Next Questions in Costing and Modeling Methods

- Part 1: Costing Immunization System Improvements
- Part 2: Cost of Illness & Economic Burden of Vaccine-Preventable Diseases

IHEA INTERNATIONAL HEALTH ECONOMICS ASSOCIATION

IMMUNIZATION ECONOMICS.ORG

Disclaimer: The views expressed in this presentation are solely those of the presenters and do not necessarily represent the official position of the U.S. Centers for Disease Control and Prevention or the U.S. Government.

Costing Immunization System Improvements

Sarah Pallas (spallas@cdc.gov) and Roopa Darwar (rdarwar@cdc.gov)

Economics Unit, Global Immunization Division, Global Health Center, U.S. Centers for Disease Control and Prevention

IHEA INTERNATIONAL HEALTH ECONOMICS ASSOCIATION

IMMUNIZATION ECONOMICS.ORG

DEPARTMENT OF HEALTH & HUMAN SERVICES USA

CDC CENTERS FOR DISEASE CONTROL AND PREVENTION

What do we mean by immunization system improvements?

Interventions in the systems that support immunization delivery that are ultimately intended to improve immunization coverage

- Immunization information systems
- Vaccine safety monitoring systems
- Vaccine-preventable disease (VPD) surveillance systems
- Vaccine supply chain/distribution systems
- Immunization-specific policy making systems (e.g., National Immunization Technical Advisory Group (NITAG))
- Health worker capacity building interventions

Examples of immunization-specific system improvement interventions

- **DHIS2 Routine Immunization module** added to existing DHIS2 platform
- **Case-based VPD surveillance** (polio AFP, measles, rubella, etc.) added to existing aggregate notifiable disease surveillance system
- **Adverse events following immunization (AEFI) surveillance/causality committee** added to existing pharmacovigilance
- **NITAG** added to existing health technology assessment (HTA) or health policy processes

Why do we need to cost immunization system improvements?

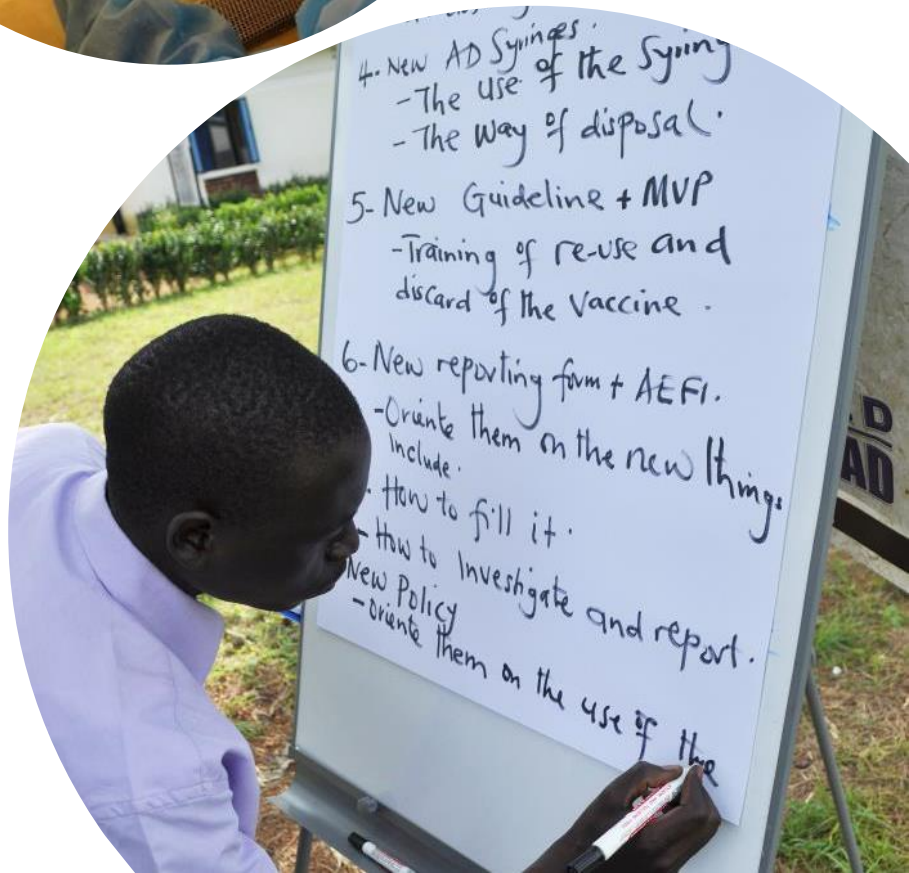
- Capture **full resource needs** to deliver vaccines and **ensure intended impact of vaccination**
  - Immunization information systems, VPD surveillance, and safety monitoring allow us to know if vaccines are working as intended and target vaccination where needed

- **Optimize efficiency** of system interventions specifically intended to improve immunization coverage

IHEA INTERNATIONAL HEALTH ECONOMICS ASSOCIATION IMMUNIZATION ECONOMICS.ORG

Aren't immunization system investments already captured in immunization delivery costs?

- More frequently included:
  - Vaccine/immunization-specific training, supervision, social mobilization
  - Modifications to reporting forms/systems for new vaccine introduction



- Less frequently included:
  - Vaccine-preventable disease surveillance
  - AEFI surveillance (and treatment)
  - Cross-vaccine information system improvements

IHEA INTERNATIONAL HEALTH ECONOMICS ASSOCIATION IMMUNIZATION ECONOMICS.ORG

What is **the same** about costing immunization system improvements vs immunization delivery?

- Can apply same program **costing methods**
  - Resource input categories included
  - Financial, fiscal, and economic cost definitions
  - Ingredients-based microcosting or activity-based costing

Inputs

- **Perspectives** used for costing immunization delivery also relevant
  - Societal; Government; Payer; Provider
  - Beneficiary cost perspective may be less relevant for system improvements

What is **different** about costing immunization system improvements vs immunization delivery?

- **Unit of output** ("production function") less well defined for system improvements vs delivery

Outputs

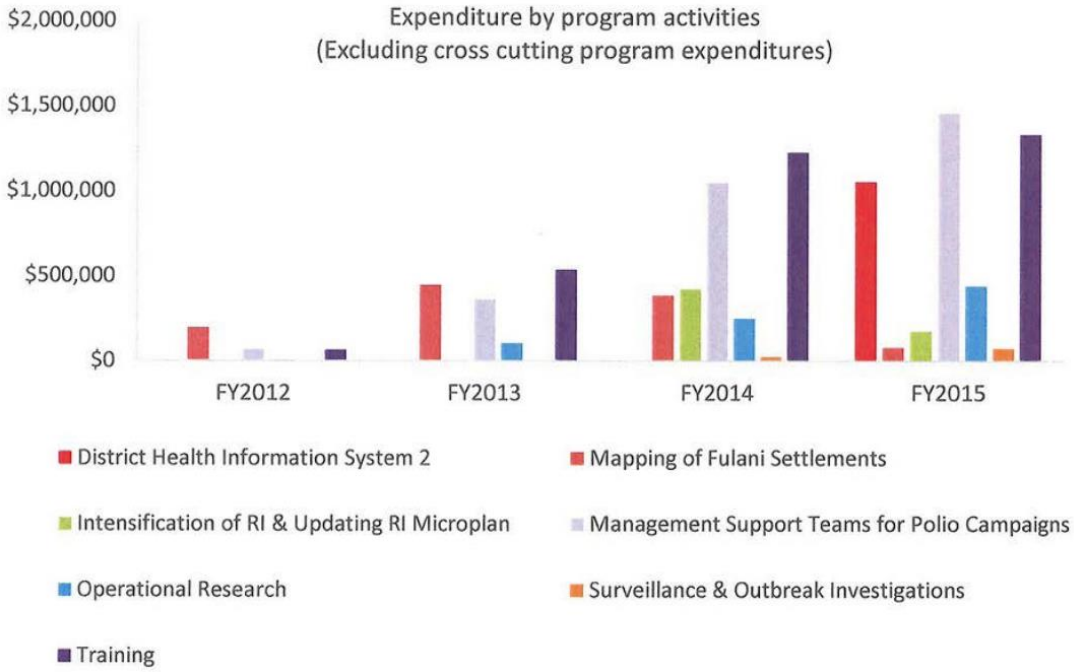
- Intervention **effectiveness not always rigorously evaluated**
- Possible to cost these interventions but their ***value* is hard to quantify** and compare without a metric of intervention effectiveness
  - Willingness to pay for system improvements (e.g., improved timeliness and accuracy of data) is undefined; hard to communicate to decision makers
  - Value may depend on behavior change outside of the system (e.g., use of data)

Examples of costing immunization system improvements: previous work

Research

PanAfrican Medical Journal

An assessment of the contribution of National Stop Transmission of Polio Program to Nigeria's Immunization Program



IHEA INTERNATIONAL HEALTH ECONOMICS ASSOCIATION

IMMUNIZATION ECONOMICS.ORG

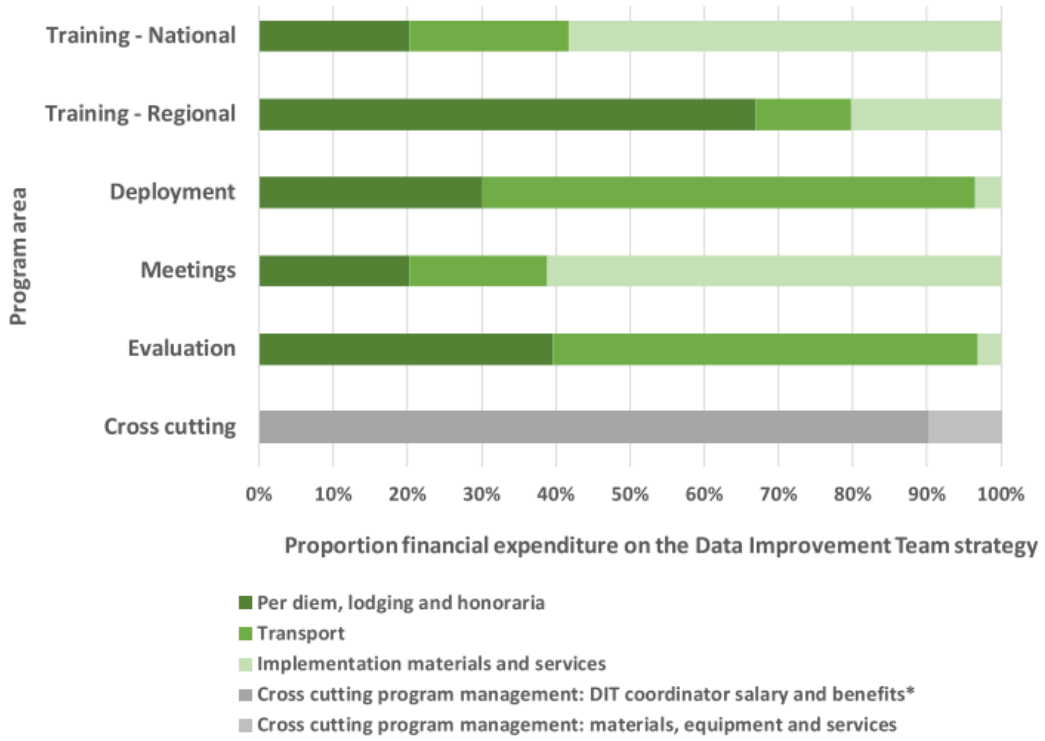
ELSEVIER

Contents lists available at ScienceDirect

Vaccine

journal homepage: www.elsevier.com/locate/vaccine

Financial cost analysis of a strategy to improve the quality of administrative vaccination data in Uganda



Examples of costing immunization system improvements: ongoing work

- Costing vaccine-preventable disease surveillance in Ethiopia, 2018-19

Country-wide economic (including financial) surveillance costs by VPD													
	VPD												
Statistic	General (i.e., not specific to one VPD)	Polio/ Acute Flaccid Paralysis	Measles & Rubella	Neonatal Tetanus	Meningococcal meningitis (pediatric)	Yellow Fever	Cholera	Rotavirus	Congenital Rubella Syndrome	Invasive-bacterial VPDs	Human Rabies	Other (diphtheria, pertussis, typhoid, smallpox)	TOTAL
Sum, weighted (Mar 2023 USD)	37,695,612	7,455,467	10,938,705	1,628,912	1,900,541	788,460	2,341,020	1,083,907	600,289	1,515,451	1,134,074	783,612	67,866,048
Share of total (%)	*55.5*	*11.0*	*16.1*	*2.4*	*2.8*	*1.2*	*3.4*	*1.6*	*0.9*	*2.2*	*1.7*	*1.2*	*100*

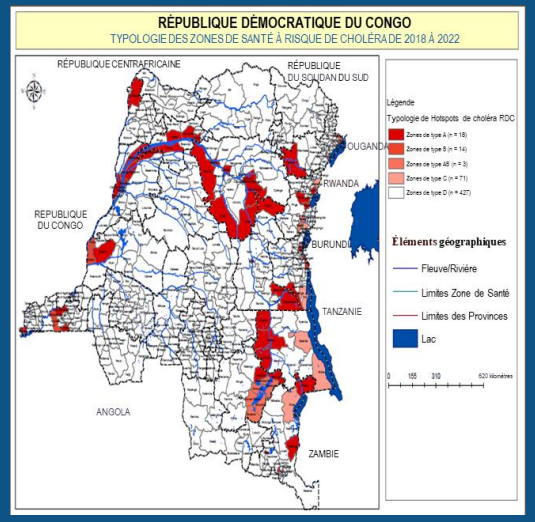
Yellow highlight = Category with the largest share of costs
Blue highlight = Category with the largest share of costs, excluding general

IHEA INTERNATIONAL HEALTH ECONOMICS ASSOCIATION IMMUNIZATION ECONOMICS.ORG

For additional information and results from this evaluation, please join our session "Costing and Budgeting for Vaccine-Preventable Disease Surveillance: Case Studies from Ethiopia, Nepal, the State of Karnataka of India, and Sudan" July 10th at 8:30 am in the Protea room.

Examples of costing immunization system improvements: ongoing work

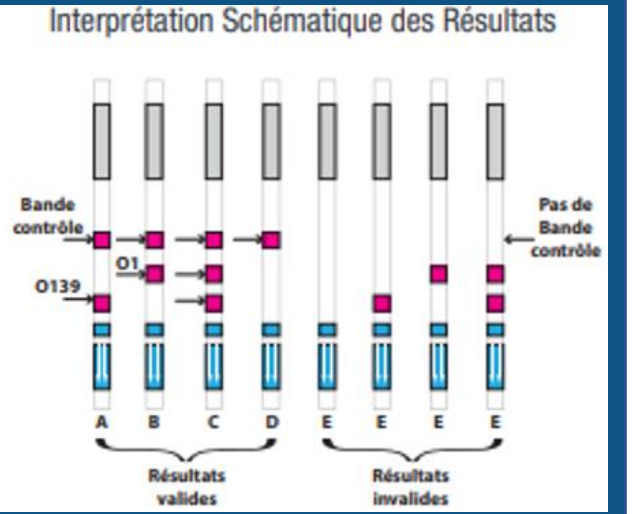
Cost analysis of **cholera** rapid diagnostic test (RDT) use in **DRC**



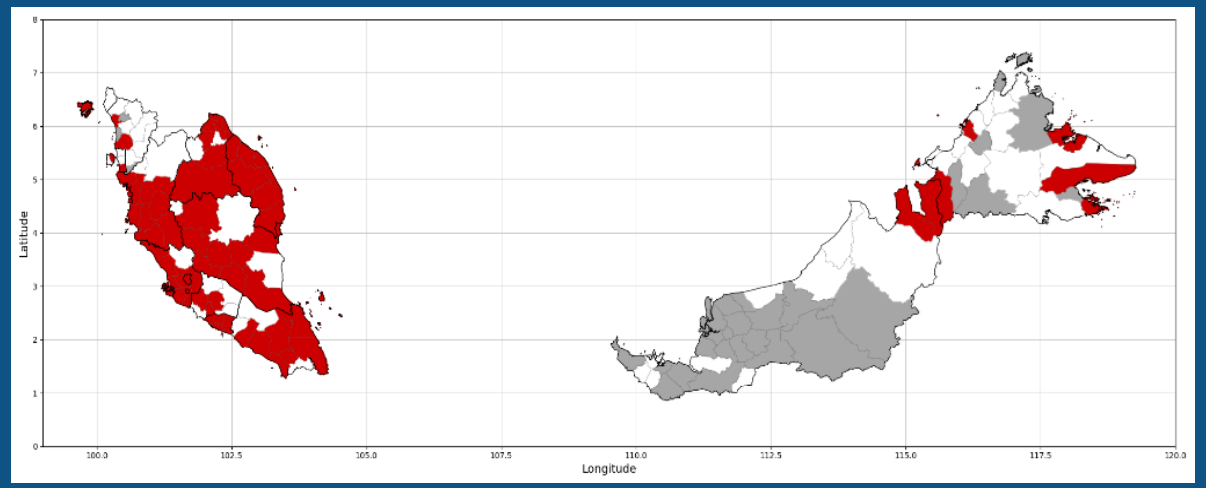
Interprétation des Résultats

Interprétation*	Bandes rouges rosées observées		
	O1	O139	Contrôle
A. *Vibrio cholerae* O139 détecté	-	+	+
B. *Vibrio cholerae* O1 détecté	+	-	+
C. *Vibrio cholerae* O1 et O139 détectés	+	+	+
D. *Vibrio cholerae* O1 et O139 non détectés	-	-	+
E. Résultats non valides	+ ou -	+ ou -	-

*La bande de contrôle doit apparaître pour que le résultat soit valide.



Cost-effectiveness analysis of **measles** rapid diagnostic test (RDT) use in **Malaysia**



Suggestions for future directions (1)

- **Standardize output metrics** for technical efficiency comparisons
- **Develop guidance/tools** for collecting programmatic output and epidemiological data alongside cost data to aid interpretation of cost results
  - E.g., cost of VPD surveillance contextualized with case investigations and incidence data
- **Conduct robust impact evaluations** of system improvement interventions in different settings
  - Only collect costs for effective interventions?
- **Define thresholds** to help assess value / interpret results for decision makers

Suggestions for future directions (2)

- **Evaluate efficiency of immunization-specific system improvements** vs integrated health system strengthening in terms of effects on immunization coverage

- Assess how other parts of the health system adapt to the immunization-specific intervention (e.g., **displacement effects, crowding in/out**)

- **Report inclusion/exclusion of system improvements** in immunization delivery costing studies (Community of Practice need to clarify guidance on this issue?)

Conclusion

- **Immunization service delivery relies on robust systems**, including for immunization information, surveillance, vaccine safety, policy, and supply chain
- Important to **assess the resources needed to improve and maintain systems** that support achieving and sustaining immunization coverage targets
- Encourage Immunization Economics Community of Practice to expand beyond service delivery to **build evidence base on costs and cost-effectiveness of immunization system improvements**




Thank You

To learn more, please join our session "Costing and Budgeting for Vaccine-Preventable Disease Surveillance: Case Studies from Ethiopia, Nepal, the State of Karnataka of India, and Sudan" tomorrow at 8:30 am in the Protea room!

IHEA INTERNATIONAL HEALTH ECONOMICS ASSOCIATION

IMMUNIZATION ECONOMICS.ORG

Cost of illness & economic burden of vaccine-preventable diseases

Sharing of experiences and panel discussion

Rachel Hounsell, University of Oxford & University of Cape Town/MASHA

Sachiko Ozawa, University of North Carolina at Chapel Hill

Sarah Pallas, U.S. Centers for Disease Control and Prevention

IHEA INTERNATIONAL HEALTH ECONOMICS ASSOCIATION

IMMUNIZATION ECONOMICS.ORG

Panelist examples of cost-of-illness (COI) / economic burden of disease studies

- **Rachel Hounsell (UCT/Oxford)**
  - DTP Boost app for diphtheria, tetanus, and pertussis vaccine booster doses (*in progress*)

- **Sachi Ozawa (UNC)**
  - Pneumococcal conjugate vaccine (PCV) value in controlling antimicrobial resistance (AMR)
  - https://doi.org/10.1016/j.vaccine.2021.04.024

- **Sarah Pallas (CDC)**
  - Typhoid and paratyphoid cost of illness studies (SEAP)
  - https://doi.org/10.1093/cid/ciaa481; ciaa1334; ciaa1335; ciaa1336

- What was the policy/ program question?
- Who was the audience?
- What costing perspective was used?
- What data sources were used?

Panelist questions

- **Challenges:** For the economic burden study you described, what challenges did you encounter in:
  - designing the scope of the study?
  - gathering the needed data?
  - analyzing and communicating the results?

- **Future directions:**
  - What **future research** do you think is **needed** regarding COI/economic burden of VPD studies?
  - What **methodological guidance** do you think **would be helpful** for future COI/economic burden of VPD studies?

Audience Q&A/Discussion Questions

1. To estimate broader economic burden, **what methods should be used to quantify and monetize secondary effects of VPDs** across health and other sectors? (e.g., COVID-19 pandemic impacts on non-COVID health conditions/services, non-health essential service delivery, schooling)

2. For which types of policy questions **do we need primary data on COI/economic burden** of VPDs vs. modeling based on secondary data?

3. When **should prices of health care services be used** in lieu of costing the economic value of resources used in COI/economic burden of VPD studies?

4. Should COI/economic burden studies of VPDs be **limited to lab-confirmed cases (vs clinically diagnosed)?** What methods would you recommend to account for background care-seeking behaviors and morbidity not attributable to the VPD?

Thank you

IHEA INTERNATIONAL HEALTH ECONOMICS ASSOCIATION

IMMUNIZATION ECONOMICS.ORG

Rachel Hounsell: rachel.hounsell@gtc.ox.ac.uk

Sachi Ozawa: ozawa@email.unc.edu

Sarah Pallas: spallas@cdc.gov