DPCP
DOSE PER CONTAINER PARTNERSHIP

DPCP SNAPSHOT

VIETNAM: EFFECTS OF CHANGING DOSE PER CONTAINER ON THE IMMUNIZATION SYSTEM

Immunization sessions in Vietnam, which are generally scheduled once a month but vary by region, offer mainly domestically produced vaccines, many in presentation of 10 or 20 doses per container (DPC). Due to the monthly session schedule, national policy requires health care workers (HCWs) to open a vial for every child and discard all vaccine vials within six hours of opening them, which is different than WHO policy that allows some vaccines to be kept for 28 days after opening if specific conditions are met. In 2017, the Dose Per Container Partnership (DPCP) conducted research examining how this policy affected immunization coverage and wastage, frequency, timeliness, safety, economic impact, and manufacturers' choices. The main findings were:

1. Except for a few regional variations, HCWs adhere to the national policy of opening a vial for every child as immunization sessions are often only held monthly; this is coupled with many mobilization strategies to ensure coverage targets are reached yet wastage is still high, especially in higher-dose presentations.
2. Respondents at all levels of the immunization program expressed a preference for lower-dose presentations in order to reduce wastage. However, DPCP's cost analysis suggested that such changes would only be cost-effective for higher-priced vaccines (pentavalent, JE, and MR).
3. In the past, domestic government manufacturers have changed DPC in response to a request by the national immunization program and through a consultative process considering program need, cost, and cold chain constraints.

THE TAKEAWAY

In the balance between achieving high coverage and avoiding wastage in Vietnam's immunization program, HCWs and program managers prioritize coverage, which results in some wastage of vaccines that are presented in multi-dose vials. Immunization sessions are held relatively infrequently in Vietnam; thus, achieving coverage and timeliness goals requires much effort to mobilize caregivers to bring their children into the health facilities and to outreach points at the right time. HCWs appear to understand and cope well with national policies and procedures. Given the relative infrequency of sessions and the national policy of discarding vials after each session, decisions on changing DPC require careful consideration by national, provincial, and district-levels of the relative costs and benefits as they apply to the Vietnamese context.

DPCP: EXAMINING THE EFFECTS OF MULTIDOSE VACCINE PRESENTATIONS

The widespread use of multidose vaccine containers in low- and middle-income countries' immunization programs is assumed to offer benefits 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 DPC, and what information decision-makers have or use when determining DPC.

To add to the limited evidence base on this topic, the Dose Per Container Partnership, or 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.

THE RESEARCH

From September to October 2017, DPCP conducted mixed-method formative research focusing on eight vaccines[1] used in the routine Expanded Programme on Immunization (EPI) schedule. Researchers collected qualitative and quantitative data, including interviews with 1 national manager, 2 regional focal persons, 4 provincial managers, 7 district managers, 3 domestic manufacturers; and 30 HCWs from 30 commune health centers (CHCs), in the Northern Region (mainly rural) and the Central Highlands Region (rural, urban, and peri-urban sites). Researchers also reviewed immunization records and observed immunization sessions (both fixed and outreach) at the 30 sites. Program costs (including the cost of wastage) were also examined and researchers analyzed the effect of offering lower-DPC presentations on vaccine cost and wastage.

THE FINDINGS

Decisions on presentation: Domestic vaccine manufacturers take part in, and respond to, national decisions on vaccine presentation. Decisions are made collaboratively among the EPI program, the Ministry of Health, and vaccine manufacturers, which are government entities; the decisions include consideration of trade-offs in ease of program need, cost per dose, cold chain constraints, and impacts on production.

Number of vaccination sessions: Session number and approach varied across provinces in the regions. HCWs from the Central Highlands Region mainly offered weekly or bi-monthly sessions; those in Northern Region mainly offered one or two sessions per month, and three HCWs offered outreach only. Of these CHCs, 18 provided sessions at fixed sites and 9 combined fixed and outreach approaches. Most HCWs said that they did not offer all vaccines at every session, mainly to reduce wastage. HCWs mentioned using several strategies to increase coverage (see **Box 1**), and managers at the district level and above reported helping them develop outreach strategies and improve low-performing CHCs.

Coverage and wastage: National coverage overall is high based on district EPI reporting, but the research revealed large regional variations—with coverage ranging, for example, from 100 percent to 29 percent in two rural CHCs in 2017. Interviewees overall said that coverage and wastage were discussed during meetings and supervisory visits, and generally, respondents cited target coverage rates between 90 and 98 percent. A national level-respondent said that wastage rates were used for vaccine management, not for measuring CHC performance, but over half of HCWs interviewed said that wastage did influence performance assessment. HCWs reported that lifestyle, religion, cultural practices, and beliefs affect both coverage and timeliness of immunization. For example, some families may be reluctant to bring newborns for immunization, fearing that vaccination could make them ill.

Timeliness: This indicator, which is defined by the National EPI as the period during which the dose can be administered and considered on-time, varied, possibly reflecting both DPC and the duration of the timeliness window. For example, the measles vaccine, offered in a 10-dose vial, had a high rate of on-time administration, and a long timeliness window (91 days). BCG (a 20-dose presentation with a 30-day window) had much lower timeliness (42%) than pentavalent (a single-dose vial with a 35-day window) and 73% timely administration.

BOX 1. OUTREACH TO INCREASE VACCINE COVERAGE

To reach coverage targets while coping with the predominance of multidose presentations and the national requirement to discard each vial after an immunization session, HCWs use numerous strategies including:

- Partnership with local organizations
- Communication and advocacy
- Communication materials (videos, radio announcements, loudspeakers, leaflets) to increase awareness
- Listing children due for vaccination to help village health workers mobilize communities
- Combining villages to increase the number of children vaccinated
- Ensuring high-quality services, including appropriate HCW attitudes and good injection skills.

1 The vaccines examined were bacille Calmette-Guérin (BCG), bivalent oral polio vaccine (bOPV), diphtheria- tetanus-pertussis (DTP, fourth dose), hepatitis B birth dose, Japanese encephalitis (JE), measles, measles/mumps/rubella (MR), and pentavalent—all domestically produced—and DTP, hepatitis B, and *Haemophilus influenzae* type B (DTP-Hep B-Hib or pentavalent), which is produced outside Vietnam.

HCWs' decisions on opening vials: Nearly all respondents said that coverage outweighed wastage in importance, except for five HCWs, who said that the two were equally important. Of 19 HCW respondents, the majority said—in accordance with national policy—that only one child need be present to open a new vaccine vial. The others specified that three, four, or five children must be present. All HCWs reported discarding unused vaccine at the end of each session, as mandated in national policy.

Wastage rates: Estimated wastage rates varied from 3% for pentavalent, available in a single-dose vial, to 53% for BCG in a 10-dose vial, but was relatively high overall. Wastage was higher for higher-dose presentations, mostly because all open vials were discarded after each session. The value of the vaccines wasted increased with higher per-dose prices; ME and MR had the highest value of doses wasted (see **Table 1**). Rural CHCs had significantly higher wastage than urban and peri-urban facilities, and wastage rates were also higher in CHCs that held only outreach sessions. CHCs that held four or five fixed sessions per month had lower wastage rates than those who held fewer sessions.

DPC preferences: The majority of interviewees at all levels expressed a preference for a lower-dose presentation for all vaccines currently presented in multidose vials. Most preferred a single-dose vial except for bOPV; for this vaccine, 19 preferred single-dose vials, and 15 preferred 10-dose vials. HCWs understood the trade-offs of higher per-dose cost for lower DPC, but were less likely than respondents at the district level and above to mention cold-chain constraints with a lower DPC.

Cost of immunization programs: The total average cost of immunization per CHC was US$4,319. CHCs in urban and peri-urban settings had higher costs than those in rural settings (due to more staff on average equaling higher human resource costs in these areas); and those that only conduct outreach sessions had the highest costs (see **Graph 1**). Human resources made up the largest share of this cost (averaging from $2,562 to $3,820); vaccines and syringes were second highest. Thus, changes in per-dose price will likely affect costs at each level of the supply chain, especially when EPI introduces higher-priced vaccines (such as rotavirus and pneumococcal conjugate).

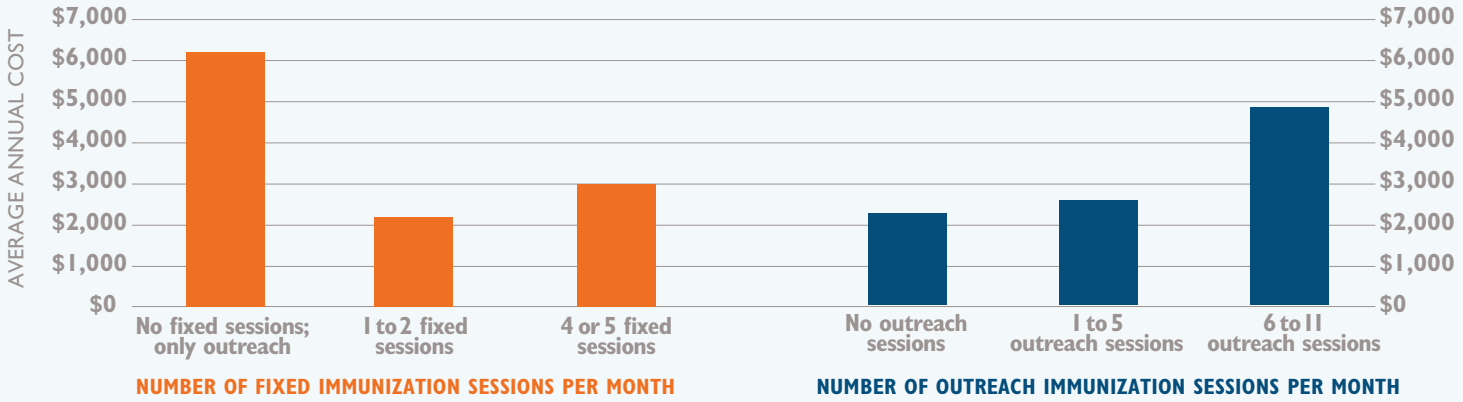
Effects of DPC changes on coverage and wastage: DPCP researchers conducted an analysis, including a break-even analysis, of changing the presentation of BCG, bOPV, DPT, JE, and measles vaccines. These are all multidose vaccines that have high wastage rates ranging from 37% (JE) to 53% (BCG), and for which respondents preferred a different vial size. Findings showed that switching to a lower-dose presentation would result in only small changes in timeliness, waste disposal costs, and human resource costs, but would increase costs for vaccines and immunization supplies.

HCWs believed that switching to a lower DPC would reduce wastage; many managers also believed that this would also improve coverage and timeliness. However, the break-even analysis showed that switching to a lower-dose vial would require balancing the reduction in wastage costs with

TABLE 1. DPC, PRICE, AND AVERAGE VALUE OF VACCINES ADMINISTERED AND WASTED PER PARTICIPATING CHC

	BCG	BOPV	PENTA-VALENT	MEA	JE	MR	DTP	TETANUS TOXOID
Cost per dose	$0.07	$0.21	$0.98	$0.25	$0.48	$0.68	$0.11	$0.05
DPC	10	20	1	10	10	10	20	20
Total value of vaccines used (administered and wasted)	$25	$206	$541	$90	$283	$218	$55	$44
Value of vaccines administered	$11	$117	$531	$47	$149	$122	$23	$21
Value of vaccines wasted	$14	$89	$10	$43	$134	$95	$32	$23
Estimated wastage rate	**53%**	**43%**	**3%**	**46%**	**37%**	**39%**	**52%**	**49%**

GRAPH 1. AVERAGE ANNUAL COSTS FOR VACCINATION WHEN COMMUNE HEALTH CENTERS ARE STRATIFIED BY FREQUENCY OF IMMUNIZATION SESSIONS.



the increased per-dose cost for a lower DPC. Examination of this balance showed that for lower-cost vaccines such as BCG (currently available in a 10-dose vial at $0.07 per dose, and with a 53% wastage rate), even a small per-dose price increase ($0.02 in the case of BCG) could outweigh the savings gained through reduced wastage. By contrast, for higher-priced vaccines such as JE and MR, the increased per-dose price of a lower-DPC presentation would be offset by reduced costs in wastage. These findings suggest that given Vietnam's policy on discarding multidose vials after each session, a switch to lower-dose presentations would always require careful consideration and calculation of costs and benefits. It might be feasible, in some areas like the Central or Northern Highlands where CHCs conduct multiple immunization sessions each month, to save costs by reconsidering the use of the WHO multidose policy. ■

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