

# Revising global indicative wastage rates: a WHO initiative for better planning and forecasting of vaccine supply needs

## Concept Note

8 April 2019

### Why revising vaccine wastage rates matters

Vaccine wastage is the sum of vaccines discarded, lost, damaged or destroyed. Since vaccines account for a significant portion of immunization programme costs, ensuring that wastage is minimized without jeopardizing vaccination coverage is key. Accurately calculating the wastage rate<sup>1</sup> is essential for reducing stock-outs and over-stock, choosing the most appropriate vaccine presentation and immunization session size, as well as sizing supply chain infrastructure at country level. At global level, vaccine wastage rate is a key input in forecasting for global vaccine access programmes.

Investing in a more rational approach to estimate wastage rates will enable countries to adjust their budgets based on accurate vaccine supply forecasting. In addition, it would help procuring agents, such as UNICEF and PAHO, to improve predictability of the global demand for vaccines and share this information with manufacturers. It will also enable donors to maximize value for money of their investments to support enhanced vaccine coverage and equity.

### WHO historical guidance to estimate vaccine wastage

WHO has historically recommended that the national wastage rate be estimated as:

$$1 - (1 - w_c)^n \times (1 - w_o)$$

Where:

- closed vial wastage ( $w_c$ ) is due primarily to ineffective temperature control, temperature monitoring and stock management during storage and transportation. It may result from expiry, excess heat exposure, freezing, breakage, missing inventory or discard following outreach sessions; and,
- open vial wastage ( $w_o$ ) attributable to immunization workers' practices and discarding of unused doses from vials of unused doses of multi-dose vials.

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<sup>1</sup> Defined as the comparison between the total number of vaccine doses administered and the number of doses supplied

WHO has issued indicative vaccine wastage rates (Table 1) for vaccine forecasting<sup>2</sup> to facilitate the estimation of vaccine requirements and cost in the absence of national figures. These WHO indicative vaccine wastage rates are still used to conduct vaccine forecasts and estimate supply needs.

*Table 1: WHO Global Indicative Wastage Rates, 2002*

Vial presentation	Routine	Campaigns
Single Dose	5%	5%
2 or 5-dose, regardless of MDVP	10%	10%
10 or 20-dose: if opened vial can be re-used in subsequent sessions	25%	15%
10 or 20-dose: if opened vial must be discarded at end of session or maximum in 6 hours from the time the vial was opened	40%	15%
20-dose or more: if opened vial must be discarded at end of session	50%	20%

Indicative wastage rates have several significant limitations and do not reflect necessarily country context. One such limitation is the use of the same indicative wastage rate for each antigen by available vaccine presentation across all countries.

### More accurate wastage rates

To provide more precise vaccine wastage rates, WHO developed a new vaccine wastage algorithm<sup>3</sup> for estimating opened vials wastage based on a binomial distribution of session size for different service delivery settings.

The total vaccine wastage rate can be now estimated as the combination of three types of wastage: closed vial wastage ( $w_c$ ); avoidable open vial wastage ( $w_{ao}$ ); and, unavoidable open vial wastage ( $w_{uo}$ ).

Where:

- closed vial wastage ( $w_c$ ) is due primarily to inefficiencies in the supply chain, including temperature control, temperature monitoring, and stock management during storage and transportation. It may result from vaccine expiry, excess heat exposure, freezing, breakage, missing inventory or discard following outreach sessions. Effective Vaccine Management (EVM) limits at maximum wastage rates  $w_i = 1\%$  per storage facility. For the entire supply chain:  $\sum n w_i$ , where  $n$  = the number of supply chain levels.
- avoidable open vial wastage ( $w_{ao}$ ) is usually attributable to immunization workers' practices and include errors in reconstitution, suspected contamination, patients' reaction, excess

<sup>2</sup> Review of WHO indicative vaccine wastage rate assumptions S. Kone, R. Eggers, M. Dicko, WHO/IVB/EPI, July 2011. Unpublished.

<sup>3</sup> IPAC meeting report, October 2013:

[https://www.who.int/immunization/programmes\\_systems/policies\\_strategies/IPAC\\_2013\\_October\\_report.pdf?ua=1](https://www.who.int/immunization/programmes_systems/policies_strategies/IPAC_2013_October_report.pdf?ua=1)

heat, freezing or breakage. This remains indicative and is not a key driver of wastage levels – set up to 5%.

- unavoidable open vial wastage ( $w_{uo}$ ) refers to discarded doses from vials of unused doses of multi-dose vials and determined by vial size, session size and discard time. Unavoidable open vial wastage ( $W_{uo}$ ) is the primary source of vaccine wastage.

## Calculating unavoidable wastage rate

The binomial distribution of the number of doses administered per session is based on the size of the target population, the number of doses per target and the frequency of vaccination sessions. (Figure 1).

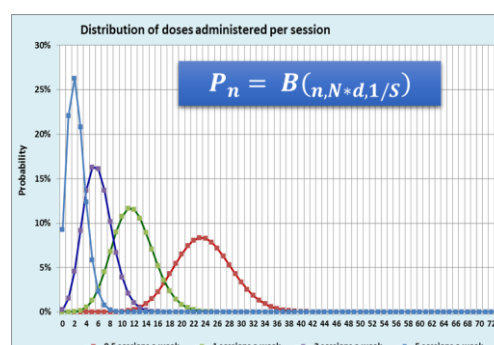


Figure 1. Binomial distribution per administered doses

The doses of vials opened to be discarded at the end of a session depends on the vial size (2, 5, 10, 20-doses/vial) and the status of MDVP (discard, reuse) (Figure 2).

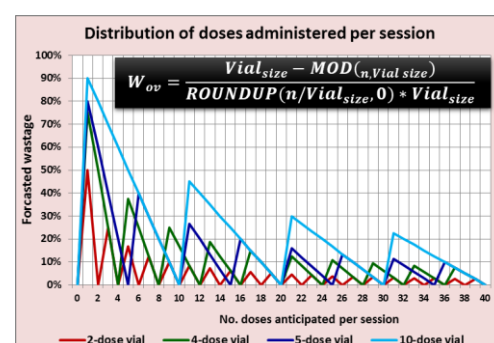


Figure 2. Forecasted wastage per dose per session

The anticipated wastage rate is defined as the sum product of each of the binomial distribution results multiplied by the individual wastage calculation results (Figure 3). An additional consideration in estimating the anticipated wastage rate is the application of the multi-dose vial policy (MDVP), as the discard point for open vials of 6 days or 28 days is also a variable determining the level of anticipated wastage.

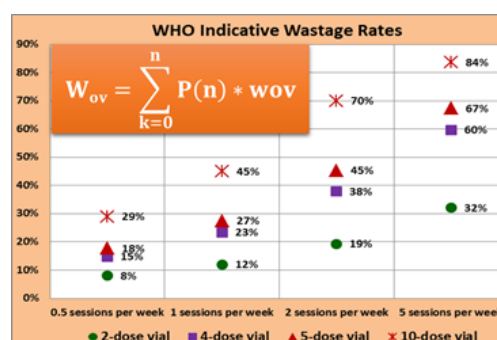


Figure 3. Anticipated wastage rate

## A three workstreams towards more tailored wastage rates

Following the endorsement of the WHO model by the WHO's Immunization Practices Advisory Committee (IPAC) in 2015<sup>4</sup>, WHO aims to enhance programmatic efficiency by achieving two objectives:

<sup>4</sup> IPAC meeting report:

[https://www.who.int/immunization/programmes\\_systems/policies\\_strategies/ipac\\_2015\\_october\\_report.pdf?ua=1](https://www.who.int/immunization/programmes_systems/policies_strategies/ipac_2015_october_report.pdf?ua=1)

1. to ensure use of the new WHO methodology to estimate tailored and more accurate wastage rates; and,
2. to enhance effective use of vaccine wastage rates for evidence-based decision-making and management including planning, implementation and monitoring.

Organized along three workstreams (Figure 4), WHO will support programme managers at country level to forecast vaccines based on actual needs and usage as a mean to move towards better organization and planning of immunization programmes. This ambitious objective cannot be achieved without the concerted efforts of all stakeholders working together.

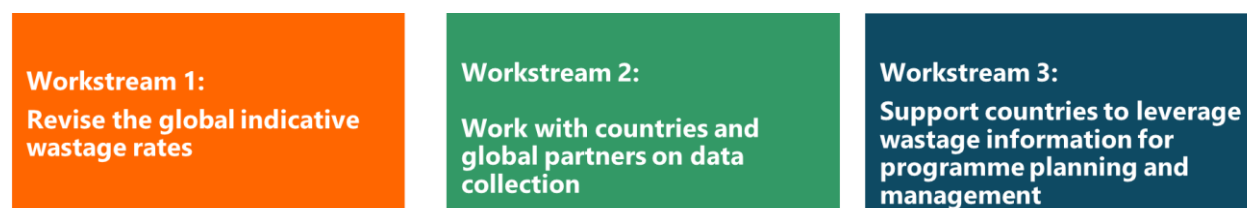


Figure 4. Parallel workstreams of work for wastage

### Workstream 1: Revise the global indicative wastage rates

WHO is providing a new vaccine wastage rates calculator tool based on the WHO model. This is a first important step in meeting the challenges associated with revising global vaccine wastage rates. The target audience of the wastage rates calculator is national programme managers and global partners.

The goal of the vaccine wastage rates calculator is to estimate more accurate wastage rates automatically according to country contexts and for all WHO prequalified vaccines. The overall objective of this new tool is to provide guidance for more accurate vaccine forecasting and setting benchmarks for monitoring vaccine utilization and wastage. Extended benefits of the tool include enhanced service delivery planning and optimal vaccine vial selection.

The required data inputs include data from the immunization programme's targets, service delivery settings, and specific vaccine data. WHO recommends that countries record, monitor and analyze vaccine wastage rates at all levels. In the absence of data at country level, the wastage rates calculator also gives the option of generating wastage rates based on the WHO normative targets on immunization service delivery for coverage<sup>5</sup>, frequency of immunization<sup>6</sup> and facility density<sup>7</sup>. Although the WHO normative approach may not reflect the reality of each country context, the resulting wastage rates provide an improved reference point.

The wastage rates calculator is accessible through the WHO website, as will other mobile applications to calculate wastage rates on and off-line and associated technical documents:

[https://www.who.int/immunization/programmes\\_systems/supply\\_chain/resources/tools/en/](https://www.who.int/immunization/programmes_systems/supply_chain/resources/tools/en/)

<sup>5</sup> Global Vaccine Action Plan 2011-2020, Indicator G3.1, Strategic Objective 3.1.

<sup>6</sup> Summary of WHO Position Papers - Recommendations for Routine Immunization. December 2018.

[https://www.who.int/immunization/policy/Immunization\\_routine\\_table1.pdf](https://www.who.int/immunization/policy/Immunization_routine_table1.pdf)

<sup>7</sup> Service Availability and Readiness Assessment (SARA), An annual monitoring system for service delivery, A reference manual. 2014. [https://www.who.int/healthinfo/systems/SARA\\_Reference\\_Manual\\_Chapter3.pdf?ua=1](https://www.who.int/healthinfo/systems/SARA_Reference_Manual_Chapter3.pdf?ua=1)

The first workstream is expected to be completed before the end of 2019.

## **Workstream 2: Working with countries and global partners on data collection**

The goal of the second workstream is to collect data to continue strengthening understanding of wastage rates. With this in mind, WHO will conduct country-based data collection on session frequency per antigen and additional needed parameters, and as well leverage data from the Effective Vaccine Management Assessment (EVMA)<sup>8</sup> and the Cold Chain Equipment (CCE) inventory update taking place during the Cold Chain Equipment Optimization Platform's (CCE OP) Operational Deployment Plan (ODP)<sup>9</sup>.

Data to calculate the country's wastage rates per antigen will be collected at the service delivery point level. The information will be circulated at the different levels within the country (district, regional, national).

By combining these two methods, the wastage rates calculator will continuously facilitate the validation of the WHO model and increase the granularity of data collection to improve the accuracy of the wastage rates calculated at country level. It will also demonstrate the usefulness of this information for better planning and management of immunization programme.

The refined wastage rates based on data collected through the EVMA will be updated each time an EVMA is conducted in the country (3 to 5-year frequency), with an initial target of 5 countries in 2019. The tailored wastage rates based on the CCE inventory update will be updated on a yearly basis, with an initially target of 4 countries having an ODP in 2019. Training and information sharing sessions need to be organized to ensure that national staff collects the information needed to run the binomial model.

This second workstream will be started in 2019 and completed by the end of 2020.

## **Workstream 3: Support countries to leverage wastage information for programme planning and management**

Capitalizing on newly-identified tailored wastage rates through the first and second workstreams, WHO will promote and roll-out the new wastage calculator in countries through collective partner action (e.g. UNICEF; Gavi; supply chain partners, etc).

The new WHO vaccine wastage rates calculator will support selected countries in computing the cost and benefits of different vaccine presentations, and thereby select the most appropriate presentations available based on their routine immunization sessions' vaccine consumption and frequency pattern, as well as the country's immunization supply chain capacity. This tool will allow its users not only to revise a country's vial-size procurement strategy, but also help plan for new vaccine introduction and the initial procurement of the most appropriate vial size.

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<sup>8</sup> WHO Effective Vaccine Management (EVM) Initiative:

[https://www.who.int/immunization/programmes\\_systems/supply\\_chain/evm/en/](https://www.who.int/immunization/programmes_systems/supply_chain/evm/en/)

<sup>9</sup> Cold chain equipment optimization platform, Gavi: [https://www.unicef.org/supply/files/1-3\\_GAVI\\_presentation\(4\).pdf](https://www.unicef.org/supply/files/1-3_GAVI_presentation(4).pdf)

WHO will ensure linkages with Total System Effectiveness (TSE) & Market Information for Access to Vaccines (MI4A) <sup>10</sup> towards enhanced country product choices and informed manufacturer investments and other relevant partner initiatives.

The third workstream will begin in 2019, to be completed before the end of 2021.

### Collaborative process

The use of the wastage calculator will contribute to a more rational vaccine needs assessment and better planning and management of immunization programmes. It will as well enhance the capacity of immunization programmes to assess and improve the quality of their wastage data and benchmark vaccine wastage monitoring against realistic values.

Despite the availability of guidance on vaccine wastage monitoring, country studies demonstrate that vaccine wastage monitoring is a weak area of program management globally. Data collection will be needed from countries to gather key inputs (e.g. session frequency, number of service points). In the absence of data, countries may have to use, as an alternative means, the new WHO vaccine wastage rates calculator based on normative targets on immunization service delivery.

The alignment and collaboration of immunization partners will be needed to ensure successful data collection from countries and consistent use of the calculator to inform forecasting and programme planning.

WHO has consulted with all immunization partners and will continue to do so to:

- advocate for the use of the wastage calculator by countries and partners;
- encourage and support country data collection leveraging all existing opportunities; and,
- provide catalytic funding for the roll out of the wastage calculator tool.

### Contact

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