

Analysis of Under-Five Mortality in Egypt for Sustainable and Equitable Reduction
‘A Mixed-Methods Research Using the Mosley & Chen Framework’

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Executive Summary

Egypt has achieved remarkable progress in reducing under-five mortality over recent decades. Yet this improvement has slowed, and today approximately 18 children per 1,000 live births still die before reaching their fifth birthday¹. Most strikingly, more than half of these deaths occur in the neonatal period, the first 28 days of life, reflecting an epidemiological shift in the causes of child mortality². While infectious diseases once dominated mortality statistics, prematurity and congenital anomalies have now emerged as the leading causes of deaths of infants and young children in Egypt. This change signals both the success of past interventions and a growing need to strengthen systems that would combat the emergent causes of child death and support survival immediately before, during, and after birth.

To investigate these evolving causes of under-five mortality, this study conducted mixed-methods research in five governorates representing Upper, Lower, and Urban Egypt; Alexandria, Qalyoubia, Ismailia, Assiut, and Sohag. A total of 4,000 household surveys identified 390 deaths among children under five years of age. The quantitative data revealed that prematurity accounted for one-third of all deaths, followed closely by congenital anomalies, while pneumonia and diarrhea still contributed a smaller but important share. Infants who died due to prematurity did so very early in life, at just over two months of age on average, indicating that the first days are decisive for survival.

Alongside this analysis, fifty focus group discussions (FGDs) with bereaved parents and one hundred in-depth interviews (IDIs) with healthcare providers uncovered the lived experiences and systemic challenges that can explain and untangle the numbers. Parents consistently described delayed recognition of serious symptoms, limited guidance from healthcare workers, financial struggles that postponed treatment, and the persistent difficulty of securing a neonatal intensive care bed as the main contributing factors to the loss of their children. Providers echoed these factors, noting that families often arrive only when children are already critically ill and that many facilities lack the resources required for optimal neonatal care.

¹ UNICEF. Country Profiles: Egypt. Retrieved from UNICEF Data: Trends in under-five mortality rate in Egypt: https://data.unicef.org/country/egy/?utm_source=chatgpt.com. (Accessed on 27 October 2025)

² World Health Organization 2025 data.who.int, Egypt [Country overview]: https://data.who.int/countries/818?utm_source=chatgpt.com. (Accessed on 27 October 2025)

Together, these data converge to illustrate a preventable mortality pathway: social and financial vulnerability increases the likelihood of maternal risk during pregnancy; fragile newborns require highly specialized care that remains unevenly available across the country; and delays in detection, referral, transport, and post-discharge follow-up repeatedly transform treatable conditions into fatal emergencies. Prematurity and congenital anomalies do not act alone — rather, they become lethal within a system that is overstretched and often reactive rather than preventive.

The implications are clear. Egypt has reached a stage in its child survival journey where neonatal health must become the central focus. Reducing under-five mortality any further will require strengthening the quality of antenatal and delivery care, expanding neonatal intensive care capacity in underserved regions, ensuring timely and affordable transport for sick newborns, monitoring high-risk infants after discharge from hospitals, and addressing ongoing reproductive risks such as consanguinity and unsafe medication use during unrecognized pregnancy.

With these targeted investments and system adjustments, Egypt can regain its momentum in reducing under-five mortality and ensure that no child's survival depends on where they were born or what resources their family can afford.

1. Introduction

Under-five mortality (U5M) is a widely recognized and sensitive measure of population health because it reflects both the biological vulnerability of young children and the performance of the health system that is responsible for their protection and care. Egypt has made remarkable progress in reducing U5M over the past thirty years, driven largely by investments in primary healthcare, immunization, family planning, and water and sanitation infrastructure. As a result, deaths from infectious diseases such as pneumonia and diarrhea have declined dramatically.

However, this success has brought a new challenge. Despite improvements, the pace of reduction in mortality has slowed in recent years. National estimates show that Egypt's U5M rate continues to hover around 20 deaths per 1,000 live births, and the decline has almost stalled. This plateau indicates that the determinants of child death have changed faster than systems and strategies designed to prevent them.

A striking epidemiological shift has occurred: whereas the major threats to children's lives used to be preventable infections, the most significant causes of death today are complications related to premature birth, congenital anomalies, and conditions requiring urgent and specialized neonatal care³. In essence, children are no longer dying primarily from exposure to external risks; they are dying from issues that arise at birth and require high-quality, rapidly accessible clinical support.

This study seeks to answer a central question: If Egypt has succeeded in controlling post-neonatal infectious diseases, why are so many newborns still dying? To answer this, we examined not only who is dying and from what, but why and how these outcomes continue to occur in an era of medical advancement. We argue that Egypt's child health strategy must shift from broad community-level prevention toward a focused strengthening of neonatal care systems; spanning antenatal support, delivery safety, referral pathways, and post-discharge follow-up.

This research provides evidence to guide that transition by analyzing the social, behavioral, and systemic determinants that convert neonatal vulnerability into preventable death.

³ Ghazy RM, Fekry MM, Omran AR, Tahoun MM. Causes of under-five mortality using verbal autopsy and social autopsy studies (VASA) in Alexandria, Egypt, 2019. *Journal of Global Health Reports*. 2020;4:e2020080. doi:[10.29392/001c.14379](https://doi.org/10.29392/001c.14379)

2. Conceptual & Analytical Framework

This study uses the Mosley and Chen (1984) Framework⁴ as both a conceptual and analytical tool. The model proposes that childhood survival depends on a series of causal pathways, beginning with social structures and flowing through behavioral and environmental factors until they manifest as biological outcomes. It distinguishes three interconnected levels of determinants:

1. **Underlying determinants:**

Structural conditions such as poverty, education, geographic inequity, and cultural norms shape a family's ability to protect a newborn and to access care when needed. For example, low maternal educational attainment limits health literacy, while residence in rural areas restricts access to timely specialized care.

2. **Intermediate determinants:**

These operate at the household and community level — including sanitation, care-seeking behavior, nutrition, transport availability, and beliefs about illness. Delays in recognizing neonatal danger signs or reaching care quickly transform manageable symptoms into life-threatening emergencies.

3. **Proximate determinants:**

These represent the biological mechanisms that immediately lead to death — prematurity, congenital anomalies, infections, and respiratory failure. They are the final expression of upstream disadvantage and system failure.

This framework allows us to understand mortality as a chain reaction rather than isolated events. It shows how a child born preterm in a family with limited resources and weak access to health services is exposed to an escalating cascade of risks, in which each step increasing the probability of death. The model also provides a rigorous structure for mixed-methods integration, ensuring that quantitative findings identify patterns and strength of associations, while qualitative findings explain how and why those patterns occur in real life.

⁴ Mosley, W. H., & Chen, L. C. (2003). An analytical framework for the study of child survival in developing countries: public health classics / W. Henry Mosley and Lincoln C. Chen. *Bulletin of the World Health Organization: the International Journal of Public Health*, 81(2), 140-145. Retrieved from <https://apps.who.int/iris/handle/10665/71801>

Using this framework, the Results and Discussion chapters illustrate clearly how preventable deaths emerge from predictable and understandable determinants, and how interventions can disrupt that chain to protect children's lives.

3. Methodology

This study employed an analytical cross-sectional mixed-methods design to investigate both statistical patterns and lived experiences associated with under-five mortality in Egypt. Mortality is shaped not only by biological or clinical factors, but also by social and economic conditions, as well as system performance. A mixed-methods approach therefore allowed the quantitative data to identify the scale and distribution of determinants, while qualitative findings provided context and explanation for how those determinants operate in real life. Integration of both components was guided by the Mosley and Chen Framework.

The research was conducted across five governorates representing diverse geographic and socioeconomic contexts in Egypt: Alexandria representing Urban Governorates (U5MR 27/1000 live births), Qalyubia and Ismailia representing Lower Egypt (U5MR 39 and 38/1000 live births respectively), and Assiut and Sohag representing Upper Egypt (U5MR 50 and 47/1000 live births respectively). These areas differ in health system capacity, access to neonatal and child healthcare services, and underlying socioeconomic risk, enabling meaningful comparison.

A total of 4,000 households⁵ were selected using a stratified random sampling method to ensure adequate representation. The target population was stratified by the selected districts, where each district represented a stratum. From these, 390 deaths among children under five years of age (9.75%) were identified and included in the quantitative analysis. The qualitative component was designed to complement this evidence by exploring mechanisms behind the observed patterns. It included 50 focus group discussions (FGDs) with approximately 280 bereaved parents, organized separately by gender and by urban or rural setting to enhance disclosure and comfort. In addition, 100 in-depth interviews (IDIs) were conducted with physicians, nurses, and midwives involved in newborn and maternal care. Qualitative sampling was purposeful, and it continued until new data no longer produced additional themes, confirming theoretical

⁵ The sample size in each stratum will be determined based on the finite population corrected Cochran's formula. Cochran, W. G. (1977). In *Sampling Techniques, 3rd Edition*. New York: John Wiley & Sons.

saturation. The overall sample size ensured both statistical reliability and rich contextual understanding.

Governorate	Urban	Rural	Total
Alexandria	800	0	800
Ismailia	160	640	800
Qalyubia	320	480	800
Assiut	160	640	800
Sohag	160	640	800
Total	1600	2400	4000

Table 1: Quantitative Sample Distribution

Governorate	Males	Females	Total
Alexandria	28	29	57
Ismailia	29	28	57
Qalyubia	30	30	60
Assiut	27	29	56
Sohag	25	25	50
Total	139	141	280

Table 2: FGDs Distribution

Governorate	Doctors	Nurses	Midwives	Total
Alexandria	7	7	6	20
Ismailia	7	7	6	20
Qalyubia	7	7	6	20
Assiut	7	7	6	20
Sohag	7	7	6	20
Total	35	35	30	100

Table 3: IDIs Distribution

The quantitative survey instrument was adapted from the Egypt Demographic and Health Survey (DHS) 2014 and expanded to capture neonatal-specific risk factors such as prematurity and congenital anomalies. Additional modules assessed care-seeking behaviors, timing of referrals, birthplace and attendant characteristics, and out-of-pocket expenditures on emergency care. The qualitative guides used open-ended questions to elicit perceptions of illness severity, barriers to timely care, referral experiences, and the influence of financial and emotional pressures on decision-making throughout a child's illness.

Research validity was strengthened through multiple safeguards. All tools were piloted to ensure clarity, feasibility, and cultural sensitivity. Data collectors were trained healthcare workers or social researchers who were familiar with community norms. Qualitative analysis included peer debriefing and double coding to enhance consistency, with discrepancies resolved through consensus. Triangulation across quantitative and qualitative sources further reinforced the validity of interpretations.

Ethical Considerations

The necessary approval was secured from The Central Agency for Public Mobilization and Statistics (CAPMAS). Verbal informed consent was obtained from every participant to minimize emotional burden and allow flexibility during discussions of child loss. Confidentiality and psychological safety were strictly maintained. No identifying information was recorded, and participants who experienced distress were offered psychosocial support referrals whenever needed.

4. Results

4.1 Under-five Mortality in the Sample

The prevalence of under-five mortality (U5M) within the sample was 9.75% (n=390). Regional variations were observed, with Alexandria reporting the highest percentage of U5M cases (25.09%; n=101), followed closely by Qalyubiya (24.87%; n=97). Slightly more than half of the reported deaths in the study were for male children (52.26%; n=204). Rural areas exhibited a higher prevalence of U5M (63%; n=245) compared to urban areas (37%; n=145).

Prematurity was the most frequently reported cause of death, accounting for 33.08% (n=129) of cases, followed by congenital anomalies (24.36%; n=95), while genetic diseases were the least common cause (0.77%; n=3). The frequency of causes of death is detailed in Figure 2.

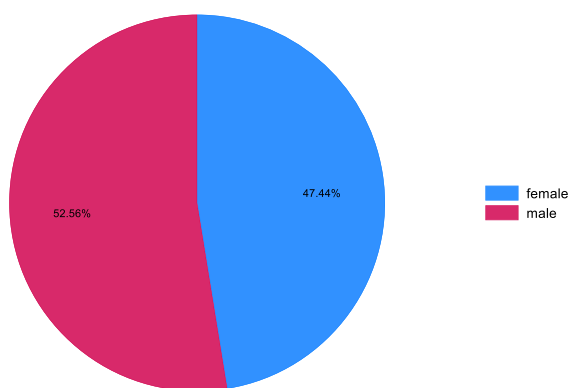


Figure 1: Sex prevalence of children who died under 5 in the sample

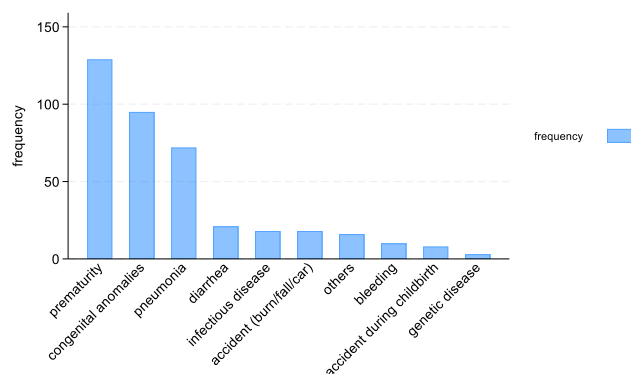


Figure 2: Frequency of different causes of death in the sample

4.2 Proximate Determinants — Biological and Immediate Causes

Under-five mortality in this study was shaped overwhelmingly by neonatal circumstances, with nearly 64% of deaths occurring in the first month of life. The data demonstrate that biological fragility becomes fatal when system responsiveness is delayed or insufficient. Prematurity, congenital anomalies, and early-life infections do not inevitably lead to death; rather, death arises when families lack timely recognition of danger, reliable transport, and access to high-quality intensive neonatal care.

4.2.1 Prematurity

Prematurity emerged as the dominant proximate determinant, responsible for 33.08% of under-five deaths. Infants who died from prematurity did so at an average age of 2.02 months, significantly younger than infants who died from congenital anomalies (6.51 months) or pneumonia (8.19 months). This steep gradient in survival time reveals that the first days and weeks of life form a critical vulnerability window.

A consistent theme emerged from parental discussions: families were discharged from facilities with fragile infants before stabilization and with minimal guidance. One mother recalled, *“He was so tiny when they sent us home... we did not know what to do when he stopped feeding.”* Pediatric providers echoed these concerns, describing babies brought back only when deterioration had reached an irreversible stage. Prematurity itself does not kill most infants, because it can be dealt with if addressed promptly; however, when the need of newly born to medical care is not met timely and effectively, the outcome is fatal.

4.2.2 Congenital Anomalies

Congenital anomalies accounted for 24.36% of deaths and showed a statistically significant association with consanguinity ($p<0.05$). Many affected newborns died without a proper diagnosis before their final deterioration, and when diagnoses were finally made, surgical interventions were often limited by distance, cost, or long waiting lists.

Parents described being surprised by sudden deteriorations in their children's health conditions that had been silently progressing since birth without them being able to identify early warning signs. A mother in Alexandria shared, "*We only discovered the problem when he could no longer breathe.*" These narratives highlight that the health system is delayed in identifying newborn health problems with limited, or in some cases no, accessibility to care for high-risk newborns. The preventable nature of these losses underscores missed opportunities in post-natal detection, parents' education and awareness, timely referral, and surgical intervention.

4.2.3 Pneumonia

Pneumonia caused 16.15% of deaths and was characterized by a significant association with late arrival at health facilities ($p<0.001$). Qualitative accounts indicated that parents frequently misread early signs such as fast breathing and poor feeding as benign symptoms. Many sought pharmacy advice or traditional remedies first, delaying formal medical care.

A pediatrician from Sohag emphasized the consequence: "*When they finally come, the baby is already in respiratory failure.*" Unlike older children, newborns can deteriorate rapidly⁶ and unexpectedly, and thus timely management of pneumonia, or respiratory infections in general, in newborns is crucial to lower mortality due to this cause.

4.2.4 Diarrhea

Although diarrhea comprised 10.64% of deaths, it exposed a foundational risk pathway. Birth attended by non-professionals was associated with a three-fold increase in mortality risk due to diarrhea ($\chi^2=18.952$, $p<0.001$). Infants born outside health facilities begin life without sterile

⁶ Simen-Kapeu A, Seale AC, Wall S, Nyange C, Qazi SA, Moxon SG, Young M, Liu G, Darmstadt GL, Dickson KE, Lawn JE. Treatment of neonatal infections: a multi-country analysis of health system bottlenecks and potential solutions. BMC Pregnancy Childbirth. 2015;15 Suppl 2(Suppl 2): S6. doi: 10.1186/1471-2393-15-S2-S6. Epub 2015 Sep 11. PMID: 26391217; PMCID: PMC4578441.

conditions, without preventive feeding guidance, and without early assessment of hydration or jaundice.

A mother in Upper Egypt explained, *“There was no nurse for the delivery... he was sick from the beginning.”* Preventable infections become fatal when exposure occurs early on in life before parents have even learned how to care for a newborn, and in absence of skilled healthcare professionals.

4.2.5 Additional Immediate Complications Exacerbating Neonatal Mortality

Other proximate determinants converged to intensify early fragility. Birth asphyxia and intrapartum complications resulted in deaths typically within the first days of life, highlighting that delivery itself is a very important point of intervention to prevent mortality. Low birthweight frequently overlapped with prematurity, resulting in problems in feeding and thermoregulation difficulties. Observed disability in the early days of life was strongly associated with mortality ($\chi^2=28.648$, $p<0.001$), not due to disability itself, but due to the lack of follow-up and post-discharge support. These disabilities may be results of congenital anomalies; however, our survey questionnaire did not explore this point.

A mother in Sohag described caring alone for a newborn who could not feed properly: *“He never fed well after we got home... I did not know how to help him.”* Such accounts show that newborns who need intensive clinical support at birth may face increased mortality risk once they leave the healthcare facility and return families not yet equipped to satisfy their health needs.

Conclusion

Across all proximate determinants, two interconnected patterns consistently shape the pathway to under-five mortality. First, biological vulnerability increases the fatality risk for premature infants, those living with congenital anomalies or disabilities, and newborns exposed to infection from their first moments of life. Their vulnerable condition means any complication can escalate rapidly. Second, this inherent vulnerability results in mortality when structural delays are present. Early warning signs are often misinterpreted or even missed, transportation to healthcare facilities may be unavailable, and there is a problem in the accessibility to NICUs, either due to limited affordability to the caregiver, or availability firsthand. Together, these forces convert preventable complications into tragic loss. This is further compounded by demographic

disparities, where male infants show higher mortality rate than females, and higher rates in rural areas compared to urban areas demonstrating that survival depends on where a baby is born and how quickly care can respond.

4.3 Intermediate Determinants — The Pathway Through Delay

While proximate determinants identify the immediate causes of death, intermediate determinants reveal the chain of delays that transform vulnerability into tragedy. These factors exist in the spaces between onset of disease or condition that may lead to death and receipt of adequate care. It reflects major defects in the continuum of care for children and newly born especially at homes, gatekeeping healthcare facilities, or in between. These determinants show that child mortality usually does not happen suddenly; it progresses step by step as delays and complications accumulate. Each finding below illustrates a point along this preventable pathway.

4.3.1 Delayed Recognition of Danger/Warning Signs

Families frequently underestimated the severity of early neonatal illness. The quantitative data showed a strong association between late arrival to health facilities (delayed access to healthcare services) and under-5 mortality due to pneumonia ($p < 0.001$), and qualitative evidence revealed why this delay occurred. Parents described fast breathing, difficulty feeding, or lethargy as “normal tiredness” or minor colds, which reflects complete ignorance of early warning signs especially in newborns and young infants. This can be attributed to absence of parent education that should be viewed as a major system defect.

One mother explained, “*He was breathing fast, but we thought it was nothing — babies cry and breathe fast all the time.*” This misperception resulted in delayed seeking of medical advice, which in turn lead to another preventable and easily avoidable child death. In newborns, survival probabilities can shift within hours⁷. By the time the caregivers can understand the dangerous situation facing their children, the probability of saving the child life had already decreased.

⁷ Dol J, Hughes B, Bonet M, Dorey R, Dorling J, Grant A, Langlois EV, Monaghan J, Ollivier R, Parker R, Roos N, Scott H, Shin HD, Curran J. Timing of neonatal mortality and severe morbidity during the postnatal period: a systematic review. *JBIM Evid Synth.* 2023 Jan 1;21(1):98-199. doi: 10.11124/JBIES-21-00479. PMID: 36300916; PMCID: PMC9794155.

4.3.2 Barriers to Transportation and Inadequate Referral Systems

Even when danger signs were recognized, many families could not act immediately. Rural households, particularly in Upper Egypt governorates, had limited or no access to nighttime transport, making emergency care logistically impossible. As one father from Assiut shared, *“If he can’t breathe at night, we wait until morning — there is no car for babies at night.”*

Moreover, referrals between facilities often occurred without clinical support, forcing sick infants to travel long distances without oxygen or temperature regulation. During these transfers, deterioration continued in absence of medical staff that can detect and stop it. Thus, distance from specialized care was not simply a location; it was a major determinant that can determine life expectancy of a child.

4.3.3 The Cost of Healthcare

Economic hardship played a direct role in delaying care. Statistical analysis showed a significant association between financial difficulty and mortality outcomes ($p = 0.038$). When faced with emergency fees, ICU costs, or even transportation charges, families made decisions that are not based on the child health current status, but on affordability and financial feasibility.

A father described losing a child while trying to gather money for treatment:

“We were calling everyone to borrow money. By the time we reached the hospital, he was already gone.” In these moments, parents must first solve a financial crisis before confronting the medical one — and newborns cannot wait for liquidity. Poverty therefore becomes a biological risk factor, because it results in delayed initiation of the needed healthcare⁸. Which signals that economic empowerment of vulnerable populations needs to be included in programs combating child mortality and any other relevant healthcare improvement program.

4.3.4 Defective Follow-Up

Our study found that 69.23% of deceased infants received no postnatal examination within the first two months of life. Once discharged, families described being left without advice, monitoring, or structured follow-up. Complications emerged in environments lacking medical

⁸ Lohela, T.J., Nesbitt, R.C., Pekkanen, J. *et al.* Comparing socioeconomic inequalities between early neonatal mortality and facility delivery: Cross-sectional data from 72 low- and middle-income countries. *Sci Rep* **9**, 9786 (2019). <https://doi.org/10.1038/s41598-019-45148-5>

oversight. Feeding issues, jaundice, respiratory distress, and dehydration remained invisible and undetected until severe.

Health professionals acknowledged the absence of continuity of care: *“We lose them after discharge. There is no system that returns to check the newborns who leave our unit.”* This finding shows a critical disruption in the continuum of care for newborns and infants. The gap between the care the children received in the hospital environment and inattention at home is very evident, and it is not bridged properly due to defective follow up.

4.3.5 Feeding and Breastfeeding Challenges

Breastfeeding status showed highly significant associations with infant mortality causes ($p < 0.001$), with prematurity being significantly more prevalent among non-breastfed infants 60.67% ($n=108$) compared to breastfed infants 23.12% ($n=43$). Yet, many mothers described their milk decreasing after stressful NICU stays, repeated hospital visits, or postpartum complications. Feeding difficulties often signaled deterioration — but in the absence of professional monitoring, families attributed low intake to infant “stubbornness” or normal tiredness.

As one mother from Sohag explained, *“He stopped feeding well after we came home, but I was exhausted — I couldn’t keep going back and forth to hospitals.”* Thus, breastfeeding failure does not reflect caregiver neglect, but caregiver depletion.

4.3.6 Unequal Access to Skilled Birth Support

Newborns delivered by non-professional attendants experienced significantly higher mortality ($p < 0.001$). Home or unassisted births have a much higher risk of fatal complications, which is consistent with the absence of basic emergency responses such as suctioning for asphyxia or thermal regulation for premature infants.

One nurse summarized the issue: *“Sometimes labor begins at night when no doctor is available. They try to help each other, but those babies need support we cannot give at home.”* Where skill is absent at birth, preventable harm is embedded from the first minute of life.

Conclusion

In summary, the evidence shows that intermediate determinants function not as isolated barriers but as an accelerating chain of delay. Quantitative analysis confirmed that late recognition of neonatal danger signs, delayed care-seeking, transport obstacles, and financial constraints are all

significantly associated with higher mortality ($p < 0.05$ – 0.001). Each delay amplifies the next, transforming manageable conditions into irreversible decline. This finding vividly echoed in qualitative accounts. Parents and providers alike described the same sequence: illness advancing faster than awareness, and awareness advancing faster than access. As one provider observed, *“Infants don’t die instantly. They die waiting.”* Neonatal mortality pathways are defined by a critical mismatch between the rapid progression of disease and the delayed response capacity of the healthcare system.

4.4 Underlying Determinants — Structural Origins of Risk

Behind every episode of delay in the care for a child or vulnerable newborn lies a set of deeper structural factors that determine who becomes vulnerable in the first place. These underlying determinants; such as poverty, geographic isolation, maternal education, cultural norms, and systemic inequity; does not shape only the likelihood of newborn complications but also a family’s capacity to respond when those complications arise. These represent the foundational causes of mortality risk, providing the contextual framework within which the proximate and intermediate determinants operate.

4.4.1 Socioeconomic Inequity

Poverty consistently emerged as a primary determinant of neonatal mortality, influencing both the timing and quality of care received. Quantitative analysis demonstrated a significant association between financial hardship and mortality outcomes ($p = 0.038$), with households in the lowest income categories showing longer delays in care-seeking and higher mortality among preterm and infection-related cases. Families facing economic constraints were also more likely to rely on non-professional birth attendants and lower-tier health facilities, both of which were independently associated with increased mortality rates ($p < 0.001$).

Qualitative data reinforced these findings, illustrating how the cost of transportation, medication, or admission often forced families to postpone or forego care. Parents often described making heartbreaking decisions. One father explained how they sought help too late because they needed time to borrow money: *“We were calling everyone... trying to get money. By the time we reached the hospital, he was already gone.”*

Collectively, the evidence indicates that financial barriers not only restrict access but also extend the time between symptom recognition and effective intervention, making poverty a systemic amplifier of neonatal risk.

4.4.2 Maternal Education and Empowerment

Maternal education emerged as a critical determinant of neonatal survival, which affect the child survival even before the onset of any life-threatening condition. Quantitative analysis revealed a strong association between lower maternal education and higher mortality risk ($p < 0.001$).

Mothers with limited or no formal education were less likely to recognize early neonatal danger signs, to seek prompt medical advice, or to navigate referral systems effectively. These findings align with international evidence linking maternal education to improved care-seeking and child health outcomes⁹.

Qualitative data further illustrated this relationship: across multiple focus groups, mothers with lower educational levels expressed uncertainty about normal neonatal behavior and symptom interpretation. One mother from Sohag explained, “*We did not know these were signs of sickness... we thought babies breathe like that.*” Such statements reflect a clear knowledge gap that delays recognition of critical illness. In this context, maternal education functions not just as a social variable but as a protective mechanism, enhancing a caregiver’s ability to identify, understand, and respond to early warning signs. In the absence of maternal education, early manifestations of neonatal illness often are undetected, resulting in delayed care-seeking until the condition has progressed beyond the point of effective intervention.

4.4.3 Geographic Disparities — Survival Depends on Location

Under-five mortality was disproportionately concentrated among rural households, which accounted for approximately 60% of all recorded deaths. Quantitative analysis demonstrated a significant association between place of residence and mortality outcome ($\chi^2 = 10.63$, $p = 0.001$), indicating that children from rural settings faced substantially higher odds of dying compared to children born in urban areas. Living in remote and isolated areas emerged as a critical

⁹ Balaj M, York HW, Sripada K, Besnier E, Vonen HD, Aravkin A, Friedman J, Griswold M, Jensen MR, Mohammad T, Mullany EC, Solhaug S, Sorensen R, Stonkute D, Tallaksen A, Whisnant J, Zheng P, Gakidou E, Eikemo TA. Parental education and inequalities in child mortality: a global systematic review and meta-analysis. *Lancet*. 2021 Aug 14;398(10300):608-620. doi: 10.1016/S0140-6736(21)00534-1. Epub 2021 Jun 10. PMID: 34119000; PMCID: PMC8363948.

determinant of survival; the greater the distance to a neonatal intensive care unit (NICU), the lower the probability of survival. In cases where access required multiple referrals, the likelihood of reaching definitive care in time was markedly reduced, which results in poor outcomes.

Providers voiced their frustration with these realities, as one physician in Assiut observed, *“By the time they reach us, it is often too late; the baby needed care hours earlier.”* The evidence collectively underscores that distance and referral complexity are main determinants that affects under-5 mortality directly, as delays in reaching the needed care frequently worsen fatal outcomes, irrespective of diagnosis.

4.4.4 Sociocultural Norms

Cultural practices and social norms significantly influenced both vulnerability and response to child illness. Quantitative findings indicated that parental consanguinity was strongly associated with mortality due to congenital anomalies ($p < 0.05$). Among families reporting such relationships, the prevalence of congenital anomalies reached 24.4% of all identified causes of death, compared with markedly lower proportions among non-consanguineous couples.

Despite this association, qualitative interviews revealed a widespread lack of awareness regarding the genetic and reproductive health risks linked to consanguineous marriage. Most families reported never receiving premarital or antenatal counseling about these potential outcomes. As one father explained, *“This is how it has always been in our family; no one told us it could cause problems.”* The evidence underscores that while cultural continuity maintains social cohesion, it can simultaneously reinforce biological risk when preventive information and genetic counseling are absent.

Moreover, reliance on traditional household remedies was a major contributor to delayed utilization of professional healthcare services. Quantitative analysis revealed that families who reported initial use of traditional treatments before seeking medical care experienced significantly higher mortality ($p < 0.05$). These delays were most common among rural and low-income households, where access to professional care was constrained by cost and distance.

Qualitative findings further explained that such practices were not acts of neglect but of necessity in environments characterized by limited health education and medical resources. Parents described turning to herbal preparations, home massage, or advice from community elders as

their first line of response. As one mother stated, *“We tried what our mothers used to do before going to the hospital.”*

In these contexts, cultural norms functioned as the default guidance system, shaping decisions in the absence of accessible or trusted biomedical alternatives.

4.4.5 Health Service Resources Distribution

Marked disparities in healthcare services availability were reported across governorates, reflecting systemic inequities in service distribution and facility readiness. Quantitative data showed that hospitals in Upper Egypt accounted for a disproportionately high share of neonatal deaths (57% of total cases), consistent with the data that provided evidence on limited neonatal intensive care capacity and delayed referrals. The absence of structured follow-up for discharged newborns and ineffective referral system further weakened continuum of care, particularly in rural governorates.

Providers described wide variation in resource availability; while a few tertiary facilities were adequately equipped, others experienced persistent shortages of incubators, oxygen supply, and ventilation equipment, as well as long waiting times for emergency admissions. Staffing limitations, especially in experienced nursing staff, also deepened these gaps, with nurses frequently responsible for multiple critically ill infants at once. Qualitative interviews revealed that even where scientific knowledge and experience were sufficient, limited resources constrained practice. As one nurse explained, *“We know what to do, but we don’t always have what we need.”*

Collectively, these findings underscore that inequitable distribution of neonatal resources directly influences survival outcomes, not through a lack of expertise but through constrained system capacity and limited resources. Healthcare quality and accessibility therefore vary by region, turning public health infrastructure into a determinant of child mortality.

Conclusion

The analysis of underlying determinants demonstrates that neonatal mortality in Egypt is not a random occurrence but a structured phenomenon, reflecting socioeconomic inequity. The analysis of these determinants and their interrelations indicated three dynamics. First, the risk of mortality is established even before birth, influenced by family wealth, maternal knowledge, and

place of residence. Second, the response to the risk is dependent on available resources, including time, transportation, economic status, and accessibility to healthcare services. Third, there is evident inequity across different populations in the opportunity for survival. Moreover, the underlying determinants interact rather than act independently, with poverty reinforcing geographic disadvantage and geography determining the reach of skilled medical support. The cumulative effect is a child with predictable vulnerability. Consequently, Egypt's neonatal mortality challenge is not solely healthcare related but primarily structural. Hence, improving under-5 mortality in the country requires addressing inequity and access barriers as integral components of prevention, rather than treating child mortality as an isolated medical outcome.

4.5 Summary of Cause-Determinant Pathways

The following tables summarize the pathways linking the three layers of determinants, allowing a rapid visualization of how preventable mortality evolves along a predictable chain.

4.5.1 Determinant Pathways to Neonatal Mortality: Linking Clinical Causes with Structural Drivers

Cause of Death	Proximate Biological Mechanism	Intermediate Determinant	Underlying Structural Driver	Supporting Evidence
Prematurity	Organ immaturity, respiratory distress	Late arrival + weak post-discharge care	Low NICU availability, maternal exhaustion, rural barriers	33.08% of deaths; Mean age 2.02 months, $p < 0.001$
Congenital Anomalies	Anatomical / metabolic defects	Absence of early screening or referral	Consanguinity, lack of genetic counseling	24.36% of deaths; Significant consanguinity link $p < 0.05$
Pneumonia	Rapid onset hypoxia	Danger sign misinterpretation → late care	Lack of parental guidance, transport barriers	Late arrival associated with mortality $p < 0.001$
Diarrhea	Dehydration / electrolyte imbalance	Poor hydration practices, late care	Non-skilled birth attendants; hygiene exposure	3 times higher mortality if unskilled birth $p < 0.001$

Table 4: Integrated Cause–Determinant Matrix

4.5.2 Prematurity Pathway Analysis

Determinant Level	Risk-Creating Factor	Mechanism of Harm	Evidence and Quotes
Underlying	Rural residence	Long distance to NICU → time lost in transit	“No transport at night; we wait until morning.” — Father, Assiut
Intermediate	Financial barrier	Families borrow money before seeking help	significant link to delays (p<0.05)
Intermediate	Post-discharge abandonment	No follow-up to detect decline	69.23% received no postnatal check
Proximate	Respiratory immaturity	Hypoxia worsens rapidly without support	33.08% of deaths; Mean 2.02 months

Table 5: Prematurity Pathway Analysis

4.5.3 Congenital Anomalies Pathway Analysis

Determinant Level	Risk-Creating Factor	Mechanism of Harm	Evidence + Quotes
Underlying	Consanguinity	Increases anomaly prevalence	Significant association (p<0.05)
Intermediate	Late diagnosis	Parents unaware until collapse	“We discovered the problem only when he could not breathe.” — Mother, Alexandria
Intermediate	Referral gaps	Surgical care often distant or unaffordable	Provider: “We cannot always get them to the right center in time.”
Proximate	Physiological defect	Inability to sustain breathing or cardiac function	Mean age 6.51 months — delayed decline vs prematurity

Table 6: Congenital Anomalies Pathway Analysis

4.4.4 Interpretation of the Determinant Pathways

Analysis across all mortality causes reveals a consistent causal hierarchy linking biological vulnerability, care-seeking behavior, and structural context. Biological conditions initiate risk, but it is the accumulation of delays; either in recognition, decision-making, or access to care; that transforms vulnerability into fatality. These delays, in turn, are shaped and sustained by structural inequities, including socioeconomic constraints, residency in remote areas, and differential access to skilled health services. The resulting sequence can be conceptualized as a continuum in which biological fragility interacts with systemic failure, producing predictable mortality patterns.

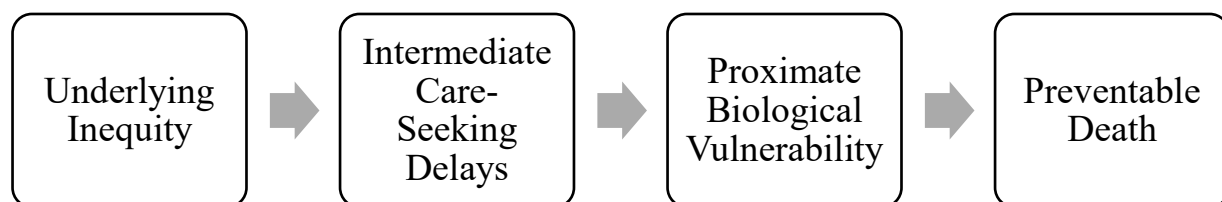
The findings emphasize that under-5 mortality is not the consequence of parental inaction only but also of health systems that place excessive logistical, financial, and informational demands on families during the narrow window in which survival remains possible.

5. Discussion

5.1 Determinant Cascade and Theoretical Interpretation: A Process of Avoidable Harm

The findings of this study indicate that under-five mortality in Egypt does not represent an isolated failure in providing healthcare services that would prevent death of children; however, it provides the evidence that under-five mortality in Egypt is a cascade of progressive, but preventable, events. A newborn's likelihood of survival is determined well before the onset of illness, and shaped by the socioeconomical and structural context into which they are born. Factors such as household income, geographic accessibility to specialized care, and the availability of accurate health information collectively can determine the possibilities of child survival.

Within this framework, neonatal mortality should be viewed as a gradual process rather than a discrete event. It starts with structural deficiencies and presented by clinical manifestations, reflecting the cumulative effect of unmet needs across multiple levels of care in between. This progression can be conceptualized as a determinant cascade, in which inequities at the social and systemic levels initiate a chain of events that eventually translate into biological harm and preventable death.



Parents in this study often recognized danger only when deterioration was already advanced. Providers described infants being brought in when “there is nothing left we can do.” These patterns reveal a clear timing discrepancy between the rate of decline of the child health status and the responsiveness of the health system. This, in turn shows that under-five mortality is not only the result of parental actions, but from systemic limitations that restrict timely access to life-saving care.

The Mosley and Chen framework provides a lens through which this cascade can be understood. It moves beyond categorizing risk factors to reveal how each child death traces a path of

causation where every delay and disadvantage leads to the next. Underlying determinants; such as poverty, low maternal education, and rural residence; create unequal exposure to risk by determining where a child is born, who attends the delivery, and how far families must travel to reach skilled care. Intermediate determinants convert these vulnerabilities into imminent risk, when parents misinterpret symptoms, delay seeking care due to transportation or cost barriers, or arrive at facilities unequipped for emergencies. At the proximate level, biological conditions such as prematurity, congenital anomalies, and infection determine the pace at which deterioration becomes irreversible.

The framework therefore transforms this research from description into explanation. It helped us to show that under-five mortality follows a sequence of preventable events that can, and should be, dealt with systemically. Interventions designed to lower under-five mortality must therefore operate across all levels simultaneously; reducing poverty and inequity, improving maternal knowledge and trust, and ensuring timely, high-quality neonatal care. Preventable neonatal deaths can be averted by addressing this full causal chain, transforming Egypt's neonatal survival from a matter of chance to a matter of system design.

5.2 Epidemiological Shift: From Environmental Protection to System Responsiveness

Egypt's success in controlling infectious diseases has historically positioned community-based and preventive interventions; such as immunization, sanitation, and nutrition programs; at the center of its child-survival achievements. However, national mortality data now demonstrate a clear epidemiological shift, in which the leading causes of death have shifted from post-neonatal infections to conditions arising during the neonatal period¹⁰. In this new phase, survival depends not primarily on environmental protection but on the capacity of the health system to stabilize medically fragile newborns in the first days and weeks of life¹¹.

This shift represents a fundamental change in both risk and response. Earlier public-health challenges allowed gradual, population-wide interventions; neonatal threats require immediate,

¹⁰ UNICEF Egypt & Ministry of Health and Population. (2022). *Situation Analysis of Children in Egypt 2021*. Cairo, Egypt.

¹¹ United Nations Inter-agency Group for Child Mortality Estimation (UN IGME). (2023). *Levels and trends in child mortality: Report 2023*. New York, NY: UNICEF.

facility-based, and technically sophisticated care¹². The decline in post-neonatal mortality has been achieved largely through expanded vaccination and infection control, yet the neonatal period, where biological fragility is greatest, remains the most difficult to protect. Even brief delays in recognition or referral can lead to irreversible outcomes, as premature, asphyxiated, or septic infants deteriorate rapidly without timely stabilization¹³.

Evidence from countries that have sustained further declines in neonatal mortality demonstrates that progress hinges on system-level responsiveness. Key features include skilled attendance at every birth, immediate neonatal resuscitation and stabilization, effective referral and transport networks, and structured post-discharge follow-up to identify complications early¹⁴. Each of these interventions shortens the time between the onset of risk and delivery of appropriate care.

Egypt is currently positioned at a pivotal stage in its child survival programs. Scaling up and investing in earlier interventions will yield diminishing returns unless accompanied by sustained investment in the capacity of health facilities to deliver timely, continuous, and equitable care to newborns. Future gains therefore require a deliberate transition from a prevention-centered to a responsiveness-centered health system model, in which survival outcomes are determined not by geography, socioeconomic status, or system delay, but by the reliability and accessibility to timely healthcare services.

5.3 Parental Preparedness: Strengthening the First Line of Response

Building upon the preceding discussion on system responsiveness, the next determinant shaping neonatal survival lies at the household level. While institutional efficiency determines how quickly care can be provided, outcomes often depend first on how early families recognize and act upon warning signs. The caregiver's capacity to interpret symptoms and initiate timely action represents the first, and often critical, step in the chain of survival.

¹² Bhutta, Z. A., Das, J. K., Bahl, R., Lawn, J. E., Salam, R. A., Paul, V. K., Sankar, M. J., Blencowe, H., Rizvi, A., Chou, V. B., & Walker, N. (2020). *Can available interventions end preventable deaths in mothers, newborn babies, and stillbirths, and at what cost?* **The Lancet**, **384**(9940), 347–370. [https://doi.org/10.1016/S0140-6736\(14\)60792-3](https://doi.org/10.1016/S0140-6736(14)60792-3)

¹³ Lawn, J. E., Blencowe, H., Oza, S., You, D., Lee, A. C. C., Waiswa, P., Lalli, M., Bhutta, Z. A., Barros, A. J. D., Christian, P., Mathers, C., Cousens, S., & The Lancet Every Newborn Study Group. (2014). *Every Newborn: Progress, priorities, and potential beyond survival*. **The Lancet**, **384**(9938), 189–205. [https://doi.org/10.1016/S0140-6736\(14\)60496-7](https://doi.org/10.1016/S0140-6736(14)60496-7)

¹⁴ World Health Organization (WHO). (2023). *Improving the quality of care for small and sick newborns in health facilities: Implementation guidance*. Geneva: WHO.

The study findings indicate that parents in Egypt are placed at the front line of newborn survival but are insufficiently equipped for this role. Health literacy, early recognition of danger signs, and trust in the healthcare system are unevenly distributed across households. Quantitative and qualitative evidence show that caregivers consistently seek help once illness is perceived as serious; however, recognition typically occurs only after deterioration has become advanced. This delay does not reflect neglect, but rather a deficit in preparedness and guidance¹⁵.

Effective parental preparedness requires structured education and counseling beginning during antenatal care and continuing through the postnatal period. This includes instruction on identifying warning signs, knowing when and where to seek emergency help, and understanding follow-up requirements for high-risk infants.

Strengthening parental preparedness therefore complements system-level interventions by ensuring that the first response to neonatal illness begins at home. Empowering caregivers with the knowledge, confidence, and trust to act early transforms them from passive observers of decline into active agents of survival, bridging the crucial time gap before formal care is reached.

5.4 Global Relevance and Comparison

Egypt's neonatal mortality burden mirrors that of several middle-income nations that have transitioned away from deaths dominated by vaccine-preventable diseases. Globally, reductions in post-neonatal mortality have outpaced improvements in neonatal survival, particularly in settings where infrastructure, referral systems, and maternal education have not fully kept pace with other development gains¹⁶.

Countries that have made rapid improvements in neonatal outcomes have done so by redesigning their systems around responsiveness¹⁷. This involves ensuring that every premature or high-risk infant is delivered in — or quickly transported to — a facility capable of sustaining life in the first hours. It also involves adopting home visitation and early post-discharge surveillance to

¹⁵ Ministry of Health and Population (Egypt), El-Zanaty & Associates, & ICF. (2023).

Egypt Demographic and Health Survey (EDHS) 2022. Cairo, Egypt, and Rockville, Maryland, USA: MOHP and ICF.

¹⁶ Guilmoto, C. Z., & Dumont, A. (2021). *Distribution of under-5 deaths in the neonatal, post-neonatal, and childhood periods: a multicountry analysis in 64 low- and middle-income countries*. *International Journal for Equity in Health*, 20(45). <https://doi.org/10.1186/s12939-021-01449-8>

¹⁷ Murless-Collins, S., Ezeaka, V.C., Masoud, N.S. *et al.* Born Too Soon: Care for small and sick newborns, evidence for investment and implementation. *Reprod Health* **22** (Suppl 2), 114 (2025). <https://doi.org/10.1186/s12978-025-02032-y>

catch deterioration before it advances¹⁸. In that context, Egypt now faces the same crossroads: to maintain mortality decline, the health system must evolve from general child survival to precision neonatal survival.

Thus, this study strengthens international evidence demonstrating that improving newborn outcomes requires not only addressing what newborns die from, but correcting **how long** it takes for lifesaving care to reach them.

5.5 Implications for Health Policy and System Design in Egypt

These findings highlight the need for strategic investment in the most time-sensitive components of the child healthcare continuum. Sustaining progress in reducing under-five mortality will require shifting toward a system that can respond rapidly to the changing and deteriorating child health conditions, with urgency in the underserved regions especially in Upper Egypt, where most of the vulnerabilities exist. This includes expanding neonatal intensive care capacity in governorates with the highest mortality burden, and establishing reliable referral and transportation systems that is continuously available and equipped to support critically ill newborns with oxygen and monitoring during transfer. In addition, structured post-discharge follow-up must become a standard element of care for preterm, low-birthweight, and medically vulnerable children, ensuring clinical oversight continues beyond hospital walls. Financial barriers to emergency services must be eliminated so that parents are never forced to delay life-saving care due to cost.

As part of this system transformation, caregivers should be empowered through practical counseling and accessible education on early warning signs. This can be done through institutionalizing post-delivery counseling/ awareness, and introduce this information during compulsory immunizations. Together, these measures recognize that most preventable deaths stem from predictable delays, and that redesigning the care system to act faster can save the lives of Egypt's most fragile newborns.

¹⁸ Sharma, G., & Ramasundaram, N. (2019). Continuity of care for high-risk newborns after discharge from hospital in low- and middle-income countries: a scoping review. *BMC Pediatrics*, 19, 408. <https://doi.org/10.1186/s12887-019-1855-2>

5.6 Study Limitations

Results must be interpreted considering a few study limitations. Retrospective caregiver reporting introduces the risk of recall bias, especially regarding timing and symptom onset. Some deaths are likely under-reported, particularly among infants who never reached facilities. Statistical associations demonstrate strong relationships but cannot resolve full causal directionality; however, triangulation with qualitative data increases confidence in the mechanisms identified. Despite these constraints, the convergence of findings across multiple methods and sources strengthens the credibility and transferability of the conclusions.

The evidence shows that inequity is not inevitable and delay is not destiny. With focused investment and system redesign, the future for Egypt's most fragile newborns can shift from uncertainty to opportunity, transforming preventable loss into sustained survival.

6. Conclusions and Recommendations

6.1 Conclusions

This research demonstrates that under-five mortality in Egypt is affected by the interplay between structural inequities, health system responsiveness, and parental preparedness. Neonatal deaths, which now constitute the majority of under-five mortality, rarely result from untreatable conditions. Instead, they reflect the degree to which the health system can respond within the narrow window of neonatal vulnerability, and the extent to which families are equipped to recognize danger and act upon it. The findings reaffirm that mortality is not random; it follows an identifiable and preventable pathway.

The analysis of the results of this study produces three overarching conclusions about Egypt's current under-five survival landscape. First, time has emerged as the decisive factor of survival. The speed of deterioration in neonatal conditions such as prematurity, respiratory distress, and sepsis is much faster than the time needed to respond in the existing health system. This temporal mismatch reveals that neonatal mortality can be lowered by investing in the health system to improve its responsiveness both in time and equity. The data show that infants often do not die because any intervention is unavailable in the country, but because it is inaccessible at the time it is most needed.

Second, inequity distorts the opportunity of survival. Mortality risk remains unequally distributed, concentrated among families with the least access to specialized services and the fewest financial resources. The findings indicate that rural households, those with low maternal education, and those living in remote areas far from specialized medical care experience disproportionately higher mortality rates. These disparities persist even in the presence of national gains in health infrastructure, suggesting that improvements in access and utilization have not been evenly distributed. The higher rates of mortality in the underprivileged areas is masked or diluted by the very lower rates of mortality in other areas, which reveals a marked gap in the child survival opportunities.

Third, families bear a disproportionate share of responsibility for navigating neonatal risk. The health system continues to rely heavily on caregivers' ability to identify early signs of distress and to initiate the care without sufficient guidance or support. Qualitative evidence from our research demonstrates that parents act when they perceive illness as serious; however, this perception often comes too late. Limited health literacy, neglected counseling during antenatal and postnatal visits, and ineffective communication between healthcare providers and families contribute to delay seeking medical advice, which is translated into mortality risk.

Taken together, these conclusions suggest that Egypt's neonatal mortality reflects a transitional phase in its public health evolution, in which success in continuing the reduction of under-five mortality rates will be dependent on shifting the child survival programs from combating infectious and post-neonatal deaths to preventing neonatal loss.

Fundamentally, this research positions neonatal mortality as a measure of system responsiveness and social equity. The persistence of preventable deaths, even when medical care is available, shows a gap between having the needed resources to provide healthcare and being able to deliver this care timely and equitably to those in need. Egypt's progress in child survival, specifically in lowering under-five mortality is dependent on how well the health system can respond to the urgent needs of newborns in real time. The evidence generated by this study indicates that survival depends does not depend solely on the illness itself, but, and to a greater extent, on how the system is established to respond to it.

6.2 Recommendations

Egypt has achieved substantial progress in reducing under-five mortality, preventing countless deaths from infectious and vaccine-preventable diseases, such as diarrhea and pneumonia. The remaining challenge now lies in neonatal mortality that constitutes more than fifty per cent of the total under-five mortality, where survival depends on the health system's ability to respond as rapidly as neonatal conditions can deteriorate. The findings of this study suggest that preventable neonatal death can be lowered through redesigning the health system to be able to respond promptly and equitably to the medical conditions leading to the neonatal deaths. When delays in recognition, referral, and treatment are minimized, survival improves significantly; when the first days of life are adequately protected, long-term child health outcomes are strengthened.

To reduce preventable neonatal mortality, a strategic system redesign approach is required. The following recommendations align directly to the determinant cascade identified in this research and represent the most impactful points for intervention:

1. Strengthen facility-based readiness at birth

Egypt should ensure that every birth, particularly those involving high-risk pregnancies, occurs in a facility equipped to provide immediate neonatal care or can be rapidly transferred to another one than can provide this service. Achieving this goal requires more than just increasing the number of facilities; it demands a coordinated system in which capacity, staffing, and referral pathways function as an integrated continuum of care. This can be done through expanding neonatal intensive care unit (NICU) capacity in governorates with the highest mortality burden, and improving the distribution of skilled neonatal personnel to underserved regions. Equally important is ensuring that NICUs are equipped with the logistical and communication infrastructure necessary for swift referral and emergency transport.

2. Develop emergency neonatal referral networks and transport

A dedicated and reliable neonatal referral network is also essential to preventing avoidable deaths. Egypt needs to create a strong referral system that is able to maintain real-time communication and coordination between hospitals to enable quick activation of referrals.

For many families, especially those in rural or underserved areas, delays in seeking medical care for the newborns occur because there is no safe or timely way to reach the needed care. The

Egyptian Ambulance Authority need to have special ambulances that are capable of supporting critically ill newborns with oxygen, thermal regulation, and continuous monitoring during transfer. In addition, these ambulances should be distributed proportionally to the population and the current area-specific mortality rates. Trained personnel must accompany these transfers to maintain stability and reduce deterioration before arrival.

3. Remove financial barriers to emergency neonatal treatment

Emergency neonatal care should never depend on a family's ability to pay. To ensure that financial hardship does not delay treatment, policy reforms must eliminate upfront fees for life-saving neonatal services and provide targeted financial protection to households facing economic vulnerability. While Egypt is moving towards Universal Health Coverage System, through the establishment of the Universal Health Insurance Authority (UHIA), certain measures should be put in place ensure the inclusion of neonatal emergency and ambulatory services and avoid being missed while transitioning. Close coordination between the Ministry of Health and Population (MOHP) and UHIA to ensure coverage of all newborns securing essential referral and transportation for any newborn in need to specialized medical care. Families cannot fight for their child's survival while negotiating expenses. Their focus must remain solely on securing the needed medical care.

4. Establish structured post-discharge follow-up

For preterm, low-birthweight, or medically complex newborns, clinical protection must extend beyond the hospital stay and into the early weeks or months at home. Structured and consistent post-discharge follow-up is essential, including scheduled home visits by well-trained community health workers during the first month of life, and regular follow-up appointments supported by digital reminders (e.g. SMS, online communication platforms). These mechanisms enable early detection of emerging complications, allowing timely intervention before conditions worsen. Discharge should signal the start of continuous monitoring and support, not the end of care.

5. Strengthen caregiver knowledge and empowerment

Families should never be placed in a position where they must guess whether their newborn is in crisis. A nationwide caregiver education package is needed to ensure parents have the knowledge and confidence to act quickly when danger arises. This support should include clear guidance on

neonatal danger signs, feeding practices, and when to seek emergency care. Importantly, this counseling must be delivered through educational sessions before discharge rather than after symptoms become apparent, particularly for families of preterm or low-birthweight infants. This education package should be supported by accessible telephone or telehealth services that families can turn to when uncertainty or concerns arise. This can be done through the establishment of a comprehensive national caregiver education and support program that ensures all parents possess the essential knowledge and confidence to respond promptly when signs of danger appear. When parents are informed and connected to timely guidance, critical time is saved and the chances of newborn survival improve significantly.

7. Annexes

7.1 [Quantitative Report](#)

7.2 [Qualitative Report](#)