

IARC/WHO CHRONOS Initiative: Centre of Excellence for Monitoring HPV Vaccination Impact

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International Agency
for Research on Cancer







HPV Technical Board
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Session 3: Redefining coverage measurement and methodology



IARC Public Health Decision Science Team

-  Team led by **Dr Iacopo Baussano** in **Early Detection, Prevention & Infections Branch** led by **Dr Partha Basu**
-  **Collect high-quality local data** through field studies to measure cancer burden and impact of preventive interventions
-  **Evaluate local cancer risk** and assess the **expected impact of cancer prevention** using quantitative tools to guide decisions on policies and programs
-  **Country-level evaluations** to support **cervical cancer elimination**

Two key initiatives of the team:



Website



METHIS

Modelling tools for
HPV infection-related cancers



Website





CHRONOS

Centre of Excellence for
Monitoring HPV Vaccination Impact

CHRONOS is an IARC/WHO International Coordination Centre to assess local population-based HPV vaccination impact in low- and middle-income countries.

Monitoring the impact of HPV vaccination is a component of the WHO strategy for Cervical Cancer Elimination.

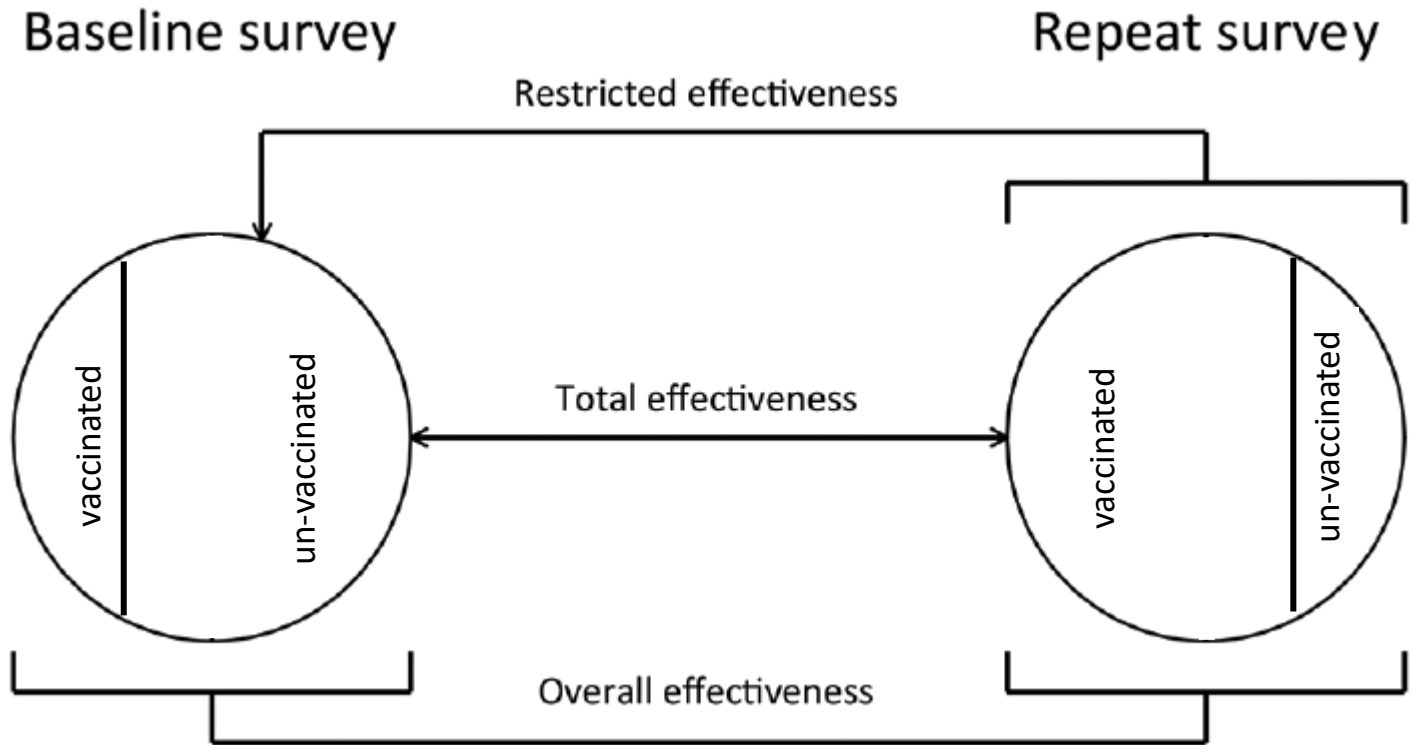
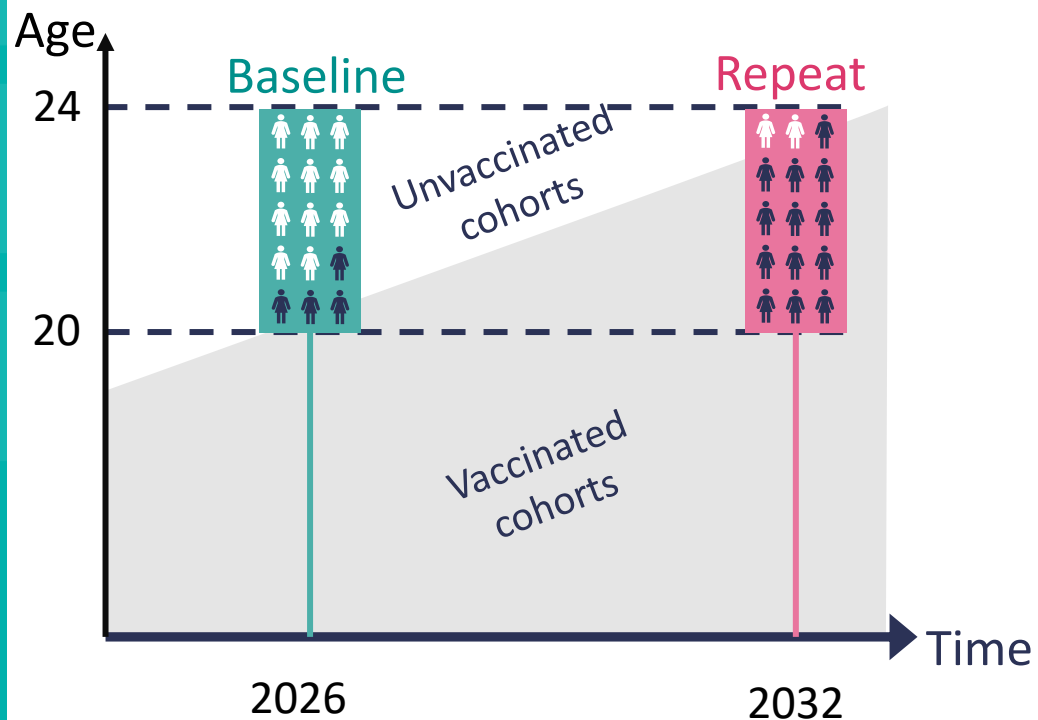
Local evidence to inform context-specific **cervical cancer control policies** and to ensure the comparability of programmes over time, across countries and populations.

WHO Framework for Monitoring & Evaluation of Cervical Cancer Elimination Strategy

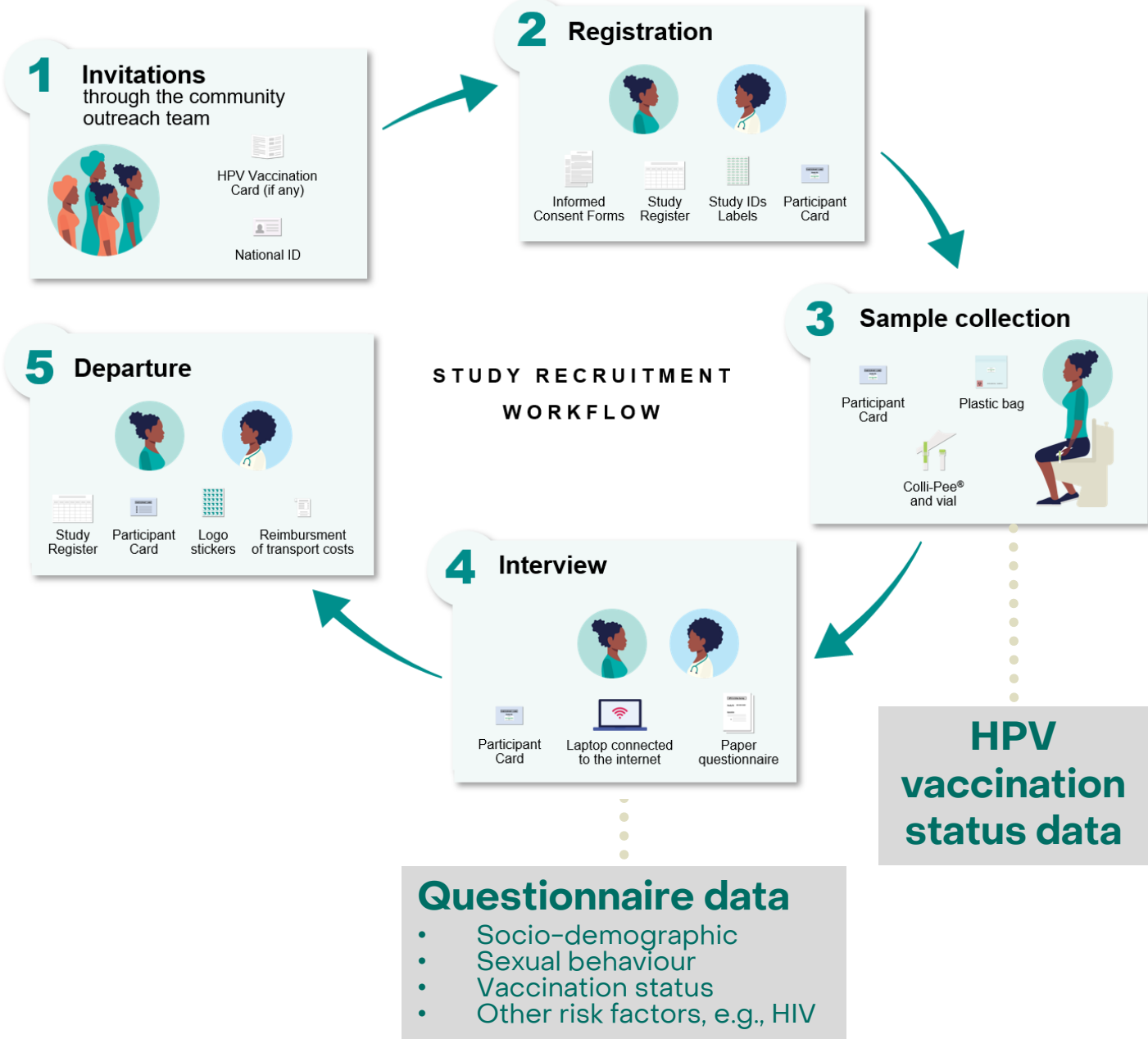
| | Primary prevention | Secondary prevention | Tertiary prevention | |
|--|--|--|--|--|
| 2030 targets | <p>HPV vaccination and health promotion</p> <p>90% of girls fully vaccinated with HPV vaccine by 15 years of age</p> | <p>Screening and pre-cancer treatment</p> <p>70% of women screened using a high-performance</p> | <p>Treatment and supportive care</p> <p>90% of women identified with a cervical disease are treated (90% of women with pre-cancer treated and 90% of women with invasive cancer managed)</p> | |
| Population-based data | <ul style="list-style-type: none"> HPV prevalence HIV prevalence Tobacco use prevalence Condom use at last high-risk | <p>Few years needed to measure impact on HPV prevalence</p> | | |
| Programme monitoring | <ul style="list-style-type: none"> HPV vaccination coverage | | | <ul style="list-style-type: none"> Screening test positivity rate* Cervical pre-cancer treatment rate* <p><small>*Stratify by HPV status</small></p> |
| Policies/ Programmes and health system capacity | <ul style="list-style-type: none"> HPV vaccine in National Immunization HPV vaccine availability HPV vaccine cost | <ul style="list-style-type: none"> Availability of national cervical cancer screening program Availability of pre-cancer treatment HPV test availability in PHC | <ul style="list-style-type: none"> Availability of guidelines for the management of women with cervical disease, including high-risk groups Availability of surgical services Availability of palliative care | |
| Cross-cutting Incidence and mortality | <p>Modelling (indicated by a large teal arrow pointing from the Policies/Programmes and health system capacity row to the Cumulative risk of cervical cancer box)</p> | | | <p>Decades needed to measure impact on cervical cancer</p> |
| | Cumulative risk of cervical cancer | Cervical cancer incidence | Cervical cancer mortality | Premature mortality from cervical cancer |

How CHRONOS works?

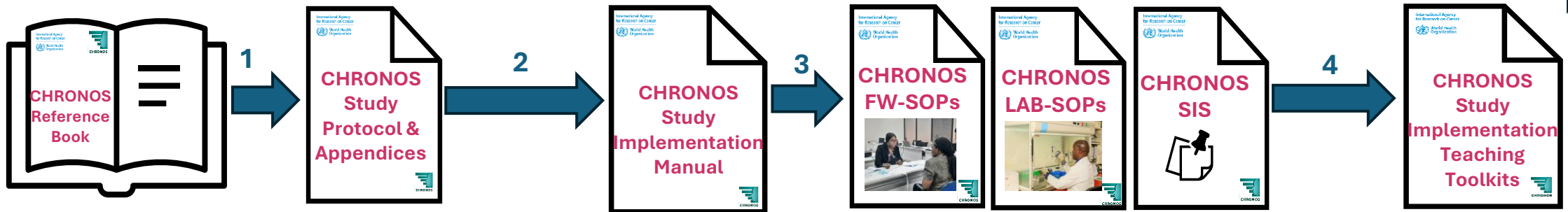
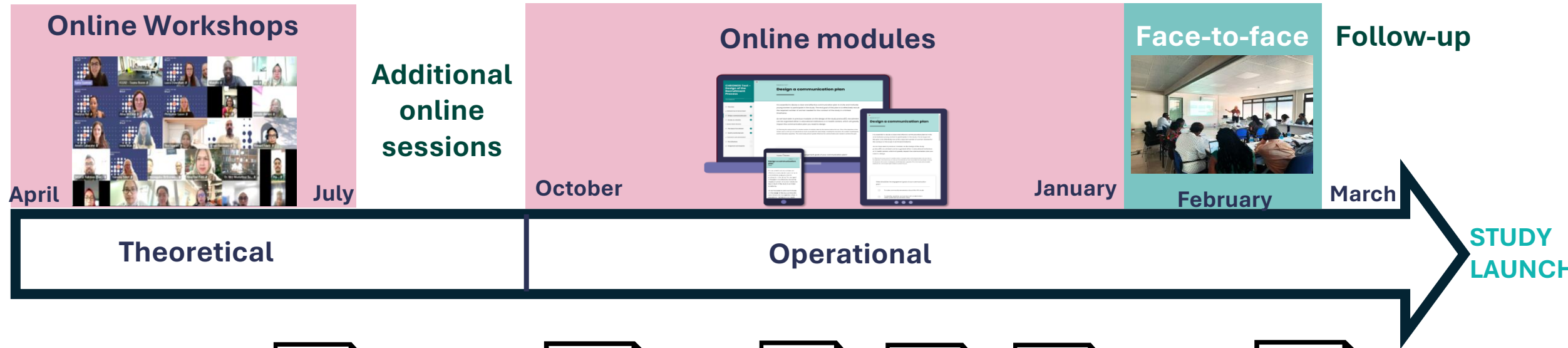
Simple study design:
repeat cross-sectional surveys to measure reduction of HPV prevalence due to HPV vaccination



CHRONOS Study workflow



CHRONOS standardised methodology and training



- Investigators
- Study Coordinators

- Ethics Committees
- Investigators
- Study coordinators

- Field operation managers
- Laboratory managers



- Field & Lab managers
- Study staff

- Study staff

Countries involved in CHRONOS

| | Baseline | Repeat |
|-------------------------|----------------|---------------|
| Bhutan* | Completed [1] | Completed [2] |
| Rwanda* | Completed [3] | Completed [4] |
| Armenia* | Completed [5] | TBD |
| Uganda | Completed | TBD |
| Laos | Completed | TBD |
| Zimbabwe (general pop.) | Completed | TBD |
| Zimbabwe (WLWHIV) | Ongoing | TBD |
| Indonesia | In preparation | TBD |
| Eswatini | In preparation | TBD |
| Bangladesh | In preparation | TBD |
| Cambodia | In preparation | TBD |
| China | In preparation | TBD |
| India | In planning | TBD |

*Urine-based surveys (among women <25 year-old) are coupled with cell-based survey (among women <50 year-old).

Subsequently, surveys have been conducted only among young women.

1. Tshomo et al. BMC Infect Dis (2014).
2. Baussano et al. Ann Intern Med (2020).
3. Ngabo et al. BMC Infect Dis (2016).
4. Sayinzoga et al. Lancet Glob Health (2023).
5. Baussano et al. Vaccine (2025)

Example results

Genotype specific HPV prevalence results (HR and LR)

| HPV type | Urine-based Survey (n=2446) | | | |
|------------------|-----------------------------|----------|-----------|------|
| | Single | Multiple | Total (%) | |
| HPV- | - | - | 2336 | 95.5 |
| HPV+ | 63 | 47 | 110 | 4.5 |
| <i>High-risk</i> | | | | |
| 16 | 4 | 13 | 17 | 0.7 |
| 18 | 5 | 7 | 12 | 0.5 |
| 31 | 7 | 13 | 20 | 0.8 |
| 33 | 1 | 3 | 4 | 0.2 |
| 35 | 0 | 2 | 2 | 0.1 |
| 39 | 0 | 1 | 1 | 0.0 |
| 45 | 2 | 1 | 3 | 0.1 |
| 51 | 0 | 6 | 6 | 0.2 |
| 52 | 1 | 6 | 7 | 0.3 |
| 56 | 4 | 7 | 11 | 0.4 |
| 58 | 0 | 5 | 5 | 0.2 |
| 59 | 3 | 7 | 10 | 0.4 |
| 68 | 1 | 1 | 2 | 0.1 |
| X | 2 | 0 | 2 | 0.1 |
| Any | 30 | 42 | 72 | 2.9 |

Prevalence of overall HPV types among 2446 girls aged 17-20 years in Armenia, 2019 and 3017 women aged 21-39 in Armenia, 2021-22. All HPV types detected by GP5+/6+.

Cervical cancer case series

Proportion of HPV genotypes in cervical cancer cases

| HPV type | All | |
|-----------------|-----|------|
| | N | % |
| Total | 206 | 100 |
| HR HPV negative | 21 | 10.2 |
| Any HR HPV | 185 | 89.8 |
| Multiple HR HPV | 7 | 3.4 |
| HPV16 | 104 | 50.5 |
| HPV18 | 29 | 14.1 |
| HPV45 | 16 | 7.8 |
| HPV59 | 7 | 3.4 |
| HPV31 | 7 | 3.4 |
| HPV56 | 5 | 2.4 |
| HPV58 | 5 | 2.4 |
| HPV35 | 4 | 1.9 |
| HPV52 | 4 | 1.9 |
| HPV39 | 4 | 1.9 |
| HPV68 | 3 | 1.5 |
| HPV33 | 2 | 1.0 |
| HPV51 | 2 | 1.0 |

Prevalence of HPV types among 206 cervical cancers

(Baussano et al. 2025, <https://doi.org/10.1016/j.vaccine.2025.127405>)

Questionnaire collected data

HPV vaccination status

- *Self-reported and/or from HPV vaccination card*

Sexual behaviour

- *History of sexual intercourse*
- *Age at first sexual intercourse*
- *Age of partner*
- *Number of sexual partners in the last year*
- *Number of lifetime sexual partners*

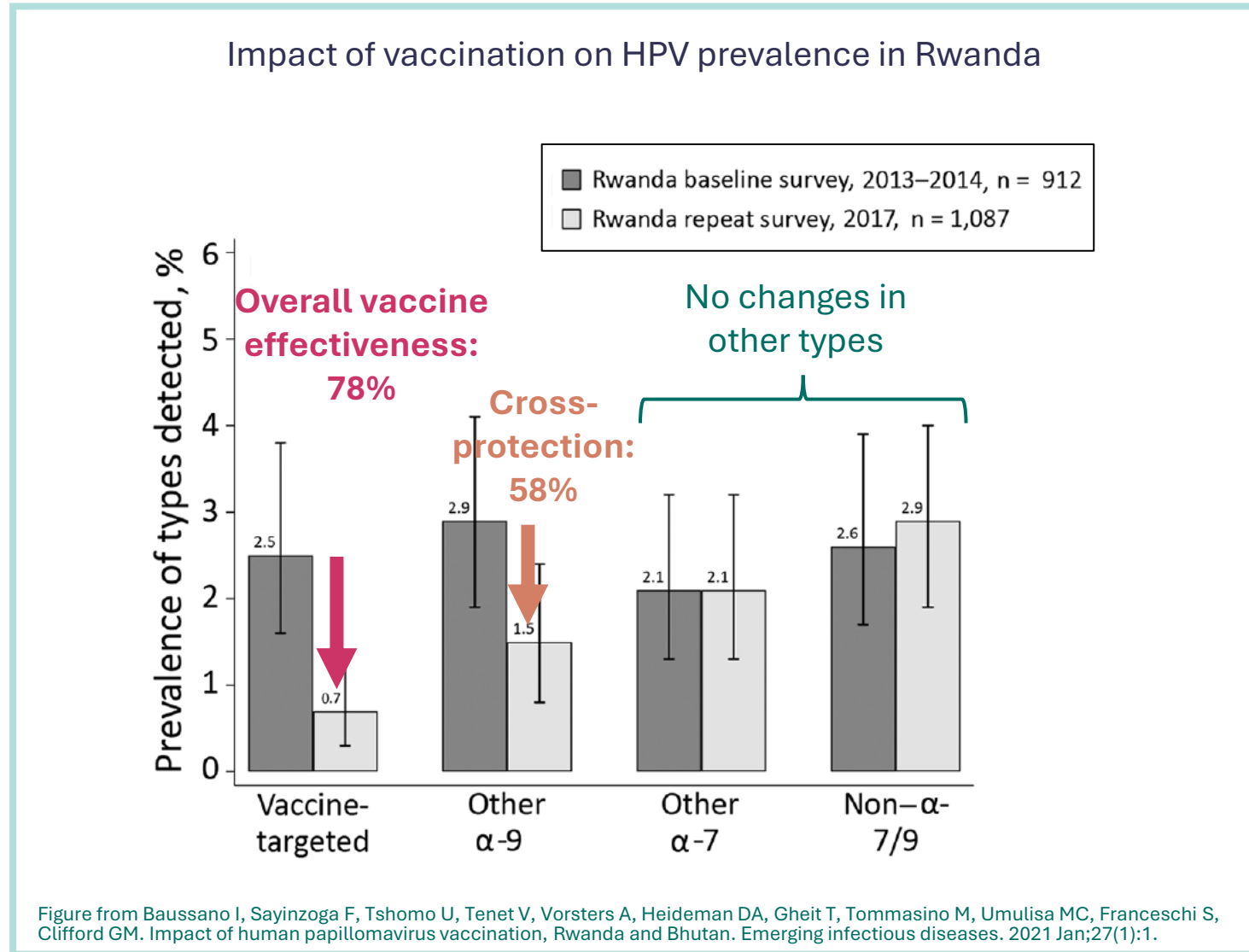
Socio-demographic

- *Type of recruitment*
- *Place of birth*
- *Ethnicity*
- *Religion*
- *Education*
- *Occupation*
- *Marital status*

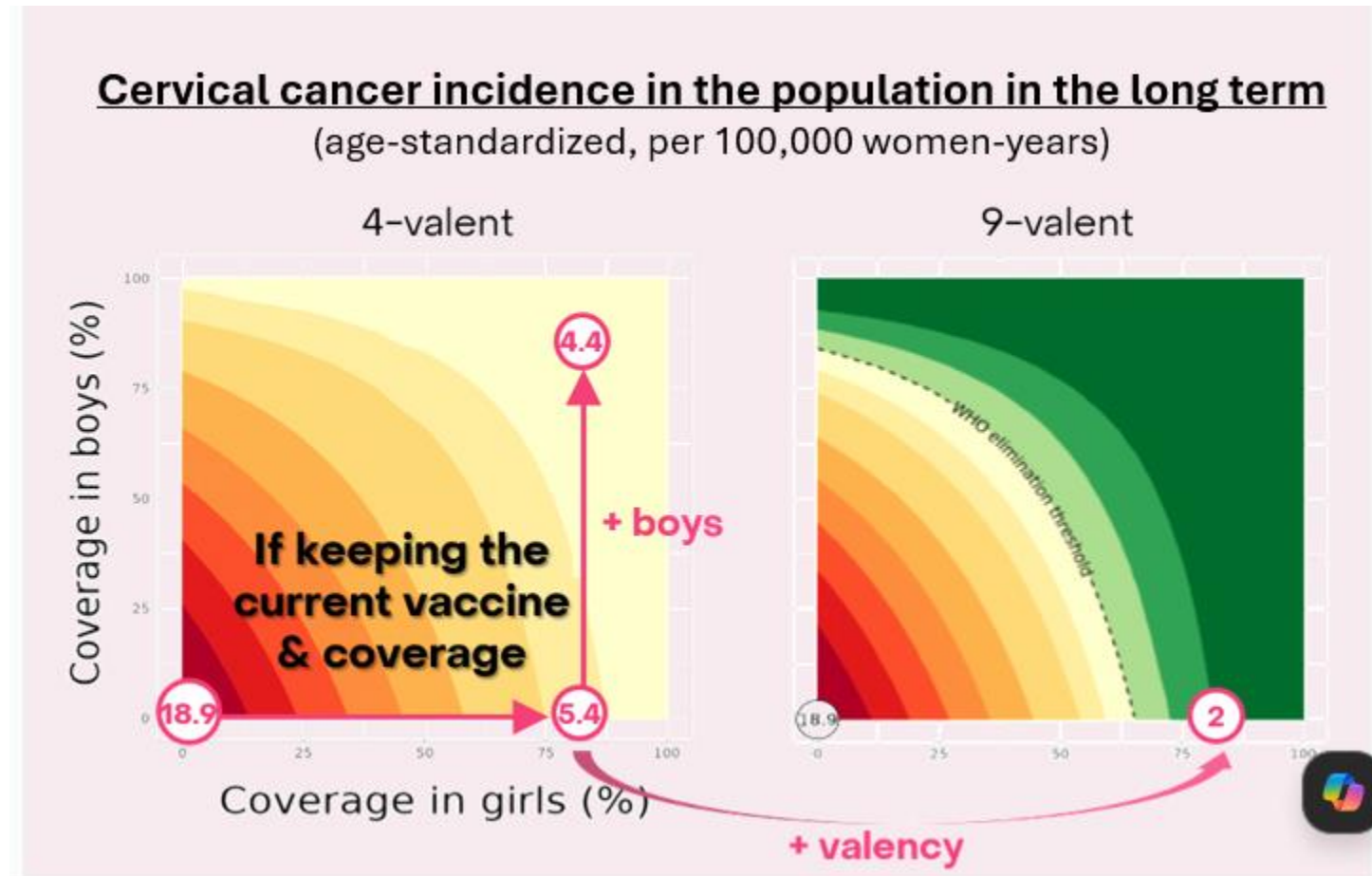
HIV status

- *Self-reported and/or from clinical data*

Example from Rwanda – HPV vaccination impact assessment baseline and repeat surveys



Rwanda CHRONOS results + METHIS modelling



Example from Bhutan – HPV vaccination impact assessment baseline and repeat surveys

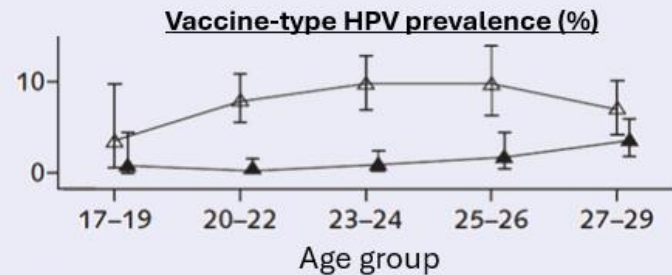
ORIGINAL RESEARCH

Annals of Internal Medicine

Prevalence of Human Papillomavirus and Estimation of Human Papillomavirus Vaccine Effectiveness in Thimphu, Bhutan, in 2011-2012 and 2018

A Cross-sectional Study

Iacopo Baussano, MD; Ugyen Tshomo, MD; Vanessa Tenet, MSc; Daniëlle A.M. Heideman, PhD; Tshering Wangden, MD; Silvia Franceschi, MD; and Gary M. Clifford, PhD



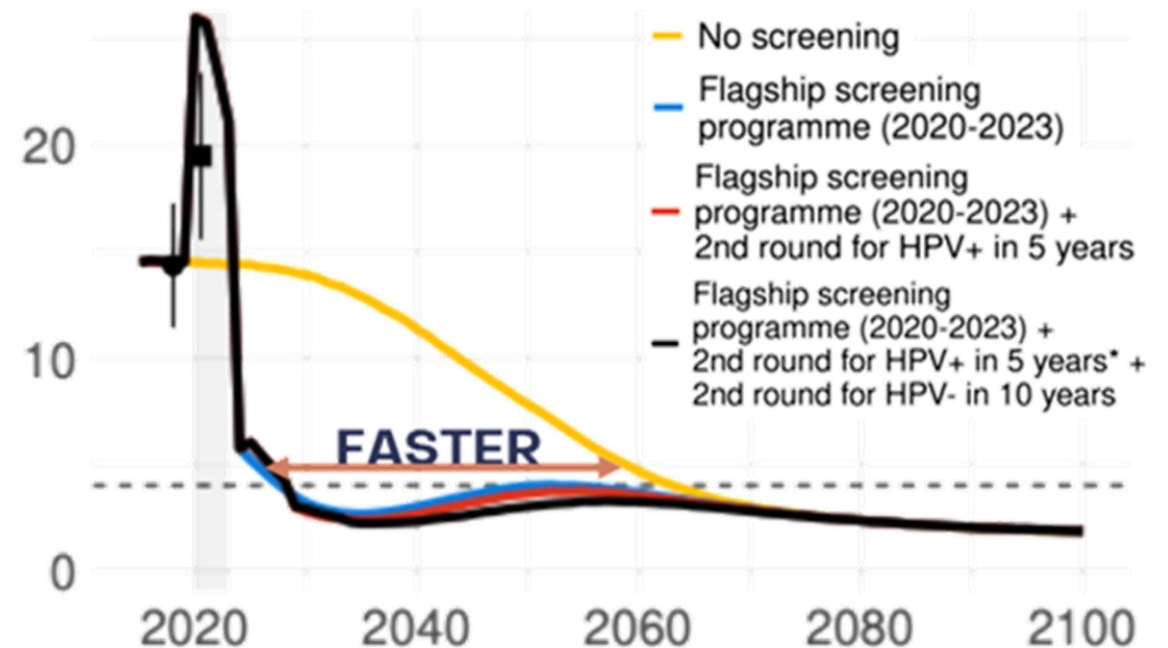
↓
88%
reduction in
infection

CHRONOS

CHRONOS results

+

METHIS modelling



Cervical cancer incidence in the population over time

(age-standardized, per 100,000 women-years)

CHRONOS approach

- **Standardised methodology and training** based on decades of experience
- **Knowledge sharing** and **capacity building** through partnerships with local actors
- **HPV vaccination impact monitoring** in 5 years through repeat cross-sectional surveys
- Essential **data on HPV genotype-specific prevalence, HPV vaccination status, sexual behaviour**, and socio-demographic characteristics (inequalities)
- Scalable to specific or **vulnerable populations** (e.g. WLHIV)
- **Community of practice** – sharing lessons learned
- Coordination/regulatory role for setting standards as new sampling and testing technologies arise.
- Role of ensuring data/evidence for HPV effectiveness over the world to become available and accessible
- **Integration with modelling platform** for cancer impact projections, HPV-faster

Lessons learned

- Highly **feasible and acceptable study** for the participants (short questionnaire, self-collected urine)
- Simple design, **no follow-up**
- **Engagement of different essential stakeholders** depending on country/context
- **Flexibility and adaptation** to different cultural contexts and sensitivities
- Strong partnerships with the local coordination team
- **Close monitoring of recruitment** after fieldwork start
- Dissemination and continued collaboration after study results to generate impact
- High quality lab procedures (referent lab in Antwerp), with flexibility for local testing under the right conditions



Thank you to the IARC CHRONOS team and the country CHRONOS teams

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