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Preventable under-five mortality in Niger's sahelian instability (2020–2025): an integrated analysis of health, socioeconomic and security determinants.

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ABSTRACT

This study examines the determinants of preventable under-five mortality in Niger during the period of Sahelian instability from 2020 to 2025, employing an integrated analytical framework that considers health system, socioeconomic, and security factors. Despite a gradual decline in the under-five mortality rate from 120.73 per 1,000 live births in 2020 to 111.62 in 2025, Niger continues to record approximately 124,300 child deaths annually, with more than 350 children dying each day from largely preventable causes. Using a mixed-methods approach combining secondary analysis of demographic and health survey data, humanitarian situation reports, and peer-reviewed literature, this study identifies the pathways through which insecurity, displacement, and socioeconomic deprivation converge to produce excess child mortality. The analysis reveals that malaria, pneumonia, and diarrhea account for nearly 60 percent of under-five deaths, with malnutrition as a critical underlying contributor. Distance to health facilities emerges as a significant determinant, with mortality increasing by 5 percent for each kilometer of distance from a primary health center. The study finds that the security crisis has created a dual burden: direct effects through violence and displacement, and indirect effects through disruption of health services, supply chains, and livelihoods. Regional disparities are pronounced, with rural mortality rates more than twice those of urban areas. The findings contribute to the literature on child survival in fragile and conflict-affected settings by demonstrating that security, health system, and socioeconomic determinants operate synergistically, requiring integrated rather than siloed interventions.

Keywords: Under-five mortality, preventable deaths, Sahelian instability, health determinants, socioeconomic factors, security crisis, Niger, child survival

RESUME

Cette étude examine les déterminants de la mortalité évitable des enfants de moins de cinq ans au Niger pendant la période d'instabilité sahélienne de 2020 à 2025, en employant un cadre analytique intégré qui considère les facteurs liés au système de santé, aux conditions socioéconomiques et à la sécurité. Malgré une baisse progressive du taux de mortalité infanto-juvénile, passant de 120,73 pour 1 000 naissances vivantes en 2020 à 111,62 en 2025, le Niger continue d'enregistrer environ 124 300 décès d'enfants par an, avec plus de 350 enfants mourant chaque jour de causes largement évitables. Utilisant une approche mixte combinant l'analyse secondaire des données d'enquêtes démographiques et de santé, des rapports de situation humanitaire et de la littérature évaluée par les pairs, cette étude identifie les voies par lesquelles l'insécurité, les déplacements et la privation socioéconomique convergent pour produire une surmortalité infantile. L'analyse révèle que le paludisme, la pneumonie et la diarrhée représentent près de 60 pour cent des décès d'enfants de moins de cinq ans, la malnutrition étant un contributeur sous-jacent critique. La distance aux établissements de santé apparaît comme un déterminant significatif, la mortalité augmentant de 5 pour cent pour chaque kilomètre de distance d'un centre de santé primaire. L'étude constate que la crise sécuritaire a créé un double fardeau : des effets directs par la violence et les déplacements, et des effets indirects par la perturbation des services de santé, des chaînes d'approvisionnement et des moyens de subsistance. Les disparités régionales sont prononcées, les taux de mortalité ruraux étant plus de deux fois supérieurs à ceux des zones urbaines.

Mots-clés : Mortalité infanto-juvénile, décès évitables, instabilité sahélienne, déterminants de la santé, facteurs socioéconomiques, crise sécuritaire, Niger, survie de l'enfant

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1. INTRODUCTION

1.1 Background

Niger presents a paradox in child survival: despite sustained progress in reducing under-five mortality over the past three decades, the country continues to record one of the highest absolute numbers of preventable child deaths in the world. The under-five mortality rate declined from 318 deaths per 1,000 live births in 1992 to 123 in 2021, yet this figure remains far above the Sustainable Development Goal target of 25 per 1,000. More than 350 children under five die every day in Niger a daily toll exceeding the population of a primary school with malaria, pneumonia, and diarrhoea accounting for nearly 60 percent of these deaths.

The period from 2020 to 2025 has been particularly challenging for child survival efforts in Niger. The security crisis in the Sahel, which began around 2012, intensified significantly during this period, with armed violence, population displacement, and disruption of essential services affecting large areas of the country. The regions of Tillabéri, Tahoua, Dosso, and Diffa have been most severely affected, with insecurity creating barriers to humanitarian access and constraining the delivery of health services.

1.2 Problem Statement

While the determinants of child mortality in Niger have been documented in previous research, most studies have focused on the pre-crisis period or have examined health, socioeconomic, and security factors in isolation. The convergence of these factors during the 2020–2025 period of heightened instability has created conditions that may not be adequately captured by analyses treating each determinant separately.

The central problem addressed by this study is the need for an integrated understanding of how health system factors, socioeconomic conditions, and security dynamics interact to shape preventable under-five mortality in Niger during a period of acute instability. Without such an integrated perspective, interventions may address one dimension of the problem while leaving others unaddressed, resulting in suboptimal outcomes.

1.3 Study Objectives

This study addresses the following objectives:

1. To document trends in under-five mortality in Niger from 2020 to 2025, with attention to regional and socioeconomic disparities.
2. To identify the principal health system determinants of preventable under-five mortality, including access to care, service availability, and quality.
3. To examine the socioeconomic determinants of child survival, including maternal education, household wealth, and geographic location.
4. To assess the impact of the security crisis on child mortality through direct and indirect pathways.
5. To derive integrated policy and programmatic recommendations for accelerating progress in child survival in conflict-affected settings.

1.4 Significance of the Study

This study contributes to the literature on child survival in fragile and conflict-affected settings by demonstrating the utility of an integrated analytical framework. The findings have implications for the design of health and humanitarian interventions in Niger and comparable contexts, suggesting that effective responses must address the synergies among security, socioeconomic, and health system determinants rather than treating them as independent factors.

2. LITERATURE REVIEW

2.1 Trends and Patterns in Under-Five Mortality in Niger

Niger has achieved substantial reductions in under-five mortality over the past three decades, though progress has been uneven and the current rate remains unacceptably high. The Demographic and Health Surveys conducted between 1992 and 2021 documented a decline from 318 to 123 deaths per 1,000 live births. More recent estimates from the World Population Prospects indicate a rate of 111.62 per 1,000 in 2025, continuing the downward trend.

However, aggregate national figures mask significant disparities. Rural children face mortality rates more than twice those of urban children: 132 per 1,000 versus 58 per 1,000 in 2021. Regional disparities are equally pronounced, with Tillabéri (142 per 1,000), Zinder (137 per 1,000), and Tahoua (127 per 1,000) recording the highest rates in 2021, while Agadez (37 per 1,000) and Niamey (61 per 1,000) recorded the lowest.

2.2 Health System Determinants of Child Survival

The health system determinants of child survival in Niger encompass access to care, service availability, and quality of services. Access to health facilities is a critical constraint: 56 percent of Niger's population lives more than five kilometres from a health facility. Distance to care has been shown to significantly affect child survival. A secondary analysis of the MORDOR cluster randomized trial found that in the placebo arm, each kilometre increase in distance from a primary health centre was associated with a 5 percent increase in all-cause mortality among children aged 1 to 59 months.

The quality of care at health facilities is also a determinant of survival. A national verbal and social autopsy study found that among caregivers who sought care for fatal child illnesses, 35 percent reported cost as a constraint, 35 percent reported distance, and 30 percent reported lack of transport. The same study found that among children who left the first health care provider alive, 52.6 percent were not referred for further care, indicating gaps in the referral system.

2.3 Socioeconomic Determinants of Child Survival

Socioeconomic factors exert powerful influence on child survival in Niger. Maternal education emerges as a robust predictor: in 2021, the under-five mortality rate was 127 per 1,000 for children whose mothers had no education, compared to 68 per 1,000 for children whose mothers had secondary education or higher. Household wealth shows a similar gradient: children in the poorest households experienced a mortality rate of 149 per 1,000, compared to 71 per 1,000 for children in the wealthiest households.

The relationship between poverty and child mortality in Niger has been examined in longitudinal analyses. A thesis examining trends from 1998 to 2012 found that maternal factors and socio-cultural factors, including use of care, differentiated the risk of death in children, with geographical location (Niamey, other towns, and rural areas) also playing a significant role.

2.4 Security and Humanitarian Context

The security crisis in the Sahel has created a complex humanitarian emergency that disproportionately affects children. In 2025, violence and climate shocks displaced 459,585 people in Niger, 60 percent of whom were children. Floods affected 77,506 households, destroying 60,388 homes and damaging 564 sanitation facilities and four health centres.

The humanitarian situation has been characterized by convergence of multiple crises. The 2025 SMART/SENS survey reported global acute malnutrition (GAM) at 11.1 percent and severe acute malnutrition (SAM) at 2.8 percent, above WHO emergency thresholds. Malaria accounted for the largest disease burden, with over 6.5 million suspected cases of priority diseases reported in 2025.

Humanitarian access has been significantly constrained. Médecins Sans Frontières has documented that border closures, insecurity, and other challenges disrupted supply chains for medicines and nutrition products. UNICEF reported that 79 percent of its 2025 appeal for Niger was unmet, constraining its capacity to deliver life-saving assistance.

3. RESEARCH QUESTIONS

This study is guided by the following research questions:

Research Question 1: What are the trends in under-five mortality in Niger from 2020 to 2025, and how do these trends vary by region, residence (urban/rural), and socioeconomic status?

Research Question 2: What are the principal health system determinants of preventable under-five mortality in Niger, including access to care, service availability, and quality of services?

Research Question 3: How do socioeconomic determinants maternal education, household wealth, and geographic location influence child survival in Niger?

Research Question 4: Through what direct and indirect pathways does the security crisis affect under-five mortality in Niger's affected regions?

Research Question 5: How do health system, socioeconomic, and security determinants interact to produce excess child mortality, and what integrated interventions are required to address these synergies?

4. METHODOLOGY

4.1 Research Design

This study employs an integrated mixed-methods design combining secondary analysis of quantitative data from national surveys and humanitarian reporting with qualitative synthesis of peer-reviewed literature and programmatic reports. The integrated design is appropriate for examining the synergistic effects of multiple determinants that cannot be adequately captured through single-factor analyses.

4.2 Data Sources

Quantitative data sources include:

- **Demographic and Health Surveys (DHS):** Data from the 2012 DHS and the 2021 Enquête Nationale sur la Fécondité et la Mortalité des Enfants (ENAFEME) provide information on under-five mortality rates, health-seeking behavior, and socioeconomic characteristics.
- **World Population Prospects:** Estimates of under-five mortality rates from 2020 to 2025.
- **UNICEF Humanitarian Situation Reports:** Data on displacement, malnutrition, disease outbreaks, and humanitarian access for 2025.
- **Ministry of Health Statistical Yearbooks:** Data on causes of mortality at health facilities by region.

Qualitative and contextual sources include:

- Peer-reviewed studies on distance to health facilities and child mortality.
- Verbal and social autopsy studies on social determinants of child mortality.
- Reports from Médecins Sans Frontières and other humanitarian organizations on access constraints.
- UNICEF situation reports and appeals documenting the humanitarian context.

4.3 Analytical Framework

The analysis is organized around three interconnected domains: health system determinants (access, availability, and quality), socioeconomic determinants (maternal education, household wealth, and residence), and security determinants (violence, displacement, and access constraints). The framework posits that these domains do not operate independently but interact to produce mortality outcomes, with the security crisis amplifying pre-existing vulnerabilities in the health system and socioeconomic conditions.

4.4 Data Analysis

Quantitative analysis involves descriptive statistics to characterize trends, disparities, and patterns. Where available, data are disaggregated by region, residence, maternal education, and wealth quintile to identify differential effects. Qualitative synthesis identifies thematic patterns in the literature regarding pathways through which insecurity affects child survival.

4.5 Ethical Considerations

This study relies exclusively on publicly available secondary data and published literature. No primary data collection involving human subjects was conducted. Ethical approval was therefore not required.

5. RESULTS

5.1 Trends in Under-Five Mortality, 2020–2025

The under-five mortality rate in Niger declined gradually from 120.73 per 1,000 live births in 2020 to 111.62 in 2025, representing an average annual reduction of 1.85 percent. This rate of decline, while positive, remains insufficient to achieve the Sustainable Development Goal target of 25 per 1,000 by 2030.

Despite the declining rate, the absolute number of child deaths remains high. More than 124,300 children die annually before reaching their fifth birthday, equivalent to more than 350 deaths per day. The daily toll includes approximately 90 deaths from malaria, 65 from pneumonia, and 60 from diarrhea.

5.2 Regional and Geographic Disparities

Under-five mortality exhibits pronounced regional disparities. In 2021, Tillabéri recorded the highest rate at 142 per 1,000, followed by Zinder (137 per 1,000) and Tahoua (127 per 1,000). In contrast, Agadez recorded 37 per 1,000 and Niamey 61 per 1,000. The Diffa region, despite relatively lower mortality rates, showed an increasing trend from 41 per 1,000 in 2015 to 72 per 1,000 in 2021, reflecting the impact of insecurity on child survival.

Rural-urban disparities are equally stark. In 2021, the under-five mortality rate was 132 per 1,000 in rural areas compared to 58 per 1,000 in urban areas more than a two-fold difference. Although the rate declined in both settings between 2015 and 2021, the absolute gap between rural and urban areas remained substantial.

5.3 Health System Determinants

Data from the MORDOR trial secondary analysis provide robust evidence on the relationship between distance to health facilities and child survival. In the placebo arm, each kilometre increase in distance from a primary health center was associated with a 5 percent increase in all-cause mortality among children aged 1 to 59 months (adjusted incidence rate ratio, 1.05; 95% CI, 1.03–1.07). This finding underscores the critical importance of geographic access to care.

The verbal and social autopsy study documented significant gaps in care-seeking and referral. Among caregivers who sought care for fatal child illnesses, 35 percent reported cost as a constraint, 35 percent reported distance, and 30 percent reported lack of transport. Of 601 children tracked through the Pathway to Survival, 62.4 percent reached the first health care provider after approximately 67 minutes of travel time. Among the 306 children who left the first provider alive, 52.6 percent were neither referred for further care nor received home care recommendations.

5.4 Socioeconomic Determinants

Maternal education shows a strong gradient in child survival. In 2021, the under-five mortality rate was 127 per 1,000 for children whose mothers had no education, compared to 68 per 1,000 for those whose mothers had secondary education or higher. Household wealth exhibits a similar pattern: children in the poorest wealth quintile experienced a mortality rate of 149 per 1,000, compared to 71 per 1,000 for children in the richest quintile.

The relationship between poverty and child mortality is complex. A study examining trends from 1998 to 2012 found that maternal factors and socio-cultural factors, including use of care, differentiated mortality risk, with geographical location also playing a significant role. However, a study on poverty and child disparities noted that mortality trends are not always correlated with poverty trends at the regional level, suggesting the impact of targeted health programmes.

5.5 Security and Humanitarian Determinants

The security crisis has created direct and indirect pathways to excess child mortality. Directly, violence has killed and injured children, with the United Nations documenting more than 1,500 grave violations including killing, abduction, and recruitment of children by armed groups.

Indirect pathways are more extensive. In 2025, violence and climate shocks displaced 459,585 people, 60 percent of whom were children. Displacement disrupts access to health services, increases exposure to disease, and undermines livelihoods and food security. Floods in 2025 affected 77,506 households, destroyed 60,388 homes, damaged 564 sanitation facilities and four health centres, and caused 27 deaths.

The humanitarian context has been characterized by critical levels of malnutrition and disease. The 2025 SMART survey reported GAM at 11.1 percent and SAM at 2.8 percent, above WHO emergency thresholds, with Diffa (17.1 percent) and parts of Maradi and Zinder in critical condition. Over 6.5 million suspected cases of priority diseases were reported in 2025, with malaria accounting for the largest burden.

Humanitarian access has been severely constrained. Médecins Sans Frontières documented that border closures, insecurity, and other challenges disrupted supply chains for medicines and nutrition products. UNICEF reported that 79 percent of its 2025 appeal was unmet, significantly limiting its response capacity.

6. DISCUSSION OF RESULTS

6.1 Interconnected Determinants of Child Survival

The findings demonstrate that health system, socioeconomic, and security determinants of child mortality in Niger are not independent but interact synergistically. Distance to health facilities, already a significant barrier in normal conditions, becomes more consequential when insecurity disrupts transportation networks and restricts movement. Socioeconomic deprivation limits the ability of families to overcome distance barriers by paying for transportation or accessing private care. Security incidents can directly target health facilities or force their closure, eliminating access entirely.

The MORDOR trial finding that children farthest from health facilities benefited most from azithromycin mass administration underscores the inverse care law in operation: those with least access to formal health services have greatest need for alternative interventions. This finding has important implications for targeting of health interventions in insecure areas.

6.2 The Dual Burden of Insecurity

The analysis reveals that the security crisis affects child survival through dual pathways. The direct pathway operates through violence, displacement, and destruction of infrastructure. The indirect pathway operates through disruption of health services, supply chains, and livelihoods, as well as through the diversion of resources from health to security. These pathways are not mutually exclusive but reinforce each other: displacement increases demand for health services while simultaneously disrupting their supply; livelihood disruption increases malnutrition, which increases vulnerability to disease.

The increase in under-five mortality observed in Diffa from 41 per 1,000 in 2015 to 72 per 1,000 in 2021 provides evidence of the security crisis's impact. Diffa, located on the border with Nigeria, has been among the regions most affected by Boko Haram violence and subsequent military operations.

6.3 The Persistence of Socioeconomic Disparities

The strong gradient in child survival by maternal education and household wealth reflects the persistence of structural inequalities that predate the current security crisis but have been exacerbated by it. The finding that rural children face mortality rates more than twice those of urban children indicates that geographic location remains a fundamental determinant of survival, reflecting the concentration of health infrastructure and services in urban areas.

The paradox observed in some regions where mortality declined despite increasing poverty suggests that targeted health programs can achieve results even in adverse socioeconomic conditions. Community health posts, vaccination campaigns, and free care for children under five have contributed to mortality reduction, though their reach has been constrained by insecurity and underfunding.

6.4 Implications for Intervention Design

The integrated analysis suggests that effective interventions must address the synergies among determinants. Vertical disease-specific programs while valuable for addressing malaria, pneumonia, and diarrhoea will have limited impact if children cannot access them due to distance, insecurity, or cost. Community-based approaches that bring services closer to households have demonstrated effectiveness in Niger and may be particularly valuable in insecure areas where fixed facilities are inaccessible.

The finding that azithromycin mass administration had greater mortality reduction effect at greater distances from health centres suggests that campaigns targeting the most underserved populations may achieve the greatest benefit. However, such campaigns require careful planning to ensure access to areas affected by insecurity.

Addressing the socioeconomic determinants of child survival requires interventions beyond the health sector. Maternal education, poverty reduction, and social protection are essential complements to health system strengthening. The strong gradient in mortality by maternal education indicates that investments in girls' education will yield long-term dividends for child survival.

6.5 Contribution to Knowledge

This study contributes to the literature on child survival in fragile and conflict-affected settings by demonstrating the utility of an integrated analytical framework. While previous research has documented individual determinants of child mortality in Niger, the synergistic interactions among health system, socioeconomic, and security factors during periods of acute instability have received less attention. The findings suggest that analyses treating these determinants in isolation may underestimate the mortality burden and misdirect intervention priorities.

7. CONCLUSION

This study has examined preventable under-five mortality in Niger during the period of Sahelian instability from 2020 to 2025, employing an integrated framework that considers health system, socioeconomic, and security determinants. The findings reveal that while the under-five mortality rate has continued its gradual decline, the absolute number of child deaths remains unacceptably high, with more than 350 children dying each day from largely preventable causes.

The analysis demonstrates that health system, socioeconomic, and security determinants do not operate independently but interact synergistically to produce mortality outcomes. Distance to health facilities increases mortality risk, but this effect is amplified by insecurity that restricts mobility and disrupts services. Socioeconomic deprivation limits the ability of families to overcome distance barriers, while maternal education is a robust predictor of child survival. The security crisis operates through both direct pathways (violence and displacement) and indirect pathways (disruption of services, supply chains, and livelihoods), with the effects disproportionately concentrated in regions most affected by conflict.

The policy implications are clear. Achieving further reductions in under-five mortality in Niger will require integrated approaches that address the synergies among determinants. Community-based health services that bring care closer to households, campaigns targeting the most underserved populations, and complementary investments in maternal education and poverty reduction are essential. Humanitarian access must be maintained and expanded, despite the challenging security environment, to prevent further erosion of child survival gains.

8. LIMITS OF THE STUDY

This study has several limitations that should be acknowledged.

First, the analysis relies on secondary data sources that may have limitations in coverage, quality, and timeliness. Data from conflict-affected areas may be incomplete, and humanitarian reporting may be subject to access constraints.

Second, the study does not include primary data collection, which would allow for more precise measurement of determinants and their interactions. The reliance on existing literature and reports means that the analysis is constrained by the questions that previous studies have addressed.

Third, the cross-sectional nature of most available data limits the ability to establish causal relationships. While the MORDOR trial provides robust evidence on distance and mortality, other relationships are based on observational data.

Fourth, the study focuses on national and regional patterns and does not capture community-level or household-level heterogeneity. Local contexts may differ in ways that are not reflected in aggregate data.

Fifth, the study period of 2020–2025 coincides with the COVID-19 pandemic, which disrupted health services globally. While this study focuses on security determinants, the pandemic's effects on health system functioning and care-seeking may confound some findings.

9. ACKNOWLEDGMENTS

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10. AUTHOR CONTRIBUTIONS

The author confirms sole responsibility for the study conception and design, data collection, analysis, interpretation, and manuscript preparation.

11. COMPETING INTEREST

The author declares no competing interests.

12. FUNDING INFORMATION

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors

13. DATA AVAILABILITY

The data supporting this study are derived from publicly available sources including the World Population Prospects, Demographic and Health Surveys, UNICEF humanitarian situation reports, and peer-reviewed literature. Specific sources are identified in the Bibliography.

14. DISCLAIMER

The views and opinions expressed in this article are those of the author and do not necessarily reflect the official policy or position of any institution. The analysis is based on publicly available data and documents as of the date of writing.

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