DOI 10.26724/2079-8334-2026-1-95-225-231
UDC 616-053.31-056.7:614.1

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GLOBAL TRENDS AND RISK FACTORS OF LOW BIRTH WEIGHT

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Low birth weight, defined as a birth weight below 2500 grams, remains a major global health concern, especially in low- and middle-income countries, where over 95 % of cases with low birth weight occur. This review synthesizes current global and regional trends, prevalence estimates, and associated risk factors for low birth weight based on data from WHO, UNICEF, and peer-reviewed studies. Key determinants include preterm birth, intrauterine growth restriction, maternal undernutrition, anemia, socioeconomic status, and limited access to quality antenatal care. Despite advances in healthcare, progress toward reducing low birth weight has been slow and uneven across regions. The review underscores the need for improved data quality, targeted interventions, and comprehensive maternal health strategies to reduce low birth weight-related mortality and long-term complications. Strengthening perinatal care, improving maternal education, and addressing social determinants are essential steps toward achieving global child health targets.

Key words: low birth weight, neonatal mortality, maternal health, risk factors, socioeconomic determinants.

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ГЛОБАЛЬНІ ТЕНДЕНЦІЇ І ФАКТОРИ РИЗИКУ НИЗЬКОЇ МАСИ ТІЛА ПРИ НАРОДЖЕННІ

Низька маса тіла при народженні, яка визначається як маса тіла новонародженого менше 2500 грамів, залишається серйозною глобальною проблемою охорони здоров'я, особливо в країнах з низьким та середнім рівнем доходу, де реєструється понад 95 % випадків низької маси тіла при народженні. У цьому огляді узагальнюються сучасні глобальні та регіональні тенденції, оцінки поширеності та пов'язані фактори ризику низької маси тіла при народженні на основі даних ВООЗ, ЮНІСЕФ та наукових досліджень, що рецензуються. Ключовими детермінантами є передчасні пологи, затримка внутрішньоутробного розвитку, недостатнє харчування матері, анемія, соціально-економічний статус та обмежений доступ до якісної допологової медичної допомоги. Незважаючи на досягнення у сфері охорони здоров'я, прогрес у зниженні частоти низької маси тіла при народженні залишається повільним та нерівномірним у різних регіонах світу. В огляді наголошується на необхідності покращення якості даних, розробки цільових втручань та впровадження комплексних стратегій охорони здоров'я матері для зниження смертності та довгострокових ускладнень, пов'язаних з низькою масою тіла при народженні. Посилення перинатальної допомоги, підвищення рівня освіти матерів та усунення соціальних детермінантів здоров'я є важливими кроками на шляху до досягнення глобальних цілей охорони здоров'я дітей.

Ключові слова: низька маса тіла при народженні, неонатальна смертність, здоров'я матері, фактори ризику, соціально-економічні детермінанти.

Funding. *This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. The study was conducted at the authors' primary place of work and was funded from their income there.*

Children with low birth weight (LBW), defined as a birth weight of less than or equal to 2499 grams (or 2.49 kg) regardless of gestational age, and preterm births, defined as babies born alive before 37 completed weeks of gestation, account for the majority of neonatal mortality worldwide. It is estimated that in 2020, 13.4 million babies were born preterm (PTB), and 19.8 million were born with LBW [28, 29, 31, 40]. Learning disabilities, as well as visual and hearing impairments, are among the lifelong challenges faced by many children who survive PTB and LBW. Furthermore, with approximately 900,000 deaths in 2019, complications of PTB are considered the leading cause of death among children under five years of age [30].

Out of the 134,767,000 global births in 2020, 55.5 % of live births occurred in South Asia (26.8 %) and sub-Saharan Africa (28.7 %); nevertheless, these two regions accounted for about 65 % of all preterm births worldwide, making preterm birth a truly global health issue. It is believed that current cost-effective treatments could prevent three-quarters of these deaths [29]. Preterm birth rates differ by country and range from 4 % to 16 % of infants born in 2020. There are clear disparities in survival rates across the globe. For example, in low-income countries, half of the babies born at 32 weeks or earlier die due to the lack of practical and accessible care such as warmth, nursing support, and basic treatment for infections and respiratory conditions. In contrast, nearly all of these babies survive in high-income countries. The burden of disability among preterm infants who survive the neonatal period is increasing due to suboptimal use of technologies in low- and middle-income countries [31].

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The purpose of the study was to characterize global and regional trends in the prevalence of low birth weight, analyze associated risk factors—including socioeconomic, demographic, medical, and environmental determinants—and highlight the implications for public health strategies and policy planning, particularly in low- and middle-income countries. The findings aim to support evidence-based interventions to reduce LBW-related mortality and morbidity, and to improve perinatal and maternal healthcare outcomes worldwide.

Materials and methods. This review included studies reporting on preterm birth and/or low birth weight, their prevalence, risk factors, and health outcomes. Studies that did not contain original data or focused on older populations were excluded. Studies were grouped thematically (epidemiology, risk factors, outcomes). The literature was searched in PubMed, Scopus, Web of Science, and Google Scholar databases. Additional sources included WHO registries, UNICEF websites, and reference lists of relevant articles. The last search was conducted in April 2025.

Data collected included: prevalence of preterm birth and LBW, regional stratification, sex, gestational age, survival rates, complications, comorbidities, and socioeconomic determinants.

Included studies were subsequently grouped thematically into the following categories: epidemiology and prevalence, maternal and perinatal risk factors, neonatal outcomes and complications.

For each study, the following characteristics were extracted: study design, population characteristics, geographical region, prevalence estimates, gestational age categories, sex distribution, neonatal outcomes, and associated maternal and socioeconomic risk factors. As most included studies were observational, the risk of bias was assessed using the Newcastle-Ottawa Scale.

Study Selection and Characteristics. The search strategy was developed to capture studies related to low birth weight, preterm birth, prevalence, risk factors, and health outcomes.

Database 1 – PubMed. Search query (verbatim): (“low birth weight” OR “LBW”) AND (“preterm birth” OR “premature birth”) AND (“risk factors” OR “determinants”) AND (“prevalence” OR “epidemiology”) AND (“neonatal outcomes” OR “neonatal mortality”). Filters applied: Humans only, publication years: 2021–2026, English language.

Database 2 – Scopus. Search query (verbatim): TITLE-ABS-KEY (“low birth weight” OR LBW) AND TITLE-ABS-KEY (“preterm birth” OR “premature birth”) AND TITLE-ABS-KEY (“risk factors” OR determinants) AND TITLE-ABS-KEY (“prevalence” OR epidemiology). Filters applied: publication years: 2021–2026**,** article or review.

Database 3 – Web of Science. Search query (verbatim): TS= (“low birth weight” OR LBW) AND TS= (“preterm birth” OR “premature birth”) AND TS= (“risk factors” OR determinants) AND TS= (“prevalence” OR epidemiology) Filters applied: publication years: 2021–2026**,** article or review.

Database 4 – Google Scholar. Search query (verbatim): “low birth weight” AND “preterm birth” AND “risk factors” AND prevalence. Search results were screened manually, and the first 200 most relevant records were evaluated for eligibility.

Additional data sources included: World Health Organization (WHO) Global Health Observatory, UNICEF databases and reports.

PRISMA flow diagram is presented in the figure below (Fig. 1).

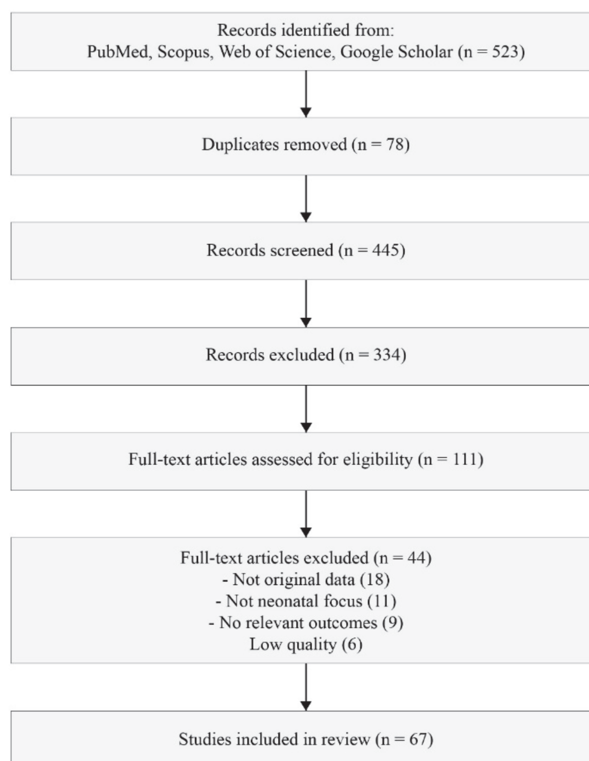

Fig. 1. PRISMA flow diagram.

Results were described using relative risks (RR), percentages, and 95 % confidence intervals. Results were compiled and summarized in tabular form. No meta-analysis was performed, as the primary objective was qualitative synthesis. Findings are presented through descriptive tables and thematic sections. Completeness of reporting was analyzed by comparing results with study protocols, where available. Risk of bias from reporting was assessed qualitatively. The certainty and applicability of the body of evidence were assessed using the GRADE approach.

Results of the study and their discussion. Low birth weight remains a significant public health challenge, associated with increased mortality, developmental delays, and chronic diseases in adulthood. An estimated 20+ million newborns are born with LBW each year, with over 95 % of cases occurring in low- and middle-income countries. The World Health Organization has set a goal to reduce LBW prevalence by 30 % by 2025, contributing to

the achievement of the UN Sustainable Development Goals (Zero Hunger). Despite the growing number of births in medical institutions, data gaps on LBW remain, especially in developing countries. Updated LBW estimates are needed to monitor the global burden, assess program effectiveness, and design strategies to improve maternal and newborn health [17]. Reducing LBW rates and related mortality is key to decreasing child mortality and improving children's health [22].

In 2020, 19.8 million newborns (14.7 % of all births) were affected by LBW. These infants had higher odds of dying in the first month of life, and survivors faced lifelong consequences such as stunted growth, lower IQ, and chronic diseases in adulthood like obesity and diabetes. Progress on reducing low birthweight prevalence has been slow or lacking in all regions. The largest decrease occurred in South Asia, where prevalence dropped by 4.5 percentage points over 20 years (from 29.4 % [credible interval (CrI): 25.9–33.4] in 2000 to 24.9 % [CrI: 21.1–29.8] in 2020). There were small decreases in prevalence from 2000 to 2020 in West and Central Africa, Eastern and Southern Africa, and Europe and Central Asia. Several regions saw either no change or a slight increase in prevalence from 2000 to 2020, including Latin America and the Caribbean, North America, the Middle East and North Africa, and East Asia and the Pacific [38].

Between 2016 and 2021, the average LBW prevalence in the U.S. was 9.31 %, and very low birth weight (VLBW) was 1.50 % [43]. A Japanese study reported an LBW rate of 24 %, with 39 % of full-term LBW infants being small for gestational age [15]. In India, 17.29 % of newborns had LBW, and 6 % were VLBW (<1500 g). Despite economic growth, LBW prevalence remains stable [10]. In Shenzhen (China), the LBW rate was 4.48 %, with 1.65 % of cases in full-term infants [13].

Unlike LBW, preterm birth (PTB) rates have remained largely unchanged over the past decade, while LBW declined slightly by 1.9 percentage points between 2000 and 2020. Both indicators remain highest in South Asia and Sub-Saharan Africa, accounting for 65 % of PTB and 71.6 % of LBW cases. From 2010 to 2020, the average annual reduction rates for PTB and LBW were –0.14 % and 0.3 %, respectively [29].

In 2021, Kazakhstan, Kyrgyzstan, Uzbekistan, and Tajikistan were among 36 countries with high-quality national data used by the UN for child mortality estimation [38]. A multi-country analysis showed that PTB and small gestational age are key risk factors for neonatal mortality. In 23 low- and middle-income countries, 37.6 % of newborns were classified as small (LBW, PT, or SGA), with the highest prevalence in South Asia (52.4 %) and 34.9 % in Sub-Saharan Africa [10]. In Japan, ELBW infant mortality declined from 17.0 % (2005) to 9.8 % (2015) [24].

An analysis of 125.5 million live births in 15 countries showed the highest neonatal mortality risk was among infants born before 28 weeks (median RR 279.5) and those weighing <1000 g (median RR 282.8), underscoring the need to prevent preterm birth and improve perinatal care [33].

The frequency of low birth weight (LBW) and the distribution of preterm newborns by levels of medical care vary between countries. In Germany, the criteria for the highest level of care include a birth weight of <1250 g and a gestational age of <29+0 weeks, whereas international standards more commonly use thresholds of 1250–1500 g and 32+0 weeks. Differences in approaches to classification may influence survival and complication rates in LBW infants; however, only one international guideline provides scientific justification for these thresholds [18].

The frequency of newborns with very low birth weight (VLBW) in the studied perinatal centers in Germany was as follows: 94 % (9300 cases per year) in Level 1 centers (163 centers, median 51 cases per center, range 13–186); 6 % (538 cases per year) in Level 2 centers (49 centers, median 9 cases per center, range 4–28). The total number of VLBW cases per year in the studied centers amounted to 9838 newborns [36, 12].

In 2020, an estimated 19.8 million newborns, representing 14.7 % of all babies born worldwide that year, had low birth weight. These infants were more likely to die within the first month of life, and those who survived faced lifelong consequences, including a higher risk of stunted growth, lower IQ, and chronic diseases in adulthood, such as obesity and diabetes [38].

Low birth weight remains a serious issue associated with a high risk of mortality and long-term health consequences. In 2020, 13.4 million newborns were born preterm, 23.4 million were small for gestational age (SGA), and 1.5 million were both preterm and SGA. More than half of all neonatal deaths were linked to one of these categories. Improving data on LBW requires accurate recording of each newborn's weight and gestational age to enable effective monitoring and targeted interventions [20].

Each year, around 15 million children are born preterm worldwide, and 10.7 million are born at term but with low birth weight (<2500 g) [7]. The frequency of LBW in various regions of Italy increased from 26.9 to 30.2 per 1,000 live births, while in Taranto it remained consistently high – about 42 per 1,000 live births. The incidence of extremely low birth weight (ELBW) in the region ranged from 2.0 to 2.2 per 1,000 live births [35]. The rates of LBW and VLBW by regions are presented in Table 1.

Table 1

Low birth weight (LBW) and very low birth weight (VLBW) rates by region

Country/Region	LBW Rate (%)	VLBW Rate (%)
Global (2020)	14.7	
USA (2016–2021)	9.31	1.5
Japan	24.0	
India	17.29	6.0
Shenzhen (China)	4.48	
Italy	3.02	0.22
Taranto (Italy)	4.2	

LBW is defined as a birth weight under 2500 g, regardless of gestational age, and includes both preterm newborns (<37 weeks) and growth-restricted infants. It is a critical public health indicator, especially in regions where gestational age estimation is difficult. Over 80 % of neonatal deaths occur among LBW infants, with two-thirds being preterm and one-third being full-term but small for gestational age. LBW is linked to higher morbidity, growth delays, and long-term health issues such as cardiovascular disease [5]. LBW is a global health problem tied to high infant morbidity and mortality. Home births and neonatal mortality are associated with a lower likelihood of weighing infants and accurate birth weight reporting. Studies show major gaps in birth weight data, even for institutional births. Maternal education is positively associated with the availability of weight data. High rounding rates point to measurement accuracy issues. Improving birth weight recording, using medical records, and better communication with mothers can enhance data quality [4].

Risk factors include socioeconomic determinants, access to healthcare, maternal education, quality of perinatal care, and newborn registration. Enhanced registration systems, digital scales, and targeted interventions can reduce neonatal mortality and improve outcomes [26]. In Central Asia, infant mortality rate (IMR) analyses show declines, especially in Kazakhstan, but socioeconomic factors such as unemployment and income inequality continue to affect IMR. Investments in healthcare and social equity can further reduce IMR [42]. In Kazakhstan, birth weight's impact on infant mortality was analyzed, showing urban-rural and gender disparities. Higher birth weight had a protective effect. Infants from pregnancies with early-onset preeclampsia had significantly lower birth weights (mean 1565 g) [1, 27].

A study in Košice (Slovakia) linked LBW to social and medical factors like low maternal education, unmarried status, inadequate prenatal care, and preterm birth. Of 1946 newborns, 271 (13.90 %) had LBW. Better healthcare access and awareness can reduce LBW [9]. The “Countdown to 2030” initiative in Kyrgyzstan revealed that full-term SGA infants had 4× higher neonatal mortality risk. Preterm infants had nearly 60× the risk if appropriate for gestational age and 80× if SGA, stressing the need to prevent PTB and improve neonatal care [14].

A Brazilian analysis found that VLBW prevalence ranged from 0.9 % to 1.4 %, with no increasing trend. LBW risk was 2× higher among the poorest households. Despite declining neonatal mortality in <1500 g infants, this group still accounted for 61 % of all neonatal deaths [39].

U.S. data showed that mothers aged 18–35 and white had the lowest LBW (7.63 %) and VLBW (1.17 %) rates. Those ≤18 and Black had the highest rates (15.45 % LBW, 4.70 % VLBW). Maternal age and race/ethnicity significantly influenced LBW risk [43, 8, 6]. A German study found that perinatal center volume did not affect survival in VLBW infants, suggesting that LBW risk factors are multifactorial, including medical and social aspects such as access to specialized care [36].

In Wales (UK), a national birth cohort analysis found LBW risk factors included multiple pregnancy, short birth interval (<1 year), maternal conditions (diabetes, anemia, depression), substance use, and domestic violence. High deprivation increased LBW risk, while living in better-off areas reduced it [3]. Other risk factors include prematurity, multiple pregnancies, hypertensive disorders of pregnancy, fetal growth restriction, maternal underweight, low weight gain, anemia, 37-week delivery, female sex, and congenital anomalies [15]. Additional risks: low maternal BMI, low income, pre-pregnancy hypertension, first-trimester bleeding, gestational diabetes, placental issues, PROM, oligohydramnios [13]. Maternal education and higher wealth index reduce LBW risk [11].

In Switzerland, birth weight varied by region: infants born in German-speaking areas weighed more than those born in French- or Italian-speaking areas. Higher weights were also seen in boys and multiparous mothers. Maternal age <20 or >40 was associated with lower birth weight. Nationality also played a role [21].

Birthweight plays a crucial role in lifelong health, yet its association with maternal serum ferritin during pregnancy remains inconclusive. This cross-sectional study (n=151, Nov 2019–Apr 2020) investigated the prevalence of low birth weight in term infants born to mothers with reduced serum ferritin levels. Results showed a 33.11 % incidence of LBW among this group. The findings highlight the need for iron supplementation, improved maternal nutrition, and antenatal care to reduce perinatal morbidity. Public health strategies should also focus on delaying early pregnancies, ensuring adequate birth spacing, and discouraging consanguineous

marriages [16]. Low birth weight remains a key factor in neonatal survival and child development. Birth data from the Volta Region, Ghana (2019–2023), using the District Health Information Management System. Of 190,385 live births, 15,960 (8.4 %) were LBW, with the highest rate (8.8 %) in 2022. Multiparous mothers accounted for 59.8 % of LBW cases. District-level variation was notable, with Ho and South Dayi reporting the highest rates (12.0 %) and Afadzato South the lowest (2.0 %). These findings underscore the need for targeted interventions to reduce LBW incidence in high-burden areas [19].

Preterm birth and LBW are major global health challenges, contributing significantly to neonatal mortality and long-term complications. LBW infants face increased risks of respiratory distress, infections, feeding difficulties, and developmental delays. Monitoring neonatal mortality, breastfeeding rates, use of kangaroo care, and availability of trained staff and equipment is essential for quality improvement [25].

Low birth weight accounted for 52.4 % of infant deaths in Bandung, Indonesia. This retrospective cross-sectional study analyzed 233 LBW cases from 2022 to identify associated risk factors. Bivariate analysis showed significant associations with preeclampsia, gestational age, PROM, oligohydramnios, multiple pregnancy, and IUGR. Multivariate analysis confirmed preeclampsia, prematurity, PROM, multiple pregnancy, and IUGR as significant predictors of LBW. Oligohydramnios was not statistically significant. Findings underscore the need for early detection and management of maternal complications to reduce LBW incidence and improve neonatal outcomes [32]. This study analyzed policy targets for reducing low birth weight in Indonesia using data from 17,848 live births. Binary logistic regression identified key risk groups: women in urban areas, older age (especially 45–49), never married, low education, unemployment, primiparity, and lower wealth status. These groups showed higher odds of delivering LBW infants. The study recommends focusing policies on these vulnerable populations to effectively reduce LBW incidence [41].

Extremely low birth weight (ELBW) infants pose a major challenge in NICUs due to high risks of mortality and complications. A study conducted at King Abdulaziz Medical City, Riyadh (2017–2020), recorded 256 ELBW infants among 36,000 live births, with a prevalence of 0.71 %. Birth weights <750 g, were linked to twin/triplet pregnancies, while PROM and lower gestational age were associated with weights of 750–1000 g. Maternal age showed a positive correlation with birth weight. The study emphasizes the need for enhanced antenatal care, maternal education, and nutrition to reduce the prevalence of ELBW in Saudi Arabia [2].

Low birth weight contributes to 80 % of neonatal deaths in low- and middle-income countries (LMICs). This study analyzed 343,898 births from 44 LMICs (2015–2022) to estimate regional LBW prevalence and determinants. The overall LBW rate was 13.7 %, Asia region had the highest prevalence at 16 %, followed by Latin America, the Caribbean, and Europe at 11.5 %, and Africa at 9.5 %. Although a slight decline was observed over time, no consistent trend emerged. Key associated factors included maternal age, education, household wealth, healthcare access, prenatal care, and iron supplementation. Targeted maternal and health system interventions are essential to reduce LBW in LMICs [23].

Trends in birth weight among newborns were studied in Japan, with a particular focus on births at 39 weeks' gestation. An analysis of national birth data for 2000, 2010, and 2020 showed that the incidence of LBW babies increased in 2010 but decreased significantly by 2020, although not to the 2000 level. Among first-time mothers who gave birth at 39 weeks, the average birth weight in 2020 was higher than in 2010. These results suggest a recent positive shift in birth weight trends in Japan [34].

Low birth weight is a major health issue in Somalia, contributing to neonatal mortality and long-term health risks. In a 2024 cross-sectional study conducted in hospitals in the Benadir region, LBW prevalence was 17.9 % among 384 newborns. Key associated factors included poor maternal nutrition, anemia, inadequate antenatal care, short birth intervals, and lack of supplementation. Targeted improvements in maternal health, nutrition, and ANC (antenatal care) services are vital to reducing LBW rates [25].

Thus, the results highlight the significant burden of LBW births, with noticeable differences in rates between countries and regions. The study also shows a slight decline in low birth weight over time, although no consistent trend was observed. Importantly, maternal and household factors play a substantial role in the risk of low birth weight. Therefore, addressing these factors through targeted interventions and policies may help reduce the incidence of low birth weight in low- and middle-income countries.

Limitations. This study has several limitations that should be considered when interpreting the findings. First, most of the included studies were observational, which may limit the ability to establish causal relationships between risk factors and low birth weight. Second, substantial heterogeneity existed across studies in population characteristics, study settings, diagnostic criteria, and reported outcomes, which precluded a formal meta-analysis and limited the possibility of quantitative synthesis. Third, the quality and completeness of epidemiological data varied between regions, particularly in low- and middle-income countries where birth registries and perinatal surveillance systems may be incomplete. Finally, publication bias cannot be entirely excluded, as studies with significant findings are more likely to be published and indexed in major databases.

Conclusion

The presented review demonstrates that LBW remains a serious global issue, particularly in low- and middle-income countries. Evidence from multiple studies consistently demonstrates that infants with low birth weight have substantially higher risks of neonatal mortality, respiratory complications, and long-term developmental impairments compared with infants born with normal birth weight. Despite advances in healthcare, the proportion of newborns with LBW remains high and calls for a comprehensive, multisectoral approach. The main risk factors include preterm birth, intrauterine growth restriction, socioeconomic conditions, and maternal health status. Improving maternal care, preventing preterm birth, and supporting women's mental health are vital to reducing LBW prevalence. Regional differences underscore the need for targeted public health actions to close disparities and improve the quality of care. Improving the quality of perinatal care, ensuring accurate data collection, and implementing targeted interventions are crucial for reducing the prevalence of LBW and improving neonatal outcomes. Future research should focus on improving data quality in underrepresented regions and on developing integrated maternal-child health strategies to reduce the global burden of low birth weight and its long-term consequences.

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Conflict of interest. The authors have no conflicts of interest to declare.

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Article received: 11.02.2025.