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Patterns and trends of maternal mortality, Sierra Leone 2018–2024

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Abstract

Objective To examine maternal mortality trends and cause-specific distributions in the nationally representative mortality platform called Healthy Sierra Leone.

Methods We analysed maternal deaths captured in Healthy Sierra Leone during 2018–2024 and assigned causes of death using an electronic verbal autopsy system paired with independent physician review. We computed maternal mortality ratios per 100 000 livebirths and cause-specific distributions nationally, by region and by age group. To contextualize maternal mortality patterns and trends we compared results with other data sources.

Findings Healthy Sierra Leone recorded 408 maternal deaths from over 60 000 homes surveyed. Direct causes accounted for 81% (332/408) deaths, led by obstetric haemorrhage (125), sepsis (56), abortion or miscarriage (29) and hypertensive disorders (27). The average national maternal mortality ratio per 100 000 livebirths over 2018–2024 was 280 (95% confidence interval, CI: 254–305). This ratio declined by 41%, from 365 (95% CI: 320–410) in 2018 to 216 (95% CI: 173–261) in 2024. An estimated 548 women died in childbirth in 2024, compared with 900 women dying in 2018. Over the study period, emergency obstetric care-related causes accounted for 32% (25/79) of deaths in the western region compared with 54% (336/624) in other regions. Maternal mortality ratios were highest in the eastern region and lowest in the western (capital) region. The proportion of deaths from obstetric haemorrhage rose between 2018 and 2024.

Conclusion Maternal mortality in Sierra Leone has declined, but with regional disparities. Direct causes of death underscore gaps in emergency obstetric care.

Introduction

Sierra Leone, a West African nation of over eight million people,[1] consistently ranks among countries with the highest maternal mortality ratio globally. For the year 2000 the modelled maternal mortality ratio was 2650 per 100 000 livebirths, nearly threefold higher than West Africa's average (974 per 100 000 live births).[2] While contemporary models suggest that maternal mortality ratios declined to 1180 by 2015,[3] and to 354 by 2023,[4] maternal mortality reduction remains a high national health priority. Most deaths, including from maternal causes, still remain unrecorded or lack attributable causes.[5–7]

Accurately measuring maternal mortality remains challenging globally, particularly where it is highest, due to limited reliable data and varying estimation methods.[4] Until 2015, Sierra Leone relied primarily on Demographic Health Surveys (DHSs), censuses and World Health Organization (WHO) model-based estimates for maternal health indicators. While informative, these data are limited in frequency, timeliness and ability to characterize causes and patterns of maternal mortality.

Continuous, population-based mortality data are essential for assessing progress in reducing maternal mortality,[8] and for robust evaluations of levels, trends, causes and distribution. The Sierra Leonean government and stakeholders therefore established varied surveillance systems.[9–11] Since 2018, Healthy Sierra Leone, a sample-based surveillance system known as Heal-SL, has provided nationally representative mortality data, enabling population-level assessment of maternal mortality and causes of death.[5,7]

Here we assess the levels, trends, causes and distribution of maternal mortality using Healthy Sierra Leone data (2018–2024), contextualizing our findings using estimates from other sources.

Methods

Sampling frame

Healthy Sierra Leone was launched in 2018 by Sierra Leone's National Public Health Agency and Njala University, in collaboration with the Centre for Global Health Research (Toronto, Canada) and funded by the Gates Foundation. Healthy Sierra Leone conducts continuous, population-level surveillance of births and deaths using electronic verbal autopsies to determine causes of death.[5,7]

Healthy Sierra Leone provides annual mortality estimates by age and sex[12] and covers approximately 5% of the national population (over 60 000 households; about 340 000 individuals) in 661 randomly selected enumeration areas (blocks or villages) identified using the 2015 census.[12] The design and sampling method are published elsewhere.[5,7] The stratified sample represents urban and rural residences across Sierra Leone's five regions and 16 districts, with sampling being proportional to district population size and weighted to capture lower education and higher child mortality areas.

Baseline and verbal autopsy

Healthy Sierra Leone activities include household enumeration followed by electronic verbal autopsy interviews. Verbal autopsy-based ascertainment of causes of death is a recognized alternative where vital registration and medical certification of deaths remain low.[7,8,13]

During enumeration, about 45 trained surveyors record household members, births and deaths for the reference period. Each reported death activates an electronic verbal autopsy, using an enhanced 2016 WHO verbal autopsy instrument[14] version 1.5.1, which is optimized for offline use, with an embedded database for simultaneous data recording, validation and quality control resampling.

Electronic verbal autopsies collect structured symptom and circumstance data and free-text narratives describing events leading to death, including care-seeking. Completed electronic verbal autopsies are uploaded daily to a secure cloud server for physician cause-of-death review and assignment. Quality assurance includes random narrative reviews, re-sampling, surveyor performance dashboards and programmed checks.

Following informed consent, household members, aged 18 years or older, familiar with each death complete electronic verbal autopsies. Initially interviews these covered deaths in the preceding three years; subsequent surveys cover deaths occurring within the previous two years.

Cause of death determination

Each death is assigned an underlying cause-of-death code (online repository)[15] using the International Statistical Classification of Diseases and Related Health Problems (ICD; 10th revision, ICD-10).[16] Two trained physicians independently and anonymously review randomly assigned electronic verbal autopsy records using a validated online coding platform.[17,18] Discrepancies undergo anonymous reconciliation, with persisting disagreements adjudicated by an anonymous senior physician.

In 2024, large language models and two symptom-checklists algorithms were integrated into physician coding as decision-support tools, allowing physicians to alter initial diagnosis based on narrative-derived large language model diagnoses and symptom-based algorithmic results. These tools inform but do not replace physician coding.[18] Evaluations show strong performance, particularly with large language models, compared to standard physician coding.[19] We retrospectively applied these tools to earlier verbal autopsies to ensure steady cause-of-death classification over time. Healthy Sierra Leone's workflow is provided in the online repository.[15]

Definitions of maternal deaths

We applied the WHO definition of maternal deaths, defined as death during pregnancy or within 42 days of pregnancy termination, irrespective of the duration and site, from any cause related to or aggravated by the pregnancy or its management, excluding accidental or incidental causes.[16] All deaths initially assigned maternal-related ICD codes underwent secondary reviews by two trained obstetricians following standard coding, reconciliation and adjudication procedures. We tabulated maternal deaths by direct (underlying) and indirect (contributory) causes according to WHO–ICD guidelines.[16] We excluded deaths from external or unrelated causes.

Other data sources

Additional data sources for comparison included Maternal Death Surveillance and Response[10,11,20] and Integrated Disease Surveillance and Response[9,21] systems, DHSs,[22–24] national census,[12] and WHO modelled estimates.[4,25] Given the differences in estimation approaches, no methodological harmonization or statistical equivalence were assumed. Data sources are summarized in the online repository.[15]

Data analyses

We included maternal deaths recorded in Healthy Sierra Leone (2018–2024) among women aged 15–49 years. We examined two age groups: younger women (aged 15–29 years), representing adolescents and young mothers in peak childbearing years (that is, 20–29 years),[26] and older women (aged 30–49 years).

We applied Healthy Sierra Leone's sample-weighted age-specific death proportions to the United Nations' World Population Prospects' (2024)[1] death totals for women aged 15–49 years to estimate the absolute number and cause-specific distribution of maternal deaths nationally. We distributed deaths across Sierra Leone's five regions using census-based regional proportions. We estimated maternal deaths using World Population Prospects' annual births

(expected stillbirths were subtracted) among women 15–49 years by distributing births regionally using census-based birth proportions.

We classified maternal deaths using obstetric or maternal-related ICD codes and compared cause-specific distribution by age groups between the more affluent western region (including Freetown, the capital of Sierra Leone, with about 1.5 million inhabitants) and the rest of Sierra Leone (non-western). We considered deaths from haemorrhage, sepsis, abortion or miscarriage as indicators of emergency obstetric care quality.[27]

We computed national and subnational maternal mortality ratios per 100 000 livebirths for each survey year and for the overall period. Sampling weights accounted for clustering and sampling-unit variance, and were applied to derive nationally and regionally representative proportions. We derived 95% confidence interval (CI) for age- and cause-specific ratios using the delta method,[28] incorporating design-based standard errors of weighted proportions. We calculated 95% CIs for the resulting estimates by projecting the sampling variance of Healthy Sierra Leone's proportions during scaling. World Population Prospects' totals were treated as fixed, contributing no additional sampling uncertainty. We estimated lifetime risk of death using standard methods at both national and regional levels.[25]

Healthy Sierra Leone's maternal mortality ratios and causes of deaths were compared with Maternal Death Surveillance and Response (2016–2023) and Integrated Disease Surveillance and Response (2017–2024) systems, DHSs (2008, 2013, 2019),[22] the country's census (2015),[12] and WHO (2007–2023) estimates.[4,25] For the Integrated Disease Surveillance and Response, we used 80% of livebirths, conservatively below the 83% figure for institutional delivery reported in 2019.[22] The 80% proportion reflects births occurring in health facilities. Data extraction details are summarized in the online repository[15]. All analyses (ICD-10 coding, and summary statistics) were done using Stata version 16 (StataCorp LLC, College Station, USA).

Ethical considerations

The Sierra Leone Ethics and Scientific Review Committee (SLESRC No. 025/04/2023) and Unity Health Toronto Research Ethics Board (REB#15–231) granted ethics approval.

Results

Between 2018 and 2024, Healthy Sierra Leone recorded 408 maternal deaths (Table 1), of which 90.9% (371 deaths) were captured outside the western region. The southern (38%; 154 deaths)

and north-eastern (26%; 107 deaths) regions accounted for the highest proportions of deaths. Young women aged 15–29 years comprised 53% (215) of deaths. About half of the women who died (52%; 211 deaths) had no formal education. Most of the maternal deaths (67%; 274/407) occurred in hospitals or health facilities, 22% (90/407 deaths) occurred at home and 11% (43/407 deaths) on route to hospital or health facilities. Two-thirds of women, (68%; 269/393) received treatment before death, with 60% (162/269) seeking care outside of home.

For 2018–2024, the national annual average number of maternal deaths was 702 (95% CI: 638–766) with a maternal mortality ratio of 280 (95% CI: 254–305) per 100 000 livebirths (Table 2). Maternal deaths accounted for about 12% (702/6073) of all deaths among women aged 15–49 years. The lifetime risk of maternal death was 1.2% (1% and 0.2% for direct and indirect causes of death, respectively). The maternal mortality ratio was highest in the eastern region (371; 95% CI: 283–459) and lowest in the western region (173; 95% CI: 119–226).

The maternal death proportion was lowest in the western region (8%; 37/488) and highest in the north-western region (15%; 49/339; Fig. 1). The maternal death proportion in the eastern, north-eastern and southern regions ranged from 11% (61/548) to 13% (107/814). The lifetime risk of maternal death ranged from 0.6% (western region) to 1.4% (non-western regions; online repository).[15]

Maternal mortality accounted for a higher proportion of deaths among younger women younger than 30 years (15%; 215/1411) than among older women aged 30–49 years (9%; 193/2120). However, the maternal mortality ratio was lower among younger women (214, 95% CI: 187–242) versus older women (423, 95% CI: 365–481).

Using the 702 national maternal deaths as denominator, 81% (571) were attributed to direct causes and 19% (131) to indirect causes of death. Leading direct causes were obstetric haemorrhage (31%; 215 deaths; 95% CI: 178–252), maternal sepsis (14%; 96 deaths; 95% CI: 71–121), abortion or miscarriage (7%; 50 deaths; 95% CI: 32–68) and hypertensive disorders of pregnancy (7%; 46 deaths; 95% CI: 29–64; Table 2). Emergency obstetric care-related conditions caused 51% (361) of deaths. Among indirect causes, malaria was the leading communicable cause (43%; 39/91), while sickle cell anaemia accounted for 22% (9/40) of noncommunicable causes. The proportion of deaths attributable to haemorrhage rose from 26% (231/900) in 2018–2020 to 40% (217/547) in 2023–2024, while maternal sepsis increased slightly from 14% (122/900) to 16% (87/547; Fig. 2).

In the western region, haemorrhage remained the leading cause of maternal death (19%;15/79; online repository).[15] followed by hypertensive disorders (14%; 11/79). In non-western regions, haemorrhage and hypertensive disorders of pregnancy accounted for 32% (198/623) and 6% (37/623) of maternal deaths, respectively. Emergency obstetric care-related conditions accounted for nearly twice the percentage of deaths in the non-western region (54%; 336/624) compared with the western region (32%; 26/79).

The Maternal Death Surveillance and Response (2016–2023) recorded 4337 deaths and the Integrated Disease Surveillance and Response (2017–2024) recorded 3816. We extracted 1570 maternal deaths from the 2015 census. Three rounds of DHSs reported 562 pregnancy-related deaths (including 159 uniquely identified maternal deaths in 2019).[22–24] Maternal Death Surveillance and Response and Healthy Sierra Leone showed similar patterns, with most maternal deaths occurring in non-western regions and among women aged 25–29 years (online repository).[15]

Direct causes of death predominated across systems, with obstetric haemorrhage being the leading cause of death. The Maternal Death Surveillance and Response recorded a higher proportion of deaths from hypertensive disorders compared with Healthy Sierra Leone, whereas slightly higher proportions of deaths from maternal sepsis, abortions or miscarriage were reported in Healthy Sierra Leone. Patterns were similar across younger and middle-aged women (online repository).[15] Regional patterns were similar. Non-western regions had higher proportions of obstetric haemorrhage and lower proportions of hypertensive disorders of pregnancy than the western region. The Maternal Death Surveillance and Response reported higher proportions of emergency obstetric care-related deaths, whereas Healthy Sierra Leone reported higher proportions of maternal sepsis and abortion- or miscarriage-related deaths, particularly in non-western regions (online repository).[15]

In Healthy Sierra Leone, the western region had the lowest maternal mortality ratio (173 per 100 000 livebirths, 95% CI: 119–226) but one of the highest maternal mortality ratios according to the Integrated Disease Surveillance and Response (311, 95% CI: 291–332) and the Maternal Death Surveillance and Response (277, 95% CI: 260–294). Conversely, the eastern region had the highest maternal mortality ratio in Healthy Sierra Leone (371, 95% CI: 283–459) but it was among the lowest in the Integrated Disease Surveillance and Response and the Maternal Death Surveillance and Response (204, 95% CI:190–220; and 199, 95% CI: 186–213). Maternal mortality ratios for the north-eastern and southern regions were comparable between

Healthy Sierra Leone and the Maternal Death Surveillance and Response, although facility death shares varied across regions (Fig. 3).

Using Healthy Sierra Leone data, annual maternal deaths in Sierra Leone declined from 900 in 2018 to 548 in 2024, while maternal mortality ratio fell by 41%, from 365 (95% CI: 320–410) to 216 (95% CI: 173–261) per 100 000 live births.

Despite regional differences, national maternal mortality ratios declined across all data sources. Healthy Sierra Leone's trend was concordant with the Integrated Disease Surveillance and Response and the Maternal Death Surveillance and Response, particularly for the period 2023–2024 (Fig. 4). In the Integrated Disease Surveillance and Response, the maternal mortality ratio per 100 000 livebirths declined by 19% from 254 (95% CI: 233–278) in 2017 to 206 (95% CI: 187–227) in 2024 and by 38% in the Maternal Death Surveillance and Response from 293 (95% CI: 272–316) in 2016 to 181 (95% CI: 165–198) in 2023 (online repository).[15]

Discussion

We examined national and subnational cause-specific maternal mortality in Sierra Leone from 2018 to 2024, using Healthy Sierra Leone data. Overall, our findings indicate a substantial decline in maternal mortality since 2018, with regional differences in maternal mortality ratios and cause-specific patterns. Obstetric haemorrhage was the leading cause of maternal death both nationally and regionally and accounted for an increasing proportion of deaths over time as other causes declined. Obstetric haemorrhage as the leading cause of maternal death is consistent with findings from other studies in similar settings.[7,13,29–32] More than half of maternal deaths were attributable to emergency obstetric care-related conditions, highlighting the continued burden of preventable causes. Deaths were concentrated among younger women and in non-western regions.

Sierra Leone's maternal mortality ratio declined from 1180 per 100 000 livebirths in 2015[3] to 510 by 2020[7] (WHO estimated a slightly lower ratio of 443 for 2020)[25] reflecting an intensified focus on maternal health over the previous decade. Since introducing the Free Health Care Initiative for women and children in 2010, institutional births rose from an estimated 25% in 2008 to over 80% in 2019.[22] Increased training and deployment of skilled birth attendants and community health workers may have contributed to the observed reduction.[33,34] Despite progress, 22% of births captured in Healthy Sierra Leone still occurred at home.

Regional disparities remain, reflecting inequalities observed in other countries.[30,35] About 96% of the population in the two highest national wealth quintiles reside in the western region. In other regions, about 75% of the population falls within the middle or lower wealth quintiles.[22] As is common, health personnel and higher-quality facilities are concentrated in wealthier areas,[36–38] leaving remote areas underserved and contributing disproportionately to maternal deaths.

An association between increased facility births and declining maternal mortality underscores the importance of accessible, high-quality health care: rising facility-based births in Sierra Leone have seen a corresponding increase in institutional maternal deaths, reflecting the system's limited health-care capacity[39] and critical gaps in emergency obstetric care.[32] For instance, Sierra Leone has low availability of essential medicines and a low density of medical doctors, nurses and midwives per 1000 population.[40]

The substantial proportion of maternal deaths among adolescents aged 15–19 years highlights the need to reduce teenage pregnancies, which are often linked to early marriages. Although excluded from the main analysis, Healthy Sierra Leone recorded 12 maternal deaths among girls under 15 years. In 2020, United Nations Children's Fund reported over 400 000 girls in Sierra Leone had married before the age of 15 years, with 30% between ages 15 and 18 years.[41] The 2024 Prohibition of Child Marriage Act, which bans marriage under 18 years in Sierra Leone and penalizes participating adults, represents a significant policy shift.[42]

Healthy Sierra Leone, the Maternal Death Surveillance and Response and the Integrated Disease Surveillance and Response indicate declining maternal mortality, although trends vary partly due to differing methods and coverage. Healthy Sierra Leone is demographically and geographically representative, capturing deaths across the country, in homes and in health facilities and in urban and rural areas. In contrast, the Maternal Death Surveillance and Response and the Integrated Disease Surveillance and Response are biased towards health facility deaths, comprising 81% in the Maternal Death Surveillance and Response compared with 67% in Healthy Sierra Leone. Nonetheless, findings should be interpreted as complementary rather than directly comparable estimates, as they provide synthesis of maternal mortality patterns across surveillance platforms rather than equivalent measures.

Reducing maternal mortality requires strengthening comprehensive emergency obstetric care, (including timely referral systems), and improving reliable access to blood transfusion and essential medicines. Given that many women had accessed care, improving the quality of care,

clinical decision-making and intrapartum management are as essential as increasing service utilization. Targeted investment should address geographic inequities in services access, particularly in underserved regions.

A key strength of Healthy Sierra Leone is its nationally representative, population-based mortality surveillance capturing community and facility deaths using electronic verbal autopsy. Physician adjudication remains central, with large language models and automated algorithms improving classification quality and consistency.[19] Despite the robust, validated verbal autopsy tool, misclassification may lead to under- or overestimation of maternal death from abortions, obstructed labour and psychosis.[35] Maternal deaths are rare and require large samples to reliably estimate levels and trends. Healthy Sierra Leone captured relatively few maternal deaths, resulting in uncertainty around estimates (online repository)[15]. Although underreporting, particularly in remote areas, is possible, the visibility of maternal deaths, and field staff's established rapport with community members through repeated household visits, likely minimized undercounting. Healthy Sierra Leone captured home-based maternal deaths better than the Maternal Death Surveillance and Response. Applying Healthy Sierra Leone death proportions to robust World Population Prospects' estimates helped mitigate underestimation.[32] Possible undercounts are unlikely to vary greatly over time. Hence, the observed downward trends in maternal mortality ratio are likely reliable. Healthy Sierra Leone's limited parity data could be expanded to better characterize mortality by birth order. Methodological differences across data sources limit direct comparability.

Sierra Leone still has among the highest maternal mortality ratios of any country. Improving health system infrastructure and the quality of care, particularly in non-western regions, remains a priority. Continuing and improving maternal mortality monitoring and surveillance remain essential.

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Competing interests:

None declared.

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Table 1. **Characteristics of maternal deaths recorded in Healthy Sierra Leone, 2018–2024**

Characteristic	No. of maternal deaths, % *n* = 408[a]
Region	
Western	37 (9)
Non-western (total)	371 (91)
Southern	154 (38)
North-eastern	107 (26)
Eastern	61 (15)
North-western	49 (12)
5-year age group (years)	
15–19	44 (11)
20–24	76 (19)
25–29	95 (23)
30–34	80 (20)
35–39	66 (16)
40–44	33 (8)
45–49	14 (3)
Education level	
No formal education	211 (52)
Some formal education	197 (48)
Place of maternal death (*n* = 407)	
Hospital or health facility	274 (67)
Home	90 (22)
On route to hospital or health facility or other	43 (11)
Treatment received[b] (*n* = 393)	
Yes	269 (68)
No	124 (32)
Care outside home[c] (*n* = 268)	
Yes	162 (60)
No	106 (40)
Cost prohibits other household payments[d] (*n* = 398)	
Yes	81 (20)
No	317 (80)
Distance to hospital greater than 2 hours[e] (*n* = 402)	
Yes	92 (23)
No	310 (77)

[a] Sample size, if not otherwise stated.

[b] Treatment received for illness that led to death.

[c] Care sought outside the home for this illness.

[d] Total cost of care and treatment prohibits other household payments.

[e] Distance to the nearest hospital or health facility from deceased's home takes more than 2 hours.

Note: unknown and missing cases for each category are not detailed. Inconsistencies arise in some values due to rounding.

Table 2. **Causes of maternal deaths, Sierra Leone, 2018–2024**

Cause of death	No of maternal deaths recorded in Healthy Sierra Leone	2018–2024		
		Average of annual national maternal deaths, no. (%)	Maternal mortality ratio per 100 000 live births (95% CI)	Lifetime risk, %
Direct causes of death	332	571.0 (81)	228 (204–251)	1.0
Haemorrhage	125	215.0 (31)	86 (71–100)	0.4
Sepsis	56	96.3 (14)	38 (28–48)	0.2
Abortion or miscarriage	29	49.9 (7)	20 (13–27)	0.1
Other obstetric complications	45	77.4 (11)	31 (22–40)	0.1
Hypertensive disorders of pregnancy	27	46.4 (6.6)	19 (12–25)	0.1
Ill-defined	50	86.0 (12)	34 (25–44)	0.1
Indirect causes of death	76	130.7 (18.7)	52 (40–64)	0.2
Communicable[a]	53	91.1 (13)	36 (27–46)	0.2
Noncommunicable[b]	23	39.6 (6)	16 (9–22)	0.1
All maternal deaths	408	701.7 (100)	280 (254–305)	1.2
Emergency obstetric care deaths by region[c]				
Eastern region				
Emergency obstetric care deaths	23	84.2 (42)	140 (84–196)	0.6
Total maternal deaths	61	201.2 (100)	371 (283–459)	1.5
North-eastern region				
Emergency obstetric care deaths	63	78.6 (65)	179 (137–221)	0.7
Total maternal deaths	107	120.8 (100)	304 (250–358)	1.1
North-western region				
Emergency obstetric care deaths	23	93 (52)	152 (92–213)	0.9
Total maternal deaths	49	179.4 (100)	325 (241–409)	1.9
Southern region				
Emergency obstetric care deaths	90	79.7 (65)	127 (102–153)	0.6
Total maternal deaths	154	122.6 (100)	218 (186–250)	1.0
Western region				
Emergency obstetric care deaths	11	25.5 (32)	51 (21–81)	0.2
Total maternal deaths	37	78.6 (100)	173 (119–226)	0.6
All regions				
Emergency obstetric care deaths	210	361 (51)	144 (125–163)	0.6
Total maternal deaths	408	702 (100)	280 (254–305)	1.2

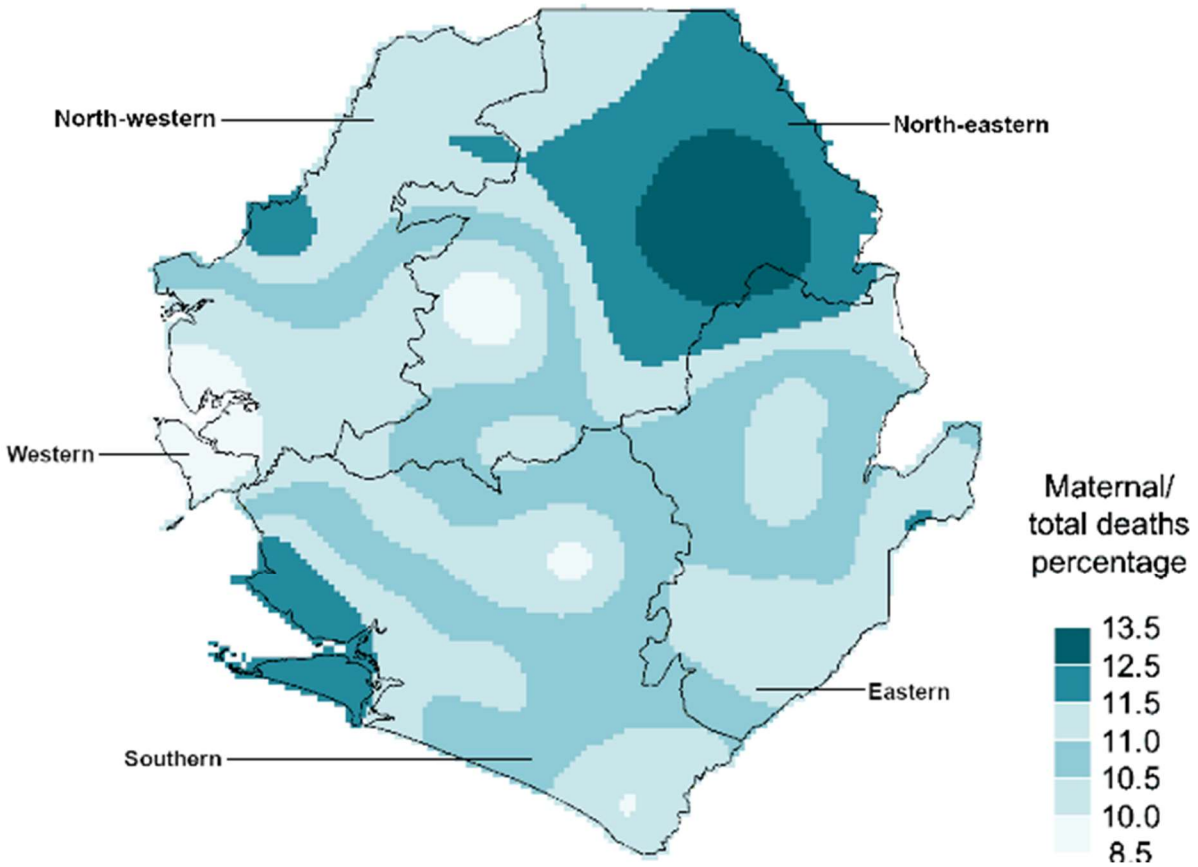
[a] Communicable (53; 100%) refers to deaths due to: maternal infectious and parasitic causes (23; 43.4%); malaria (23; 43.4%); HIV (2; 3.8%), tuberculosis (2; 3.8%); other infections and fever (3; 5.7%).

[b] Noncommunicable (23; 100%): sickle cell anaemia (5; 21.7%); other noncommunicable maternal disease (6; 26.1%); circulatory system diseases (5; 21.8%); other anaemias (2; 8.7%); breast cancer (1; 4.4%); other noncommunicable diseases (4; 17.4%).

[c] Include haemorrhage, sepsis, abortion or miscarriage.

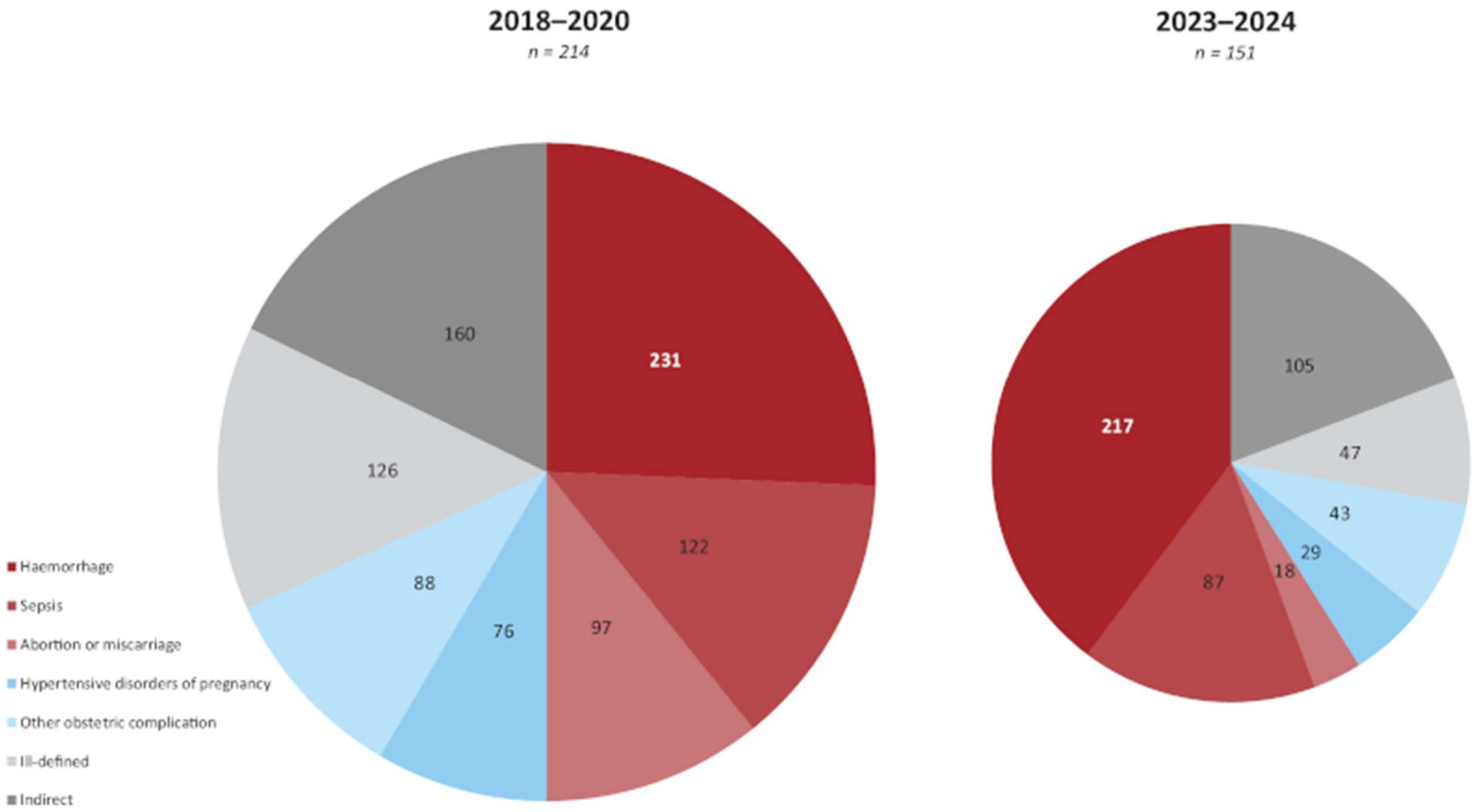
Note: totals may not sum exactly due to rounding.

Fig. 1. **Spatial distribution of regional maternal deaths as a percentage of total deaths in females aged 15–49 years. Healthy Sierra Leone, 2018–2024**



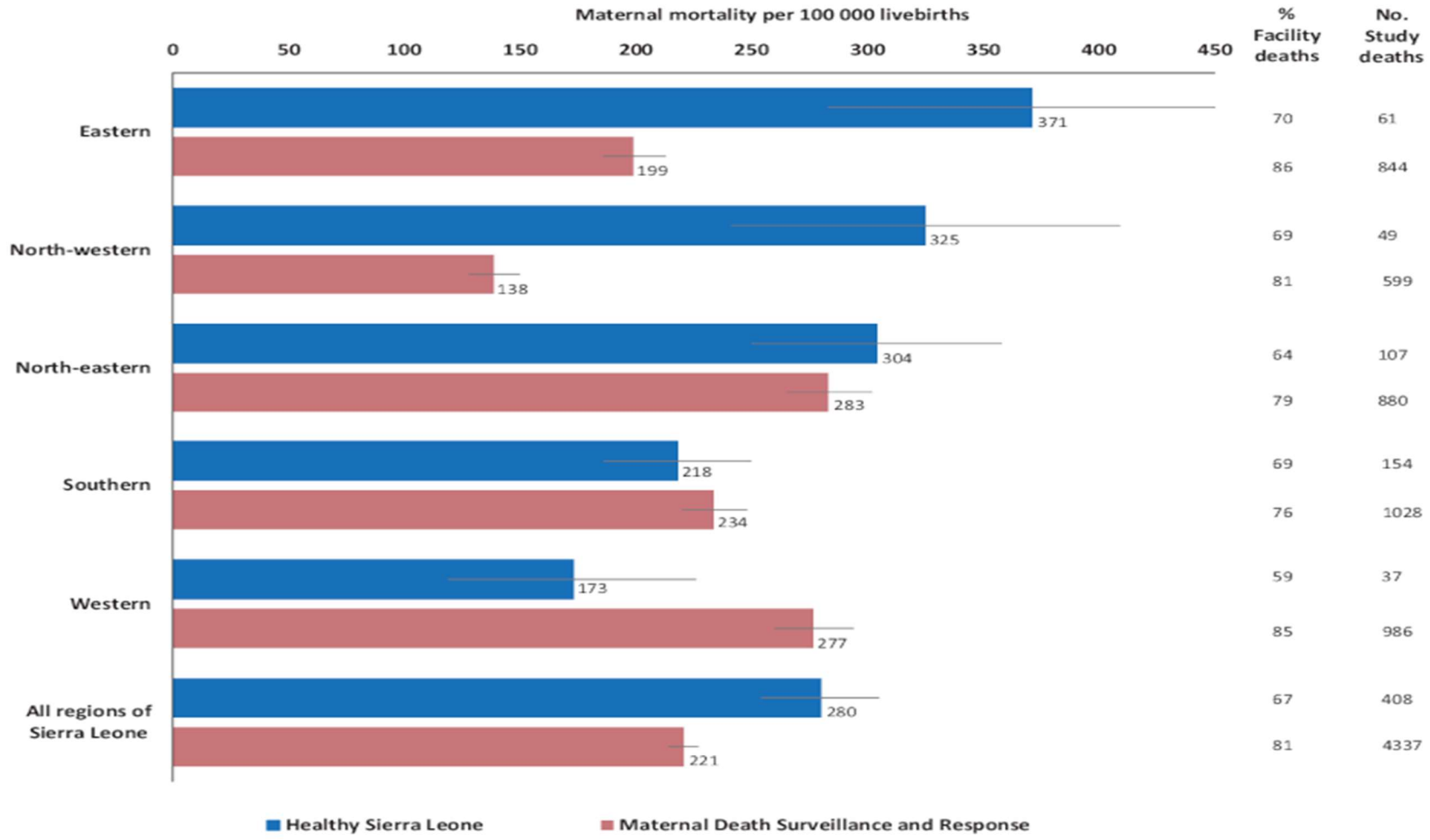
Notes: Enumeration-area-level estimates were derived from maternal deaths among women aged 15–49 years, adjusted using United Nations mortality estimates, and modelled using a Poisson generalized linear geostatistical model with spatial smoothing.

Fig. 2. **Distribution of leading causes of maternal deaths, Sierra Leone, 2018–2020 versus 2023–2024**



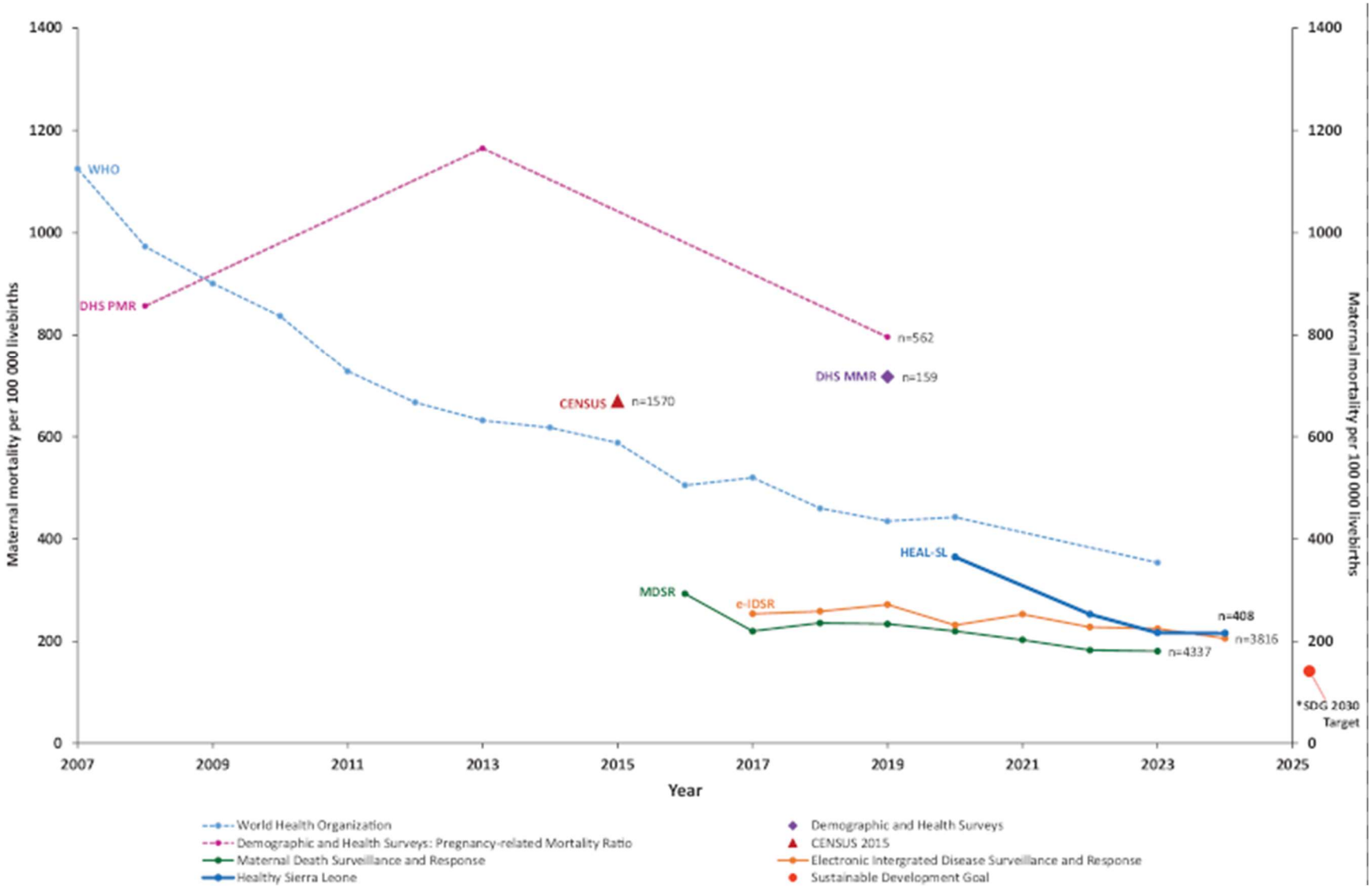
Note: the sample sizes are from Healthy Sierra Leone and numbers of deaths shown in pie chart are derived with World Population Prospects.

Fig. 3. **Maternal mortality ratios, recorded in Healthy Sierra Leone versus the Maternal Death Surveillance and Response system, 2018–2024**



CI: confidence interval.

Fig. 4. **National trends in maternal mortality ratios, Sierra Leone, 2007–2024**



DHS: demographic and health survey; HEAL-SL: Healthy Sierre Leone; SDG: sustainable development goal; WHO: World Health Organization.

Notes: the live birth denominator was adjusted to accurately reflect the maternal mortality ratio estimates for Integrated Disease Surveillance and Response, which captures facility deaths. Numbers on markers represent the total sample of maternal deaths for all survey periods. The WHO trend line is based on the latest WHO model estimates published in 2023 and 2025.[4,25]