



**Partnership for Reviving Routine
Immunisation in Northern Nigeria;
Maternal Newborn and Child Health Initiative**

**Changes in Maternal and Child Health Care Behaviors:
Early evidence of the impact of community-based programs**

Operations Research Technical Assistance Unit (Output 4)

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Revised Draft

Introduction

Maternal health outcomes in Nigeria are among the worst in the world, with Nigeria second only to India in the number of maternal deaths. (UNICEF 2008;WHO, 2011) In Northern Nigeria the MMR is estimated to be appreciably higher than the national average (Federal Ministry of Health of Nigeria, et al. 2009) with recent estimates for the north over 1,000 per, 100,000 live births, compared to MMR estimates for the southern region below 300 per 100,000 live births (Centre for Reproductive Rights and Women Advocates Research and Documentation Centre 2008). In northern Nigeria, high levels of mortality reflect low levels of antenatal care utilization (31% and 43% in the North West and North East regions, respectively) and deliveries with a skilled birth attendant (9% and 13% in the North West and North East regions, respectively). (National Population Commission [Nigeria] and ICF Macro 2009). In addition, there has been slow progress in improving infant and child survival and primary care utilization. As of 2008, vaccination coverage rates in the four northern states of Zamfara, Katsina, Jigawa, and Yobe were all 5.4% and below. When their young children became sick with pneumonia, malaria or diarrhea, under half of all sick children were taken to a health facility for treatment. Infant mortality was 139 per 1000 live births, while under 5 mortality was 217 and 222 (per 1000 live births), respectively.

In response to the low rates of routine vaccination coverage in the North West and North East regions, the Partnership for Reviving Routine Immunization in Northern Nigeria (PRRINN) was established in 2006, and expanded in 2008 to include maternal, newborn and child health (MNCH), becoming PRRINN-MNCH in the four northern states of Jigawa, Katsina, Yobe and Zamfara. PRRINN-MNCH is a strategic attempt to reduce maternal and child mortality through systems changes addressing issues of health governance, human resources, health information utilization and community engagement alongside the strengthening of clinical services.

The programme uses an operations research approach to assessing the impact of its combined strategies, in order to inform program decision makers in a timely way about what is working and what is not. Of particular focus in this report is the implementation of community-based service delivery programs that bring key reproductive health services directly to the hard-to-reach communities. The study reported here reports on changes in the maternal and child health care for the period 2009 to 2011, roughly at the mid-point in implementing the program.

Methods

Intervention Design

This programme has been implemented in the four northern Nigerian states of Jigawa, Katsina, Yobe, and Zamfara, with populations of, respectively, 5.1, 5.8, 2.3, and 3.3 million according to the 2006 population census of Nigeria. The program design focuses on revitalizing and improving maternal care in clusters of LGAs per state, which each comprise a catchment area for emergency obstetrical care (EOC) services. A total of 14 LGAs were selected as the first intervention clusters, averaging 2-5 per state. The clusters of LGAs where the partnership has worked first to upgrade EOC services with corresponding strengthening of demand and

primary care services for MNCH were designated as the intervention areas, and the balance of LGAs were designated as control or “low-intensity,” where statewide policy changes may have an impact but intensive upgrading and systems changes have yet to be made. Within the intervention cluster the partners identify supply-side changes in the health system which support the delivery of quality maternal and child health care, such as facilitating the posting and training through the Midwife Service Scheme, improved planning and management techniques, upgrading of surgical facilities for obstetric care, and so on. One key programme initiative, for example, has been “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 is the introduction or enhancement of activities that create a demand for MNCH services. In selected groups of villages served by primary care facilities linked to the upgraded EOC facility, partners work within the LGA and district structures to develop social structures and processes for talking about and encouraging preventive care and use of the primary health facility. These community engagement activities range from radio “spots” developed by the community teams to promote birth preparedness or childhood immunizations, to support for enhancing women’s groups, and to cultivating and training a network of community volunteers and community health workers to meet with groups or individual families in underserved communities more than ten kilometers from the primary health care post or clinic. In the year before the mid-term survey the program developed a small cadre of community health workers who would provide primary health services directly to families through rotating visits or extended availability through residence in the communities.

Evaluation Design

The assessment of the impact of the community-based service delivery programs at the mid-term uses a quasi-experimental design with controls. If these interventions are successful in changing health care behaviors and perspectives on service use, more women will use the available and enhanced services. The impact on use of the services and, importantly, changes in the understanding of health problems and how to address them with the help of the health care services, can only be assessed by hearing from those who have used the health care services and those who have not. Therefore, the evaluation of the impact of this integrated set of initiatives needs to include feedback from the entire community of women, those who have used services and those who have not. This means that the evaluation needs to control for two variables, whether the person lives in an intervention community where the integrated health system and community-based services were available and whether the individual participated in any of the community-based service activities or services. This impact assessment therefore was conducted in both intervention and control areas and on a pre-post model, to capture changes in the availability of programme- and community-based services, and a quasi-experimental design, to assess changes in women’s health behaviors with and without their participation in the programme-related services or activities. For purposes of this assessment, pre-intervention was defined by the time period of the baseline survey, namely 2009, and post-intervention is defined by at least 6 months after programme implementation, namely 2011. Availability of the

enhanced supply and demand services was assessed by contrasting the intervention and control areas, and the individual exposure to the program is assessed by the woman's responses regarding the source of information or health care advice, which allowed for different sources corresponding to the alternative community-based service delivery strategies.

Survey design and sample

The baseline or pre-intervention and mid-term or post-intervention (incomplete) survey used the same basic sampling design, but not including the same communities or households unless they happen to be randomly selected again. The survey is cross-sectional in that each survey can be an accurate "snapshot" of maternal, newborn, and child health at the time each survey was conducted. The survey is population-based to ensure that all families living in these participating states are reflected in the survey findings, not just the subgroups that use health care services of a particular type. Because the goal of the survey is to assess changes in health status, behaviours, and care utilisation, survey questions included all relevant health behaviours and health care utilisation patterns, as well as the sources of health care and health care advice, precisely specified by type of health care worker so that each variant on community-based service delivery can be identified. This is critical for assessing exposure to the MNCH activities.

As the MNCH activities are implemented in key clusters in each state, the sample design needed to include enough respondents in these clusters to allow estimation of program impact. Therefore, the sampling plan is a stratified two-stage cluster, random sample, with oversampling of individuals in the MNCH intervention clusters. Individuals from MNCH clusters are oversampled according to a ratio of 2:1, even though MNCH clusters cover a significantly lower proportion of the population of each state. In the baseline survey there were 24 LGAs, with 3901 households sampled in the intervention area and 2444 in the control areas. For the mid-term survey, these same LGAs were included, with the addition of 6 LGAs from Jigawa (not included in the baseline) and the exclusion of LGAs including the state capital, considered not an appropriate control for the largely rural intervention. This left 21 LGAs in the sampling frame for the mid-term survey. Due to a reduced budget, the mid-term sample size was reduced to 770 per state, yielding a sample of 2360 households in the intervention areas and 960 in the control areas. In both the baseline and mid-term surveys, the number of households at the first stage was proportional to the size of the unit, the EA in the baseline and the LGA in the mid-term survey. In the mid-term survey, 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 mid-term survey, 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 is 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) were interviewed, whereas in the mid-term survey only one ever-married woman with children born in the last 5 years was selected for interview. In the baseline survey there were 6842 women with successfully completed interviews, while in the mid-term survey there were 3079 completed interviews.

Analysis

We use bivariate analyses to report on the basic findings from each survey. Both surveys included socio-demographic characteristics of the households and women interviewed. The dependent variables of interest are the key health promotion behaviors pertaining to antenatal care, deliveries, newborn care, immunizations and care of sick children. 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 at baseline and mid-term. Because of this focus on the differences between the control and intervention communities at the mid-term survey, results are reported for all four states in the mid-term survey, while the results at baseline are for the three states, without Jigawa. The baseline-follow-up comparison for all states therefore excludes Jigawa. In addition to the comparison between the two periods of time, the analyses also test for significant differences between the baseline and the mid-term survey results by intervention status (intervention or control). This report does not use multi-variety analysis to control for socio-demographic differences between the samples, and it will be important to do that in more detailed analyses.

Results

Respondent Characteristics

In the mid-term survey, the selection for women only with births in the past five years led to a slightly different profile of respondent, even after excluding Jigawa. Whereas only 30.3% of the women surveyed were aged 20-29 in the baseline survey, 49.2% were in their twenties in the mid-term survey. Slightly more were second or third wives than among the wives interviewed in the baseline. Fewer had any education, and among those who had been to school, more (72.1%) had attended primary school only, compared to 53.0% among those interviewed in the baseline. Consistent with the low level of schooling, fewer of the women interviewed for the mid-term were able to read or write in any language (Hausa, Arabic, and English). In neither survey did many women list their work as farming, and there were fewer listing themselves as working in food or agricultural processing (40.7% vs. 33.0%, baseline vs. mid-term). In contrast, the women interviewed in the mid-term survey were more likely to list their occupations as trading or selling (17.5% versus 26.4%, baseline vs. mid-term) or housewife (30.3% vs. 43.6%, baseline vs. midterm.) The women interviewed in the mid-term survey were also much more

likely to have access to a cell phone (7.9% vs. 31.7%, baseline vs. midterm). Thus, the women interviewed with the mid-term survey appear to be younger and of lower social status, characteristics often associated with poor access health care workers or services.

1.0 Pregnancy Care

As shown in Table 1.1, there was a significant drop in the proportion of women who had no antenatal care (ANC) for their most recent pregnancy in the past five years, from 67.4% to 51.0%. The proportion with no ANC was significantly lower in the intervention areas than in the control areas, 46.2% vs. 56.1% ($p < .001$). Analysis of the source of ANC shows that the increase from baseline to mid-term was completely related due to increased ANC provided by community health workers (CHEWs), in the facility or in the community. Whereas CHEWs provided ANC to only 6.9% of pregnant women at the baseline, they provided care to 22.1% of pregnant women at the mid-term assessment. Finally, the increase in ANC provided by the CHEWs was significantly greater in the intervention than control communities, 26.7% vs. 17.2%.

Table 1.1: Source of antenatal care (ANC) during pregnancy in the past five years MNCH BS-2009 and MNCH MTS-2011

Source of Antenatal Care	Baseline 2009	Total 2011	Control 2011	Intervention 2011	p-value BS vs. Int	p-value Ctl vs Int
None	67.4	51.0	56.1	46.2	<.0001	<.0001
Doctor, nurse or midwife	25.2	26.0	25.4	26.6	0.1855	0.383
CHEW-facility	6.5	19.9	15.4	24.1	<.0001	<.0001
CHEW-community	0.4	2.2	1.8	2.6	<.0001	0.063
TBA (inc. trained)	0.6	0.2	0.2	0.2	0.0260	0.906
Total	5041	2022	969	1053		

Difference between control and intervention 2011 Chi-square=32.4 (<.001)

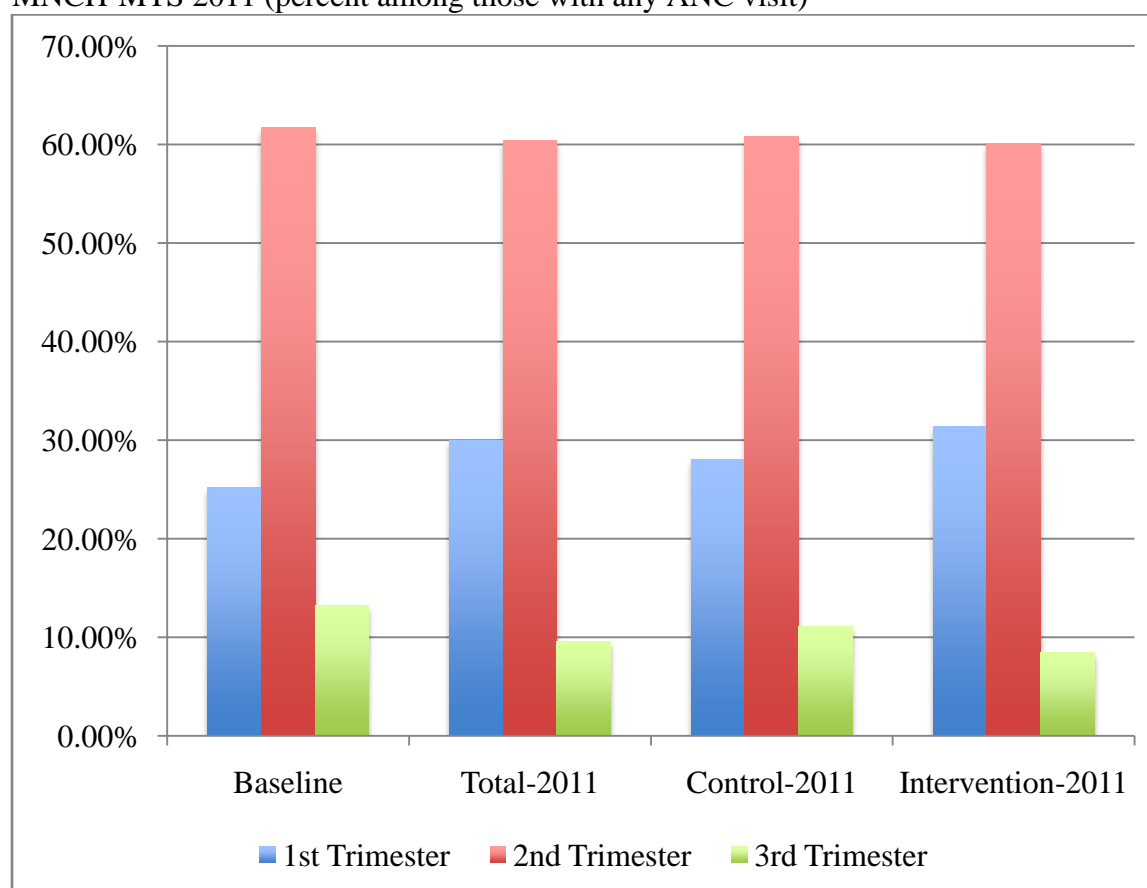
Notes: For women with two or more live births in the five-year period, data refer to the most recent birth; Some numbers for sub-categories may not add up to the total due to (1) inconsistencies across related variables and (2) reference to specific categories. CHEW-Community includes CHEW on outreach, CHEW providing CBSD, CHEWs on a van.

As seen in Table 1.2, there was no change in the mean number of ANC visits for women with any ANC visit. However, there was a shift in the timing of the first ANC visit. At mid-term, significantly more women had their first ANC visit in the first trimester, and this proportion was greater in the intervention communities. (See Figure 1.1) The percent of women 15-49 who have received a recent anti-tetanus vaccination rose from 69.2% at baseline to 83.6% at mid-term, with no difference in the rate for control and intervention communities.

Table 1.2: Mean number of ANC visits for most recent birth in previous five years, if had any ANC, MNCH BS 2009 and MNCH MTS- 2011

Survey	Mean	Standard Deviation	[Minimum, Maximum]	Number
MNCH-BS 2009	4.9	2.7	[1, 30]	1,747
MNCH-MTS 2011	4.8	2.2	[1,15]	1,704
Control	4.9	2.2	[1,12]	738
Intervention	4.8	2.2	[1,15]	966

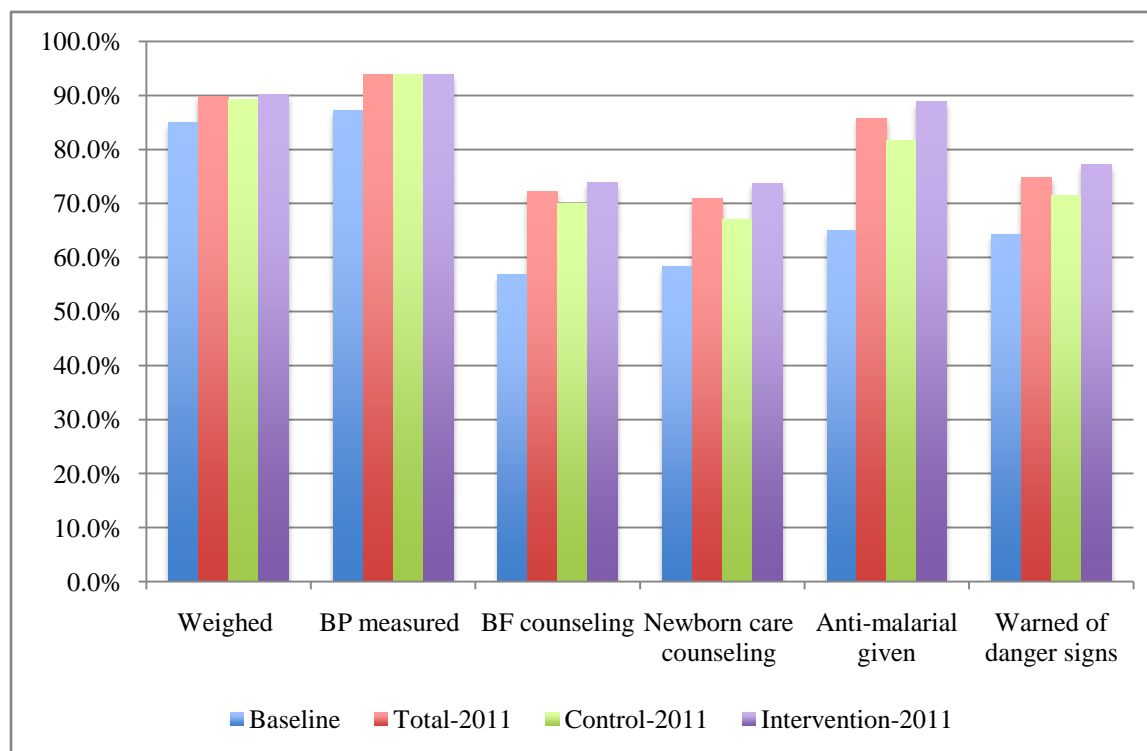
Figure 1.1 Timing of first ANC visit for pregnancies in previous five years, MNCH BS-2009 to MNCH-MTS 2011 (percent among those with any ANC visit)



The data presented in Figure 1.2 show that the women receiving ANC also received more of the critical elements of antenatal care. At baseline, only 85% were weighed and had their blood pressure assessed during any ANC visit, and fewer than 60% received counseling on breastfeeding, newborn care, or danger signs. At mid-term there were significant increases in the delivery of all these key care elements, up to 90% or more being weighed and having their blood pressure assessed in both the intervention and control communities. The sharpest increase in services delivered is for the distribution of anti-malarials, which rose from 64% at baseline to

86% at mid-term, and to 89% at mid-term in the intervention communities. Breastfeeding counseling rose from 57% to 72% at mid-term, with little difference between the intervention and control communities at mid-term. There were significant differences in newborn care counseling, which increased from 58% to 71% at mid-term, rising to 74% in the intervention communities. Additionally, counseling on maternal danger signs increased from 64% to 74.7% at mid-term and further rose to 77% in intervention communities.

Figure 1.2 ANC content for most recent pregnancy in the 5 years preceding the survey, MNCH BS 2009 vs. MNCH MTS-2011 (percent among women with any ANC)



As shown in Table 1.3, the percent of women who know no danger signs was not significantly different between the baseline and follow-up (5.3% vs. 6.1%, $p=.286$). In the intervention communities, more women knew 2 or more danger signs of pregnancy and delivery, 47.1% vs. 41.6%. Between the baseline and mid-term in the intervention communities, there were significant increases in the proportions knowing the critical danger signs of severe headache (42.6% to 76.2%), swelling (2.2% to 48.9%), convulsions (1.4% to 39.0%), excessive bleeding (0.3% to 40.8%), and severe abdominal pain (0.4% to 37.3%). Knowledge of these also increased in the control areas, but the knowledge was greater in the intervention communities for all but the danger signs of abdominal pain and reduced fetal movement.

Table 1.3: Knowledge of pregnancy or delivery danger signs for most recent pregnancy in the past 5 years, MNCH BS-2009 vs MNCH MTS-2011(percent)

Danger Sign	Baseline	2011 Control	2011 Intervention	p-value Ctl vs Int
None	5.3	6.1	6.3	.2685
Severe headache	42.6	66.7	76.2	<.0001
Blurred vision	25.7	8.2	11.8	0.021
Reduced fetal movement	16.4	12.4	13.9	0.389
High blood pressure	5.6	NA	NA	NA
Swelling of face/hands	2.2	20.8	48.9	<.0001
Convulsions	1.4	33.1	39.0	0.018
Excessive vaginal bleeding	0.3	28.7	40.8	<.0001
Severe lower abdominal pain	0.4	40.5	37.3	0.208
Other	0.1	NA	NA	
Number	2,473	848	1135	

There was a large increase in the numbers of women who sought advice about their own or their expected child's health, from only 25.1% at baseline to 73.9% at mid-term, with the percent higher in the intervention than control communities (78.3% vs. 69.0%, Chi-square for 2011 Control vs. intervention= 44.8,p<.001). (See Table 1.4)While there were significant increases in the percent of women seeking advice from a doctor, nurse or midwife (5.7% to 10.4%), the most notable increases, particularly in the intervention communities, were in the percent of women seeking advice from CHEWs, either at the health facility or in the community, as well as from community volunteers. By the time of the mid-term survey, the percent of women in the intervention areas who sought advice from all community health workers or volunteers was 29.8%. In the control areas traditional birth attendants (TBAs) were increasingly sought (14.2%), compared to only 6.6% seeking advice from a TBA in the intervention areas. Finally, there was more discussion and advice seeking from friends and family (17% to 29.5%).

Table 1.4: Source of advice for women who sought advice about their health or the health of their future baby during their most recent pregnancy in the past five years, MNCH BS-2009 vs. MNCH-2011 (percent)

	Baseline	MNCH- MTS-11	2011- Control	2011- Intervention	p-value BS vs Int	p-value Ctrl vs Int
No one	74.9	26.1	31.0	21.7	<.0001	<.0001
MD/nurse/MW	5.7	10.4	9.9	10.9	<.0001	0.292
CHEW-facility	0	8.6	7.5	9.5	<.0001	0.023
CHEW-common	0	2.6	1.4	3.8	<.0001	<.0001
CHEW-Van	0	0.6	0.7	0.6	<.0001	0.544
TBA	2.5	10.2	14.2	6.6	<.0001	<.0001
CV	0	8.3	0	15.9	<.0001	<.0001
Friends/family	17	29.5	32.2	27.1	<.0001	<.0001
Radio	NA	2.0	1.7	2.3	NA	0.237
n	4730	2022	969	1053		

The percent of women who delivered at home declined only slightly from 89.4% to 87.1%. More women delivered at home in the intervention than control communities (88.7% vs. 83.7%, $p=0.0001$), with corresponding increases in deliveries at health facilities, 10.9% and 14.0% in the intervention and control communities, respectively. While there were more deliveries enroute in the control communities, this declined to 0.2% in the intervention communities. Among those who delivered at a health facility after having complications, the proportion that had a Caesarian section increased from 5.8% to 6.9%. There was no significant difference in the Caesarian section rate between the intervention and control communities, 6.8% vs. 7.4%, respectively ($\text{Chi-square}=0.385$, $p=0.844$).

Table 1.5 Place of delivery for the most recent birth in the past 5 years, MNCH-BS 2009 vs. MNCH-MTS-2011 (percent)

Place of delivery	Baseline -2009	MNCH -MTS- 2011	MNCH -MTS- control	MNCH- MTS- intervention	p-value BS vs Int	p- value Ctrl vs Int
Home	89.4	86.0	83.7	88.7	0.4493	<.0001
Health facility	9.7	12.4	14.0	10.9	0.0002	0.003
En route	0.4	0.5	0.8	0.2	0.2238	0.004
Other	0.5	0.8	1.4	0.2	0.0012	<.0001
n	2473	2021	969	1052		
Chi-square (control vs. intervention)	40.02 ($p<.001$)					

The reasons for not delivering at a health facility continue to be dominated by feeling more comfortable at home (43.8% at baseline and not asked at midterm) or that going to a health facility was not necessary (18.6% at baseline and 50.2% at mid-term) or not customary (7.6% at baseline and 11.8% at mid-term). At mid-term 24.8% said they did not deliver at a facility because “I am a strong woman,” with more indicating this reason in the control than intervention communities (31.0% vs. 22.1%). There was a light increase in women citing lack of their husband’s permission from 3.4% to 4.4%. In contrast, there were declines in the proportion indicating that cost was a barrier (3.8% to 1.3%) or that the facility was too far or they had no transportation (13.6% to 2.6%).

Table 1.6: Reason for not delivering at a health facility for most recent live births in the five years preceding the MNCH BS-2009 vs. MNCH-MTS 2011 (percent)

Reason	Baseline 2009	Midterm- 2011	Midterm- Control	Midterm- Intervention	p-value Ctrl v Int
More comfortable at home	43.8	NA	NA	NA	
Not necessary	18.6	48.9	44.5	52.7	<.0001
“I am a strong woman”	NA	26.2	30.9	22.1	<.0001
Not customary	7.6	11.1	8.6	13.2	<.0001
Too far/no transportation	13.6	2.6	2.8	2.5	0.494
Cost too much	3.8	1.4	1.6	1.2	0.282
No spousal permission	3.4	4.9	6.8	3.3	<.0001
Health worker’s attitude	2.1	1.3	0.9	1.7	0.037
Other reason	7.2	5.2	4.4	5.9	0.052
Number	4,482	1745	811	934	

2.0 Newborn and sick childcare

More newborns were first breastfed within 24 hours from birth, with the percent increasing from 42.9% to 58.3%, with significantly more (62.7%) in the intervention areas. (See Table 2.1) Almost one-third (29%) of the infants are exclusively breastfed for at least 3 days after birth. Fewer infants had a postnatal check by and health worker within 48 hours of birth, down from 39.2% at baseline to 23.3% in the intervention and 17.1% 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 TBA (40.8%), while at the mid-term most newborns were checked by the nurse/midwife at the health facility, 58.3% in the control areas and 45.6% in the intervention areas. More newborns were checked by CHEWs, with even more in the intervention (45.8%) than control areas (32.4%).

Table 2.1: Selected postnatal care characteristics, most recent live births in the five years (percent)

Characteristic	Baseline 2009	Midterm 2011	Control 2011	Interven tion2011	p-value BS vs Int	p- value Ctl vs Int
First breastfeeding baby done within 24 hours	42.9	60.6	58.3	62.7	<.0001	0.004
n		2022	969	1053		
First postnatal check within 48 hours	39.2	20.7	17.1	23.3	<.0001	0.006
n		1313	550	763		
Person checking newborn						
Nurse/midwife	34.5	51.2	58.3	45.6	<.0001	<.0001
CHEW- health post	4.7	32.4	25.9	37.4	<.0001	<.0001
CHEW- outreach	NA	7.6	6.5	8.4	—	0.175
TBA	40.8	1.6	1.5	1.6	<.0001	0.849
Other	20.0	7.3	7.7	7.0	<.0001	0.587
n	1335	1542	672	870		

In 2011 significantly fewer women had no one giving them advice on the care of their newborn, down from 31.0% to 21.7%. (See Table 2.2) In addition, there was a change in the type of person giving information about newborn care, with a shift from family and friends (32.2% down to 27.1%) and TBAs (14.2% down to 6.6%) to nurse/midwives (11.0%) and CHEWs (13.8%). As seen in Table 2.3, most women knew at least one of the newborn danger signs, with the most commonly known danger sign being high fever, known by 83.9% in the control and 85.7% in the intervention communities. Many knew other critical danger signs that indicated the need for the baby to be seen by a health worker. One-third of women in both communities knew to worry about excessive crying, and one-fourth knew to watch out for vomiting or a swollen abdomen. In the intervention areas, just over one-fourth knew to worry about diarrhea and dehydration and about convulsions, significantly more than in the control areas. Women in the intervention areas were also more likely to know about jaundice, breathing problems and not being able to suckle.

Table 2.2: Sources of knowledge about postnatal care, most recent live birth in past five years (percent)

	Control 2011	Intervention 2011	p- value
Nurse/midwife	10.4	11.0	<0.0001
CHEW in health post	7.5	9.5	
CHEW in outreach	2.2	4.3	
TBA	14.2	6.6	
Family/ friends	32.2	27.1	
Drug vendor/ Chemist	0.4	0.0	
Other	2.1	19.8	
No one mentioned	31.0	21.7	
n	888	1094	

Table 2.3: Caregiver knowledge of newborn danger signs, most recent live births in past five years (percent)

	Control 2011	Intervention 2011	p- value
None	9.7	7.7	0.103
High fever	83.9	85.7	0.297
Convulsions	16.1	27.1	<.001
Jaundice	4.0	15.7	<.001
Breathing problems	14.9	18.0	0.083
Excessive crying	31.3	34.1	0.212
Not able to suckle	11.1	15.2	0.013
Diarrhea/dehydration	21.9	29.9	<.001
Vomiting and swollen abdomen	25.7	24.0	0.426
Hypothermia	4.5	3.7	0.393
Lethargy	3.5	2.8	0.425
Local infections/sepsis	6.1	7.5	0.273
n	378	470	

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 (30.5%) than intervention communities (26.5%). (See Table 2.4) The knowledge of the newborn danger signs is reflected in a greater distribution of the types of newborn danger signs reported among the intervention than control communities. One in five newborns in the intervention communities (20.0%) cried excessively, noted by significantly more mothers in the intervention than control communities (16.2%). 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, regardless of control or intervention community. More newborns in the intervention

communities than control communities were observed to have jaundice and not being able to suckle.

Table 2.4: Reported incidence of newborn illness in first 6 weeks of life, most recent live births in the past five years (percent)

	Control 2011	Intervention 2011	p- value
Fever	30.5	26.5	0.021
Convulsions	5.2	4.2	0.244
Swollen stomach	15.1	16.9	0.216
Diarrhea	15.9	17.1	0.414
Jaundice	4.9	7.7	0.003
Breathing problems	4.9	7.1	0.019
Excessive crying	16.2	20.0	0.013
Not able to suckle	5.5	5.9	0.612
Vomiting	6.2	9.3	0.004
N of newborns with any newborn danger signs	407	527	

Between the baseline and mid-term survey there was a significant increase in the proportion of women who knew basic information about immunizations. While at the baseline, the percent that knew when a child's first vaccination was due was only 10.3%, by the mid-term survey this proportion had increased to 48.8%, with the percent higher in the intervention (52.3%) than control communities (32.3%, $p < .0001$). There was a similar increase in the proportion knowing the number of visits needed to fully immunize a child, from 7.7% to 50.0%, with 51.7% in the intervention and 41.7% in the control communities ($p < .0001$). The percent of women with standing permission from their husbands to take a child to the health post doubled, from 40.2% to 78.0%, with 81.9% in the intervention and 69.7% in the control communities ($p < .0001$).

Table 2.5: Immunization-related knowledge, attitudes and practices among women with children under age 5, Northern Nigeria MNCH-BS 2009 vs. MNCH-MTS 2011 (percent)

	MNCH -BS 2009	MNCH -MTS	MNCH -MTS- Control	MNCH MTS- Intervent ion	Chi-square Control v Intervention (p value)	p-value BS v Int
Knows when first shots are due	10.3	41.2	34.8	47.3	84.0 (<.001)	<.0001
Knows # visits needed	7.7	48.8	41.7	51.7	3.2 (.074)	<.0001
Husband gave standing permission	40.2	75.8	69.2	81.7	56.0(<.001)	<.0001
Number of women	4441	1884	899	985		

While the percent with no information about immunizations was not significantly changed between the baseline and the midterm survey (29.5% at baseline versus 35.2% at the mid-term, with 30.6% in the intervention communities), the sources of information showed a more diverse set of sources. In the intervention communities, 33.5% knew about immunizations from CHEWs and 7.8% from their women's group meetings. Health workers remained a source of information for about 14% of women, while fewer heard about immunizations from other sources, such as the radio or pharmacist.

Table 2.6 Source of information about immunizations by intervention zone, MNCH-BS 2009 vs. MNCH-MTS 2011 (percent)

Source of Information	Baseline 2009	Mid-term 2011	Control 2011	Intervention 2011	p value Ctrl vs Int
None	29.5	35.2	40.0	30.6	<.0001
Health worker	11.2	13.6	13.1	14.2	0.292
CHEW	NA	28.2	22.5	33.5	<.0001
Traditional leader	NA	2.0	1.8	2.2	0.452
Family and friends	7.1	10.3	11.2	9.5	0.074
Women's group	NA	4.3	0.5	7.8	<.0001
Other(radio, pharmacist)	20.2	17.5	22.4	13.6	<.0001
N	1974	1884	899	985	

Intervention vs. Control 2011 Chi-square = 112.7, p<.0001

Childhood vaccination rates are up significantly, with the proportion of one-year olds with measles vaccine rising from 20.1% to 58.1%, polio3 from 25.7% to 51.7%, and DPT3 from 5.1% to 38.7%. (See Table 2.7) The proportion of one-year olds fully vaccinated (all sources, polio-DPT-measles) rose from 2.2% to 31.5%.

Table 2.7 Immunization rate among one-year olds (12-23 months) by antigen, MNCH-Baseline 2009 vs. MNCH-MTS 2011 (percent)

Immunization Rate by Antigen	Baseline 2009	Midterm 2011	Control 2011	Intervention 2011	Ctrl vs. Int Chi-square
Measles	20.1	58.1	50.9	63.9	8.87(<.001)
OPV3 (polio3)	25.7	51.7	43.4	58.7	11.3 (.001)
DPT3	5.1	38.7	28.0	47.4	19.2(<.001)
Fully immunized (all sources)	2.2	31.5	20.0	40.7	23.6(<.001)
Fully immunized, for children with vaccination cards	16.0	73.7	60.0	78.0	3.01(.083)
n	1974	393	175	435	

There also was a shift in the source of advice about sick childcare between the baseline and mid-term survey. (See Table 2.8) Fewer women received no advice about the care of sick children, from 36.0% down to 22.5% in the intervention communities. More women learned how to care for sick children from CHEWs, both at the health post and in the community, from 10.2% at baseline to 18.2% in the intervention communities at the mid-term survey. Fewer learned about sick childcare from TBAs or herbalists in the intervention communities, and there also was a sharp reduction in the proportion of women learning about sick childcare from the itinerant drug vendors or chemists.

Table 2.8: Source of general advice on care of sick child, MNCH-BS 2009 vs. MNCH-MTS 2011(percent)

Source of advice	Baseline 2009	Midterm 2011	Control 2011	Intervention 2011	p -value BS vs Int	p-value Ctl vs Int
Nurse/midwife	28.9	11.7	11.4	12.1	<.0001	0.477
CHEW in health post	10.2	14.6	10.7	18.2	<.0001	<.0001
CHEW in outreach	NA	4.8	3.8	5.6	<.0001	0.008
TBA	6.0	4.7	7.7	1.9	<.0001	<.0001
Family/ friends	NA	29.5	32.2	27.1	<.0001	<.0001
Drug vendor/ chemist	49.6	1.7	2.6	1.0	<.0001	<.0001
Traditionalhealer/ other	1.4	1.9	0.6	0.4	<.0001	0.279
No one mentioned	36.0	25.3	28.3	22.5	<.0001	<.0001
n	2206	2021	969	1052		

When a child became ill in the past month, the person who actually gave advice on care differed from the general sources of advice. As shown in Table 2.9, fewer women consulted the nurse/midwife, while in the intervention communities many more consulted the CHEW, at the health post (31.7%) or in the community through the community-based service delivery program initiated by PRRINN-MNCH (7.0%). Fewer relied on family and friends in the intervention communities, 46.8% vs. 28.7% in the control communities. In the intervention communities, fewer women went to a drug vendor or chemist for advice on treating a sick child.

Table 2.9: Source of advice for treating sick child in the past month, (percent)

	Midterm 2011	Control 2011	Intervention 2011	p-value Ctl vs Int
Nurse/midwife	14.8	14.3	15.1	0.730
CHEW in health post	24.4	15.2	31.7	<.0001
CHEW in outreach	6.7	6.3	7.0	0.641
TBA	1.0	1.3	0.8	0.492
Family/ friends	36.7	46.8	28.7	<.0001
Drug vendor/ chemist	23.5	28.3	19.6	<.0001

chemist				
Traditional healer/ other	1.9	1.3	2.3	0.194
No one mentioned	26.2	27.5	25.0	0.283
n	1070	474	596	

As seen in the bottom row of Table 2.10, at both the baseline and mid-term survey follow-up, 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. Although it is recommended that women continue to breastfeed and give more fluids to sick children whether they have fever, cough, diarrhea, or some combination of these, at the mid-term follow-up this recommendation was followed by fewer than one in five mothers, and slightly more mothers gave additional fluids to their sick children in the control than intervention communities. Compared to the baseline, at the mid-term follow-up fewer children received oral rehydration solution (ORS) (or its alternative labels, sugar-salt solution (SSS) or oral rehydration therapy (ORT)). Despite the general decline in the use of ORS the use of ORS was somewhat higher in the intervention than control communities.

Between the baseline and mid-term survey, there was also a substantial 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. One-third in the control and one-fourth in the intervention communities also report using cough medicine or other patent medications for cough, with or without fever. These are given in combination with medications recommended for treatment of these illnesses. Over one-third used an analgesic (paracetamol) to bring down fever at both baseline and mid-term follow-up, with more using analgesics for diarrhea at mid-term than at baseline. 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. For fever and cough, in the control and intervention communities, the use of antibiotics was slightly lower than the baseline with more of a drop in the control than intervention communities. For children with cough only, antibiotic use went up to 38.2% in the control communities while it dropped to 30.1% in the intervention communities. Antibiotics continued to be used for diarrhea by about one-third of all parents, but the use was higher in the control (39.2%) than intervention (32.2%) communities. Use of anti-malarials dropped precipitously between the baseline, when 57.5% used them for fever and/or cough to 25% or less in both the intervention and control communities at the mid-term follow-up. Even fewer children with diarrhea were given anti-malarials, even though diarrhea is a frequent co-morbidity with malaria.

Table 2.10: Type of care given to sick child in the month preceding the survey, MNCH-BS 2009 vs. MNCH-MTS 2011(percent)

Type of care (n with any care)	Baseline Fever/ cough n=1205	Fever only n=884		Cough only n=407		Fever and Cough n=348		Baseline Diarrhea n= 1335	Diarrhea n=566	
		Contrl	Interv	Contrl	Interv	Contrl	Interv		Contrl	Interv
Homecare										
Gave more fluids	NA	12.8	11.0	15.0	13.7	17.3	14.2	NA	12.2	11.0
Gave ORS	18.9	11.5	12.8	6.4	9.9	7.4	11.2	32.7	15.6	20.1
Medication use										
Analgesics	39.0	37.4	38.9	27.9	33.3	31.0	33.8	29.9	33.0	35.2
Antibiotics	35.9	29.8	29.4	38.2	30.1	31.0	33.1	36.2	39.2	32.2
Anti-malarial	57.5	22.8	20.5	**	**	25.9	20.6	55.8	14.4	18.8
Other drug	8.0	9.9	7.2	13.2	7.8	15.5	7.5	13.0	13.4	10.0
Gave patent or cough medicine	NA	12.3	11.8	35.3	24.2	32.8	24.4	NA	12.4	10.7
Traditional remedies										
Traditional medicine/ herbs	13.2	19.9	26.3	14.7	29.0	15.5	30.0	11.6	24.7	26.4
Total sick	2910	234	650	94	313	81	267	1415	147	419
Did nothing	35.2	32.1	38.0	31.9	39.3	33.3	386	40.0	34.0	37.7

Notes: **Bold** indicates that the intervention % exceeds the control %.

Percents do not sum to 100% because multiple care activities may have been used per episode.

** too few cases in cell

Between the baseline and the mid-term survey, there was a significant drop in the infant mortality rate per 1000 live births (IMR), from 90 at the baseline to 55.6 at the mid-term. In the intervention communities, the rate was even lower, 45.4, versus 82.1 in the control communities. This sharp reduction in the IMR contributed to a reduction in the overall under-5 mortality rate (per 1000), from 160 to 110 in both the intervention and control communities.

Discussion and Conclusions

While the PRRINN-MNCH programme has been underway for just over two years, comparison of the baseline and mid-term survey results shows that there is significant improvement in several of the key maternal, newborn, and child health behaviors and outcomes.

First, more pregnant women were seeking antenatal care, with the proportion having care rising from 33% to 49%, slightly more in the intervention communities (53%). Analysis of the source of antenatal care shows that the increase was almost entirely comprised by ANC provided by trained CHEWs, either at the health post or in the community. While the CBSD pilots were launched only in the last year before the mid-term, it is also possible that those indicating they received their ANC from a CHEW in the community may already be benefiting from the community-based delivery of ANC consultations. Another notable change in antenatal

care is a shift toward earlier visits, with significantly more making their first ANC visit in their first trimester. Finally, there is evidence that the quality of ANC has improved. More women were receiving key components of ANC. The overall rise in total and first trimester ANC consultation rates reflects the intensive community engagement efforts to promote ANC and especially early ANC, whether through the community volunteers, the activation of the community health committee, or the establishment of women's groups. The increase in total and quality of ANC visits are likely to reflect the increased availability of trained staff capable of providing quality antenatal care, through the supply-side efforts of PRRINN-MNCH to improve human resource skills and equipment at primary health care centers. The higher quality of the visits is also reflected by the rise in the percent of women with a recent anti-tetanus vaccination, from 69% to 84%.

The synergy of the supply-side and demand-side efforts to improve obstetric care is seen by the dramatic rise in the percent of women knowing critical danger signs of pregnancy and delivery. Although there was no reported increase in discussion of maternal danger signs in the mid-term survey (and indeed there was a drop), the fact that more women knew more about the danger signs indicates that they are learning through community sources. At baseline, 75% had not sought any advice about their own or their infant's health, while at the mid-term this had flipped to 74% having sought advice. In the intervention communities, the women obtained advice from the nurse/midwife, the CHEWs, the community volunteers, and friends and family, including women's groups.

Although more women have had ANC and know about danger signs, there is no significant increase in the proportion delivering at a facility. Women continue to feel that going to the facility for a delivery is not necessary because they are strong, nor is it customary. The impact of the ETS program and other incentives to increase the proportion of women having their infants delivered by a skilled birth attendant have yet to be seen in these communities.

Second, there is evidence that newborn care is improving. The proportion breastfeeding within 24 hours rose to 61%, and almost one-third of women report exclusive breastfeeding. Both shifts in breastfeeding behaviors will reduce the exposure of the infant to contaminated fluids and increase exposure to the benefits of breastmilk, e.g. transfer of immunity from mother to child. While fewer women report having a first post-natal check on the baby within 48 hours of birth, there is a large shift in the qualifications of the person making that check. At baseline the relatively high rate of reported check-ups on newborns were made by the TBA (41%), and if these had been excluded as a qualifying check, the baseline rate would have been much lower. At the mid-term survey, TBAs were reported to make only 1.6% of the newborn check-ups, while the majority (84%) were made by the nurse/midwife and CHEW at the health center or post, and another 8% were made by CHEWs in the community. This shift reflects a change in understanding about what constitutes a newborn check and the importance of having it made by a trained individual very soon after the infant's birth.

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. While we 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 there with their newborn could indeed be a life-saving trip.

Third, 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. 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 that has been observed in the intervention communities. In addition, the rise in the anti-tetanus vaccination rate may have reduced the incidence of tetanus among newborns.

Fourth, there were sharp increases in knowledge about immunizations, as well as in the vaccination coverage rates themselves. At baseline, only one in ten knew when the first shots are due, while at mid-term half knew when to start immunizing their child. Similarly, knowledge of the number of visits needed to fully immunize a child also grew to 50%. The percent of women who had received standing permission to immunize their infants doubled. All these knowledge and readiness indicators were higher in the intervention than control communities, reflecting the intense community engagement efforts in the intervention clusters. Through these efforts plus intensified efforts to assure the availability of routine vaccination services at health centers, the immunization rate (all key antigens) went from 2% to 32%, and even higher in the intervention communities to 41%. Analysis of the antigen-specific one-year old vaccination coverage rates suggests that had there not been persistent stock-outs of DPT, the vaccination coverage rates would have been much higher, as that appears to have been the missing vaccination for most children who had not completed the series.

Fifth, there were substantial reductions in infant and under-5 mortality. This can be related to the significant increase in women seeking advice on the care of their children. Increasingly, they are learning about recommended care practices to prevent or treat childhood illnesses from CHEWs, community volunteers, and other informed women, such as participants in the women's groups. All the CHEWs deployed by the program have been trained in Nigeria's adaptation of the WHO/UNICEF IMCI (Integrated Management of Childhood Illnesses) program, and they have begun to relay information about danger signs of childhood illness and how to respond to them. The nurse/midwives at the health posts have likewise been trained in the IMCI protocol, which improves the advice and care given to mothers with sick children. The mid-term survey data on how sick children were treated do not as yet show major changes in the use of medications for fever, cough, or diarrhea, the main illnesses targeted by IMCI. Indeed, some care behaviors reflect fewer adherences to the IMCI-recommended treatment protocols (e.g., use of antibiotics to treat fever and/or cough; use of ORS for diarrhea). The reduction in medication use was complemented by an increase in the use of traditional medication or herbs. While we do not know why fewer sick children were given anti-biotics or anti-malarials, it is possible that this reflected a change in cost or availability of the needed drugs. Implementation of drug subsidy programs, currently underway in the programme area, may change use, if cost or availability is the problem. In any case, it is clear that to reduce the child mortality rate is going to take additional efforts to promote knowledge of childhood illness danger signs, assuring the availability of assistance when children do become ill, and greater

penetration of the prevention messages of IMCI, needed to reduce the overall incidence of these serious childhood illnesses.

In summary, this early look at the impact of the program in the intervention communities suggests that the PRRINN-MNCH programme is beginning to have significant impact. The focus on antenatal care and newborn care is bearing fruit in the reduction of infant mortality. The chain of knowledge and behavioral outcomes suggest the combined influence of the supply-side and demand-side activities. While the CBSD efforts had only just been implemented at the time of the mid-term survey, these preliminary results provide encouragement that they are beginning to take hold within the community, as the CHEWs become respected sources of information and care.

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