Introduction:
In June 2012, a high-level delegation from Tajikistan led by the First Deputy Minister of Health participated in a meeting, ‘A Promised Renewed’ in Washington D.C., where Tajikistan, together with 23 other countries, committed to renewing its efforts to end preventable child deaths by 2035. Within this context, UNICEF provided technical and financial assistance to the Ministry of Health and Social Protection to conduct a causal analysis of infant deaths (hospital-based assessment). The Ministry of Health study team examined more than 3,000 files at hospitals nationwide to identify the determinants of infant deaths and to analyse the association of infant deaths with socio-economic factors, maternal health status, quality of hospital care, availability of essential medicines and equipment, and geographical locations.

Objectives:
The specific objectives of the study were:

1) To determine the causes of infant deaths by sex, age and residence in 2012
2) To examine the association of socio-economic, maternal, environmental, and health system factors with the length of child survival
3) To estimate the percentage of preventable deaths out of all hospital-based infant deaths in 2012

Methodology:
The study was quantitative in nature, and it covered all infant deaths which occurred in hospitals in Tajikistan in 2012 (about 3,000 cases). Data was collected through three questionnaires: 1) a questionnaire on all individual infants who died in hospital in 2012 completed based on hospital records; this includes the information on the infants’ socio-economic background, their mothers’ health status during pregnancy, the infants’ health conditions in the last admission at hospital, and the cause of death as per ICD 10 code. 2) a questionnaire on hospital resources, including facilities, equipment, medicine, and human resources, completed for all hospitals where infant deaths occurred in 2012; and 3) a questionnaire on health status and health indicators at district level, filled based on health service statistics.

The study team comprised a coordinator and a technical director at national level, eight consultants and supervisors, 30 interviewers and 4 experts to monitor all aspects of data gathering. While the medical files of all 3,000 hospital-based infant deaths were reviewed by the interviewers, the eight-member scientific committee reviewed 30% (about 900) of these files for quality assurance. The analysis was conducted in 2 phases: 1) descriptive component – mostly describing the prevalence and incidence of infant deaths based on the collected data; 2) analytical component – including the analysis of correlation between different factors and
the length of survival among infants who died in hospital. All computation was conducted via STATA 11.0 software.

**Findings:**

The major findings from the study are as follows:

- **Nearly 70% of the hospital-based infant deaths occurred during the first 6 days of life (early neonatal) and 78% during the first four weeks of life (neonatal).** This implies that 90% of the hospital-based neonatal mortality in Tajikistan now occurs during the early neonatal period.

- **About two-thirds of early neonatal deaths were recorded among the low-birth weight (LBW) and 70% of neonatal deaths amongst premature babies (born before 37 weeks).** Figures 1 and 2 show the distribution of the early neonatal deaths by ‘child’s weight at birth’, and the distribution of neonatal deaths by ‘gestational age’, respectively. The trend is similar in all regions except for GBAO where the sample size collected in the study was very small. In Dushanbe, the proportion of LBW and prematurity was even higher at 80%. As such, in Tajikistan, like many other countries in the world, prematurity is now the single most important condition associated with child deaths in the critical first month of life. This calls for an increasing attention to mortality associated with preterm birth, small-for-gestational-age (SGA), and preterm and SGA combinations.

**Figure 1. Percentage of early neonatal deaths by ‘child’s weight at birth’ and region**

![Percentage of early neonatal deaths by ‘child’s weight at birth’ and region](image-url)
• Most of the top 10 leading causes of infant deaths are ultimately preventable, with main causes for neonatal mortality being birth asphyxia, respiratory distress of newborn and birth trauma; and main causes for post neonatal mortality being Acute Respiratory Illness (ARI), pneumonia and diarrhea. Many of the causes for neonatal mortality suggest links with poor quality of skilled care at birth. It should also be noted that a significant number of deaths from ARI and diarrhea, which can be easily prevented at household and community levels, are still occurring particularly in rural areas.

Table 1. Top 10 leading causes of infant mortality in Tajikistan

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>National Rank (%)</th>
<th>Dushanbe Rank (%)</th>
<th>GBAO Rank (%)</th>
<th>Khatlon Rank (%)</th>
<th>RRS Rank (%)</th>
<th>Sughd Rank (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth asphyxia</td>
<td>1 (18.0%)</td>
<td>1 (22.3%)</td>
<td>3 (13.0%)</td>
<td>1 (20.8%)</td>
<td>2 (12.3%)</td>
<td>1 (14.1%)</td>
</tr>
<tr>
<td>Respiratory distress of newborn</td>
<td>2 (10.8%)</td>
<td>5 (4.9%)</td>
<td>-</td>
<td>2 (11.5%)</td>
<td>1 (21.9%)</td>
<td>2 (11.2%)</td>
</tr>
<tr>
<td>Birth trauma</td>
<td>3 (6.5%)</td>
<td>9 (3.2%)</td>
<td>6 (8.7%)</td>
<td>7 (6.0%)</td>
<td>3 (11.7%)</td>
<td>3 (7.7%)</td>
</tr>
<tr>
<td>Bacterial sepsis of newborn</td>
<td>4 (6.4%)</td>
<td>3 (15.8%)</td>
<td>-</td>
<td>12 (1.9%)</td>
<td>9 (3.7%)</td>
<td>7 (4.4%)</td>
</tr>
<tr>
<td>Atelectasis</td>
<td>5 (5.8%)</td>
<td>2 (17.6%)</td>
<td>-</td>
<td>17 (1.0%)</td>
<td>-</td>
<td>9 (3.3%)</td>
</tr>
<tr>
<td>ARI</td>
<td>6 (5.0%)</td>
<td>27 (0.3%)</td>
<td>-</td>
<td>3 (11.2%)</td>
<td>5 (6.5%)</td>
<td>10 (2.5%)</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>7 (4.8%)</td>
<td>7 (4.3%)</td>
<td>10 (4.4%)</td>
<td>8 (5.0%)</td>
<td>11 (2.5%)</td>
<td>4 (5.9%)</td>
</tr>
<tr>
<td>Diarrhea and gastroenteritis of infectious origin</td>
<td>8 (4.0%)</td>
<td>16 (0.7%)</td>
<td>-</td>
<td>6 (6.4%)</td>
<td>4 (9.6%)</td>
<td>12 (2.4%)</td>
</tr>
<tr>
<td>Intrauterine hypoxia</td>
<td>9 (3.8%)</td>
<td>23 (0.4%)</td>
<td>1 (21.7%)</td>
<td>4 (9.7%)</td>
<td>-</td>
<td>16 (1.9%)</td>
</tr>
<tr>
<td>Congenital malformations of heart</td>
<td>10 (3.8%)</td>
<td>6 (4.9%)</td>
<td>-</td>
<td>10 (2.2%)</td>
<td>26 (0.3%)</td>
<td>5 (5.6%)</td>
</tr>
</tbody>
</table>

(NB: Top 3 causes were shaded and shown in italics.)
• The most commonly used curative procedures were resuscitation with bag and mask ventilation (operation ambu) and oxygen therapy, followed by oral rehydration therapy (ORT). In view of the scientific committee, 99% of the curative procedures used were considered as necessary. A blood test was the most commonly used laboratory test, while it was also found that a number of children did not receive any tests. In view of the committee, about 70% of the laboratory tests conducted were deemed necessary. Overall, the committee concluded that 55%, 52% and 60% of the infant deaths could have been prevented at hospital, primary health care, and household levels, respectively.

• High risk pregnancy (young age, high parity, short birth intervals (less than 2 years)) is likely to be associated with high neonatal mortality, which points to the importance of family planning. It was also observed that some of the maternal conditions such as bleeding, pre-eclampsia, anemia and prolonged labour had negative effects on the survival length of children. Figure 3 shows that, with increase in the number of morbidities of mothers during pregnancy, their children’s survival length was reduced. The study also indicates that the children whose mothers’ BMI was less than 18.5 or more than 30 had shorter survival length. All these findings confirm the direct links between maternal and child health. This reaffirms the importance of ‘quality’ antenatal care (ANC) to identify high risk pregnancy and to address any morbidities or complications during pregnancy. Figure 4 illustrates this as well, showing that children whose mothers did not see a skilled health professional for ANC had a shorter survival length. The same graph indicates that children with mothers who visited ANC more than 6 times also had a shorter length of survival. This may be because frequent ANC visits were possibly due to the presence of complications during pregnancy. At the same time, this is also a call for a stronger focus on content and quality of care provided rather than mere ANC attendance.

**Figure 3.** Distribution of infant age at death by co-morbidities in pregnancy (bleeding, pre-eclampsia, prolonged labor, anemia, and other)
Shortage of drugs, equipment, and basic facilities such as water, sanitation, and electricity line, was observed as a major bottleneck to scale up the coverage of proven interventions. The study found that only 5.3% of the hospitals had all 20 essential drugs\(^1\) (Figure 5); and that only 1.1% of the hospitals had all 33 items of equipment deemed necessary\(^2\) (Figure 6). On average, hospitals in Tajikistan had about 57% of the essential medicines and 60% of the required equipment. Furthermore, not all hospitals in Tajikistan had primary facilities, such as water, sanitation, and an electricity line. Only 65.6% had all these facilities, with regional variation – all hospitals in Dushanbe had these facilities, while in GBAO half of the facilities lacked water resources.

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\(^1\)In this study, the following are considered as essential medicines: Adrenaline, Amoxicillin, Ampicillin, Natrum hidrotsarbonat, NaCl solution, Benzylpenicillin, Gentamicin, Dexamethasone, Diazepam, KCl, Magnesium, Ketamine, Mebendazole, Dopamine, Nystatin, Prednisolone, Salbutamol, Furosemide, Ceftriaxone, and Glucose.

\(^2\)In this study, availability of the following equipment was surveyed: generator, ambulance, baby mask, laryngoscope, endotracheal tube, electric/foot operated suction, lamp for phototherapy, incubators, stomach catheters, aspirator of meconium, umbilical catheters, stethoscope, pulse oximeter, multi functional monitors, infusion pumps, reanimation table with warming mattress, SPAP system, baby warmer/mattress, radiant warmer system, glucometer, urine catheters, scissors, sterile glovers, scalp, liquid soup or disinfection, wall thermometer, newborn thermometer, oxygen flow cannula, single use urine collectors, disposable probes for child feeding, disposable catheters for aspiration of mucus, needles for lumbar injection, and breastmilk pump.
**Figure 5.** Medicine completeness

![Graph showing medicine completeness](image)

**Figure 6.** Equipment completeness

![Graph showing equipment completeness](image)
The proportion of post-neonatal deaths was higher among those less educated, the mothers aged 15-20 or beyond 35. This reflects the fact that the post-neonatal deaths are linked with suboptimal family care practices. The study found significant regional variations on many indicators, including the causes of deaths as seen earlier in Table 1. Also, the percentage of infant deaths was lower in urban areas than the rural areas in all age groups (early neonatal, late neonatal, and post neonatal). This suggests the need for specific interventions based on local needs.

Conclusions:

Tajikistan experienced a significant reduction in the Under 5 Mortality Rate (U5MR) from 93 per 1,000 live births in 2000 to 43 in 2011 and Infant Mortality Rate (IMR) from 75 per 1,000 live births in 2000 to 34 in 2011. On the other hand, the neonatal mortality rate was only reduced from 20 per 1,000 live births in 2003-2007 to 19 in 2008-2012, which is one important barrier to progress toward Millennium Development Goal (MDG) 4. By showing that nearly 80% and 70% of infant deaths at hospitals in Tajikistan occurred during the first month and the first week of life, respectively, the study reaffirms the vital need for accelerated efforts to address neonatal mortality, with special attention to the early neonatal period. Top three causes of deaths accounting for 35% of all infant deaths – i.e., birth asphyxia, respiratory distress of newborns, and birth trauma – as well as the strong maternal and child health links, which were confirmed by the study, underscores the importance of improving a coverage of ‘quality’ ‘continuum of care’ for reproductive, maternal, neonatal, and child health (RMNCH).

Packages of globally proven interventions are available that should ensure provision of the basic and additional care for women and newborns in order to prevent or treat the main causes of neonatal mortality. These interventions include: (i) management of preterm birth, including the antenatal use of corticosteroids; (ii) skilled care at birth; (iii) basic obstetric care; (iv) comprehensive obstetric care; (v) essential newborn care including warmth, hygiene and feeding; (vi) neonatal resuscitation; (vii) kangaroo mother care; (viii) treatment of possible severe neonatal infections; and (ix) supportive care for sick newborns. Above all, in light of the fact that the majority of the early neonatal deaths are now associated with prematurity, small-for-gestational-age, and their combinations, the study particularly recommends for the introduction and scale-up of a range of low-cost interventions that, if fully implemented, could immediately and substantially reduce prematurity-related death and disability.

Tajikistan Demographic and Health Survey (DHS) 2012 showed that the poorer family care and practices and health seeking behaviors (such as antenatal and postnatal care by skilled health professional, institutional deliveries) are observed among the women less educated, the older women (above 35), and very young mothers aged 15-20.

Tajikistan Demographic and Health Survey (DHS) 2012

Every Newborn, An Action Plan to End Preventable Deaths, Every Woman Every Child, WHO and UNICEF, 2014
At the same time, the study highlighted significant shortage of drugs, equipment, and basic facilities such as water, sanitation, and electricity line in the hospitals in Tajikistan as major constraints to scale up the coverage of proven interventions, and calls for action to address this bottleneck.

Finally, the study reminds that conditions such as ARI, pneumonia and diarrhea are still among the top 10 leading causes of infant deaths in Tajikistan. These deaths can be easily prevented at household and community levels, and thus continued efforts are required to enhance the quality coverage of Integrated Management of Childhood Illness (IMCI) programme, including interventions to improve family care practices, particularly among the marginalised households with less access to information in rural communities.