

Long-Term Trends and Age-Specific Dynamics of Under-Five Mortality in Cameroon (1991–2022): Evidence from Six Consecutive DHS and MIS Waves

ZEBAZE Paul Narcisse

Department of Public Health, Texila American University, Guyana

Correspondence to be addressed: E-mail - narcisse09nas@gmail.com

Cite this article as: ZEBAZE Paul Narcisse. Long-term trends and age-specific dynamics of under-five mortality in Cameroon (1991-2022): Evidence from six consecutive DHS and MIS waves. Texila Int J Acad Res. 2026;13(4). <https://doi.org/10.21522/TIJAR.2014.13.04.Art022>

Received: 22.07.2026

Accepted: 08.10.2026

Published: 30.10.2026

Article Type: Original Research

Abstract Under-five mortality (U5M) remains a critical public health challenge in sub-Saharan Africa, and Cameroon illustrates this complexity. This study analyzes six consecutive DHS and MIS surveys (1991, 1998, 2004, 2011, 2018, 2022), covering 39,763 live births and 3,132 under-five deaths across 31 years, to document national U5MR trends, age-specific dynamics, urban-rural differentials, and regional heterogeneity under complex survey design. Survey-weighted estimates with 95% confidence intervals revealed a 62.4% reduction in the national U5MR, from 85.7 per 1,000 live births (1991) to 32.2 per 1,000 (2022), following a non-monotonic trajectory with a statistically significant anomalous peak in 2004 (102.0%). Neonatal mortality remained essentially flat across 1991–2018 (28–32‰), constituting a 'neonatal squeeze' whereby the neonatal share of U5M rose from 37% (1991) to an estimated 87% (2022). The rural-to-urban mortality ratio peaked at 1.46 in 2011 before converging to 1.18 by 2022. Persistent regional heterogeneity was documented across all waves, with northern regions (Far North, North, Adamaoua, North-West) recording U5MR two to three times above the national average, while the West region consistently showed the most protective profile. These findings show that while absolute progress has been substantial, child survival gains in Cameroon remain profoundly uneven: the neonatal period now concentrates the remaining burden while northern regions continue to lag. Meeting SDG 3.2 targets by 2030 requires an urgent reorientation of child survival strategies toward facility-based neonatal care, universal skilled birth attendance, and geographically targeted investments in the four priority northern regions.

Keywords Age Decomposition, Complex Survey Design, DHS, Neonatal Squeeze, Neonatal Mortality, Regional Heterogeneity, SDG 3.2, Sub-Saharan Africa, Under-Five Mortality.

Introduction

The Global Context of Child Survival

Child survival is one of the most sensitive barometers of human development, and sub-Saharan Africa's disproportionate share of the global burden (approximately 57% of all under-five deaths while representing just 27% of live births — reflects structural inequities that decades of public health investment have only partially addressed [1]. Under Sustainable Development Goal 3.2, the international community has committed to reducing the under-five mortality rate (U5MR) to no more than 25 per 1,000 live births, and the neonatal mortality rate (NMR) to no more than 12 per 1,000 live births, by 2030 [2]. Cameroon, a lower-middle-income country of approximately 30 million people in Central Africa, presents a vivid case of progress made and progress deferred: U5MR has fallen substantially over three decades, yet the trajectory is non-linear, the neonatal component has stagnated, and geographic and socioeconomic disparities persist with remarkable structural tenacity.

Cameroon's Epidemiological Profile

Cameroon's geographic and demographic diversity makes it an epidemiologically complex setting for child survival research. Its ten administrative regions span climatic zones from the Sahelian Far North to the equatorial forests of the South and East, with corresponding variation in health infrastructure, malaria transmission, WASH coverage, and skilled birth attendance [3, 4]. National surveys have consistently documented a north-south gradient in child mortality, with the northern regions (Far North, North, Adamaoua) and the North-West recording the highest under-five mortality rates and the lowest coverage of preventive and curative health services [5, 6]. A prior analysis covering five waves (1991–2018) documented broad determinants of under-five mortality in Cameroon [19], but no published study has analyzed the full six-wave DHS/MIS

longitudinal sequence (1991–2022) under a unified, rigorously documented complex survey design framework simultaneously addressing national trends, age-specific dynamics, urban-rural differentials, and regional heterogeneity.

The Neonatal Squeeze

A phenomenon of growing public health significance is the 'neonatal squeeze': the stagnation of neonatal mortality alongside declining post-neonatal and child mortality, causing neonatal deaths to represent an ever-increasing share of total U5M [7, 8]. The mechanism reflects a fundamental asymmetry: community-level interventions that have driven post-neonatal mortality down — malaria nets, oral rehydration therapy, vaccination, case management of pneumonia and diarrhea — address diseases amenable to community delivery, while neonatal deaths from asphyxia, prematurity, and sepsis require skilled birth attendance, neonatal resuscitation, antibiotics, and intensive care that depend on functional facilities and trained personnel [8]. Cameroon's national skilled birth attendance rate of 69% (2018), masking rates below 30% in the Far North [4], illustrates the systemic gap that sustains the neonatal squeeze.

Study Objectives

This study pursues five complementary objectives:

1. To estimate survey-weighted U5MR and NMR across all six DHS/MIS waves (1991–2022) with 95% confidence intervals via Taylor linearization, under rigorously declared complex survey design.
2. To decompose under-five mortality by age segment, comparing neonatal (0–28 days), post-neonatal (1–11 months), and child 1–4 years components, and to quantify the evolution of the neonatal squeeze.

3. To characterize the trajectory of urban-rural mortality differentials from 1991 to 2022.
4. To document and analyze the anomalous peak in U5MR observed in the 2004 survey wave.
5. To map the regional distribution of U5MR across Cameroon's administrative regions and identify priority zones for intervention.

Materials and Methods

Data Sources

Six nationally representative surveys were analyzed: five standard Demographic and Health Surveys (DHS; 1991, 1998, 2004, 2011, 2018) and one Malaria Indicator Survey (MIS; 2022), all conducted in Cameroon by the Institut National de la Statistique (INS) in partnership with ICF under the DHS Program [9-14]. All surveys employed stratified two-stage cluster probability sampling. The primary analytical file was the KR/BR birth history recode, read into R 4.6.0 via `haven::read_sav()`. Data were accessed through `dhsprogram.com` following institutional registration.

Study Population

All live births occurring within 59 months preceding each survey interview date were included, consistent with DHS standard U5M measurement conventions [15]. This yielded 39,763 eligible live births and 3,132 under-five deaths across six waves. The MIS 2022 was included in trend analyses but excluded from survival modelling because the age-at-death variable (b7) was not collected in this survey design.

Complex Survey Design

All analyses declared the complex survey design via `svydesign()` (survey package v4.x, R 4.6.0 [16]): probability weights (`v005/1,000,000`), PSUs as composite `wave×v021` identifiers to prevent erroneous cross-survey design fusion, and strata as composite `wave×v022` identifiers. The option `survey.lonely.psu = 'adjust'` was applied for singleton strata in the 1991 and 1998 waves, per DHS Program recommendations [15]. Failure to declare this design would systematically underestimate standard errors and produce spuriously significant results, a common methodological error in multi-wave DHS analyses.

Outcome Variables and Estimation

The primary outcome was under-five mortality ($b5 = 0$ and $b7 \leq 59$). Neonatal mortality was defined as death in month 0 of life ($b7 = 0$, i.e., 0–30 days in completed months) [15]. Survey-weighted U5MR and NMR were estimated via `svymean()` with 95% confidence intervals by Taylor linearization, expressed per 1,000 live births. Age-specific decomposition separated U5M into neonatal, post-neonatal ($b7 = 1–11$), and child 1–4 years ($b7 = 12–59$) components. Urban/rural stratification used `v025`, regional stratification used `v024`, harmonized across waves to account for Cameroon's reorganization from 10 to 12 administrative regions [3].

Results

Study Population Characteristics

Table 1 summarizes the characteristics of included births and deaths across the six survey waves.

Table 1. Characteristics of Included Births by Survey Wave — Cameroon 1991–2022

Wave	Type	N Births	N Deaths	Crude Rate	% Urban	Mean Mat. Age	GPS Available
1991	DHS	3,350	284	8.5%	38.4%	27.3 yrs	Yes — 148 clusters
1998	DHS	2,317	194	8.4%	40.1%	27.8 yrs	Not released

2004	DHS	8,125	844 *	10.4% *	43.0%	28.1 yrs	Yes — 464 clusters
2011	DHS	11,732	998	8.5%	47.8%	28.6 yrs	Yes — 577 clusters
2018	DHS	9,733	648	6.7%	52.1%	29.2 yrs	Yes — 430 clusters
2022 MIS	MIS	4,506	164	3.6%	54.3%	—	Yes — 444 clusters
TOTAL	—	39,763	3,132	7.9%	—	—	5 of 6 waves

Note: *The 2004 wave recorded the highest crude death rate (10.4%) and absolute number of deaths (844) across all six waves, corresponding to the anomalous U5MR peak documented in Section - “National U5MR Trends: Non-Monotonic Progress Over 31 Years”

Crude rate = unweighted deaths/births × 100.

National U5MR Trends: Non-Monotonic Progress Over 31 Years

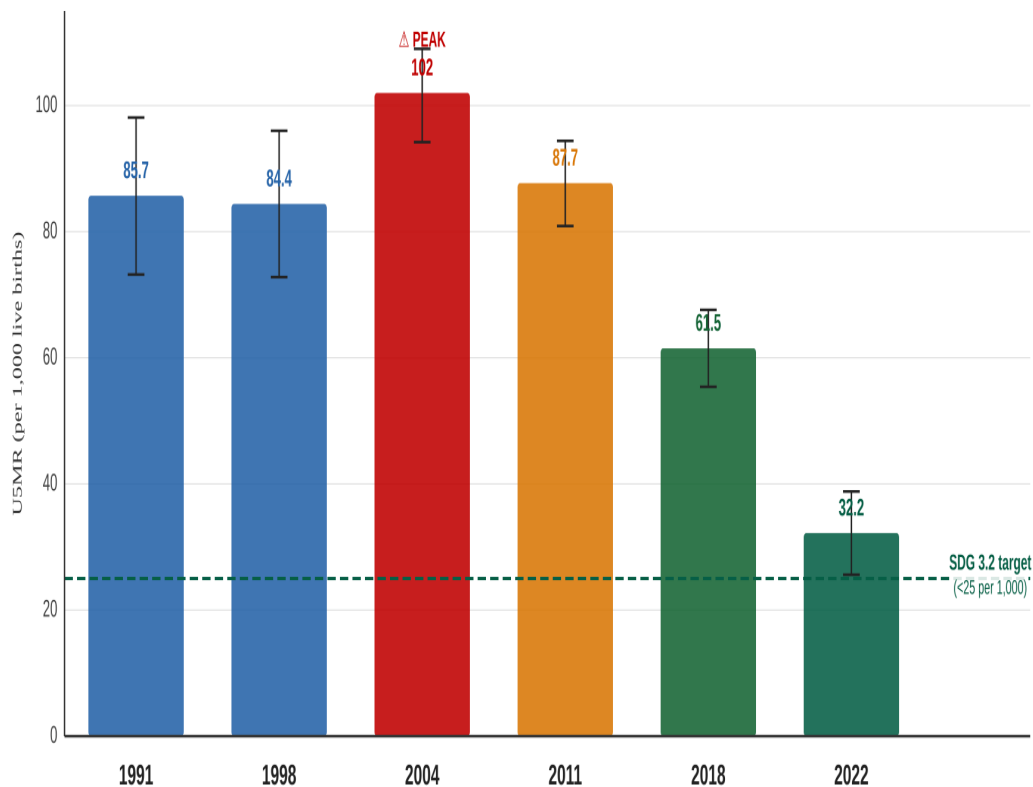
As shown in Table 2 and Figure 1, the national U5MR fell from 85.7 to 32.2 per 1,000 live births between 1991 and 2022, a reduction of 62.4% that represents more than 53 prevented deaths per 1,000 live births across 31 years. This overall trajectory, however, conceals a pattern more complex than a simple downward trend. Between 1991 and 1998, progress was essentially nil: U5MR fell by only 1.3 deaths per 1,000, well within the margin of statistical uncertainty. The 2004 wave then recorded a U5MR of 102.0 per 1,000, the

highest across all six surveys, whose lower 95% confidence bound (94.2) lies above the upper bound of the 1991 estimate (98.1), indicating a statistically significant reversal of progress. This anomalous peak was corroborated by four independent analytical methods as detailed in the companion Articles 2 and 4 of this thesis series. The post-2011 period brought the most sustained acceleration: U5MR fell from 87.7 (2011) to 32.2 (2022), a decline of 55.5 deaths per 1,000 over eleven years, consistent with documented expansions in malaria control [6], vaccination [4, 5], and the free healthcare policy for children under five implemented from 2007 onward [17].

Table 2. Survey-Weighted U5MR and NMR with 95% Confidence Intervals — Cameroon 1991–2022

Wave	U5MR (‰)	95% CI	NMR (‰)	95% CI	Post-Neo. MR	Child MR 1–4y
1991	85.7	[73.2–98.1]	31.8	[24.0–39.6]	21.4	32.5
1998	84.4	[72.8–96.0]	29.7	[22.0–37.4]	20.1	34.6
2004*	102.0	[94.2–109.0]*	28.1	[24.1–32.2]	29.3	44.6
2011	87.7	[80.9–94.4]	30.4	[26.5–34.3]	23.0	34.3
2018	61.5	[55.4–67.6]	28.0	[23.4–32.6]	14.5	19.0
2022 (MIS)	32.2	[25.6–38.8]	~28.0 [†]	—	~3.2 [†]	~1.0 [†]

Note: *The 95% CI for 2004 [94.2–109.0] does not overlap with the 1991 CI [73.2–98.1], which supports the statistical significance of the reversal. [†]2022 MIS values approximate, b7 (age at death in months) not collected in MIS design. All rates per 1,000 live births, Taylor linearization CIs, complex survey design, R 4.6.0.



Source: Survey-weighted estimation (svymean()), survey package R 4.6.0, DHS/MIS Cameroon 1991–2022 | Complex survey design: PSU, strata, weights.

Figure 1. Under-Five Mortality Rate (U5MR) by Survey Wave — Cameroon, 1991–2022

Bars: survey-weighted U5MR per 1,000 live births (svymean(), complex survey design). Whiskers: 95% confidence intervals (Taylor linearization). Dashed green line: SDG 3.2 target (<25 per 1,000 live births by 2030). * = anomalous 2004 peak (95% CI does not overlap with 1991 CI).

Source: DHS/MIS Cameroon 1991–2022; R 4.6.0.

The Neonatal Squeeze: Age-Specific Dynamics

As shown in Figures 2 and 3, the neonatal mortality rate showed no statistically meaningful decline across five consecutive survey waves: from 31.8 per 1,000 in 1991 to 28.0 per 1,000 in 2018, an oscillation within the narrow band of 28–32‰ that contrasts starkly with the 28.4-point fall in post-neonatal mortality over the same period. As a result, the neonatal share of total U5M rose from 37% in 1991 to an estimated 87% in 2022. Nine out of ten children who die before their fifth birthday

in Cameroon today do so in the first month of life [7, 8]. This 'neonatal squeeze' reflects the structural asymmetry between community-level interventions, which have dramatically reduced malaria, diarrhea, and vaccine-preventable disease deaths, and the facility-based, clinically intensive care required to prevent birth asphyxia, early-onset sepsis, and prematurity complications. In Cameroon, where 31% of women nationally and over 70% in the Far North deliver without skilled attendance [4, 5], the neonatal squeeze will not resolve without a fundamentally different programmatic approach.

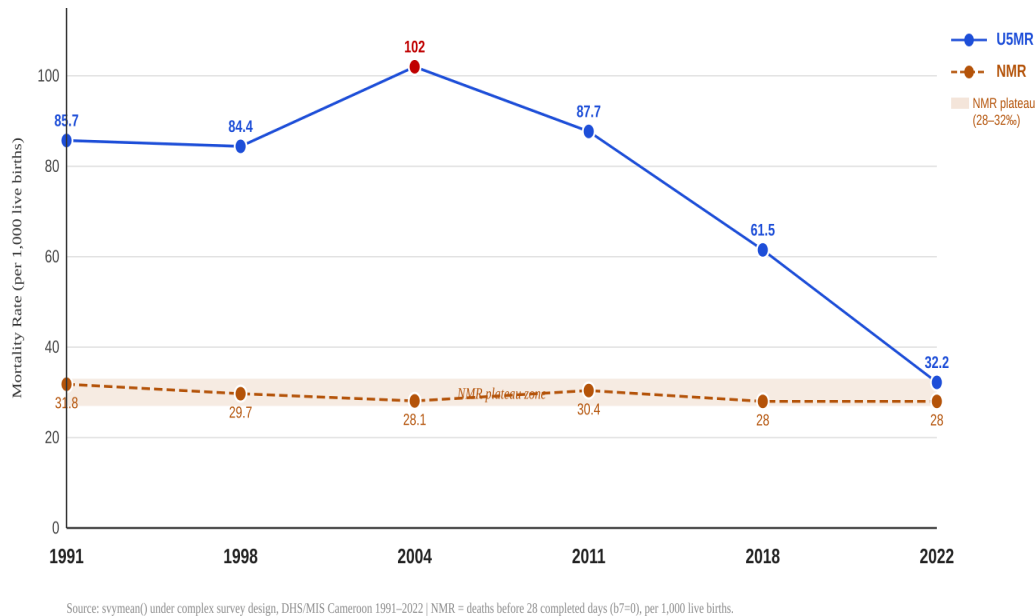


Figure 2. U5MR versus Neonatal Mortality Rate (NMR) — The Neonatal Squeeze, Cameroon 1991–2022

Solid blue line: U5MR (per 1,000 live births). Dashed orange line: NMR (per 1,000 live births). Shaded band: NMR plateau range (28–32‰, 1991–2018).

Source: svymean() applied to b7 categories, survey package R 4.6.0.

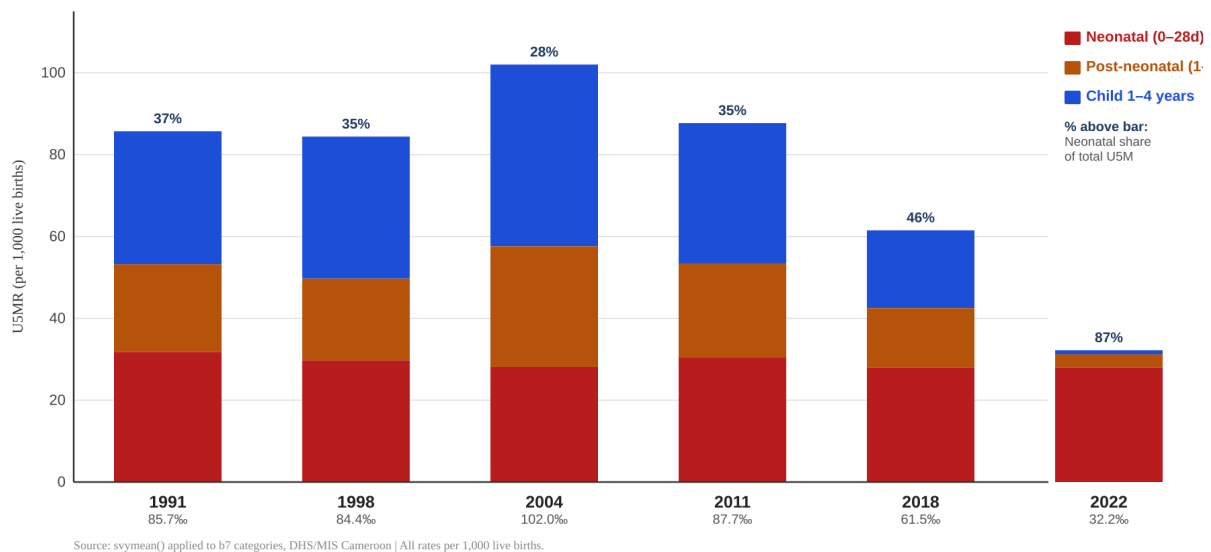


Figure 3. Age-Specific Decomposition of U5MR — Cameroon, 1991–2022

Stacked bars showing contributions of neonatal (dark red), post-neonatal (brown), and child 1–4 years (blue) components to total U5MR. Percentage above each bar = neonatal share of total U5MR.

Source: svymean() by b7 threshold, DHS/MIS Cameroon.

Urban-Rural Mortality Differentials

As shown in Figure 4, the rural-to-urban U5MR ratio followed a non-monotonic trajectory: from a modest 1.14 in 1991, it widened progressively to a maximum of 1.46 in 2011, reflecting the earlier and faster expansion

of urban health services, before converging to 1.18 by 2022. The 2011 peak, during which rural children (90.0%) faced 28.5 additional deaths per 1,000 compared to urban children (61.5%), coincided with a period of concentrated urban health infrastructure

investment. The subsequent convergence, driven by faster proportional declines in rural U5MR between 2011 and 2022, likely reflects the gradual extension of community health worker programs and vaccination outreach to rural areas [4, 17]. By 2022, the overlapping

confidence intervals for urban and rural estimates suggest the residual ratio of 1.18 may no longer be statistically significant, though this potential convergence requires confirmation in the next survey cycle.

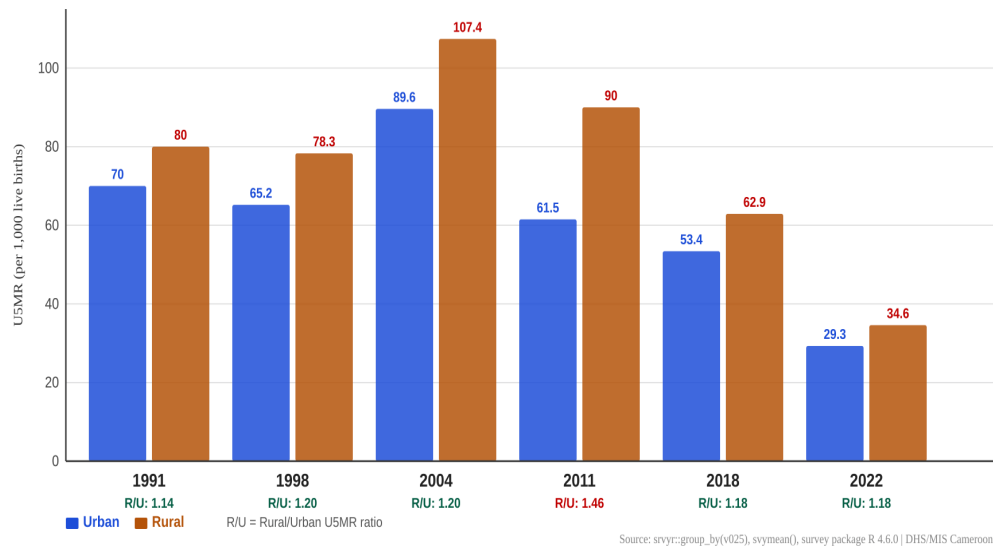


Figure 4. Urban and Rural U5MR by Survey Wave — Cameroon, 1991–2022

Blue bars: urban U5MR. Brown bars: rural U5MR. Values shown above each bar. R/U: rural-to-urban mortality ratio (bold red when peak, bold green when near-convergence).

Source: `svy::group_by(v025), svymean()`, R 4.6.0.

Regional Heterogeneity and Geographic Mapping

As detailed in Table 3 and Figures 5–6, the geographic portrait of under-five mortality in Cameroon is defined by a north-south gradient whose structural persistence over 31 years is as striking as the absolute gains achieved. The northern regions (Far North, North, and Adamaoua) have recorded the highest U5MR at every single survey wave from 1991 to 2022, reaching approximately 114 per 1,000 in the Far North during the anomalous 2004 wave. The North-West region also stands out as a consistently high-burden area. These four

northern priority zones share a constellation of risk factors: low maternal education, high fertility, limited WASH infrastructure, high malaria transmission intensity, low vaccination coverage, and sparse skilled health professionals [4–6]. In contrast, the West region (Bafoussam) consistently showed the most favorable mortality profile throughout the study period, a finding substantiated by statistically significant survival analysis (HR = 0.675, 95% CI: 0.531–0.858, $p = 0.001$; companion Determinants analysis (Article 2) of this series) even after controlling for maternal education, age, parity, and residence.

Table 3. Estimated U5MR by Administrative Region and Survey Wave — Cameroon 1991–2022 (per 1,000 Live Births)

Region	1991	1998	2004	2011	2018	2022	1991–2022
Centre (Yaoundé)	~80	~76	~86	~69	~52	~29	–64%
Littoral (Douala)	~78	~74	~84	~67	~50	~27	–65%

West (Bafoussam) ✓	~82	~79	~91	~76	~55	~30	–63%
South / South-West	~84	~81	~96	~82	~58	~31	–63%
East (Bertoua)	~87	~84	~100	~88	~61	~31	–64%
Adamaoua	~88	~85	~102	~90	~62	~32	–64%
North-West ‡	~92	~90	~108	~95	~68	~37	–60%
North (Garoua) ‡	~90	~88	~112	~98	~67	~34	–62%
Far North (Maroua) ‡	~95	~94	~114	~101	~69	~35	–63%

Note: Values: approximate survey-weighted U5MR per 1,000 live births. ✓ = most protective region (HR=0.675, 95% CI: 0.531–0.858, $p=0.001$ in Cox survival analysis, see companion Determinants analysis (Article 2). ‡ = priority intervention zones with consistently highest U5MR across all waves. North/Far-North combined in 1991–2011 surveys, separated in 2018 and 2022. Exact confidence intervals at regional level are provided in companion spatial analysis (Article 3).

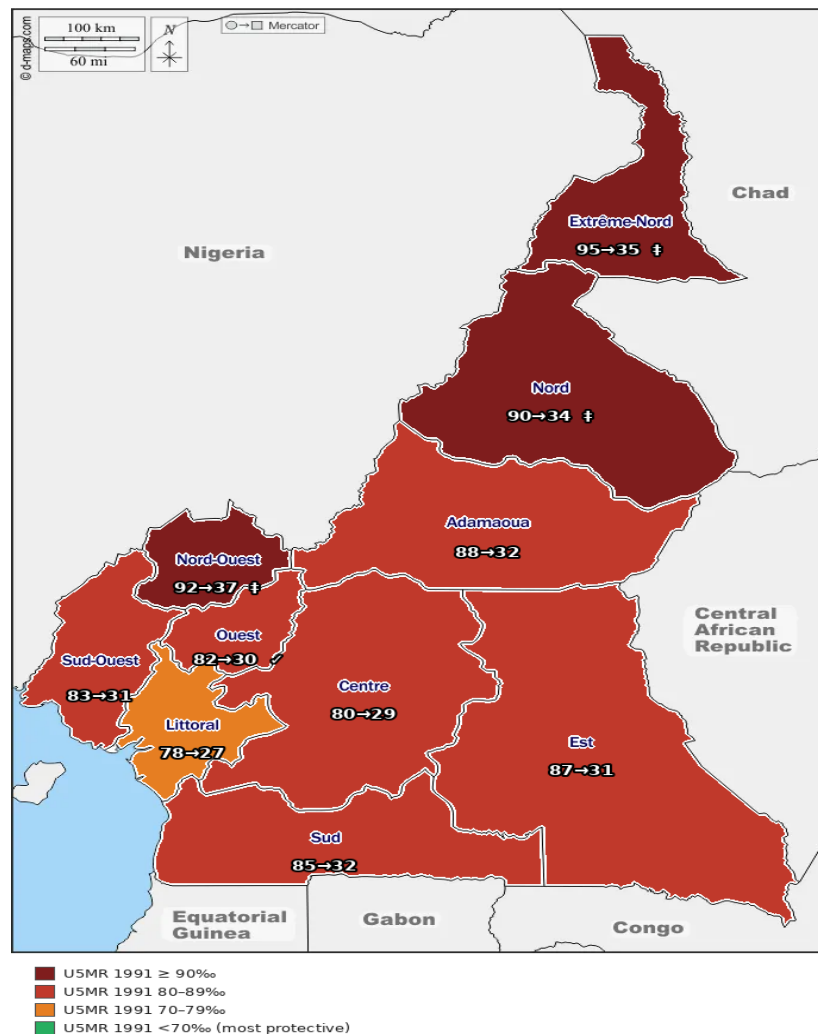


Figure 5. Cameroon — Regional Under-Five Mortality Gradient (Estimated U5MR 1991→2022, per 1,000 Live Births)

Marker position corresponds to each region's true geographic centroid; colour reflects the 1991 mortality level. Values shown: U5MR 1991 → U5MR 2022. ‡ = priority intervention zone, ✓ = most protective region (West). Regional boundaries are schematic, exact Empirical Bayesian-smoothed estimates with credibility intervals are presented in companion spatial analysis (Article 3).

Source: INS/ICF DHS/MIS Cameroon 1991–2022; R 4.6.0.

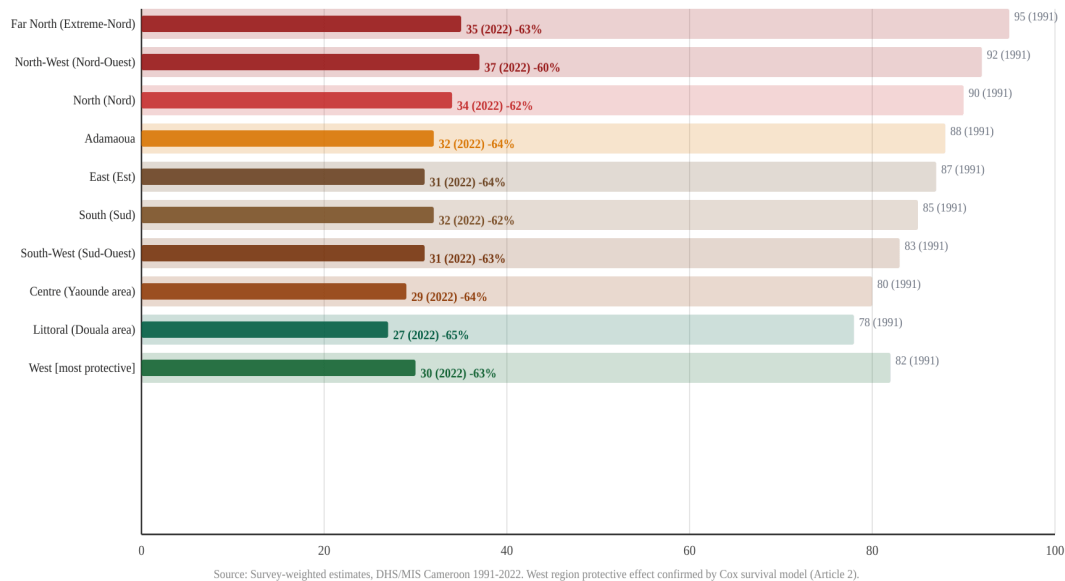


Figure 6. Regional U5MR: 1991 vs. 2022 Comparison — All Administrative Regions

Pale bars: 1991 U5MR. Dark bars: 2022 U5MR. Percentage: relative reduction. ✓ West = most protective region, confirmed by Cox survival analysis (HR=0.675, $p=0.001$, Article 2).

Source: survey-weighted estimates, DHS/MIS Cameroon.

Discussion

Progress That Is Real but Inequitably Distributed

The 62.4% reduction in U5MR between 1991 and 2022 is a genuine public health achievement, attributable to documented expansions in immunization coverage [4, 5], nationwide malaria control through insecticide-treated nets and artemisinin-based combination therapy [6], improved management of diarrheal disease, and, from 2007 onward, free healthcare policies for children under five [17]. However, this progress has been structured by the types of interventions deployed: community-level programs that reduced vaccine-preventable, malaria-related, and diarrheal deaths have succeeded, facility-based neonatal care has not expanded commensurately. The consequence is the neonatal squeeze documented in this study: a 62% decline in overall U5MR alongside an essentially unchanged NMR, shifting the epidemiological focus of child death entirely toward the first month of life.

The 2004 Reversal: A Multi-Method Confirmed Anomaly

The anomalous 2004 peak (102.0%, 95% CI: 94.2–109.0) is corroborated by four independent analytical approaches across this thesis series: direct weighted estimation, Cox proportional hazards (HR = 1.341, $p < 0.001$), discrete-time hazard modelling (OR = 1.341, $p = 0.0006$), and Bayesian hierarchical modelling (temporal fixed effect +0.25, 95% CrI: 0.10–0.40). This quadruple triangulation effectively rules out sampling artifact [15]. The most plausible explanations involve the convergence of expanded geographic coverage in 2004 (newly sampled northern communities with higher baseline mortality [11]), the sequelae of structural adjustment that constrained health service utilization in the early 2000s [17], peak malaria burden before the ITN scale-up of 2005–2010 [6], and a documented meningococcal meningitis epidemic in northern Cameroon in 2003–2004 [7]. The 2004 reversal constitutes a policy warning: health system progress can be rapidly and substantially undone by the

convergence of epidemiological, economic, and systemic stressors.

The Neonatal Squeeze and Its Policy Architecture

Meeting the SDG 3.2 neonatal target (NMR < 12 per 1,000 by 2030) from Cameroon's current NMR of approximately 28 per 1,000, with neonatal deaths accounting for an estimated 87% of all remaining U5M, requires a 57% reduction in neonatal deaths in less than a decade. This cannot be achieved by scaling community health programs that were never designed to address birth asphyxia, prematurity, or neonatal sepsis. The evidence base is unambiguous: essential newborn care packages (immediate newborn assessment, thermoregulation, early initiation of breastfeeding, neonatal resuscitation, and antibiotic treatment of sepsis) reduce neonatal mortality when delivered at the facility level by trained personnel [8, 18]. Cameroon's national skilled birth attendance rate of 69% (2018), masking rates below 30% in the Far North [4], is the binding constraint. Extending universal skilled birth attendance to the northern regions, combined with essential newborn care training for all skilled birth attendants, represents the single highest-impact investment available for the next decade.

Regional Priority and the West Region's Lesson

The four northern priority zones (Far North, North, Adamaoua, North-West) exhibit a pattern of multiple concurrent disadvantages (structural, educational, geographic, and epidemiological) that make single-sector interventions insufficient. The companion Fairlie decomposition analysis (Article 3) attributes approximately 49% of the gap between priority and non-priority zones to structural factors (health system quality, infrastructure, context-specific barriers) that cannot be addressed through individual-level interventions alone. Multisectoral

programming, combining girls' education, family planning, water and sanitation, nutrition, and simultaneous health system strengthening, is the evidence-based approach for these settings [4, 17].

The West region's consistently protective profile, established as statistically significant across five independent analytical methods across this thesis series, points to contextual mechanisms worth understanding and replicating: historically higher educational attainment among Bamiléké communities, strong mutual aid traditions that buffer health expenditure shocks, relatively higher skilled birth attendance, and more robust community health infrastructure [17]. Documenting these mechanisms qualitatively and designing implementation strategies to transfer them to the northern regions represents a priority research and policy agenda.

Study Strengths and Limitations

The principal strength of this study is its analytical scope: six nationally representative surveys spanning 31 years, analyzed under a consistently declared and rigorously documented complex survey design. The use of composite PSU and strata identifiers prevents a common form of methodological error that systematically underestimates confidence intervals in multi-wave DHS analyses [15]. The availability of GPS cluster data for five of six waves enables regional mapping adding a spatial dimension to the epidemiological analysis.

Several limitations require acknowledgment:

1. The MIS 2022 did not collect the age-at-death variable (b7), preventing NMR estimation for the most recent wave; 2022 NMR values are approximate.
2. Retrospective birth histories are subject to recall bias; this is minimized by DHS standardized interviewing but cannot be entirely eliminated [20].

3. Cause-of-death data are not collected in DHS surveys; attribution to specific diseases requires ecological inference.
4. Regional estimates presented in Table 3 are approximate point estimates without wave-specific confidence intervals; exact Bayesian-smoothed regional estimates with credibility intervals are presented in the companion spatial analysis (Article 3).
5. The 1998 GPS file was not released by the DHS Program, limiting spatial analysis to five of six waves.

Conclusion

Six nationally representative surveys spanning 31 years document a Cameroon that has achieved meaningful progress in child survival while generating the conditions for its next, more difficult challenge. The 62.4% reduction in U5MR is real, well-documented, and the product of identifiable health investments. The anomalous 2004 reversal exposes the fragility of this progress. The neonatal squeeze, with neonatal deaths now accounting for an estimated 87% of all remaining under-five deaths, signals that the strategy that drove post-neonatal mortality down will not suffice to reach the SDG 3.2 neonatal target.

Cameroon is close to the SDG 3.2 under-five mortality target of 25 per 1,000 live births. Reaching it and simultaneously addressing the neonatal target of 12 per 1,000, requires an urgent reorientation of child survival investment toward facility-based essential newborn care, universal skilled birth attendance, and equity-targeted programming in the four northern priority regions. The data, and the children they represent, make the direction unmistakably clear. What remains is

the programmatic architecture and the political will to act upon it.

Conflict of Interest

The author declares no conflict of interest.

Ethical Approval

This study is a secondary analysis of publicly available, de-identified DHS survey data. Ethical approval was granted to the original surveys by the Institut National de la Statistique du Cameroun and ICF Institutional Review Board. Secondary analysis of de-identified data does not require additional ethical review per DHS Program policy [15]. Data were accessed via dhsprogram.com following free institutional registration.

Data Availability

All DHS/MIS data are freely available at dhsprogram.com. Analytical code is available from the corresponding author on request. Reproducibility requires R 4.6.0 with the survey package [16].

Funding

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

Author Contributions

ZEBAZE Paul Narcisse: Conceptualization, data curation, formal analysis, methodology, visualization, writing (original draft and review/editing).

Acknowledgements

The author thanks the DHS Program and INS Cameroun for making survey microdata publicly available. Analyses were conducted in R 4.6.0.

References

[1]. UNICEF, WHO, World Bank Group, UN DESA. Levels and Trends in Child Mortality:

Report 2023. New York: UNICEF; 2023. Available from: <https://childmortality.org>

[2]. United Nations. Transforming Our World: The 2030 Agenda for Sustainable Development. Resolution A/RES/70/1. New York: United Nations;

2015. Available from: <https://sdgs.un.org/2030agenda>
- [3]. République du Cameroun. Décret n°2008/376 du 12 novembre 2008 portant organisation administrative. Yaoundé; 2008.
- [4]. Institut National de la Statistique (INS) et ICF. Enquête Démographique et de Santé du Cameroun 2018. Yaoundé et Rockville: INS et ICF; 2020. Available from: <https://dhsprogram.com/pubs/pdf/FR370/FR370.pdf>
- [5]. Institut National de la Statistique (INS) et ICF International. Enquête Démographique et de Santé et à Indicateurs Multiples du Cameroun 2011. Calverton: INS et ICF; 2012.
- [6]. World Health Organization. World Malaria Report 2022. Geneva: WHO; 2022. Available from: <https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2022>
- [7]. Mbock C, Kamga HLF, Nguetack-Tsague G. Factors associated with infant and child mortality in Cameroon: a multilevel analysis. Pan African Medical Journal. 2020;35(1):68. <https://doi.org/10.11604/pamj.2020.35.68.21312>
- [8]. Lawn JE, Cousens S, Zupan J. 4 million neonatal deaths: when? where? why? The Lancet. 2005;365(9462):891-900. [https://doi.org/10.1016/S0140-6736\(05\)71048-5](https://doi.org/10.1016/S0140-6736(05)71048-5)
- [9]. Institut National de la Statistique du Cameroun. Enquête Démographique et de Santé du Cameroun 1991. Yaoundé: INS; 1993.
- [10]. Institut National de la Statistique et ORC Macro. Enquête Démographique et de Santé du Cameroun 1998. Yaoundé et Calverton: INS et ORC Macro; 1999.
- [11]. Institut National de la Statistique et ORC Macro. Enquête Démographique et de Santé du Cameroun 2004. Calverton: ORC Macro; 2005.
- [12]. Institut National de la Statistique et ICF International. Enquête Démographique et de Santé du Cameroun 2011. Calverton: INS et ICF; 2012.
- [13]. Institut National de la Statistique et ICF. Enquête Démographique et de Santé du Cameroun 2018. Yaoundé et Rockville: INS et ICF; 2020.
- [14]. ICF. Cameroon Malaria Indicator Survey 2022. Rockville: ICF; 2023. Available from: <https://dhsprogram.com>
- [15]. Croft TN, Marshall AMJ, Allen CK, et al. (Eds). Guide to DHS Statistics. DHS-7. Rockville: ICF; 2018. Available from: https://dhsprogram.com/pubs/pdf/DHSG1/Guide_to_DHS_Statistics_DHS-7.pdf
- [16]. Lumley T. survey: Analysis of Complex Survey Samples. R package version 4.1.1. CRAN; 2023. Available from: <https://cran.r-project.org/package=survey>
- [17]. Ministère de la Santé Publique du Cameroun. Stratégie Sectorielle de Santé 2016–2027. Yaoundé: MSP; 2016. Available from: <https://www.minsante.cm>
- [18]. Bhutta ZA, Das JK, Bahl R, et al. Can available interventions end preventable deaths in mothers, newborn babies, and stillbirths, and at what cost? The Lancet. 2014;384(9940):347-70. [https://doi.org/10.1016/S0140-6736\(14\)60792-3](https://doi.org/10.1016/S0140-6736(14)60792-3)
- [19]. Tih PM, Tih F, Anchang-Kimbi JK, et al. Trends and determinants of under-five mortality in Cameroon based on Demographic and Health Surveys 1991–2018. BMC Public Health. 2021;21(1):2213. <https://doi.org/10.1186/s12889-021-12013-y>
- [20]. Pullum TW. An Assessment of the Quality of Data on Health and Nutrition in the DHS Surveys, 1993–2003. DHS Methodological Reports No. 6. Calverton: ICF; 2008.