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Household-reported non-completion of childhood vaccination inTogo: sociodemographic and consumption-related patterns in EHCVM 2021–2022 A cross-sectional secondary analysis of a national living standards survey

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Abstract

Background

Assessing household reports of childhood vaccination may reveal equity-related patterns, but such reports must not be mistaken for age-appropriate vaccination status. We investigated sociodemographic and consumption-related correlates of respondents' answers to a broad vaccination-completion question among children aged 12–59 months in Togo, and described the stated reasons for negative answers.

Methods

We analysed the 2021–2022 EHCVM using a two-category respondent-reported outcome (yes/no to receipt of all compulsory vaccines), survey-weighted descriptive estimates and multivariable logistic regression. Covariates included child age and sex, maternal schooling, household head characteristics, region, residence, survey wave and five national per capita consumption quintiles. The survey item contains no verified antigen- or dose-specific histories and does not permit age-appropriate under-vaccination to be identified. Six maternal education codes were recategorised after investigator clarification; exclusion of these records was assessed in a sensitivity analysis.

Results

Among 3,173 resident children aged 12–59 months, 790 had a negative household response (survey-weighted 24.1%, 95% CI 21.8–26.5). This percentage represents reported non-completion, not verified under-vaccination. Compared with children aged 48–59 months, those aged 12–23 months had higher adjusted odds of a negative response (aOR 4.00, 95% CI 2.94–5.43); Q2 versus Q5 consumption was also associated (aOR 2.07, 95% CI 1.31–3.27). Overall tests were p = 0.002 for consumption quintile, p = 0.133 for region and p = 0.393 for maternal schooling. Among children with a negative response, 81.2% (weighted) selected 'not yet reached the age limit'; this response cannot establish that a dose was overdue.

Conclusions

Around one in four children received a negative household report of receipt of all compulsory vaccines, but the estimate cannot be interpreted as the prevalence of age-inappropriate or overdue vaccination. The strong age pattern and frequent age-limit response make validation against the national schedule and dated vaccination records essential before inferring true gaps. Consumption-related differences describe reporting patterns and should be regarded as exploratory rather than causal or programmatically diagnostic.

Clinical trial registration

Not applicable. This observational secondary analysis did not allocate interventions and is not a clinical trial.

Background

Immunisation reduces illness and deaths from vaccine-preventable diseases and is central to the equity objectives of Immunization Agenda 2030 [1]. In Togo, routine vaccination includes birth doses, a primary infant series at 6, 10 and 14 weeks, a visit at 9 months and a second-year-of-life visit at 15 months [8]. National monitoring indicators provide useful context but measure specific doses rather than household judgments of 'all compulsory vaccines'. For 2022, WHO/UNICEF-linked country indicators reported DTP3 coverage of 82% and first-dose measles coverage of 71%; these should not be directly compared with the EHCVM completion item [12].

Earlier empirical work from Togo and neighbouring countries has identified economic, educational and geographical disparities in routine immunisation, although associations vary by setting and outcome. A 2017 survey of 1,261 Togolese households reported 72.3% full immunisation among children aged 12–23 months and found associations with maternal schooling, household income, vaccination-card availability and travel time [9]. A 13-country West African DHS analysis found that vaccine-card possession, recent contact with health services and some socioeconomic factors were associated with complete childhood vaccination, but no single predictor was consistent across all countries [10]. Research from Benin also found wealth- and residence-related inequalities [11]. These studies generally use age- or antigen-defined outcomes and commonly employ household asset-wealth measures or other resource indicators, limiting direct comparison with the present EHCVM consumption-expenditure measure.

Togo's national routine programme during the survey period included a 15-month visit; that policy fact makes age-at-assessment particularly important. The 2021 schedule was explicitly set out by the national Expanded Programme on Immunization [8]. In consequence, 'complete' cannot be interpreted without specifying which doses were already due, while a household respondent may reasonably understand completion as reaching the end of the entire schedule.

The Togo EHCVM 2021–2022 links a broad respondent-reported vaccination item to nationally comparable household consumption expenditure and demographic characteristics [4]. This combination adds a complementary perspective on *reported* completion and on how respondents explain negative answers; it does not supply a validated vaccination register. Our objective was to describe the proportion of negative reports among children aged 12–59 months and their associations with age, household consumption and contextual factors, while explicitly examining why the questionnaire cannot quantify age-appropriate under-vaccination, zero-dose status or delayed vaccination.

Methods

Study design and survey setting

We performed a cross-sectional secondary analysis of the Togo Enquête harmonisée sur les conditions de vie des ménages (EHCVM) 2021–2022, implemented by INSEED with support from UEMOA and the World Bank [4]. The two-stage design sampled 540 enumeration areas and approximately 12 households per area, with fieldwork in October 2021–January 2022 and April–July 2022. Different halves of the household sample participated in the two waves to represent seasonal variation; children were not followed longitudinally. During this period Togo's routine schedule included BCG and oral polio at birth; pentavalent, oral polio, pneumococcal and rotavirus series from 6 to 14 weeks; measles-rubella, yellow fever and inactivated polio at 9 months; and measles-rubella dose 2 plus meningococcal A vaccine at 15 months [8]. Therefore children aged 12–14 months could legitimately be awaiting scheduled 15-month vaccines.

Vaccination outcome

The primary variable was the household respondent's answer to EHCVM health item s03q52: 'Has [name] received all compulsory vaccines (BCG, DTC1, DTC2, …)?' [4]. Code 1 ('yes') was treated as a positive *reported-completion* response and code 2 ('no') as a negative *reported-completion* response. Both are reports, not validated vaccine-status categories. Neither a vaccination card nor dose dates, dose-by-dose antigen history or exact due dates are available in this analytical outcome; consequently, a 'no' response alone cannot identify a genuinely overdue child, a child who is simply younger than the next scheduled dose, or a zero-dose child. Throughout, the outcome is called 'household-reported non-completion', not confirmed incomplete or age-inappropriate vaccination.

For children whose answer to s03q52 was 'no', item s03q53 asked for one principal reason and offered five coded answers: (1) not yet reached the age limit, (2) no vaccination campaign, (3) unaware, (4) no health facility and (5) does not want vaccination [4]. The reason wording is a respondent interpretation and cannot determine whether a vaccine was actually due. In the analysed 12–59-month cohort, all 790 negative reports had a recorded reason. The 'age-limit' response was not automatically reclassified as vaccinated or as delayed: it may be appropriate for some 12–14-month-olds awaiting the 15-month visit but cannot be verified without child age in months and dated antigen-specific records.

Sociodemographic and economic variables

Child age was measured in completed years and grouped as 12–23, 24–35, 36–47 and 48–59 months (1, 2, 3 and 4 completed years). The model also contained child sex; urban versus rural residence; Grand Lomé, Maritime, Plateaux, Centrale, Kara and Savanes; maternal education; sex, age, schooling and previous-seven-day employment of the household head; household size; five national per capita

consumption quintiles; and survey wave. Maternal and head education were each classified as none/preschool, primary, and secondary or higher. Household-head age was grouped as < 35, 35–49 and > = 50 years, and household size as 1–4, 5–7 and > = 8 members. 'Household head' is a roster role, not necessarily the father or mother of the child.

The co-resident mother's record refers to an individual linked to the child through household roster identifiers, rather than simply to a female household head. When this link was not available, the child's roster information was used to obtain maternal education. Six values originally coded 'does not know' were assigned to none/preschool after an investigator-supplied clarification that these mothers had not attended school. This assignment is *not* derivable from the original response code; the supporting documentation for that clarification was not available for independent checking in the materials supplied for this revision. We therefore report it transparently and show results excluding the six children. Confirmation of the original clarification source is required before final submission.

Annual household consumption expenditure per person, rather than an asset-based wealth index or income, was used to construct national quintiles. All households in the welfare file were ranked using a person-weighted measure (household weight multiplied by household size), and children were assigned their household category. The five categories were Q1 poorest, Q2 poorer, Q3 middle, Q4 richer and Q5 richest. National quintile cut-points do not imply that exactly 20% of children in the analytic sample belong to each category.

Statistical analysis

Unweighted sample counts and survey-weighted percentages with 95% confidence intervals were calculated. Household weights were attached to child observations. The survey variance approximation used the 540 released enumeration areas as primary sampling units, including clusters with no eligible children, and 11 reconstructed region-by-residence strata. Taylor linearisation with replacement was used without a finite population correction (529 design degrees of freedom). The reconstructed strata are an approximation to the unreleased original design. Where more than one child belonged to a household, their within-household dependence was included within the same enumeration-area cluster contribution; no separate household random effect was fitted.

We used survey-weighted logistic models with both unadjusted odds ratios (ORs) and mutually adjusted ORs (aORs). The adjusted model entered the prespecified variables simultaneously; no selection based on bivariable p values was used. Adjusted multi-category associations were examined using joint design-based Wald F tests, with individual coefficient tests treated as exploratory and no correction for multiple comparisons. The model included both maternal and household-head education because they represent potentially different people and roles; however, in households where the mother is also the head, the two measures may overlap. The available computational checks established full model-matrix rank, but formal variance-inflation diagnostics or a model omitting head education were not available for independent verification in this revision; residual collinearity is therefore acknowledged.

Predictive margins for consumption categories were obtained by averaging fitted probabilities over a common survey-weighted covariate distribution [6]. The additional original sensitivity analyses excluded the six maternal-schooling assignments, omitted maternal education, substituted a poverty-status indicator for quintiles and removed reconstructed strata from the variance approximation. No age-appropriate reclassification, exclusion of 'age-limit' reasons, 24–59-month-only regression or refitted model could be verified from the supplied tabular outputs; these additional checks are needed before the outcome is interpreted as a measure of under-vaccination. Original computations used Python 3.12.14, NumPy 2.3.5, pandas 2.2.3 and SciPy 1.17.0.

Results

Participants and reported vaccination

From 3,179 children aged 1–4 completed years in linked records, six non-residents were excluded, leaving 3,173 resident children from 2,439 households in 535 enumeration areas. All had a valid binary s03q52 answer. The available statistical output includes 790 negative responses and 2,383 positive responses; the primary reported regression used all 3,173 children after the documented investigator reclassification of six maternal-education codes. Table 1 describes the observed distribution. These are retrospective results from the source analysis, not recomputed estimates of schedule-defined under-vaccination.

Table 1
Distribution of children and household-reported non-completion of vaccination by characteristics

Characteristic	n	Weighted share %	Negative report % (95% CI)	Global p value
All children	3173	100.0	24.1 (21.8–26.5)	
Child age				**< 0.001**
12–23 months	692	21.2	43.5 (38.9–48.3)	
24–35 months	741	24.3	21.3 (17.5–25.6)	
36–47 months	922	28.2	18.8 (15.6–22.4)	
48–59 months	818	26.3	16.8 (13.5–20.7)	
Child sex				**0.759**
Male	1583	49.2	24.4 (21.6–27.3)	
Female	1590	50.8	23.9 (21.1–26.8)	
Residence				**0.178**
Urban	889	35.2	21.8 (17.8–26.4)	
Rural	2284	64.8	25.4 (22.7–28.2)	
Region				**0.046**
Grand Lomé	355	20.8	18.0 (12.6–25.2)	
Maritime	436	17.3	24.1 (18.8–30.3)	
Plateaux	583	22.0	24.2 (19.6–29.6)	
Centrale	437	10.4	22.3 (17.0–28.7)	
Kara	628	13.8	31.6 (26.5–37.3)	
Savanes	734	15.6	26.6 (22.0–31.8)	
Maternal education				**0.115**
None	1388	39.3	26.8 (23.5–30.4)	
Primary	884	29.5	22.8 (18.9–27.3)	
Secondary or higher	901	31.1	21.9 (18.5–25.8)	
Gender of household head				**0.488**
Male	2712	85.1	23.8 (21.4–26.4)	

CIs are survey-design-based 95% intervals.

Characteristic	n	Weighted share %	Negative report % (95% CI)	Global p value
Female	461	14.9	25.6 (21.1–30.7)	
Age of household head				**0.049**
Under 35 years	972	30.4	25.0 (21.4–28.9)	
35–49 years	1528	48.7	25.7 (22.3–29.5)	
50 years or older	673	20.9	19.1 (15.4–23.4)	
Education of household head				**0.003**
None or preschool	1144	30.8	26.9 (23.5–30.7)	
Primary	844	28.0	27.7 (22.9–33.0)	
Secondary or higher	1185	41.2	19.5 (16.5–22.9)	
Household size				**0.085**
1–4 members	796	27.3	21.3 (18.0–24.9)	
5–7 members	1621	49.1	24.2 (21.2–27.5)	
8 or more members	756	23.6	27.2 (22.2–32.8)	
Employment of household head				**0.552**
Not employed	172	5.4	21.2 (13.2–32.2)	
Employed	3001	94.6	24.3 (22.0–26.7)	
Consumption quintile				**< 0.001**
Q1, poorest	921	25.2	23.3 (19.6–27.5)	
Q2, poorer	739	22.9	32.0 (27.1–37.4)	
Q3, middle	613	20.7	22.0 (18.1–26.6)	
Q4, richer	566	18.5	22.5 (18.2–27.4)	
Q5, richest	334	12.6	17.1 (12.7–22.6)	
CIs are survey-design-based 95% intervals.				

The survey-weighted prevalence of a negative s03q52 response was 24.1% (95% CI 21.8–26.5; unweighted n = 790/3,173). It was higher at ages 12–23 months (43.5%) than at ages 48–59 months (16.8%). Across regions it ranged from 18.0% in Grand Lomé to 31.6% in Kara; Q2 households had 32.0%

negative reports, versus 23.3% in Q1 and 17.1% in Q5. These are differences in how completion was reported, not verified differences in doses overdue for age.

Adjusted associations

For the broad respondent-reported outcome, negative reporting was more common at 12–23 than at 48–59 months (aOR 4.00, 95% CI 2.94–5.43; Table 2). The overall consumption-quintile test was p = 0.002, driven in part by a higher adjusted odds estimate for Q2 compared with Q5 (aOR 2.07, 95% CI 1.31–3.27). Primary versus secondary-or-higher education of the household head had an aOR of 1.57 (95% CI 1.13–2.19), and head age > = 50 versus 35–49 years had an aOR of 0.64 (95% CI 0.44–0.94). These coefficients were not re-estimated against an age-appropriate dose endpoint.

Table 2
Survey-weighted logistic regression of household-reported non-completion (not confirmed overdue vaccination)

Characteristic / category	Crude OR (95% CI)	Adjusted OR (95% CI)	Contrast p	Global p
Child age				**< 0.001**
12–23 months	3.82 (2.81–5.20)	4.00 (2.94–5.43)	< 0.001	
24–35 months	1.34 (0.95–1.88)	1.36 (0.97–1.92)	0.075	
36–47 months	1.15 (0.86–1.53)	1.16 (0.87–1.55)	0.309	
48–59 months	1.00 (reference)	1.00 (reference)		
Child sex				**0.781**
Male	1.00 (reference)	1.00 (reference)		
Female	0.97 (0.81–1.16)	1.03 (0.85–1.24)	0.781	
Residence				**0.096**
Urban	1.00 (reference)	1.00 (reference)		
Rural	1.22 (0.91–1.63)	0.75 (0.54–1.05)	0.096	
Region				**0.133**
Grand Lomé	1.00 (reference)	1.00 (reference)		
Maritime	1.44 (0.85–2.44)	1.64 (0.92–2.92)	0.094	
Plateaux	1.45 (0.88–2.41)	1.56 (0.88–2.75)	0.126	
Centrale	1.31 (0.76–2.25)	1.29 (0.69–2.41)	0.426	
Kara	2.10 (1.28–3.45)	2.08 (1.20–3.60)	0.010	
Savanes	1.65 (1.00–2.70)	1.71 (0.95–3.09)	0.073	
Maternal education				**0.393**
None or preschool	1.30 (1.00–1.70)	0.96 (0.69–1.32)	0.786	
Primary	1.05 (0.78–1.42)	0.82 (0.61–1.11)	0.196	
Secondary or higher	1.00 (reference)	1.00 (reference)		
Sex of household head				**0.141**
Male head	1.00 (reference)	1.00 (reference)		

All adjusted variables are included simultaneously.

Characteristic / category	Crude OR (95% CI)	Adjusted OR (95% CI)	Contrast p	Global p
Child age				**< 0.001**
Female head	1.10 (0.84–1.45)	1.26 (0.93–1.72)	0.141	
Age of household head				**0.035**
Under 35 years	0.96 (0.74–1.24)	1.02 (0.78–1.33)	0.891	
35–49 years	1.00 (reference)	1.00 (reference)		
50 years or older	0.68 (0.49–0.94)	0.64 (0.44–0.94)	0.022	
Education of household head				**0.024**
None or preschool	1.52 (1.15–2.01)	1.38 (0.98–1.94)	0.062	
Primary	1.58 (1.16–2.16)	1.57 (1.13–2.19)	0.008	
Secondary or higher	1.00 (reference)	1.00 (reference)		
Household size				**0.205**
1–4 members	1.00 (reference)	1.00 (reference)		
5–7 members	1.18 (0.91–1.53)	1.11 (0.85–1.46)	0.452	
8 or more members	1.38 (1.03–1.86)	1.37 (0.97–1.93)	0.075	
Employment of household head				**0.820**
Not employed	0.84 (0.47–1.49)	0.93 (0.48–1.80)	0.820	
Employed	1.00 (reference)	1.00 (reference)		
Consumption quintile				**0.002**
Q1, poorest	1.47 (0.98–2.20)	1.18 (0.74–1.88)	0.481	
Q2, poorer	2.28 (1.50–3.46)	2.07 (1.31–3.27)	0.002	
Q3, middle	1.37 (0.89–2.09)	1.24 (0.79–1.94)	0.358	
Q4, richer	1.40 (0.93–2.11)	1.36 (0.89–2.08)	0.156	
Q5, richest	1.00 (reference)	1.00 (reference)		
Survey wave				**0.281**
Wave 1	1.00 (reference)	1.00 (reference)		
Wave 2	0.91 (0.71–1.17)	0.87 (0.66–1.13)	0.281	
All adjusted variables are included simultaneously.				

The omnibus adjusted regional association was not statistically clear (joint p = 0.133), despite a higher exploratory contrast for Kara versus Grand Lomé (aOR 2.08, 95% CI 1.20–3.60). Maternal schooling also showed no clear overall adjusted association (joint p = 0.393). The rural-versus-urban estimate included the null (aOR 0.75, 95% CI 0.54–1.05). Such findings should not be interpreted as reliable determinants of confirmed missed vaccinations when the primary outcome may misclassify children who are up to date for age.

Reported reasons and standardised probabilities

Among the 790 children with a negative report, 663 respondents selected 'not yet reached the age limit' (survey-weighted 81.2%; Table 3). The remaining unweighted counts were 32 for no campaign, 42 for unawareness, 13 for no facility and 40 for unwillingness (127 in total across these four categories). Thus the predominant reason concerns perceived eligibility or timing rather than a verified missed vaccine. These reason categories cannot be used to validate an overdue dose or to redefine the outcome without child-month-specific and dose-specific information.

Table 3
Principal reported reasons among children with a negative vaccination-completion response

Respondent category	n	Weighted % (95% CI)
Not yet reached the age limit	663	81.2 (76.3–85.4)
No vaccination campaign	32	4.6 (2.9–7.4)
Unaware	42	5.9 (3.9–8.8)
No health facility	13	1.7 (0.7–4.5)
Does not want vaccination	40	6.5 (3.7–11.3)

The reported model-standardised probability of a negative response was 21.5% for Q1, 31.5% for Q2, 22.3% for Q3, 23.8% for Q4 and 19.1% for Q5 (Table 4). The Q5-minus-Q1 difference was − 2.5 percentage points (95% CI -9.3 to 4.4; p = 0.476).

Table 4
Model-standardised probability of a negative household vaccination-completion response by consumption quintile

Consumption quintile	Incomplete % (95% CI)
Q1, poorest	21.5 (17.8–25.8)
Q2, poorer	31.5 (26.6–36.7)
Q3, middle	22.3 (18.5–26.6)
Q4, richer	23.8 (19.5–28.8)
Q5, richest	19.1 (14.3–25.0)

Discussion

This analysis describes negative household responses to a general question on receipt of 'all compulsory vaccines' among 3,173 Togolese children. It does not estimate the proportion who missed an age-due dose. The distinction is pivotal: the observed 24.1% and its regression associations may be shaped by how respondents interpreted the national schedule. The findings are therefore useful as a measure of the limitations and equity-related patterns of reported completion, but insufficient to establish the burden or determinants of actual incomplete vaccination.

The strongest contrast concerned child age: 43.5% of children aged 12–23 months had a negative report compared with 16.8% at 48–59 months. Togo's 2021 routine schedule delivered measles-rubella dose 2 and meningococcal A vaccine at 15 months [8]. Children aged 12–14 months who had received all earlier doses could thus be correctly up to date for age yet reported not to have received 'all compulsory vaccines'. Completed-year age bands cannot identify these children individually. Moreover, the very high frequency of the 'not yet reached the age limit' answer suggests a timing interpretation for many households, but cannot prove either timely protection or actual delay. A valid analysis of missed vaccination requires documented antigen and dose dates, exact age and the birth-cohort-appropriate schedule; neither blanket reclassification of this reason nor its automatic retention as true incomplete vaccination is defensible.

The unusual consumption pattern should be interpreted in relation to the measurement instrument. Q2 rather than Q1 had the highest probability of a negative report. Unlike the wealth-asset scores frequently used in Demographic and Health Surveys, EHCVM consumption per person is an expenditure-based indicator that can vary with household composition and recent economic conditions. A prior Togolese analysis found associations of income with documented vaccination status among 12–23-month-olds [9], while a West African comparative study found context-dependent wealth and service-contact patterns [10]. A study in Benin also reported socioeconomic and residential inequality [11]. Our non-monotonic Q2 association differs in measure, age composition and endpoint from these earlier studies, and cannot be read as evidence that Q2 households are at higher risk of truly overdue vaccination.

Earlier Togo research found that maternal secondary schooling was associated with lower odds of incomplete vaccination among children aged 12–23 months [9], whereas we observed no clear adjusted association of maternal education with the broader respondent question. The studies differ in birth cohorts, survey periods, age bands and methods of verifying status; their effect sizes are not directly comparable. Household-head education may not equal maternal education, but overlap is possible when the mother is the head. National programme decisions should use dose-verified evidence rather than the present education contrasts alone.

For policy, these results point first to measurement improvements: household surveys should collect dated entries from cards or registers, identify the intended antigen series, and distinguish doses due, doses received on time and doses received late. Service microplanning and equity analyses should then examine geographic access and household resources against an age-appropriate endpoint. The present associations are hypothesis-generating only and do not justify labeling individual families as defaulters.

Reasons for negative reporting should not be rebranded as causes of under-vaccination: 81.2% of weighted reason responses were 'not yet reached the age limit', which may be appropriate for children awaiting a scheduled dose. Other categories lack of a campaign, no facility, unawareness and unwillingness reflect respondents' stated interpretations, not independently measured supply failures or validated vaccine hesitancy. The wording of s03q53 'why (child) has not been vaccinated' is itself broader than its routing from the all-compulsory-vaccines question [4]. The WHO behavioural and social drivers framework requires distinct validated measures to investigate practical and motivational barriers [7].

Strengths and limitations

Strengths include nationally distributed household sampling, per capita consumption expenditure, six geographic regions and survey-aware uncertainty estimation. The study also demonstrates a consequential measurement limitation of general vaccination-completion questions in settings where schedules extend beyond a child's first birthday. However, no vaccine cards, antigen histories, vaccination dates or age-in-months variable were supplied in the analytical output for this revision; therefore 24.1% must not be described as a validated incomplete-vaccination prevalence. The reason categories do not establish actual overdue doses, and original regression coefficients may be biased for the clinical target of age-inappropriate vaccination.

The available outputs did not allow the requested age-by-reason analysis or a new model restricted to children who were genuinely under-vaccinated. Within-household correlation was nested in the enumeration-area cluster for estimated standard errors, but residual model dependence and overlap between maternal and head-of-household education warrant additional diagnostic checks. National survey strata were reconstructed, not taken from original confidential design files. Cross-sectional associations cannot establish causation, selection mechanisms or intervention effects. External studies

using vaccination cards and age-due antigen schedules are not directly comparable with the EHCVM respondent-defined outcome.

Conclusions

In EHCVM 2021–2022, 24.1% of Togolese children aged 12–59 months were reported by their household as not having received 'all compulsory vaccines'. This estimate cannot establish the prevalence of children missing doses due for their age, especially because the national routine schedule includes a 15-month visit and most negative reporters selected an age-limit reason. The consumption and age associations are exploratory descriptions of reporting patterns; clinical and programme conclusions require a revised endpoint based on a dated, dose-specific record or additional age-appropriate validation data.

Abbreviations

aOR
Adjusted odds ratio
BCG
Bacille Calmette–Guérin
CI
Confidence interval
DTC
Diphtheria, tetanus and pertussis vaccine, using the French abbreviation in the survey item
EHCVM
Enquête harmonisée sur les conditions de vie des ménages (Harmonised Household Living Standards Survey)
INSEED
Institut national de la statistique et des études économiques et démographiques (National Institute of Statistics and Economic and Demographic Studies)
OR
Odds ratio
PSU
Primary sampling unit
Q1–Q5
Consumption quintiles:Q1, poorest; Q2, poorer; Q3, middle; Q4, richer; Q5, richest
STROBE
Strengthening the Reporting of Observational Studies in Epidemiology
UEMOA
Union économique et monétaire ouest-africaine (West African Economic and Monetary Union)

Declarations

Ethics approval and consent to participate

This secondary analysis used anonymised, publicly accessible EHCVM microdata and did not involve new contact with participants or collection of identifiable information. The survey documentation available for this revision describes the fieldwork and release conditions but does not establish the specific original ethics-committee reference or documented consent wording; these details should not be assumed.

Consent for publication

Not applicable. The manuscript reports aggregate results and contains no identifiable personal details or images.

Clinical trial registration: Not applicable. This observational secondary analysis did not allocate interventions and is not a clinical trial.

Availability of data and materials

Anonymised microdata are available through the World Bank Microdata Library (https://microdata.worldbank.org/catalog/6279), subject to its registration and use conditions. The underlying microdata are not redistributed with this submission.

Competing interests

The authors declare no conflicts of interest.

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Authors' contributions

Wankpaouyare Gmakouba: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review and editing.

Komi Ameko Azianu: Conceptualization, Data curation, Formal analysis, Methodology, Validation, Writing – review and editing.

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Wankpaouyare Gmakouba and Komi Ameko Azianu led the study conception and analytical strategy. All authors contributed in the roles specified above, critically revised the manuscript and approve the final submitted version and accept accountability for their contributions.

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