

# Is it affordable to vaccinate girls against HPV in Low and Middle income countries?

Using cost analysis to design affordable HPV vaccination programs: experiences from India, Peru, Uganda, Vietnam and Tanzania

Carol Levin, Ph.D.

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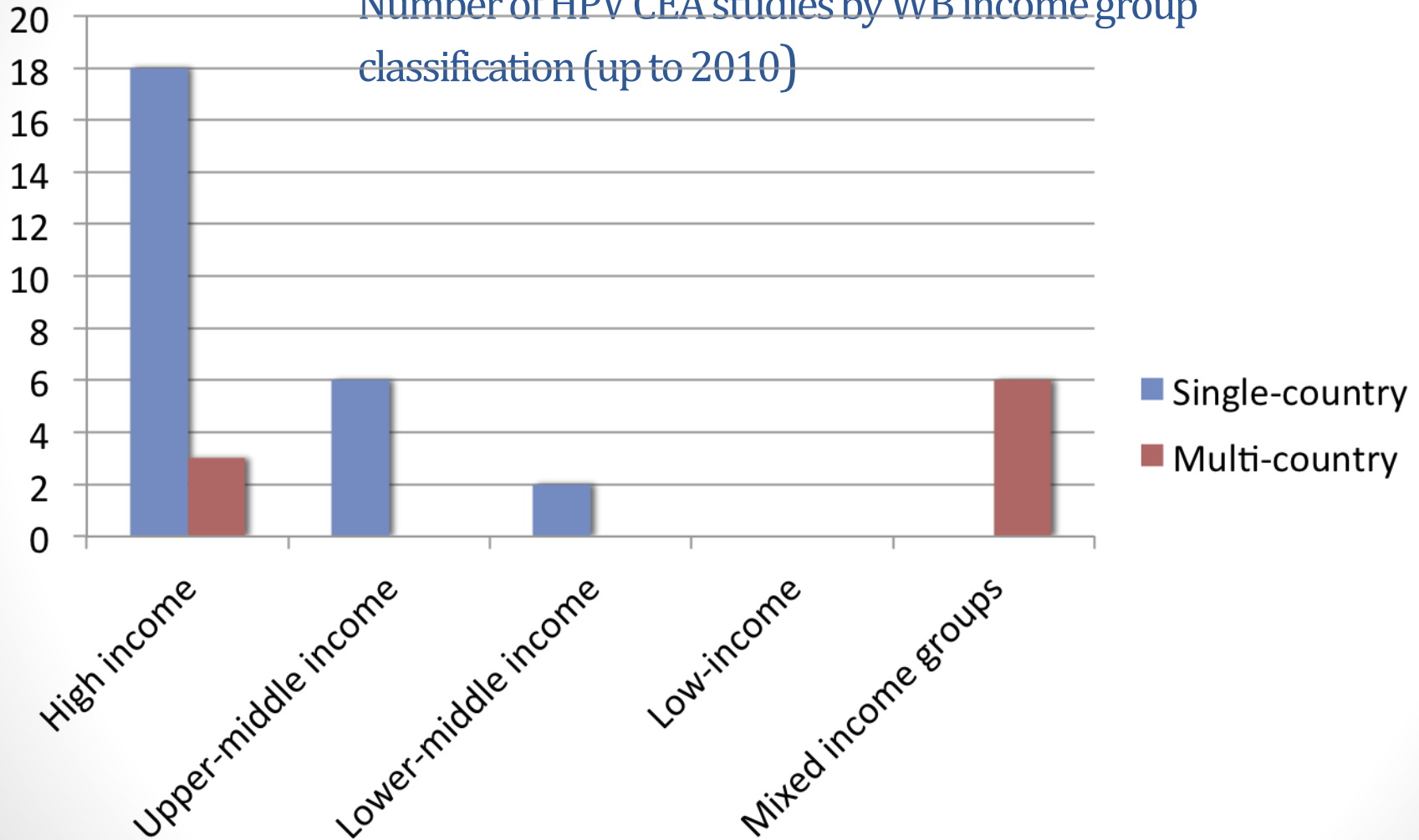
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# Background

- The World Health Organization (WHO) recommended that routine HPV vaccination for 9-13 year old girls be included in national immunization programmes, in countries where:
  - Prevention of cervical cancer and/or other HPV-related diseases is a public health priority,
  - Vaccine introduction is programmatically feasible and fundable;
  - Cost-effectiveness of vaccination strategies in the country or region has been duly considered.
- Operational costs of HPV vaccination are greater than for vaccines targeted towards infants → **different target group that uses health services less frequently**
- Important to examine cost data on HPV vaccine introduction in LMIC to see if affordable

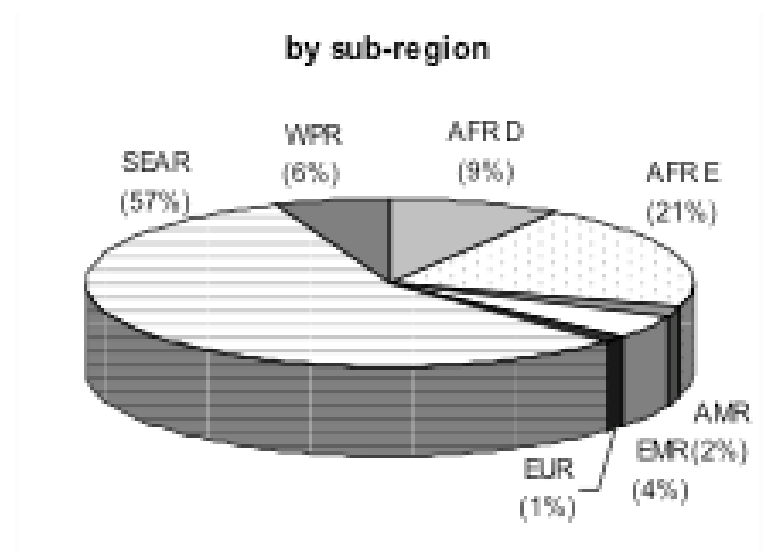
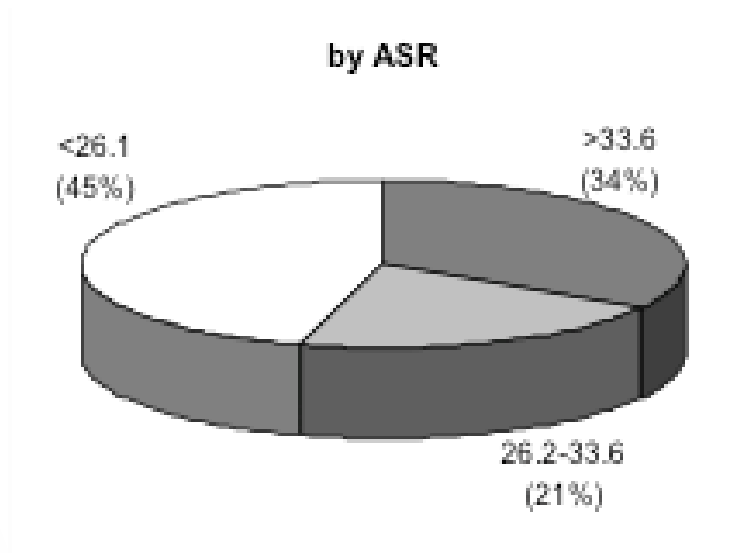
# HPV Vaccination is cost-effective in a wide variety of settings

Number of HPV CEA studies by WB income group classification (up to 2010)



# Distribution of avertable deaths

GAVI eligible countries



Source: Goldie et al. Benefits, cost requirements and CE of the HPV16,18 vaccine for cervical cancer prevention in developing countries: policy implications RHM 2008

# Vaccine cost most influential factor for cost-effectiveness

- For a cost per vaccinated girl (CVG) of \$50 or less, HPV vaccination of preadolescent girls was good value for money in most countries evaluated.
- In countries with a relatively lower disease burden and/or lower per-capita GDP, the vaccine cost threshold at which HPV vaccination was cost-effective was lower, at \$10 or \$25 per CVG.

# Is it affordable?

Research

## Delivery cost of human papillomavirus vaccination of young adolescent girls in Peru, Uganda and Viet Nam

Carol E Levin,<sup>a</sup> Hoang Van Minh,<sup>b</sup> John Odaga,<sup>c</sup> Swampa Sarit Rout,<sup>d</sup> Diep Nguyen Thi Ngoc,<sup>e</sup> Lysander Menezes,<sup>f</sup> Maria Ana Mendoza Araujo<sup>g</sup> & D Scott LaMontagne<sup>h</sup>

**Objective** To estimate the incremental delivery cost of human papillomavirus (HPV) vaccination of young adolescent girls in Peru, Uganda and Viet Nam.

**Methods** Data were collected from a sample of facilities that participated in five demonstration projects for HPV vaccine delivery: school-based delivery was used in Peru, Uganda and Viet Nam; health-centre-based delivery was also used in Viet Nam; and integrated delivery, which involved existing health services, was also used in Uganda. Microcosting methods were used to guide data collection on the use of resources (i.e. staff, supplies and equipment) and data were obtained from government, demonstration project and health centre administrative records. Delivery costs were expressed in 2009 United States dollars (US\$). Exclusively project-related expenses and the cost of the vaccine were excluded.

**Findings** The economic delivery cost per vaccine dose ranged from US\$ 1.44 for integrated outreach in Uganda to US\$ 3.88 for school-based delivery in Peru. In Viet Nam, the lowest cost per dose was US\$ 1.92 for health-centre-based delivery. Cost profiles revealed that, in general, the largest contributing factors were project start-up costs and recurrent personnel costs. The delivery cost of HPV vaccine was higher than published costs for traditional vaccines recommended by the Expanded Programme on Immunization (EPI).

**Conclusion** The cost of delivering HPV vaccine to young adolescent girls in Peru, Uganda and Viet Nam was higher than that for vaccines currently in the EPI schedule. The cost per vaccine dose was lower when delivery was integrated into existing health services.

Abstracts in [عربي](#), [中文](#), [Français](#), [Русский](#) and [Español](#) at the end of each article.

### Introduction

Cervical cancer is a major public health problem: globally it is associated with over 560 000 new cases and around 275 000 deaths each year, more than 85% of which are in developing countries.<sup>1</sup> Systematic, organized screening programmes for cervical cancer have had limited success in low-resource settings.<sup>2</sup> However, human papillomavirus (HPV) vaccines may offer a new strategy for prevention and recent studies indicate that vaccination can greatly reduce cervical cancer incidence and mortality.<sup>3,4</sup>

As developing countries consider whether they can afford to introduce HPV vaccination, much attention has focused on the private sector price of two currently available HPV vaccines: the quadrivalent and bivalent formulations. These vaccines cost more than 100 United States dollars (US\$) per dose, or more than US\$ 300 for the three-dose series. Reported prices in the public sector have been declining and, in 2011, the manufacturer of the quadrivalent vaccine offered it at US\$ 5 per dose to the GAVI Alliance for use in countries eligible for Alliance support. Low- and middle-income countries in Latin America can purchase HPV vaccine for US\$ 10–US\$ 15 per dose through the Revolving Fund of the Pan American Health Organization (PAHO). Young adolescent girls will benefit most from vaccine-based protection against cervical cancer because they are less likely than older girls to have been infected with

the HPV types targeted by the vaccine. Although the price per vaccine dose will remain a key consideration when deciding whether to introduce the HPV vaccine, national governments and donors must also take into account the additional resources required for vaccine delivery.<sup>5</sup>

Between 2006 and 2010, the non-profit global health organization PATH collaborated with the governments of Peru, Uganda and Viet Nam to collect evidence that would assist government decision-making on whether and how to introduce HPV vaccination. The results of formative research<sup>6</sup> were used to design demonstration projects of different types of vaccine delivery in partnership with each country's ministry of health, subnational health and education sectors and other key stakeholders.<sup>6–10</sup> Three delivery strategies were investigated: school-based outreach, health-centre-based outreach and integrated outreach, which made use of existing health services. The eligible population was selected by either school grade or age. The areas of implementation were limited geographically but large enough to cover complete administrative districts and to be broadly representative of each country's population, thereby providing models that were suitable for scaling up in the future.

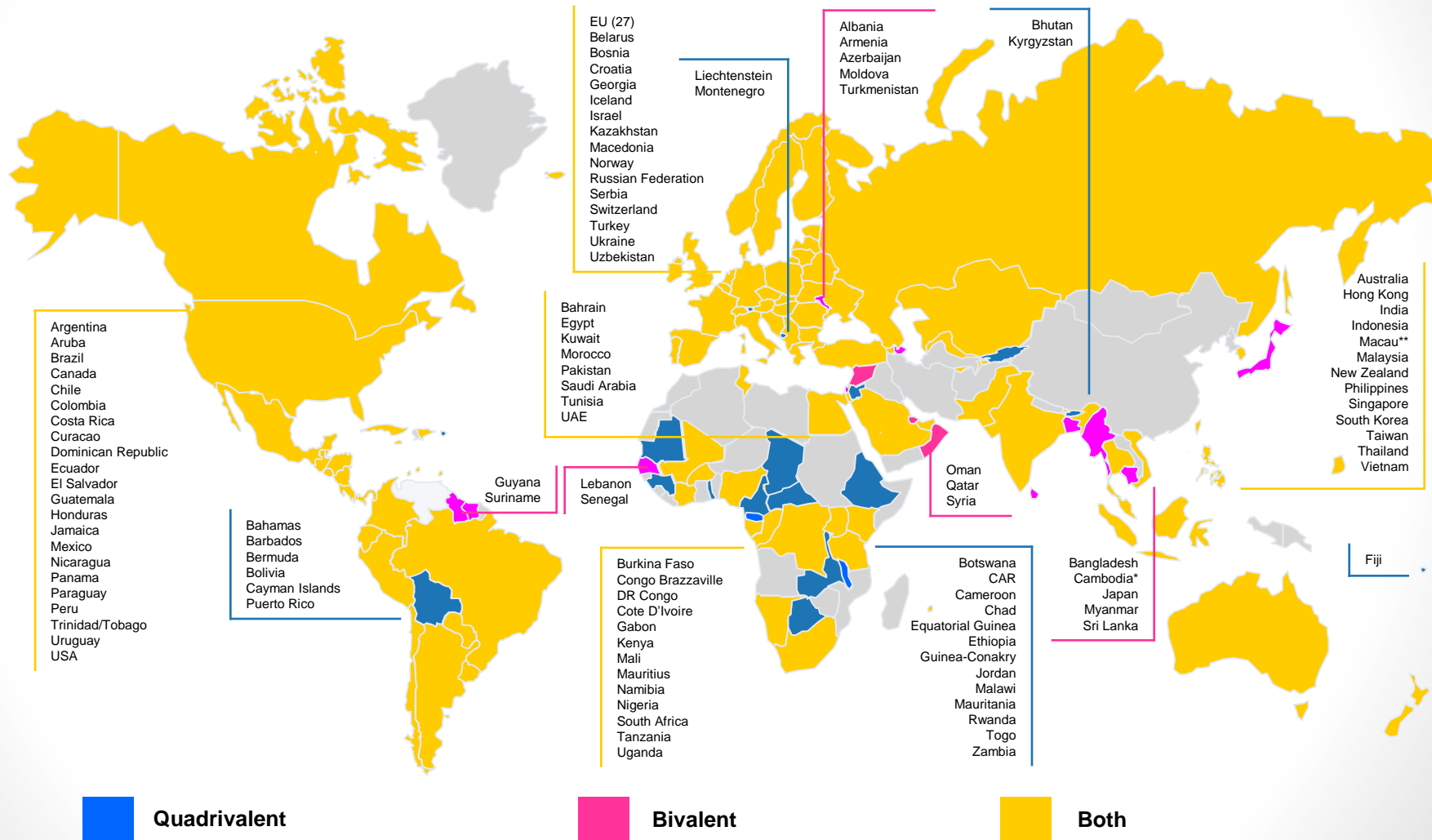
The strategies used in demonstration projects achieved high coverage among young adolescent girls and were found to be acceptable and feasible.<sup>11–17</sup> For school-based outreach, vaccine coverage was 82.6% in Peru, 88.9% in Uganda and

<sup>a</sup> Department of Global Health, University of Washington, 325 Ninth Avenue, Box 359931, Seattle, Washington, 98104, United States of America (USA)

<sup>b</sup> Department of Health Economics, Hanoi Medical University, Hanoi, Viet Nam

<sup>c</sup> Child Health and Development Centre, Makerere University, Kampala, Uganda

# Global HPV vaccine licensure status as of June 2011



\*Cambodia: Bivalent

\*\*Macau: Bivalent

# Evidence from pilot studies

- Introduction of HPV vaccine to prevent cervical cancer
- Multi-country Study
  - India
  - Peru
  - Vietnam
  - Uganda





# Tanzania-a national HPV vaccination program

- Rationale
  - High cervical cancer disease burden
  - Plan to introduce HPV vaccination to ten year old girls
  - Girls have high school enrollment in primary school
- Estimated cost of introducing HPV vaccine nationwide with WHO C4P (Cervical Cancer Prevention and Control) costing tool
  - Assumed vaccination would take place in schools
  - Would be phased in over three years
  - Trainings, sensitization meetings, and micro-planning would take place in regions during the year of introduction

# Objectives for cost analyses

- Estimate the incremental operational **program** costs associated with innovative HPV vaccine delivery strategies to reach young adolescent target group in **Peru, Uganda, Vietnam, and India.**
- Estimate incremental cost of HPV vaccine introduction nationwide **in Tanzania.**

# Methods: Estimating costs of introducing the HPV vaccine

- Microcosting data based on ingredients approach and budget expenditure data
- Payer perspective (Ministry of Health)
- Multi-level: national, provincial, district, community
- Sub-sample of health facilities
- Excludes project-related expenses
- Incremental cost to existing immunization services
  - Start-up costs represent investment in first year only
  - Recurrent costs assume HPV vaccination is integrated into existing national immunization program

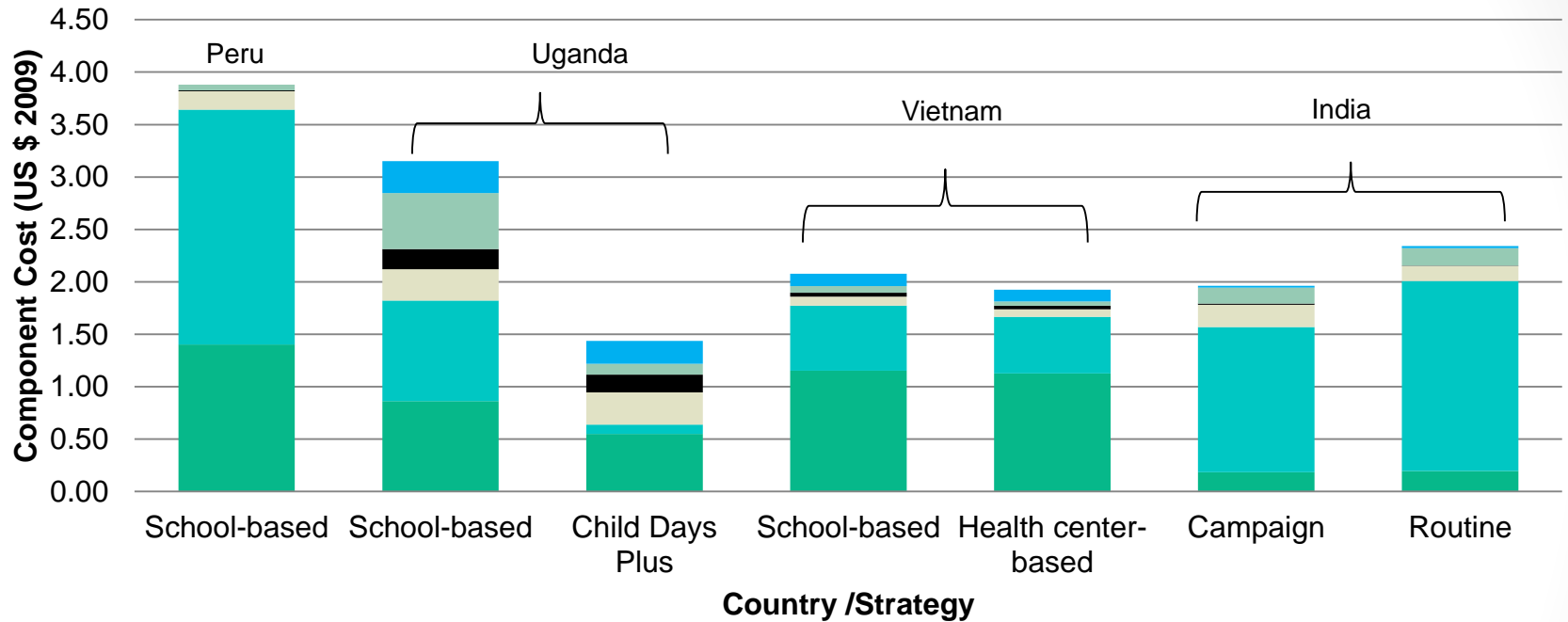
# Costs represent the value of resources used to deliver HPV vaccine

- **Financial costs** represent the actual expenditure on goods and services purchased.
  - Use for financial analysis (affordability, budget allocation)
  - Excludes salaries of personnel
- **Economic costs** include the inputs that are not paid for in the current project budget
  - Donated goods, volunteer labor, discounted goods or services.
  - Use for Economic Evaluations, such as CEA or CUA

# Cost categories

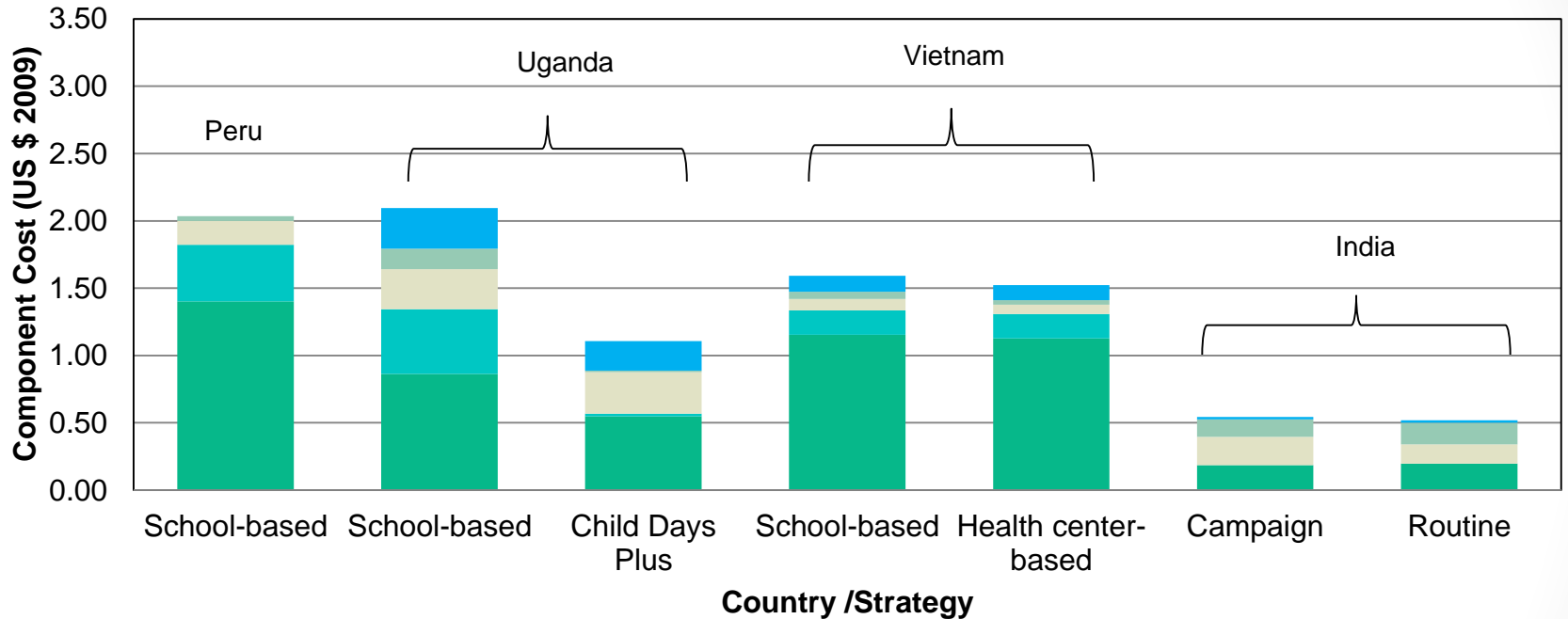
| Activity or input                                   | Start-up | Recurrent |
|---|----------|-----------|
| Microplanning                                       | √        |           |
| IEC activities                                      | √        |           |
| Training  | √        |           |
| Personnel   |          | √         |
| Supplies<br>(does not include vaccine)              |          | √         |
| Transport<br>(depreciation and operating expenses)  |          | √         |
| Cold chain<br>(depreciation and operating expenses) |          | √         |
| Waste management                                    |          | √         |

# PATH pilot project: HPV economic program cost per dose and cost components



- Other
- Vehicles and transportation
- Cold Chain
- Supplies
- Personnel
- Start up activities (microplanning, awareness raising, training)

# PATH pilot project: HPV financial program cost per dose and cost components



- Other
- Transportation
- Supplies
- Personnel allowances
- Start up activities (microplanning, awareness raising, training)

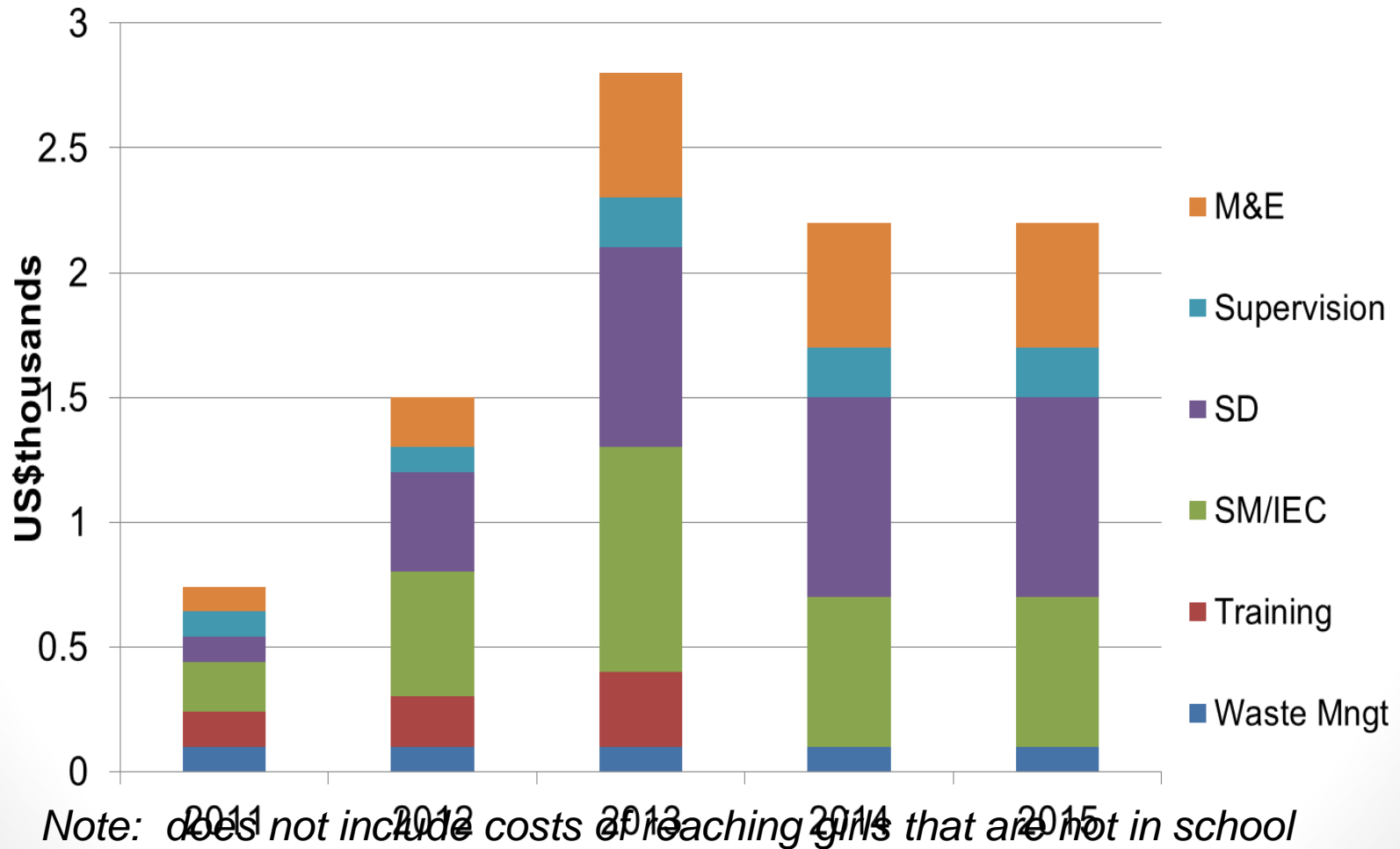
## Tanzania: Summary of Costs: 2011-2015, School based Vaccination, price/dose = \$5

|  | Financial Costs<br>US\$ | Economic Costs<br>US\$ |
|--|-------------------------|------------------------|
| Training                                   | 645,700                 | 1,029,600              |
| Social Mobilization/IEC                    | 2,797,600               | 4,803,824              |
| Service Delivery (personnel and transport) | 2,743,900               | 10,505,600             |
| Vaccines                                   | 20,891,000              | 35,688,650             |
| M&E  | 1,814,100               | 1,814,084              |
| Supervision                                | 671,800                 | 1,138,900              |
| Waste Management                           | 188,000                 | 188,000                |
| <b>Total</b>                               | <b>\$29,792,400</b>     | <b>\$55,169,004</b>    |

Note: Assumes school enrollment rate of 97% (UNICEF 2011) and does not include cost of vaccinating girls not in school.



# Tanzania: Projected Financial Costs for Delivery: 2011-2015, School based Vaccination



# Factors affecting cross-country results

- Methodological
  - Specific included and excluded items—not significant
- Contextual
  - Scope and scale: number of girls vaccinated by country
  - Strategy: campaign, school-based, health facility, CDP
  - Differences in national income levels and related public health cost, infrastructure, and salary structures
  - Health system policies and programs that influence specific implementation plans affect resource use and costs across the countries

# Important observations from the HPV cost analyses

- Costs are likely to be lower where:
  - HPV activities are Integrated with other health service delivery
  - Population density is high
  - Health centers are close to target population or schools served
- Cost are likely to be higher where:
  - Health facilities have small catchment area and communities are geographically dispersed
  - Health centers are far from schools
  - Outreach per diems are high
- Important cost driver is:
  - IEC and social mobilization to get high coverage

# Affordability

# PATH pilot projects: Financial considerations

Projected total HPV vaccination costs, including cost of vaccine, by country and strategy (2009 US\$)

| Strategy by country              | Estimate of eligibles (80% of all 10-year-olds) | Vaccine cost | Program delivery cost | Total financial costs | Non-vaccine program costs as a share of total costs | 2009 national immunization budget (2009 US\$) | Percentage of 2009 national immunization budget |
|----------------------------------|---|--------------|-----------------------|-----------------------|---|---|---|
| <b>Peru</b>                      |   |              |                       |                       |   | <b>113,963,713</b>                            |   |
| School-based                     | 228,480   | 13,047,076   | 1,391,443             | 14,438,519            | 10%   |   | 13%   |
| <b>Uganda</b>                    |   |              |                       |                       |   | <b>35,672,010</b>                             |   |
| School-based                     | 351,200   | 230,683      | 2,212,560             | 2,443,243             | 91%   |   | 7%  |
| Integrated outreach              |   | 230,683      | 1,169,496             | 1,400,179             | 84%   |   | 4%  |
| <b>Vietnam</b>                   |   |              |                       |                       |   | <b>28,083,812</b>                             |   |
| School-based                     | 534,720   | 351,227      | 2,598,739             | 2,949,966             | 88%   |   | 11%   |
| Health center-based              |   | 351,227      | 2,486,448             | 2,837,675             | 88%   |   | 10%   |
| <b>India</b>                     |   |              |                       |                       |   | <b>N/A</b>                                    |   |
| Pulsed campaign (Andhra Pradesh) | 586,080   | 384,962      | 911,911               | 1,296,873             | 70%   |   | N/A   |
| Routine monthly (Gujarat)        | 407,040   | 267,361      | 660,983               | 928,344               | 71%   |   | N/A   |

HPV, human papillomavirus

# Tanzania National Introduction: Financial Considerations

|   | Financial Costs, US\$ |
|---|-----------------------|
| <b>Total Estimated Costs<br/>2011-2015</b>  | <b>\$29,792,400</b>   |
| <b>Estimated Cost of 2010-<br/>2014 National<br/>immunization Programme<br/>(2009 US\$)</b> | <b>\$230,000,000</b>  |
| <b>Percentage of national<br/>immunization Programme<br/>Costs</b>                          | <b>13%</b>            |

# Shaping national and global programs to support HPV vaccination

- **Peru** introduced HPV vaccination nationwide in 2011
- **Uganda** will apply for GAVI support using a hybrid program of school-based and child health days.
- **Vietnam and India** have not introduced vaccine.
- Tanzania plans to introduce HPV vaccination in 2014
- **GAVI** opened a funding mechanism to support HPV vaccines
- GAVI secretariat recommended increasing the introduction grant to \$2.40 per targeted girl, based on data from PATH cross-country demonstration studies and WHO estimates from Tanzania.



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# PATH Economic research team

- Carol E. Levin, PhD: University of Washington, Seattle (formerly at PATH)
- Scott LaMontagne, Ph.D: PATH, Seattle
- Hoang Van Minh, PhD: Department of Health Economics, Hanoi Medical University, Hanoi, Vietnam
- John Odaga, PhD: Child Health and Development Centre, Makerere University, Kampala, Uganda
- Swapna Sarit Rout, MSc: Centre for Operations Research and Training, Vadodara, India
- Diep Nguyen Thi Ngoc, MD, MPH: PATH' s Vietnam Country Program, Hanoi, Vietnam
- Lysander Menezes, PhD: PATH' s India Country Program, New Delhi, India
- Maria Ana Mendoza Araujo, MD: Estrategia Sanitaria Nacional de Inmunización (National Expanded Program for Immunization), Ministry of Health, Peru

**\*Corresponding researcher: [clevin@uw.edu](mailto:clevin@uw.edu)**

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