Unified Methodologies for Vaccination Tracking:

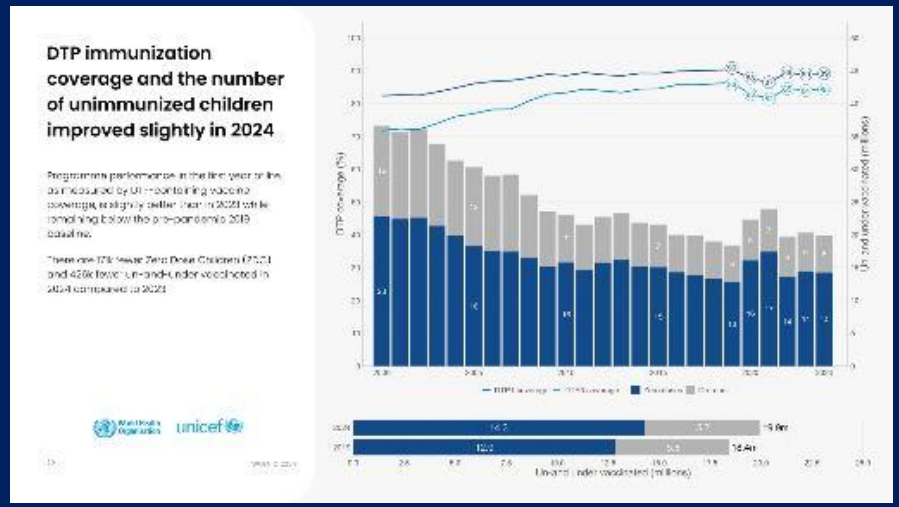
Discussion on the work to merge childhood vaccine and HPV methodologies into a single unified approach

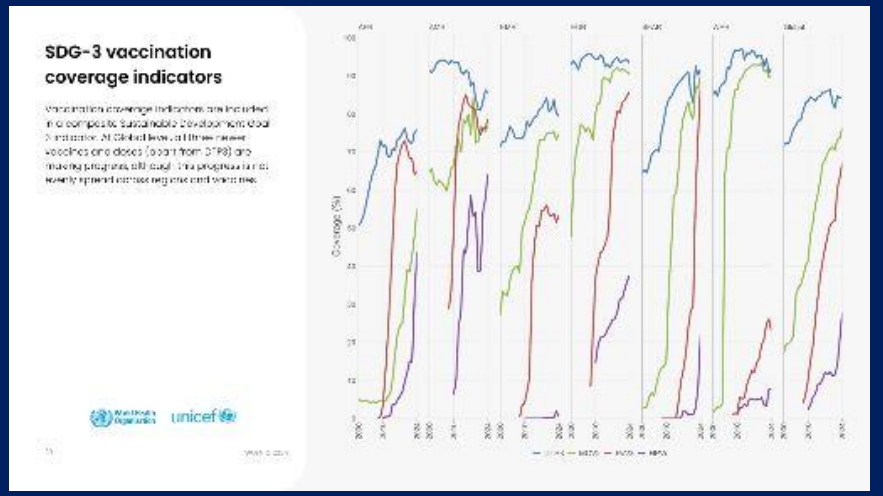
Marta Gacic Dobo WHO
gacicdobom@who.int

unicef

World Health Organization

Every year on 15 July WHO and UNICEF publishes a summary on progress and challenges with achieving universal immunization coverage

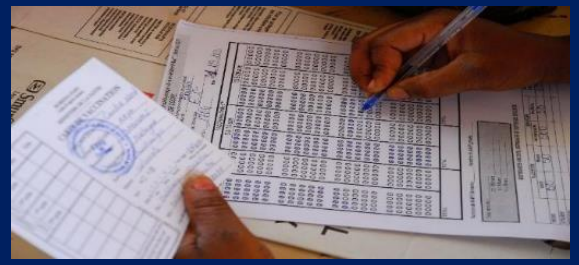




Measuring immunization coverage

Measles vaccination coverage=82%

Administrative method



$$\frac{\text{Number of doses administered through routine services}}{\text{Number of population in target group}}$$

Survey method

$$\frac{\text{Number of children in the sample vaccinated}}{\text{Number of children in the sample}}$$

Advantages and disadvantages of administrative and survey methods

Administrative method

- Advantages:
  - Based on data necessary for service provision
  - Timely management monitoring tool
  - Provides data at local level

- Disadvantage / Limitations :
  - Denominator (target population may be projected based on old census data)
  - Transcription or calculation errors
  - Incomplete reporting
  - May Include vaccination conducted outside the target group.
  - May not include private sector

Surveys

- Advantages:
  - Estimate of immunization coverage can be obtained if the denominator is unknown.
  - Provides additional information on social economical status of reached and unreached children
  - Vaccinations given by the private sector reflected
- Disadvantage / Limitations:
  - Provide information on the previous birth year's cohort.
  - Immunization card availability
  - Reliance on recall
  - Interviewer interaction
  - Length or complexity of the questionnaire may compromise the accuracy of the response
  - Representativeness of sample

Data collection:
Electronic Joint Reporting Form (eJRF)

- Since 1998, WHO and UNICEF have jointly collected data from all UN Member States using the standardized Joint Reporting Form (JRF).

- In 2021, the JRF transitioned to a cloud-based platform – **the electronic Joint Reporting Form (eJRF)** – which enhanced efficiency and accessibility of reporting.

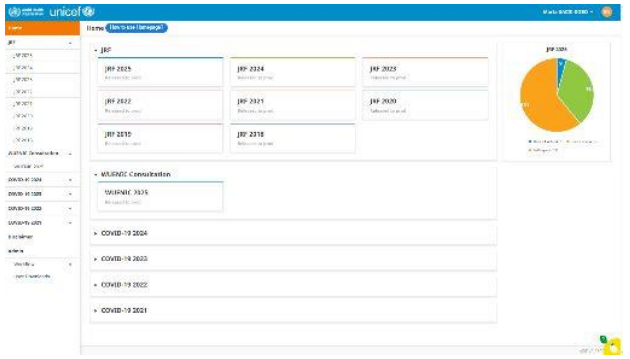
- Since its inception, the JRF has evolved to capture a wide range of domains of **standard performance, planning, financing and quality indicators.**

- The eJRF is completed online by national immunization programme staff

- The immunization system performance data are **collected annually for the previous calendar year (January to December**) and countries may update prior years' data at any time.

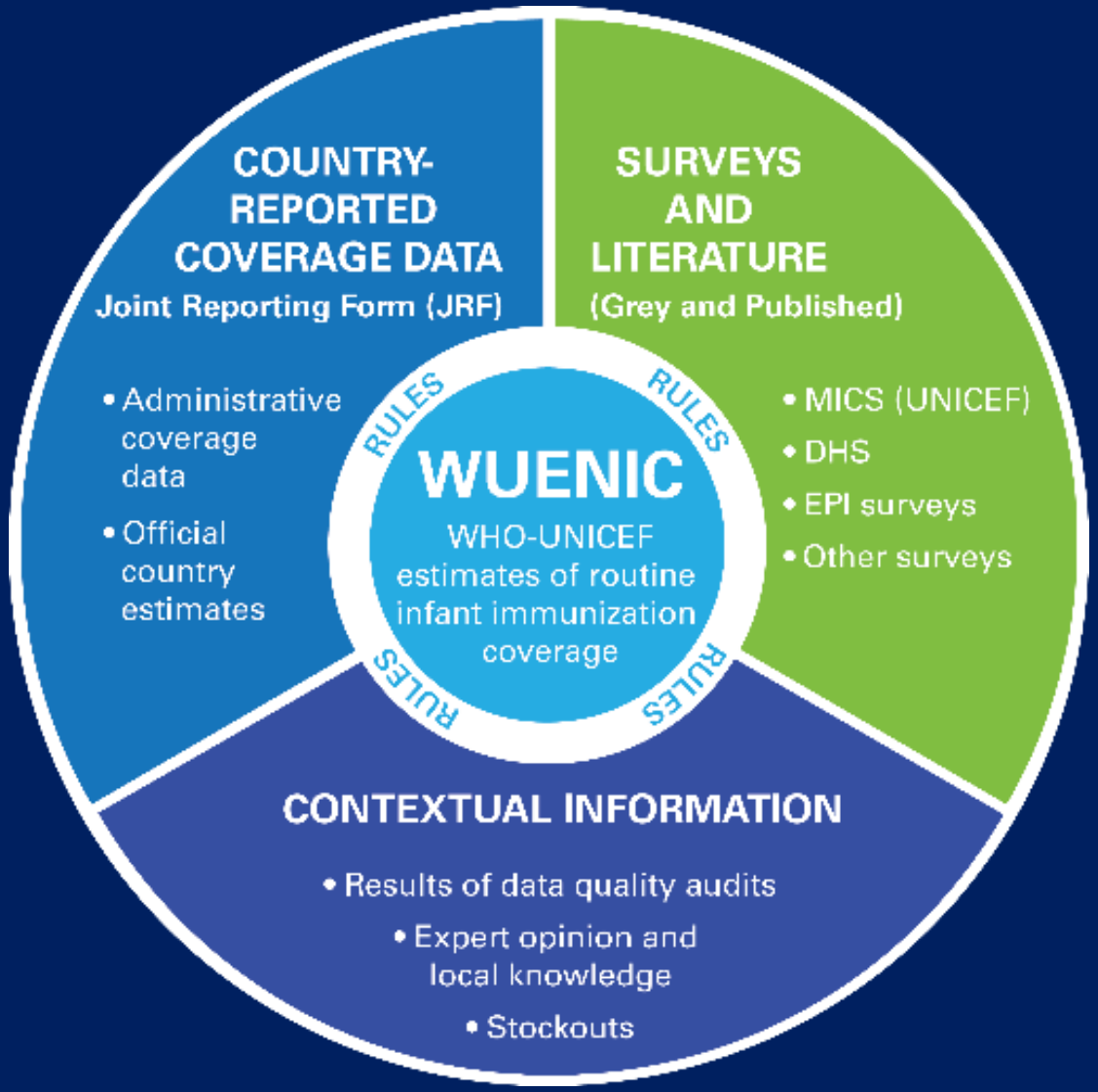
- The eJRF reporting period is from the first Wednesday of **March to the 30th April**. Reporting completeness very high over 95%.

- The data collected through the eJRF are accessible from: https://www.who.int/data/immunization



Data validation: WHO UNICEF Estimates of National Immunization Coverage WUENIC

The eJRF isone of the main source of data that informs WUENIC



WUENIC: Current characteristics and guiding principles

- Rule-based data triangulation exercise undertaken by WHO and UNICEF HQ
- Estimates produced for 16 childhood vaccines/doses
- Routine immunization among single year cohorts (catch-up doses not included)
- All WHO Member States and most of UNICEF programming countries and territories
- Before release subject to county consultation (not clearance)
- Annual release (mid-July) with revision of entire time series , which incorporates new data for previous years
- Immunization coverage trends since 1980 to previous year (e.g. in 2025, 1980-2024)
- Methodology developed in 1999 and incrementally improved by WHO/UNICEF with ad hoc reviews by independent advisory bodies.

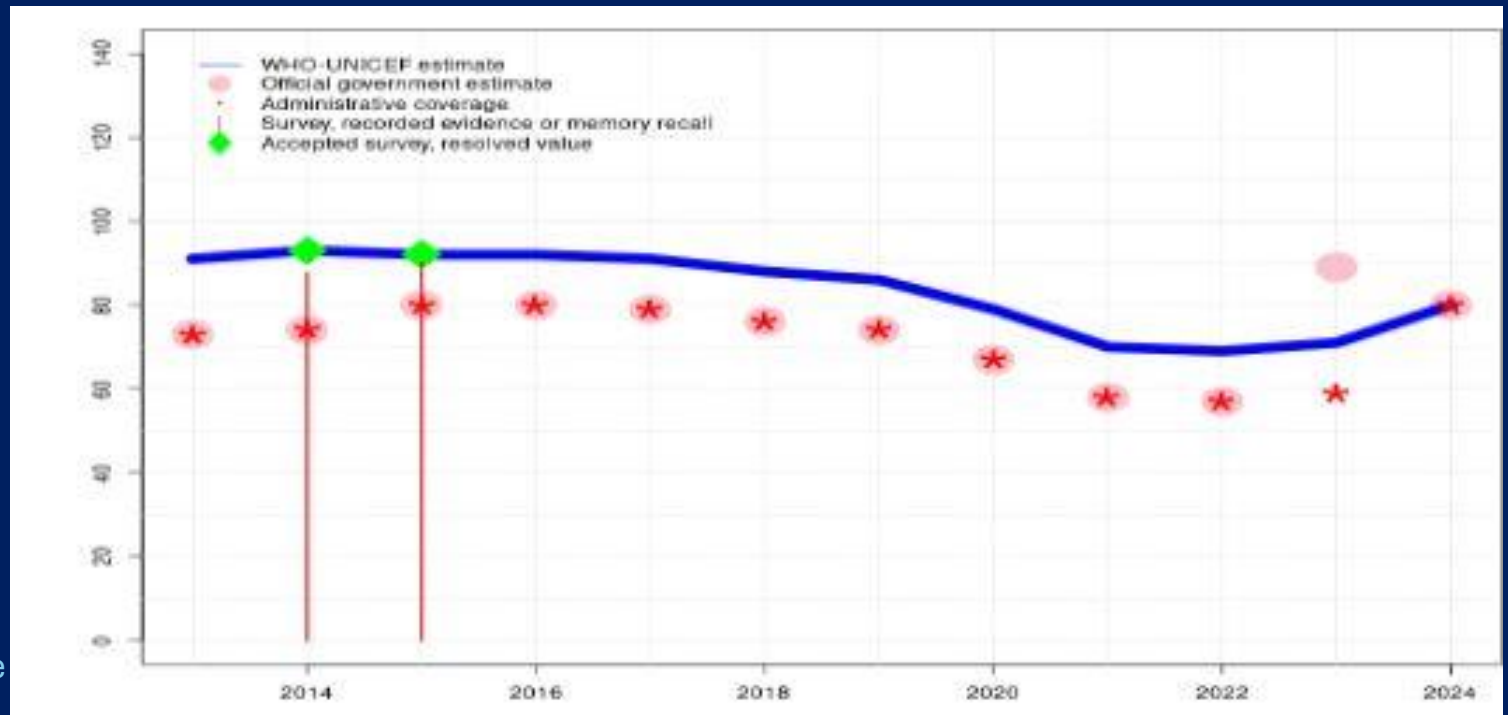
Data triangulation from multiple sources

- Red stars = country-reported administrative coverage
- Pink circles = official estimates
- Red bars = survey estimate
  - Moved to the correct cohort year (i.e. the year the children would have been vaccinated, not the year of the survey)

Fieldwork:
- June – September 2016

Children 12-23 m were born one year before, and 24-35 m born two years before based on fieldwork dates

Cohort years:
- 12-23 m = 2015
- 24-35 m = 2016



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Estimate	91	93	92	92	91	88	86	79	70	69	71	80
Estimate GoC	•	•	•	•	•	•	•	•	•	•	•	•
Official	73	74	80	80	79	76	74	67	58	57	89	80
Administrative	73	74	80	80	79	76	74	67	58	57	59	80
Survey	–	88	90	–	–	–	–	–	–	–	–	–

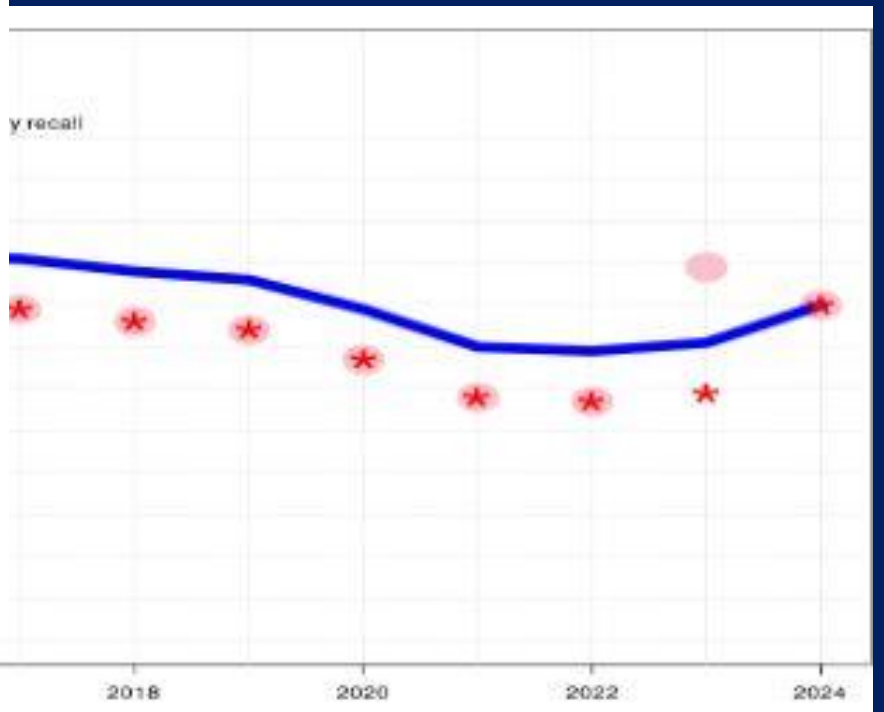
Why is 2024 data point accepted?

- June – September 2016

Children 12-23 m were born one year before, and 24-35 m born two years before based on fieldwork dates

Cohort years:

- 12-23 m = 2015
- 24-35 m = 2016



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Estimate	91	93	92	92	91	88	86	79	70	69	71	80
Estimate GoC	•	•	•	•	•	•	•	•	•	•	•	•
Official	73	74	80	80	79	76	74	67	58	57	89	80
Administrative	73	74	80	80	79	76	74	67	58	57	59	80
Survey	–	88	90	–	–	–	–	–	–	–	–	–

Estimates of routine coverage

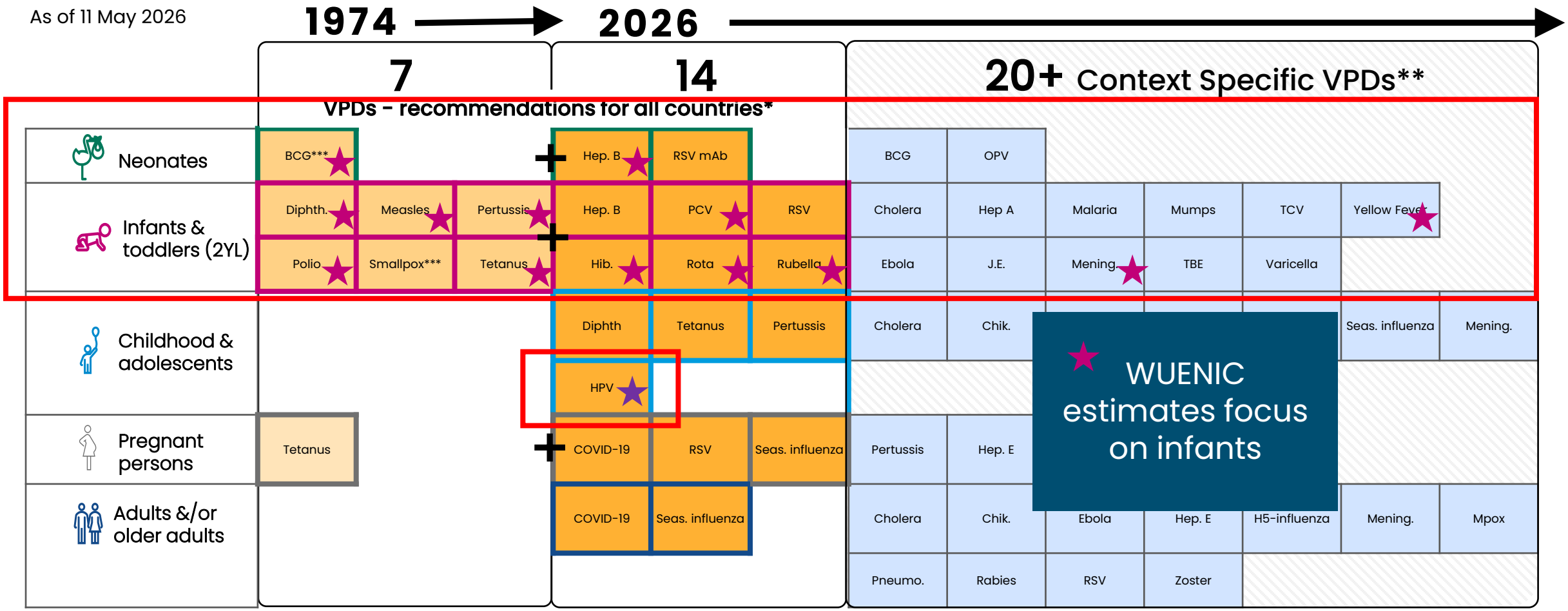
1999	2005	2010	2014	2016	2017	2024
BCG	BCG	BCG	BCG	BCG	BCG	BCG
DTP3	DTP3	DTP3	DTP3	DTP3	DTP3	DTP3
POLIO3	POLIO3	POLIO3	POLIO3	POLIO3	POLIO3	POLIO3
MCV1 (measles)	MCV1	MCV1	MCV1	MCV1	MCV1	MCV1
HEPB3	HEPB3	HEPB3	HEPB3	HEPB3	HEPB3	HEPB3
	DTP1	DTP1	DTP1	DTP1	DTP1	DTP1
	HIB3	HIB3	HIB3	HIB3	HIB3	HIB3
		PCV3	PCV3	PCV3	PCV3	PCV3
		ROTA (last dose)	ROTA (last dose)	ROTA (last dose)	ROTA (last dose)	ROTA (last dose)
		YELLOW FEVER	YELLOW FEVER	YELLOW FEVER	YELLOW FEVER	YELLOW FEVER
			MCV2	MCV2	MCV2	MCV2
			HEPBB	HEPBB	HEPBB	HEPBB
				RCV (rubella)	RCV	RCV
					IPV	IPVC
						MenA

BCG – for BCG using countries
Yellow Fever - for countries at risk *(national coverage)*
MenA - *for countries in meningitis belt*

WUENIC Methodology Publications

- Burton et al. 2009. WHO and UNICEF estimates of national infant immunization coverage: methods and processes.
- Burton et al. 2012. A formal representation of the WHO and UNICEF estimates of national immunization coverage: a computational logic approach.
- Brown et al. 2013. An introduction to the grade of confidence used to characterize uncertainty around the WHO and UNICEF estimates of national immunization coverage.
- Brown at al, 2015, An examination of a recall bias adjustment applied to survey-based coverage estimates for multi-dose vaccines
- Danovaro-Holliday at al, 2021 Compliance of WHO and UNICEF estimates of national immunization coverage (WUENIC) with Guidelines for Accurate and Transparent Health Estimates Reporting (GATHER) criteria

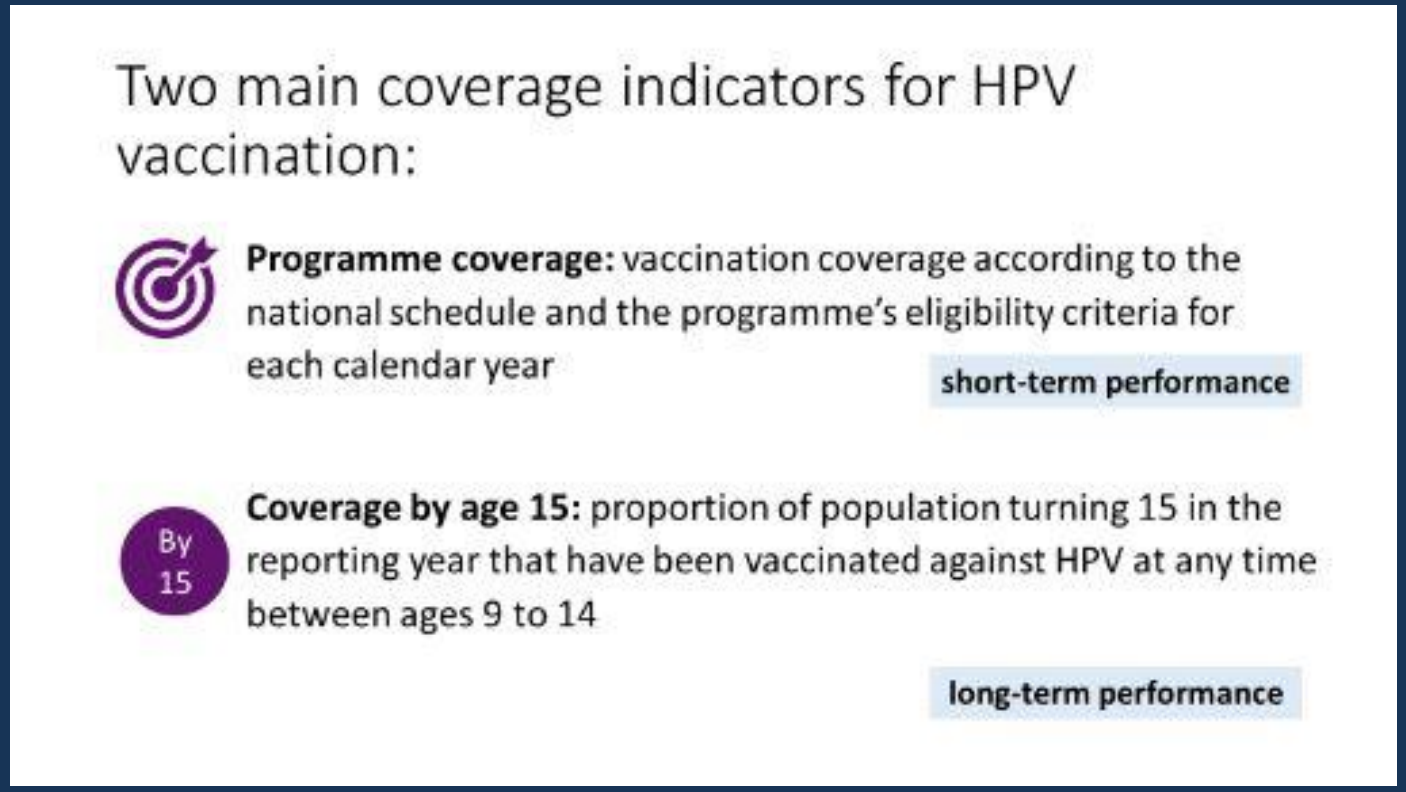
Scope of protection | From **7** VPDs in 1974 to more than **30** VPDs in 2026, of which **14** formally recommended for all countries.



*Fourteen VPDs with WHO recommendations for all countries: WHO Vaccine Position Papers . For COVID-19 vaccines (upcoming Position Paper in 2026), latest recommendations: Highlights WHO SAGE meeting March 2026. **Not all context specific VPDs included in this slide have WHO Position Papers., some have published WHO guidance: Considerations for pneumococcal vaccination in older adults; Ebola vaccination, conclusions and SAGE recommendations Context-specific' refers to vaccines targeting VPDs in particular geographic areas or populations, and/or taking into account specific prerequisites or flexibilities of the immunization programme. ***Smallpox and BCG no longer formally recommended for all countries.
BCG: bacillus Calmette–Guérin; Hib: Haemophilus influenzae type b; HPV: human papillomavirus; JE: Japanese Encephalitis; H5-influenza: H5 influenza; PCV: pneumococcal conjugate vaccine; RSV: respiratory syncytial virus; mAb: monoclonal antibody; Seas. influenza Seasonal Influenza; TBE: Tick-Borne Encephalitis; TCV: typhoid conjugate vaccine.

HPV Coverage estimates

- Since 2019 **annual Estimates of National HPV Immunization Coverage**
  - Historical series from 2010
  - By sex, dose and age cohorts
- These estimates are derived mainly from administrative data but also few surveys
  - Few available surveys
  - Age-groups vary – young adolescents, women 15-19 yrs



Refs: Bruni et al 2021 Prev Med, WHO Immunization Data portal: https://immunizationdata.who.int/

WUENIC vs. HPV estimates

Similarities

- Shared data collection platform (eJRF)
- Annual programme performance tracking
- Multi-source data triangulation

Differences

- WUENIC: default - reported coverage;
- HPV: default - recalculated coverage

- HPV includes campaigns and coverage by age 15
- WUENIC single cohort and annual performance

- WUENIC started in 1999 and now automated standardised rules with documented justification for exceptions.
- HPV started in 2019

Strengths and limitations

Strengths

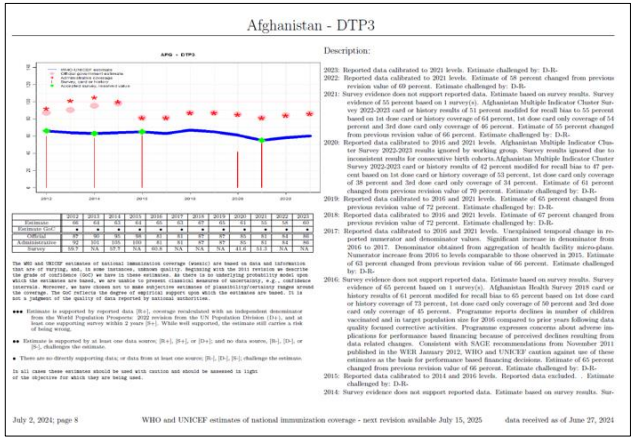
- Estimates are made using country-specific data
- Programme contextual information is considered
- Grade of Confidence is used

Limitations

- Estimates are affected by the quality of underlying data
- No quantitative estimation of uncertainty
- Most recent year estimates are informed by less data (surveys inform estimates for earlier year)

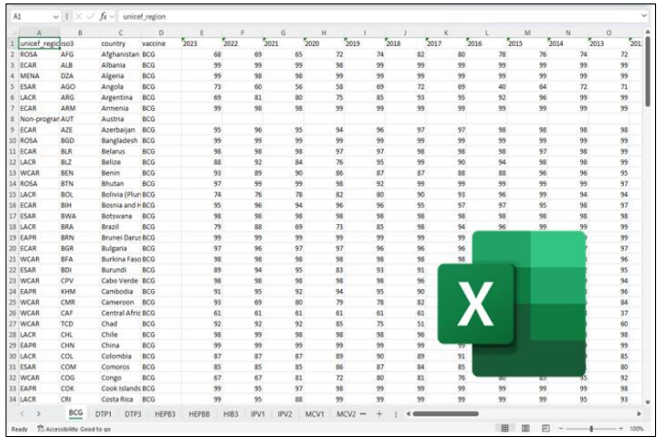
- Historical series are revised as new data becomes available (updates from UNPD, countries and surveys)

WUENIC country profiles



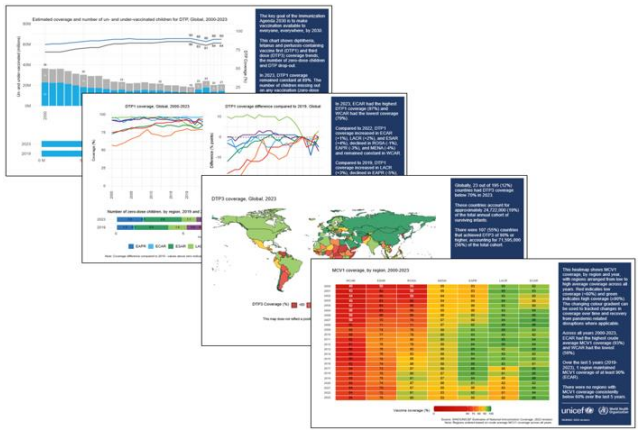
Interactive WUENIC country profiles

Datasets:
WUENIC, HPV, survey database



Country and region-specific slide decks:

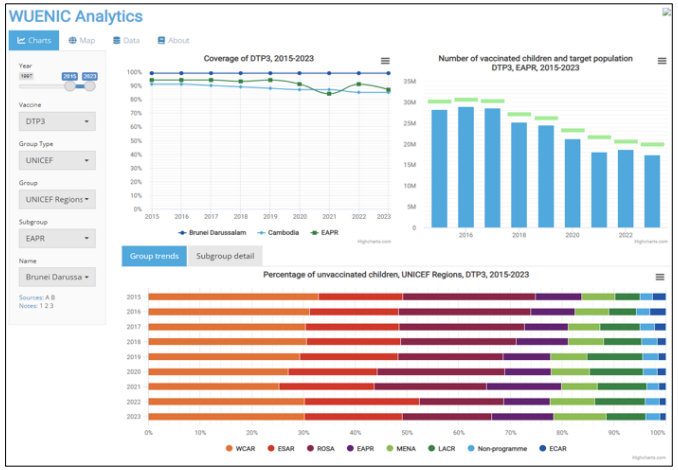
UNICEF, WHO, World Bank, Gavi and African Union regions



Interactive immunization regional snapshots:

UNICEF, WHO, World Bank, Gavi and African Union regions

WUENIC Analytics Dashboard



Additional resources

Additional immunization data resources can be found at: https://data.unicef.org/resources/immunization/

Interactive WUENIC country profiles can be found at: https://worldhealthorg.shinyapps.io/wuenic-trends/

unicef

World Health Organization

Thank you!

GATHER compliance

- Checklist of 18 items consistent with best practice in publishing health estimates
- *Not* designed for health service delivery coverage indicators like vaccination coverage, but provides a useful framework for documenting WUENIC. WUENIC meets all criteria with a caveat

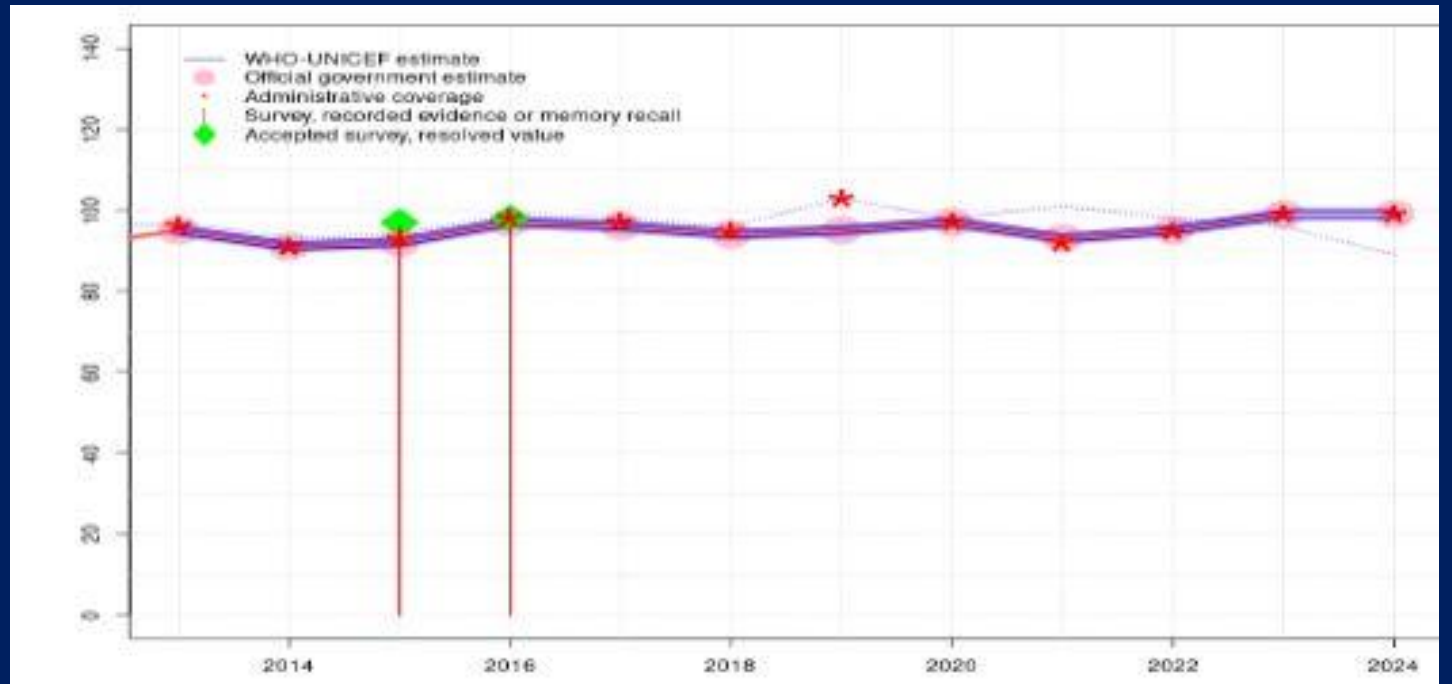
Candidate model evaluation: now done

Uncertainty: Grade of Confidence—a qualitative measure of uncertainty in WUENIC (2011 revision)

http://gather-statement.org/

Administrative coverage data

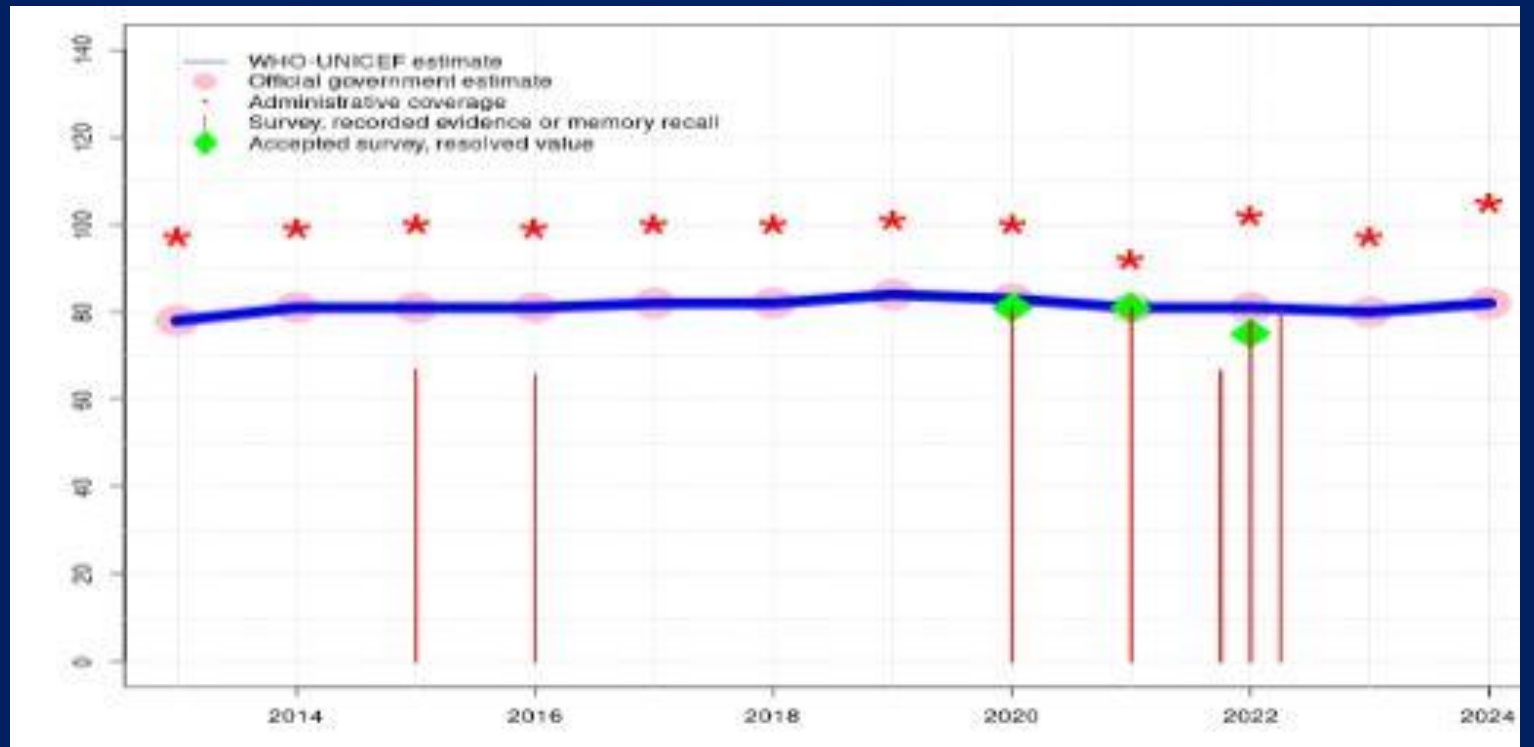
- Red stars = country-reported administrative coverage
- Admin coverage is presented as the percentage of a target population that has been vaccinated (y-axis).
- For example, administrative coverage for the third dose of DTP is calculated by dividing the number of children receiving the third dose of DTP vaccine by the number of children who survived to their first birthday.



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Estimate	95	91	92	97	96	94	95	97	93	95	99	99
Estimate GoC	•••	•••	•••	•••	•••	•••	••	••	••	••	••	••
Official	95	91	92	97	96	94	95	97	93	95	99	99
Administrative	96	91	93	98	97	95	103	97	92	95	99	99
Survey	-	-	96	96	-	-	-	-	-	-	-	-

Official estimates

- Pink circles = official estimates
- National authorities also provide an official government estimate of vaccination coverage (displayed as pink circles alongside admin coverage *)
- Official estimates take into account admin coverage, survey data and additional information that may impact vaccine coverage
- Often the same as the admin data in many countries
- But not always



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Estimate	78	81	81	81	82	82	84	83	81	81	80	82
Estimate GoC	•	•	•	•	•	•	•	•	•	•	•	•
Official	78	81	81	81	82	82	84	83	81	81	80	82
Administrative	97	99	100	99	100	100	101	100	92	102	97	105
Survey	-	-	67	66	-	-	-	81	81	*	-	-

Additional adjustments