Optimizing cervical cancer screening programs: Using decision-modeling results to guide policy

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Background

- Nearly 90% of cervical cancer cases and deaths are in low- and middle-income countries (LMICs).
- With limited resources and competing priorities, securing best value for money is critical.
- Feasible and effective methods for screening are becoming available, but there are numerous decision points in designing screening and precancer treatment programs.
- PATH and Harvard University collaborated to combine field data from LMICs and modeling expertise to explore trade-offs in program design choices.
Questions explored and outcomes considered

• Questions:
  – What age and how often to screen?
  – Is it better to increase coverage or increase screening frequency?

• Outcomes:
  – Value for money (discounted lifetime costs and incremental cost-effectiveness ratios).
Methods and key parameters

• Used an existing individual-based mathematical simulation model of the natural history of HPV and cervical cancer.

• Estimated lifetime health and economic outcomes associated with screening and treatment.

• Used field data from a previous PATH project in India, Nicaragua, and Uganda.

• Evaluated the cost-effectiveness of screening at various ages (from 25–50 years), intervals (5 or 10 years), and frequencies (1–3 times).

• Using data from Uganda, compared the health and economic impact of once-in-a-lifetime screening (1x) to screening 2 times (2x) and 3 times (3x) as coverage varied from low to high baseline levels.
Results: Screening between ages 30–40 years yields greatest benefit

- India
- Nicaragua
- Uganda

Source: Campos et al, PVR, 2015.
Results: Screening 3x with HPV testing reduces cancer burden by approximately 50%

Source: Campos et al, PVR, 2015.
Results: Increasing coverage with 1x screen more beneficial than 2–3x screens until baseline coverage is high.
Results: Increasing coverage with 1x screen more beneficial than 2–3x screens until baseline coverage is high.
Results: Increasing coverage with 1x screen more beneficial than 2–3x screens until baseline coverage is high

![Graph showing cervical cancer cases averted per 100,000 women and direct medical cost per 100,000 women (US$, thousands) for HPV 1x, HPV 2x, and HPV 3x at different coverage levels.]

- 30% coverage
- 90% coverage
- 70% coverage

Cervical cancer cases averted per 100,000 women

Direct medical cost per 100,000 women (US$, thousands)
Other potential questions and role for decision-modeling

• Other potential questions that have been addressed:
  – Which screening test—HPV, VIA, cytology?
  – Should VIA (or cytology) triage be offered after HPV-positive test result?
  – What is the trade-off between provider-collected (cervical) and self-collected (vaginal) specimen for HPV testing?

• Models useful for exploring uncertainty or “What ifs.”

• Caution needed when using modeling
  – Underlying assumptions are critical.
  – Conclusions may not apply equally to another setting.
Conclusions

• Decision modeling from 3 LMICs supports the WHO recommendations for age of screening (30–49 years), and that screening with HPV testing is more effective and cost-effective than VIA or cytology.

• While increasing screening from 1x to 3x doubles the cancer reduction (if timed well), countries will see greater health impact from increasing coverage with a single screen than screening the same women 3x—until coverage reaches 50–70%.

• Modeling can play an important role in designing efficient screening programs and guide resource-allocation decisions.
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