DPCP
DOSE PER CONTAINER PARTNERSHIP

DPCP SNAPSHOT

THE EFFECTS OF DOSE PER CONTAINER CHANGE IN ZAMBIA

ZAMBIA'S DPC CHANGE

The Dose Per Container Partnership (DPCP) undertook quantitative and qualitative research in Zambia between January 2017 and July 2018 to examine the effects on the immunization system of administering measles-containing vaccine (MCV) in 5-dose vials rather than the standard 10-dose vials. The Government of Zambia recommends lyophilized MCV at 9 months of age for the first vaccination (MCV1) and 18 months of age for the second (MCV2).

DPCP research has shown that health care workers can be hesitant to open a vaccine vial containing a higher number of doses if too few children present for an immunization session, because the vial with remaining doses may have to be discarded soon after opening to adhere to safety standards. Even though many health care workers are not held to wastage targets, they often perceive the need to reduce wastage, which can lead to missed opportunities for vaccination (MOV).

> **"IT HAS MADE THINGS EASIER FOR US, IN THAT YOU DO NOT HAVE TO WORRY ABOUT BABIES NOT BEING IMMUNIZED; IT'S RARE THAT WE MISS OUT ANY CHILD. IT HAS MADE OUR WORK EASIER, OUR MINDS ARE FREE THAT WE ARE DOING OUR JOB (IMMUNIZING)."**
>
> **— HEALTH CARE WORKER USING 5-DOSE MR VACCINE**

Therefore, a key focus of DPCP's study in Zambia was understanding health care worker perceptions and preferences, and assessing whether a lower number of doses per vial would increase their willingness to open a vial for any number of children presenting, ultimately helping reduce MOVs and increase coverage.

DPCP: EXAMINING THE EFFECTS OF MULTI-DOSE VACCINE PRESENTATIONS

The widespread use of multi-dose vaccine containers in low- and middle-income countries' immunization programs is assumed to offer benefit and efficiencies for health systems, such as reducing the purchase price per vaccine dose and easing cold chain requirements.

Yet the broader impacts on immunization coverage, costs, and safety are not well understood. It is also unclear what processes governments typically go through to determine their choices about dose per container (DPC), and what information decision makers have or use when determining DPC.

To add to the limited evidence base on this topic, DPCP is undertaking a series of activities to explore current decision making on DPC options and better understand the relationship between DPC and immunization systems, including operational costs, timely coverage, safety, product costs/wastage, and policy/correct use.

KEY FINDINGS INCLUDED:

- A statistically significant increase in coverage — a 3-percentage-point increase in MCV1 coverage and 10-percentage-point increase in MCV2 coverage — among children in districts using 5-dose vials, compared to those using 10-dose vials.
- Significantly lower wastage rates in health facilities using 5-dose vials (16%) than in those using 10-dose vials (31%).
- The perception among health care workers using 5-dose vials that they are able to reach more children because they will open a vial for even only one child presenting for immunization, compared to waiting on average for five children when using 10-dose vials.

THE TAKEAWAY

In the balance between achieving high coverage and maintaining low vaccine wastage, health care workers must decide when to open a vial, and this can affect timely and equitable coverage, wastage, and costs. The common perception that higher DPC brings significant efficiencies, especially in costs and storage, did not bear out in this study. The increases in cost and cold chain storage requirements were minimal, and were outweighed by lower wastage rates and increased coverage rates.

DPCP also found that health care workers perceived an increased willingness to open vaccine vials for any number of children presenting, which they felt increased coverage. All health care workers interviewed preferred the 5-dose vials and did not want to return to using 10-dose vials.

RESEARCH DESIGN

DPCP conducted implementation research in 14 districts (seven intervention and seven control) in Central and Luapula provinces, all chosen by the Ministry of Health (MOH), to examine the effects of switching from 10-dose to 5-dose MCV vials on the following factors:

- Timely and equitable coverage rates
- Wastage rates
- Cold chain and supply chain footprint
- Total systems costs
- Safety
- Health care worker behavior
- Perceptions and preferences of health care workers, district supervisors, and pharmacists related to the management and delivery of vaccine services

During the implementation period, health facilities in the intervention group received 5-dose vials of MCV, while those in the control group continued with the standard 10-dose vials.

> **"YES, WASTAGE RATE HAS REDUCED; THIS TIME WE CAN OPEN THE VIAL. EVEN WHEN WE HAVE TWO CHILDREN, WE ONLY LOSE THREE DOSES, AS COMPARED TO THE TIME WE WERE USING 10-DOSE VIAL, WHICH WOULD MAKE US LOSE EIGHT DOSES."**
>
> **— HEALTH CARE WORKER USING 5-DOSE MR VACCINE**

RESEARCH METHODS

The DPCP implementation research team collected data at baseline, during project implementation, and at endline. Data collection methods included:

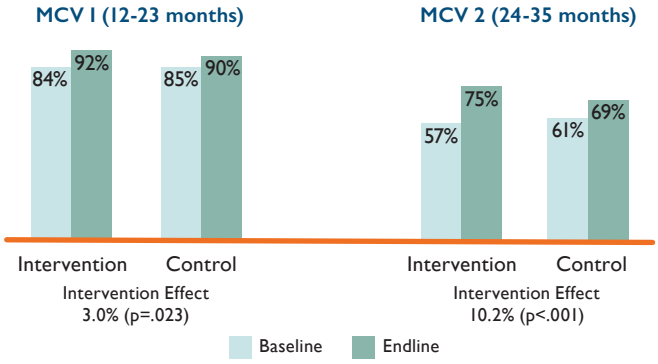
- **Household coverage survey:** DPCP used a survey questionnaire to obtain childhood vaccination information from caretakers.
- **Implementation monitoring:** Health care workers completed a DPCP form every day detailing doses administered and wasted, MR vials opened, session size and frequency, stockouts, and resupply.
- **Health facility, district, and national key informant interviews:** The project conducted interviews of key informants at health facilities and district offices to examine factors associated with MOV, safety, equitable coverage, and health care worker preferences for vial sizes.
- **Routine immunization session observation:** Data collection staff conducted 20 observations of vaccine handling and vaccination practices at health facilities.
- **Health facility and district costing survey:** DPCP used a structured questionnaire to gather information on resources utilized for logistics and immunization service delivery to estimate system costs with the standard 10-dose vials and following the switch to 5 dose vials.

SUMMARY OF DPCP FINDINGS BY IMMUNIZATION SYSTEM COMPONENT

COVERAGE

The household coverage survey found a statistically significant increase in coverage for both MCV doses attributable to the change in vial size — a 3-percentage-point increase in MCV1 coverage and 10-percentage-point increase in MCV2 coverage — among children in districts using 5-dose vials, compared to those using 10-dose vials (based on vaccination cards plus caregiver recall).

INCREASE IN COVERAGE



Dropout rates were also significantly lower. Dropouts between MCV1 and MCV2 receipt were 13 percentage points lower for those using 5-dose vials than for those using 10-dose vials.

Health care workers perceived an increase in session frequency when using the 5-dose vials and reported that they were willing to open vials for any number of children. Conversely, most respondents using the 10-dose vials reported not being able to conduct fixed and outreach sessions at times because they were not willing to open 10-dose vials without enough children present. Despite these perceptions, however, DPCP did not find an increase in session frequency according to project monitoring data.

WASTAGE

Wastage decreased statistically significantly in health facilities where 5-dose MR vials were used, even while coverage increased. Wastage was 16% for 5-dose MR vials, compared to 31% for 10-dose vials.

As observed in most other countries where DPCP has conducted research, health care workers in Zambia are concerned about wastage — despite not being responsible to achieve wastage targets — and they tailor their behavior to achieve low wastage rates.

COSTS PER DOSE AND CHILD VACCINATED

Considering wastage rates documented in DPCP's research, wastage-adjusted vaccine price per dose was only $0.04 higher with 5-dose vials than with 10-dose vials, and in small health facilities, vaccine purchase costs were lower using 5-dose vials because the reduction in wastage outweighed the increase in vaccine price.

No additional costs were reported for cold chain, transport, outreach, or waste disposal when switching to 5-dose vials, with the only cost category showing increases being human resources. The incremental annual costs for switching to 5-dose vials (excluding the value of vaccines) was $0.11 per dose used.

SAFETY

DPCP requested reports on adverse events following immunization (AEFI), but none of the districts had AEFI reports during the retrospective period or implementation. Health care workers did not mention any AEFI or abscesses during key informant interviews. At the district level, respondents stated that they wanted to re-train health facility staff because district staff suspected that health facility staff did not know how to report AEFI.

Due to the unavailability of data, DPCP is not able to report on differences in safety attributable to the switch in vial size.

COLD CHAIN, SUPPLY CHAIN, AND DISTRIBUTION CAPACITY

One frequent concern about switching to a smaller vial size is the potential impact on cold chain capacity requirements. DPCP found that all health facilities in the implementation districts had sufficient cold chain space for the increase in volume required for introducing 5-dose MR vials.

The total net storage requirement per fully immunized child for 10-dose vials of MR was 88.46 cm^3. For 5-dose MR vials, it was 93.66 cm^3. This translates to a 4.9% increase in cold chain requirements when switching from 10-dose to 5-dose vials (when considering wastage rates found during implementation).

HEALTH CARE WORKER BEHAVIOR, INCLUDING WILLINGNESS TO OPEN A MULTI-DOSE VIAL NO MATTER HOW MANY CHILDREN PRESENT

The majority of respondents using 10-dose vials indicated that they waited for a minimum of five children before opening a vial of MCV. When using 5-dose vials, health care workers reported offering MCV at every fixed and outreach session, regardless of number of children presenting. By contrast, all except one respondent using the 5-dose vials reported opening vials regardless of the number of children at a session.

All health care workers reported that they preferred the 5-dose vials over 10 doses because they believed the change in vial size would raise coverage due to children not being turned away, as well as reduce wastage. The majority of health care workers did not want multiple presentations of the same vaccine, expressing a number of concerns, including potential confusion, safety risks, increased reporting burden, and increased wastage.

This document was developed by JSI through the Dose Per Container Partnership (DPCP). The partnership is coordinated by JSI Research & Training Institute, Inc. in collaboration with colleagues from the Clinton Health Access Initiative, the HERMES modeling team and the International Vaccine Access Center (IVAC) through Johns Hopkins School of Public Health, and PATH. This material is intended to provide stakeholders evidence to guide informed, sustainable decisions on DPC when considering vaccine products and program design and may be used freely by all partners.

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