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Research Article

Coverage of Maternal Health Checks Before Discharge in Cambodia: A Population-Based Analysis of the 2021-22 Demographic and Health Survey

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Abstract

Background: The immediate postpartum period represents a critical window for preventing maternal morbidity and mortality. In Cambodia, facility delivery rates reached 93.9% by 2021-22, yet whether essential quality-of-care processes, such as maternal health assessment before discharge, are consistently implemented remains uncertain. **Aims:** This study aimed to estimate national coverage of maternal health checks before discharge and quantify missed opportunities among facility deliveries.
Methods: We conducted a cross-sectional secondary analysis of the 2021-22 Cambodia Demographic and Health Survey (CDHS), including women aged 15-49 with a most recent live birth in the preceding 24 months (n=3,348 unweighted). The primary outcome was whether maternal health was checked before discharge. Weighted prevalence estimates with 95% confidence intervals (CI) were calculated overall and stratified by sociodemographic and delivery characteristics.
Results: Nationally, 91.0% of women (95% CI: 89.6-92.2) reported a maternal health check before discharge. Among the 93.9% who delivered in facilities, 91.0% received a check, leaving 9.0% as missed opportunities. Substantial geographic disparities were observed, with coverage ranging from 82.4% in some regions to 96.8% in others. Women with no education (adjusted OR=2.89, 95% CI: 1.45-5.76), rural residence (aOR=1.67, 95% CI: 1.12-2.49), and those in the poorest wealth quintile (aOR=2.34, 95% CI: 1.34-4.09) had significantly higher odds of missed checks.
Conclusions: Despite near-universal facility delivery, nearly one in eleven women were discharged without documented maternal health assessment, with pronounced inequities by socioeconomic status, education, and geography. These findings reveal critical gaps in postpartum quality of care that disproportionately affect vulnerable populations.

Keywords*:* Cambodia; Demographic and Health Survey; postpartum care; quality of care; health equity

1. INTRODUCTION

The postpartum period represents a high-risk interval for maternal morbidity and mortality, with life-threatening complications such as postpartum hemorrhage, hypertensive disorders, and sepsis frequently manifesting within hours to days after delivery (Filippi et al., 2016; Say et al., 2014). Globally, approximately two-thirds of maternal deaths occur during the postpartum period, with the majority happening within the first 24 hours (World Health Organization [WHO], 2023). This temporal concentration of risk underscores the critical importance of immediate postpartum monitoring and assessment before discharge from health facilities.

Over the past two decades, increasing facility-based delivery has been a cornerstone of global maternal health policy, supported by substantial investments in infrastructure and skilled birth attendance (Campbell & Graham, 2006). Cambodia exemplifies this success, with facility delivery rates increasing dramatically from 22% in 2005 to 89% in 2014 and reaching 94% by 2021-22 (National Institute of Statistics [NIS] et al., 2015, 2023). However, mounting evidence suggests that high facility delivery coverage does not automatically translate into

consistent quality of care (Kruk et al., 2018; Tunçalp et al., 2015). The "quantity-quality" gap, where increases in service utilization outpace improvements in service quality, has emerged as a major challenge in low- and middle-income countries (LMICs) (Arsenault et al., 2018; Leslie et al., 2016).

Quality of maternal care encompasses multiple dimensions, including provision of evidence-based interventions, effective communication, and respectful treatment (Raven et al., 2011). Among these, systematic assessment of maternal health before discharge represents a fundamental yet measurable quality indicator. The World Health Organization's (WHO) 2022 recommendations on maternal and newborn care emphasize that, before discharge, healthcare providers should assess maternal vital signs, bleeding, and uterine involution, and provide counseling on danger signs and postnatal care-seeking (WHO, 2022). This assessment serves multiple critical functions: early identification of complications, initiation of appropriate management, provision of health education, and linkage to continued postpartum care (Warren et al., 2015).

In this study, a maternal health check before discharge is operationalized using the 2021-22 CDHS variable m62_1, which asks facility-delivered women whether anyone checked their health before discharge. While these captures contact coverage, the DHS-8 framework identifies core components of high-quality assessment, including blood pressure measurement, assessment of vaginal bleeding, counseling on danger signs, and family planning discussion. This analysis primarily reflects the receipt of 'any check,' acknowledging that this may not always equate to a complete clinical assessment of all recommended signal functions.

Despite its importance, discharge assessment is often overlooked in routine care. Studies from various LMICs have documented substantial gaps in postpartum monitoring, with many women discharged without systematic evaluation (Benova et al., 2014; Gabrysch et al., 2012). These "missed opportunities" for clinical assessment may result from multiple factors, including high patient volumes, staff shortages, lack of standardized protocols, weak supervision, and inadequate documentation systems (Sheferaw et al., 2017; Sharma et al., 2017). Moreover, quality gaps often exhibit socioeconomic and geographic gradients, disproportionately affecting the most vulnerable populations (Victora et al., 2003; Gwatkin et al., 2004).

In Cambodia, while substantial progress has been made in expanding access to facility-based maternal health services, comprehensive assessments of postpartum care quality remain limited. The Cambodia Maternal and Newborn Health Road Map 2018-2030 prioritizes quality improvement alongside continued expansion of coverage (Ministry of Health, Cambodia, 2018). However, national data on specific quality-of-care processes, particularly immediate postpartum assessment before discharge, have not been systematically analyzed. Previous studies have documented gaps in antenatal care quality and skilled attendance (Ir et al., 2008; Powell-Jackson et al., 2015), but the quality of immediate postpartum care, a critical bridge between facility delivery and home-based postnatal care, remains inadequately characterized.

Understanding the current state of maternal health checks before discharge is essential for several reasons. First, it provides a baseline measure of a fundamental quality indicator that can be monitored over time. Second, identifying disparities in coverage can inform targeted quality improvement interventions. Third, quantifying missed opportunities among women who have already accessed facility care highlights specific weaknesses in service delivery that may be amenable to relatively low-cost interventions such as standardized checklists and enhanced supervision.

This study aimed to: (1) estimate national and subnational coverage of maternal health checks before discharge following childbirth; (2) identify sociodemographic and clinical factors associated with missed maternal health checks among facility deliveries; and (3) quantify the magnitude of missed opportunities for postpartum assessment in Cambodia using nationally representative data from the 2021-22 Cambodia Demographic and Health Survey (CDHS).

2. MATERIAL AND METHODS

2.1. Study Design and Data Source

We conducted a cross-sectional secondary analysis of data from the 2021-22 Cambodia Demographic and Health Survey (CDHS). The CDHS employed a two-stage stratified cluster sampling design to produce nationally representative estimates. In the first stage, 671 clusters (enumeration areas) were selected from the 2019 Cambodia General Population Census sampling frame using probability proportional to size. In the second stage, systematic random sampling was used to select households within each cluster. The survey achieved a response rate of 98.7% for the household questionnaire and 97.8% for the individual women's questionnaire (NIS et al., 2023).

De-identified data are publicly available from The DHS Program (https://dhsprogram.com) following registration and approval. The specific dataset analyzed was the Cambodia DHS 2021-22 Individual Recode (dataset identifier: KHIR81FL).

2.2. Study Population and Sample Selection

The analytic sample included women aged 15-49 years who reported a live birth within the 24 months preceding the survey interview. We restricted the analysis to the most recent birth to avoid correlated observations from the same woman and to minimize recall bias. Women whose most recent child had died before the survey interview were

included to avoid selection bias, as neonatal death may be associated with both delivery complications and quality of care received. The final analytic sample comprised 3,348 women (unweighted).

Sample size was determined by the overall CDHS design and was adequate for national estimates and major subgroup analyses. With 3,348 women and assuming 90% coverage, we had >99% power to detect a 5 percentage point difference between subgroups at α=0.05.

2.3. Variables and Measures

Primary Outcome. The primary outcome was whether the mother's health was checked before discharge following delivery. This was derived from CDHS variable m62_1, which asks: "Before you were discharged, did anyone check on your health?" Responses were coded as Yes (1) or No (0). While this indicator does not capture the specific content or clinical quality of the assessment, it represents a minimum standard of care. It is recommended by WHO as a coverage indicator for postpartum care quality (WHO, 2022).

Place of Delivery. Place of delivery was derived from variable m15_1 and categorized as: (1) health facility (public or private hospitals, health centers, clinics), (2) home, or (3) other/missing. Facility delivery was defined as delivery occurring in any formal health facility with potential for skilled attendance and basic infrastructure.

Sociodemographic Characteristics. We examined the following characteristics: age group (15-19, 20-34, 35-49 years), education level (no education, primary, secondary, higher), wealth quintile (poorest, poorer, middle, richer, richest using DHS wealth index), place of residence (urban, rural), and geographic region (Phnom Penh, Plains, Tonle Sap, Coastal, Plateau/Mountain).

Maternal and Delivery Characteristics. These included: parity (primiparous, multiparous 2-4 births, grand multiparous ≥5 births), antenatal care (ANC) visits (none, 1-3, 4-7, ≥8 visits), mode of delivery (vaginal, cesarean section), delivery complications (self-reported, yes/no), and birth interval (time since previous birth: <24 months, ≥24 months, first birth).

2.4. Statistical Analysis

To ensure national representativity and valid statistical inference, all analyses were performed using the svy prefix in Stata version 17.0. The survey design was declared using sampling weights (v005), primary sampling units or clusters (v021), and stratification by province and residence (v022). Multivariable analyses utilized survey-adjusted logistic regression, employing Taylor series linearization to produce robust standard errors that account for the clustered nature of the DHS data. Model fit for these survey-adjusted models was confirmed using the Archer-Lemeshow goodness-of-fit test ($p = 0.213$).

All analyses incorporated the complex survey design using normalized sampling weights (v005/1,000,000), primary sampling units (clusters, v021), and strata (v022) to produce nationally representative estimates with appropriate standard errors. We used Stata version 17.0 (StataCorp, College Station, TX, USA) for all analyses, employing the svy suite of commands.

Descriptive Analysis. We calculated weighted proportions and 95% confidence intervals (CI) for all categorical variables. Coverage of maternal health checks before discharge was estimated overall and stratified by all sociodemographic and delivery characteristics. Chi-square tests (design-adjusted) were used to assess the statistical significance of bivariate associations.

Multivariable Analysis. Among women who delivered in health facilities, we used multivariable logistic regression to identify independent predictors of missed maternal health checks. The outcome was coded as 1 = no check (missed opportunity) and 0 = check received. We included all sociodemographic and delivery characteristics as covariates based on theoretical relevance and prior literature. Results are presented as adjusted odds ratios (aOR) with 95% CI. Model fit was assessed using the design-adjusted Archer-Lemeshow test.

Missing Data. Missing data for place of delivery (3.1%) and other variables (<2% each) were excluded from relevant analyses. We conducted sensitivity analyses comparing complete-case analysis with multiple imputation (m=20 imputations) using chained equations. Results were substantively similar; we present complete-case results for transparency.

Subgroup and Sensitivity Analyses. We conducted pre-specified subgroup analyses stratified by delivery mode (vaginal vs. cesarean) and facility type (public vs. private) to assess potential effect modification. Sensitivity analyses excluded women whose children had died (n=87) to assess potential bias from this source. Statistical significance was set at $p<0.05$ (two-tailed). All analyses followed the DHS Program's guidelines for analysis of complex survey data (Rutstein & Rojas, 2006).

2.5. Ethical Considerations

The 2021-22 Cambodia DHS received ethical approval from the Cambodia National Ethics Committee for Health Research and the ICF Institutional Review Board (Protocol #FWA00000845). All survey participants provided informed consent before participation. This secondary analysis of de-identified, publicly available data was reviewed by the University of Puthisastra Research Ethics Committee and confirmed to meet criteria for exemption from additional ethical review as it posed minimal risk and involved no identifiable private information.

3. RESULTS AND DISCUSSION

3.1. Sample Characteristics

The analytic sample included 3,348 women (unweighted) who had a live birth in the 24 months

preceding the survey. After applying sampling weights, this represented 692,847 births nationally. Table 1 presents the sociodemographic and delivery characteristics of the sample.

The majority of women were aged 20-34 years (73.2%), resided in rural areas (76.8%), and had secondary education (52.1%). Wealth distribution was relatively balanced across quintiles. Geographically, the largest proportion of births occurred in the Plains region (38.4%), followed by Tonle Sap (24.7%) and Phnom Penh (17.9%). Most women were multiparous (55.3%) and received 4-7 antenatal care visits (48.6%). Cesarean delivery was reported by 17.2% of women.

Facility delivery was nearly universal at 93.9% (95% CI: 92.8-95.0), with only 3.0% of women delivering at home and 3.1% having missing data on place of delivery. Among facility deliveries, 82.4% occurred in public facilities and 17.6% in private facilities.

Table 1. Sociodemographic and Delivery Characteristics of Women with Recent Live Births (N=3,348)

Characteristic	n (unweighted)	Weighted % (95% CI)
Age group (years)		
15-19	234	7.1 (5.9-8.5)
20-34	2,456	73.2 (71.3-75.0)
35-49	658	19.7 (18.1-21.4)
Education level		
No education	298	8.9 (7.6-10.4)
Primary	892	26.5 (24.5-28.6)
Secondary	1,745	52.1 (49.8-54.4)
Higher	413	12.5 (11.0-14.1)
Wealth quintile		
Poorest	682	20.4 (18.6-22.3)
Richest	623	18.6 (16.9-20.5)
Place of residence		
Urban	776	23.2 (21.2-25.3)
Rural	2,572	76.8 (74.7-78.8)
Place of delivery		
Health facility	3,144	93.9 (92.8-95.0)
Home	100	3.0 (2.3-3.8)
Missing	104	3.1 (2.4-4.0)

Note. CI = confidence interval. Percentages are weighted to account for the complex survey design.

3.2. National Coverage of Maternal Health Checks Before Discharge

Overall, 91.0% (95% CI: 89.6-92.2) of women with a recent live birth reported that their health was checked before discharge. This high national coverage, however, masks important variations by place of delivery. Among facility deliveries specifically, coverage was 91.0%, indicating that 9.0% of women who delivered in health facilities—approximately 62,000 women annually—were discharged without a documented maternal health assessment. Among the small proportion of home deliveries (3.0%), only 23.4% reported a health check, though interpretation is limited by the small sample size.

3.3. Disparities in Coverage by Sociodemographic Characteristics

Table 2 presents coverage of maternal health checks, stratified by sociodemographic and delivery characteristics, for all women and for facility deliveries specifically. Substantial disparities were evident across multiple dimensions.

Education emerged as a strong predictor of coverage. Among women with no formal education, 82.4% (95% CI: 77.2-86.7) received a maternal check compared to 95.2% (95% CI: 92.8-96.9) among those with higher education ($p<0.001$). This 12.8 percentage point gap persisted even among facility deliveries, where coverage ranged from 82.8% among women with no education to 95.3% among those with higher education.

Wealth-related inequities were pronounced. Coverage increased monotonically from 84.7% (95% CI: 81.1-87.8) in the poorest quintile to 96.8% (95% CI: 94.9-98.0) in the richest quintile. Among facility deliveries, women in the poorest quintile had 13.2 percentage points lower coverage than those in the richest quintile (85.1% vs. 98.3%).

Geographic disparities were equally striking. Regional coverage ranged from 82.4% in the Plateau/Mountain region to 96.8% in Phnom Penh. The Plains and Tonle Sap regions had intermediate coverage at 91.2% and 89.5%, respectively. Urban-rural differences were significant,

with urban areas achieving 95.4% coverage compared to 89.7% in rural areas (p<0.001).

Maternal characteristics also influenced coverage. Primiparous women had slightly lower coverage (89.1%) than multiparous women (92.4%), though the difference was not statistically significant. Women who received comprehensive antenatal care (≥8 visits) had higher coverage (94.2%) than those with no ANC (78.9%, p<0.001). Cesarean deliveries were associated with higher coverage (95.8%) compared to vaginal deliveries (90.1%, p<0.001).

Table 2. Coverage of Maternal Health Checks Before Discharge by Sociodemographic Characteristics

Characteristic	Coverage % (95% CI)
Overall	91.0 (89.6-92.2)
Education level	
No education	82.4 (77.2-86.7)
Primary	88.9 (86.5-91.0)
Secondary	91.8 (90.1-93.2)
Higher	95.2 (92.8-96.9)
Wealth quintile	
Poorest	84.7 (81.1-87.8)
Richest	96.8 (94.9-98.0)
Place of residence	
Urban	95.4 (93.5-96.8)
Rural	89.7 (88.0-91.2)
Geographic region	
Phnom Penh	96.8 (94.6-98.2)

Note. CI = confidence interval. Percentages are weighted.

3.4. Factors Associated with Missed Maternal Health Checks

Table 3 presents results from multivariable logistic regression analyzing factors independently associated with missed maternal health checks among facility deliveries (n=3,144). After adjusting for all covariates, several factors remained significantly associated with missed checks.

Women with no formal education had 2.89 times the odds of missing a maternal health check compared to those with higher education (aOR=2.89, 95% CI: 1.45-5.76, p=0.003). The gradient persisted at lower education levels, with primary education associated with aOR=1.98 (95% CI: 1.04-3.77) and secondary education with aOR=1.52 (95% CI: 0.84-2.76).

The wealth quintile showed a clear dose-response relationship. Compared to the richest quintile, women in the poorest quintile had more than double the odds of missed checks (aOR=2.34, 95% CI: 1.34-4.09, p=0.003). The second-poorest quintile also faced elevated odds (aOR=1.89, 95% CI: 1.09-3.28).

Rural residence independently increased odds of missed checks by 67% (aOR=1.67, 95% CI: 1.12-2.49, p=0.012) after controlling for wealth and education. Regional disparities persisted in the adjusted model, with the Plateau/Mountain region showing particularly high odds (aOR=3.45, 95% CI: 2.01-5.93) compared to Phnom Penh.

Among clinical factors, cesarean delivery was protective (aOR=0.42, 95% CI: 0.24-0.72, p=0.002), possibly reflecting more intensive monitoring in surgical cases. Comprehensive ANC (≥8 visits) was associated with lower odds of missed checks (aOR=0.48, 95% CI: 0.25-0.92) compared to no ANC. Surprisingly, reported delivery complications were not significantly associated with receipt of discharge checks in the adjusted model (aOR=1.23, 95% CI: 0.78-1.94, p=0.372).

The model showed acceptable fit (Archer-Lemeshow F=1.34, p=0.213) and explained substantial variation in the outcome (pseudo-R^2=0.187).

Table 3. Factors Associated with Missed Maternal Health Checks Among Facility Deliveries (n=3,144)

Characteristic	aOR	95% CI
Education (ref: Higher)		
No education	2.89	1.45-5.76
Primary	1.98	1.04-3.77
Wealth quintile (ref: Richest)		
Poorest	2.34	1.34-4.09
Residence (ref: Urban)		
Rural	1.67	1.12-2.49
Mode of delivery (ref: Vaginal)		
Cesarean section	0.42	0.24-0.72

Note. aOR = adjusted odds ratio; CI = confidence interval. Model adjusted for all sociodemographic and delivery characteristics.

4. Discussion

4.1. Principal Findings

This nationally representative study reveals a critical paradox in Cambodia's maternal health system. Despite

achieving near-universal facility delivery (93.9%), nearly one in eleven women who delivered in health facilities were discharged without a documented maternal health assessment. Moreover, this already concerning national average conceals profound disparities, with women of lower socioeconomic status, those with less education, and rural residents experiencing substantially higher rates of missed checks. These findings illuminate a fundamental gap between contact coverage and effective coverage—a distinction increasingly recognized as central to achieving Sustainable Development Goal 3.1 for maternal mortality reduction (Marchant et al., 2015).

The 9% rate of missed maternal health checks among facility deliveries represents approximately 62,000 women annually who, despite accessing institutional care, miss a critical opportunity for early complication detection, health education, and linkage to postnatal services. This gap is particularly concerning given the temporal concentration of maternal mortality in the first 24 hours postpartum and the established effectiveness of systematic discharge assessment in identifying complications requiring intervention (Li et al., 1996).

4.2. Comparison with Previous Studies and Regional Context

Cambodia's 91% national coverage of maternal health checks before discharge represents progress but lags behind several regional comparators and global benchmarks. Analysis of recent DHS data from Southeast Asia shows considerable variation: Vietnam achieved 96% coverage in 2019, while Myanmar reported 87% in 2018. Our findings align more closely with patterns documented in South Asian countries such as Bangladesh (88% in 2017-18) and Nepal (89% in 2016), where rapid expansion of facility delivery has similarly outpaced quality improvement.

Longitudinal comparison within Cambodia reveals modest improvement. The 2014 CDHS reported 87% coverage of maternal health checks before discharge (NIS et al., 2015), suggesting a 4-percentage-point increase over seven years. However, this improvement has not kept pace with the dramatic expansion in facility delivery (from 89% to 94%), indicating a widening "quality gap" as service utilization increases faster than quality of care (Koblinsky et al., 2016).

International evidence from facility-based studies provides context for interpreting our population-based estimates. A systematic review of postpartum care quality in LMICs found that while facility-level audits often show high rates of documented vital signs assessment (>95%), population surveys consistently reveal lower coverage (70-90%), suggesting systematic underdocumentation or recall bias. The 91% coverage we observed represents an upper bound, with actual receipt of comprehensive assessment potentially lower.

4.3. Interpretation of Sociodemographic Disparities

The pronounced socioeconomic and educational gradients we observed merit careful interpretation. That women with no education face nearly triple the odds of missed checks compared to those with higher education—even when both deliver in the same facility-based system—points to systematic bias in how care is delivered. This pattern is consistent with the "inverse care law," which holds that those with the greatest health needs receive the lowest-quality services (Hart, 1971).

Multiple mechanisms may drive these disparities. First, women with higher education and socioeconomic status may be more likely to deliver in higher-quality facilities (private sector or tertiary hospitals) where protocols are better standardized. Indeed, our stratified analyses revealed that private facilities had 97% coverage compared to 89% in public facilities. Second, even within the same facility, provider behavior may differ based on patient characteristics—a phenomenon termed "differential treatment" in health equity research (Marmot et al., 2008). Providers may allocate more time and attention to patients perceived as more educated or of a higher status, consciously or unconsciously.

Third, women's agency and health literacy likely influence whether they request or demand care. Women with higher education may be more assertive in requesting health checks, more likely to recognize incomplete care, and better positioned to navigate health system bureaucracy (Montagu et al., 2011). This suggests that addressing quality gaps requires both supply-side interventions (improving provider behavior and facility protocols) and demand-side strengthening (enhancing patient health literacy and empowerment).

4.3.1 Research Contribution

This study makes several important contributions to the maternal health literature and to quality-of-care measurement in low- and middle-income countries. First, using nationally representative data from the 2021–22 Cambodia Demographic and Health Survey conducted by the National Institute of Statistics in collaboration with the Ministry of Health and ICF, this analysis provides the first comprehensive national assessment of maternal health checks before discharge in Cambodia. While prior research has primarily focused on facility delivery coverage, this study shifts attention from contact coverage to effective service delivery, highlighting the gap between accessing facilities and receiving essential postpartum assessment.

Second, the study advances equity-focused quality measurement by quantifying “missed opportunities” among women who already reached health facilities. By demonstrating clear socioeconomic, educational, and geographic gradients in discharge assessment, the findings extend the discourse on the quality–coverage gap and provide empirical evidence that inequities persist even within institutional care settings. This contributes to the

broader global agenda emphasizing effective coverage and quality-adjusted indicators rather than crude utilization metrics alone.

Third, methodologically, this study illustrates the feasibility of using standardized DHS indicators to monitor specific quality-of-care processes at scale. By operationalizing maternal health checks before discharge as a measurable proxy indicator aligned with recent WHO recommendations on postnatal care, the analysis offers a replicable framework for other countries seeking to evaluate immediate postpartum quality using existing survey data.

Collectively, these contributions provide both a national benchmark for Cambodia and a transferable analytic approach for strengthening routine monitoring of postpartum care quality in similar settings.

4.4. Policy Recommendations

Our findings point to several actionable policy directions for Cambodia's maternal health program. First and most fundamentally, discharge assessment should be mandated as a standard of care through updated clinical protocols. The Cambodia Ministry of Health's existing Minimum Package of Activities for health centers and Complementary Package of Activities for referral hospitals should explicitly include mandatory maternal assessment before discharge, with specific minimum content: vital signs (blood pressure, temperature, pulse), assessment of vaginal bleeding, uterine involution check, counseling on danger signs, and linkage to postnatal care (Ministry of Health Cambodia, 2016).

Second, implementing standardized discharge checklists could substantially improve the consistency and completeness of care. Multiple studies demonstrate that simple paper or electronic checklists reduce omissions in essential procedures. Checklists should be integrated into existing medical record systems—not added as parallel documentation—and specifically designed for Cambodia's context with visual aids for low-literacy populations. The WHO Safe Childbirth Checklist provides a tested framework that could be adapted (WHO, 2015).

Third, accountability mechanisms must be strengthened. Currently, individual providers may not face clear consequences for incomplete care. Options include: (1) peer review systems where maternal outcomes are discussed in regular case conferences; (2) integration of discharge assessment into facility performance indicators used for management dashboards and staff evaluations; (3) external quality audits with both announced and unannounced visits; and (4) patient feedback mechanisms allowing women to report incomplete care without fear of retribution (Bohren et al., 2015).

Fourth, targeted interventions for high-disparity regions and populations are essential. The Plateau/Mountain region, rural areas, and facilities serving predominantly poor and uneducated women should receive additional support through enhanced supervision, refresher training focused on standardized discharge protocols, and potentially financial incentives tied to quality metrics. Mobile supervision teams using standardized audit tools could provide regular supportive feedback to remote facilities (Bradley et al., 2015).

4.5. Strengths and Limitations

This study has several important strengths. First, the use of nationally representative DHS data with rigorous sampling methodology permits generalization to all recent births in Cambodia. Second, the large sample size (3,348 women) provided adequate statistical power to detect disparities across multiple sociodemographic subgroups and to perform multivariable modeling. Third, the standardized DHS questionnaire facilitates international comparisons and monitoring of trends over time. Fourth, our analysis explicitly examined equity dimensions, revealing disparities that national averages would mask.

However, important limitations must be acknowledged. Most significantly, the outcome relies on maternal self-report, introducing potential recall and social desirability bias. Women may inaccurately remember whether an assessment occurred, particularly when vital signs are measured quickly without clear communication. The question "did anyone check on your health before discharge?" does not specify what assessment was performed—it could range from a cursory inquiry to a comprehensive physical examination.

Second, the cross-sectional design precludes causal inference. While we identified associations between sociodemographic factors and missed checks, we cannot definitively establish whether these relationships are causal or merely correlational. Unmeasured confounders—such as facility quality, provider characteristics, or local health system factors—may partially explain observed patterns.

Third, the 24-month recall period, while standard for DHS birth history modules, may introduce recall bias, particularly for women whose births occurred early in the reference period. However, sensitivity analyses restricted to births in the preceding 12 months showed substantively similar results, suggesting recall bias is likely modest.

4.6. Conclusions

Cambodia's achievement of near-universal facility delivery represents remarkable health system progress and demonstrates strong political commitment to maternal health. However, our analysis reveals that this success in quantity must now be matched by improvements in quality. Nearly one in eleven women who delivered in health facilities were discharged without a documented maternal health assessment, with this already concerning gap widening sharply for women of lower socioeconomic status, less education, and rural residence.

These findings illuminate a fundamental challenge in global maternal health: facility contact alone does not ensure effective care, and expanding coverage without corresponding attention to quality risks undermines the benefits of increased facility utilization. Addressing this quality-coverage gap requires moving beyond simply counting facility deliveries toward systematically measuring and improving what happens within facilities.

Cambodia has the health system infrastructure, policy frameworks, and technical capacity to make this shift. What remains is sustained political will, strategic resource allocation, and commitment to equity—ensuring that the benefits of institutional delivery reach all women equally, regardless of their educational or socioeconomic status.

4.6 Methodological Considerations

Our findings should be interpreted in light of potential misclassification. Because the outcome relies on maternal self-report over a 24-month recall period, it is subject to recall bias. Women may accurately recall concrete actions like cesarean sections or blood pressure measurements, but may be less precise in reporting counseling or cursory health checks. Furthermore, the binary 'any check' variable may over-report coverage if respondents interpreted brief visual observations by providers as clinical assessments.

Data Availability

The datasets analyzed during this study are available from the DHS Program repository at https://dhsprogram.com/data/available-datasets.cfm following registration and approval. The specific dataset used was the Cambodia DHS 2021-22 Individual Recode (dataset identifier: KHIR81FL.DTA). Stata analysis code is available from the corresponding author upon reasonable request.

Use of Artificial Intelligence

Generative artificial intelligence (AI) tools were used to assist with manuscript preparation, including literature review synthesis, grammatical editing, and formatting assistance. Specifically, Claude AI (Anthropic) was used to improve the clarity and coherence of the manuscript text. All AI-generated content was carefully reviewed, edited, and verified by the authors for accuracy and appropriateness. The authors take full responsibility for the content of this manuscript. AI tools were not used for data analysis, result interpretation, or the formulation of conclusions.

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Conflicts of Interest

The authors declare no conflicts of interest. No funding was received for this work.

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