

USING THE COMMUNITY INFORMANT-BASED (MADE-IN and MADE-FOR) METHODOLOGY TO ESTIMATE THE NEONATAL MORTALITY RATE (NMR) IN NOWSHERA, KHYBER PAKHTUNKHWA: A FEASIBILITY STUDY

NOVEMBER 2016

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(MADE-IN and MADE-FOR) Methodology
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A Feasibility Study**

Population Council

November 2016

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"I have read the report titled "Using the Community Informant Based (MADE-IN and MADE-FOR) Methodology for Estimating the Neonatal Mortality Rate (NMR) in Nowshera, Khyber Pakhtunkhwa Province– A Feasibility Study", and acknowledge and agree with the information, data and findings contained".

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Acknowledgment:

"Using the Community Informant Based (MADE-IN and MADE-FOR) Methodology for Estimating the Neonatal Mortality Rate (NMR) in Nowshera, Khyber Pakhtunkhwa Province– A Feasibility Study" is a project implemented by the Population Council Pakistan and funded by the Reproductive, Maternal and Newborn Health Project (RMNHP), implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for Economic Development and Cooperation (BMZ).

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Acknowledgments

This study was funded by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH to obtain a neonatal mortality estimate for the Nowshera district of Khyber Pakhtunkhwa province. We gratefully acknowledge the cooperation and support provided by Dr. Patrick Tabatabai, Ms. Jasmin Dirinpur, and Ms. Alexandra Plueschke at GIZ in the implementation of the study.

For their complete support and help in facilitating this study's implementation, we extend our appreciation and gratitude to the Director General (DG) Health of Khyber Pakhtunkhwa and other officials of the Health and administration departments, particularly the District Health Officer (DHO), District Coordination Officer (DCO), District Coordinators of the Maternal, Newborn and Child Health Program (MNCH), and Lady Health Worker Program Coordinators of Nowshera.

In conducting the study and preparing this report, the authors benefited from important inputs of several colleagues at the Population Council: We warmly thank Dr. Gul Rashida Shaikh, Senior Director, for providing programmatic inputs; Mr. Muhammad Usman, for working late hours to complete data entry and analysis in time; Mr. Maqsood Sadiq, Senior Program Officer, for his active involvement in data analysis; Mr. Imran Ahmed, Director of Finance, Administration and Human Resources, and his team, for expertly handling all logistic and financial matters; Ms. Kiren Khan, for excellent editorial support; Mr. Ali Ammad, for the final formatting of the report; and Ms. Tahira Parveen for her inputs at various stages of the study. We especially thank the interviewers and team supervisors for their tireless work in the field to collect data on schedule.

Finally, we owe a debt of gratitude to the community informants who participated in this study, particularly the families of the deceased neonates, who willingly gave their time to participate and share the painful memories of events surrounding the deaths of their newborn children.

Abbreviations

ADC	Assistant District Coordinator
ANC	Antenatal care
BEmONC	Basic emergency obstetric and neonatal care
BHU	Basic Health Unit
CEmONC	Comprehensive emergency obstetric and neonatal care
CSPRO	Census and survey processing system
DCO	District Coordination Officer
DHDC	District Health Development Center
DOCO	District Officer Community Organization
DFID	UK Department for International Development
DHQ	District Headquarters Hospital
DHS	Demographic and health survey
DoH	District Officer Health
EDO	Executive District Officer
Immpact	Initiative for Maternal Mortality Programme Assessment
KP	Khyber Pakhtunkhwa
LHW	Lady Health Worker
LHWP	Lady Health Workers Programme
MADE-IN	Maternal death from informants
MADE-FOR	Maternal death follow-on review
MDG	Millennium Development Goal
MICS	Multiple Indicator Cluster Survey
MIMS	Maternal and Infant Mortality Survey
MMR	Maternal mortality rate
MNCH	Maternal, newborn, and child health
NMR	Neonatal mortality rate
PDHS	Pakistan Demographic and Health Survey
PRD	Pregnancy-related death
PMR	Perinatal mortality rate
RHC	Rural Health Centre

SBA	Skilled birth attendant
SBR	Stillbirth rate
SDGs	Sustainable Development Goals
SRS	Sample registration system
SVR	Sample vital registration
TBA	Traditional birth attendant
TFR	Total fertility rate
THQ	Tehsil Headquarters Hospital
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
VA	Verbal autopsy
WHO	World Health Organization
WRA	Women of reproductive age

Executive Summary

Pakistan's neonatal mortality rate (NMR), at 55 per 1,000 live births (PDHS 2013), is the second highest in the world. Notwithstanding a decline in infant mortality, the NMR is estimated to have risen by eight percent between 2006-2007 and 2012-2013 (PDHS 2007 and 2013). In the province of Khyber Pakhtunkhwa (KP), however, NMR did not rise but remained stagnant, at 41 per 1,000 live births, during the same period. To improve strategies for addressing this issue, there is a need for deeper understanding of factors underlying neonatal mortality along with regular monitoring of its extent and patterns. This strategy is impeded by the absence of a fully functional vital registration system, incomplete and outdated population census data, and the high costs associated with household surveys. Provincial governments, as a result, must find innovative and cost effective ways to regularly measure and understand neonatal mortality within their domains.

Concerned about high levels of neonatal mortality, the KP government expressed a need to adapt and test a new approach that uses community-based informants to estimate the number of maternal deaths. This approach—commonly referred to as the “MADE-IN/MADE-FOR” method—has been used successfully in recent years to estimate the maternal mortality rate (MMR) in Punjab province and in two districts of KP, Nowshera and Haripur. The current pilot study in Nowshera was commissioned by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and conducted by the Population Council to test the feasibility of using the same method, and the same community-based informant networks that had been used to measure maternal mortality, for estimating neonatal deaths.

In the two-part “MADE-IN/MADE-FOR” technique, networks of community-based informants, such as Lady Health Workers, religious leaders, *Nikah* registrars and male and female councilors are trained and then mobilized to identify the number of deaths (e.g. maternal or neonatal) that occurred in their community within a specific period. Use of more than one network per community enables cross-verification and adjustment of lists of reported deaths. In the second stage, each listed death is followed up with interviews with relatives of the deceased for verbal autopsies. The data collected is analyzed to estimate a mortality rate and provide other critical insights for identifying risks, causes, and circumstances of these deaths.

In addition, a separate rapid health facility assessment was carried out at secondary care facilities in the district to assess their capacity and readiness for offering care to newborns.

Study Objectives

The study's primary objectives were:

- To assess the feasibility of applying the MADE-IN/MADE-FOR methodology to estimate the neonatal mortality rate in a district in KP (Nowshera district was selected for the pilot study); and
- To utilize the project to build capacity overall within the province of KP to generate neonatal mortality estimates routinely on a sustainable basis.

The study's secondary objectives were:

- To assess whether the key informant networks already identified within rural and urban communities to identify deaths among women of reproductive age(WRA) could also be used to identify neonatal deaths;
- To determine the circumstances under which the neonatal deaths occurred; and
- To develop a mechanism that could be employed at the community level for determining the cause of neonatal deaths.

Methodology

The current study aimed to use the MADE-IN/MADE-FOR approach to present a full count of neonatal deaths (i.e. deaths within 0 to 28 days of birth, as well as stillbirths) in Nowshera district for the preceding two years, from January 2014 to December 2015. To minimize recall bias, the shorter duration of two years was used as the reference period. The study was carried out in all three *tehsils* of the district, Jahangira, Nowshera and Pabbi. In each *tehsil*, we used two networks of community-based informants so as to apply the capture-recapture technique, which helps to adjust the number of deaths taking into account cases that may have been missed by reporting networks.

A total of 907 Lady Health Workers (LHWs), 1,054 councilors, 64 *Nikah* registrars, and 517 religious leaders participated as informants. Verbal autopsies were conducted by Lady Health Worker Supervisors, and the data was analyzed at the Population Council office in Islamabad. A rapid facility assessment of secondary care facilities in Nowshera district was also carried out.

Findings

The main findings of the study are:

- Nowshera's neonatal mortality rate is estimated to be 28 per 1,000 live births.
- The majority of neonatal deaths took place within 24 hours of birth; 75 percent of deaths took place within 72 hours of birth.
- Nearly 50 percent of all neonatal deaths took place at a health facility, about five percent en route to a health facility, and the rest (45%) were at home.
- Nearly half of the deaths that occurred away from home took place at tertiary care facilities.
- Nearly one third of the deaths were due to birth-related complications such as asphyxia; a quarter were caused by neonatal infections; and another quarter were due to prematurity. Together, these three causes contribute to roughly 80 percent of all neonatal deaths.
 - This pattern confirms the pattern of disease identified in earlier studies to underlie neonatal mortality.
 - More male deaths were reported than female deaths, which is consistent with the biological survival advantage of girls in the neonatal period.
- 90 percent of the mothers of deceased neonates had availed antenatal care services and three quarters of the deliveries had taken place at health facilities.
- Postnatal care was availed by a third of the mothers.
- The high proportion of deaths taking place at tertiary care facilities indicates gaps in capacity to handle neonatal emergencies. Many deaths also occurred on the way to or at second and third contact facilities, highlighting the need for stronger referral and transportation arrangements.
- Distinct patterns of neonatal death risks are identified in this study:
 - Male neonates had a 28 percent increased risk of death than female neonates.
 - There was a 43 percent increase in risk of neonatal death if the mother was illiterate compared to if she was literate.
 - There was a 27 percent increased risk of death if the mother was in the lowest wealth quartile compared to if she was in the richest quartile.
 - Low birth weight neonates have a 25 percent increased risk of death if born in a low wealth household quartile compared to those born in households in higher wealth quartiles.

- Neonates were at 171 percent increased risk of death in their first seven days (days 0 to 6) compared to those seven to 28 days old.
- There was a 150 percent increase in risk of death if neonates were born second in pregnancy order, and a 220 percent increase risk if born third.
- The cost of applying this method was \$0.71 per neonatal death, which is much lower than the cost of \$10 per household estimated by K Hill et al. (2006) for household surveys.

Recommendations

This study has clearly shown, in addition to identifying maternal deaths, that community informants can identify neonatal deaths. This approach can be institutionalized by provincial Health departments for information, for mortality estimations by communities. Informant networks can also be utilized for collecting other health and surveillance-related information, and sensitizing and mobilizing communities to raise awareness of safeguards for avoidable deaths. Because of their influential positions, the community networks identified by this study can play an important role in creating community awareness for issues related to birth preparedness and newborn care.

Major health sector interventions necessary for reducing neonatal mortality in Nowshera include:

- Underserved communities should be provided expanded options of home-based care through low-cost interventions that have worked globally in resource-constrained settings including Pakistan.
- Awareness should be created in communities, among both men and women, to foster healthy behaviors such as birth spacing, maternal nutrition, hygiene, breastfeeding, and appropriate complementary feeding.
- Simple life-saving practices in preventive newborn care must be promoted, such as neonatal hygiene, delayed bathing, keeping neonates warm, and early breastfeeding initiation.
- Provision of timely postnatal care, especially in the first 24 hours, must be prioritized both at health facilities and by health workers. Awareness of the importance of this component of care should also be developed among communities.
- The network of trained community midwives and LHWs must be expanded to reach underserved populations.
- Task sharing between LHWs and community midwives can produce synergies and positively affect home-based care. Community health workers must be trained in neonatal resuscitation and other necessary elements of newborn health care, such as antibiotic use at home for bacterial infections.
- Improvements are required in the provision of equipment and supplies at the secondary and tertiary care facilities. To enhance the quality of care, the requisite supplies and staff trained in neonatal resuscitation must be in place.
- Steroids should also be made available at all levels of facilities for managing pre-term deliveries. Incubators must be made available at the District Headquarters Hospital, the district's largest public health facility. Functional Neonatal Intensive Care Units should be established at all referral facilities.
- In addition to public sector efforts, private sector health care providers must be involved, trained, and regulated for quality neonatal services.
- Financial access for marginalized, underserved communities must be improved by introducing pro-poor voucher schemes and conditional cash transfers.

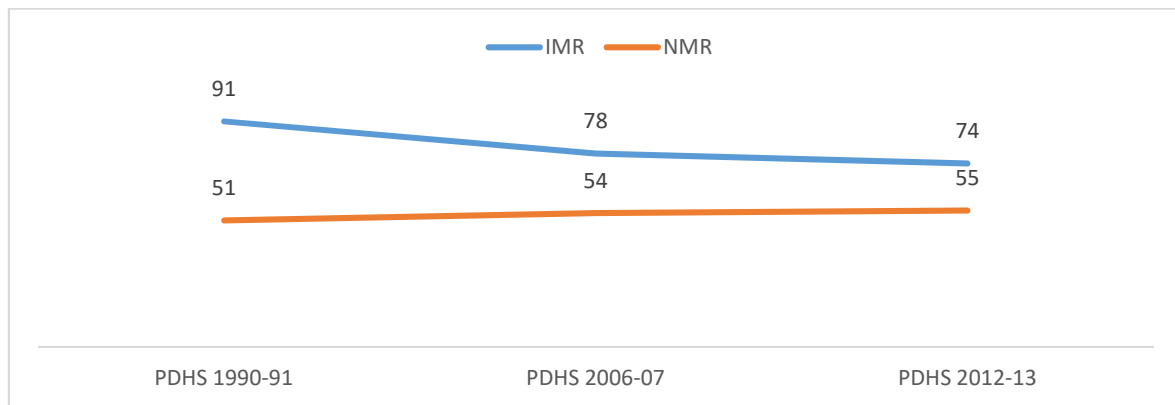
Introduction

This study was conducted by the Population Council in Khyber Pakhtunkhwa (KP) province's Nowshera district to estimate its neonatal mortality rate (NMR) and assess the feasibility of using community-based informant networks for NMR estimation. The study was commissioned by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, which, on behalf of the German Federal Ministry for Economic Development and Cooperation (BMZ), is assisting the KP government's strengthening of its health system's capacity for effective, efficient, client-oriented, and affordable health care.

Background

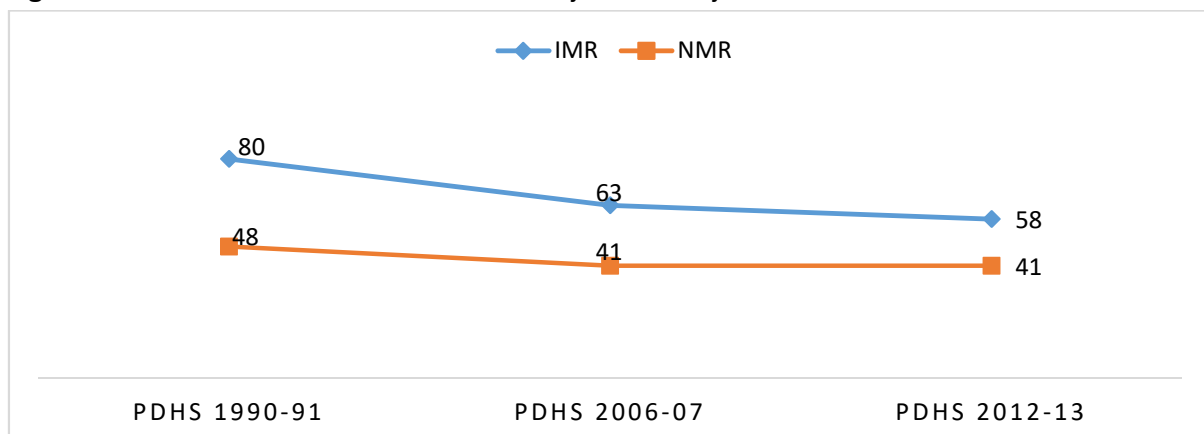
Poor maternal and child health conditions continue to be leading causes of death and disability in Pakistan. Neonatal deaths account for approximately 74 percent of infants deaths (PDHS 2012-13). As shown in Figure 1.1, while infant mortality has fallen at a moderate pace over the last two decades, neonatal mortality has increased from 51 deaths per 1,000 live births in 1990-91 to 54 in 2006-07, and finally 55 in 2012-13 (PDHS).

Figure 1.1: Trends in neonatal and infant mortality rates in Pakistan



The situation is slightly better in Khyber Pakhtunkhwa (KP), where the neonatal mortality rate is 41 per 1,000 live births and has not risen between 2007 and 2013 (Figure 1.2). However, the persistence of the same level of neonatal mortality, especially in a period when overall infant mortality has declined, is a concern, indicating a need for more effective approaches.

Figure 1.2: Trends in neonatal and infant mortality rates in Khyber Pakhtunkhwa



Planners and policymakers in KP realize that a reduction in neonatal mortality is necessary for improving childhood survival, and the government's Integrated Development Strategy 2014-2018 includes a focus on maternal and child health care and coverage of critical illnesses. Based on the KP Health Sector Strategy 2010-2017 (Government of KP 2010.), trainings are being imparted on the integrated management of neonatal and childhood illness to all levels of providers in both the public and the private health sectors. Efforts are also being made to raise awareness among the public through the media and Lady Health Workers (LHWs) to enable communities to recognize danger signs in newborns and seek prompt treatment. Furthermore, Neonatal Intensive Care Units are to be established at all division level hospitals. The Maternal, Newborn and Child Health (MNCH), LHW, and nutrition programs, and the Expanded Programme on Immunization (EPI) have also been integrated to enhance service coverage.

Government efforts are supported by GIZ in two KP districts, Haripur and Nowshera, with the Reproductive, Maternal and Newborn Health Project (RMNHP), which aims to increase the availability, accessibility, acceptability and quality of reproductive, maternal and newborn health services. In both districts, the World Health Organization (WHO) Safe Childbirth Checklist is administered in all health facilities.

Rationale

The KP Department of Health and RMNHP recognize that to measure progress and to improve the design of existing strategies, there is a need to obtain precise sub-national estimates of maternal and neonatal mortality. Moreover, the high and unchanging level of neonatal mortality requires in-depth analysis of the causes and circumstances of newborn deaths to inform health policy, planning, and adjustments in interventions. As a first step, it was agreed that the "MADE-IN/MADE-FOR" methodology should be tried as a pilot to estimate Nowshera district's neonatal mortality.

The **Maternal Death from Informants/Maternal Death Follow On Review** (MADE-IN/MADE-FOR) methodology was developed by the Initiative for Maternal Mortality Programme Assessment (Immpact) at the University of Aberdeen. It is an innovative method for estimating maternal mortality at the community level using networks of community-based informants to identify deaths of women of reproductive age (WRA) within each community. These deaths are subsequently confirmed through home visits and the circumstances and cause of death ascertained through verbal autopsies.

The need to adapt this method for measuring neonatal mortality in Pakistan arises from the absence of or difficulty of using other methods and sources, such as a vital registration system, household surveys, census, or hospital data. The constraints associated with use of these methods in Pakistan are outlined in Box 1. The MADE-IN/MADE-FOR method avoids many of these limitations and has previously been tested for estimating maternal mortality in Indonesia (Qomariya et al. 2010), Somaliland, and Pakistan. In Pakistan, the technique was first tested by the Population Council as a pilot in Chakwal district in January-April 2014 (Mir et al. 2015). It was later scaled up in six districts of the Punjab province for a provincial maternal mortality rate (MMR) estimate in 2014-2015 (Population Council 2015). Subsequently, the feasibility of estimating the MMR using community-based informant networks was established in two districts of KP, Nowshera and Haripur (Population Council 2016).

The studies successfully identified and confirmed the different networks of community informants that can be used to collect data on maternal deaths in communities in Pakistan, including LHWs, community midwives (CMWs), religious leaders, *Nikah* (marriage) registrars, and elected councilors, both male and female. Given the success of the initiative and the efforts invested in establishing the independent informant network infrastructure in the two implementation districts in KP, the question arose whether the same networks could be used to collect neonatal mortality data. This study tested this idea in one district—Nowshera—and represents the first time the community informants' network approach is being used in Pakistan to obtain data on neonatal deaths.

Box 1: Constraints in Using Conventional Data Sources to Estimate Neonatal Mortality in Pakistan

Ideally, a **vital registration system** is the most accurate way of estimating vital events, provided the system includes questions on cause of death and the deaths are fully recorded. However, Pakistan's vital registration system is still not fully functional; there is no provision for mandatory registration of deaths and the importance of reporting deaths and births is not widely recognized. Another major limitation is that the existing system does not distinguish infant deaths, neonatal deaths, stillbirths, and fetal deaths. While some discrete efforts are being made in Punjab, Sindh and KP to improve birth and death registration through raising community awareness, it will take time before the system can be relied on to estimate neonatal mortality.

Household surveys have played a significant role over the past four decades in assessing childhood mortality through birth histories. Through this method, full birth histories are collected from women aged 15 to 49 years in sampled households. Mortality estimates are calculated according to the conventional life table approach. In Pakistan, the Pakistan Demographic and Health Survey (PDHS), Pakistan Social and Living Standards Measurement Survey (PSLM), and the Multiple Indicator Cluster Surveys (MICS) conducted at the provincial level during alternate years have provided infant mortality estimates. However, this method is too costly to undertake frequently—in Pakistan, household surveys are typically conducted once in three to five years. To obtain reliable provincial or district estimates with small confidence intervals through this method, large sample sizes are required. Moreover, the reliability of mortality estimates calculated from prospective and retrospective birth histories through community-based studies depends on the integrity of the information provided on births and deaths.

A national **census** that covers the entire population and can generate indirect estimates of mortality levels is an important potential source of data for the measurement of mortality. Specific modules can estimate child, adult, and age-specific mortality. This approach eliminates sampling errors (because the whole population is covered) and allows a more detailed breakdown. However, the last census in Pakistan was conducted too long ago, in 1998, and the census survey only asked about births and deaths in the preceding 12 months.

Hospital data are also insufficient for obtaining population-based estimates of neonatal mortality unless nearly all women deliver in a health care institution and all neonatal conditions are treated in a health facility. The situation is quite different in less developed countries like Pakistan, where 52 percent of births still occur at home. Additional limitations include the poor quality and availability of hospital records, poor classification of health conditions, and lack of record keeping at private health facilities.

Study Objectives

The study's primary objectives were:

- To assess the feasibility of applying the MADE-IN/MADE-FOR methodology to estimate the neonatal mortality rate in a district in KP (Nowshera district was selected for the pilot study); and
- To utilize the project to build capacity overall within the province of KP to generate neonatal mortality estimates routinely on a sustainable basis.

The study's secondary objectives were:

- To assess whether the key informant networks already identified within rural and urban communities to identify deaths among women of reproductive age (WRA) could also be used to identify neonatal deaths;
- To determine the circumstances under which the neonatal deaths occurred; and
- To develop a mechanism that could be employed at the community level for determining the cause of neonatal deaths.

Methodology

The pilot study in Nowshera sought to present a full count of neonatal deaths (i.e. deaths within 28 days of birth) in the district for the preceding two year period, from January 2014 to December 2015. We also aimed to examine the feasibility of utilizing various informant networks at the community level in the district for this purpose.

As mentioned above, we had earlier conducted a study to estimate the MMR in Nowshera and Haripur; the experiences and lessons learnt from that study were built upon in the current effort. Apart from demonstrating the applicability of the MADE-IN/MADE-FOR approach, the earlier MMR study had explored modalities for continuing such estimation efforts on a sustainable basis. It established suitable modes of operation for ‘enrolling’ community-based informant networks, efficiently arranging meetings, and determining, in detail, the steps required for such studies. We were then able to recommend the most suitable networks for a district. A major lesson was that greater involvement of the health and local government staff in data collection can help institutionalize the approach within the health system, which was incorporated in the methodology used for the current study in Nowshera, outlined below.

(The rapid assessment of health facilities was carried out as a separate exercise from the pilot study to estimate NMR. Its methodology is outlined briefly at the end of this sub-section.)

Site and Coverage

District Nowshera consists of three *tehsils* (sub-districts), Nowshera, Jahangira, and Pabbi, and 47 union councils. It is bordered by Peshawar in the west, Mardan and Charsada in the north, Swabi in the northeast, Kohat in the south, Orakzai Agency in the southwest, and Attock district in the east. The district covers an area of 1,748 square kilometers and has a total estimated population of 1,394,000; the population density is 500 per square kilometer. About one quarter (26%) of the district’s population is urban.

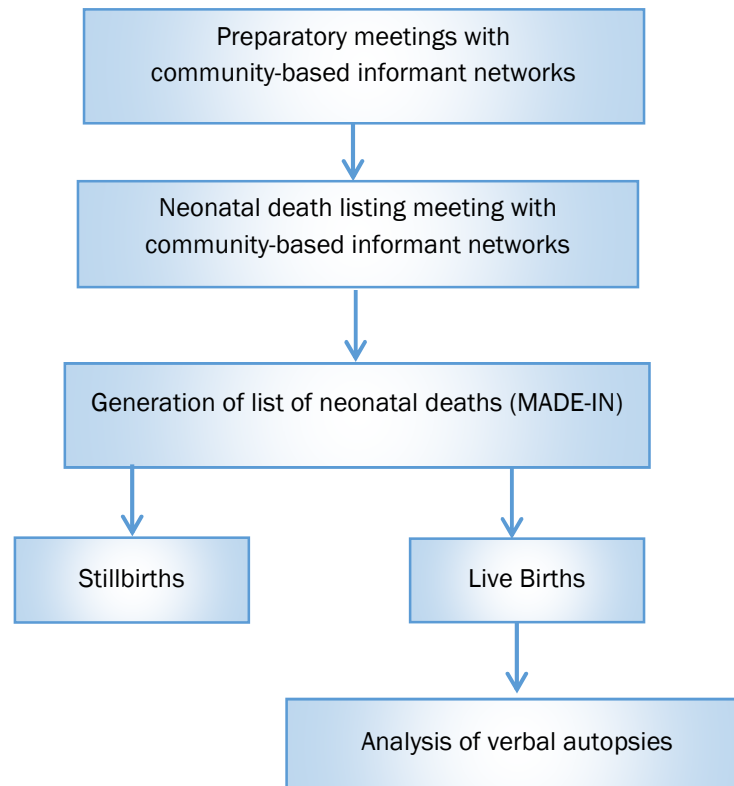
The pilot study covered all the 47 union councils and all three tehsils of Nowshera.

In accordance with the MADE-IN/MADE-FOR methodology, identification of neonatal deaths was in two main steps:

1. **Listing of deaths by informants (MADE-IN):** Village informant networks identified neonatal deaths (newborns up to 28 days old) in their communities. Specific listing forms were developed.
2. **Follow up of death cases with verbal autopsies (MADE-FOR):** Follow up interviews were then conducted with family members of each deceased newborn to confirm whether the death occurred after live birth, and to explore the cause of and circumstances surrounding the death. The standardized WHO Verbal Autopsy (VA) 2012 version was used to collect data.

These core steps were preceded by identification of informant networks and training and preparation of the informants. The sequence of main steps is shown in Figure 1.3.

Figure 1.3: Sequence of data collection activities



Identification of Informant Networks

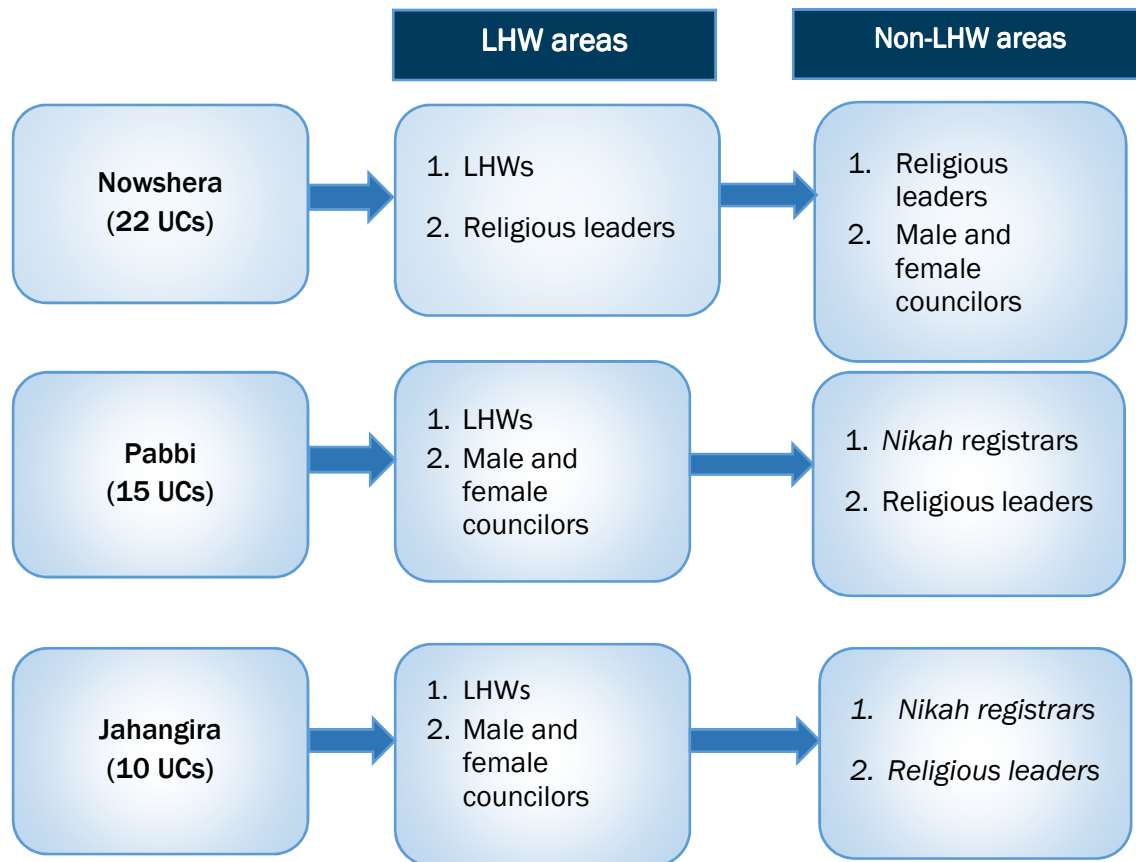
In our earlier effort to collect information about WRA deaths in communities in Haripur and Nowshera, we had worked with local religious leaders, LHWs, Nikah registrars, and elected male and female councilors. We opted to use the same networks to collect information on neonatal deaths in Nowshera.

The choice of informant networks was based on their relative advantages. LHWs are already well-established in the communities they serve, and were therefore used wherever they were working. The religious leaders and *Nikah* registrars are local residents and well respected because of their status as spiritual leaders who are present at important family occasions in the communities, such as births, marriages, and funerals. Councilors are notables of the areas and well in touch with all events taking place in their communities. Other alternatives, such as teachers and vaccinators, were deemed unsuitable for this purpose as they were not residents of the area: they were therefore less knowledgeable about events in the communities they served, and also less trusted and respected by the communities. We did not use traditional birth attendants (TBAs) because they are mostly illiterate and therefore cannot prepare the lists or fill the forms required for collecting data on deaths. CMWs could have been another potential source of information but they are very few and, as yet, not well established.

The first step in implementing the study entailed obtaining the help of the District Coordination Officer (DCO) and District Health Officer (DHO) in Nowshera to update the previously developed comprehensive list of religious leaders, *Nikah* registrars, and councilors for the entire district. The DCO instructed the secretaries of all 47 union councils to update these lists, while the district coordinator of the LHW Programme (LHWP) provided a list of LHWs. The secretaries' *naib qasids* visited each community to update the lists. A schedule was then drawn up outlining the dates for preparatory meetings to which the religious leaders, *Nikah* registrars, and councilors would be called. The Union Council secretaries and Assistant District Coordinator (ADC) of the LHWP informed each network of the date and venue of these meetings.

Two informant networks were used in each of the three tehsils in order to employ the capture-recapture technique (described in Section 2 of this report) in collecting data on neonatal deaths. In Nowshera district, LHW coverage is not universal and there are areas which are not covered by LHW services. Figure 1.4 shows the specific informant networks used in LHW-covered and non-LHW areas of the three *tehsils* in the district.

Figure 1.4: Community-based informant networks identified for data collection in Nowshera



Training and Preparation of Informants (MADE-IN)

A series of preparatory meetings were held with the ‘independent’ community-based informants at the offices of the secretaries of the Union Council. Meetings with the LHWs were held at the District Health Development Centre and health facilities in the catchment areas. The meetings were held at both tehsil and Union Council levels.

The objectives of these meetings were to:

- Introduce the informants to the study’s objectives and methodology;
- Seek their cooperation in all data collection activities and explain the type of information to be gathered;
- Explain the ethical considerations that applied when collecting information, especially how to seek informed consent and provide assurance of confidentiality; and
- Decide on a time and venue to reconvene for the neonatal death listing meeting.

During the preparatory meetings, training on the above was provided to informants by local researchers. Each informant was provided a Neonatal Death Listing form and asked to use it to document the following information regarding deaths of newborns up to 28 days old:

- Whether the newborn was born alive or dead,
- The date and place of death,
- Age and name of father/mother, and
- Residential address.

The Neonatal Death Listing form is attached in Appendix 1.

Listing of Neonatal Deaths by Informants

After the preparatory meetings, informants were asked to collect the data and return with their completed listing forms. The area's field coordinator arranged a separate neonatal death listing meeting with each network at the Union Council office and health facilities. On average, 25 to 30 informants were invited to each listing meeting, which were generally two or three days after the preparatory meeting.

During the listing meetings, participants discussed all the deaths they had listed, collectively agreed on a consolidated list of neonatal deaths, and identified stillbirths. The address of each deceased newborn's household was also verified to ensure that there was no missing information. The number of listing meetings and participation by informants in these meetings are indicated in Table 1.1.

Following the neonatal death listing meetings, the field supervisors compiled and completed summary forms that separated the deaths that had been reported by individual networks and those reported by both networks (i.e. matched cases).

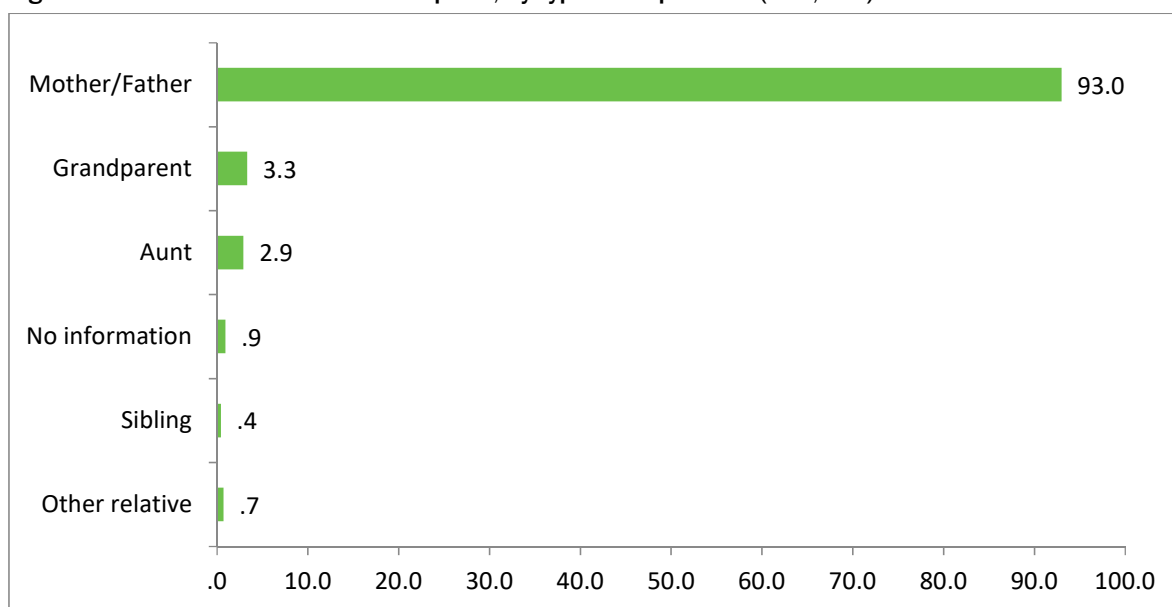
Follow Up Visits for Verbal Autopsies (MADE-FOR)

Through the listing meetings, we were able to develop lists of live births and stillbirths for each village. The lists included information on neonatal deaths that had occurred among residents in the village as well as families residing elsewhere but present in the village at the time of death.

Once the lists were finalized, each household where a neonatal death had been reported was visited by the LHW Supervisor. During the home visits, detailed information was obtained on each death, using the revised WHO Verbal Autopsy questionnaire with additional questions on the socio-economic characteristics of the family, health seeking behavior, and quality of care provided to the neonate around the time of death (Appendix 2).

In selecting VA respondents, the priority was to seek respondents who had been present at the time of the last illness of the deceased newborn. The VAs were conducted mainly with the parents; where neither parent was available, interviews were conducted with relatives of the deceased newborn who were present at the time of death and had knowledge about the circumstances leading up to it (Government of KP 2014). Figure 1.5 (page 11) shows the distribution of the verbal autopsies conducted by type of respondents. The majority (93%) of VA respondents were parents (mainly mothers) of the deceased, followed by grandparents and aunts.

Figure 1.5: Distribution of verbal autopsies, by type of respondent (n=1,625)



Each respondent was asked how many children the mother of the deceased neonate had, how many sons and daughters, how many were living and how many deceased, if she had ever had a stillbirth and, if so, the sex of the child. Information was also recorded on multiple births and their survival status. The births were listed in chronological order, and the existing status, i.e. alive or dead, was recorded. Information was also obtained on abortions, both spontaneous and induced. Close-ended questions were asked on the history of illness surrounding the death of the neonate. Verbatim accounts of the circumstances leading to the neonatal deaths were also recorded.

Response Rate

Table 1.1 shows the number of meetings with identified key informants, the response rate for the listing meeting, and the verbal autopsies conducted. There were no refusals to attend the listing meetings in any of the four informant networks. For the verbal autopsies, the refusal rate, i.e. the proportion of respondents who refused to participate in the verbal autopsy interview, was one percent.

Table 1.1: Participation of key informants in listing meetings (MADE-IN)

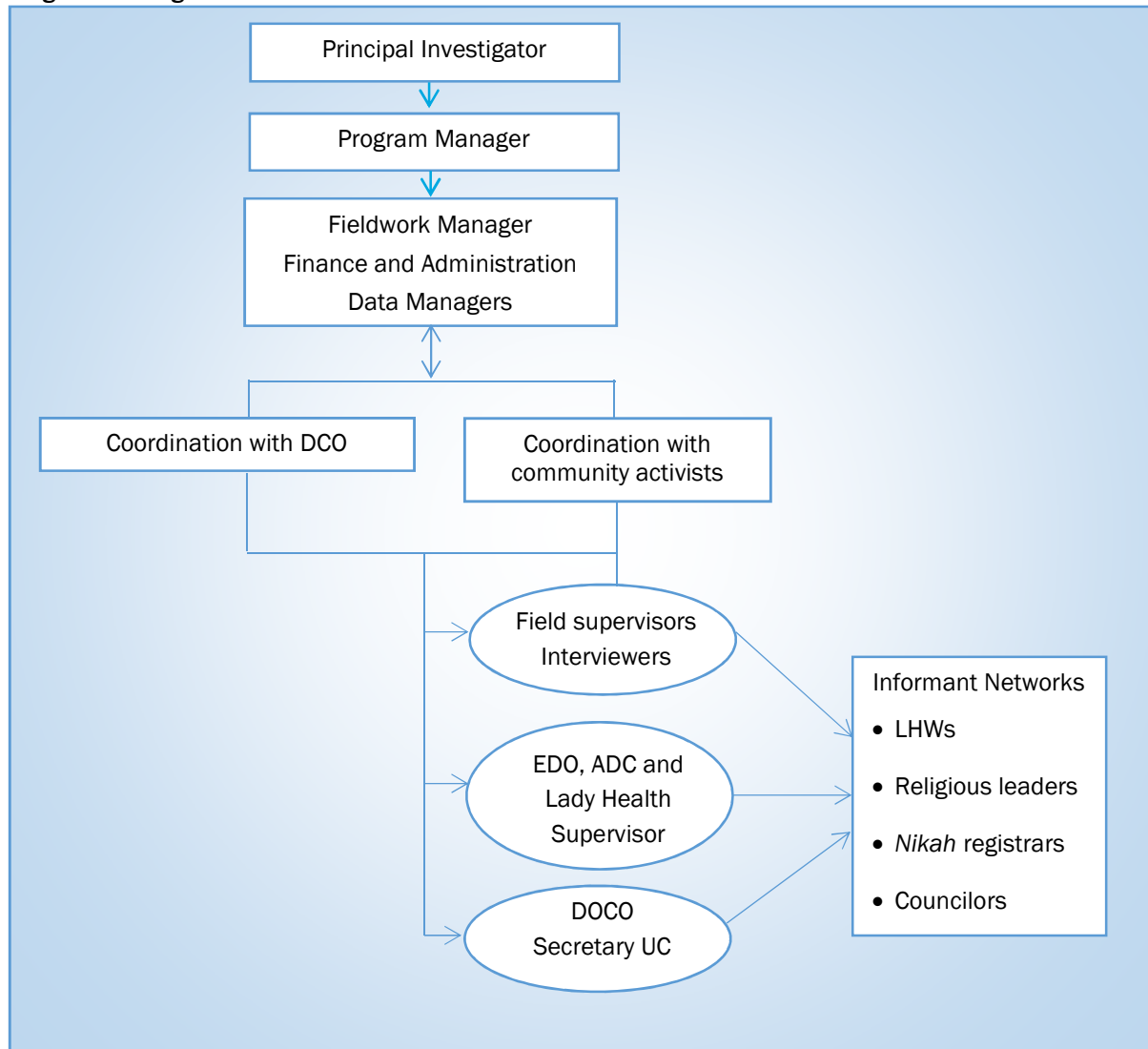
Type of Informant	No. of Informants	No. of Listing Meetings	Attendance Rate, %	Refusal Rate, %
LHWs	907	36	100	0
Councilors	1,054	43	86	0
<i>Nikah</i> registrars	64	4	84	0
Religious leaders	517	25	78	0

Organization of Field Work

Six teams were constituted, two for each *tehsil*, for the MADE-IN component of the study. Each team comprised four members, who were divided into sub-teams of two members each. Each team was supervised by a field coordinator. Data collectors were recruited to work on a full-time basis for the study. Most had master's or bachelor's degrees in sociology or anthropology and research work experience. For the MADE-FOR part, we used 30 LHW Supervisors of the Health Department.

Field activities were supervised by the field coordinators, study manager, and principal investigator. Each day after the fieldwork, the teams conducted a debriefing session to discuss the day's data collection and resolve any problems that had arisen. The organization of fieldwork for the study is shown in Figure 1.6.

Figure 1.6: Organization of field work



Data Management and Analysis

All listing forms and verbal autopsy questionnaires were cross-checked by the data collectors themselves before being double checked by the field supervisor. The next steps involved a re-check by the team leader and a final check by the study manager.

A data entry template utilizing Excel was developed for entering the listing data; CsPro (version 5.1) was used to enter the verbal autopsy data. The InterVA-M software (version 4.0) was used to determine the cause of death. Data were analyzed using SPSS version 20. For the descriptive analysis, frequencies, percentages and rates were calculated, and 95 percent confidence intervals (CIs) were determined for mortality rates.

Analysis of Verbal Autopsies

Estimates of the cause of death were obtained using a computerized algorithm, InterVA-M, compatible with the WHO questionnaire (Fottrell et al. 2007).

The questionnaire has been tested in Pakistan where data was collected from two tertiary teaching hospitals in Sindh. The reference cause of death was established by two senior pediatricians using the instrumental cause of death coding system. The diagnostic accuracy of the WHO verbal autopsy tool for ascertaining neonatal deaths was found to be high and the researchers concluded that it had reasonable validity in determining causes of neonatal deaths and could be used in resource-limited community-based settings where neonatal mortality rate is high (Qomariyah et al. 2010).

NMR Estimation

Estimation of the NMR for Nowshera entailed use of the capture-recapture technique and a complex process of calculations, which are explained in detail in Section 2.

Quality Assurance

A number of measures were instituted to ensure that the highest quality standards were maintained, both in data collection and in analysis. These measures are discussed below.

- **Standard operating procedures:** The Population Council developed a field manual and standard operating procedures for all field research activities.
- **Determination of roles and responsibilities:** The roles and responsibilities of team members and field coordinators were clearly identified and each team member provided written instructions that he/she was required to follow.
- **Training:** Field staff were trained in conducting preparatory and listing meetings, obtaining data from the network participants, pretesting the data collection, and reviewing the pretesting and adapting the methods and tools accordingly. Field interviewers received five days' training in the use of listing forms and VAs. This included sessions on research protocol, ethics, obtaining informed consent, maintaining privacy during the interview process, and interviewing techniques. The training focused on how to adhere to the standard operating procedures and study objectives.
- **Monitoring:** The field manager remained in the field throughout the duration of the study. Each field team had a team supervisor to ensure that data quality standards were met. The principal investigator and project manager visited randomly selected villages in each tehsil regularly to ensure that all protocols were being followed. They randomly selected and scrutinized the completed questionnaires during monitoring visits to check for completeness, data accuracy, and to determine any re-interviewing requirements. During the monitoring visits the project manager had separate meetings with all team members to clarify queries in filling the VA questionnaire. The teams were provided feedback to ensure the quality of data.

Assessment of Public Health Facilities

A rapid assessment of four public sector secondary care facilities in Nowshera gauged the readiness of the system to provide neonatal care services. Capacity was assessed in terms of availability of basic and comprehensive emergency obstetrics care, basic infrastructure, essential equipment for neonatal care, and essential medicines. A team of two visited each facilities and with the help of an inventory checklist and interviews with the facility in-charge carried out the assessment.

Ethical Considerations

Ethical approval was obtained from the National Bioethics Committee of Pakistan and by the Institutional Review Board of the Population Council (Appendix 3).

Informed consent was obtained from all study participants after describing to them in detail all issues related to the study. Interviewers described the scope and purpose of the questionnaire and its approximate duration, and stressed that participation was entirely voluntary. The interviews were conducted in private and out of hearing of other people. When these conditions could not be met, interviewers offered participants an alternative venue or time to complete the questionnaire. All individual data was treated as strictly confidential. Participants were informed that if they had any complaint, they could contact the study manager or the focal person of the Department of Health. Contact details of these individuals were provided to the respondents.

Limitations

Obtaining retrospective information on an event that is not well known or well publicized within communities, such as an early neonatal death, can pose certain difficulties. The number of deaths can be incomplete because of under-reporting and misreporting. Underreporting of infant deaths is usually greater for deaths that occur very early in infancy.

The accuracy of the data collected may be affected by recall bias. For example, respondents' memory of the exact age at death may be inaccurate and some deaths recorded may have occurred after the neonatal period.

Results

This section presents the primary results of the study for neonatal deaths reported by the community informants, the estimated neonatal mortality rate for Nowshera, and the main causes of neonatal deaths identified through verbal autopsies. Although calculation of the perinatal mortality rate was not part of this study's scope, the data collected enabled an estimate, which is also presented. The discussion includes a number of technical terms, definitions of which are presented in Box 2.

In addition, estimates of the accuracy of the neonatal deaths captured in this study as well as the probabilities of deaths captured by each type of informant network used are presented. These estimates were part of the process of NMR estimation described, and are also useful indicators of the technical feasibility of the study's approach. Finally, to contribute to an assessment of the financial feasibility of the approach, the cost of this study (per neonatal death) is estimated and compared with the cost of a household survey.

Box 2: Basic Definitions

The International Statistical Classification of Diseases and Related Health Problems (ICD-10(1)), developed by WHO defines the following standard definitions related to fetal, perinatal, and neonatal mortality.

Live birth is the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born.

Stillbirth is the death of a fetus weighing 500g or more, or of 22 weeks' gestation or more if weight is unavailable (ICD 10).

Neonatal period commences at birth and ends 28 completed days after birth.

Neonatal Mortality Rate is the number of resident newborns in a specified geographic area dying at less than 28 days of age divided by the number of resident live births for the same geographic area (for a specified time period, usually a calendar year) and multiplied by 1,000

Early Neonatal Mortality Rate is number of deaths in first week / Total live births * 1,000

Late Neonatal Mortality Rate is number of deaths 8 to 27 days) / Total live births * 1,000

Neonatal deaths are deaths among live births during the first 28 completed days of life.

Early neonatal deaths occur during first six days of life.

Late neonatal deaths occur after the sixth day but prior to 28 completed (7-27) days of life.

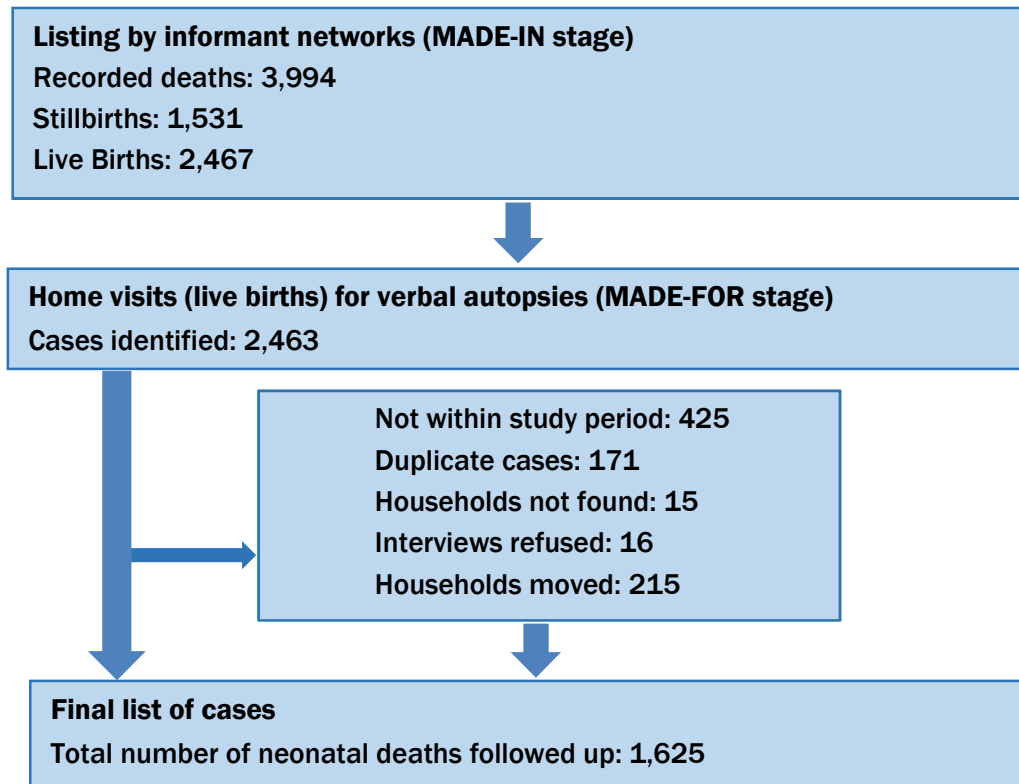
Perinatal period commences at 22 completed weeks (154 days) of gestation (when birth weight is normally 500 g), and ends seven completed days after birth.

Perinatal Mortality Rate = (Early neonatal deaths + stillbirths) / (Total births where total births = live births + stillbirths) * 1,000

Reported Neonatal Deaths

In Nowshera, community informants identified 3,994 neonatal deaths during 2014 and 2015. Of these, 2,467 were identified as neonatal deaths, and 1,527 as stillbirths. During verbal autopsies, 425 cases were discovered to have not taken place within the prior two years, and these were therefore omitted from the analysis. A total of 171 cases were counted twice due to discrepancies in reporting names or addresses. Fifteen respondents could not be located due to incomplete addresses. In addition, 215 households belonging to Afghan refugees had shifted or migrated, and 16 respondents refused to participate. After excluding these cases, 1,629 neonatal deaths were retained for the final analysis.

Figure 0.1: Number of neonatal deaths identified and analyzed



Adjusted Neonatal Deaths

Using the total reported number of neonatal deaths, which were verified by verbal autopsy, the adjusted number of neonatal deaths in Nowshera district was calculated by applying the capture-recapture (CRC) technique. This technique is used to adjust the number of cases that may have been missed by individual networks. The term 'capture-recapture' is derived from wildlife applications wherein a sample of animals from a target population is captured, marked, and released. A second sample is captured at a later time. The number of animals captured each time, and both times, is noted. In public health applications, individuals are 'captured' on different databases and a key stage is matching, i.e. identifying individuals who appear on more than one database (Laska 2002).

Four critical assumptions predicated the simple capture-recapture analysis:

- The set of 'individuals or 'events' to be estimated is fixed, i.e. the number of neonates cannot increase or decrease.

- Individuals captured by both databases can be matched through follow up visits and duplicate cases can be resolved.
- Capture in the second sample is independent of capture in the first. (Separate meetings for the networks and allowing limited time for data collection helped avoid the possibility of contamination and copying of information between networks.)
- Within each occasion or database, the probability of capture does not differ between individuals.

In all tehsils, the deaths were listed by two individual networks, enabling application of the capture-recapture technique to estimate both total neonatal deaths in each *tehsil* and coverage of each network, i.e. the proportion of total deaths identified by each network.

The formula used to estimate the total number of cases (T) was $T = N1 \times N2 / M$, where N is the number of cases captured by any informant and M is the number of cases captured by both networks. The results are presented in Table 2.1. As a result of the CRC technique, the adjusted number of neonatal deaths was calculated as 2,210.

Perinatal Mortality Rate

In all, 2,708 perinatal deaths were recorded among a total of estimated 80,823 births (including live births as well as stillbirths). As shown in Table 2.2, of these perinatal deaths, 1,185 were early neonatal deaths and 1,523 were stillbirths. The perinatal mortality rate (PMR) was estimated at 33.5 per 1,000 total births.

Table 2.2: Estimated prenatal mortality rate in Nowshera

Births	Early neonatal deaths	Stillbirths	Perinatal mortality rate	95% CI
80,823	1,185	1,523	33.5	32-34

CI=confidence interval

Neonatal Mortality Rate

To obtain the neonatal mortality rate, the denominator population of total live births was based on the size of the estimated WRA population and total fertility rate:

- 1998 census data served as a base for cohort component population projections with the population for each year for KP calculated based upon age and sex distribution from 1998 to 2013.
- For estimates of population by age and sex at the district level, district representative data from the Pakistan Social and Living Standards Measurement Survey for 2010-2011 were used.
- Age-specific fertility rates for KP were obtained from PDHS 2012-13, and were used to estimate the number of live births for Nowshera.

In this manner, the number of live births in the district between January 2014 and December 2015 was estimated at 79,300.

Based on the total recorded and verified deaths (1,625), the Unadjusted NMR for Nowshera was calculated to be 21 per 1,000 live births. After applying the capture-recapture technique and adjusting the number of deaths to 2,210, NMR was estimated at 28 per 1000 live births, 95 percent CI (26 to 29).

Table 2.1: NMR estimates for Nowshera

	Live births	Unadjusted neonatal deaths	Unadjusted NMR	95% CI	Adjusted neonatal deaths	Adjusted NMR	95% CI
NMR	79,300	1,625	21	19-21	2,210	28	26-29

2014-2015							
NMR 2015	39,650	909	23	21-24	1,184	30	28-32
NMR 2014	93,650	716	18	17-19	1,039	26	25-28

CI=confidence interval, NMR=neonatal mortality rate

Accuracy of Capturing Neonatal Deaths

Among the 1,629 neonatal deaths identified as live births, it was found upon verbal autopsy that four had been wrongly identified as live births and were actually stillbirths, giving a sensitivity of 100 percent and specificity of 99.7 percent, positive predictive value of 99.7 percent, and negative predictive value of 100 percent.

Among the stillbirths, a verbal autopsy for a sample of 350 cases, or 27 percent of the total stillbirths, found that none were live births. Verbal autopsy of all stillbirths was not included in the scope of the study.

Probability of Capturing Neonatal Deaths

The probability of individual networks reporting a case was calculated by dividing the number of cases identified by each network by the total number of adjusted cases identified by the two networks. Table 2.3 provides the probability of capturing deaths for each network by *tehsil*.

Table 2.3: Probability of capturing neonatal deaths by key informants in LHW and non-LHW areas

Nowshera		Capture-Recapture Technique					
Tehsil/Area	Type of Network	(A)	(B)	(C)	(D)	(E)	(F)
		Network 1 (N1) cases	Network 2 (N2) cases	Matched cases	Total cases recorded N1+N2	Adjusted number of cases— $\frac{N1 \times N2}{M}$	Probability of neonatal death reporting by individual networks
Pabbi—LHW	1. LHW (N1)	358	285	149	494	685	52
	3. MFC (N2)						42
Pabbi—Non-LHW	2. RL (N1)	19	21	7	33	57	33
	4. NR (N2)						37
Total		377	306	156	527	742	
Jahangira—LHW	1. LHW (N1)	326	122	62	386	641	51
	3. MFC (N2)						19
Jahangira—Non-LHW	2. RL (N1)	13	6	0	19	0	
	4. NR (N2)						
Total		339	128	62	405	641	-
Nowshera—LHW	1. LHW (N1)	567	278	213	632	740	77
	2. RL (N2)						38
Nowshera—Non-LHW	2. RL (N1)	34	51	20	65	87	39
	3. MFC (N2)						59
Total		601	329	233	697	827	-
Grand Total		1,317	763	451	1,629	2,210	-

LHW=Lady Health Worker, MFC=male and female councilors, NR=*Nikah* registrars, RL=religious leaders

It is noteworthy that LHWs, who are supposed to report all vital events in their communities, had reported 197 neonatal deaths to the health system for the study period, yet after training in the MADE-IN/MADE-

FOR method, they identified many more—specifically, 824—eligible for verbal autopsy, a **76 percent** increase over the original reporting. Additionally, the other networks reported 801 deaths (Table 2.4).

Table 2.4: Reporting of deaths in Nowshera by LHWs before and after training

Deaths reported by LHWs before study (n)	Deaths reported by LHWs during study (n)	Additional cases identified by LHWs ^a (n)	Deaths reported by other networks during study (n)	Total deaths reported (n)
197	824	627	801	1,625

^a Difference in number of deaths identified by LHWs before and during the study

The four networks reported a combined total of 1,629 neonatal deaths. After the capture–recapture technique, the adjusted number of deaths was 2,210. Therefore, the probability of reporting deaths through this study is estimated as $1,625 / 2,210 \times 100 = 73$ percent, 95 percent CI (71-75).

Cost

The cost of implementing the community-based MADE-IN/MADE-FOR approach was estimated by calculating separately the logistical and administrative costs associated with the field work. The cost analysis included expenditures for training, salaries for enumerators, accommodation for field staff, travel, field monitoring, supervision, and other general expenditures (supplies and services). The cost of applying the technique at the district level came to Rs. 75, or \$0.71 per neonatal death. A detailed breakdown is presented in Table 2.5.

According to Kenneth et al. (2007), the average unit cost of a household survey with a reasonable sample size is \$10 per household. The MADE-IN/MADE-FOR methodology should be considered more economical than a conventional household survey.

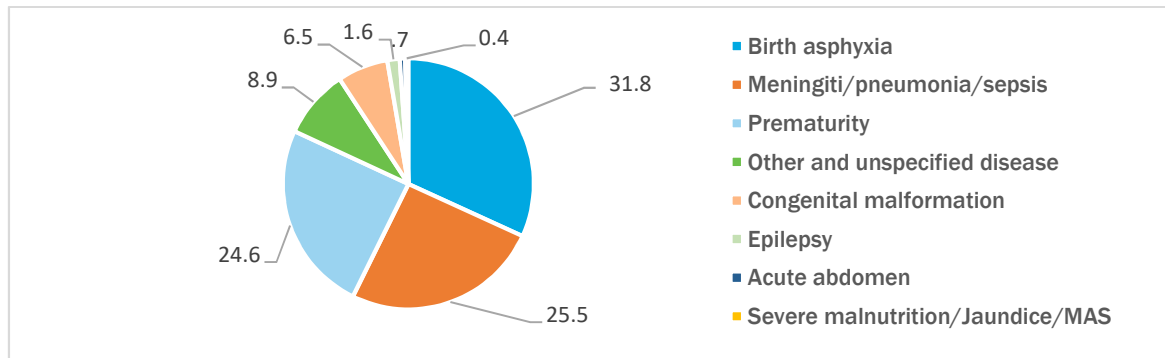
Table 2.5: Costs of Community-Based Informant (MADE-IN/MADE-FOR) technique, US\$

	MADE-IN	MADE-FOR	Total
Administrative	3,892.73	854.23	4,746.96
Travel allowance	9,816.24	670.04	10,486.28
Salary	13,792.39	16,988.24	17,001,816.39
Miscellaneous	1,769.74	206.78	1,976.52
Printing	586.215	586.215	1,172.43
Refreshment	861	861	1,722
Stationery	527.76	160.90	688
Travel	4,787.91	205.87	586,215
Total Amount	37,482	19,086	56,568
Amount per Live Birth (Total births: 80,823)	0.46	0.23	0.71

Major Causes of Neonatal Deaths

Figure 2.2 shows the distribution, by cause, of the 1,625 reported neonatal deaths, with nearly one third due to birth-related complications such as an asphyxia. One quarter were due to neonatal infection including meningitis and pneumonia, while an additional quarter were due to prematurity. These three major causes account for approximately 80 percent of all neonatal deaths.

Figure 2.2: Distribution of reported neonatal deaths, by cause (n=1,625)

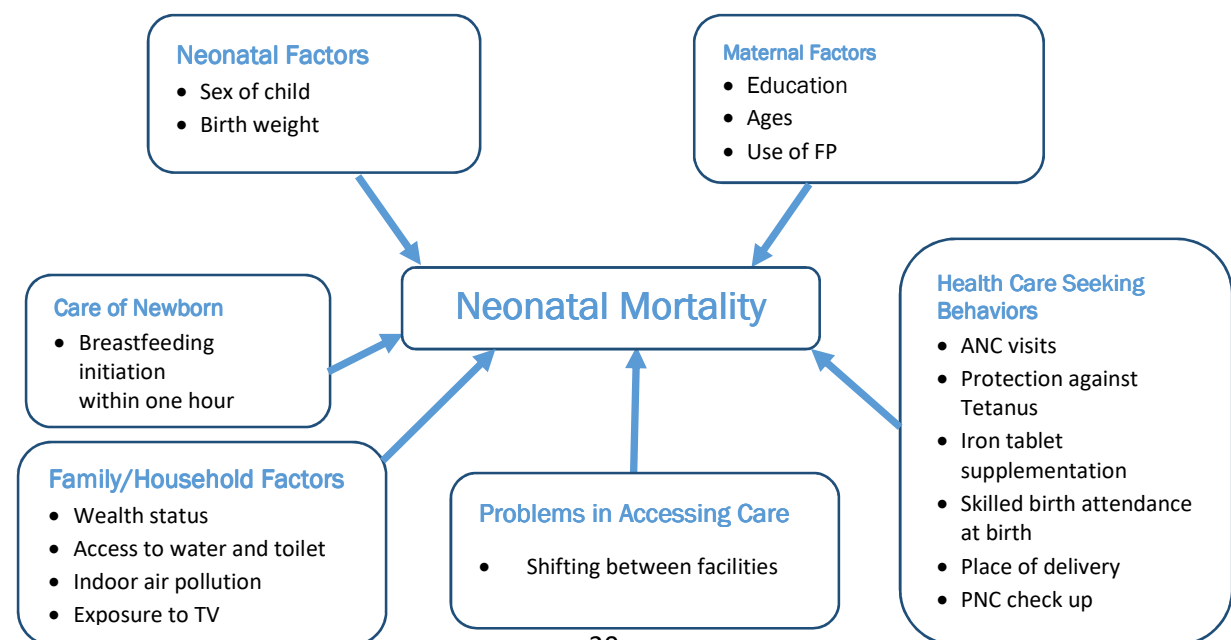


Risk Factors for Neonatal Mortality

Neonatal mortality is influenced by a number of risk factors such as maternal, neonatal, and household socio-demographic characteristics, as well as maternal and family care seeking behaviors (Stoll 1997, Fort, Kothari, Abderrahim 2008). Based on a review on existing literature, these risk factors may be grouped within a conceptual framework shown in Figure 3.1. The rich data from verbal autopsies of the reported 1,625 neonatal deaths in Nowshera made it possible to investigate the relationship between several of these factors and incidence of neonatal death in the district.

Besides the factors shown in the figure below, availability and quality of health care also shape neonatal health outcomes. The findings of the assessment of selected health facilities in Nowshera district are also presented, at the end of the section.

Figure 3.1: Conceptual framework describing factors affecting neonatal mortality

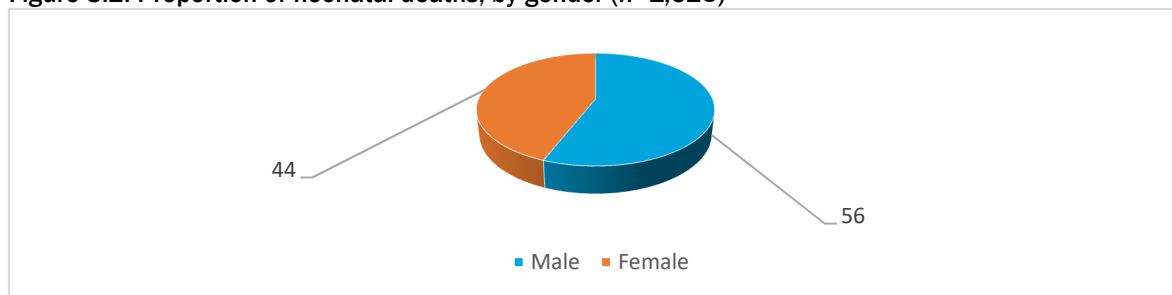


Factors Associated with Neonatal Deaths

Gender

There were proportionately more male than female deaths, and boys had a slightly higher risk at every age, shown in Figure 3.2, consistent with the biological survival advantage of girls in the neonatal period.

Figure 3.2: Proportion of neonatal deaths, by gender (n=1,625)



Age

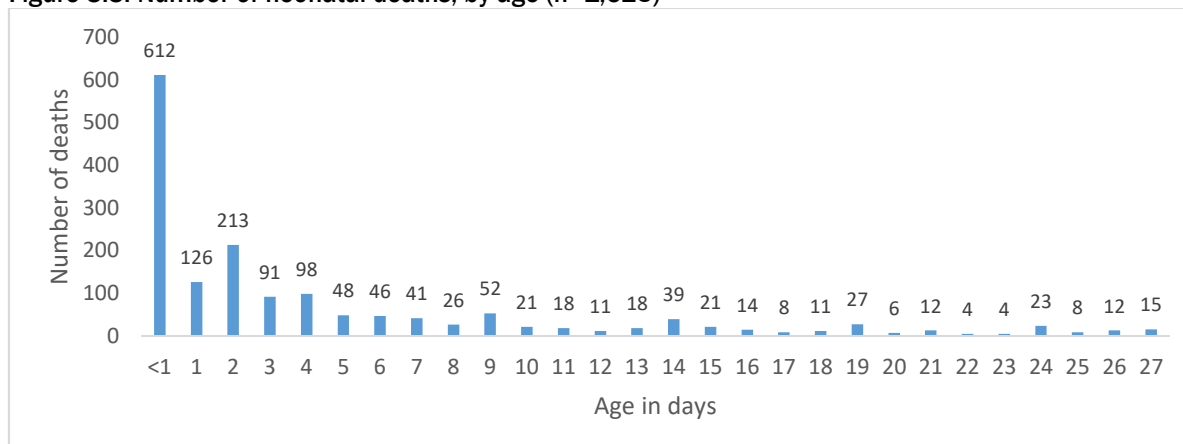
The largest group (54%) of neonatal deaths occurred in the first three days, with the highest proportion (37% of deaths) on the first day after birth (Table 3.1). Cumulatively, nearly three quarters of the deaths were within the first seven days of birth, and then fell sharply (Figure 3.3). Globally, most newborn deaths occur in the early neonatal period (0 to 6 days).

In an analysis of DHS data, in most survey data deaths are usually heaped on the seventh day due to digit preference. This is not seen in this study, however. The importance of precise reporting of day of death is due to the fact that interventions addressing deaths on the first day of life are different from those needed for children who have survived the first seven days.

Table 3.1: Age of deceased newborns, by gender

	Male		Female		Total	
	%	n	%	n	%	n
<1 day	37	340	38	272	38	612
1-2 days	20	179	22	160	21	339
3-4 days	13	115	10	74	12	189
>4 days	30	276	29	209	30	485
Total	100	910	100	715	100	1,625

Figure 3.3: Number of neonatal deaths, by age (n=1,625)



Birth Weight

Mothers were asked to subjectively evaluate whether the deceased newborn had weighed less than 2.5 kilograms, about 2.5 kilograms, or more than 4.5 kilograms at birth. Almost one third of mothers reported that their baby had a low birth weight. Babies with low birth weights are at an increased risk of acquiring infections.

Household Factors

Wealth Status

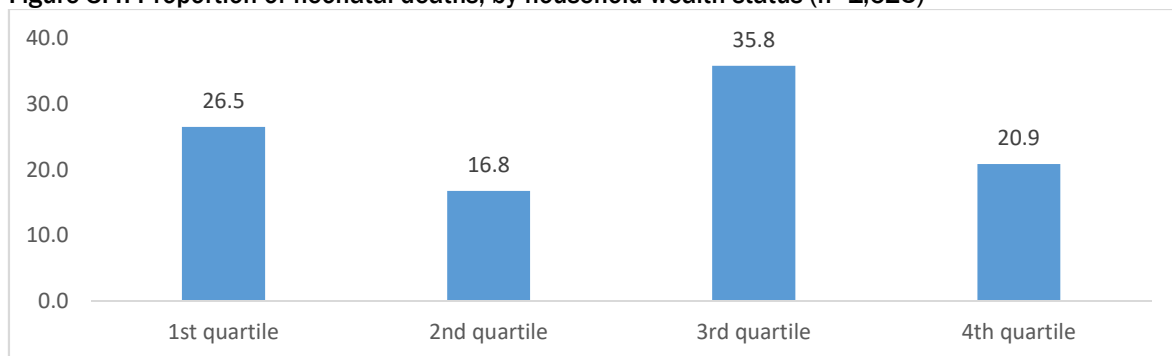
There is a well-defined relationship between neonatal and infant deaths and socio-economic characteristics of households and mothers.

Figure 3.4 shows the proportion of neonatal deaths by household wealth status. The wealth index was calculated for each household through a factor analysis for 25 household amenities and consumer goods, energy sources, and ownership of non-movable property. This procedure is similar to that used by Filmer and Pritchett (1999).

Overall, slightly more than two fifths of neonatal deaths took place among families of low and middle wealth status, while one third were in the third and one fifth were in the fourth wealth quartiles.

Socio-economic status affects access to care and thereby influences the probability of neonatal survival. International evidence shows that babies born into poor families are more likely to be born premature and have low birth weights, which leads to higher incidence of neonatal mortality (Government of UK 2014).

Figure 3.4: Proportion of neonatal deaths, by household wealth status (n=1,625)



Environment and Media Exposure

To gauge exposure to indoor pollution, information was collected about the type of fuel used for cooking in households: 46 percent of households were exposed to indoor pollution.

Access to Water and Sanitation Facilities

Access to water and sanitation facilities also has an impact on all household members' health statuses, including neonates. Only 25 percent of the households of deceased neonates had piped water, while 87 percent had a toilet in the house.

Exposure to Mass Media

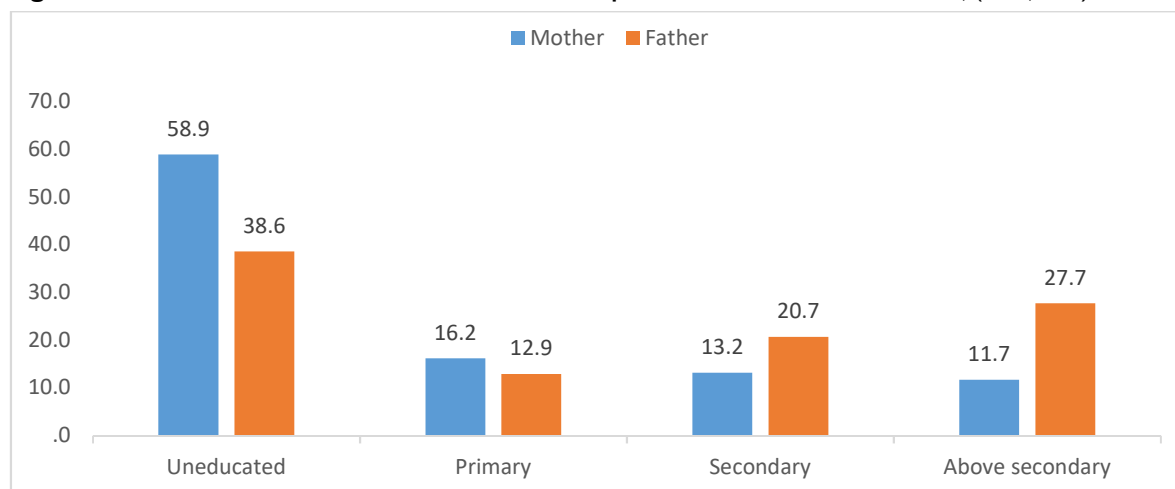
Exposure to mass media can influence health behaviors and lifestyles, as well as health seeking behaviors and, in turn, health outcomes. Among households of the deceased newborns, 66 percent had television access, and 31 percent had a radio.

Maternal Factors

Education

Usually a mother's education is inversely related to neonatal mortality risk. In this study slightly more than half of mothers and one third of the fathers were uneducated (Figure 3.5). This conforms to literacy levels in Nowshera district, where 59 percent of women and 38 percent of men are illiterate.

Figure 3.5: Distribution of educational attainment of parents of deceased newborns, (n=1,625)



Consanguinity

Slightly more than half of the parents were related to each other, denoting a high degree of consanguinity. Owing to cultural norms, consanguineous marriages are a common practice in KP province. Consanguinity is a predisposing factor responsible for hereditary conditions that affect neonatal outcomes such as congenital malformations and metabolic diseases.

Mother's Age

The mean and median ages of the deceased neonates' mothers were 28.5 years and 28 years, respectively. A third of the mothers were aged between 25 and 29 years. The mean age at marriage of mothers was 21 years. The mother's age is an important risk factor: The neonatal mortality rate was seen to increase with mother's age (Table 3.2). The most vulnerable births were those to women aged 34 or above (Titaley et al. 2008).

Table 3.2: Neonatal mortality rate, by age of mother (n=1,625)

Mother's age (years)	Unadjusted deaths	Adjusted deaths	Expected live births	Unadjusted NMR	Adjusted NMR
< 20	81	110	3,573	23	31
20-24	318	432	12,682	25	34
25-29	556	754	9,797	57	77
30-34	346	469	7488	46	63
35-39	244	331	4357	56	76
=> 40	80	109	1421	56	76

Mother's Pregnancy History

As Table 3.3 shows, more than half of mothers of deceased newborns had two to four prior pregnancies. In one quarter of cases, mothers had one previous delivery. In 54 percent of cases, there was a previous history of child death (both stillbirths and deaths following live birth). The average number of living children among mothers of deceased newborns was 2.1, and the average number of previous stillbirths was 1.3.

Table 3.3: Pregnancy history of mothers of deceased neonates

Number of living children in mother's lifetime	%	n
None	19.1	310
1	25.9	421
2-3	35.0	568
4 or more	20.1	326
Mean	0.4	-
Number of pregnancies in lifetime		
0-1	11.8	192
2-4	56.3	915
5-7	24.6	399
8 or more	7.3	119
Mean	3.8	-
Number of stillbirths in lifetime		
No stillbirth	90.0	1,462
1	7.0	114
2-3	1.8	30
4 or more	.3	5
Don't know	.9	14
Mean	0.1	-
Total (N)	100.0	1,625

Nearly one fifth of mothers reported a past abortion, of which 69 percent were spontaneous and 31 percent were induced (Table 3.4).

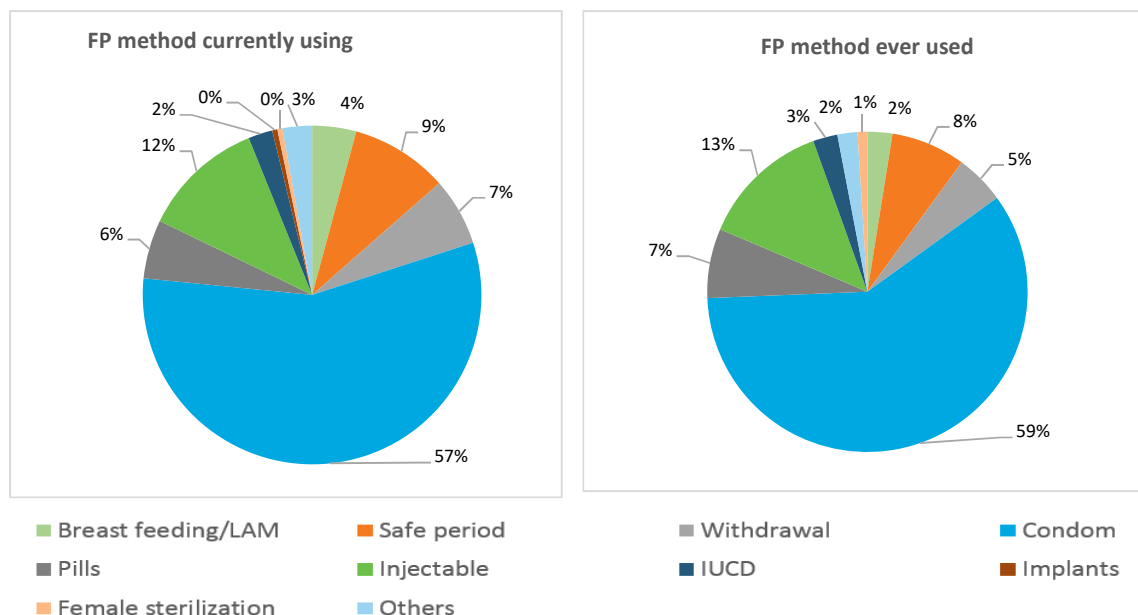
Table 3.4: History of abortions among mothers of deceased neonates

Number of abortions in mother's lifetime	%	n
None	77.8	1,264
1-2	18.8	305
3-4	2.7	44
5 or more	0.7	12
Total	100.0	1,625

Use of Family Planning Methods

Slightly more than one tenth of mothers of deceased neonates had ever used a FP method, and about the same proportion were currently using a FP method. As Figure 3.6 shows (page 25), condoms were the most commonly used method both among ever (59.3%) and current users (56.5%).

Figure 3.6: Proportion of mothers of deceased neonates who currently use and have ever used family planning, by method (n=199 for ever users, n=214 for current users)

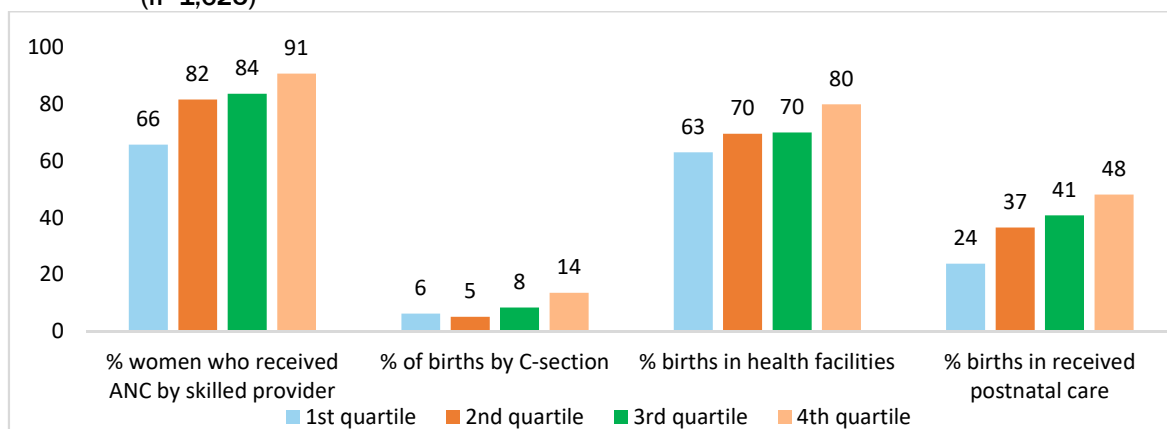


Maternal Health Care Seeking

Maternal health care is an important determinant of neonatal outcomes. Risk factors detected during antenatal care (ANC) can help avoid pre-term, premature births, which are a major cause of neonatal deaths. Similarly, care during delivery can prevent complications such as asphyxia, while postnatal care (PNC) can preclude early neonatal infections.

Figure 3.7 presents an overview of the use of maternal care services in each wealth quartile. A high proportion of mothers of deceased neonates had ANC from a skilled provider and gave birth under medical supervision at a health facility. These figures indicate far better maternal health care seeking than in other parts of Pakistan. A higher proportion of women in the fourth quartile (highest socio-economic group) use ANC services from a skilled provider, have C-sections, or give birth in a health facility as well as receive PNC, denoting that socio-economic status has a bearing upon health seeking behaviors. Nevertheless, even among the poorest women in the sample, over 60 percent received ANC and delivery services.

Figure 3.7: Proportion of mothers of deceased neonates with maternal health care, by wealth quintile (n=1,625)

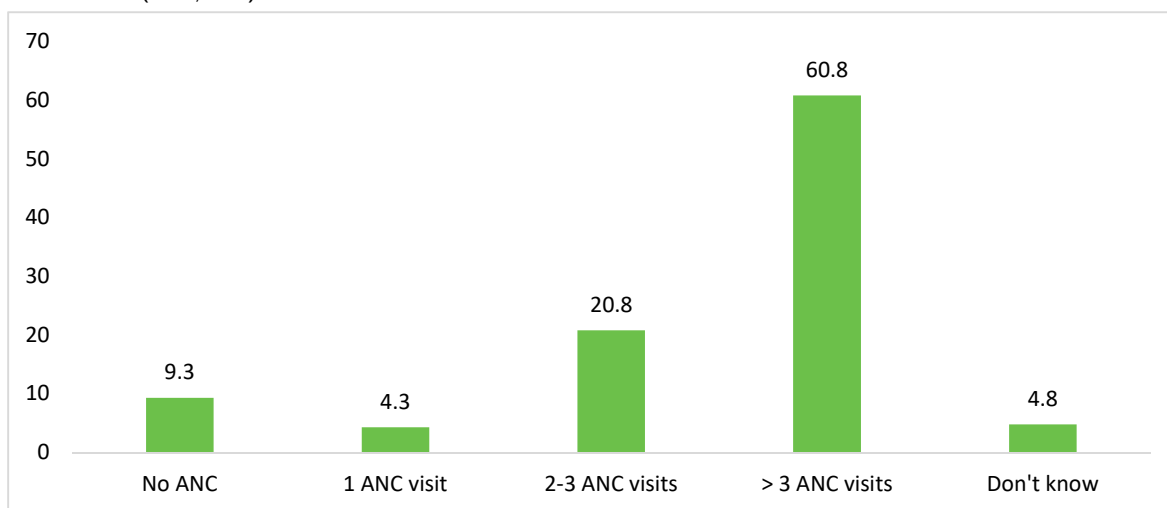


Pre-natal Care

Pre- or antenatal care refers to pregnancy health care check ups at a health facility or home by a care provider prior to delivery. According to WHO, a pregnant woman should have at least four antenatal care (ANC) visits for monitoring her pregnancy, for early detection and management of pregnancy complications with potential adverse effects on her health as well as that of the baby. Most early neonatal morbidities and mortalities are directly related to maternal health conditions like anemia, hypertension, and diabetes.

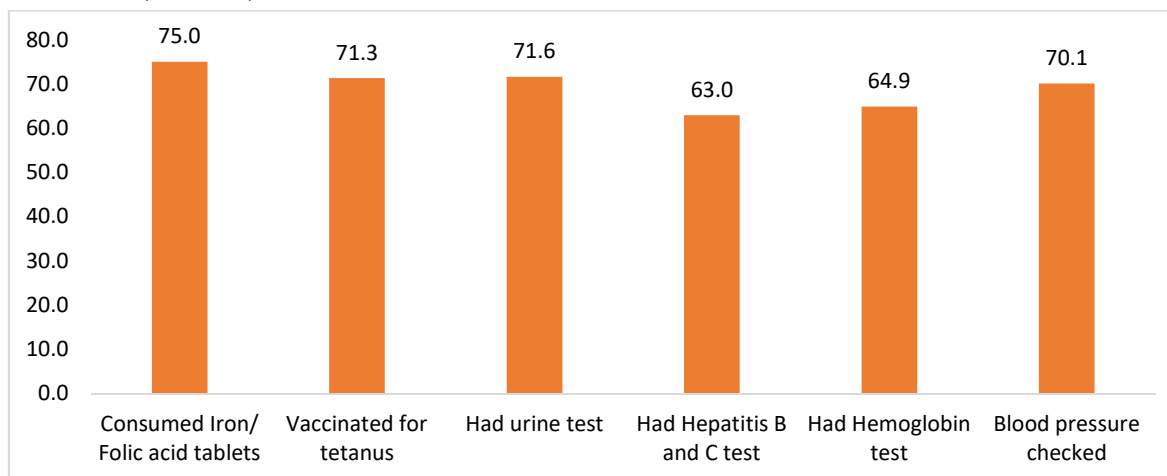
Nearly four fifths of mothers had ANC during their most recent pregnancy, as shown in Figure 3.8. Of these, almost 60 percent had more than three ANC visits.

Figure 3.8: Proportion of mothers of deceased neonates with antenatal care, by frequency of visits (n=1,625)



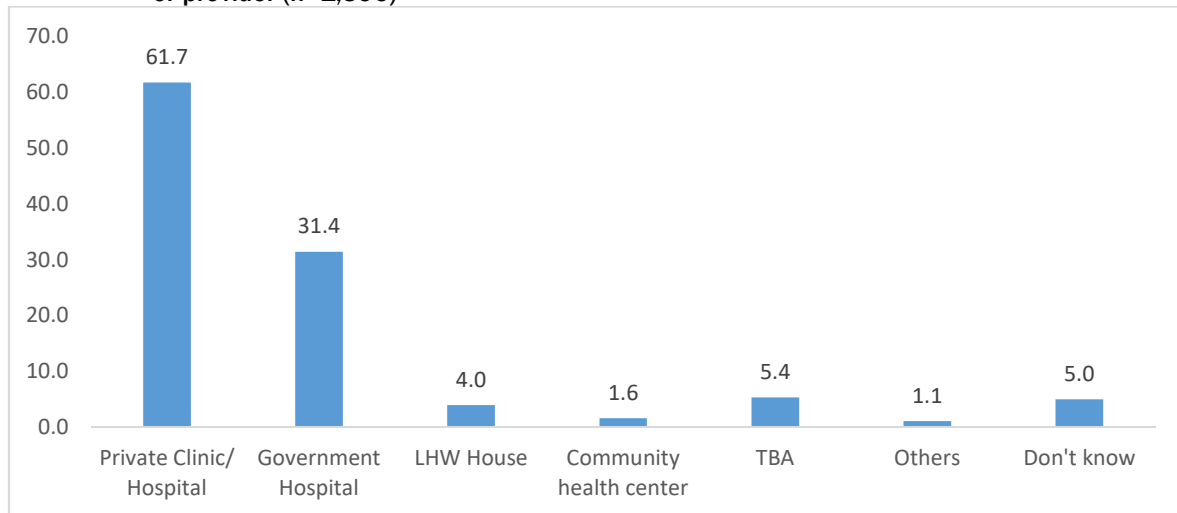
Nearly three quarters of women were given iron and folic acid tablets, tetanus toxoid injections, and had a urine test, while in nearly two thirds of cases tests for Hepatitis B, C and hemoglobin were administered. About 70 percent of expectant mothers had their blood pressure checked (Figure 3.9).

Figure 3.9: Proportion of mothers of deceased neonates with antenatal care, by type of service (n=1,625)



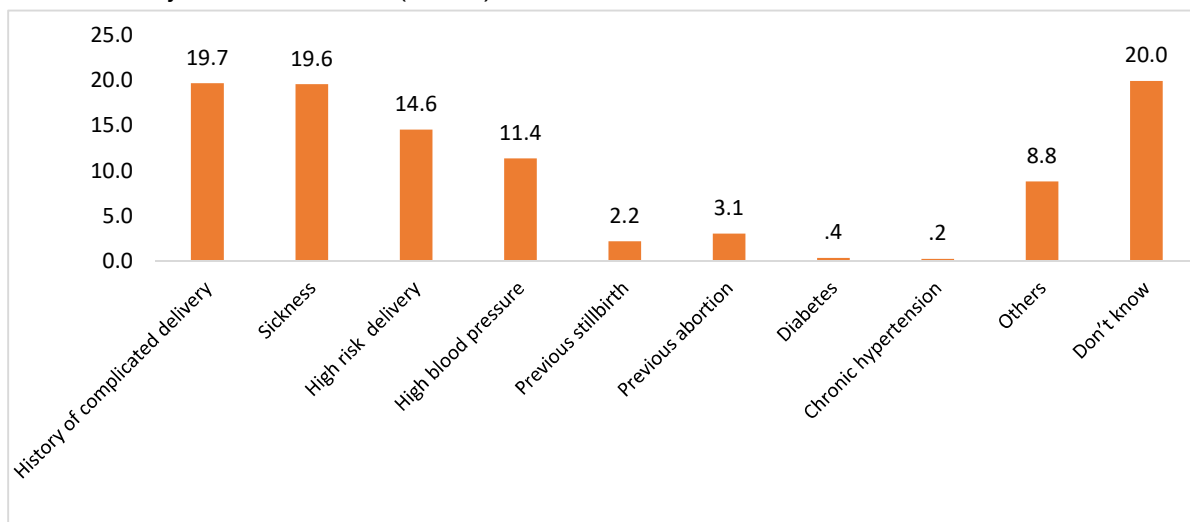
Data show that women prefer private health facilities for pre-natal care (Figure 3.10). More than half of those who had ANC services went to a private facility, while about one third went to a public facility. Three percent of mothers received pre-natal care from their area LHW, while four percent received it from a TBA, which indicates the diminishing role of TBAs in maternal health care.

Figure 3.10: Proportion of mothers of deceased newborns with antenatal care, by type of facility or provider (n=1,396)



During ANC visits, nearly half of women were advised to deliver at a facility, as they were identified as at higher risk of complications such as high blood pressure or history of complicated delivery, abortion, or stillbirth. The reasons women were referred to a hospital for delivery are shown in Figure 3.11.

Figure 3.11: Proportion of mothers of deceased neonates referred to a hospital during antenatal care, by reason for referral (n=816)



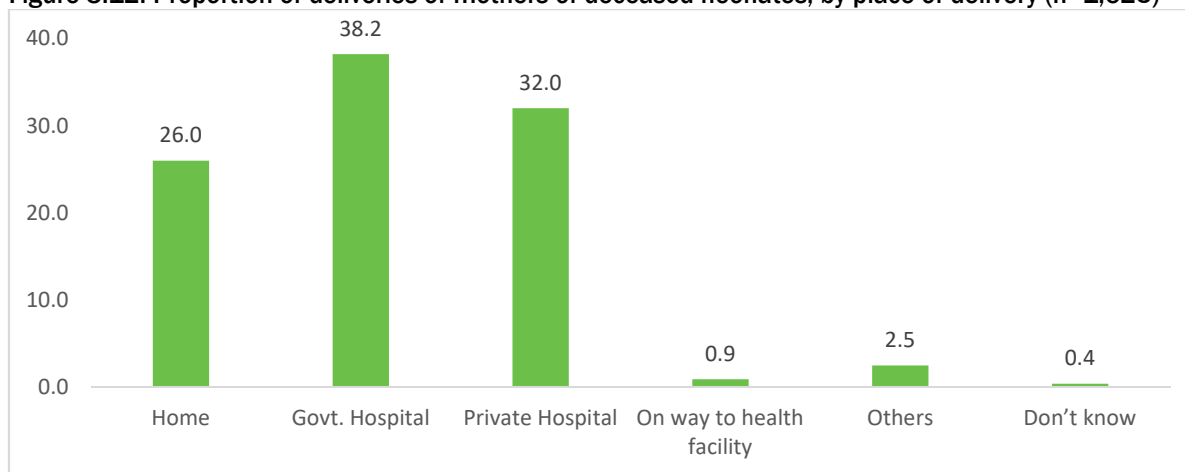
Natal Care among deceased neonates

Proper medical attention and hygienic conditions during delivery can significantly mitigate risk of complications, especially infections that can lead to both maternal and neonatal mortality.

Place of Delivery

Nearly one in four births were at home, while nearly two fifths were at public facilities and one third were at private facilities (Figure 3.12). The high proportion of facility deliveries reflects positive health seeking behaviors among mothers in Nowshera district, who seem to be better aware of the importance of institutional deliveries and are being supported by their families. This could be a major factor in the relatively low NMR estimated for Nowshera in this study.

Figure 3.12: Proportion of deliveries of mothers of deceased neonates, by place of delivery (n=1,625)



Gestational Age and Mode of Delivery

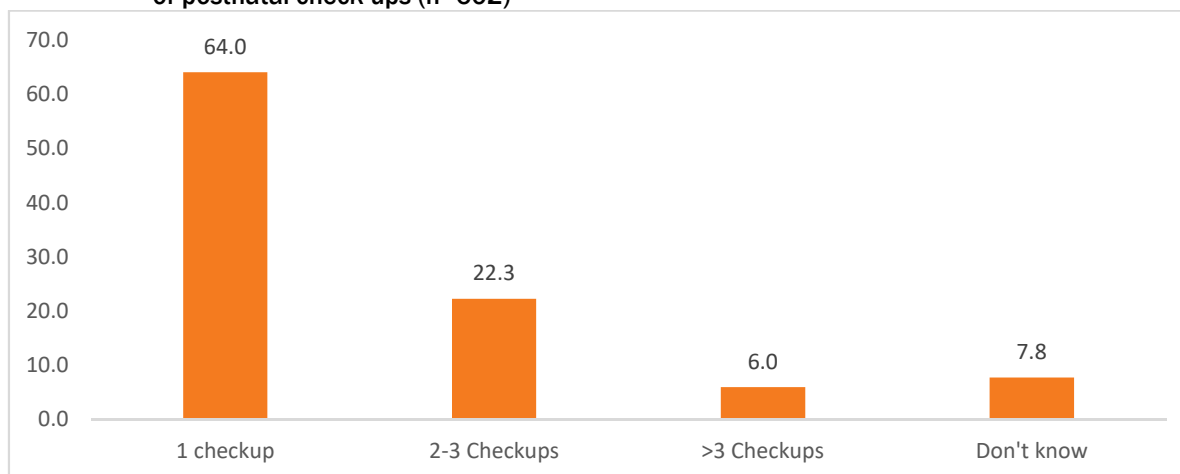
In 95 percent of cases, delivery was a spontaneous vertex delivery. In slightly less than one tenth of cases, a caesarean section was performed. One tenth of the cases were multiple births, i.e. twins. Half of births were full term (37 weeks or more), while 44 percent were at 28 to 36 weeks.

Postnatal Care

A large proportion of maternal and neonatal deaths occur in the 24 hours following delivery. A postnatal care (PNC) visit is, therefore, a vital opportunity for identifying early neonatal problems as well as educating new mothers on caring for themselves and their newborns. It is recommended that the first postnatal visit is conducted within 24 hours of birth, the second within three days, and the third within 42 days of birth.

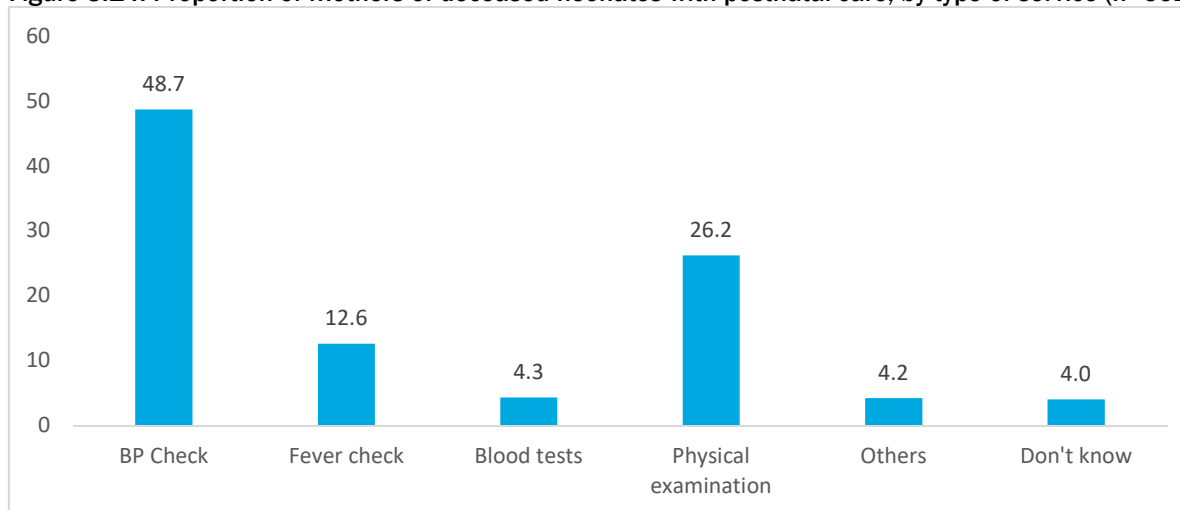
Mothers were asked whether they had PNC check ups after giving birth to a deceased neonate, along with how many visits. Only one third of mothers had a PNC check up, and among those 602 mothers, nearly two thirds had received only a single check up, while one quarter had two or three PNC visits (Figure 3.13, following page).

Figure 3.13: Proportion of mothers of deceased neonates who had postnatal care, by number of postnatal check ups (n=602)



When asked about the types of health checks during their PNC visits, nearly half of mothers reported that their blood pressure was checked, while one tenth said their temperature was taken (Figure 3.14).

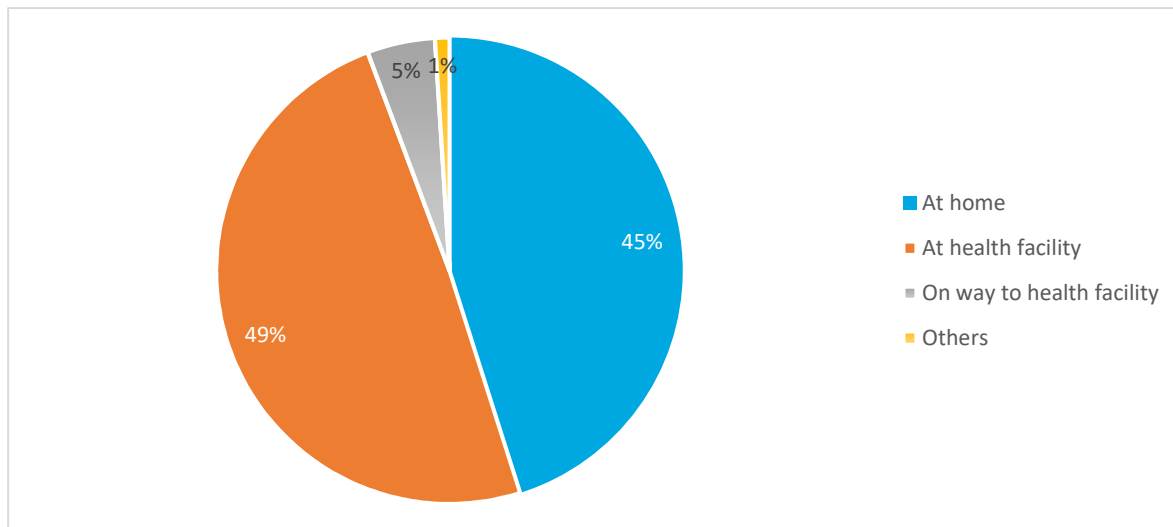
Figure 3.14: Proportion of mothers of deceased neonates with postnatal care, by type of service (n=602)



Problems in Accessing Health Care

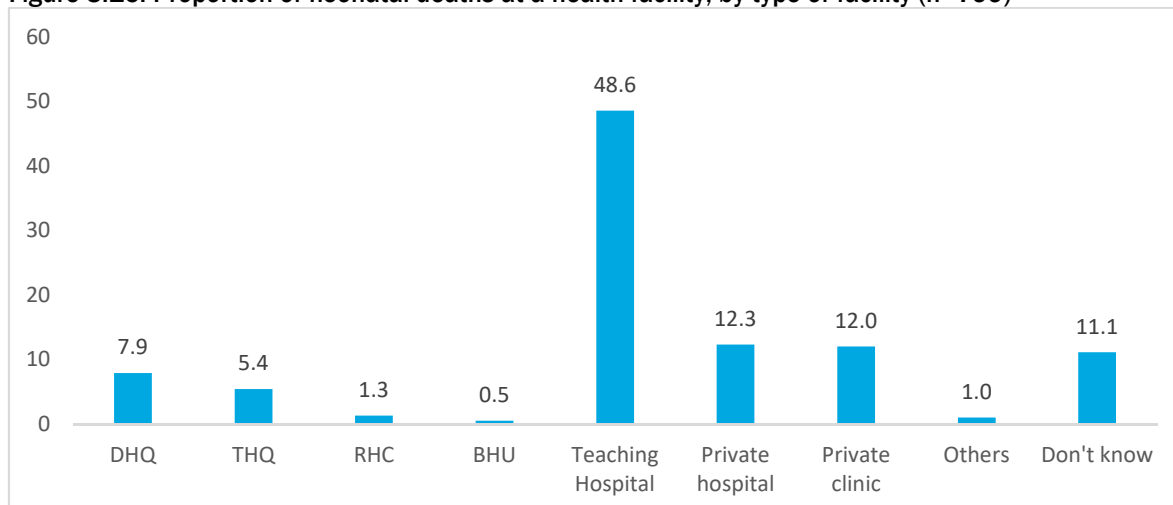
More neonatal deaths (49%) were at a health facility than at home (45%). Nearly five percent of deaths occurred while the neonate was being taken to a health facility (Figure 3.15).

Figure 3.15: Proportion of neonatal deaths, by place of death (n=1,625)



Nearly half of the deaths at health care facilities were at a tertiary care facility, with one tenth at a public secondary care facility and one quarter at a private facility (Figure 3.16).

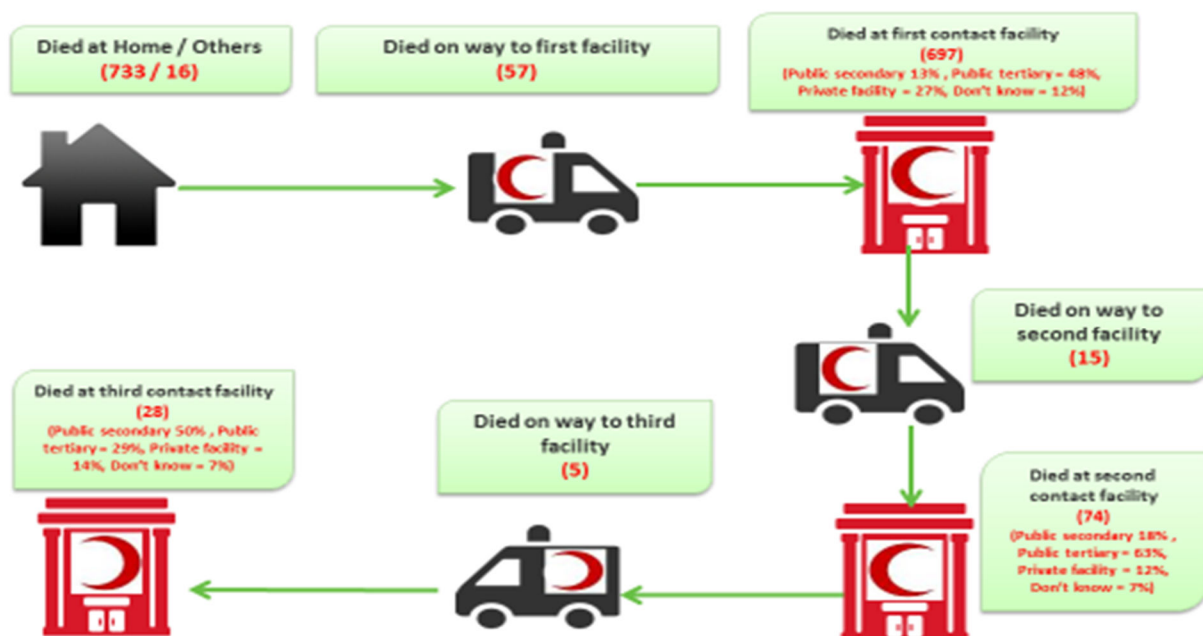
Figure 3.16: Proportion of neonatal deaths at a health facility, by type of facility (n=799)



Note: Except for private hospitals, private clinics, and "others," all facilities shown belong to the public sector. Teaching hospitals are tertiary care facilities, DHQs, and THQs are secondary care facilities, while RHCs and BHUs are primary health care facilities.

Many of the deceased neonates lost their lives at a second or third contact facility, or en route to a health facility, as shown in the health care seeking pathway in Figure 3.17 (page 31). In most (nearly half) of the cases, the first contact facility was a public tertiary care hospital, with a private hospital first point of contact in 27 percent of cases. The second contact facility, in nearly two thirds of cases, was, again, a public tertiary care facility. A total of 77 neonatal lives were lost during transportation to a facility, most on the way to a facility for first contact with health care.

Figure 3.17: Neonatal deaths, by stage of health care (n=1,625)



A close review of this care seeking pathway shows, in the majority of cases, that the preferred health facility of deceased neonates' parents was a tertiary care facility in the provincial capital. The three main tertiary care hospitals accessed were the Lady Reading Hospital and Khyber Teaching Hospital in Peshawar and the Mardan Medical College and Teaching Hospital in Mardan. This finding reflects a lack of trust in available primary and secondary level facilities, which may not be entirely misplaced: This study's assessment of health facilities found that primary and secondary health facilities are not well equipped to deal with neonatal emergencies.

It is also evident that if a well-defined and functional referral system had been in place, along with transportation arrangements in communities, it may have been possible to save the 77 lives lost while shuttling between health facilities. If closer services had been available, parents would likely have preferred to not travel long distances to tertiary care or teaching hospitals, and saved the time lost in transportation. The case study in Box 3 exemplifies how these issues lead to easily preventable deaths.

Box 3: Case Study

The deceased neonate was born in tehsil Pabbi. Her family was poor, and her mother had been married at an early age. Before this delivery, the mother had been pregnant six times but only one male baby had survived: the other five pregnancies resulted in stillbirths and infant deaths.

After the birth, the family was told the baby was in poor health and needed to be placed in an incubator. They were told to rush her to the District Headquarters Hospital (DHQ) Nowshera. But when they got to the DHQ, they were told that the hospital had no incubator, and the baby was referred to a tertiary level health facility in Peshawar, situated 48 kilometers away.

The baby was still alive when they reached the tertiary hospital, and was given initial treatment. However, her condition had deteriorated too much by then, and she did not survive.

Risk Factors Associated with Neonatal Deaths

To ascertain the level of risk associated with various neonatal mortality factors, bivariate analysis calculated their relative risks and percent relative effects.

Table 3.5: Risk factors associated with neonatal deaths

	Proportion died	Relative Risk	Percent relative effect
Parity			
2 children	0.13	2.34	134.1
3 children	0.06		
Gender of deceased child			
Male	0.56	1.27	27.3
Female	0.44		
Literacy of mother			
Illiterate	0.59	1.43	43.3
Literate	0.41		
Standard of Living Index			
1st quartile	0.27	1.27	27.1
4th quartile	0.21		
Age of deceased child			
More than 6 days	0.31	0.45	54.9
0 to 6 days	0.69		
Household Radio			
Yes	0.31	0.44	56.1
No	0.70		
Underweight neonates			
1st quartile	0.09	1.25	25.4
4th quartile	0.07		
Pregnancy order			
Last pregnancy	0.64	1.3	30
2nd last pregnancy	0.51		
2nd last pregnancy	0.51	2.5	150.0
3rd last pregnancy	0.20		
Last pregnancy	0.64	3.1	220.0
3rd last pregnancy	0.20		

A male neonate has a 27 percent increase in risk of dying compared to a female neonate. Neonates of illiterate mothers have a 43 percent increase in risk compared to neonates of literate mothers. There was a 27 percent increase in risk of dying if a mother was in the first wealth quartile compared to the fourth quartile; low birth weight neonates had a 25 percent increase in risk of dying if born in a household in the first quartile compared to those born in households in the fourth wealth quartile.

Similarly, neonates in the first seven days (0 to 6) had a 171 percent increase in risk of dying compared to those seven to 28 days old. The risk of dying also increased with increasing parity: There was a 150 percent increase in the risk of dying in second pregnancy and 220 percent increase in a third pregnancy.

In households with a radio available, there was a 56 percent decreased risk of dying compared to households without a radio, implying the possibility that households with radio had more chances to be exposed to health education messages.

Assessment of Public Health Facilities

An assessment of four secondary public sector health facilities in the three *tehsils* of Nowshera district—Jahangira, Nowshera and Pabbi—gauged their capacities for neonatal emergencies. The health facilities assessed included the Nowshera District Headquarters Hospital (DHQ) and the Pirpai Rural Health Center (RHC, which in this case is equivalent to a *tehsil* headquarters hospital), the major MNCH facility of the *tehsil*. In Pabbi *tehsil* Pabbi THQ was assessed, while in Jahangira *tehsil* only Jahangira Basic Health Unit (BHU) was visited, as there are no RHC or THQ facilities in the *tehsil*.

These four facilities' capacities of basic and comprehensive emergency obstetrics care, basic infrastructure, essential equipment for neonatal care, and essential medicines; the results are presented in tables 3.6 to 3.10, respectively.

Basic obstetric and neonatal care (BEmONC) and comprehensive obstetric and neonatal care (CEmONC) were found available only at Nowshera DHQ and Pabbi THQ. These services were not available at Jahangira BHU or Pirpai RHC (tables 3.6 and 3.7).

Table 3.6: Availability of basic emergency obstetric care at selected health facilities in Nowshera

	BHU Jahangira	DHQ Nowshera	RHC Pirpai	THQ Pabbi	Total
Injectable antibiotics	0	1	1	1	3
Injectable oxytocin	0	1	1	1	3
Injectable anti-convulsants and anti-hypertensives	0	1	0	1	2
Manual removal of placenta	0	1	0	1	2
Removal of retained products	0	1	0	1	2
Assisted vaginal delivery (forceps, vacuum extraction)	0	1	1	1	3
All 6 functions	0	1	0	1	2

1 = Available

0 = Not Available

Table 3.7: Availability of comprehensive emergency obstetric care at selected health facilities

	BHU Jahangira	DHQ Nowshera	RHC Pirpai	THQ Pabbi	Total
All 6 basic functions	0	1	0	1	2
Blood transfusion	0	1	0	1	2
Cesarean section	0	1	0	1	2
General Surgery	0	1	0	1	2
FP services (temporary or permanent)	0	1	1	1	3
Ultrasound	0	1	0	1	2
X-ray	0	1	1	1	3
Anesthesia	0	1	0	1	2
Pediatric Services	0	1	0	1	2

1 = Available

0 = Not Available

As shown in Table 3.8, most basic infrastructure elements such as electricity, refrigeration, sterilizer, and EPI cold box were available at all facilities. Running water was not available at Pirpai RHC, however, and a blood bank and operation theater were available only at Nowshera DHQ and Pabbi THQ. An ambulance was available at all facilities except Jahangira BHU.

Table 3.8: Availability of infrastructure at selected health facilities in Nowshera

	BHU Jahangira	DHQ Nowshera	RHC Pirpai	THQ Pabbi	Total
Electricity	1	1	1	1	4
Generator	0	1	1	1	3
Running water	1	1	0	1	3
Refrigerator	1	1	1	1	4
EPI cold box	1	1	1	1	4
Blood bank	0	1	0	1	2
Blood transfusion facility	0	1	0	1	2
Operation theatre	0	1	0	1	2
Chlorine solution	1	1	1	1	4
Sterilizer	1	1	1	1	4
Autoclave	0	1	1	1	3
NICU	0	1	0	1	2
Incubator	0	0	1	1	2
RHS-A center	0	1	0	1	2
Ambulance	0	1	1	1	3
Warmer/ heater	0	1	0	1	2

1 = Available

0 = Not Available

One of this study's most important findings is that a neonatal incubator was not available at Jahangira BHU or Nowshera DHQ (although available at Pirpai RHC and Pabbi THQ). The availability of a neonatal incubator is essential for managing premature cases.

Essential care equipment designed for neonates, such as weighing scales, bulb sucker, ambu bag, laryngoscope, and endotracheal tube, was available at Nowshera DHQ, Pirpai RHC and Pabbi THQ, but not at Jahangira BHU. Table 3.9 indicates that almost all essential equipment was available at all facilities except Jahangira BHU.

Table 3.9: Availability of essential equipment for neonatal care at selected health facilities in Nowshera

	BHU Jahangira	DHQ Nowshera	RHC Pirpai	THQ Pabbi	Total
Examination tables	1	1	1	1	4
Weighing scales	1	1	1	1	4
Blood pressure equipment	1	1	1	1	4
Stethoscope	1	1	1	1	4
Laboratory	1	1	1	1	4
Hep-B, C screening	1	1	1	1	4
HIV Screening	0	1	0	1	2
CBC (Complete Blood Count)	0	1	1	1	3

Urine R/E	0	1	1	1	3
Foley's catheter	1	1	1	1	4
Delivery kit	0	1	1	1	3
NG Tube	0	1	0	1	2
IV Cannula	1	1	1	1	4
Baby Weighing Scales	1	1	1	1	4
Bulb sucker (Suction)	0	1	1	1	3
Baby Ambu bag	0	1	1	1	3
Baby Laryngoscope	0	1	1	1	3
Baby endotracheal tube	0	1	0	1	2
Oxygen	1	1	0	1	3

1 = Available

0 = Not Available

Nowshera DHQ had all requisite supplies for managing maternal and neonatal emergencies (Table 3.10). There were deficiencies, however, at Jahangira BHU, where oxytocics were not available. At Pirpai RHC, anti-convulsive and oxytocics were unavailable.

Table 3.10: Availability of medicines at selected health facilities in Nowshera

	BHU Jahangira	DHQ Nowshera	RHC Pirpai	THQ Pabbi	Total
Diazepam	1	1	0	1	3
Anti-hypertensive	1	1	1	1	4
Magnesium sulfate	1	1	0	1	3
Tetanus Toxoid (TT)	1	1	1	1	4
Oral Antibiotics	1	1	1	1	4
Injectable Antibiotics	1	1	1	1	4
Ergometrine/Methergine	0	1	0	1	2
Oxytocin/Syntocinon	1	1	1	1	4
Calcium	1	1	0	1	3
Adrenaline	1	1	0	1	3
Inj. Atropine	1	1	0	0	2
Inj. Narcan	0	1	1	0	2
IV fluids/ Plasma expanders	1	1	1	0	3

1 = Available

0 = Not Available

Overall, in comparison to the Nowshera DHQ, the lower level care facilities were less equipped for neonatal emergencies. Jahangira appeared to be less served, as there is no RHC or THQ in the *tehsil*, and its BHU was under-equipped in many respects, with no sterilization equipment, ambulance, or BEmONC and CEmONC services.

Discussion

One target under the third Sustainable Development Goal (SDG)—*Ensure healthy lives and promote well-being for all at all ages*—is to reduce global neonatal mortality to at least as low as 12 per 1,000 live births by 2030. Pakistan was among the few countries in the region that failed to achieve its Millennium Development Goals. To achieve its national commitments under SDG 3, efforts will have to be directed at improving mothers' and infants' access to health care services, especially among marginalized communities (Hill and Choi 2006).

Khyber Pakhtunkhwa's neonatal mortality rate is lower than the national average, along with several other related indicators. Infant and under-five mortality rates in KP are lower than in other provinces, and more notably, the duration of exclusive breastfeeding and proportion of households with electricity are higher. KP's NMR is stagnant, however, at 41 per 1,000 live births, suggesting a need for better understanding of underlying issues and more effective strategies.

This study estimates a neonatal mortality rate of 28 per 1,000 live births for Nowshera district, considerably lower than the provincial NMR, with several potential contributing factors. It is to be expected that neonatal mortality would vary in KP's districts, as their development is not homogenous. According to the Deprivation Index developed by Sustainable Policy Development Center (SPDC), Nowshera is KP's third least deprived district; it is also fourth in education. Another contributing factor could be that women in Nowshera are marrying later than elsewhere in the province: Mean age at marriage in Nowshera is 21, while KP province's mean age of marriage is 19. This study also found positive health care seeking behaviors in the district.

This study clearly shows that community informants, in addition to identifying maternal deaths, can also identify neonatal deaths. Lady Health Workers reported 76 percent more neonatal deaths during the study period when trained as informants for the MADE-IN/MADE-FOR method. This approach is more cost-effective than household surveys and can potentially be sustained by the district government.

Based on global evidence, accurate estimates of neonatal mortality are problematic, however, as most deaths occur at home, and early infancy deaths are not much publicized, due to cultural norms. Neonatal deaths cannot be detected by community networks as easily as maternal deaths, which are more publicized with larger numbers of people attending mothers' funerals, and other associated traditions after an adult's death. Completeness and accuracy of recall of neonates' ages of death deteriorate with time, and there is an issue of misreporting, with neonatal deaths misclassified as stillbirths, due either to genuine error or cultural practices. All of these factors may result in underreporting of deaths.

This study reconfirms the pattern of disease identified in earlier studies. Roughly one third of neonatal deaths were due to birth-related complications such as asphyxia; one quarter were caused by neonatal infections; and another quarter were due to prematurity. These three causes combined contribute to roughly 80 percent of all neonatal deaths. These results are similar to the causes of neonatal mortality reported by WHO in less developed countries, as well as in small research studies in Pakistan (Baqui et al. 2009). Globally, the main causes of newborn deaths are problems arising from premature birth, complications during labor and delivery, and infections acquired by newborns during or after birth.

The major ray of hope is that simple, effective, and low cost interventions are available that can easily prevent most neonatal deaths identified. Premature births can be prevented through birth spacing, screening for infections, nutrition supplementation, and use of antenatal steroids. Birth complications such as asphyxia can be prevented through improved care during labor, especially by training health workers in neonatal resuscitation. Infection can be prevented through maternal tetanus immunization, clean birth practices, hygiene care for the umbilicus, exclusive breastfeeding, and early recognition of infection and treatment by antibiotics.

These interventions are supported by strong evidence. Introducing community-based case management of neonatal bacterial infections through trained health workers has obviated the need for hospital visits and substantially decreased neonatal mortality in Bangladesh and Nepal.^{10,11,12} Similarly, global evidence shows that pre-term births can be delayed by antenatal steroids for women in pre-term labor. A Cochrane review of 21 studies (3,885 women and 4,269 infants) showed that treatment of women at risk of pre-term birth with a single course of antenatal corticosteroids reduced risk of neonatal death by 31 percent (95% CI, 19%-42%), respiratory distress syndrome by 44 percent (95% CI, 31%-57%), and intraventricular hemorrhage by 46 percent (95% CI, 31%-67%) (Khanal et al. 2011, Black et al. 2013). Similarly, maternal micronutrient supplementation has also been shown to significantly reduce pre-term deliveries.¹

Training community health workers in neonatal resuscitation and promoting good practices in preventive newborn care including neonatal hygiene, delayed bathing, keeping neonates warm, and initiating early breastfeeding are simple home-based interventions that can save lives (Haider and Bhutta 2012, Ronsmans et al. 2009, Titaley et al. 2008).

Successful interventions in facilities include the establishment of sick newborn units in tertiary care hospitals and training hospital staff for neonatal complication management, as introduced by the Norway-Pakistan Partnership Initiative (NPPI) in Sindh province (Population Council 2014). To ensure referral facilities provide optimal services, provincial governments must ensure availability of logistical, financial and human resources, such as skilled staff, along with a functional referral system and adequate supplies and equipment, for improving the quality of neonatal care at all levels.

The study shows that risk of neonatal deaths increase with birth order, consistent with global evidence showing that first, third, and later pregnancies have higher risks than second order pregnancies (Hobcraft, McDonald, Rutstein 1985). Meta analysis of data from 144 countries shows that countries with higher contraceptive use have been successful in reducing newborn deaths. KP's contraceptive prevalence rate is stagnant, however, at the extremely low level of 28 percent. Among mothers of neonates who died, only 13 percent had ever used a family planning method. Expanding access to family planning services is a cost effective intervention that would improve both maternal and neonatal outcomes.

This study found that most neonatal deaths occurred within the first 24 hours, and such early neonatal deaths are generally related to maternal factors. Creating awareness in communities, among both men and women, to foster healthy behaviors such as birth spacing, maternal nutrition, hygiene, early exclusive breastfeeding, delivery by skilled birth attendants, and proper postnatal care, could reduce early neonatal mortality. A community approach applied successfully in Sindh by NPPI established 'focal families' who provided health education and advice to other families, especially maternal, neonatal, and infant care (Population Council 2014). Such community efforts can lead to attitude and behavior change that result in better health seeking behavior.

Nearly three quarters of all deaths were in households with low or middle socio-economic status. Although the relationship between poverty and neonatal death is not direct, poverty influences nutrition and health-seeking behaviors. Under-nutrition is an important reflection of poverty closely related to child mortality (D'Souza and Chen 1980). Mothers who are undernourished during their own childhoods or malnourished pregnant women are more likely to have babies of low birth weight (Gardosi et al. 2013). Poverty also influences access to health care services. In Pakistan 80 percent of health expenditures are out of pocket, and the government must focus on programs that help poor families access good quality services. Improved access to services can be achieved with task shifting among community-based providers and health staff in primary health care facilities, and by introducing pro-poor voucher schemes and conditional cash transfers through schemes such as the Benazir Income Support Programme (BISP).

Another finding of this study is families' preference for private sector services, especially for antenatal care, possibly because private providers are more numerous and hence more accessible (Population Council 2016). Considering governments' financial constraints and priorities, the private sector must be engaged to help improve maternal, neonatal, and child health outcomes through better regulation and service provider training.

This study clearly shows increased risk of neonatal mortality among illiterate mothers. One strategy with impacts on all facets of family health educates girls, for greater information opportunities and better decisions for all aspects of their lives, including those for their health and well-being.

The gender differentials in early neonatal mortality are also consistent with global findings, with proportionally more male deaths in the early neonatal period, a finding consistent with the well-known biological survival advantage of girls in the neonatal period (Ross and Stover 2013, Lawn et al. 2005, Fort, Kothari, Abderrahim 2008).

It is significant that almost all (about 90%) mothers of deceased neonates had utilized antenatal care services, with three quarters of deliveries at health facilities. These findings imply positive health care seeking behaviors among families in Nowshera, potentially an important factor in its relatively low neonatal mortality. Postnatal care was utilized by only one third of mothers in Nowshera, however. Global evidence shows that postnatal care within the first 24 hours of delivery helps significantly reduce early neonatal mortality.

Nearly half of neonatal deaths were at a health facility, and the high proportion of deaths at tertiary care facilities reveals the importance of improving the quality of neonatal care at all levels—primary (basic health units), secondary (*tehsil* headquarters hospitals and district headquarters hospitals), tertiary—especially in developing human resource capacities for neonatal emergencies. Addressing deficiencies at lower tier health facilities will help make the referral chain fully operational.

Finally, Lady Health Workers' role in providing antenatal care is sub-optimal and needs to be increased.

Conclusions and Recommendations

The MADE-IN/MADE-FOR approach can be institutionalized by this and other provincial Health departments for information from communities for mortality estimation. Since community informants can identify both neonatal and maternal deaths, these informant networks can also be utilized for collecting other health and surveillance information, and for sensitizing and mobilizing communities for awareness of safeguards against avoidable deaths. Due to their influential position in society, the community networks identified by this study can play an important role in creating awareness in their communities for issues related to birth preparedness and newborn care.

Major health sector interventions that are required for reducing neonatal mortality in Nowshera include:

- Low cost interventions that have worked both globally as well as in resource-constrained settings, including Pakistan, should be introduced to reach underserved communities with expanded options of home-based care.
- Awareness should be created within communities, among both men and women, to foster healthy behaviors such as birth spacing, maternal nutrition, hygiene, breastfeeding, and appropriate complementary feeding.
- Simple life-saving practices in preventive newborn care must be promoted, including neonatal hygiene, delayed bathing, keeping neonate warm, and early initiation of breastfeeding.
- Timely postnatal care, especially in the first 24 hours, must be prioritized both among health facilities and health workers. Awareness of the importance of this care should also be developed among communities.
- The network of trained community midwives and Lady Health Workers must be expanded to underserved populations.
- Task sharing between Lady Health Workers and community midwives can produce synergies and can positively affect home-based care. Community health workers must be trained in neonatal resuscitation and other necessary newborn health care elements such as home use of antibiotics for bacterial infections.
- Equipment and supply provision at secondary and tertiary care facilities must be improved; to enhance the quality of care, requisite supplies and staff trained in neonatal resuscitation must be in place.
- Steroids should be available at all levels of facilities to manage pre-term deliveries. Incubators must be available at the District Headquarters Hospital, is the largest public health facility in the district. Functional Neonatal Intensive Care Units should be established at all referral facilities.
- In addition to these efforts in the public sector, private health care providers must be involved, trained, and regulated for their effective and assured provision of quality neonatal services.
- Financial access to health services must be improved by introducing pro-poor voucher schemes and conditional cash transfers for the marginalized.

Appendices

Appendix 1

فارم-A: MADE-IN: گاؤں میں اموات کی معلومات کی فہرست

اموات کی معلوماتی فہرست کا فارم

برائے مہربانی شکستہ فارم تکمیل کرنے کیلئے ہدایات پڑھیں۔
ان نو زائید بچوں کی فہرست بنائیں جو 28-0 دنوں کی عمر کے ہوں اور یکم جنوری 2014 سے 31 دسمبر 2015 کے دوران وفات پانچے ہوں (دو سال کا دورانیہ ڈالیں)۔ ان وفات پانچاؤ والے بچوں کی فہرست بنائیں جو وفات سے پہلے عام طور پر آپ کے کام کرنے کے علاقے میں رہ رہے تھے (چنگ وہ چوڑے خرے کیلئے کہیں گے ہوں یا کسی اور جگہ پر دوران سفر فوت ہو گئے ہوں) اس میں ان نو زائید بچوں کو بھی شامل کریں جو آپ کے کام کرنے کے علاقے میں عارضی طور پر رہائش پزیر تھے اور فوت ہو گئے (چنگ وہ منتقل طور پر کسی اور جگہ پر قیام پزیر تھے اور آپ کے علاقے میں ان کا قیام عارضی تھا)۔ برائے مہربانی ہر موت کیلئے اس سوال نامے کے تمام کالم پُر کیجیے۔

A1 معلومات دینے والا ایڈورک:	A2 ایڈورک والے اولیٰ کی معلومات:	A3 خلیع کا نام:	A6 گاؤں کا نام:	A8 فارم جاری کرنے کی تاریخ: _____ سال _____ مہینہ _____ دن _____	A10 پیراڈاکٹر کا نام اور کوڈ:
1. _____	نام:	A4 تحصیل کا نام:	A7 کیڑی کی قسم: شہری 1 دیہی 2	A9 فارم موصول کرنے کی تاریخ: _____ سال _____ مہینہ _____ دن _____	A11 ڈیٹا کوڈ کا نام اور کوڈ:
2. _____	پتنہ:	A5 پٹوئی کا نام:			
3. _____	رابطہ نمبر:				
4. _____					

A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24
اولیٰ نمبر	بچے کی عمر کا نام جو فوت ہوا؟ [اگر نام نہیں لکھا گیا تو برائے مہربانی (0) لکھیں]	بچے کے والد کا نام	بچے کی عمر کا نام	بچے کی عمر کا نام 1 = لڑکا 2 = لڑکی 0 = نہیں	بچہ کی عمر کا نام 1 = لڑکا 2 = لڑکی 0 = نہیں	بچہ کی عمر کا نام 1 = لڑکا 2 = لڑکی 0 = نہیں	بچہ کی عمر کا نام 1 = لڑکا 2 = لڑکی 0 = نہیں	بچہ کی عمر کا نام 1 = لڑکا 2 = لڑکی 0 = نہیں	بچہ کی عمر کا نام 1 = لڑکا 2 = لڑکی 0 = نہیں	بچہ کی عمر کا نام 1 = لڑکا 2 = لڑکی 0 = نہیں	بچہ کی عمر کا نام 1 = لڑکا 2 = لڑکی 0 = نہیں	بچہ کی عمر کا نام 1 = لڑکا 2 = لڑکی 0 = نہیں
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7												
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9												

18/A22 کے کوڈ: (01) اپنا گھر (02) گورنمنٹ ہسپتال (03) پرائیویٹ ہسپتال (04) مرکز صحت کے راستے میں (05) مراکز صحت کے درمیان (77) کوئی دوسری جگہ (بیان کریں) (88) پتہ نہیں

فارم-B: MADE-IN: گاؤں میں اموات کی معلومات کی فہرست
اموات کی معلوماتی فہرست کا فارم

برائے مہربانی منسلک فارم کو مکمل کرنے کیلئے ہدایات پڑھیں
 جب معلومات دینے والے گاؤں کے گروہس آپس میں بات چیت کر لیں تو ہر گروپ کو چاہئے کہ وہ ایک حتمی فہرست بنائیں ان نو زائیدہ بچوں کی 28-0 دنوں کی عمر میں فوت ہوئے اور وہ ان کے گاؤں میں یکم جنوری 2014 سے 31 دسمبر 2015 تک فوت ہوئے۔ ان نئی اموات کو بھی شامل کریں جو بیننگ کے دوران علم میں آئی ہوں اور ایک جیسے دہری اموات کو ختم کر دیں۔ بیننگ کے بعد ماحول کار کو چاہئے کہ وہ ان اموات کو بھی شامل کرے یا ترمیم کرے۔ Mop-up visits سے منتخب ہوں گے۔

B1 معلومات دینے والا ایف ورک: لیڈی ہیلتھ ورکر.....1 مذہبی رہنما.....2 مرد/خواتین کونسلر.....3 کلچر رجسٹرار.....4		B2 ایف ورک والے اہل کی معلومات: نام:..... بچہ:..... رابطہ نمبر:.....	B3 خلع کا نام:..... B4 تحصیل کا نام:..... B5 پستی کا نام:.....	B6 گاؤں کا نام:..... B7 یکہائی کی قسم: شہری.....1 دیہی.....2	B8 فارم جاری کرنیکی تاریخ:..... سال..... مہینہ..... دن..... B9 فارم وصول کرنیکی تاریخ:..... سال..... مہینہ..... دن.....	B10 سپروائزر کا نام اور کوڈ:..... B11 ڈیپٹیکٹر کا نام اور کوڈ:.....
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B12	B13	B14	B15	B16	B17	B18	B19	B20	B21	B22	B23	B24
لاڈل نمبر	بچے/بچی کا نام جنم ہوا؟ [اگر نہ پتہ نہیں لکھا گیا تو برائے مہربانی (0) لکھیں]	بچے کے والد کا نام	بچے کی والدہ کا نام	بچے کی جنس لڑکا=1 لڑکی=2	کیا بچہ زندہ پیدا ہوا؟ نہیں=0 ہاں=1	بچہ اپنی کہاں پیدا ہوا تھا؟	وفات کے وقت عمر کیا تھی؟	مگر مکمل پتہ جہاں بچہ وفات کے وقت رہا تھا؟	وفات کی تاریخ دن: مہینہ: سال: معلوم نہیں (88:88:8888)	بچے کی وفات کہاں ہوئی؟	اگر بچہ ہسپتال میں فوت ہوا تو ہسپتال کا نام لکھیں	وفات کی وجہ کیا تھی؟ (بجاری کا نام لکھیں)
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B18/B22 کوڈ: (01) اپنا گھر (02) گورنمنٹ ہسپتال (03) پرائیویٹ ہسپتال (04) مرکز صحت کے راستے میں (05) مراکز صحت کے درمیان (77) کوئی دوسری جگہ (بیان کریں) (88) پتہ نہیں

فارم-C: MADE-IN: گاؤں میں اموات کی معلومات کی فہرست

اموات کی معلوماتی فہرست کا فارم

برائے مہربانی فارم کو مکمل کرنے کیلئے ہدایات پڑھیں

ان نوزائیدہ بچوں کی فہرست بنائیں جو 28-0 دنوں کی عمر میں یکم جنوری 2014 سے 31 دسمبر 2015 کے دوران فوت ہوئے ہوں خواہ نوزائیدہ بچوں کی یہ اموات کسی بھی نیٹ ورک نے رپورٹ کی ہوں۔

C1: منسلک کا نام:	C4: گاؤں کا نام:	C6: فارم چار دیواری کرنگل تاریخ: _____ سال _____ مہینہ _____ دن _____	C8: سپروائزر کا نام اور کوڈ:
C2: تحصیل کا نام:	C5: کیوٹی کی قسم: شہری 1 دیہی 2	C7: فارم وصول کرنگل تاریخ: _____ سال _____ مہینہ _____ دن _____	C9: ڈیٹا کوڈنگ کا نام اور کوڈ:
C3: بچہ کا نام:			

C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23
لاڈل نمبر	نیٹ ورک لیڈی ہیلتھ ورکر مڈہی رہنما مردا خواتین کنسلٹر نکاح رجسٹرار	بچے/بچی کا نام جو فوت ہوا؟ [اگر نام نہیں لکھا گیا تو برائے مہربانی (0) لکھیں]	بچے کے والد کا نام	بچے کی والدہ کا نام	بچے کی جنس لڑکا=1 لڑکی=2	کیا بچہ زندہ پیدا ہوا؟ نہیں =0 ہاں =1	بچہ اپنی کہاں پیدا ہوا تھا؟	وفات کے وقت عمر کیا تھی؟	گھر کا مکمل پتہ جہاں بچہ وفات کے وقت رہ رہا تھا؟	وفات کی تاریخ دن: _____ مہینہ: _____ سال: _____ معلوم نہیں (88:88:8888)	بچے کی وفات کہاں ہوئی؟	اگر بچہ ہسپتال میں فوت ہوا تو ہسپتال کا نام لکھیں	وفات کی وجہ کیا تھی؟ (بچہ کی عمر لکھیں)
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1	1 2 3 4												
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3	1 2 3 4												
4	1 2 3 4												
5	1 2 3 4												
6	1 2 3 4												
7	1 2 3 4												
8	1 2 3 4												
9	1 2 3 4												

(88) پتہ نہیں

(77) کوئی دوسری جگہ (بیان کریں)

(05) مراکز صحت کے درمیان

(04) مراکز صحت کے راستے میں

(03) پرائیویٹ ہسپتال

(02) گورنمنٹ ہسپتال

C17 اور C21 کے کوڈ: (01) اپنا گھر

Appendix 2

Processing code

|_| : |_| : |_| : |_|_| : |_|_|

DISTTEHUCPSUSRNO (Form-C)

Verbal Autopsy Form



IDENTIFICATION

A1- Name of District		Nowshehra 1	
A2- Name of Tehsil		Nowshehra 1 Pabbi..... 2 Jahangira..... 3	
A3- Name and code of Union Council		__ __	
A4- Name and code of village/PSU		__ __ __	
A5- Line number of deceased child from (Form-C)		__ __	
A6- Complete address of household			
A7- Number of visits to complete the interview		__ __	
A8- Duration of interview (2A130)		__ __ (Minutes)	
A9-Date of last visit for interview (2A140)		__ __:__ __:__ __ __ __ DD MM YYYY	
A10-Name and code of interviewer (2A120)		__ __ __	
A11-Result of interview	Complete0 1 Incomplete0 2 Refused0 3	HH not found0 4 Shifted0 5 Duplicate0 6	Out of criteria (Age)0 7 Out of criteria (Year)0 8 Others (Specify)7 7
If A11> 02 then end interview			

DEATH OF A CHILD AGED UNDER 4 WEEKS (28 DAYS)		
No.	QUESTIONS AND FILTERS	CODING CATEGORIES
SECTION 1. BASIC INFORMATION ABOUT THE INTERVIEW AND THE RESPONDENT		
سیکشن 1: انٹرو اور انٹرو والے سے متعلق بنیادی معلومات		
2A100	Name of verbal autopsy respondent:	انٹرو والے کا نام
2A110	What is your relationship to the deceased? آپ کا مرحوم / مرحومہ سے کیا ہے؟	Father01 Mother02 Sibling03 Grandparent04 Uncle05 Aunt06 Cousin07 Other relative (specify)77 No relation.....97
2A115	Did you live with the deceased in the period leading to her/his death? جن دنوں میں آپ نے (نوزائیدہ) کی موت واقع ہوئی تو کیا آپ اس کے ساتھ رہے تھے / رہتی تھیں؟	Yes 1 No 2
SECTION 2. INFORMATION ON THE DECEASED AND DATE/PLACE OF DEATH		
سیکشن 2: مرحوم کی موت کی تاریخ/جگہ سے متعلق معلومات		
1A100	What was the name of the deceased? مرحوم کا نام کیا تھا؟ والد کا نام	Name
1A110	Was the deceased female or male? اس کی جنس کیا تھی؟	Boy 1 Girl 2
1A200	Is date of birth known? کیا اس کی پیدائش کی تاریخ معلوم ہے؟	Yes 1 No 2 (Go to 1A220)
1A210	When was the deceased born? مرحوم/مرحومہ کب پیدا ہوا/ہوئی؟	_/_/_/_/____ DD MM YYYY
1A220	Is date of death known? کیا اس کی موت کی تاریخ معلوم ہے؟	Yes 1 No 2 (Go to 1A260)
1A230	When did s/he die? وہ کب فوت ہوا/ہوئی؟	_/_/_/_/____ DD MM YYYY
1A260	How old was the deceased when s/he died? جب وہ فوت ہوا/ہوئی تو اس کی عمر کیا تھی؟	a) Number of days _____
1A500	What was her/his citizenship/nationality? اس کی قومیت کیا تھی؟	Pakistani1 Afghani2 Others (Specify).....7
1A510	What was her/his ethnicity? اس کا تعلق کس صوبے/علاقے سے تھا؟	Punjabi.....01 Sindhi02

		Balochi03 Pashto04 Saraiki05 Others (Specify).....77
1A520	What was her/his place of birth? وہ کس جگہ پیدا ہوا / ہوئی؟	A) Province _ b) District _ c) Tehsil _ d) UC..... _
1A530	What was her/his place of usual residence? عام طور پر وہ کہاں رہتا / رہتی تھی؟	A) Province _ b) District _ c) Tehsil _ d) UC..... _
1A550	Where did death occur? اس کی موت کہاں واقع ہوئی؟	A) Province _ b) District _ c) Tehsil _ d) UC..... _
1A560	What was the site of death? اس کی موت کس جگہ واقع ہوئی؟	Mother/Father's home 01 Neighbor/Relative's home..... 02 At health facility04 On way to health facility 05 Others (Specify) 77
1A630	What was the name of the mother? اس کی ماں کا کیا نام تھا؟	
1A620	What was the name of the father? اس کی باپ کا کیا نام تھا؟ Surname نام مختصر Name نام	
SECTION 3. DEATH REGISTRATION AND CERTIFICATION سیکشن 3: موت کا اندراج اور اس کا سرٹیفیکیٹ		
1A700	Death registration number	
1A710	Date of registration	_ _ :_ _ :_ _ _ _ DD MM YYYY
1A720	Place where the death is registered: وہ جگہ جہاں موت کا اندراج ہوا؟	A) Province..... _ b) District..... _ c) Tehsil _ d) UC..... _
1A730	National identification number of deceased مرحوم کا قومی شناخت نمبر؟	
SECTION 4. RESPONDENT'S ACCOUNT OF ILLNESS/EVENTS LEADING TO DEATH سیکشن 4: مرحوم کی بیماری سے متعلق معلومات، جس کی وجہ سے اس کی موت واقع ہوئی		

	<p>Could you tell me about the illness/events that led to her his/death?</p> <p>کیا آپ مرحوم کی بیما ی سے متعلق معلومات بتا سکتی /سکتے ہیں جس کی وجہ سے اس کی موت واقع ہوئی؟</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
	<p>CAUSE OF DEATH 1 ACCORDING TO RESPONDENT</p> <p>جوا دہندہ کے مطابق موت کی وجہ</p> <p>_____</p>
	<p>CAUSE OF DEATH 2 ACCORDING TO RESPONDENT</p> <p>جوا دہندہ کے مطابق موت کی وجہ</p> <p>_____</p>

SECTION 4. PREGNANCY HISTORY

سیکشن 4: حمل کی تفصیل

I would like to ask you some questions concerning the mother and symptoms that the deceased had/showed at birth and shortly after. Some of these questions may not appear to be directly related to the baby's death. Kindly be patient and answer all the questions. They will help us to get a clear picture of all possible symptoms that [NAME] had.

میں آپ سے کچھ سے سوالات پوچھنا چاہوں گی جن کا تعلق ماں سے ہے، اور علامات جو کہ بچہ/بچی کی بیما ی سے متعلق پیدائش کے وقت اور تھوڑی دیر بعد ظاہر ہوئے۔ میں سے کچھ سوالات کا بچے کی موت سے براہ راست تعلق نہیں۔ برائے مہربانی حمل کیساتھ سوالات کے جوابات دیں۔ کی مدد سے ہمیں مرحوم/مرحومہ/بچے سے متعلق صحیح ممکنہ علامات تک پہنچنے میں مدد ملے گی۔

3D500	<p>How many births, including stillbirths, did the baby's mother have before this baby?</p> <p>اس بچے سے پہلے اس کی ماں نے کتنے زندہ اور مردہ بچوں کو جنم دیا؟</p>	<p>a) Number of births ____ ____</p> <p>b) Stillbirths ____ ____</p> <p>Don't Know.....98</p>
3D210	<p>How many weeks was the pregnancy when the baby was born?</p> <p>کتنے ہفتوں کا حمل تھا جب بچہ پیدا ہوا؟</p>	<p>Number of weeks ____ ____</p> <p>Don't know.....98</p>
3D510	<p>During the pregnancy did the baby's mother suffer from high blood pressure?</p> <p>کیا حمل کے دوران بچے کی ماں ہائی بلڈ پریشر کا شکار تھی؟</p>	<p>Yes.....1</p> <p>No2</p> <p>Don't know.....8</p>
3D550	<p>Did the baby's mother have vaginal bleeding during the last 3 months of pregnancy but before labor started?</p> <p>بچے کی ماں کو حمل کے آخری تین ماہ کے دوران لیکن دس دن روع ہونے سے پہلے اندام نہانی سے خوں آیا تھا؟</p>	<p>Yes.....1</p> <p>No2</p> <p>Don't know.....8</p>
3D520	<p>Did the baby's mother have foul smelling vaginal discharge during pregnancy and/or after delivery?</p>	<p>Yes.....1</p> <p>No2</p> <p>Don't know.....8</p>

	بچے کی ماں کو حمل کے دو [] [] [] بعد میں اندام نہانی سے بدبو د [] مادے کا اخراج تھا؟	
3D540	During the last 3 months of pregnancy did the baby's mother suffer from blurred vision? بچے کی ماں کو حمل کے آخری تین ماہ کے دو [] [] دھندلے پن کی [] کا [] تھی؟	Yes..... 1 No 2 Don't know..... 8
3D530	During the last 3 months of pregnancy did the baby's mother suffer from convulsions? بچے کی ماں کو حمل کے آخری تین ماہ کے دو [] [] جھٹکوں کی [] کا [] تھی؟	Yes..... 1 No 2 Don't know..... 8
3D100	Was the child part of a multiple birth? کیا متوفی بچہ جڑواں تھا؟	Yes..... 1 No 2 Don't know..... 8
3D110	Was the child born in a complicated delivery? کیا بچے کی پیدائش پیچیدہ تھی؟	Yes..... 1 No 2 Don't know..... 8
SECTION 5. DELIVERY HISTORY		
سیکشن 5: پیدائش کی تفصیل		
3D560	Was the child born in a health facility? کیا بچہ صحت کی سہولت پر پیدا ہوا تھا؟	Yes..... 1 No 2 Don't know..... 8
3D570	Was the child born at home? کیا بچہ گھر میں پیدا ہوا تھا؟	Yes..... 1 No 2 Don't know..... 8
3D580	Was the child born somewhere else (e.g. on the way to a health facility)? بچہ کہیں اور [] پیدا ہوا تھا (جیسا کہ صحت کی سہولت کے [] استے میں)	Yes..... 1 No 2 Don't know..... 8
3D590	Did the mother receive professional assistance during the delivery? کیا ماں کو پیدائش کے دو [] [] پیشہ و [] انہ طبی مدد ملی؟	Yes..... 1 No 2 Don't know..... 8
3D120	Was the baby born 24 hours or more after the water broke? کیا بچہ ماں کی پانی کی تھیلی پھٹ جانے کے 24 گھنٹے بعد پیدا ہوا؟	Yes..... 1 No 2 Don't know..... 8
3D130	Did the baby stop moving in the womb before labor started? کیا [] [] [] روع ہونے سے پہلے پیٹ میں بچے کی حرکت بند ہو گئی تھی؟	Yes..... 1 No 2 Don't know..... 8

3D140	Was baby born in a normal vaginal delivery? کیا بچہ نال مل طر قہ سے پیدا ہوا تھا؟	Yes..... 1 No 2 Don't know..... 8
3D150	Was baby born with forceps/vacuum? کیا بچہ اور ل وں (فو سب/ و کیم) کی مدد سے پیدا ہوا تھا؟	Yes..... 1 No 2 Don't know..... 8
3D160	Was baby delivered by caesarean section? کیا بچے کی پیدائش آپریشن سے ہوئی تھی؟	Yes..... 1 No 2 Don't know..... 8
3D170	Did the baby's bottom, feet, arm or hand come into the vagina before its head? کیا بچہ کا بازو/ پاؤں سر سے پہلے باہر آتا تھا؟	Yes..... 1 No 2 Don't know..... 8
SECTION 6. CONDITION OF THE BABY SOON AFTER BIRTH سیکشن 6: بچے کی حالت پیدائش کے فوراً بعد		
3D180	Was the baby of abnormal size? کیا بچے کا سائز نال مل نہیں تھا؟	Yes..... 1 No 2 Don't know..... 8
3D190	Was the baby smaller than normal, weighing under 2.5 kg? کیا بچہ معمول سے ہلکا تھا، وز 2.5 کلو سے کم تھا؟	Yes..... 1 No 2 Don't know..... 8
3D200	Was the baby larger than normal, weighing over 4.5 kg? کیا بچہ معمول سے بڑا تھا، وز 4.5 کلو سے زائد تھا؟	Yes..... 1 No 2 Don't know..... 8
3D220	Was the umbilical cord wrapped several times (more than once) around the neck of the child at birth? کیا پیدائش کے وقت آنو بچے کی گرد سے لک سے زادہ بار لپٹی ہوئی تھی؟	Yes..... 1 No 2 Don't know..... 8
3D230	Did the baby have any noticeable malformation? کیا بچے میں کوئی نمایاں نقص تھا؟	Yes..... 1 No 2 Don't know..... 8
3D240	Did the baby have a swelling/defect on the back? کیا بچے کی پیٹھ پر کوئی سوجن / نقص تھا؟	Yes..... 1 No 2 Don't know..... 8
3D250	Did the baby have a very large head? کیا بچے کا سر بہت بڑا تھا؟	Yes..... 1 No 2 Don't know..... 8
3D260	Did the baby have a very small head? کیا بچے کا سر بہت ہلکا تھا؟	Yes..... 1 No 2 Don't know..... 8
3D280	Was the baby blue in color at birth? کیا بچے کا رنگ پیدائش کے وقت نیلا تھا؟	Yes..... 1 No 2 Don't know..... 8

3D300	Did the baby breathe after birth, even a little? کیا بچہ نے پیدائش کے بعد تھوڑا سا بھی سانس لیا؟	Yes..... 1 No 2 Don't know..... 8
3D310	Was the baby given assistance to breathe at birth? کیا بچے کو پیدائش کے بعد سانس لینے کے لئے مدد دی گئی؟	Yes..... 1 No 2 Don't know..... 8
3D290	Did the baby ever cry after birth, even if only a little bit? کیا بچہ پیدائش کے بعد (تھوڑا سا بھی)؟	Yes..... 1 No 2 Don't know..... 8
3D320	If the baby did not cry or breathe, was it born dead? اگر بچے نے پیدائش کے بعد نہ سانس لیا نہ (تھوڑا سا) تو کیا مردہ پیدا ہوا تھا؟	Yes..... 1 No 2 Don't know..... 8
3D330	Was the dead baby macerated, that is, showed signs of decay? کیا مردہ بچہ کا جسم گل گیا تھا؟	Yes..... 1 No 2 Don't know..... 8

SECTION 7. HISTORY OF INJURIES/ACCIDENTS

سیکشن 7: زخموں اور حادثات کی تفصیلات

3E100	Did the baby suffer from any injury or accident that led to her/his death? کیا بچے کو کوئی (تھوڑا سا) زخم/حادثہ (تھوڑا سا) جس کی وجہ سے اس کی موت واقع ہو گئی ہو؟	Yes..... 1 No 2 Don't know..... 8
3E110	What kind of injury/accident was it? اس زخم / حادثے کی نوعیت کیا تھی؟	Road traffic accident 01 Fall 02 Drowning 03 Poisoning 04 Burns 05 Violence/ assault/ homicide/ 06 Natural calamity 07 Fire arm 08 Stab, cut or pierce 09 Hurt by animal 10 Others (specify) 77
3E120	Did baby suffer from any plant/ animal/ insect bite or stinging that led to his/her death? کیا اس کی موت کسی پودے / جانور / کیڑے کے کاٹنے سے ہوئی؟	Yes..... 1 No 2 Don't know..... 8
3E130	What type of animal/ insect was it? وہ کس قسم کا جانور / کیڑا تھا؟	Yes..... 1 No 2 Don't know..... 8
3E140	Did baby die suddenly کیا بچہ کا انتقال (تھوڑا سا) آنک ہوا؟	Yes..... 1 No 2
3E150	Did someone else hurt him/her? کیا کسی اور نے اسے تکلیف پہنچائی (تھوڑا سا)؟	Yes..... 1 No 2

SECTION 8. NEONATAL ILLNESS HISTORY		
سیکشن 8: نوزائیدہ بچے کی بیماری کی تفصیلات		
3A280	Did the baby die during the wet season? کیا بچہ گیلے موسم (برسات) کے دو □ □ فوت ہوا؟	Yes 1 No 2 Don't know 8
3A290	Did the baby die during the dry season? کیا بچہ خشک موسم کے دو □ □ فوت ہوا؟	Yes 1 No 2 Don't know 8
3A300	For how long was the baby ill before s/he died? مرنے سے پہلے کتنے عرصے سے وہ بیمار تھا / تھی؟	Yes 1 No 2 Don't know 8
3A310	Did the baby die suddenly? کیا بچہ □ □ آنک فوت ہوا؟	Yes 1 No 2 Don't know 8
3D340	Was the baby able to suckle or bottle-feed within first 24 hours after birth? کیا بچے نے □ □ ویس گھنٹے کا اند □ □ دودھ پیا □ □ کو □ □ ش کی؟	Yes 1 No 2 Don't know 8
3D350	Did the baby stop suckling of bottle feeding 3 days after birth? کیا بچے نے موت سے تین دن □ پہلے دودھ پینا □ □ ہوڑ دیا تھا؟	Yes 1 No 2 Don't know 8
3B460	Did the baby have convulsions? کیا بچے کو جھٹکے لگے تھے؟	Yes 1 No 2 Don't know 8
3D360	Did the baby have convulsions starting within the first day of life? کیا بچے کو جھٹکے پیدائش کے پہلے دن □ لگے تھے؟	Yes 1 No 2 Don't know 8
3S370	Did the baby have convulsions starting on the second day or later after birth? کیا بچے کو پیدائش کے دوسرے دن □ □ اس کے بعد جھٹکے لگے تھے؟	Yes 1 No 2 Don't know 8
3D380	Did the baby's body become stiff, with the back arched backwards? کیا بچے کا جسم سخت ہو گیا تھا او □ اس کی کمر پیچھے کی طرف □ اکڑ گئی تھی؟	Yes 1 No 2 Don't know 8
3D390	Did the child have bulging or raised fontanelle? کیا بچے کے سر کے □ □ میانے حصہ پر ابھلا تھا؟ (تصویر دکھائیے)	Yes 1 No 2 Don't know 8
3D400	Did the child have a sunken fontanelle? کیا بچے کے سر کا □ □ میانہ حصہ دب ہوا تھا؟ (تصویر دکھائیے)	Yes 1 No 2 Don't know 8
3D410	Did the baby become unresponsive or unconscious soon after birth (within less than 24 hours)? کیا بچہ پیدائش کے 24 گھنٹے اند □ بے ہو □ □ نڈھا □ ہو گیا تھا؟	Yes 1 No 2 Don't know 8

3D420	Did the baby become unresponsive or unconscious more than 1 day after birth? کیا پیدائش کے 1 دن کے بعد بچہ بے ہوش یا اندھا ہو گیا تھا؟	Yes 1 No 2 Don't know 8
3B100	Did the baby have a fever? کیا بچے کو بخار تھا؟	Yes 1 No 2 Don't know 8
3D430	Did the baby become cold to the touch before it died? کیا بچے کا فوت ہونے سے پہلے جسم ٹھنڈا پڑ گیا تھا؟	Yes 1 No 2 Don't know 8
3B130	Did the baby have a cough? کیا بچے کو کھانسی تھی؟	Yes 1 No 2 Don't know 8
3B170	Did the baby make a whooping sound when coughing? DEMONSTRATE کیا بچے کو کھانسی کے دوران کوئی غیر معمولی آواز آتی تھی؟	Yes 1 No 2 Don't know 8
3B180	Did the baby have any breathing problem? کیا بچے کو سانس لینے میں کوئی دشواری تھی؟	Yes 1 No 2 Don't know 8
3B190	Did the baby have fast breathing? کیا بچے کے سانس کی رفتار تیز تھی؟	Yes 1 No 2 Don't know 8
3B210	Did the baby have breathlessness? کیا بچے کو سانس لینے میں مشکل پیش آتی تھی؟	Yes 1 No 2 Don't know 8
3B250	Did you see the lower chest wall/ribs being pulled in as the child breathed? کیا بچے کی سانس لیتے وقت پسلیاں اندر کی طرف کھینچ جاتی تھیں؟	Yes 1 No 2 Don't know 8
3B260	Did the baby have noisy breathing (grunting or wheezing)? DEMONSTRATE کیا سانس لیتے وقت سیٹی کی آواز آتی تھی؟	Yes 1 No 2 Don't know 8
3B280	Did the baby have diarrhoea? کیا بچے کو دست کی بیماری تھی؟	Yes 1 No 2 Don't know 8
3B300	At any time during the final illness was there blood in the stools? کیا آخری بیماری کے دوران پاخانہ میں خون آیا تھا؟	Yes 1 No 2 Don't know 8
3B310	Did the baby vomit? کیا بچے کو الٹیاں ہوئیں تھیں؟	Yes 1 No 2 Don't know 8
3B320	Did the baby vomit "coffee grounds" or bright red/blood? کیا بچے کی الٹی/قے کا رنگ سیاہ یا لالہ/سرخ تھا؟	Yes 1 No 2 Don't know 8
3B360	Did the baby have a more than usual protruding abdomen? کیا بچے کا پیٹ غیر معمولی طور پر باہر کی طرف نکلا ہوا تھا؟	Yes 1 No 2 Don't know 8

3D440	Did the baby have redness or discharge from the umbilical cord stump? کیا بچے کا ناک کے قریب غیر معمولی طو پر سرخی تھی یا بدبو د مواد خراج ہو یا تھا؟	Yes 1 No 2 Don't know 8
3B530	Did the baby have any skin problems? کیا بچے کو کوئی جلد کی بیماری تھی؟	Yes 1 No 2 Don't know 8
3B540	Did the baby have any ulcers, abscess or sores anywhere except the feet? کیا بچے کے پیروں کے علاوہ جسم کے کسی حصے پر کوئی زخم یا پھوڑا پھنسی تھی؟	Yes 1 No 2 Don't know 8
3B550	Did the baby have any ulcers, abscess or sores on the feet? کیا بچے کے پیروں پر کوئی پھوڑا یا پھنسی تھی؟	Yes 1 No 2 Don't know 8
3B560	During the illness that led to death, did the baby have any skin rash? کیا بچہ کے جسم پہ موت سے پہلے جلد پر کوئی لالہ ننگ کے دھبے تھے؟	Yes 1 No 2 Don't know 8
3B580	Did the baby have measles rash? کیا بچے کے جسم پر خسرے کے لالہ ننگ کے دھبے تھے؟	Yes 1 No 2 Don't know 8
3D450	Did the baby have yellow palms or soles? کیا بچے کے پیر یا ہاتھوں کی تلیوں کا لالہ ننگ پیلا / زرد تھا	Yes 1 No 2 Don't know 8
3D460	Did the mother receive tetanus toxoid (TT) vaccine? کیا ماں کو تشنج سے بچانے کے ٹیکے لگے تھے؟	Yes 1 No 2 Don't know 8
SECTION 9 TREATMENT AND HEALTH SERVICE USE FOR THE FINAL ILLNESS		
سیکشن 9: بیماری کا علاج اور صحت کی خدمات تفصیلی جائزہ		
3G100	Was s/he adequately vaccinated? کیا اسے حفاظتی ٹیکے لگوائے گئے؟	Yes 1 No 2 Don't know 8
3G110	Did s/he receive any treatment for the illness that led to death? کیا بچہ / بچی کی بیماری کا علاج کروا گیا جس کی وجہ سے وہ موت کا شکار ہوئی/ہوا؟	Yes 1 No 2 Don't know 8
3G120	Did s/he receive oral rehydration salts? کیا اسے نمکوں کا پانی لگایا گیا؟	Yes 1 No 2 Don't know 8

3G130	Did s/he receive (or needed) intravenous fluids (drip) treatment? کیا اس نے نمکیات کے حصوں کے لیے ڈپ-عنی گلوکوز کی بوتل لگوائی/ضرورت تھی؟	Yes 1 No 2 Don't know 8
3G140	Did s/he receive (or needed) a blood transfusion? کیا اس نے خون لگا/ضرورت تھی؟	Yes 1 No 2 Don't know 8
3G150	Did s/he receive (or needed) treatment/food through a tube passed through the nose? کیا اسے ناک میں ٹیو کے ذریعے کچھ کھانے کی چیز دی گئی/ضرورت تھی؟	Yes 1 No 2 Don't know 8
3G160	Did s/he receive (or needed) injectable (IV or IM) antibiotics? کیا اسے انٹی بائیوٹک کے ٹیکے لگے/ضرورت تھی؟ [نس/گوٹ کے ذریعے]	Yes 1 No 2 Don't know 8
3G170	Did s/he have (or needed) an operation for the illness? کیا بیمار کے سلسلے میں کوئی آپریشن ہوا/ضرورت تھی؟	Yes 1 No 2 Don't know 8
3G190	Was s/he discharged from the hospital very ill? کیا بچے کو ہسپتال سے بہت زیادہ بیمار کی حالت میں ڈسچارج کروا گیا تھا؟	Yes 1 No 2 Don't know 8

SECTION 10. BACKGROUND

سیکشن 10:

4A100	In the final days, did the baby travel to a hospital or health facility? موت کے آخری دن میں کیا اس کو کسی ہسپتال/صحت کی سہولت پر لے جایا گیا؟	Yes 1 No 2 Don't know 8
4A110	Did s/he use motorized transport to get to the hospital or health facility? کیا وہ بچہ/بچی کو گاڑی/مبولینس پر ہسپتال/صحت کی سہولت تک لے گئے تھے؟	Yes 1 No 2 Don't know 8
4A120	Were there any problems during admission to the hospital or health facility? کیا ہسپتال/صحت کی سہولت میں رجسٹریشن/داخلے میں کوئی مشکل پیش آئی تھی؟	Yes 1 No 2 Don't know 8

4A130	<p>Were there any problems with the way (s)he was treated (medical treatment, procedures, inter-personal attitudes, respect, dignity) in the hospital or health facility?</p> <p>کیا علاج کے دو□ کوئی مسئلہ پیش آیا [جیسا کہ ادویات، آپشن□ا [برتاو] عزت و احترام کے حوالے سے]؟</p>	<p>Yes 1</p> <p>No 2</p> <p>Don't know 8</p>
4A140	<p>Were there any problems getting medications, or diagnostic tests in the hospital or health facility?</p> <p>مرض کی تشخیص کے لیے ٹیسٹ او□ ادویات کے حصول کے لیے کوئی مسئلہ پیش آیا تھا؟</p>	<p>Yes 1</p> <p>No 2</p> <p>Don't know 8</p>
4A150	<p>Does it take more than 2 hours to get to the nearest hospital or health facility from the deceased's household?</p> <p>کیا مرحوم بچہ /بچی کے گھر سے ہسپتال/صحت کے مرکز کا فاصلہ دو گھنٹوں سے زیادہ تھا؟</p>	<p>Yes 1</p> <p>No 2</p> <p>Don't know 8</p>
4A160	<p>In the final days before death, were there any doubts about whether medical care was needed?</p> <p>موت کے آخری □ام میں کچھ□سا سامنے آیا تھا کہ اسے طبی نگہداشت کی ضرورت ہے؟</p>	<p>Yes 1</p> <p>No 2</p> <p>Don't know 8</p>
4A170	<p>In the final days before death, was traditional medicine used?</p> <p>موت کے آخری □ام میں □وائیتی ادویات [گھڑلو ٹوٹکے] کا استعمال کیا گیا تھا؟</p>	<p>Yes 1</p> <p>No 2</p> <p>Don't know 8</p>
4A180	<p>In the final days before death, did anyone use a telephone or cell phone to call for help?</p> <p>کیا موت کے آخری □ام میں کسی نے ٹیلیفون□ کے ذریعے کسی سے مدد حاصل کی تھی؟</p>	<p>Yes 1</p> <p>No 2</p> <p>Don't know 8</p>
4A190	<p>Over the course of illness, did the total costs of care and treatment prohibit other household payments?</p> <p>کیا بیماری کے تمام □ام میں خرچ ہونے والے پیسوں کی وجہ سے گھر کے □گر اخراجات متاثر ہوئے تھے؟</p>	<p>Yes 1</p> <p>No 2</p> <p>Don't know 8</p>

INTERVIEWER'S OBSERVATIONS

سوالات کرنیوالے کے مشاہدات

TO BE FILLED IN AFTER COMPLETING INTERVIEW

COMMENTS ON SPECIFIC QUESTIONS

مختلف سوالوں سے متعلق مشاہدات

مختصراً یہاں بچہ کی وفات سے متعلق قریبی افراد سے کہہ دیا گیا کہ وہ کہاں واقع ہوئی اور علاج معالجہ کے بارے میں تفصیلات حاصل کریں

SUPERVISOR'S OBSERVATIONS

NAME OF THE SUPERVISOR:

DATE:

Appendix 3




*Institutional Review Board
Population Council
1230 York Avenue
New York, NY 10065*

APPROVAL OF PROTOCOL

DATE: August 19, 2016

TO: A. M. Mir, Principal Investigator

FROM: Nick Gontarz, IRB Administrator, on behalf of
John Bongaarts, Chairman
Institutional Review Board (IRB) 

RE: *Approval of Protocol 755* – Using the Community Informant Based (Made-in and Made-for) Methodology for Estimating Neonatal Mortality Ratio (NMR) in District Nowshera, Khyber Pakhtunkhwa

The Institutional Review Board (IRB) on human research of the Population Council has approved the above request to involve humans as research subjects.

APPROVAL DATE OF PROTOCOL: JULY 26, 2016

ADVERSE REACTIONS/COMPLICATIONS: All serious and/or unexpected side effects must be reported immediately by email to the Population Council's SAE Desk (Safety@popcouncil.org) which will notify the IRB of the Population Council.

MODIFICATIONS: All Protocol changes involving subjects must have prior IRB approval.

If this project is to continue, it must be renewed as specified by the IRB. THE EXPIRATION DATE FOR THIS PROJECT IS JULY 26, 2017. This renewal application consists of a brief status report summarizing the results obtained during the past period and a short statement of the research plan for the coming year.

If you have any questions, please contact Nick Gontarz at telephone number [212] 327-7112, email ngontarz@popcouncil.org.

cc: IRB Records and Reports File for Protocol 755



National Bioethics Committee (NBC) Pakistan



Ref: No.4-87/16/NBC-211/RDC/ 907

Date: 09th September, 2016

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Minister of State, Ministry of
National Health Services Regulations
and Coordination

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Government of Pakistan

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Director General Health, Punjab

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Pakhtun Khwa

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Dr. Ali Mohammad Mir
Director Programmes
Population Council, Pakistan
House No. 7, Street No. 62, F-6/3
Islamabad.

Subject: Using community Informat-Based (Made-In An Made-For)
Methodology for Estimating of Neonatal Mortality Rate
(NMR) in District Nowshera, Khyber Pakhtunkhwa(NBC-211)

Dear Dr. Ali Mohammad Mir

I am pleased to inform you that the above mentioned project has been cleared by "Research Ethics Committee of National Bioethics Committee".

Kindly keep the National Bioethics Committee Secretariat updated with the progress of the project and submit the formal final report on completion.

Yours sincerely

(Prof Dr. Aasim Ahmad)
Chairman
NBC-Research Ethics Committee

NBC Secretariat:

Pakistan Medical Research Council, Shahrah-e-Jamhuriat, Off Constitution Avenue, Sector G-5/2, Islamabad
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