

Revising the Global WHO Vaccine Wastage Rates

Instruction guide - How to use the WHO wastage rates calculator to improve accuracy of vaccine wastage data

Version 1.0

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Background information

The World Health Organization (WHO) recently launched a new vaccine wastage rates calculator tool. Based on a model developed by WHO¹, this new tool revises the existing WHO Global Indicative Wastage Rates calculator.² With this new tool, WHO continues to support immunization programmes by improving annual vaccine forecasting and the monitoring of the utilization of vaccines and wastage rates based on their service delivery settings.

This new tool's goal is to estimate, with more precision, vaccine supply requirements and to improve the planning and management of immunization programmes. It will estimate automatically the wastage rates for all WHO prequalified vaccines and will increase the accuracy and quality of wastage data at country level. The new WHO vaccine wastage calculator computes the total wastage rate, which includes the unavoidable open vial wastage rate, the closed vial wastage rate per storage facility³ and the avoidable opened vial wastage rate.⁴

By providing this accessible and easy-to-use tool, WHO helps to ensure that the estimation of wastage rates becomes standardized and harmonized between partners and national immunization programmes.

Objectives of the guide

The guide provides instructions about how to use the new WHO vaccine wastage rates calculator. It also provides guidance on the interpretation and use of the results and their application limitations.

Audience

This tool is intended to be used by all members of the health workforce supporting immunization, including:

- Ministry of Health staff;
- National immunization programme managers;
- Partner organizations working at international or local levels.

Using the tool

The WHO wastage rates calculator is a practical Excel-based tool offered online at the WHO website:

https://www.who.int/immunization/programmes_systems/supply_chain/resources/tools/en/

¹ IPAC meeting report, October 2013:

https://www.who.int/immunization/programmes_systems/policies_strategies/IPAC_2013_October_report.pdf?ua=1. IPAC meeting Report, October 2015.

https://www.who.int/immunization/programmes_systems/policies_strategies/ipac_2015_october_report.pdf?ua=1

² Review of WHO indicative vaccine wastage rate assumptions

S. Kone, R. Eggers, M. Dicko, WHO/IVB/EPI, July 2011. Not published.

³ 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 = No. of supply chain levels

⁴ WHO set the avoidable opened vial wastage rates at 5%

WHO is conceptualizing the development of a web-based mobile application version of the tool.

Inputs include the immunization programme's targets and service delivery settings and specific vaccine data.

WHO Normative approach versus national contextual settings

The tool enables countries to estimate tailored wastage rates according to data collected at different supply chain levels. Where country level data deficiencies exist, the tool also gives the option of generating wastage estimates based on the WHO normative targets on immunization service delivery for coverage, frequency of the immunization and facility density (Table 1). Although the WHO normative approach may not reflect the reality of each particular country context, the resulting estimated wastage rates are meant to provide improved reference point figures.

WHO standards	WHO tool	Reference
Coverage	90%	The Global Vaccine Action Plan 2011-2020 sets a coverage target population that should reach at least 90% national vaccination coverage and at least 80% vaccination in every district or equivalent administrative unit for all vaccines by the year 2020 ⁵
Frequency of the immunization	Daily session	WHO recommends routine immunization for all age groups for children and adults. Daily session frequency as being set as the default session frequency option for each antigen ⁶
Facility density	2 per 10 000 population	The number of service points target per 10 000 population is 2. The facility density is primarily an indicator of outpatient service access ⁷

Table 1: WHO normative guidance on immunization service delivery

Step-by-step

1. Demographic parameters

1.1 Select the year

The year for which the wastage rate is to be estimated (from 2018 to 2050) is selected from a drop-down list. The population figures for the selected year are generated from UN demographic data.

1.2 Facility density

The fixed number correspond to the WHO normative approach for facility density.

1.3 Group selection

The dashboard allows the user to select filters, by groups of countries and other criteria, using linked dropdown lists:

⁵ Global Vaccine Action Plan 2011-2020, Indicator G3.1, which includes Strategic Objective (SO) 3.1.



⁶ Summary of WHO Position Papers - Recommendations for Routine Immunization. December 2018.
https://www.who.int/immunization/policy/Immunization_routine_table1.pdf

⁷ 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

- **WHO regions:** all countries included in the 6 WHO regions⁸: African Region (AFR), Region of the Americas (AMR), Eastern Mediterranean Region (EMR), European Region (EUR), South-East Asia Region (SEAR) and Western Pacific Region (WPRO);
- **UNICEF regions:** all countries included in the 6 UNICEF regions⁹: East Asia and Pacific Region (EAPR), Eastern Europe and Central Asia Region (ECAR), Latin America and Caribbean (LACR), Middle East and North Africa (MENA), Eastern and Southern (ESAR), South Asia (ROSA), Eastern and Southern Africa (ESAR);
- **Partners' Evaluation Framework countries:** listed by Tier1, 2, and 3;
- **Gavi eligibility and co-financing status:** includes all eligible and non-eligible countries. Eligible countries are grouped according to their financing status: preparatory phase 1, accelerated phase 2, fully self-financing phase 3;
- **Income classification:** WHO Member States are grouped into 4 income groups: low, lower-middle, upper-middle and high, based on the World Bank list of analytical income classification.

There is also an option to select **individual countries** (one or multiple WHO Member States can be selected).

For example, clicking on the African Region (AFR) will list in blue in the country selection window all countries in this region. All parameters relevant to the African Region will also appear in blue (e.g., PEF Tiers, Gavi status, related UNICEF region, income class). All countries outside of this region and parameters not applicable to this region will appear in light blue. Parameters not related to the African Region (e.g., other WHO regions) will be disabled and will appear in white.

The user has the option of applying filters to one or multiple groups. For example, the user might select AFR in the group WHO Region, or alternatively, select AFR and Accelerated Phase within the group Gavi Status. This means that all countries in the African Region within the Gavi Accelerated Phase (in which countries are phasing out from Gavi support) will be selected. The user can also select more than one region within the group WHO Region. To do this, the user first clicks on the icon ; when this option is activated, the icon becomes light yellow. The filter button  is activated (a red cross appears) when the multiple selection icon is activated **OR** when the user selects only one selection within one group. To remove multiple selections (filters), click on the filter icon and all data in the group selection will be displayed.

2. Immunization parameters

2.1 – Select the vaccine

Select the vaccine from the drop-down list of WHO prequalified vaccines.¹⁰ The available vial size(s) for the selected vaccine will automatically be displayed in the results table.

⁸ WHO regions. <https://www.who.int/about/regions/en/>

⁹ UNICEF Regions: <https://data.unicef.org/regionalclassifications/>

¹⁰ WHO prequalified vaccines: https://extranet.who.int/gavi/PQ_Web/

2.2 – Vaccine dose schedule

Choose the specific vaccine dose schedule that corresponds to the selected vaccine. The drop-down menu allows the user to select from 1 to 4 doses.

2.3 – Coverage

Indicate the desired national coverage rate for the selected vaccine. In case of absence of this information, the Global Vaccine Action Plan normative approach can be used (see Table 1).

2.4 – Service points

Enter the number of service points. In the absence of data, leave the cell empty and the tool will use the estimated number of service points (orange cell) calculated based on the WHO normative approach for facility density, i.e. number of service points per 10,000 population (see Table 1).

2.5 – Supply chain level

Enter the number of levels in the supply chain levels that the vaccine will go through until it reaches the service delivery point. The dropdown list allows the user to select the number of supply chain levels, from 1 to 4. The names and numbering of the levels may vary according to the country. For further information, refer to the Effective Vaccine Management documents¹¹.

2.6 – Frequency of immunization sessions

Indicate the session frequency for the selected vaccine.

First, insert the percentage of health facilities organizing daily, weekly and monthly immunization sessions. The total should not exceed 100%. Daily session frequency (daily 100%) is set as the default session frequency option for each antigen. The user can adapt the frequency of the immunization session according to the actual session plan and indicate the percentage of immunization sessions organized daily, weekly or monthly. The normative approach, which suggests having daily routine immunization (daily 100%), can be used should this information not be available (see Table 1).

As a second step, the user should indicate the **number of immunization sessions** organized in the health centers: number of days/days per week/days per month.

For example:

- If all health centers hold immunization sessions on a daily basis: **100% daily**, then insert 1 as 1 session per day

% daily sessions	100%	daily	1
% weekly sessions	0%	weekly	0
% monthly sessions	0%	monthly	0

- If **half** of the health centers hold immunization sessions on a **daily basis** and the other **half** hold sessions **4 times per month**, then the following examples lead to the same result (**50% daily**):

¹¹ WHO Effective Vaccine Management initiative:

https://www.who.int/immunization/programmes_systems/supply_chain/evm/en/

% daily sessions	50%	daily	1
% weekly sessions	0%	weekly	0
% monthly sessions	50%	monthly	4

OR

% daily sessions	50%	daily	1
% weekly sessions	50%	weekly	1
% monthly sessions	0%	monthly	0

- If 30% of the health centers hold immunization sessions 18 days per month, then the result is **daily 70%**:

% daily sessions	70%	daily	1
% weekly sessions	0%	weekly	0
% monthly sessions	30%	monthly	18

The number of estimated service points calculated for the daily, weekly and monthly sessions organized, based on the data entered in 2.4 or using the WHO normative approach, the estimated average session size and the vaccination per service point are provided.

The maximum closed vial wastage rate per supply chain level, which is less than 1% at each level of the supply chain (Efficient Vaccine Management standards) and the avoidable opened vial wastage sets it at 5% have been considered in the calculation of the estimated anticipated wastage rates.

Outputs

The vaccine wastage rates for the selected year and group of countries or single country are shown in a table according to:

- the vaccine presentation values for the selected vaccine and;
- the status of the implementation of the multi-dose vial policy (MDVP).^{12,13}

Additional results include:

- The total population, the total number of annual surviving infants and the estimated total number of vaccinations;

An accompanying graph provides a visual representation of the results. It provides additional information to help improve the management and planning of immunization sessions.

¹² – “No re-use” means that the vaccine is not eligible for MDVP and must be discarded at the end of the immunization session, or within six hours of opening, whichever comes first. In this case, the results under “re-use” will remain empty. “MDVP Re-use up to 4 weeks” means that the vaccine is eligible for MDVP and the opened vaccine vial can be kept and used from 1 to 4 weeks after opening if the vaccine meets certain criteria. Results under “Re-use” will be then displayed, from 1 to 4 weeks.

¹³ WHO policy statement: multi-dose vial policy (MDVP): handling of multi-dose vaccine vials after opening, Revision 2014. <https://apps.who.int/iris/handle/10665/135972>.

Use and further interpretation of the results

Improving vaccine forecasting needs and monitoring vaccine utilization and wastage

Estimating accurate vaccine wastage is of paramount importance because it is factored by countries into their quinquennial and annual forecasting. Wastage, and therefore wastage rates, also has a considerable impact on programmes. The use of the new WHO wastage rates calculator at country level will enhance national immunization programme capacity to assess and improve the quality of their wastage data and track progress towards the achievements of the health goals included/outlined in the Global Vaccine Action Plan (GVAP) and the 13th General Programme of Work (GPW13). The use of this new tool is essential to support evidence-based decisions under the GVAP and the Sustainable Development Goals.

The WHO wastage calculator will also contribute to obtain a model-based benchmark that could serve as guidance for countries for implementing robust monitoring of vaccine utilization and wastage.

Improving frequency of immunization sessions and planning management

This tool can support decision-making by helping programme managers develop evidence-based planning, staff management

and policy recommendations. The analysis of the results of the average vaccinations per service points and the average session size can help programme managers make appropriate decisions not only about the optimal vaccine presentations but also about immunization session frequency, including decisions regarding application of MDVP and the possibility of extending the period of use of an opened vial of an eligible vaccine to minimize wastage. See examples in Boxes 1 & 2.

Support during new vaccine introduction

The WHO wastage calculator tool also allows users to not only revise a country's vial-size procurement strategy, but also help to plan for new vaccine introduction and the initial procurement of the most appropriate vial size. This translates into calculating a more

Box 1

Example 1: BCG vaccine

Year: 2018

Group selection: AFR region, Central region.

Vaccine presentation: 20-dose

Vaccine schedule: 1 dose

Coverage: 90%

Frequency of the session: Daily 100%

Service point: leave empty

Level of supply chain: 4

MDVP Status: no

Results:

Wastage rates: 93%

Average vaccinations per service points: 160

Average session size: 0.7

Interpretation and analysis:

- The results could support a strategy of changing the frequency of the sessions from 100% of the service points delivering daily sessions to 50% of service point delivering weekly sessions and the other 50% delivering monthly sessions. The estimated wastage rates **will drop from 94% to 56%**. This strategy option should be implemented if, and it only if, the negative impact on immunization coverage is minimal.
- In addition, the average session size will increase from 0.7 to 6.2 and 26 children per session respectively for weekly and monthly sessions. The immunization programme manager should ensure appropriate planning for staffing and a safe environment for the vaccination session.

accurate amount of potent vaccines and avoiding stock outages and/or overstocking at the service delivery point.

Optimizing programme cost

By linking wastage data with financial data, the new WHO vaccine wastage rates calculator assists country-level programme managers and global health agency procurement agents to optimize immunization programme costs.

Tool Limitations

Insufficient monitoring of vaccine wastage and a lack of accurate and appropriate data at the country level may lead to a misunderstanding and misuse of the results obtained through this tool. In addition, the normative approach may not reflect the country context reality and the resulting wastage rates from this tool remain indicative until such time as better-quality country-level data are available.

That being said, this revised vaccine wastage rate calculator tool provides key inputs to assess future vaccine needs and can contribute to better decision-making with respect to the selection of appropriate vaccines and immunization management at the country level.

Box 2:

Example with HepB birth dose vaccine
Group selection: EMR region, district level
Available vaccine presentation: 10-dose
Coverage: 80%
Vaccine schedule: 1 doses
Supply chain level: health facility 4
Frequency of the session: All health facilities organize daily sessions.
MDVP Status: eligible

Results:

Wastage rates: 10-dose vial
-89% - No re-use
-30% - Use up to 1-week, partial implementation of MDVP

Interpretation & analysis:

These results show that the country would benefit from fully implementing the MDVP. The anticipated wastage rates for 4 weeks would be 3 times less (9%) than the 1-week result.

Contact

For further information or guidance on the use of the WHO wastage rates calculator, contact Solo Koné: kones@who.int or Rachel Bauquerez: bauquerezr@who.int