Global Health
Supply Chain Summit

ABSTRACT #129
TRACK 14.3
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2024

VALUE CHAIN INNOVATIONS FOR UNIVERSAL HEALTH COVERAGE

Show me the Data!
Deep dive into understanding vaccine wastage rates from a unique source

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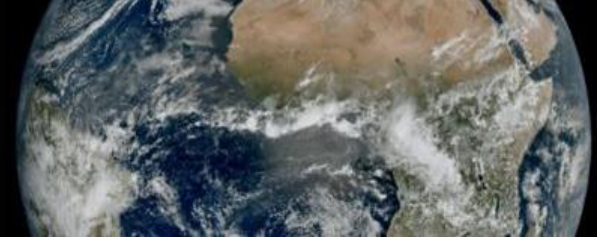
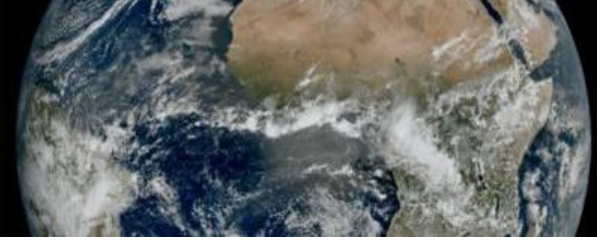
Context and motivation



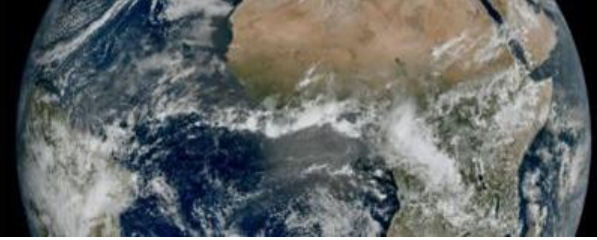
- There is a need for more accurate national level vaccine forecasts and re-supply decisions at the facility level to avoid over-stock and under-stock. This need is growing with new and more expensive vaccines being introduced.
- Re-supply decisions are typically based on:
  - Target population estimates which are often outdated and inaccurate
  - Using standard WHO wastage rates that often do not reflect reality
  - 25% buffer stock added to each level of the supply chain
- In Mozambique, additional data is being collected through routine immunization services at the facility level, providing an opportunity for further in-depth analysis to determine more accurate re-supply decisions.

Study objective



- *Objective*: Conduct a deep dive into available disaggregated data to provide greater insight into immunization service delivery in order to validate the quantity of vaccines supplied to a facility, and improve data deficiencies and data quality available in the system
- Expected insights:
  - True wastage rates based on the Mozambique context without having to conduct a heavy-lift, intensive study
  - Identify session size to estimate the average number of children who present at an immunization session
  - Estimate more accurate vaccine re-supply decisions for health facilities and establish a simplified and more accurate methodology for re-supply decisions
  - Identify data quality issues from routine data collection

Methodology (1 of 2)



- Sample selection
  - Purposeful sampling of two districts in Mozambique, (21 and 15 health facilities) with a relatively high use of daily summary sheets
  - Three months time period (Aug-Oct 2023)
- Data collection
  - Retrospective data collection at facility level from multiple data sources

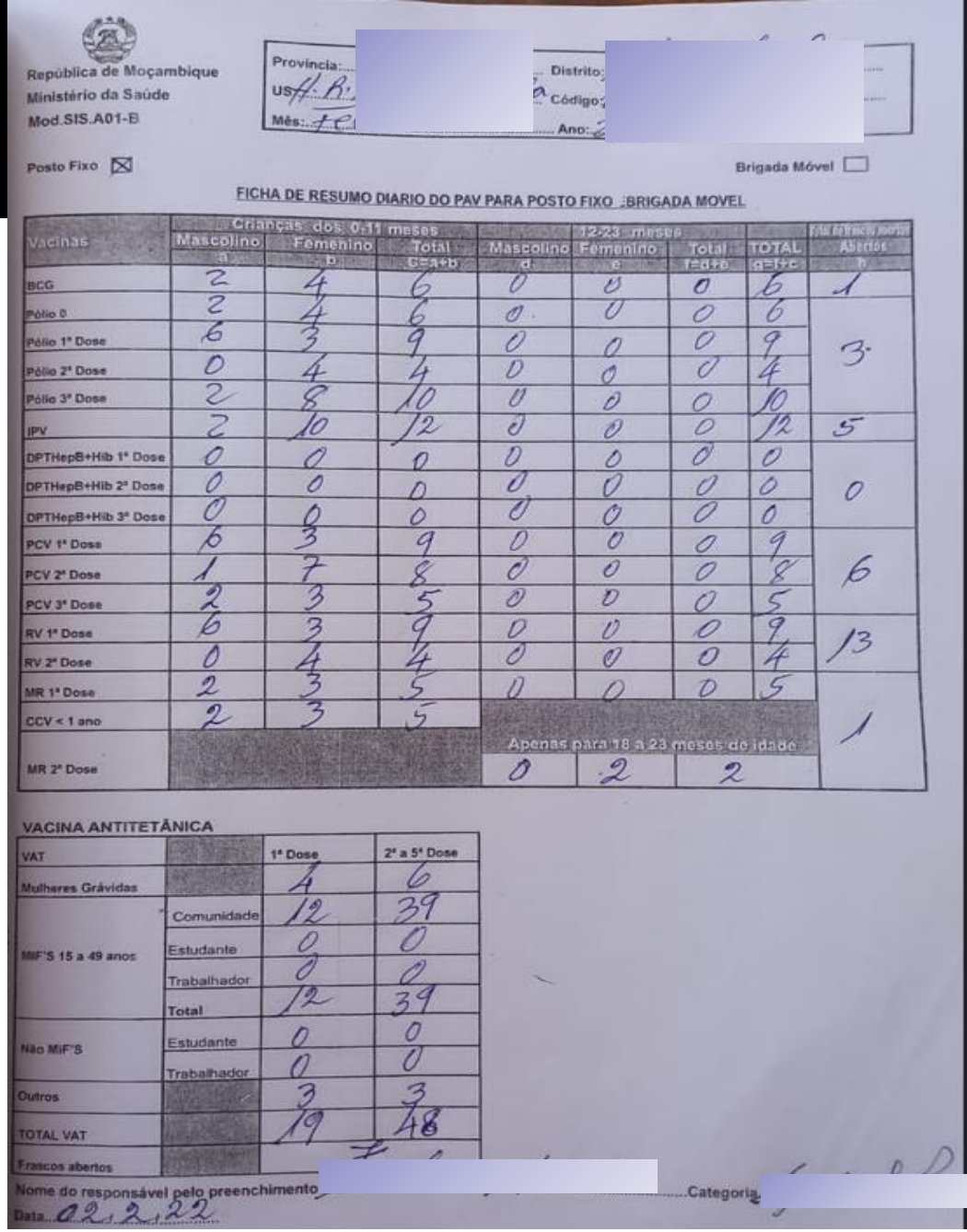
Source	Data point
Daily Summary Sheets, health facility	• Daily number of doses administered by age, gender, and dose in the series; by day. • Number vials opened
Stock card, health facility	• Opening monthly balance • Vaccines received during the month • Doses available • Doses opened • Ending monthly balance (open, unopened vials)
LMIS	• Monthly vaccine quantities issued to facility • Quantities received, available, consumed • Monthly average consumption by facility, district • Doses consumed per month by facility and district and province by month
DHIS2	• Doses administered by age, by month • Target population by facility and district

Methodology (2 of 2)

- Data analysis
  - Calculate wastage rate
  - Calculate the average session size
  - Calculate wastage rate by session size
  - Compare the accuracy of doses administered across data sources, to identify discrepancies and possible causes;
  - Compare the accuracy of revised resupply and forecasts using new data points with those determined historically;
  - Compare accuracy or revised methods with those used traditionally
- Work timeline
  - Data collected Dec 2023 – Jan 2024; analysis is on-going

Example: Daily Summary Sheet

- A relatively new form that has been introduced in the past couple of years
- Should be completed each day
- Tracks doses administered by vaccine, gender and age
- Provides a recording space for number of opened vials
- Data is aggregated at the end of the month for monthly HMIS reports
- Theoretically improves quality of data



República de Moçambique
Ministério da Saúde
Mod.SIS.A01-B

Posto Fixo ☒ Brigada Móvel ☐

FICHA DE RESUMO DIARIO DO PAV PARA POSTO FIXO :BRIGADA MOVEL

Vacinas	Crianças dos 0-11 meses: Mascolino a	Femenino b	Total c=a+b	12-23 meses: Mascolino d	Femenino e	Total f=d+e	TOTAL g=f+c	Abertos h
BCG	2	4	6	0	0	0	6	1
Pólio 0	2	4	6	0	0	0	6	
Pólio 1ª Dose	6	3	9	0	0	0	9	3
Pólio 2ª Dose	0	4	4	0	0	0	4	
Pólio 3ª Dose	2	8	10	0	0	0	10	
IPV	2	10	12	0	0	0	12	5
DPTHepB+Hib 1ª Dose	0	0	0	0	0	0	0	
DPTHepB+Hib 2ª Dose	0	0	0	0	0	0	0	0
DPTHepB+Hib 3ª Dose	0	0	0	0	0	0	0	
PCV 1ª Dose	6	3	9	0	0	0	9	
PCV 2ª Dose	1	7	8	0	0	0	8	6
PCV 3ª Dose	2	3	5	0	0	0	5	
RV 1ª Dose	6	3	9	0	0	0	9	13
RV 2ª Dose	0	4	4	0	0	0	4	
MR 1ª Dose	2	3	5	0	0	0	5	
CCV < 1 ano	2	3	5					1
MR 2ª Dose				Apenas para 18 a 23 meses de idade: 0	2	2		

VACINA ANTITETÂNICA

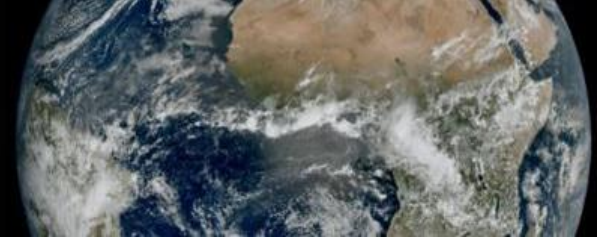
VAT		1ª Dose	2ª a 5ª Dose
Mulheres Grávidas		4	6
MIF'S 15 a 49 anos	Comunidade	12	39
	Estudante	0	0
	Trabalhador	0	0
	Total	12	39
Não MIF'S	Estudante	0	0
	Trabalhador	0	0
Outros		3	3
TOTAL VAT		19	48
Frascos abertos			

Nome do responsável pelo preenchimento [redacted] Categoria [redacted]
Data 02.2.22

Limitations

- Data quality is not good
- Data sources are not complete
- Inconsistencies in data across data sources

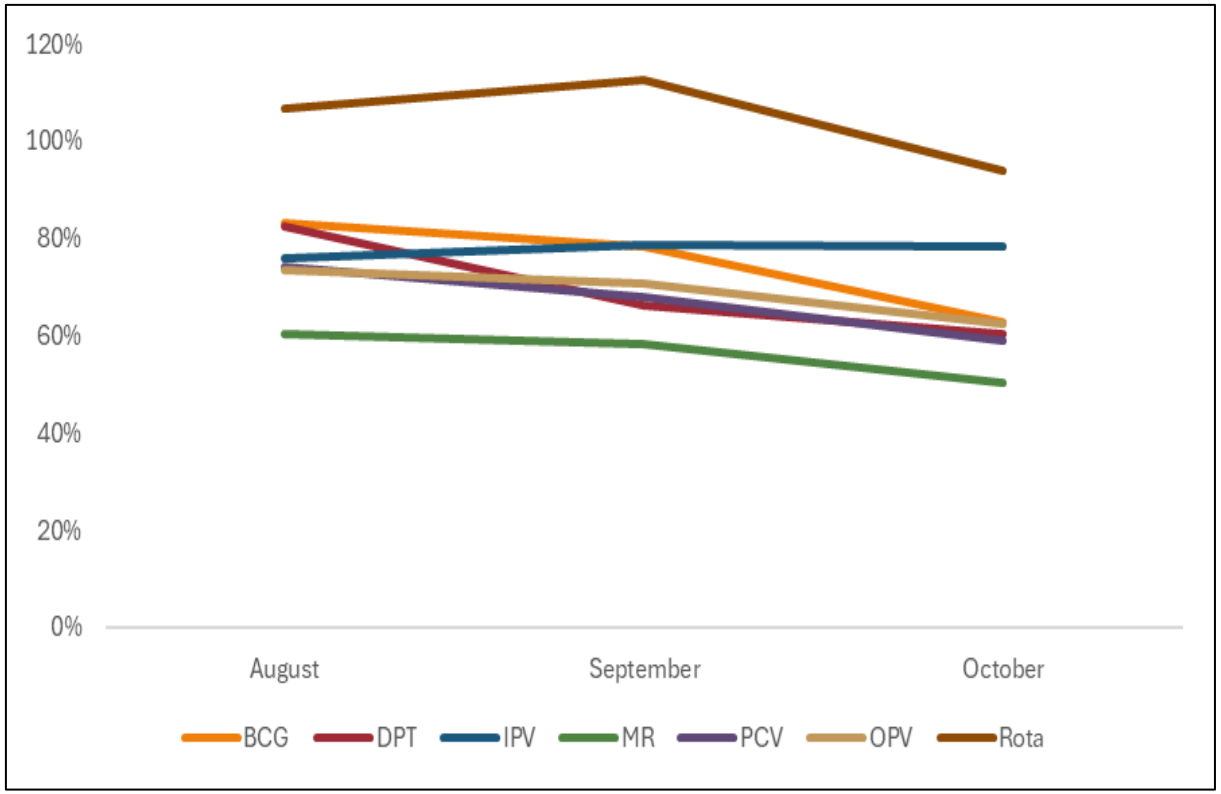
Despite the limitations and knowing that the data quality and availability are not great, the challenge is to determine how more accurate re-supply decisions can be made based on what data are available and understanding the context.



Results

Low levels of data completeness, quality and consistency between sources

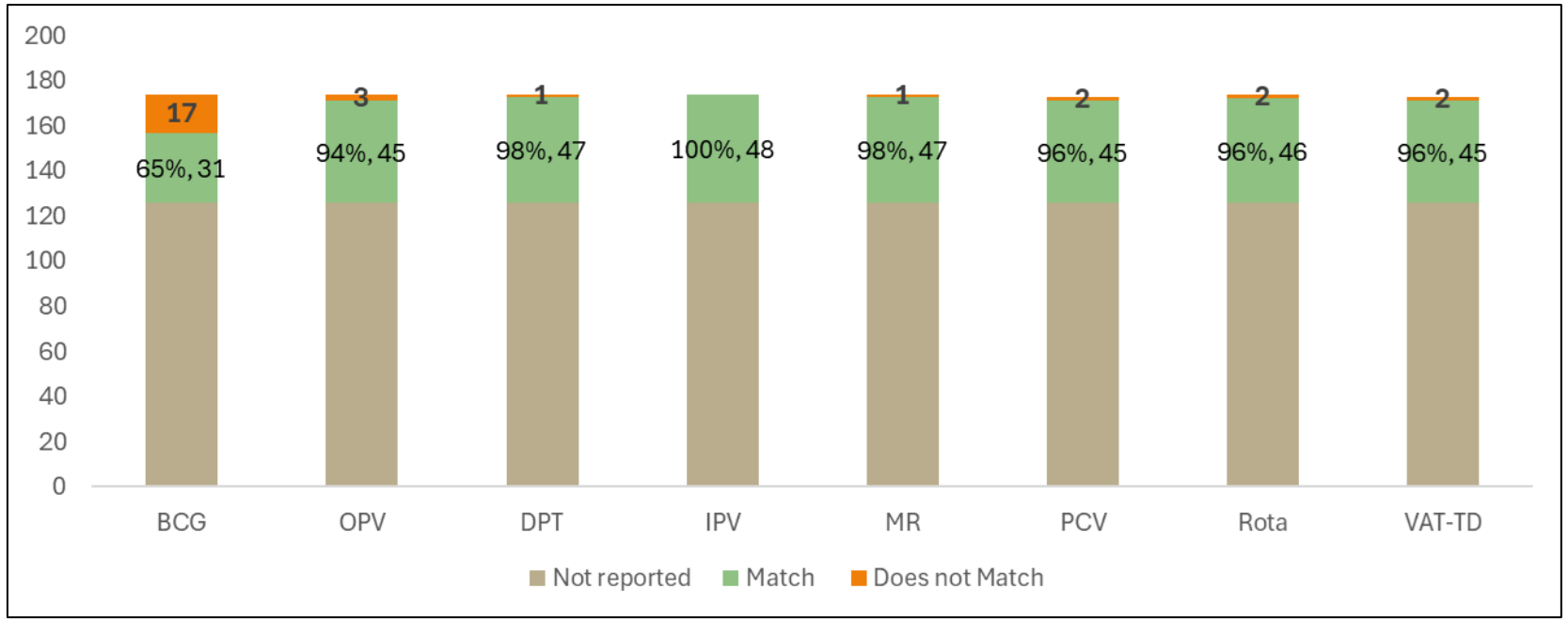
- Only 8 of 17 facilities were able to complete a full month of Daily Summary Sheets
- For the majority of vaccines administered, the Daily Summary Sheet only captures 60% - 80% of those that are reported in the monthly DHIS2 reports (graph)
- Rotavirus, as the exception, is a single dose vial which may influence the more aligned accuracy of reporting.

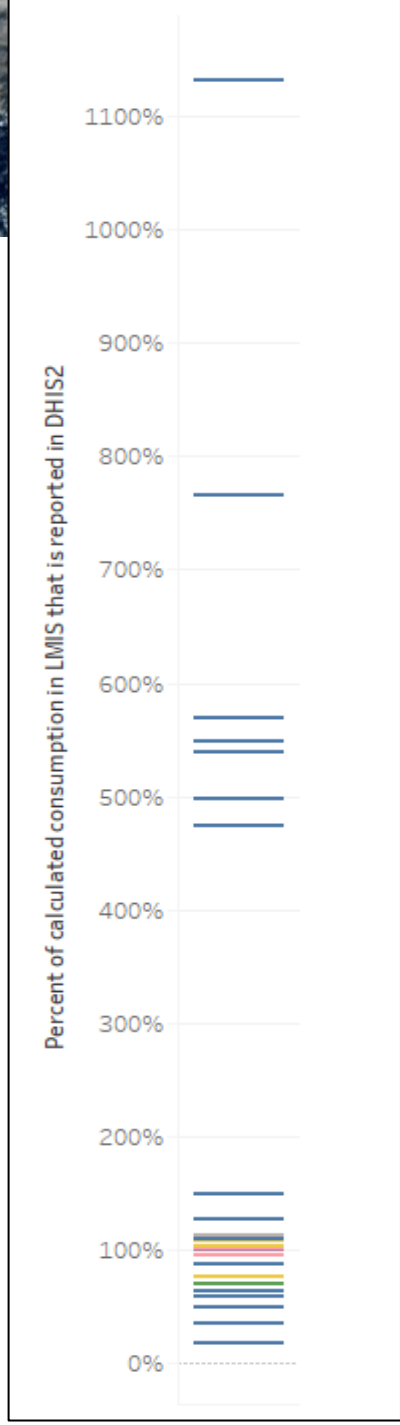


Percentage of doses administered reported in the DHIS2 that were reported in the Daily Summary Sheet

Vials opened: Consistency between HMIS and LMIS

- Largely, when reported, vials opened reported in DHIS2 is the same as what would be calculated as being consumed with LMIS data (graph below).
- Second graph shows the percentage differences between the two reports where they did not match
  - Large differences (>500%) most likely due to data error





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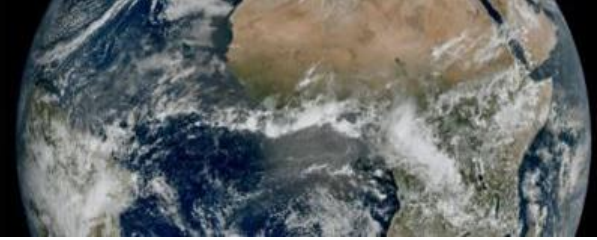
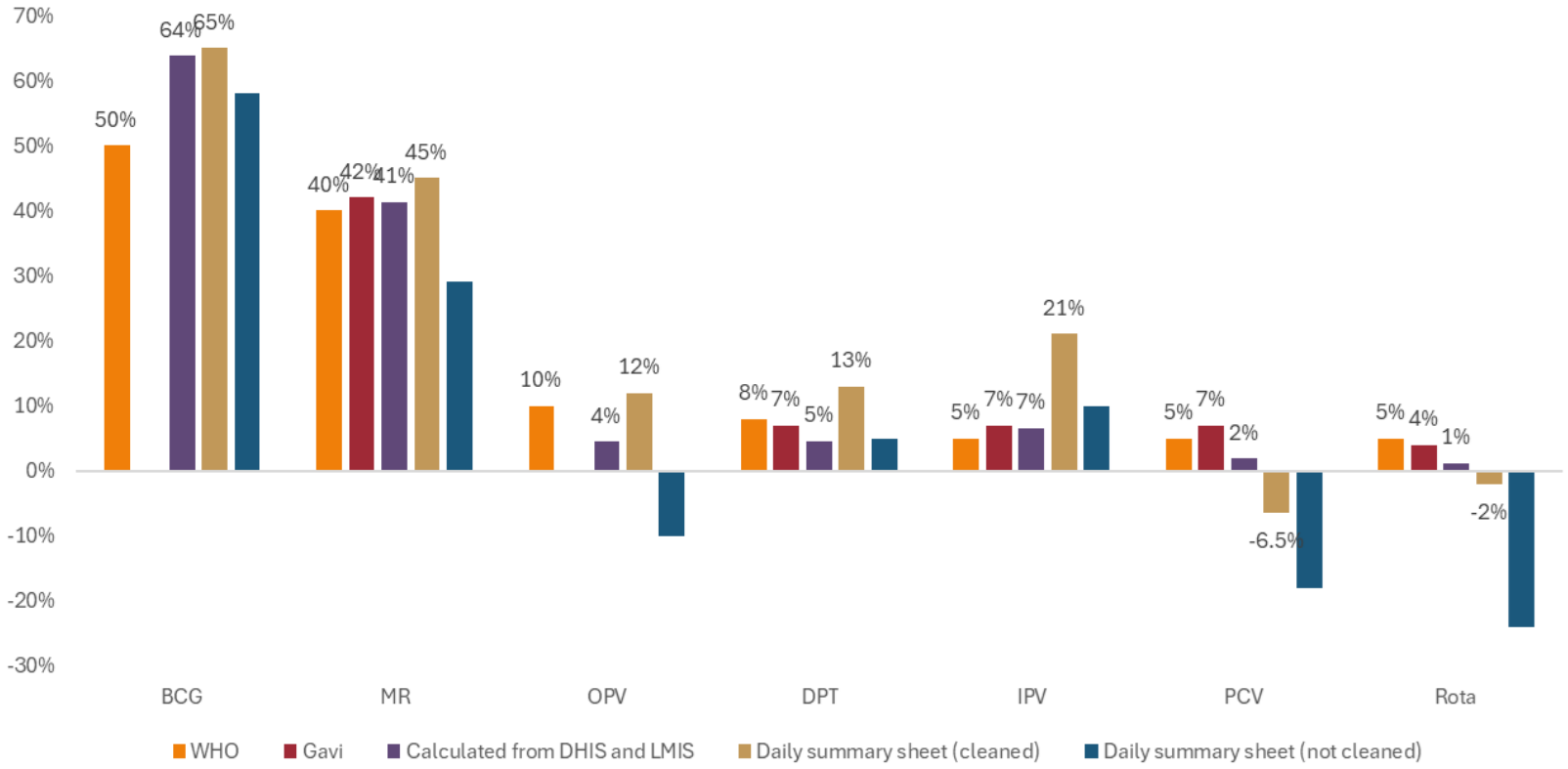
The conundrum of vaccine wastage rates



	Vial Size
Open vial wastage is an inevitable part of an immunization program as some multi-dose vials have to be discarded 6 hours after opening.	– BCG: 20 dose – Measles: 10 dose
Other vaccines can be kept for up to 30 days after opening or have small dose per container	– DPT: 10 dose – OPV: 10 dose – IPV: 5 dose – PCV: 4 dose – Rota: single dose

- Closed vial wastage is due to expiry, breakage, or losing the label and is often relatively low.
- WHO has established standard wastage rates yet they do not capture the nuance of immunization programs or facilities.
- Gavi, the Vaccine Alliance has its own standard wastage rates it applies for forecasting.
- The data required to calculate nuanced wastage rates are often not available.

Wastage rates at district level are not notably different



- District-level aggregated wastage rates are not notably different between sources, with BCG as the exception.
- For re-supply decisions at the district level, a standard wastage rate is appropriate.
- The uncleaned Daily Summary shows drastic negative levels, reflecting poor data quality and the need for data cleaning before monthly reporting.

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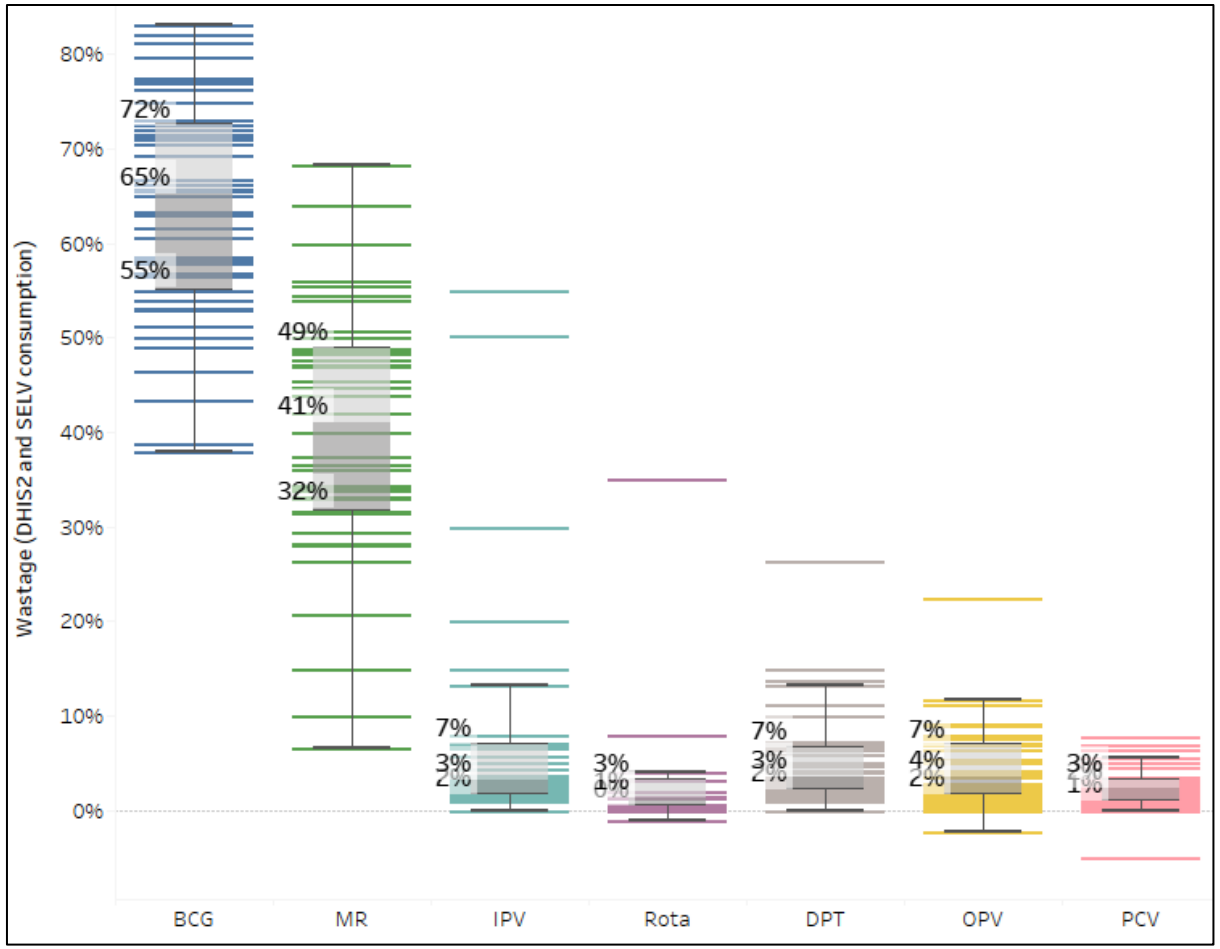
The range of wastage rates varies based on the facility/month



Range and medium of wastage rates
Source: doses administered from DHIS2 and total consumed from LMIS

- The band shows the range of wastage rates across facilities, indicating a significant difference in wastage rates by vaccine and facility.
- Particularly wider band for BCG and MR, both multi-dose vials discarded after 6 hours.
- Could be influenced by session size, rural or urban area, vaccine management and willingness to open a vial by the health worker, and data quality.
- Has important implications for re-supply decisions.

Wastage rates increase with smaller session sizes

Dose per vial	20	10	5	10	10	4	1
MDV rule	6h	6h	28d	28d	28d	28d	n/a

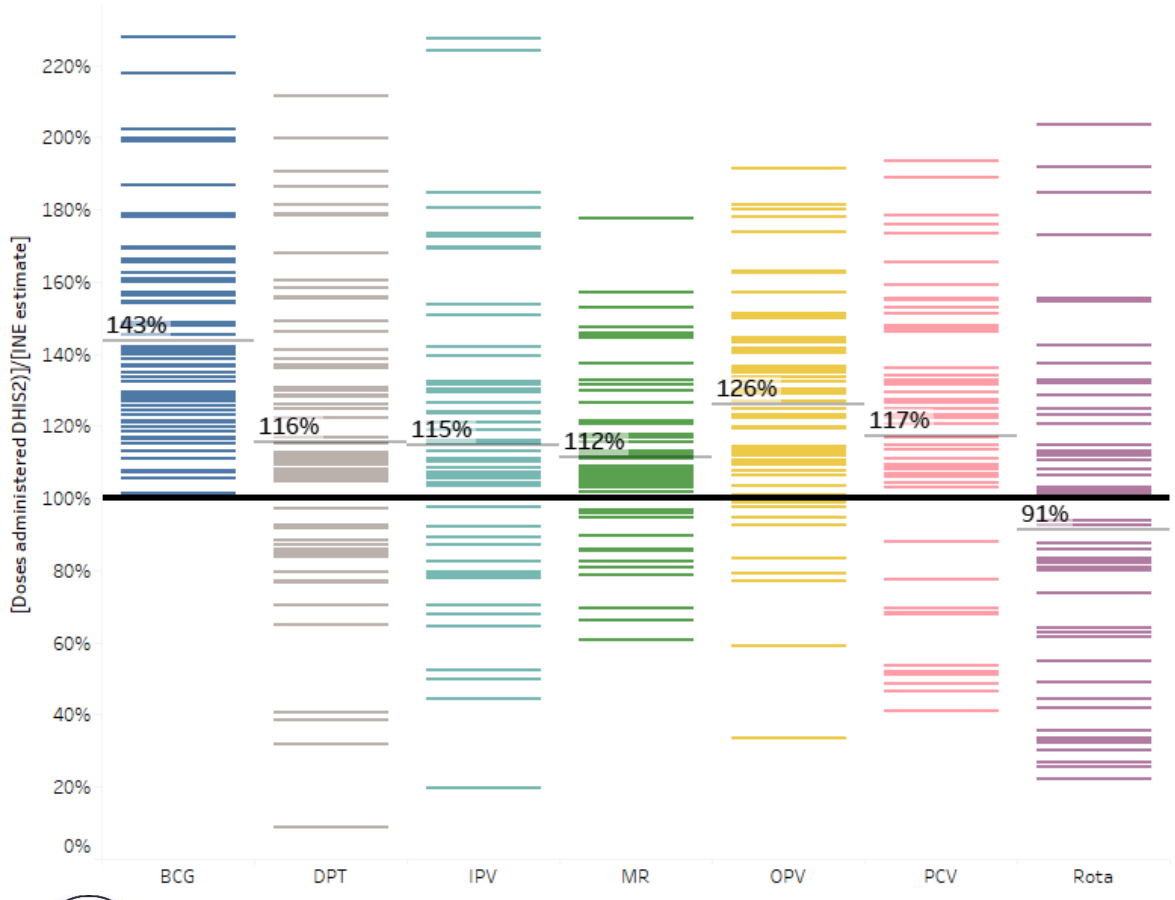
- A logical and obvious finding, the smaller the session size, the larger the wastage rate.
- Particularly true for BCG and MR (20 and 10 dose vials respectively).
- When this data is evaluated routinely, it's possible to prioritize retraining and supervision to facilities that are outliers.

Analysis shows missed opportunities of vaccines in age cohorts

Source: stockouts reported in LMIS; doses administered in HMIS

- Based on the vaccine schedule, different age cohorts should receive the same number of vaccines per schedule and visit. Example:
  - a 2 month old should receive one dose of DPT, OPV, PCV and Rota at the same visit
  - a 9 month old should receive one dose of PVC and measles
- This analysis shows the the correlation between stockouts and the deviation from the maximum number of doses given for that cohort per month.
- The greater the deviation from max, the more likely to be stocked out at the end of the month.

Doses administered are on average higher than target population estimates



The range of doses administered compared to expectation with the average highlighted

- 100% line represents a match between target population estimate and reported doses administered.
- Target population (from statistics office INE) is used to determine resupply quantities, but…
- More children are vaccinated than population estimates
  - Rota is the exception (single dose vial, possible poor data quality).
- Likely due to buffer stocks and emergency "top-ups"
  - Any "top-ups" of vaccine stock during the month are not captured clearly in the data yet could be a reason facilities are reaching a larger number of children than expected.

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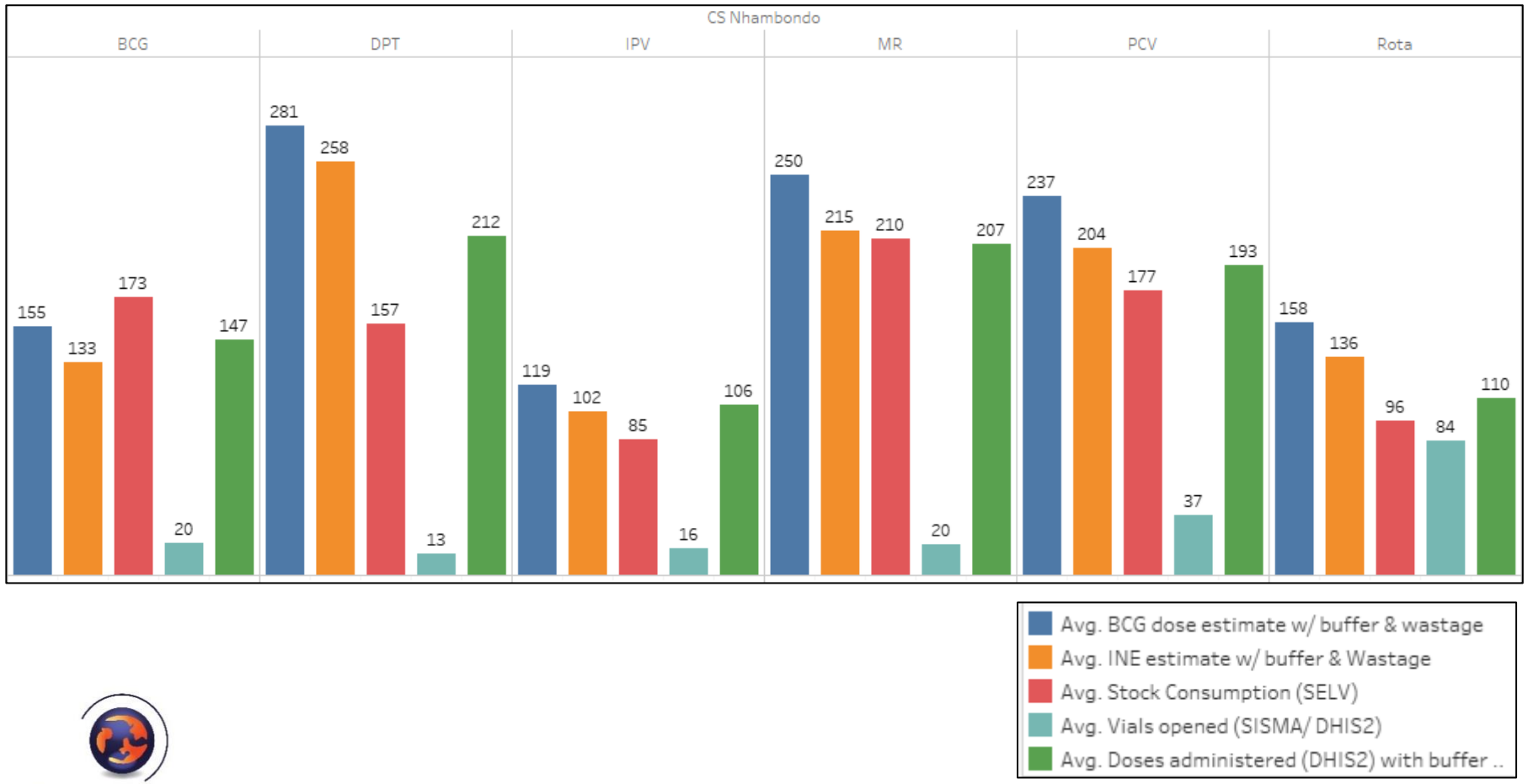
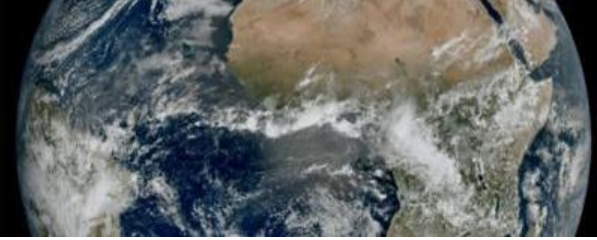
Multiple options for re-supply decisions at facility level



- Re-supply decisions currently based on target population (INE)
- INE-based forecasts do not provide enough
- Using multiple denominators or consumption-based method for re-supply decisions at the facility level provide greater insight

Interpretation



- Data quality is a consistent concern of the immunization program.
- Re-supply decisions are based on target populations that are inaccurate and result in missed opportunities to vaccinate, as demonstrated by the lack of consistency across data sources related to doses administered (among other data points).
- The analysis validates generally known challenges that are understood at sub-national level but have less visibility at national level:
  - There are regular stockouts at facility level.
  - Wastage rates are influenced by size of catchment population, immunization session size, vaccine management practices; and need to be considered at the facility level. Global standards are less accurate for facility-based planning.
  - More children are getting vaccinated than what is planned with the national forecast.

Conclusion

- This makes the case for using multiple methods to determine re-supply quantities for the facility level, as well as to explore alternative approaches for national level forecasts, and to move toward a more agile distribution system that can accommodate the known unknowns.
- More work can be done to better understand the issues, address data quality and refine re-supply decisions, thus contributing to the overall annual forecast.

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