How changing vial size can improve your immunization services

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16th TechNet Conference

Shaping a resilient and adaptive immunization program

DPCP

DOSE PER CONTAINER PARTNERSHIP

5-Dose Measles-Rubella Implementation Research in Zambia

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Table of Contents

PROJECT CONTEXT AND OVERVIEW

April 2015 – March 2019

Dose Per Container Partnership

Aims to understand the **DECISION-MAKING PROCESS** and the **PROGRAMMATIC IMPLICATIONS** when considering DPC to optimize equitable, timely, safe, and cost effective coverage.

Objectives:

- Gather evidence for global stakeholders and countries to help make informed decisions around vaccine DPC
- Convert evidence into decision support tools/guidance; build on existing processes and tools to develop integrated decision-making approaches that help countries assess their options

Framing the Issue

Countries need access to affordable and appropriate vaccine products and programmatic tools to achieve immunization coverage targets.

- There is a continued reliance on multi-dose presentations to maintain low costs
- Healthcare worker (HCW) fear of wastage and stockouts leads to missed opportunities to immunize
- More evidence needed to assess dose per container (DPC) trade-offs between costs and system impacts
- DPC decisions impact program performance
- There has been little historical focus on DPC

Systems Components Considered for DPC

- Coverage (equity, timeliness, session size and frequency)
- Cost per dose and cost effectiveness
- Supply, distribution, and cold chain storage
- Wastage rate (open and closed vial)
- Safety (risks of multi dose containers and adherence to MDVP)
- HCW behavior and needs (missed opportunities, willingness to open a vial)

Research Overview: Decision Making

Country	Research Scope
Ghana	Retrospective analysis of DPC changes for yellow fever and pentavalent vaccines
Benin, Cote d'Ivoire, DRC	Process for making DPC procurement decisions
Cote d'Ivoire, Mozambique, Nepal, Senegal, Uganda, Zimbabwe	Assessment of National Immunization Technical Advisory Group (NITAG) influence on DPC decisions through desk review and surveys
Tools Assessment	Review of 10 Excel-based tools used for EPI planning to assess for use of changing DPC

Project findings available at www.jsi.com/dpcp

Research Overview:
Understanding Programmatic Implications

Country	Research Scope
Senegal and Vietnam	Formative research on 1) Relationships between DPC and wastage, coverage, session frequency, timeliness, safety, and costs; and 2) HCWs' knowledge, behavior, and preferences related to DPC
Zambia	Implementation research on the impact of a change from 10- to 5-dose vials of measles rubella vaccine on vaccine wastage, coverage, session frequency, timeliness, safety, and costs.
	Computer simulation modeling analyzing the effect of 5-dose and 10-dose MR vaccine in different scenarios, tailoring to urban / rural districts or facilities, session size, and with HCW behavior influences.

Zambia Implementation Research

Introducing 5-dose vials of MR

Objectives

- Examine the effects of switching from 10 vials to 5 dose vials of measles containing vaccine (MCV) on first and second dose coverage, open vial wastage, dropouts, session size and frequency, storage and distribution capacity, and logistics, service delivery, and total systems costs for RI.
- Understand how vial presentation may have an influence on missed opportunities, timely coverage, equitable coverage, and safety.
- Explore HCW preferences and examine HCW behavior with various vial presentations.
- Identify the factors that enable and hinder the proper use of each of the two presentations.

MCV in Zambia

- 10-dose vials of measles containing vaccine (MCV) manufactured by Serum Institute of India (SII)
- Measles 2nd dose introduced in July 2013
- Measles-Rubella (MR) campaign in Sept 2016
- Measles to MR switch in study districts in May 2017 and country-wide in June 2017
- MR is given at 9 & 18 months through fixed and outreach sessions

- MCV1 by 12 months of age has fluctuated from 89% in 2008 to 80% in 2013 to 96% in 2017 (JRF)
- MCV2 coverage in 2017 was 64% (JRF)
- Disparities between regions and districts with MCV1 coverage in districts ranging from 64% to 256% (2017 JRF)

Pre- and Post-Intervention Mixed Methods Design

- Household cluster Coverage Survey
- Health Facility (HF), District, and National Key Informant Interviews
- Routine Immunization Session Observation (baseline only)
- HF & District Costing Survey
- Administrative Data Review (12 months retrospective)
- HF data collected during implementation on DPCP form (MR vials opened, session size & frequency, quantity of stock)

Sample

	5 dose	10 dose	Total
# of districts	7	7	14
# of HFs	135	105	240
Target Population	38,041	30,574	68,615

- MOH selected 14 districts in Central and Luapula Provinces
- Cluster randomized block design used to allocate districts into control (10 dose vials) and intervention (5 dose vials)
- Districts matched according to average population size per HF and number of HFs within each district.
- Intervention HFs received 5 dose vials through regular distribution system.

Household Survey

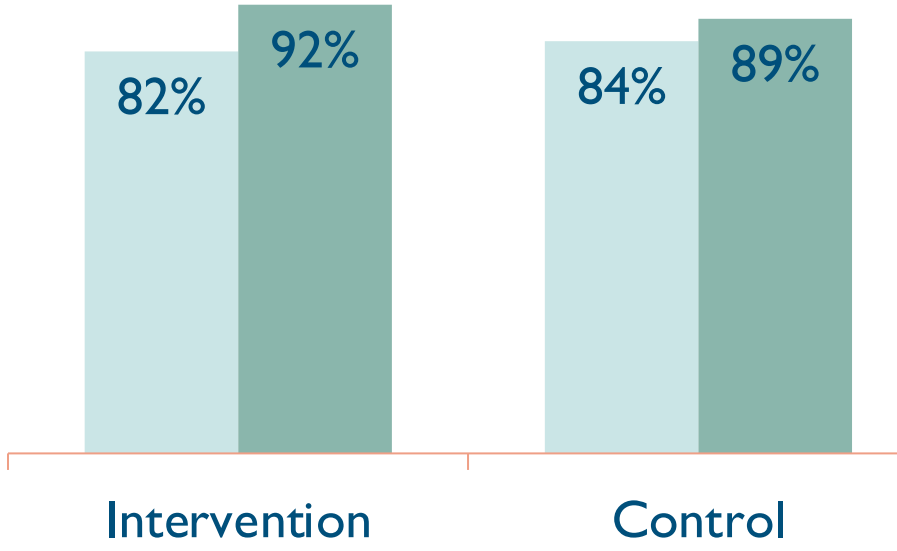
- Two-stage cluster design was conducted at baseline and endline
- Questionnaire adapted from WHO's Coverage Cluster Survey
- Two cohorts: 12-23 months to measure MCV1, 24-35 months to measure MCV2
- Data collected in SurveyCTO
- Data analyzed in Stata 14 to examine MCV1 and MCV 2 coverage and timely coverage
- Intervention effect was estimated using difference-in-difference (DinD) analysis

	12-23 months	24-35 months	Total
	n	n	
Baseline			
Intervention	1,907	1,920	3,827
Control	1,960	1,867	3,827
Total	3,867	3,787	7,654
Endline			
Intervention	1,962	1,931	3,893
Control	1,965	1,937	3,902
Total	3,927	3,868	7,795

Coverage Findings

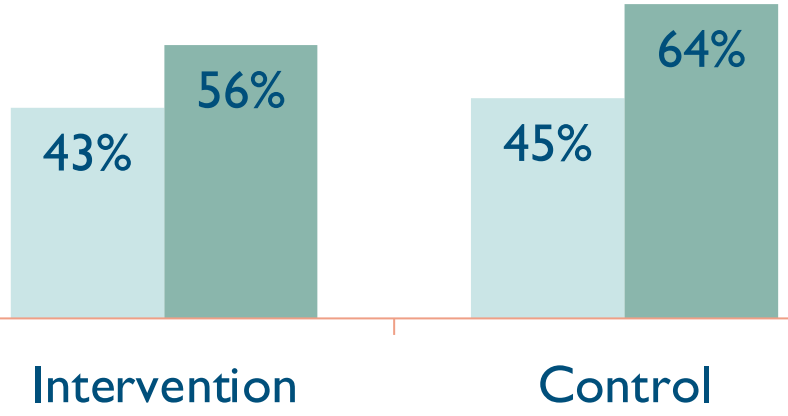
Data Source: Card + Recall

MCV1 (12-23 months)



Intervention Effect:
4.9% (p<0.001)

MCV2 (24-35 months)



Intervention Effect:
3.5% (p=0.007)

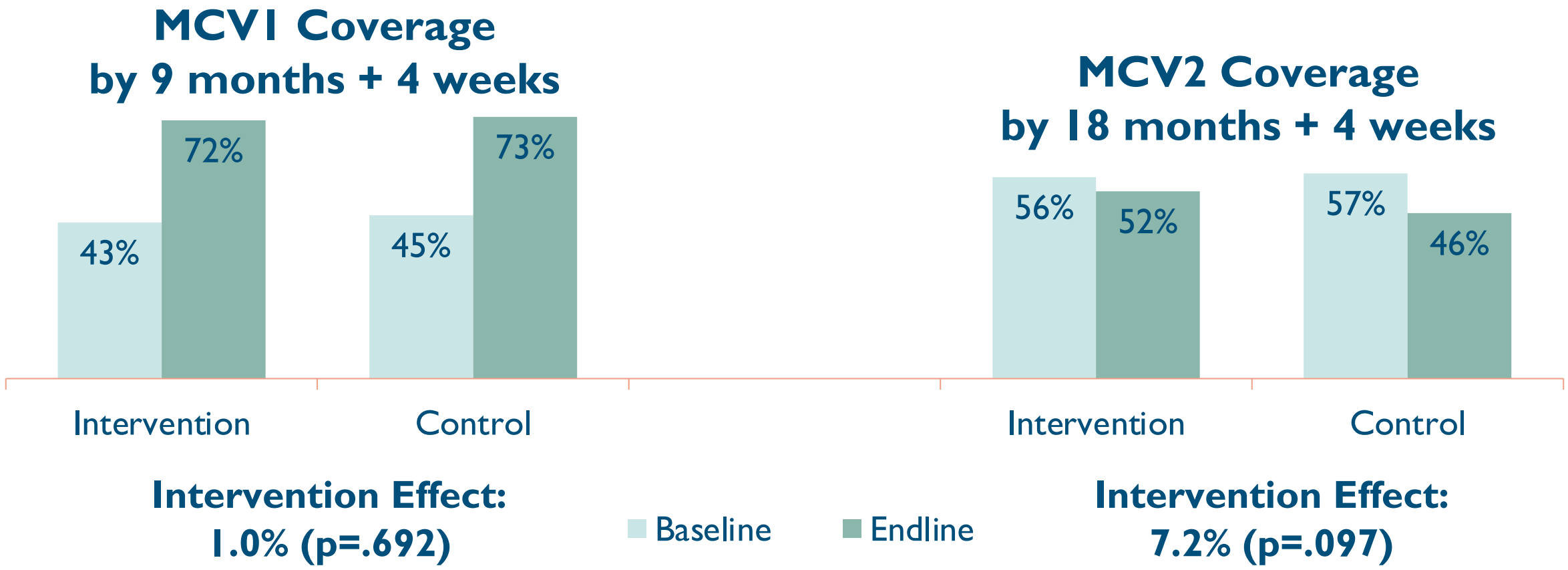
Baseline Endline

MCV1 Card Coverage: BL – 72-73%, EL – 85%

MCV2 Card Coverage: BL – 63%, EL – 75-76%

Timely Coverage

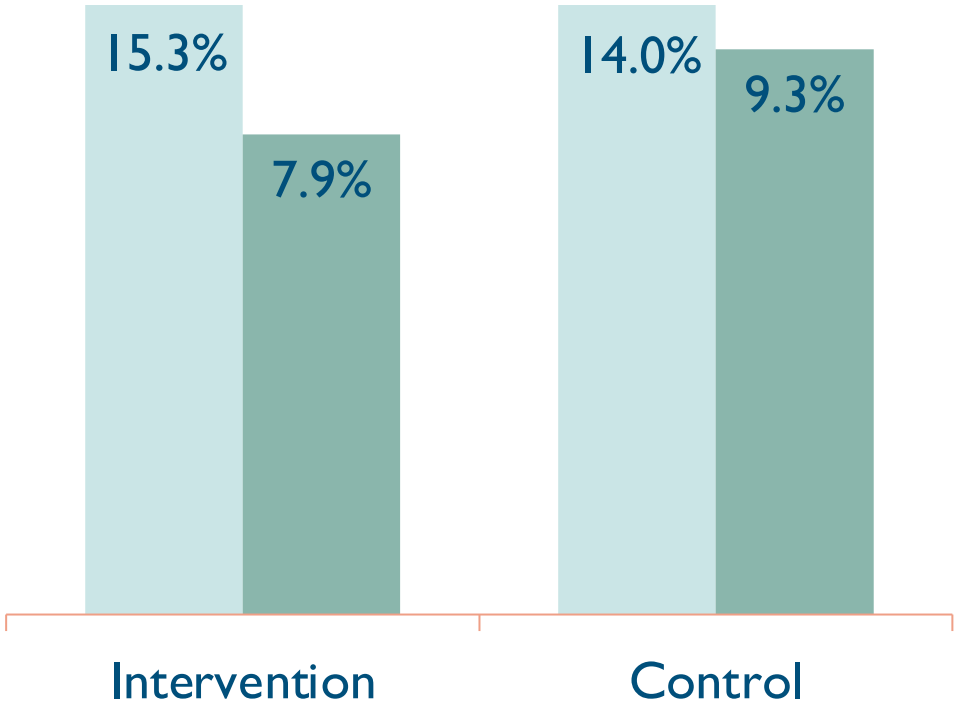
Data Source: Cards only



Drop-Out Rates

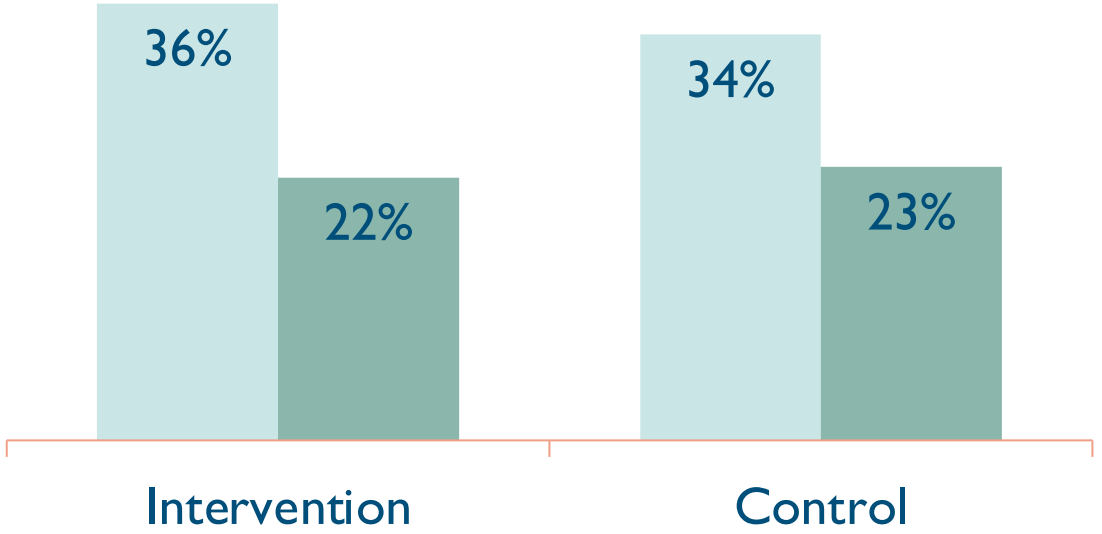
Data Source: Cards + Recall

Penta 1 – MCV1 for Children 12-23 months



Intervention Effect: 2.6% (p=0.010)

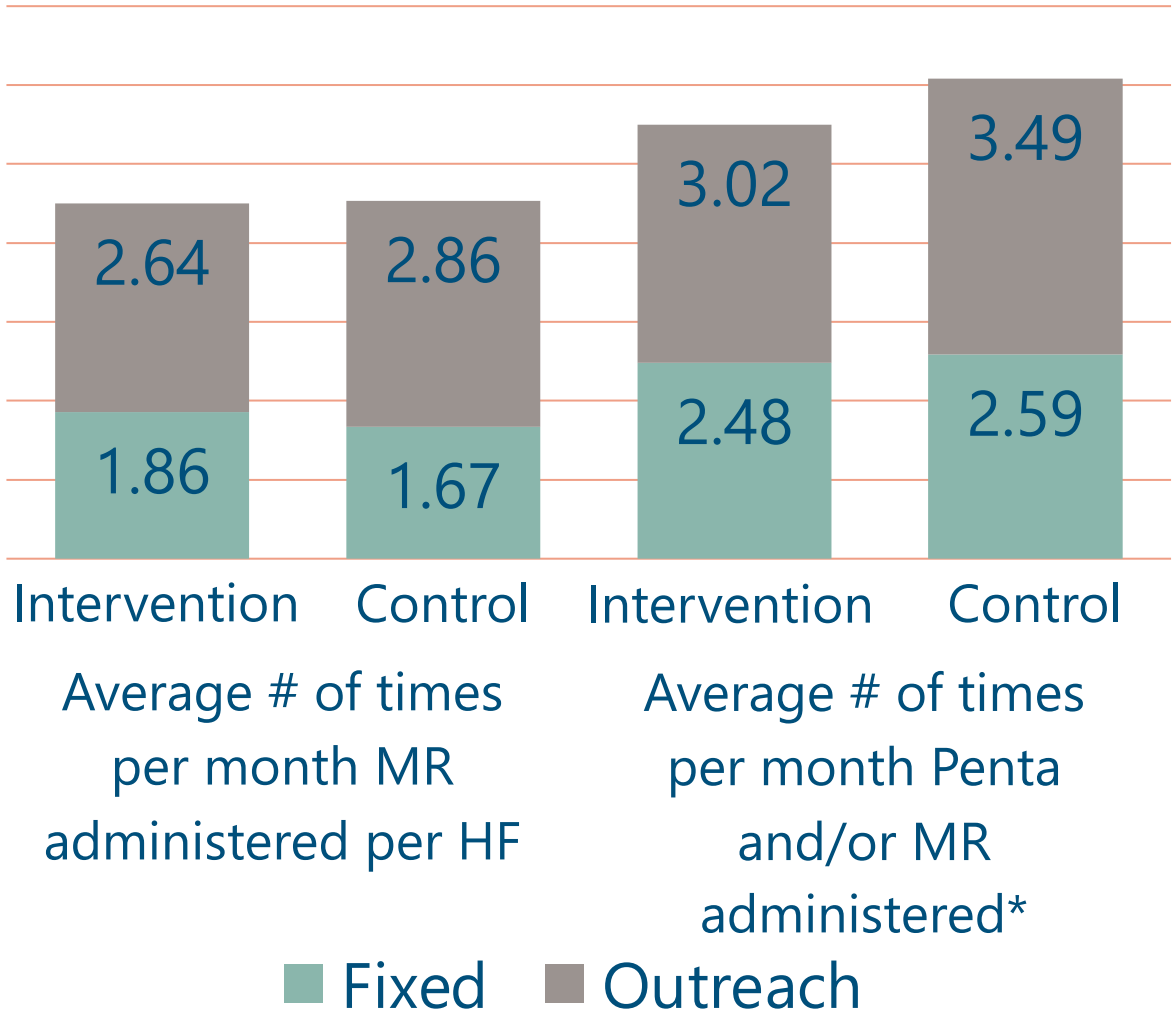
MCV1 - MCV2 for Children 24-35 months



Intervention Effect: 3.6% (p=0.038)

Baseline Endline

Session Frequency and Size



Although most HCWs interviewed who used 5-dose vials reported being able to conduct more fixed and outreach sessions, frequency of offering MR did not change based on vial size.

There also was no significant difference in session size between arms.

* p<0.05, ** p<0.01, *** p<0.001

Wastage

	Intervention	Control	Difference between intervention and control
Fixed	16.7%	30.5%	-13.76***
Outreach	17.5%	31.2%	-13.68***
Total	**16.2%**	**30.5%**	**-14.35*** **

* p<0.05, ** p<0.01, *** p<0.001

"The wastage is not much with MR 5 dose vial compared to the time we were using 10 dose vial. The wastage was high and this made us have high missed opportunities."
– HCW

All respondents using 10-dose and 5-dose vials at district and HF levels noted the importance of limiting wastage.

Cold Chain, Supply Chain and Distribution Capacity

88.46 cm^3

- Total net storage requirement per FIC for MR 10-dose vials of MR

93.66 cm^3

- Total net storage requirement per FIC for MR 5-dose vials

All HFs had sufficient cold chain space for the increase in volume required for introducing 5-dose MR vials.

4.9% increase in cold chain requirements when switching from 10- to 5-dose vials (when considering wastage rates found during implementation).

Cost

- **No change** in cold chain, transport, outreach and sharps waste disposal costs.
- **Increase** in average facility HR costs at some HFs because of the switch to using 5-dose MR vials including increase in **frequency** or **time spent** providing fixed immunization sessions, conducting stock management activities, and reporting
- Some districts reported **increase** in time spent on **vaccine stock management**
- 5-dose vials **increased program costs by $0.11 per dose** of MR used compared to 10-dose MR vials (excluding cost of vaccine)

Wastage-adjusted vaccine price per dose is $0.98 with 5-dose vials and $0.94 with 10-dose vials

In small HFs, vaccine purchase costs are lower using 5-dose vials because the reduction in wastage outweighs the increase in vaccine price

HCW Behavior and Preferences

HCWs using **10-dose vials** indicated that they waited for a **minimum of 5 children** before offering BCG or measles vaccines.

All except one respondent using **5-dose vial** reported **opening vials regardless of the number of children** at a session.

HCWs using 5 dose vials said they are…

- **Less concerned about MR wastage**
- **More comfortable opening vials to vaccinate children**.

> **"We have no restrictions when to open the 5 dose vial compared when we had the 10 dose vial we were required to have a specific number of the children to allow us open the vial."**
> **– HCW**

Results Contribute To Country Level Considerations

Decision-Making Resource Guide

- A culmination of DPCP research results to provide decision makers with evidence that can be generalized to other countries when considering vaccine presentation
- Choosing dose per container involves considering trade-offs between system components

Available at: www.jsi.com/dpcp

Steps in Decision Making Process

Key considerations from the DPCP research

1. Coverage and session size and frequency
2. Health care worker behavior
3. Cold chain requirements
4. Annual forecasting practices
5. Wastage rates and costs
6. Trade-offs of all components

Immunization in context of COVID-19

- WHO suggests holding smaller sessions at more frequent intervals
- Using 5 dose MCV vials would allow countries to limit wastage and may encourage HCWs to open a vial more frequently or when only one child is present

RITAG Recommendation, July 2020

WHO/AFRO and UNICEF, with support from Gavi Alliance and other partner agencies, should provide timely technical orientation and advocate with Ministries of Health and NITAGs to incorporate the use of vials of multi-dose vaccines with fewer doses, specifically the use of 5-dose M/MR/MMR vials rather than 10-dose vials, as part of a broad recovery strategy to raise coverage, reduce wastage and avoid HCW reluctance to open a 10-dose vial, especially where session sizes are small.

Q&A

In discussions about smaller vial size with EPI managers and logisticians, I have heard a lot of concern about cold chain space. Could you tell me a bit more about the findings from the study?

These results are only from a small sample. Do we think they are applicable in other countries and settings?

With all of the current disruptions due to COVID, should countries be diverting attention away from COVID response and preparation to consider different vial size presentations for other vaccines? Is the timing right?

What countries have switched or are considering a switch to 5 dose measles/MR?

You mentioned that a few countries have switched to 5-dose MVC. Why do you think the uptake has been so slow? Why haven't more countries made this decision?

I’ve heard mention of including both vial sizes in the same system. Are there benefits? What are the challenges? What evidence do we have on multiple presentations?