

Additional file 1. STROBE checklist adapted for the Cameroon HPV coverage analysis

Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist items adapted to a secondary analysis of publicly available aggregate WUENIC national immunisation coverage estimates and supporting programme-context evidence for Cameroon, 2020-2025.

Note: STROBE was developed for observational epidemiological studies. This checklist is used here as a transparent reporting aid only. Items requiring individual-level recruitment, matching, participant follow-up, or loss-to-follow-up assessment were considered not applicable.

Section	Item	Recommendation	Where addressed in the article
TITLE AND ABSTRACT	1a	Indicate the study design in the title or abstract.	The title identifies the work as a secondary analysis of national immunisation coverage estimates for 2020-2025. The structured abstract identifies the WUENIC 2025 revision as the primary quantitative source and describes the health-policy analytical framework.
	1b	Provide an informative and balanced summary of what was done and what was found.	The structured abstract includes Background, Methods, Results, and Conclusions. It summarises the 2023 recovery, 2024-2025 renewed decline, two-dose dropout, 2023 supply-paradox context, cross-antigen comparison, and implementation implications.
BACKGROUND	2	Explain the scientific background and rationale for the investigation being reported.	Background describes cervical cancer burden in Cameroon, HPV prevalence evidence, WHO single-dose guidance, national HPV vaccine introduction, Catholic institutional opposition, two-dose attrition, and the rationale for examining sustainability after the 2023 recovery.
	3	State specific objectives, including any prespecified hypotheses.	The final Background paragraph states the central analytical question: what operational, policy, and system factors plausibly account for Cameroon's 2023 HPV coverage recovery and renewed decline through 2025.
METHODS	4	Present key elements of study design early in the paper.	Methods describes a secondary WUENIC-based analysis informed by Walt and Gilson's health policy triangle and a root-cause-to-intervention logic model.
	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection.	Data sources define the setting as Cameroon and the analytic period as 2020-2025. The study used publicly available national WUENIC estimates and supporting programme evidence; no participant recruitment or follow-up was undertaken.
	6a	Give eligibility criteria, and sources and methods of selection of participants.	Not applicable to individual participants. The analysis included publicly available aggregate national WUENIC coverage estimates for Cameroon and comparator immunisation indicators with stable definitions across the 2024 and 2025 WUENIC revisions.
	6b	For matched studies, give matching criteria and number of exposed and unexposed.	Not applicable. This was not a matched study and did not include individual exposed or unexposed participants.
	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers.	Methods defines HPV first-dose coverage among girls, completed-series coverage, dropout, comparator-antigen coverage gaps, WUENIC indicator definitions, and the programme context of single-dose adoption, gender-neutral eligibility, PIRI, stockout documentation, and implementation bottlenecks.

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	8	For each variable of interest, give sources of data and details of methods of assessment. Describe comparability of assessment methods if there is more than one group.	Data sources identify the WUENIC 2025 revision as the primary quantitative source, WUENIC Estimate Descriptions as the source for stockout documentation, and peer-reviewed and contextual programme evidence as supporting sources. Comparator-indicator comparability and the 11-antigen stable-definition set are described.
	9	Describe any efforts to address potential sources of bias.	Methods and Strengths and limitations acknowledge WUENIC uncertainty, ecological design, unmeasured confounding, lack of subnational detail, absence of individual cohort follow-up, and cautious treatment of grey-literature programme-context evidence.
	10	Explain how study size was arrived at.	All relevant Cameroon national WUENIC HPV estimates for 2020-2025 and eligible comparator-antigen estimates were included. No formal sample-size or power calculation was applicable.
	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why.	Calculations define dropout and coverage-gap formulas. Data sources explain the 11-antigen stable-definition comparator set and the IPVC/PCVC sensitivity check.
	12a	Describe all statistical methods, including those used to control for confounding.	Calculations were descriptive and performed using Python. Dropout and coverage gaps were calculated from WUENIC point estimates. No causal model or confounder adjustment was performed because the study used aggregate national estimates and programme-context interpretation.
	12b	Describe any methods used to examine subgroups and interactions.	No individual subgroup or interaction analysis was performed. The analysis compared vaccine indicators and programme periods at the national level.
	12c	Explain how missing data were addressed.	HepBB and MengA had no WUENIC estimates for Cameroon and were excluded. Pol3 was retired and IPV2/PCV3 were redefined in the 2025 revision, so the primary comparison used stable-definition indicators; IPVC/PCVC were examined in sensitivity analysis.
	12d	If applicable, explain how loss to follow-up was addressed.	Not applicable. No individual participants were enrolled or followed over time.
	12e	Describe any sensitivity analyses.	The IPVC/PCVC replacement indicators introduced in the WUENIC 2025 revision were assessed as a sensitivity check; including them did not change the direction or substance of the cross-antigen findings.
RESULTS	13a	Report numbers of individuals at each stage of study.	Not applicable to individual enrolment. Results report national coverage estimates, dropout values, comparator-antigen coverage values, and coverage gaps.
	13b	Give reasons for non-participation at each stage.	Not applicable. The study used aggregate public coverage estimates and did not recruit participants.

Section	Item	Recommendation	Where addressed in the article
	14a	Give characteristics of study participants and information on exposures and potential confounders.	Not applicable to participant characteristics. Results describe the Cameroon programme context, HPV coverage trajectory, documented stockout context, policy milestones, and comparator-antigen coverage profile.
	14b	Indicate number of participants with missing data for each variable of interest.	Not applicable to participant-level missingness. Missing or redefined WUENIC indicators are described in Methods, Results, Additional file 2, and the Strengths and limitations section.
	15	Report numbers of outcome events or summary measures.	Results report HPV1 and HPV completed-series coverage values, dropout rates of 76% and 70%, the 2023 peak of 68%, declines to 36% in 2024 and 30% in 2025, and 2025 comparator-antigen gaps.
	16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision.	Descriptive point estimates and calculated gaps are reported. No adjusted estimates or precision intervals were produced because the analysis used WUENIC national point estimates.
	16b	Report category boundaries when continuous variables were categorised.	Not applicable. Main variables were annual percentage coverage estimates and percentage-point gaps. Comparator inclusion was based on stable WUENIC indicator definitions.
	16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period.	Relative risks were not estimated. Results are expressed as absolute coverage percentages, percentage-point changes, dropout rates, and coverage gaps.
	17	Report other analyses done.	Results report the 2023 recovery and supply-paradox context, 2024-2025 renewed decline, 2025 cross-antigen comparison, and sensitivity findings for IPVC/PCVC in Additional file 2.
DISCUSSION	18	Summarise key results with reference to study objectives.	Discussion summarises the transient 2023 recovery, renewed 2024-2025 decline, HPV/adolescent-specific delivery gap, and implications for girls-first recovery sequencing.
	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision.	Strengths and limitations discusses aggregate national data, subnational unavailability, WUENIC uncertainty, ecological interpretation, unmeasured confounding, unavailable HPV-specific stockout data, grey-literature source limitations, and comparator-indicator definition changes.
	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	Discussion and Conclusion use cautious language, frame findings as plausible mechanisms rather than causal effects, compare with experience from Rwanda and Nigeria, and interpret the recovery pathway as evidence-informed and requiring stakeholder review.
	21	Discuss generalisability/external validity.	Conclusion frames lessons for comparable constrained settings while grounding recommendations in Cameroon-specific evidence and acknowledging that context-specific adaptation is required.
OTHER INFORMATION	22	Give the source of funding and role of funders.	Declarations state that no funding was received for this work. Additional declarations address ethics, consent for publication, data availability, competing interests, author contributions, acknowledgements, abbreviations, and use of AI-assisted technology.