this need, the Partnership for Reviving Routine Immunization in Northern Nigeria (PRRINN) was established in 2006 in four northern states of Nigeria (Jigawa, Katsina, Yobe and Zamfara) and then, in 2008, expanded to include maternal, newborn and child health (PRRINN-MNCH). The program is comprehensive, encompassing multiple aspects of the health system including human resources, health governance, health information, strengthening of clinical services, and community engagement in order to reduce maternal, newborn and child mortality. The strategy adopted is to focus on revitalizing comprehensive primary care services using a cluster approach which builds capacity for the provision of emergency obstetrical care services at selected facilities, with strong primary care facilities support care and referrals to these designated centers in each cluster. Attention is paid to training of health care workers at all levels in this cluster, as well as building the demand for health care services within communities served by these designated emergency care facilities. The program utilizes an operations research approach that promotes progressive learning, with studies supporting continuous improvement of program activities.

A key element of this integrated strategy is the development of a network of CHWs, who bridge between the household and the health facility. This paper will focus on the effects of the community based service delivery program within PRRINN-MNCH from 2009 to 2011. Specifically, we will report changes in newborn and child health care knowledge and behaviors among caregivers, and changes in newborn and child morbidity.

METHODS

Intervention Design

The focus of this study is on the impact of the maternal, newborn, and child health interventions which were implemented three of the four northern Nigerian states where PRRINN has expanded its MNCH activities, namely Katsina, Yobe, and Zamfara, with respective populations of 5.8, 2.3, and 3.3 million, according to the 2006 population census of Nigeria. The program design focuses on improving maternal, newborn and child health (MNCH) care by clusters of local government areas (LGAs) per state, which each comprise a catchment area for emergency obstetrical care (EOC) services. A total of 15 LGAs were selected as the first intervention clusters, 4-6 per state. The remaining LGAs were designated as either “low-intensity” areas, characterized by having statewide policy changes without activities to improve health system infrastructure and MNCH care demand, or control areas.

The health system strengthening component of the intervention includes upgrading EOC services within local health facilities, midwife training and posting through the Nigerian government’s Midwife Service Scheme, establishing planning and management techniques within existing facilities and establishing the “Primary Health Care Under One Roof,” which consolidates and coordinates the different components of primary care in one health clinic or post. Complementing these supply-side changes, are activities that create demand for MNCH services. Selected groups of villages served by primary care facilities linked to the upgraded EOC facility participate in a community engagement process, which aims to increase awareness of and change health behaviors to respond to MNCH barriers. Core to this process is a community discussion group methodology, facilitated by trained community volunteers (CVs), which provides a space for reflection and problem solving for the most prevalent MNCH problems affecting the community. CVs are recruited in each community and trained to do outreach and social mobilization, emphasizing the use of community discussion groups and jingles and other visual-auditory cues to educate about critical MNCH issues, such as danger signs for a pregnancy or the timing of childhood vaccinations. In addition to these health education roles, the CVs also aid in identifying at risk women and children and referring them to the nearest facility for care.

Between 2010 and 2013 almost 30,000 CVs, primarily women, have been recruited, mobilized and supported in their work in over 3600 communities. Community discussion group participants are encouraged and supported to establish emergency systems to tackle key barriers of access to and affordability of MNCH services, including establishment of blood donor groups, community emergency savings schemes, community emergency transport schemes and a “mother’s helpers” system. Members of the discussion groups are encouraged to share what they know with their families and peers between sessions, leading to rapid saturation of the entire community with new ideas. This work is reinforced by mass communication activities, including the use of radio “jingles” to promote birth preparedness or childhood immunizations. Lastly, in the year before the mid-term household survey the program also developed a small cadre of CHW providing community-based service delivery (CHW-CBSD), to provide primary health services directly to families through rotating visits or extended availability through residence in the communities. This category of CHW was recruited among unemployed but previously trained Junior Community Health Extension Workers (trained by the state Schools of Health Technology), who were then given additional training and tool kits to enable them to make home visits, engage mothers using supportive communication techniques, provide basic preventive antenatal care (ANC) and NCH services, as well as limited treatment per Integrated Management of Newborn and Childhood Illness, and refer to the primary health care facility for treatment as needed. The CHW CBSD are provided with transport to enable visit families in communities on a regular basis, spending most of their time visiting and providing preventive and basic treatment services in the community. At the time of the mid-term household survey these CHWs were active in 25 communities, all of which also had CVs supporting their work through community education and mobilization.

Evaluation Design

The assessment of the impact of the CBSD programs uses a quasi-experimental design using pre- and post-intervention household surveys in both the intervention and control communities. The pre-intervention or baseline household survey (BHS) was conducted in 2009 and the post-intervention survey, the midterm household survey (MHS) was conducted in 2011. This program is grounded in the hypothesis that this multi-component intervention will lead to changes in health knowledge and behaviors and attitudes towards existing services, resulting in increased service utilization and improved health outcomes. The evaluation of the impact of this integrated MNCH package takes into account both availability of program and actual individual participation in any of the program's community-based service activities. Availability of the program activities was assessed by comparison of intervention and control areas. Individual exposure to the program was assessed by the woman's responses regarding the source of information or health care advice, which allowed for different sources corresponding to the alternative CBSD strategies.

Study sample

The sampling plan was a stratified two-stage cluster, random sample, with oversampling of individuals in the MNCH intervention clusters. Individuals from MNCH clusters were oversampled using a ratio of 2:1, even though MNCH clusters cover a significantly lower proportion of the population of each state. In the BHS there were 24 Local Government Areas (LGAs), with 3,901 households sampled in the intervention area and 2,444 in the control areas. For the MHS, the same intervention LGAs were included, but we excluded LGAs of the state capitals (considered not an appropriate control for the largely rural intervention). This left 15 LGAs in the sampling frame for the MHS. The MHS sample size was 770 per state, yielding a sample of 1,577 households in the intervention areas and 733 in the control areas. In both the BHS and MHS, the number of households at the first stage was proportional to the size of the unit, the enumeration area in the baseline and the LGA in the MHA. In the MHS, communities in the intervention LGAs were included in the intervention if it was confirmed that PRRINN-MNCH programs had been active in the community. In the MHS, sampling within each community was also proportional to size within each intervention and control LGA. The sampling fraction for each community was determined by information on the total households from the community leadership. For both surveys, households within each selected community were randomly sampled using a procedure similar to that used in the WHO-EPI cluster surveys, namely by numbering then sampling households according to the community sampling fraction along randomly selected paths leading out from the center of the village.

The household was the ultimate sampling unit. In compounds that comprised one to three households, one household was randomly chosen for interviews; in compounds with four to six households, two were surveyed; in compounds with seven or more households, three were surveyed. Within each randomly selected household, in the baseline survey, all ever-married women of childbearing age (15-49 years) were interviewed, whereas in the mid-term survey only one ever-married women with at least one child born in the last 5 years was selected for interview. In the BHS there were 6,842 women with successfully completed interviews, while in the MHS there were 2,310 completed interviews.

Analysis

The dependent variables are the key health behaviors pertaining to newborn care and care of sick children. Baseline and mid-term data were separately analyzed using appropriate sampling weights. The two sets of survey data were separately analyzed using appropriate sampling weights, and bivariate tests (Chi-square, t-tests and z-scores) were used to test for significant differences between the key indicators measured by the BHS and the MHS. In addition to the comparison between the two periods of time, the analyses also test for significant differences between the BHS and the MHS results by intervention status (intervention or control). Analyses were performed using Stata 11.0 (Statacorp, College Station, TX) and SPSS version 19.0 (SPSS Inc. Chicago, Ill).

RESULTS

Respondent Characteristics

The women interviewed with the MHS are younger and of lower social status, characteristics often associated with poor access health care workers or services. In both rounds, most women interviewed were between the ages of 20 and 34, but there was a shift toward slightly younger ages in the MHS. (See Table 1). Virtually all women interviewed were currently married, and about 80% were monogamously married. The proportion polygamous rose slightly from 19.3% to 23.3% in the MHS. Over 80% of women had no formal schooling, and among those with some schooling, there were fewer women at mid-term who had attended more than primary school (27.9% at midterm, versus 47.0% at baseline.) The majority of women in both surveys could not read or write any language (Hausa, Arabic, English). Most families earned their living by subsistence farming, with 57.0% raising millet and 29.0% raising corn. Two-thirds of the families were self-sufficient from their own production in the year prior to the survey. Two-thirds of women work without cash income on the family farm, maintaining the household, and raising children. Roughly one-third considered themselves full-time housewives (30.3% vs. 43.6%, BHS vs. MHS). Only 44.3% at the baseline vs. 33.0% at midterm worked for cash or in-kind earnings doing farming, food processing or agricultural processing. The most common alternative sources of income were trading (17.5% vs. 26.4%, BHS vs. MHS). Women interviewed in the MHS also were more likely to have access to a cell phone (7.9% vs. 31.7%, BHS vs. MHS).

[Table 1 about here]

The majority of the households (about 80% in both surveys) included only one family, but if the household has more than one family in the compound, there were an average of 2.5 families living together. There were an average of four women living in each household, and of these women, on average 1.5 had given birth in the past year.

Newborn and Child Health Outcomes

In 2011, more infants were protected from tetanus. The proportion of women who had received anti-tetanus vaccinations had increased from 69.0% to 85.0%, with the increases equal in the control and the intervention areas. There was a significant increase in the proportion newborns first breastfed within 24 hours from birth, from 42.9% to 57.5%, with significantly more (60.5%) in the intervention areas. (See Table 2) Fewer infants had a postnatal check by a health worker within 48 hours of birth, down from 39.2% at baseline to 27.5% in the intervention and 18.9% in the control areas. However, there was a large change in who checked on the newborn. At baseline, the majority of newborns were checked at home by the traditional birth attendants (TBAs) (40.8%), while at the mid-term most newborns were checked by a nurse/midwife at the health facility, 51.3% in the control areas and 38.6% in the intervention areas. More newborns were checked by CHWs, with even more in the intervention (46.3%) than control areas (35.8%). There was a significant increase in newborn care provided to the infant: cord care from 7.0% to 26.4%, washing the baby in warm water from 39.1% to 52.9%, kangaroo care from 16.8% to 17.5%, breastfeeding within eight hours from 15.6% to 39.3%, and newborn vaccinations from 3.1% to 22.2%. (See Figure 1) Consistently, the provision of newborn care elements was significantly greater in the intervention than in the control zone, the sole exception being newborn vaccinations. At the midterm in 2011, significantly more women were told about how to care for their newborn, up from 68.1% to 71.6%, with even more informed in the intervention than control areas. The other major change was a shift from relying on the TBA for information about newborn care (from 48.4% to 11.0%) to CHWs (from 6.8% to 11.7%, and further increase to 13.9% in the intervention communities). The impact of the community discussion groups is seen in the large share of women learning about newborn care from women's groups, friends, and family.

[Table 2 about here]

At the midterm follow-up, most women knew at least one of the newborn danger signs, with the most commonly known danger sign being high fever, known by 82.7% in the control and 84.2% in the intervention communities. (See Table 3) Many women knew other critical danger signs that indicated the need for the baby to be seen by a health worker. In the intervention areas, 31.0% knew to worry about diarrhea, dehydration and sunken fontanel and about fitting or convulsions, significantly more than in the control areas. Women in the intervention areas were also more likely to know about breathing problems and not being able

to suckle or refusing to feed. About half (47.2%) of the newborns experienced at least one of these danger signs during the first six weeks of life, with no difference in the frequency between control and intervention areas. Of those with one of the danger signs, the most common danger sign was fever, with significantly more of the newborns having fever in the control (31.8%) than intervention communities (27.8%). One in five newborns in the intervention communities (20.6%) cried excessively, noted by significantly more mothers in the intervention than control communities (16.6%). More newborns in the intervention versus control communities were also noted to have breathing problems (18.0% vs. 14.9%). The next most common danger signs were diarrhea and swollen stomach, each experienced by about 16% of all newborns in the control areas and 19% in the intervention areas.

[Table 3 about here]

One-third (32.6%) of the households reported a sick child (under age 5) in the month prior to the interview. The average duration of illness was 7.8 days. The most common illnesses were fever (presumed to be malaria) (26.5%), diarrhea (17.4%), cough (13.3%), and malnutrition or weight loss (13.7%). One in ten (11.2%) children had both fever and cough, as did another 10.1% who had diarrhea and malnutrition (See Table 3). The reported illness prevalence rates were slightly higher in the intervention than control communities.

Between the BSH and MHS in 2011, Table 2 shows there was a shift in the source of advice about the care of sick children. More women in the intervention communities knew about the care of their sick children, with only 22.5% in the intervention areas and 28.3% in the control areas having no one to teach them about the care of their sick children. More women learned how to care for sick children from CHWs, both at the health post and in the community, with CHWs providing this information to 14.5% in the control communities and 23.8% in the intervention communities. Fewer relied on family and friends in the intervention communities, 27.1% vs. 32.2% in the control communities. In the intervention communities, fewer women went to a TBA or drug vendor/ chemist for advice on treating a sick child.

In both time periods and regardless of the child's symptoms, about one-third of all mothers with sick children in the past month reported seeking no advice and providing no special care to the sick child. (See bottom row, Table 4) Approximately one in twelve (8%) mothers in the intervention communities gave additional fluids, including breastfeeding more, to their children with fever, cough, fever and cough, and diarrhea, compared to slightly fewer giving fluids in the control communities. Although the reported rate of giving ORS declined between the BSH and MSH, in the intervention communities over one in ten (9.2% to 13.8%) gave oral rehydration solution (ORS), compared to an ORS usage rate of 5.0% or below in the control communities.

[Table 4 about here]

Over one-third used an analgesic (paracetamol) to reduce fever at both baseline and mid-term follow-up, with more using analgesics for diarrhea at mid-term than at baseline. (See Table 4) Approximately one-third of all mothers also used antibiotics to treat their children's fever, cough, or diarrhea. Use of antibiotics generally was less at the mid-term than baseline, but there were different directions of change in the control and intervention communities. Antibiotic treatment of fever dropped to 26.4% in the control communities, compared to 32.2% in the intervention communities. A similar pattern was seen for the treatment of fever and cough. The reverse was seen for cough, for which only 31.4% of the mothers in the intervention communities gave antibiotics, compared to 37.7% in the control communities. This alternate pattern was also seen for antibiotic treatment of diarrhea, higher in the control (37.7%) than intervention (34.6%) communities. Use of anti-malarials dropped precipitously between the baseline, when 57.5% used them for fever and/or cough, down to 20% or less in both the intervention and control communities at the mid-term follow-up. About a quarter of mothers in both the control and intervention communities also reported using cough medicine or other patent medications for cough, with or without fever. Between the BSH and MSH, there was also a significant increase in the reported use of traditional medicine or herbs, particularly in the intervention communities, where the use of traditional medicine or herbs was almost double that reported in the control communities for the treatment of fever and/or cough.

Between 2009 and 2011, there was a decline in both the infant and the under-five mortality rates. (See Figure 2) In 2009 the infant mortality rate (IMR) was 90.0 deaths per 1000 live births, and this fell to 79.0 in the control communities and 50.5 in the intervention communities, averaging 58.5 in both. During this same period, the child mortality rate declined from 160 to 104 in the control communities and 84 in the intervention communities.

DISCUSSION

Although the PRRINN-MNCH Programme had been underway for just over two years when the MSH was conducted, there already was evidence of significant improvement in several of the key newborn, and child health behaviors and outcomes. The level of newborn and child morbidity remains high in these communities, with almost half of all newborns reported to show one of the danger signs and one-third of young children experiencing an illness episode in the previous month. What is changing is what their mothers are doing about these health crises. At the baseline in 2009, there were many more women who did not seek advice and who did not respond as quickly or as thoroughly as at the follow-up in 2011.

Fairly consistently, the intervention communities display improved neonatal and newborn care practices. More women in the intervention than control communities started breastfeeding immediately and exclusively, had their newborns checked by a health worker, washed their baby in warm water, kept the infant warm with kangaroo care, and knew to watch the infant for fever or other danger signs. These all were topics addressed in the community discussion groups or dialogues organized by CVs recruited and trained by the project, and the changes in care of the newborn immediately after delivery reflect this increased community dialogue, awareness and support for the need to keep an eye on the mother and newborn during this critical period. The dialogues also encouraged women to go to the CHW or the health worker at the closest health post instead of the TBA, because these trained individuals can do more to help the mother recognize and respond to any problems that might develop.

A second pattern seen in these results is the increased reliance on CHW for information about care of the newborn or sick child. At baseline, almost half of all newborns were checked by a TBA, whose activities generally consisted of assistance with cord care and cleaning up the baby. At the midterm follow-up two years later, hardly any women took their newborns to be seen by a TBA. Instead, they had their babies check by the midwife or CHW at the health post or by a CHW making an outreach visit to the community. The availability of these trained health workers was the direct result of the program's efforts to place midwives in the intervention clusters and to train CHWs on newborn care. The community dialogues generated the awareness and confidence in going to these women for advice on their newborns. A similar pattern is seen for seeking advice on the care of sick children, with the intervention group showing increased reliance on the midwives and CHWs and less on the TBA or family and friends.

Another critical change in newborn care is the increased understanding and ability to observe newborn danger signs. In the intervention communities, more women knew newborn danger signs and they also knew more of them. Mothers in the intervention communities reported higher incidence of some of the newborn danger signs, but this likely reflects their new found understanding that these signs are not "normal" and require the mother to have her child treated quickly. While we were not able to monitor what happened when these danger signs were observed, women reported that almost half of their newborns had shown at least one of these danger signs, with the most common being a high fever. It is likely that this level of observation was connected to taking steps to seeking urgent care, as that is what the danger sign message is all about. The higher quality and availability of care at the primary health centers would have given women confidence that arriving their with their newborn could indeed be a life-saving trip.

Although the recognition and treatment of sick children (under age 5) was less a priority in the initial implementation of the program, there was some evidence that mothers were responding with more home care

for their sick children. Overall, mothers reported lower utilization of ORS packets, but that change is likely related to a shift from use of the pre-packaged ORS to the instructions on mixing the sugar-salt solution at home. In the control communities, there was hardly any use of ORS at the midterm point in 2011, whereas in the intervention areas, over one in ten mothers were mixing up sugar-salt solutions to give their children at home for fever, with and without cough, and diarrhea. They also reported giving more fluids to their children, though the differences were not significant between the control and intervention areas. Both changes reflect the influence of the community discussions in the intervention areas, where women in the community learned about the importance of rehydration and how to mix the sugar-salt solutions.

This study has several limitations. First, we did not combine the datasets for an integrated analysis of the behavior change between baseline and midterm, which limits the analysis to a comparison of means and proportions. The pre-post comparison between the BHS and the planned End-of-Project Survey (May 2013) will include this merger of data, enabling regression analyses to be used to identify the predictors of behavior change and health outcomes. Second, all behaviors and health outcomes are by self-report, with no medical verification of the health events or deaths. As in any retrospective self-report, particularly of infant and child deaths, there is likely to be under-reporting. We assume that the level of under-reporting for these events is comparable across both surveys, but with the increased push for birth registration by the programme, it is possible that the reporting of births and deaths is higher in the MHS, which would tend to upwardly bias the mortality estimates relative to the BHS. Third, and most importantly, the CHW intervention components were only operational for approximately one year prior to the MHS, and hence the period of exposure is more limited for these elements of the intervention. The lack of change for some indicators between the BHS and MHS may therefore be due to limited exposure to the intervention. The End-of-Project Survey will permit a longer duration of exposure to be assessed, and it will include a more detailed set of measures of program participation.

These limitations notwithstanding, the net result of the changes in understanding about newborn and sick child care are evident in the observed declines in infant and child mortality rates during this short time period. Declines in both rates were observed in both the control and intervention areas, but they were significantly greater in the intervention communities. A number of changes in the intervention communities and in the primary care system are likely to have contributed to the decline in infant mortality from baseline to mid-term. The marked increase in anti-tetanus vaccination rates likely reduced neo-natal deaths from this disease, and the increases in early and exclusive breastfeeding likely further protected the newborn from exposure to bacteria. Most importantly, it is very likely that the changes in understanding about newborn care—both the importance of a prompt check by a qualified person and the need to be vigilant for danger signs in the newborn—contributed to the significant decline in infant mortality which has been observed in the intervention communities.

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Table 1: Background characteristics of respondents, Northern Nigeria, 2009 vs. 2011

Background characteristics	BHS 2009 Number (%)	MHS 2011 Number (%)
<i>Age group (years)</i>		
15–19	344 (4.7)	179 (7.8)
20–24	820 (11.1)	529 (22.9)
25–29	1,417 (19.2)	608 (26.3)
30–34	1,618 (22.0)	526 (22.8)
35–39	1,176 (16.0)	281 (12.2)
40–44	1,015 (13.8)	147 (6.4)
45–49	982 (13.3)	29 (1.3)
<i>Marital status</i>		
Married	6,664 (97.2)	1581 (99.0)
Widowed	78 (1.1)	5 (0.3)
Divorced or separated	115 (1.7)	10 (0.6)
<i>Rank of wife</i>		
1	5,401 (80.6)	1182 (76.2)
2	1,128 (16.8)	301 (19.4)
3 +	175 (2.7)	68 (4.4)
<i>Formal education</i>		
Yes	1,293 (18.8)	219 (13.9)
No	5,593 (81.2)	1358 (86.1)
<i>Level of formal education</i>		
Primary	713 (53.0)	155 (72.1)
Secondary	466 (34.7)	34 (15.8)
Post-secondary	166 (12.3)	26 (12.1)
<i>Reading and writing in Hausa</i>		
Not at all	5,373 (78.1)	1392 (89.5)
With difficulty	644 (9.4)	82 (5.3)
Easily	864 (12.6)	81 (5.2)
<i>Reading and writing in Arabic</i>		
Not at all	4,174 (60.5)	1352 (85.9)
With difficulty	1,635 (23.7)	167 (10.6)
Easily	1,093 (15.8)	55 (3.5)
<i>Reading and writing in English</i>		
Not at all	6,076 (88.3)	1511 (96.0)
With difficulty	410 (6.0)	36 (2.3)
Easily	399 (5.8)	27 (1.7)
<i>Occupation</i>		
Food processing	2,480 (36.2)	449 (28.5)
Agricultural processing	310 (4.5)	70 (4.5)
Farming	249 (3.6)	0 (0.0)
Trading/Selling	1,200 (17.5)	410 (26.4)
Housewife	2,079 (30.3)	682 (43.6)
Other	534 (7.8)	105 (6.7)
<i>Cell ownership</i>		
Yes	543 (7.9)	500 (31.7)
No	6,363 (92.1)	1077 (68.3)
Number	6,906	2,310

Notes: Some percentages may not add up to 100 due to rounding of decimals. Some numbers for sub-categories may not add up to the total due to (1) inconsistencies across related variables and (2) reference to specific category.

Table 2: Differences in newborn care for the most recent birth in past five years, by intervention area, Northern Nigeria, 2009 vs. 2011

Characteristic	BHS 2009 (%)	MHS 2011 (%)	Control 2011 (%)	Intervention 2011 (%)	p-value BHS vs Int	p-value Ctl vs Int
Mother had anti-tetanus vaccine	69.2	85.0	84.8	85.1	<0.0001	0.9170
n	1,335	976	244	732		
First breastfeeding within 24 hours	42.9	57.5	54.1	60.5	<0.0001	<0.0001
n	1,335	2,305	729	1,576		
First postnatal check within 48 hour	39.2	24.1	18.9	27.5	<0.0001	0.0120
n	1,335	1,753	589	1,164		
<i>Person checking newborn</i>						
Nurse/midwife	34.5	44.1	51.3	38.6	<0.0001	<0.0001
CHW- health post	4.7	30.8	27.3	34.1	<0.0001	0.0160
CHW- outreach	NA	10.6	8.5	12.2	NA	0.0730
TBA	40.8	2.8	2.6	2.9	<0.0001	0.8500
Other	20.0	11.8	11.1	12.2	<0.0001	0.6070
n	1,335	679	189	490		
<i>Care provided to the newborn</i>						
No special newborn care	NA	1.1	0.83	1.3	NA	0.0040
Cord care	7.0	26.4	20.2	31.1	<0.0001	0.0040
Wash baby	39.1	52.9	47.1	57.4	<0.0001	0.0160
Keep baby warm (kangaroo)	16.8	17.5	4.2	27.6	<0.0001	<0.0001
Breastfeed immediately	15.6	39.3	31.1	45.5	<0.0001	0.0010
Watched for danger signs	20.0	18.9	12.6	23.7	0.9147	0.0010
Register the birth	NA	3.1	1.7	4.2	NA	0.0950
Newborn vaccination	3.1	22.2	25.2	19.9	<0.0001	0.1350
Weigh baby	15.1	4.0	1.7	5.7	<0.0001	0.0180
Watch for high fever	NA	21.6	16.0	25.9	NA	0.0050
n	1,441	2,305	729	1,576		
<i>Source of information about newborn care*</i>						
No one	31.9	28.4	34.0	23.3	<0.0001	<0.0001
Nurse/midwife	25.0	6.4	6.2	6.5	<0.0001	0.6830
CHW in health post	6.8	7.7	6.0	9.3	<0.0001	0.0010
CHW in outreach	NA	4.0	1.9	4.6	NA	<0.0001
TBA	48.4	11.0	16.7	5.6	<0.0001	<0.0001
Family/ friends	NA	27.4	30.7	25.3	NA	0.0010
Drug vendor/ Chemist	NA	0.3	0.5	0.0	NA	0.0030
Other	1.8	3.0	2.5	3.4	<0.0001	0.1450
Number of women	6,208	2,305	729	1,576		

Notes: *Source of information about newborn care is the person checking the newborn and counseling the mother after delivery; "CHW" – Community Health Worker; "TBA" – Traditional Birth Attendant; "NA" – Not applicable.

Table 3: Differences in knowledge of and response to newborn danger signs and illness episodes of children under age 5 by intervention area, Northern Nigeria, 2011

Newborn danger sign knowledge and response type	Control 2011 (%)	Intervention 2011 (%)	p-value (Control vs. Intervention)
<i>Knowledge of newborn danger signs</i>			
None Known	12.3	9.2	0.0200
Known:			
High fever	82.7	84.2	0.3830
Stiff neck, fitting or convulsions	16.4	31.2	<0.0001
Jaundice	3.5	18.4	<0.0001
Difficult/fast breathing	14.2	20.6	<0.0001
Not able to suckle/refuse to feed	8.3	15.6	<0.0001
Diarrhea/dehydration/sunken soft spot	20.1	30.5	<0.0001
n	422	1,100	
<i>Observation of danger signs in newborn (<6 weeks old)</i>			
High fever	31.8	27.9	0.0170
Stiff neck, fitting or convulsions	6.6	5.3	0.1440
Swollen stomach	15.5	18.1	0.0580
Diarrhea	16.7	19.5	0.0450
Difficult/fast breathing	4.4	7.4	<0.0001
Not able to suckle / refuse to feed	5.8	6.5	0.3760
n	729	1,576	
<i>Source of advice on care of sick children</i>			
Nurse/midwife	11.4	12.1	0.9390
CHEW in health post	10.7	18.2	<0.0001
CHEW in outreach	3.8	5.6	0.6400
TBA	7.7	1.9	0.1920
Family/ friends	32.2	27.1	<0.0001
Drug vendor/ chemist	2.6	1.0	0.0130
Traditional healer/ other	0.6	0.4	0.0460
No one mentioned	28.3	22.5	0.3010
n	248	579	
<i>Acute illness episodes in past month, children <5 years</i>			
Fever	24.4	28.4	0.0370
Diarrhea	15.4	19.4	0.0150
Cough	11.4	15.2	0.0080
Malnutrition (weight loss)	11.1	15.2	<0.0001
Fever and cough	9.0	13.2	<0.0001
Diarrhea and malnutrition	8.3	11.8	0.0020
n	729	1,576	

Table 4: Type of care given to sick child in the month preceding the survey by intervention area, Northern Nigeria, 2009 and 2011

Type of care (%) (n with any care)	2009	2011- Fever only n=625		2011-Cough only n=323		2011-Fever and Cough n=274		2009- Diarrhea n= 1,335	2011- Diarrhea n=417	
	Fever/ cough n=1,205	C	I	C	I	C	I		C	I
<i>Control vs. Intervention</i>										
Homecare										
Gave more fluids	NA	7.9	7.2	6.0	8.3	7.6	8.2	NA	5.4	13.8
Gave ORS	18.9	3.9	9.2	1.2	9.2	1.6	10.1	32.7	4.5	7.5
Medication use										
Analgesics	39.0	37.6	36.3	32.1	32.5	35.6	32.7	29.9	33.8	32.7
Antibiotics	35.9	26.4	32.2	37.7	31.4	31.1	34.0	36.2	37.7	34.6
Anti-malarial	57.5	19.2	18.2	20.8	20.1	24.4	20.4	55.8	10.4	18.2
Other drug	8.0	12.8	8.3	15.1	8.3	17.8	8.2	13.0	18.2	11.2
Gave cough medicine	NA	11.2	13.4	28.3	23.1	26.7	23.8	NA	11.7	12.6
Traditional remedies										
Traditional medicine/ herbs	13.2	19.2	27.4	15.1	29.0	15.6	29.9	11.6	20.8	27.1
Did nothing	35.2	29.8	29.8	36.1	29.7	31.8	29.5	40.0	31.2	29.8
Total Sick	2,910	178	447	83	240	66	208	1,415	112	305

Notes: **Bold** indicates a p-value of <0.05 between intervention and control; Percentages do not sum to 100% because multiple care activities may have been used per episode; "C" and "I" refer to control and intervention areas, respectively.

Figure 1: Newborn Care Activities by Intervention Area, Northern Nigeria 2009 & 2011

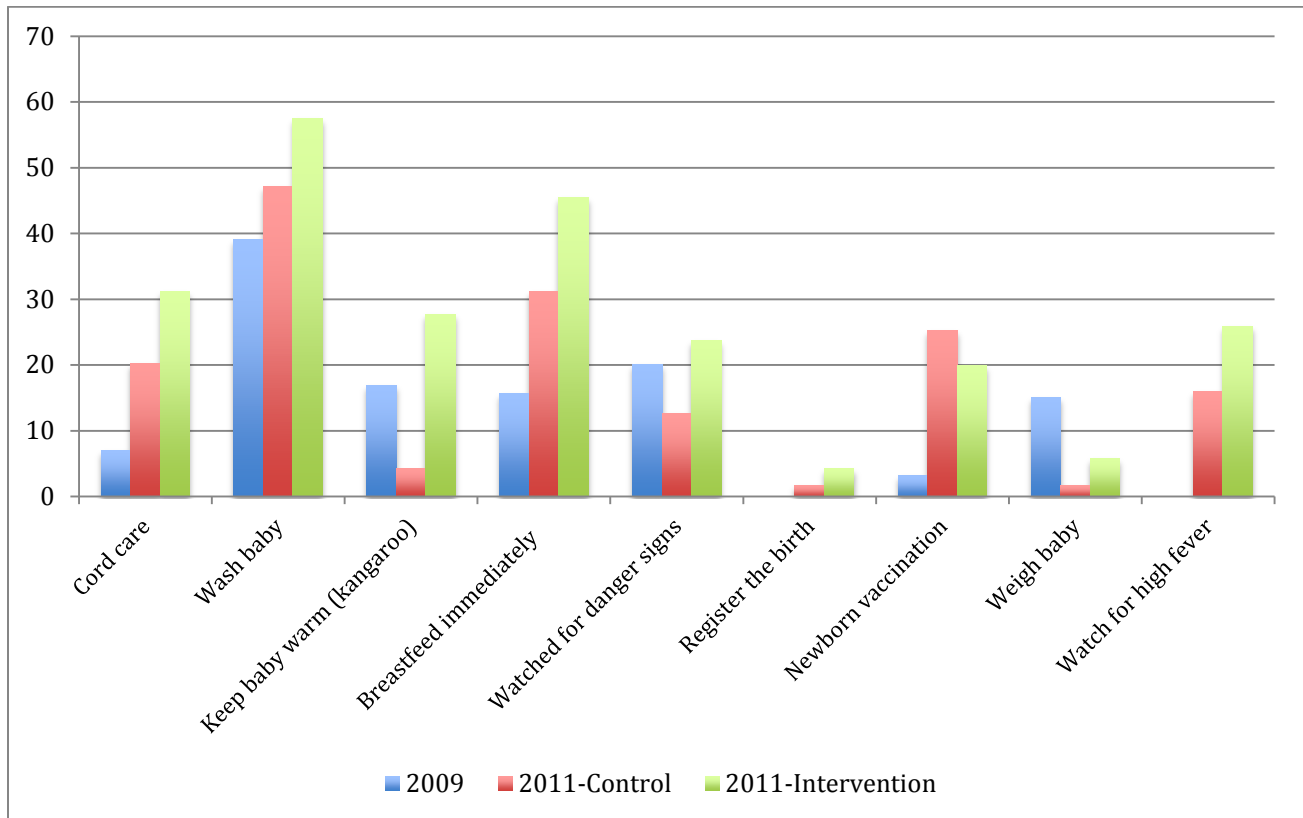


Figure 2: Infant and Child Mortality Rates by Intervention Area, Northern Nigeria, 2009 versus 2011

