Effective Vaccine Management (EVM)

Global Data Analysis

2009-2018

Update: WHO EVM database, December 2018

EVM – *setting a standard for the vaccine supply chain*

World Health Organization

unicef

What does the Effective Vaccine Management (EVM) assess?

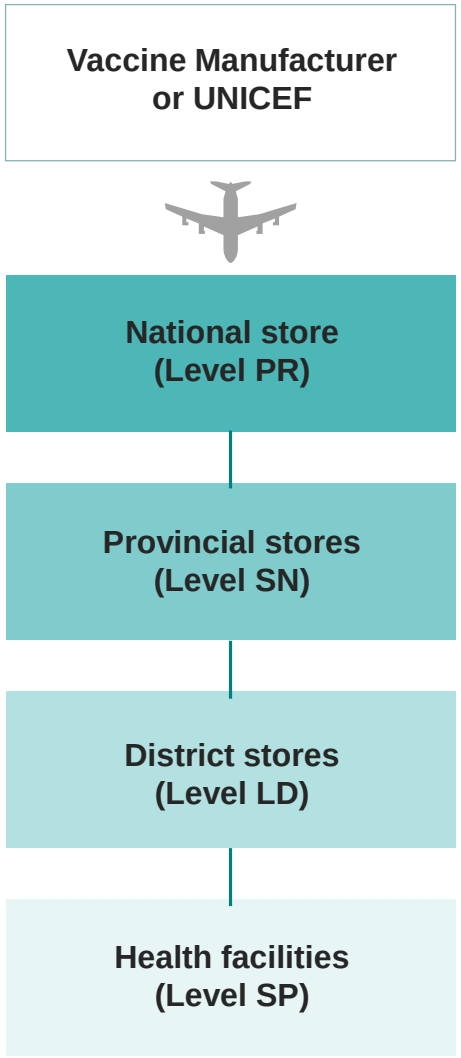
EVM assesses each level of the supply chain

Primary level (PR):
Vaccine stores that receive vaccine direct from an international vaccine manufacturer or distributors or a local vaccine manufacturer.

Sub-national level (SN):
Vaccine stores that receive vaccine from a primary store or higher level sub-national store. There may be 0, 1, or more SN levels.

Lowest distribution level (LD):
Vaccine stores that receive vaccine from a primary level or a sub-national store and supply vaccine to one or more health facilities.

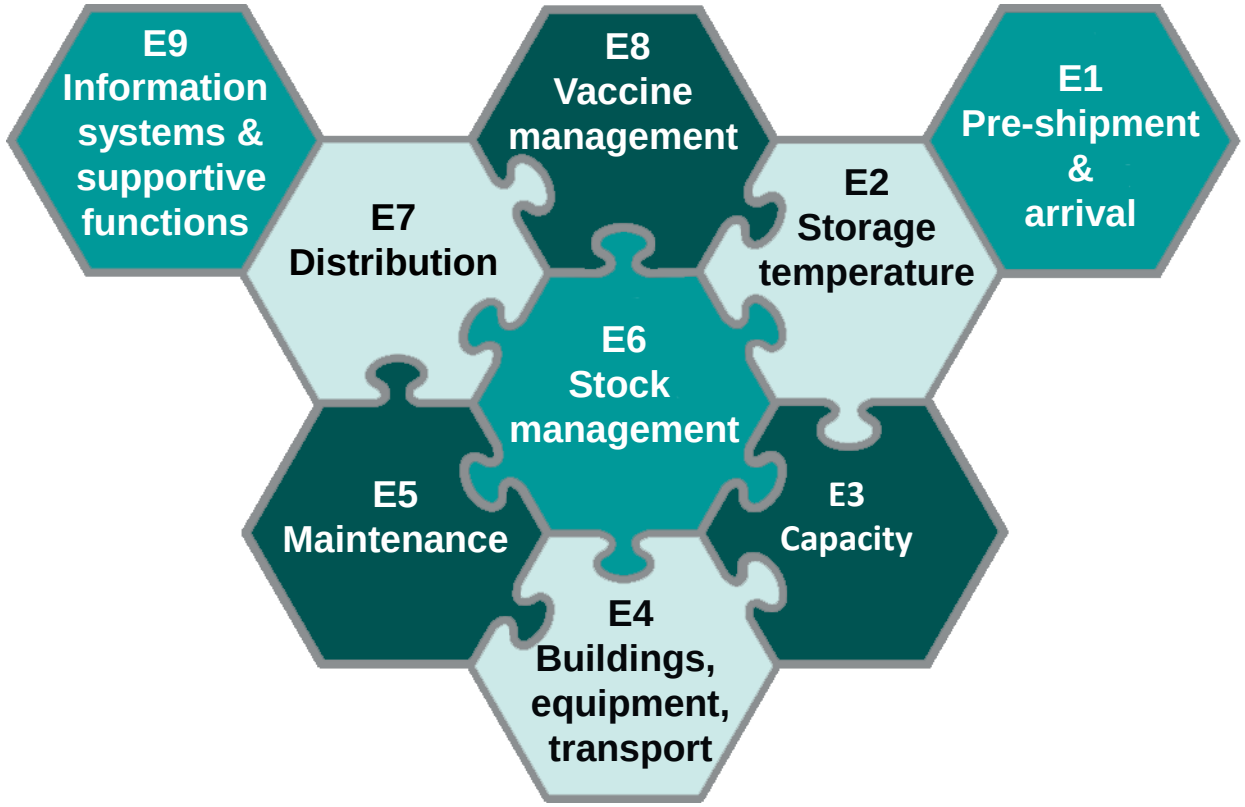
Service point level (SP):
Facilities that receive vaccine from any higher level store and supply immunization services.



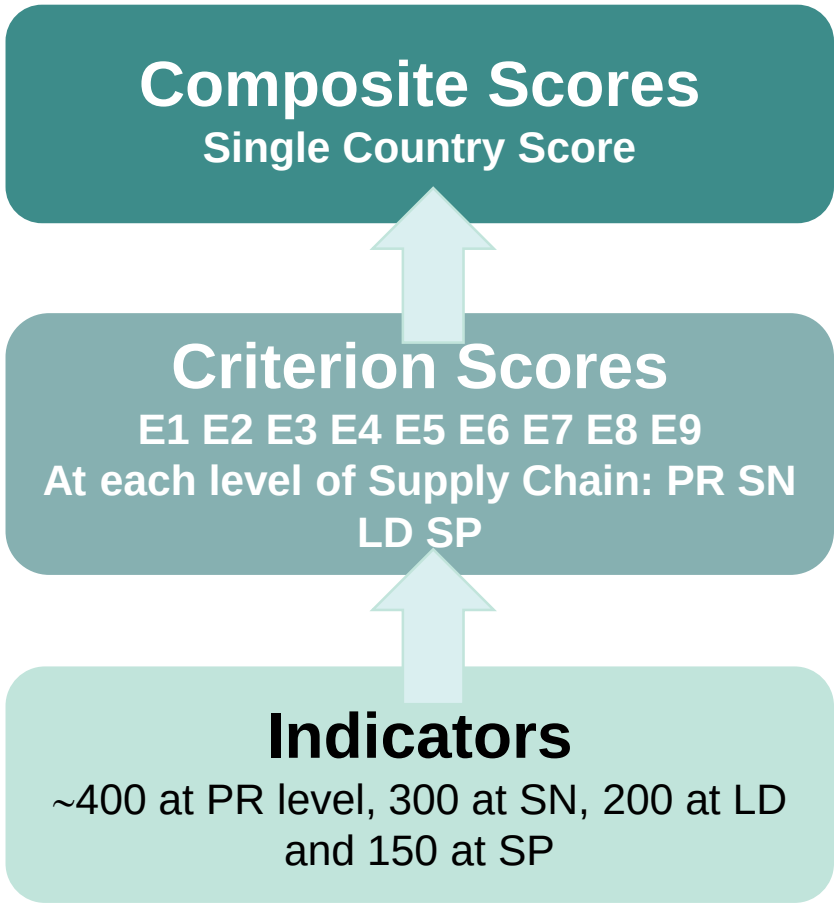
Criterion Scores

- A representative sample of sites is selected at each level of the supply chain.
- Each of the 9 EVM Criteria is assessed at each supply chain level by observation, inspection of infrastructure and records, and by interview of staff.
- Inputs, process and performance indicators are evaluated in each of the 9 areas at each level.
- Indicator scores are combined to give criterion scores for each area at each level.
- An area of vaccine management is considered “Effective” if its criterion score is greater than or equal to 80% - the EVM standard.

EVM assesses 9 areas of vaccine management – the 9 EVM “Criteria”



The Effective Vaccine Management (EVM) Assessment

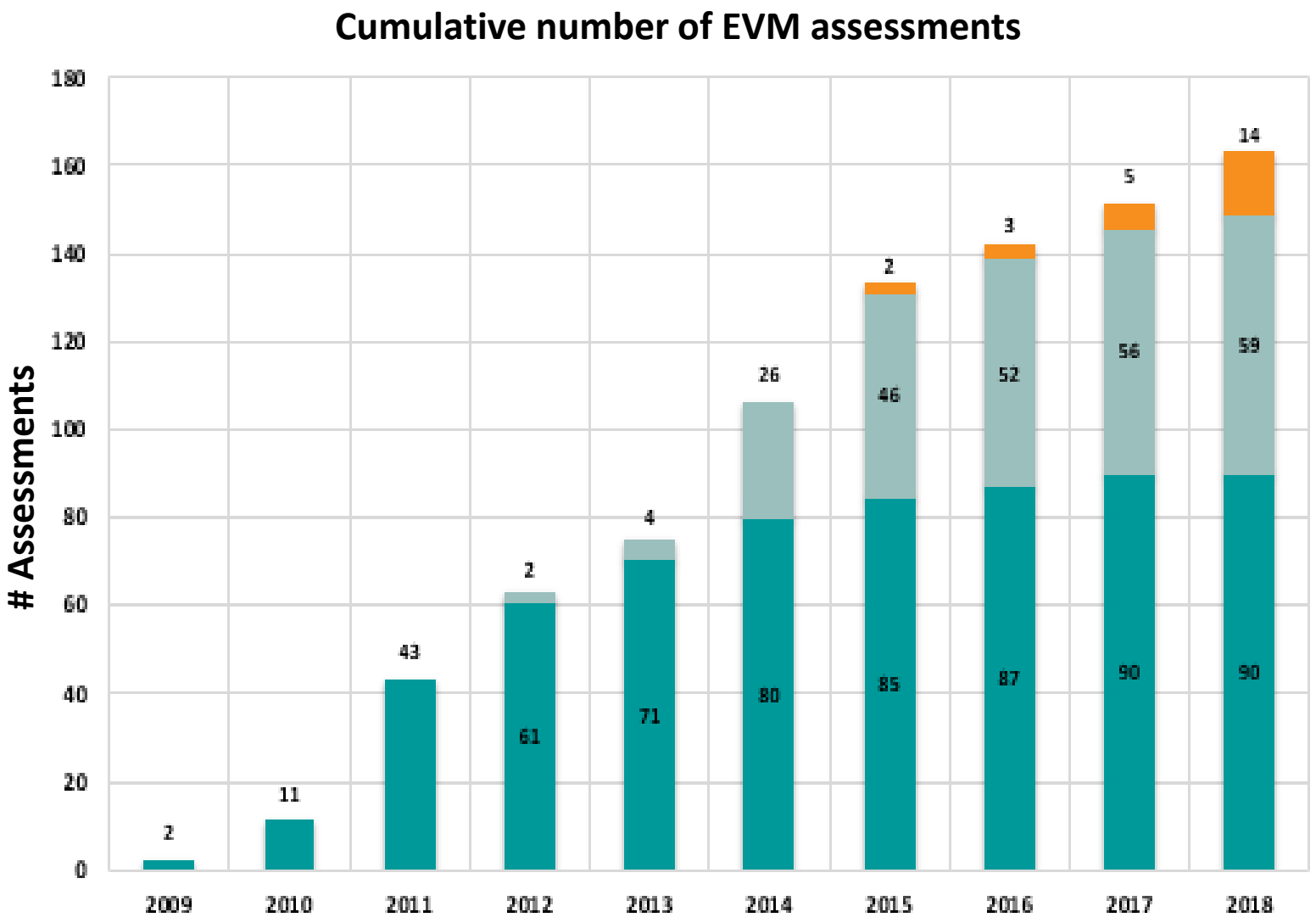


Assessments

2009-2018

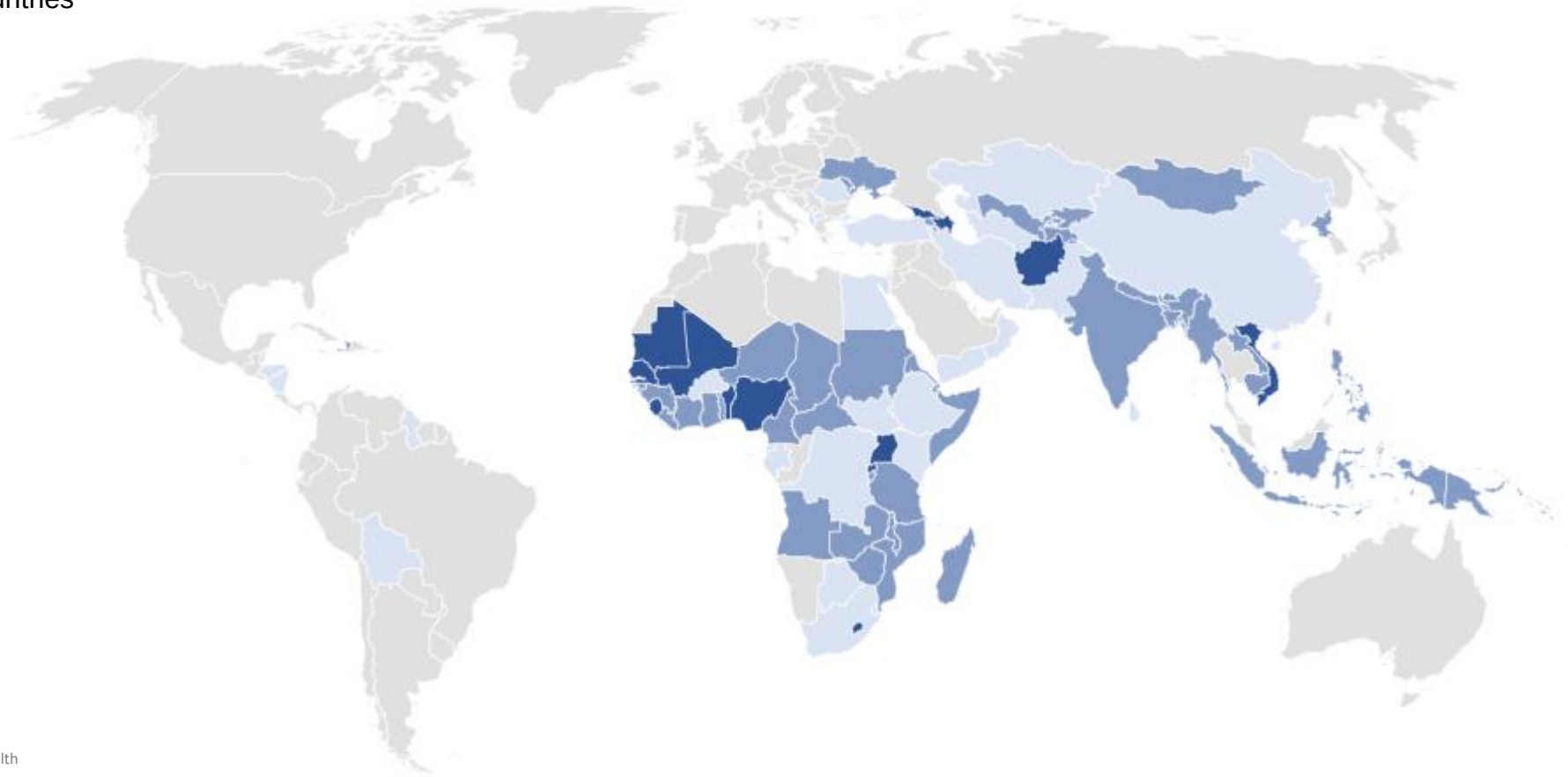
Update: WHO EVM database, December 2018

Assessments (2009-2018)



Countries (2009-2018): Assessments Completed

- 1 Assessment completed in **32** countries
- 2 Assessments completed in **44** countries
- 3 Assessments completed in **14** countries



Data Source: WHO EVM database, December 2018
Map production: Immunization Vaccines and Biologicals, (IVB), World Health Organization
Date of slide: 21 June 2019

Years of most recent assessments (2010-2018)

Data Source: WHO EVM database, December 2018
Map production: Immunization Vaccines and Biologicals, (IVB), World Health Organization
Date of slide: 30 June 2019

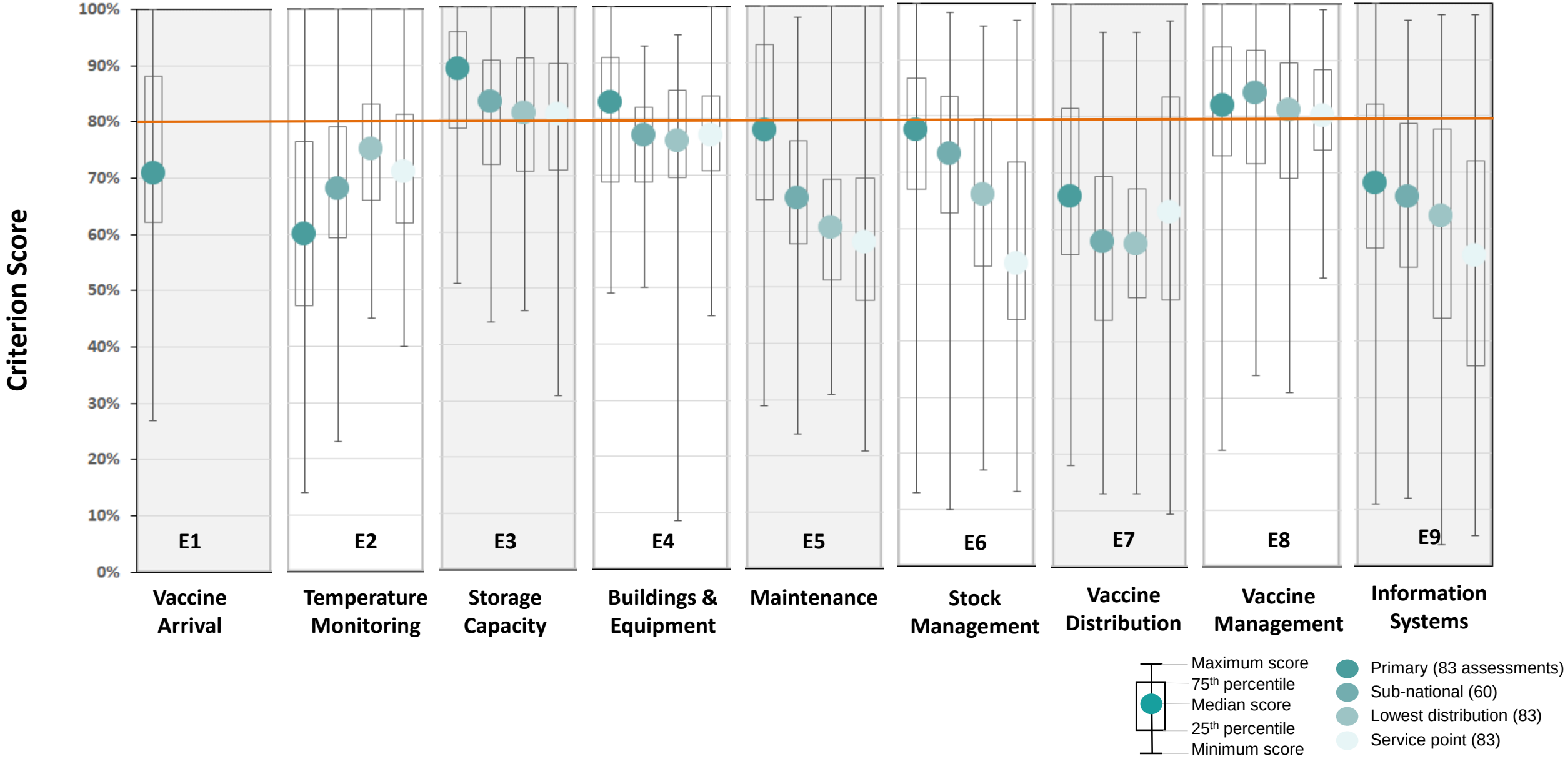
Criterion Scores

(most recent assessments only)

2009-2018

Update: WHO EVM database, December 2018

Criterion Scores (2009-2018)



Composite Scores

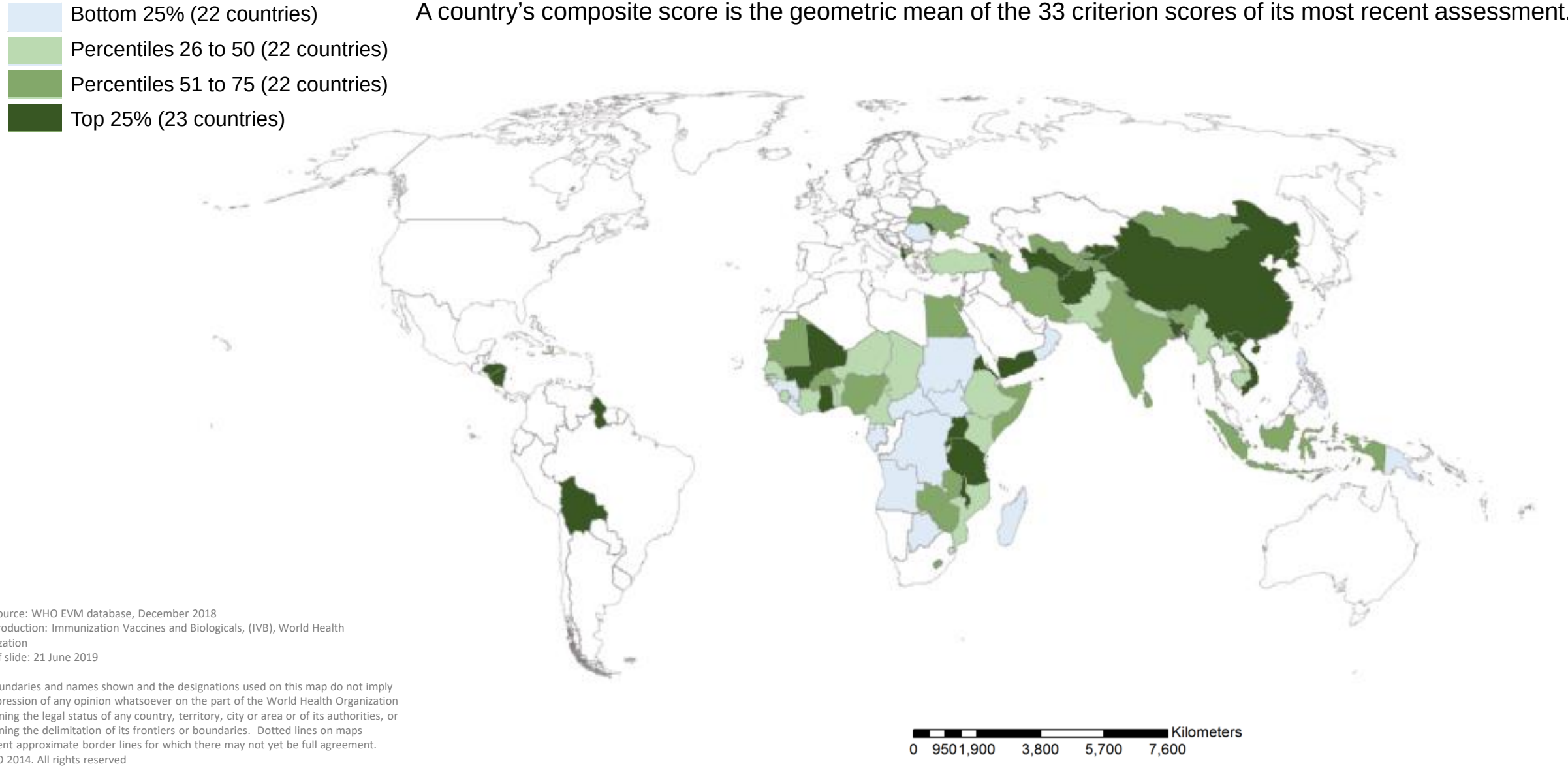
(most recent assessments only)

2009-2018

Update: WHO EVM database, December 2018

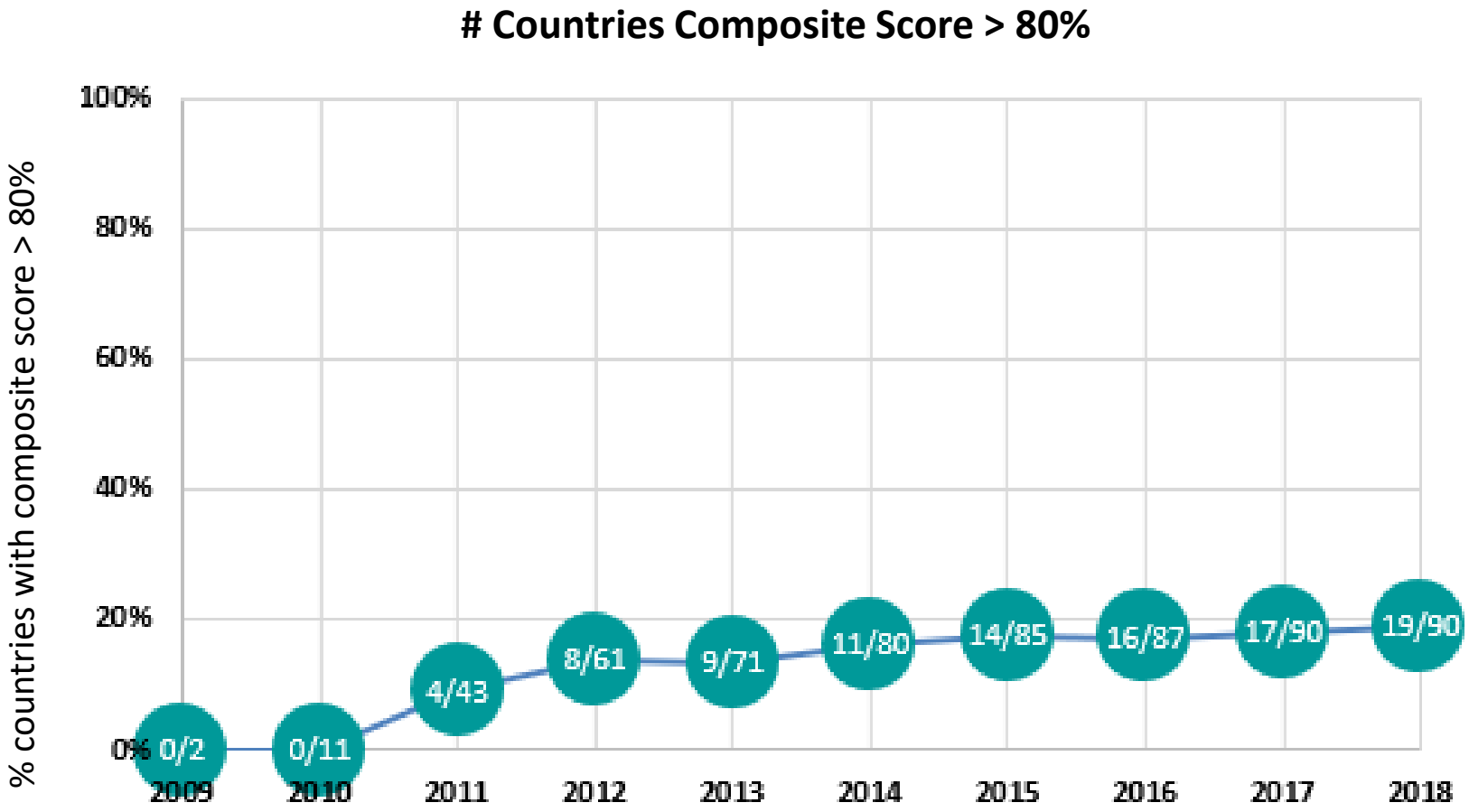
Composite Scores (2009-2018)

A country's composite score is the geometric mean of the 33 criterion scores of its most recent assessment.



Data Source: WHO EVM database, December 2018
Map production: Immunization Vaccines and Biologicals, (IVB), World Health Organization
Date of slide: 21 June 2019

Number Country Composite Scores ≥80% (2009-2018)



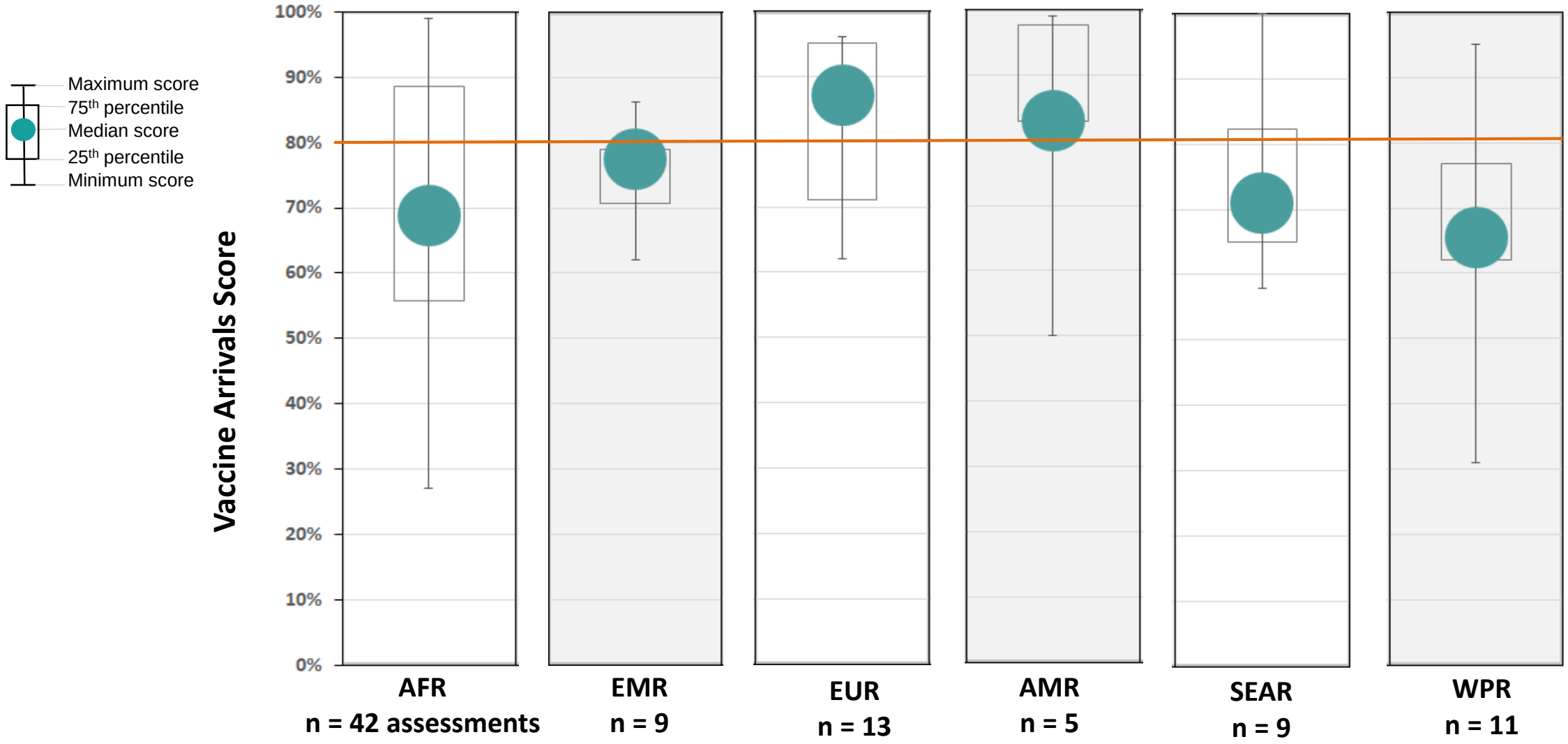
Criterion Scores by Region

(most recent assessments only)

2009-2018

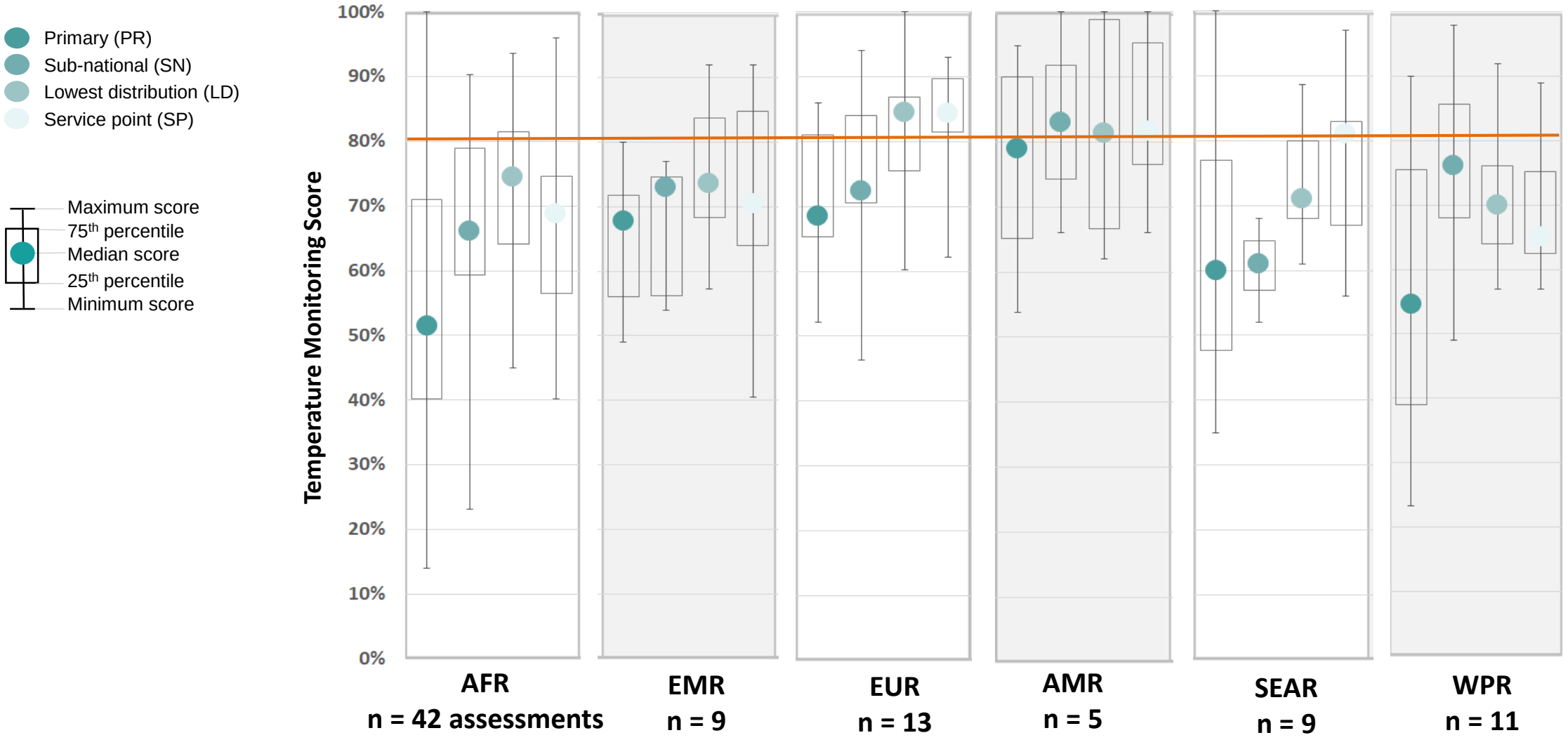
Update: WHO EVM database, December 2018

E1 Vaccine arrivals (2009-2018)



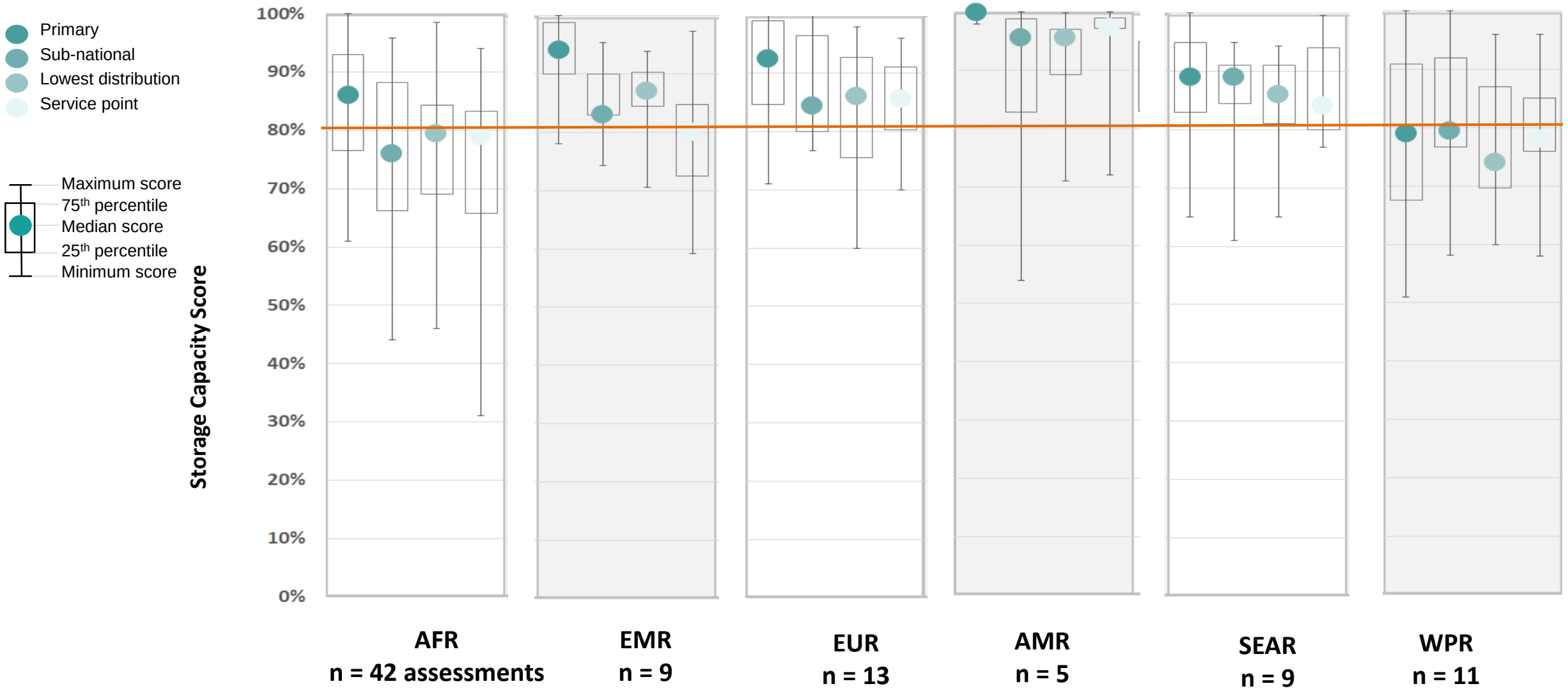
- Less than 25% of the primary stores assessed in AFR, SEAR and WPR meet the EVM standard for vaccine arrivals.
- About half of the primary stores assessed in EMR, EUR and AMR meet the standard.

E2 Temperature Monitoring (2009-2018)



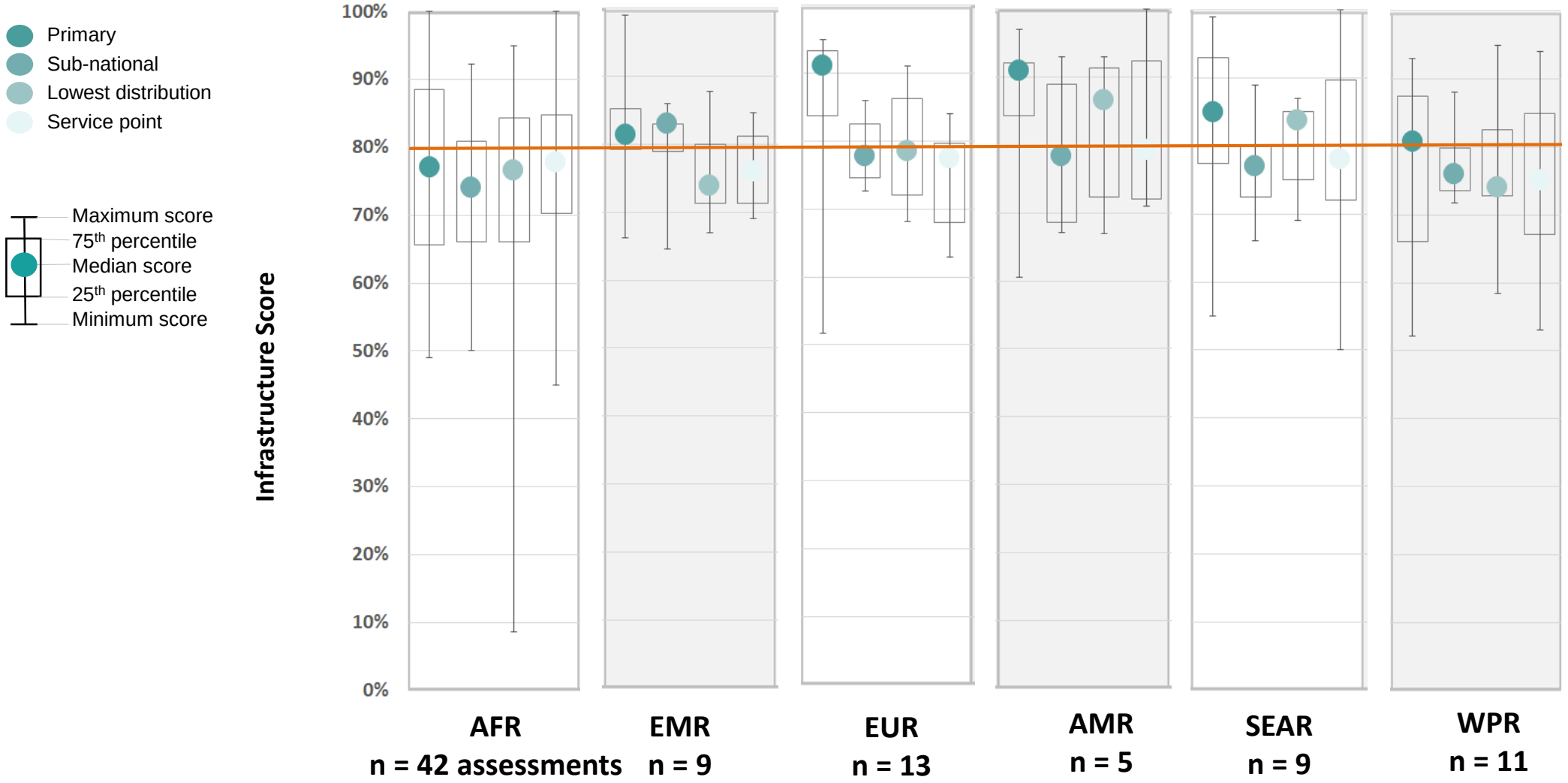
- Apart from countries in EUR and AMR, few countries meet the EVM standard for temperature monitoring, at any level.
- In EUR, more than 50% of the countries assessed meet the standard at LD and/or SP levels.
- Very few of the national (PR) stores assessed in most regions meet the EVM standard for temperature monitoring.

E3 Storage and transport capacity (2009-2018)



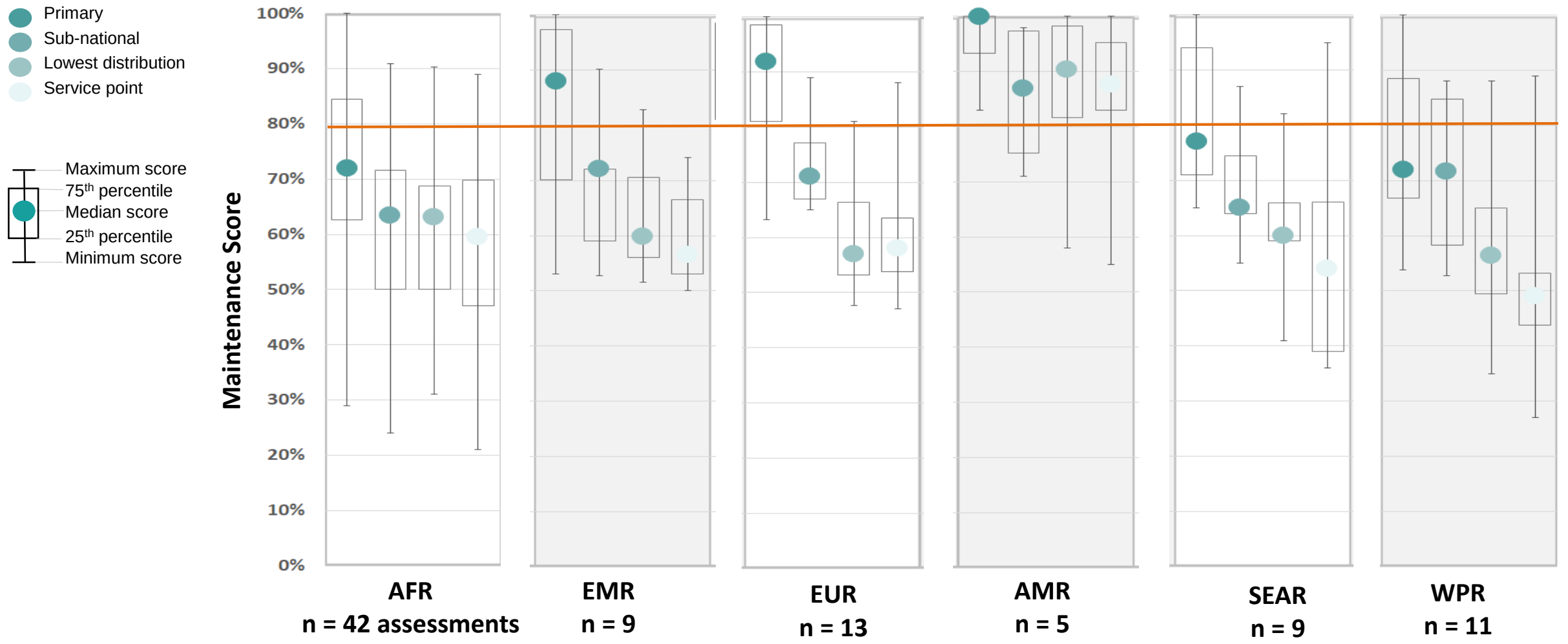
- More than 75% of most of the national (PR) stores assessed in regions have sufficient capacity.
- Many of the AFR and WPR countries assessed have significant storage and/or transport capacity shortfalls at SN, LD and SP levels.

E4 Infrastructure (2009-2018)



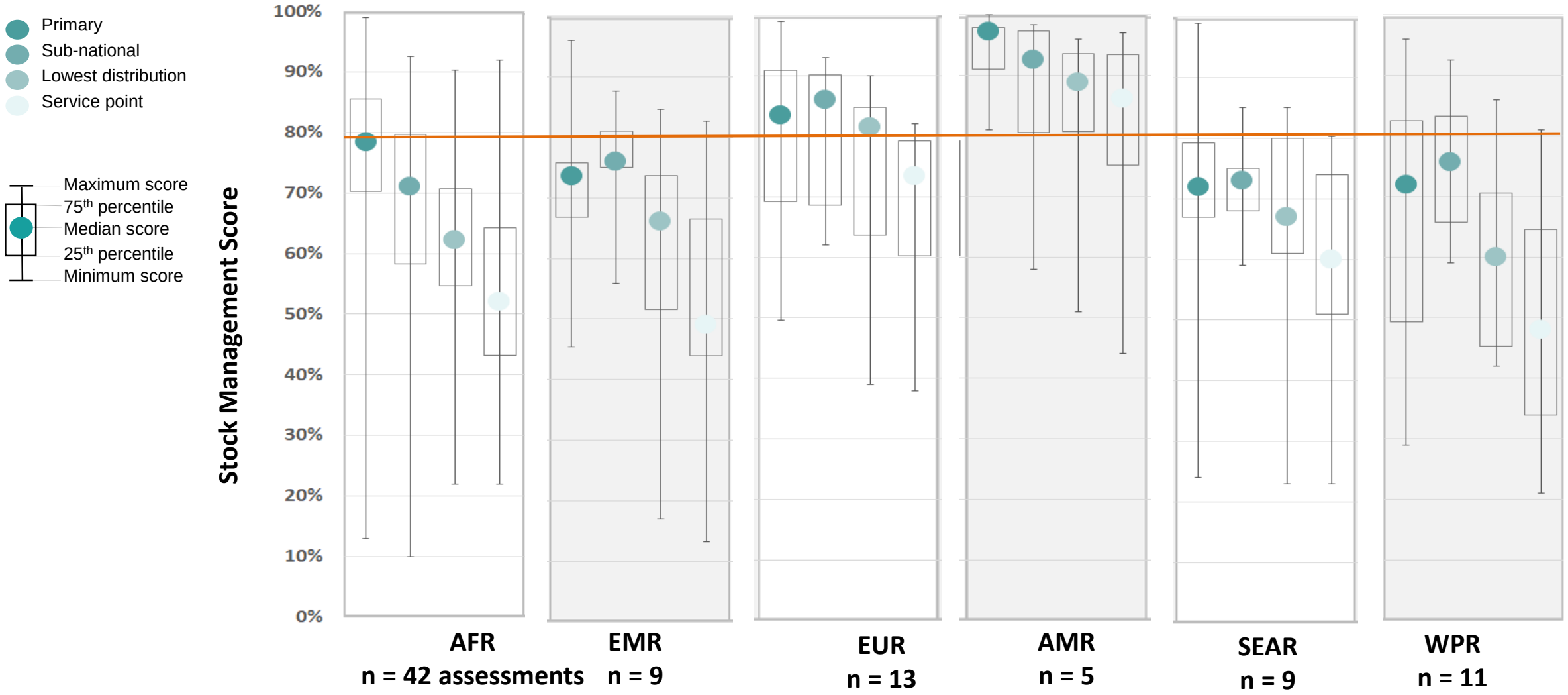
- More than half of the 39 national (PR) stores in AFR do not meet the EVM quality standard for buildings and equipment.
- Almost 75% of national (PR) stores assessed in the other regions do meet the standard.
- The quality of buildings and equipment is generally lower the further we travel down the supply chain.

E5 Preventive maintenance (2009-2018)



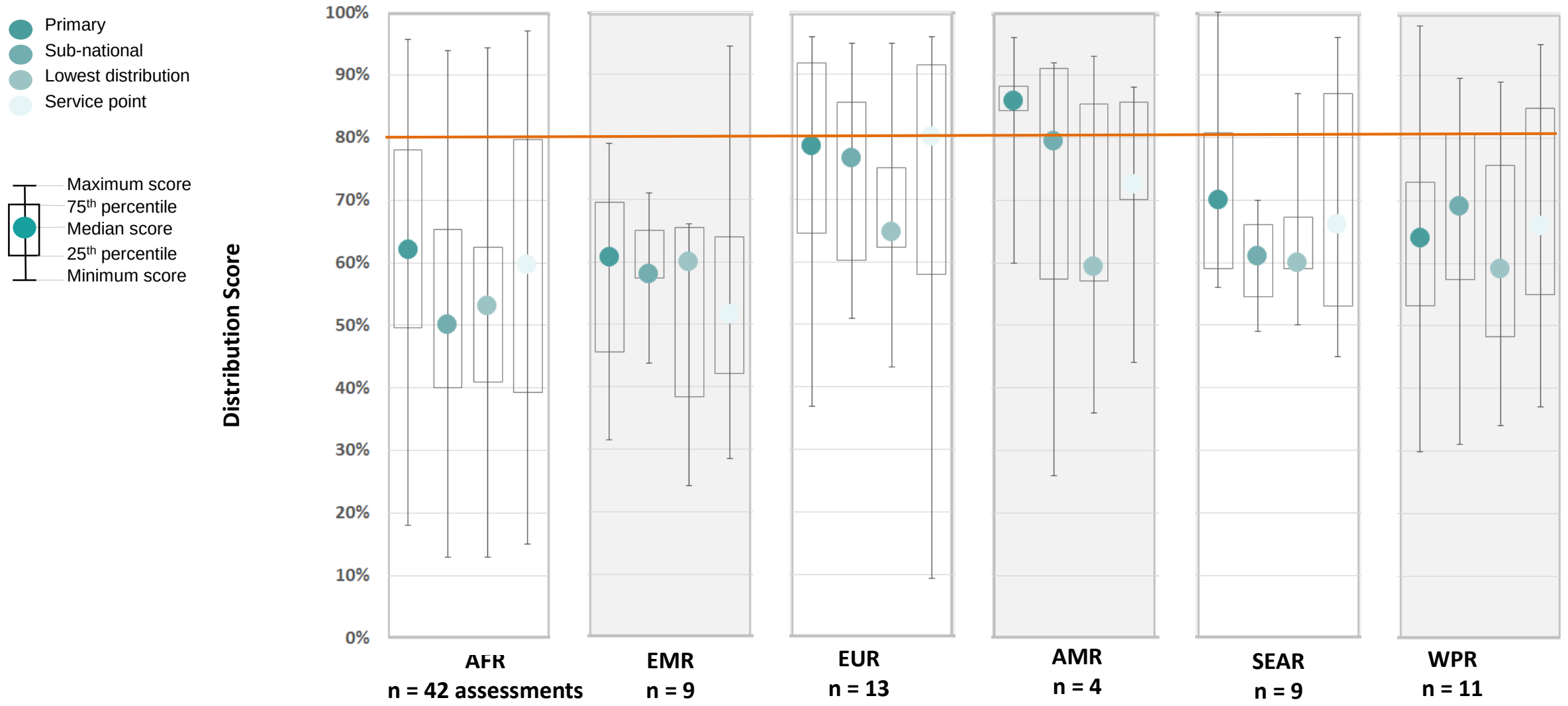
- Only at the national (PR) level in EMR, EUR and AMR does the median score exceed the 80% target for preventive maintenance.
- Other levels in all regions, except AMR, the median score is significantly lower than the target.
- The maintenance of cold chain infrastructure gets progressively weaker as vaccine flows through the supply chain from PR to SP.

E6 Stock management (2009-2018)



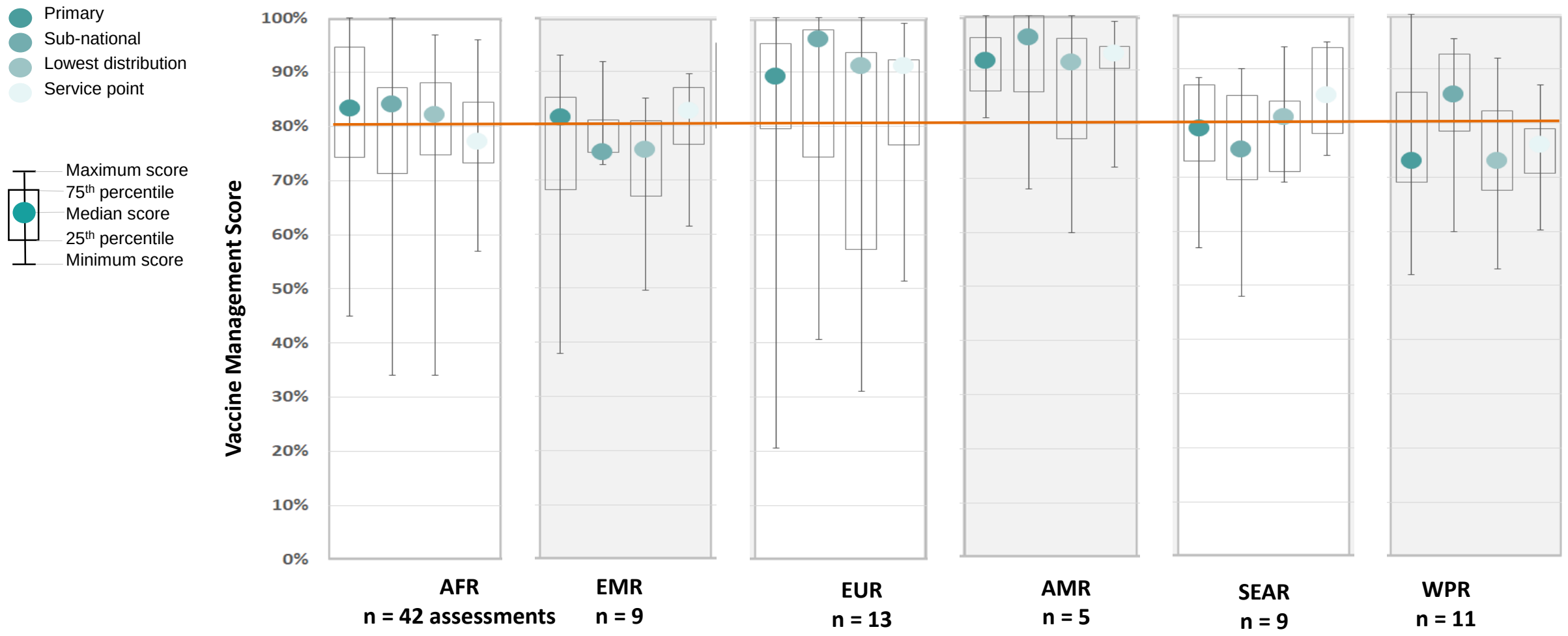
- Only the AMR region meets the EVM standard in stock management at each level of the supply chain
- EUR meets the EVM standard in stock management at each level of the supply chain except for service point
- Stock management procedures and performance get progressively weaker as vaccines flow through the supply chain from PR to SP.

E7 Vaccine distribution (2009-2018)



- All regions except EUR and AMR scored poorly in the organization of vaccine distribution between the different levels of the supply chain.

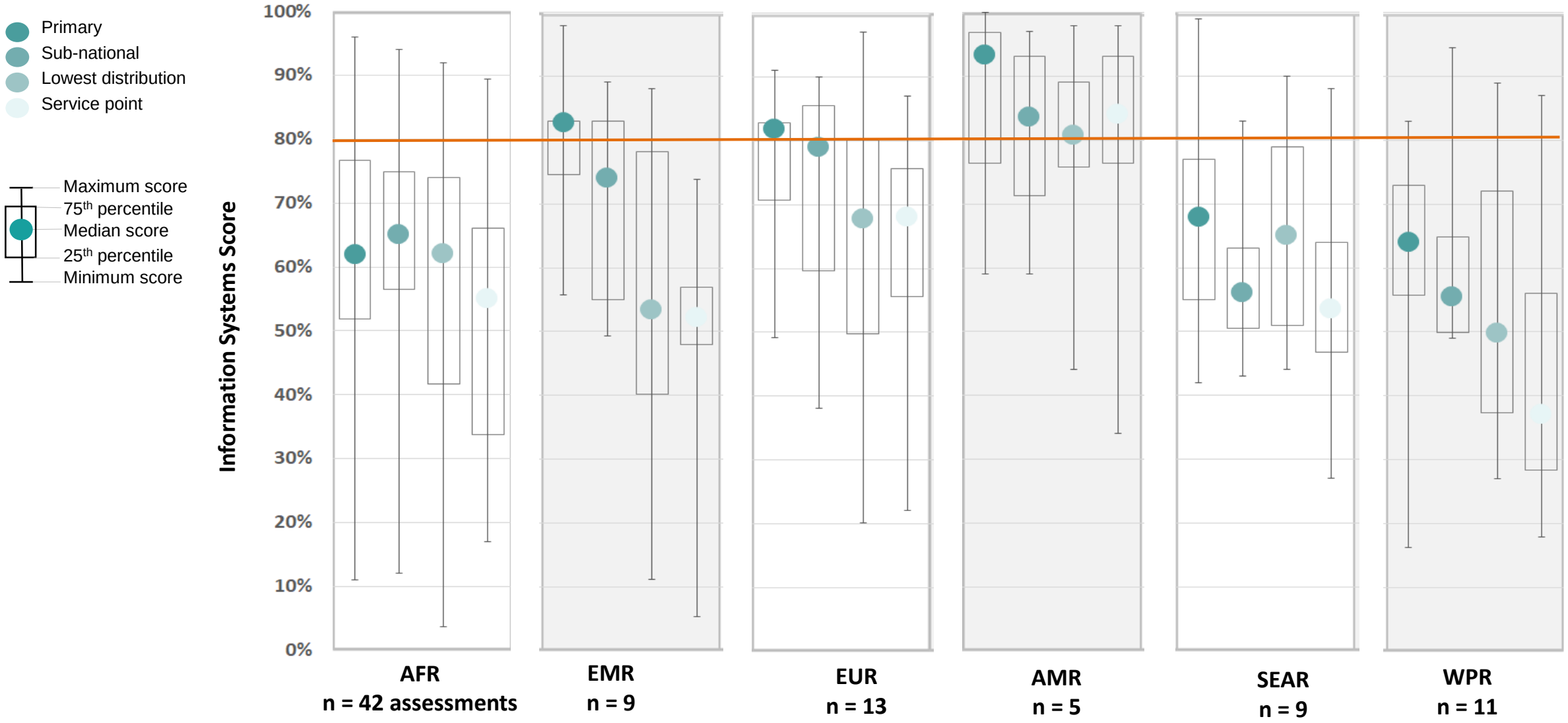
E8 Vaccine management (2009-2018)



At each level of the supply chain:

- ❑ The median countries in EUR and AMR perform better in vaccine management than the median countries in other regions.

E9 Information systems (2009-2018)



- In each region at each level of the supply chain, there is a broad range of quality in information systems.
- With the exception of AMR, at each level of the supply chain, the median information system in each region is far from the EVM standard.

Selected Indicator Scores

Most recent assessments only

2009-2018

Update: WHO EVM database, June 2018
(June 2018 data on facilities and assessments have been used due to unavailability of detailed locations for some assessments)

EVM – *setting a standard for the vaccine supply chain*

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Selected EVM Indicator Scores (2009-2018)

Explanatory note:

- There are ~400 indicators at PR level, 300 at SN, 200 at LD and 150 at SP.

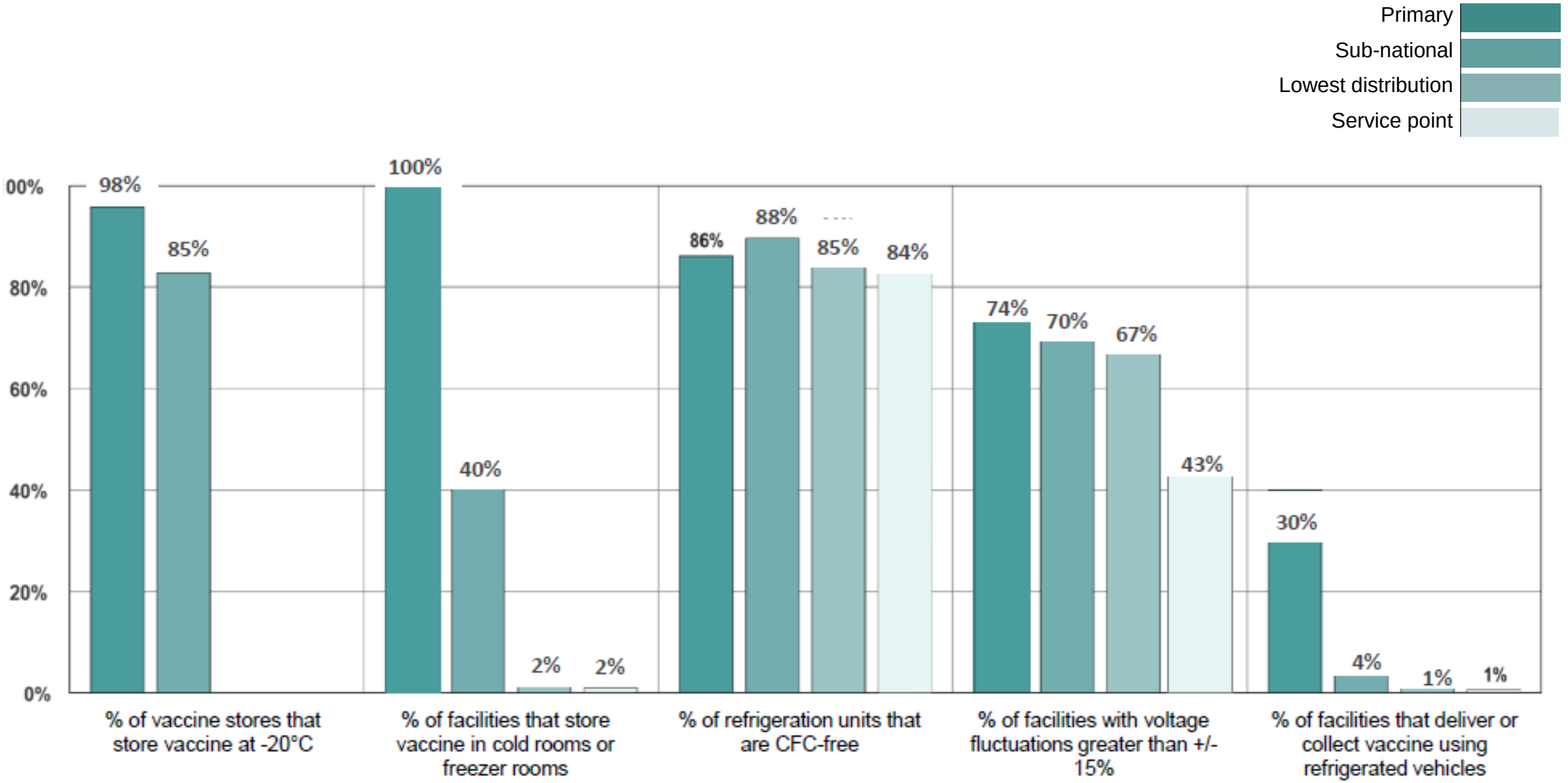
- Some indicators assess availability of required inputs (Eg. % of cold rooms with continuous temperature monitoring).
- Some indicators measure outputs (Eg. % of facilities with accurate stock records).
- Some indicators describe the context (Eg. % of stores that store vaccine at -20°C).
  - Such “context” indicators are not scored, but are used to customize the questionnaire – they turn OFF non-applicable indicators.

- The following slides present global results for selected indicators.
  - The first 3 slides show results for selected “context” indicators.
  - The remaining slides present results for selected scoring indicators.

- The scoring indicators are grouped into 3 categories:
  - **Availability**: those indicators likely to have a direct impact on the availability of vaccine at the service delivery level.
  - **Quality:** those indicators likely to have a direct impact on the quality (potency) of vaccine at the service delivery level.
  - **Efficiency:** those indicators likely to have an impact on the operational cost of the immunization supply chain.

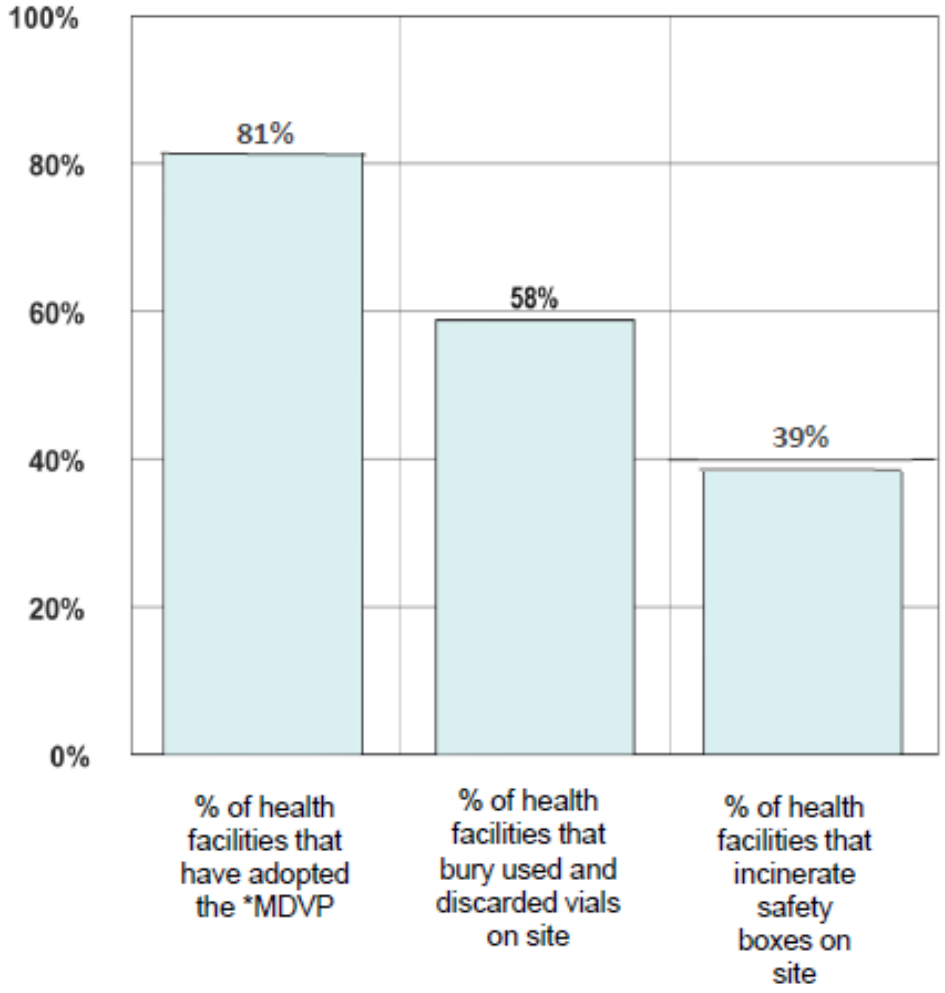
- Indicator data exist for 84 countries:
  - 152 primary stores
  - 1067 sub-national stores
  - 2125 lowest distribution stores
  - 3266 immunization service facilities.

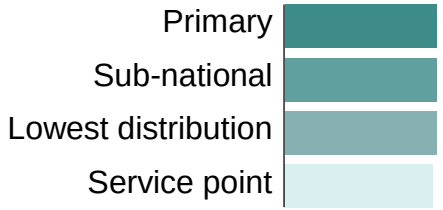
Context: Infrastructure (2009-2018), 1



*The data was collected between 2009 and 2017 in 81 countries across all 6 WHO regions and .

Context: Policy (2009-2018), 2



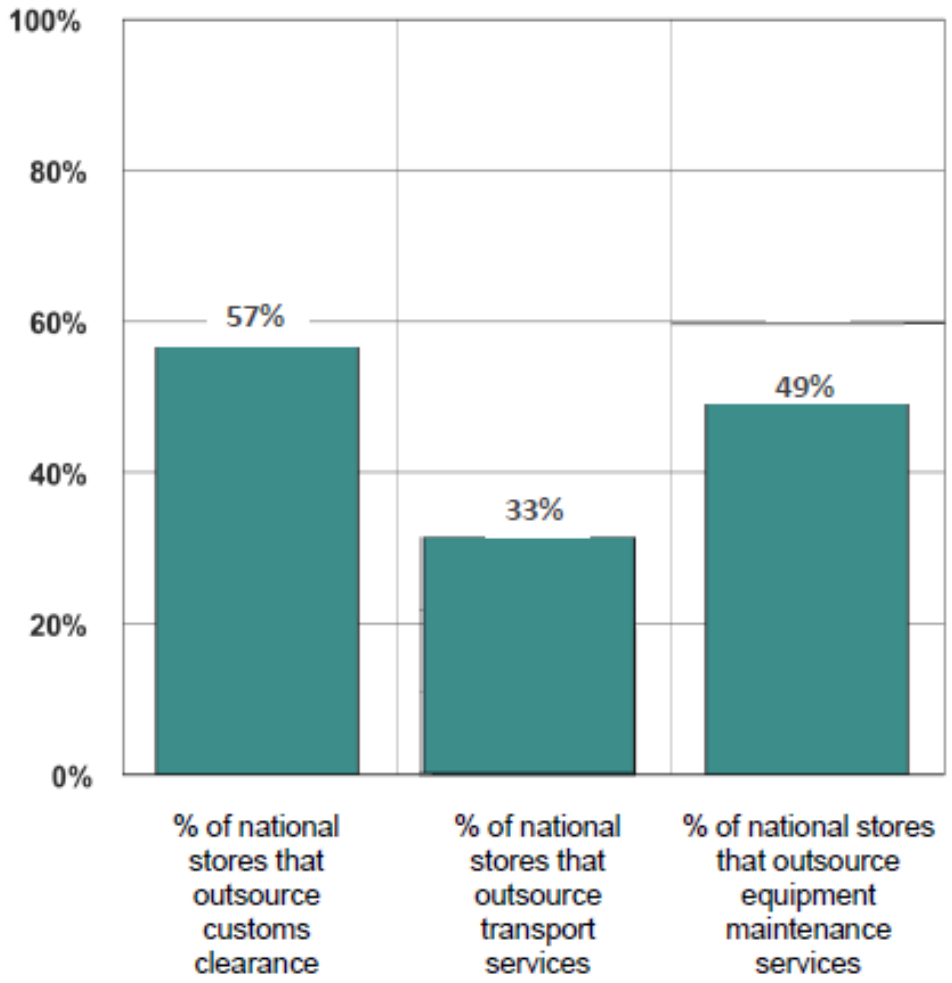


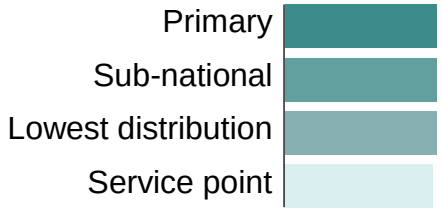
Key observations:

- ❑ The multi dose vial policy has been implemented in almost 80% of health facilities.

*The data was collected between 2010 and 2017 in 81 countries across all 6 WHO regions. *MDVP = Multi-dose vial policy

Context: Outsourcing (2009-2018), 3



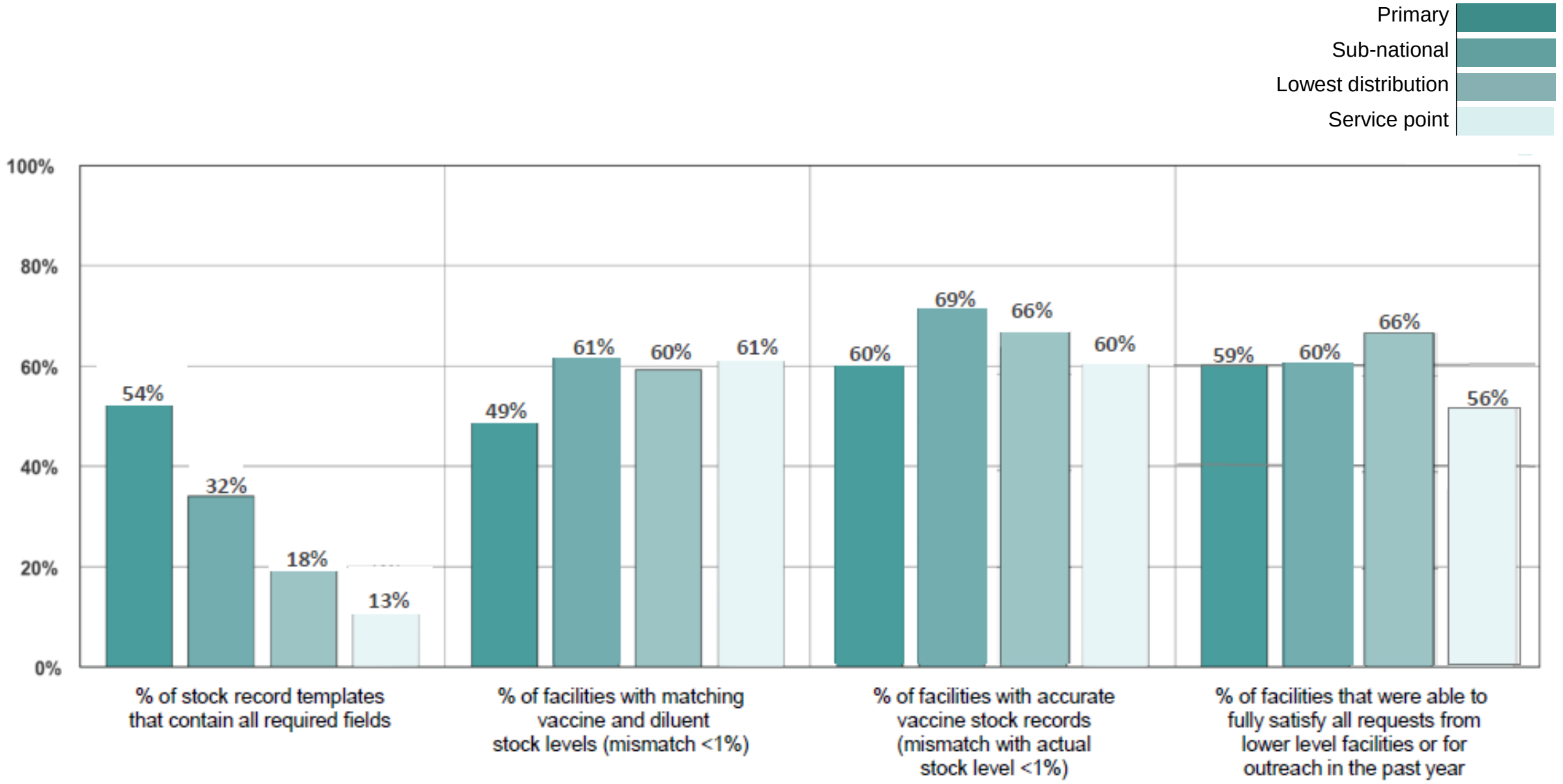


Key observations:

- Many countries outsource services such as customs clearance, vaccine transport and equipment maintenance.

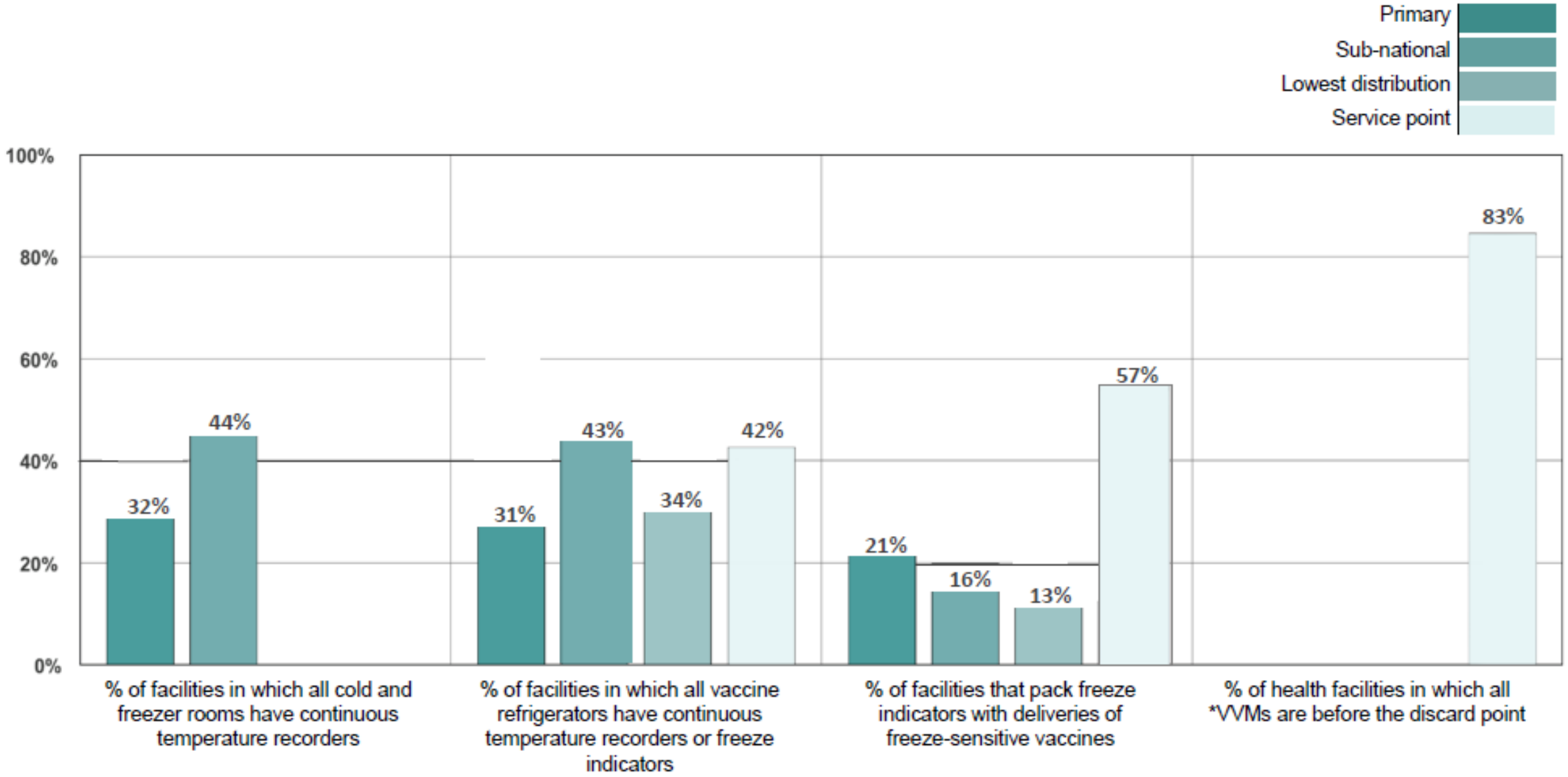
*The data was collected between 2010 and 2017 in 81 countries across all 6 WHO regions.

Availability indicators (2009-2018)



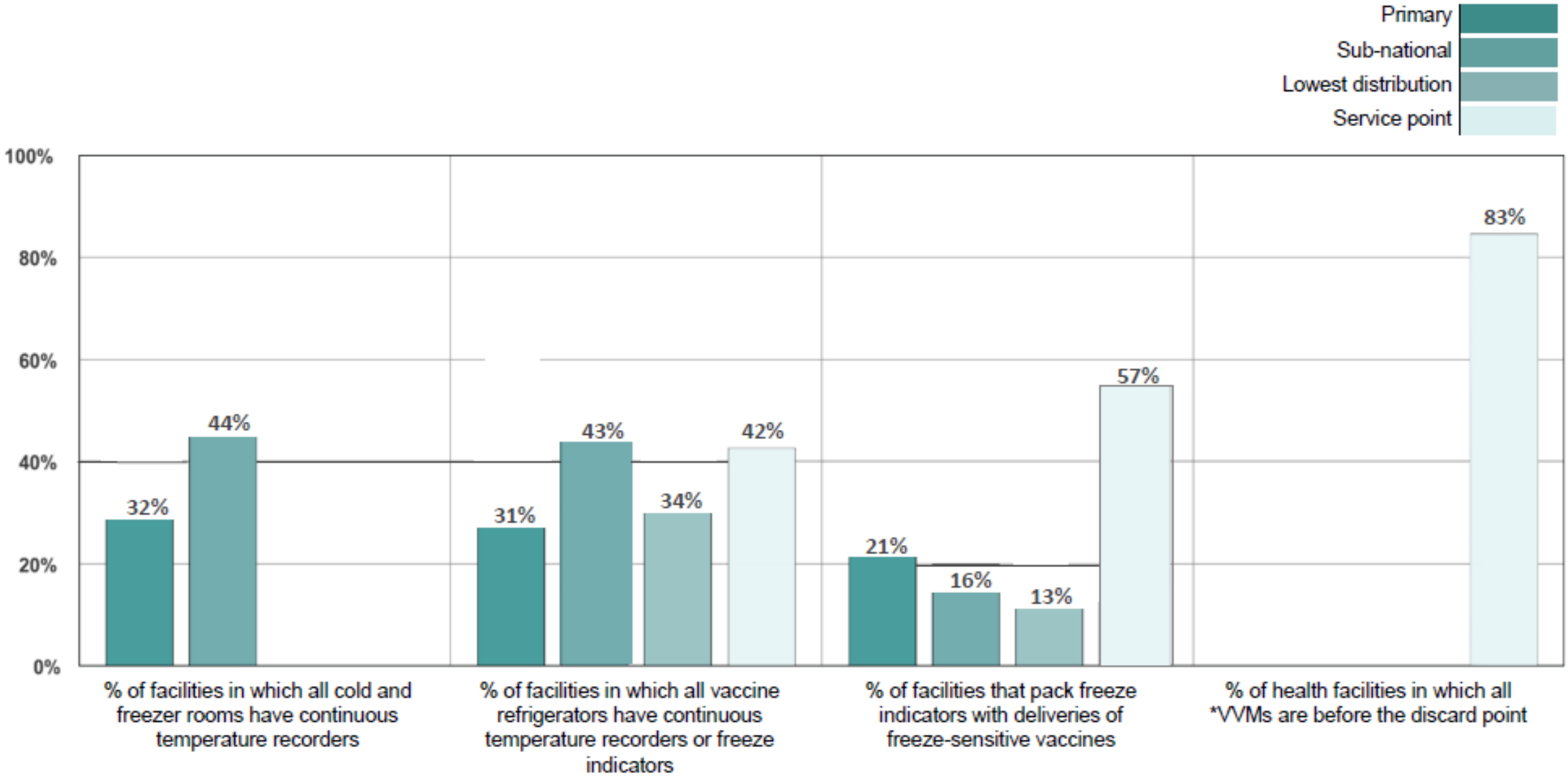
*The data was collected between 2010 and 2017 in 81 countries across all 6 WHO regions.

Quality indicators (2009-2018), 1



*The data was collected between 2010 and 2017 in 81 countries across all 6 WHO regions.

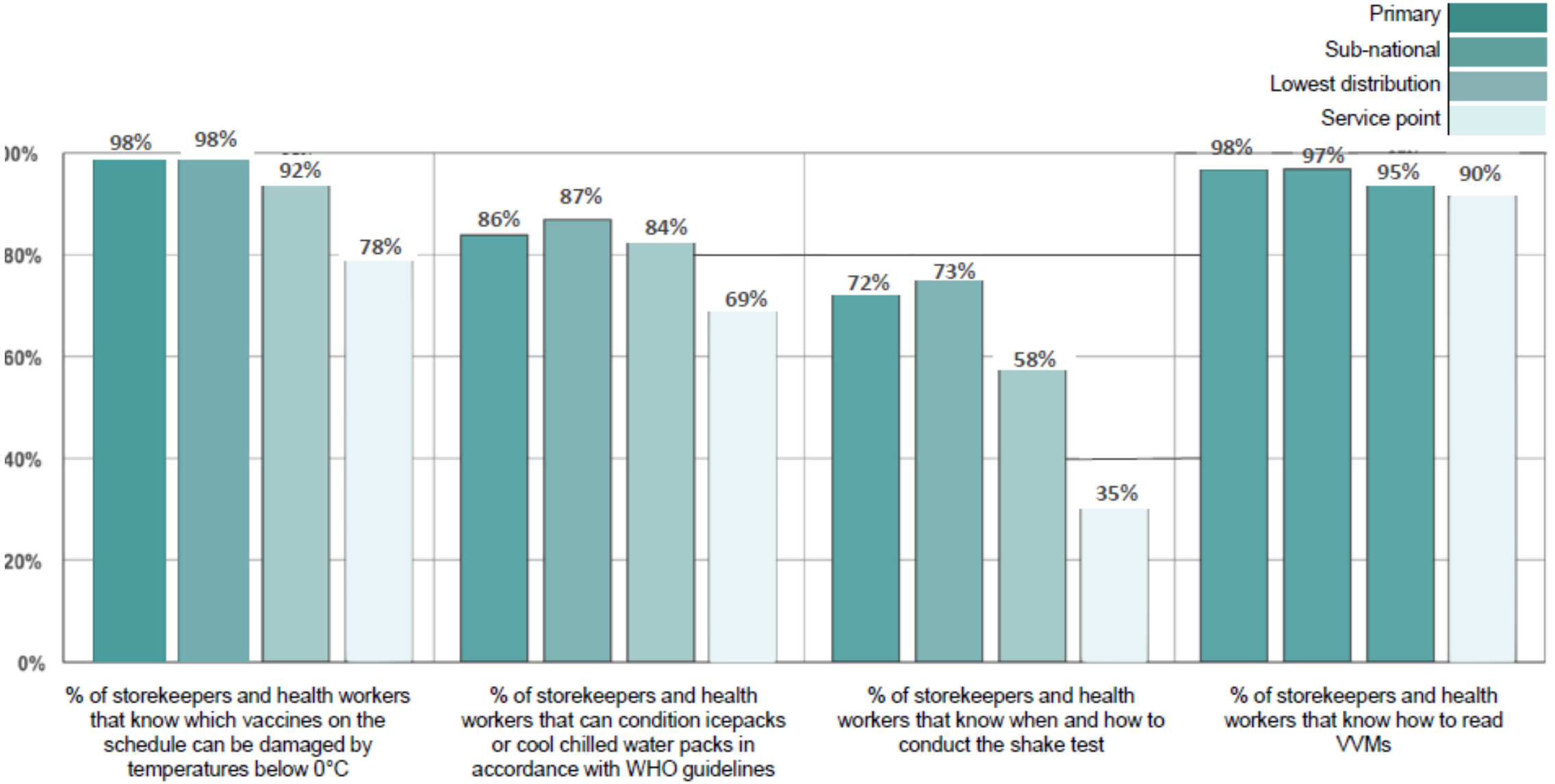
Quality indicators (2009-2018), 2



*The data was collected between 2010 and 2017 in 81 countries across all 6 WHO regions.

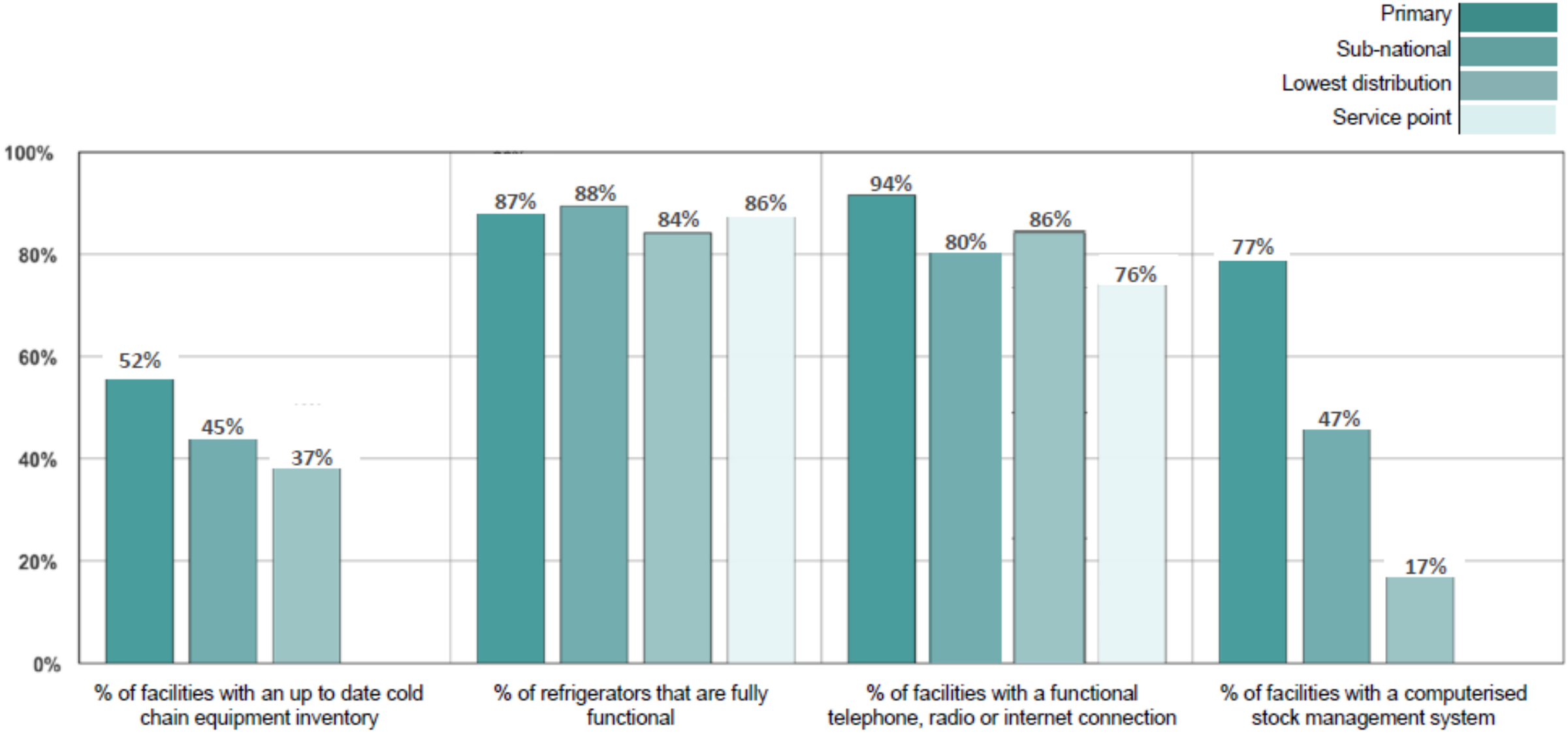
*VVM = Vaccine Vial Monitor

Quality indicators (2009-2018), 3



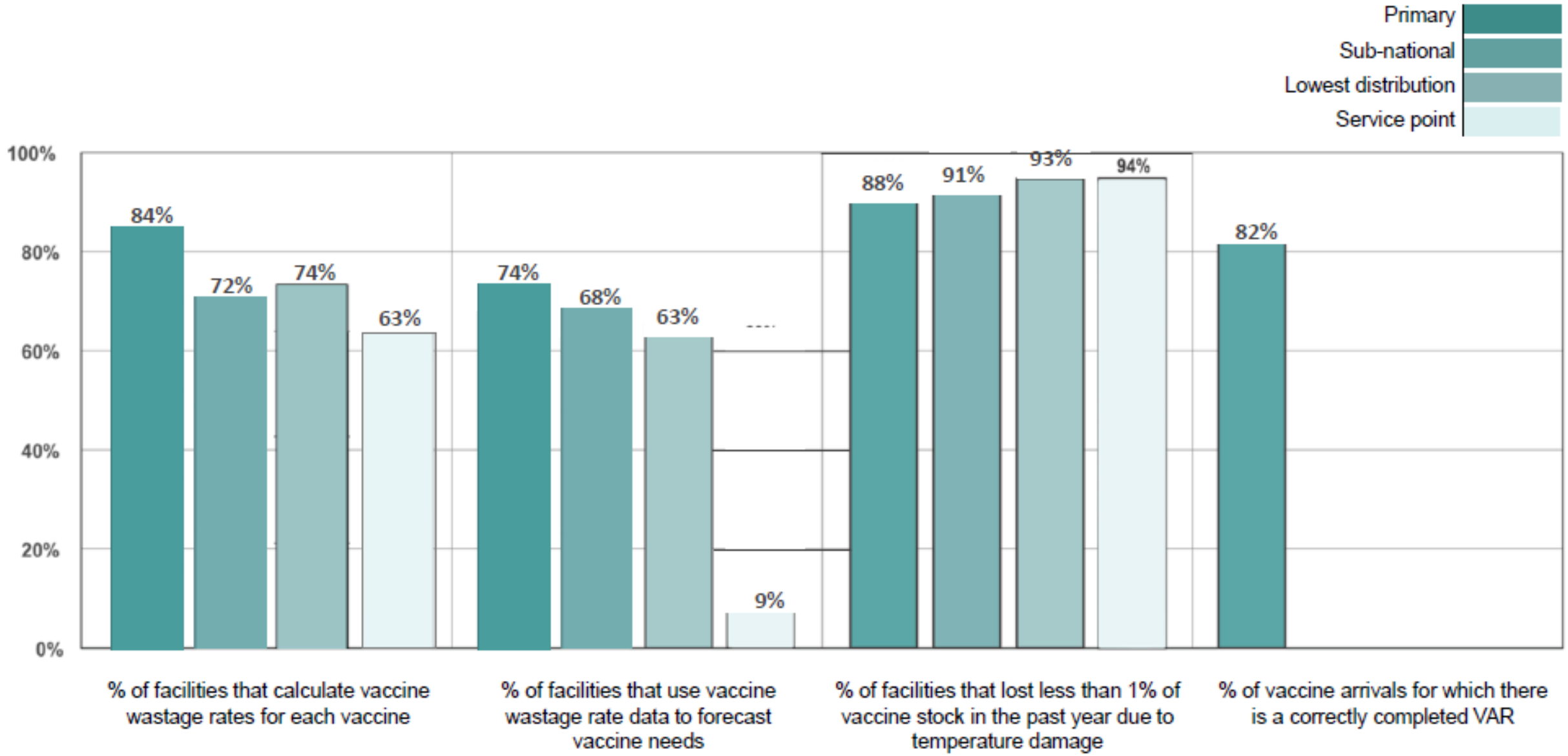
*The data was collected between 2010 and 2017 in 81 countries across all 6 WHO regions. *VVM = Vaccine Vial Monitor

Efficiency indicators (2009-2018), 1



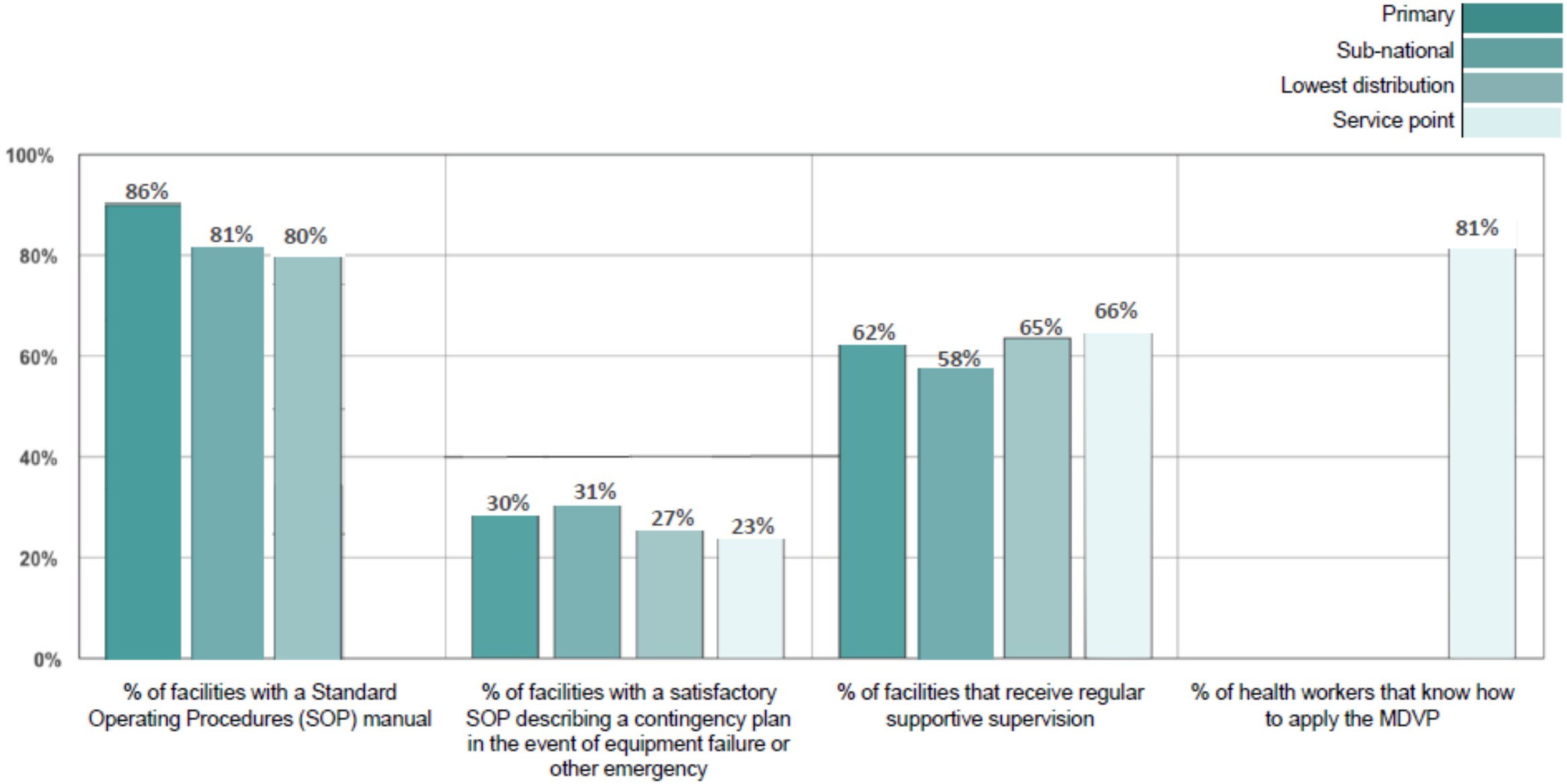
*The data was collected between 2010 and 2017 in 81 countries across all 6 WHO regions.

Efficiency indicators (2009-2018), 2



*The data was collected between 2010 and 2017 in 81 countries across all 6 WHO regions. *VAR = Vaccine arrival Report

Efficiency indicators (2009-2018), 3



*The data was collected between 2010 and 2017 in 81 countries across all 6 WHO regions. *MDVP = Multi-dose vial policy

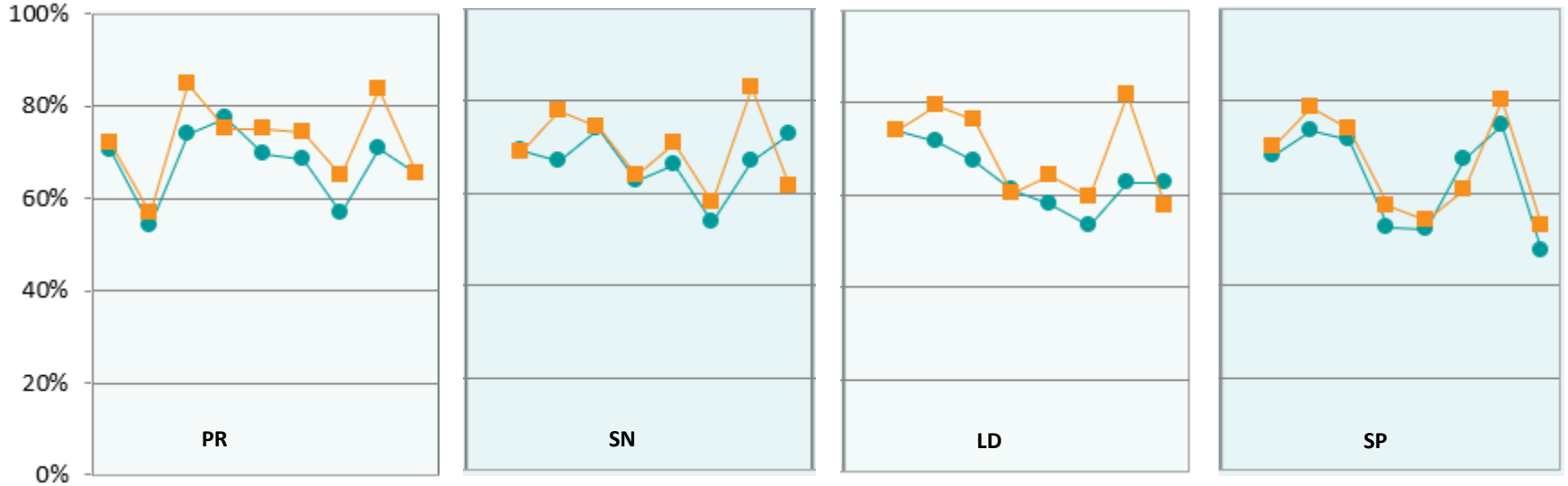
Criterion Scores

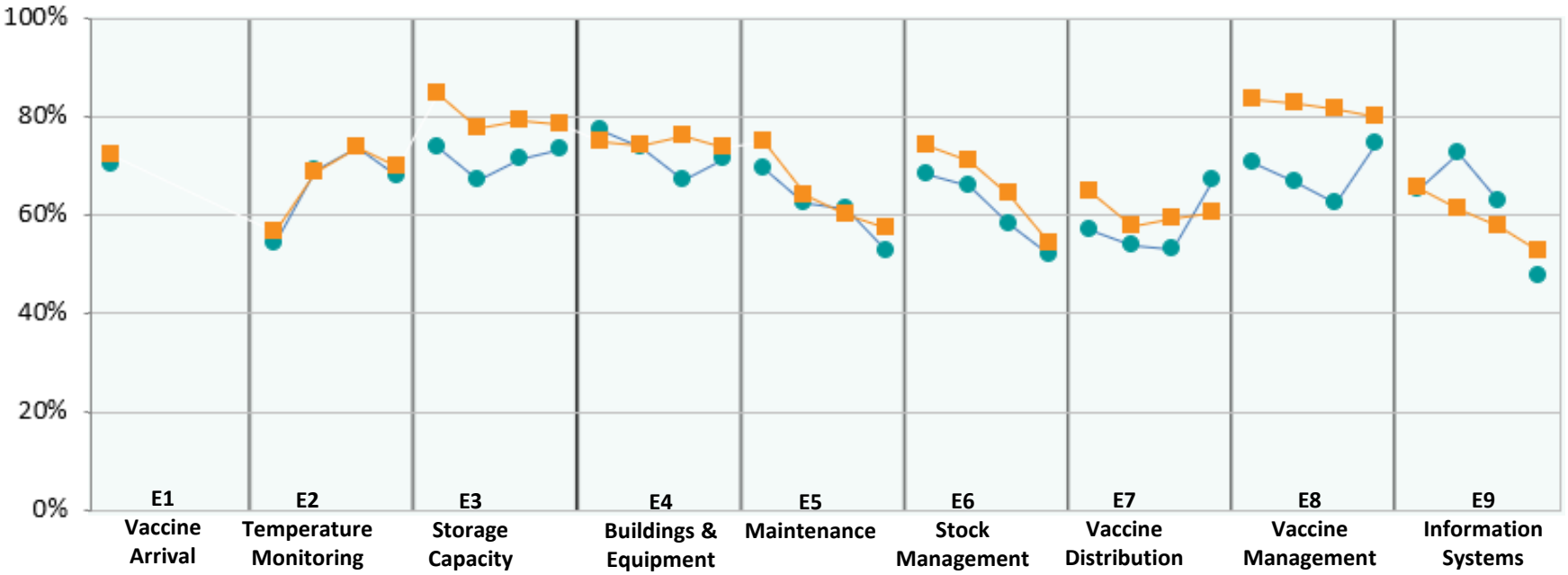
1st assessment versus
last assessment (57 countries)

2009-2018

Update: WHO EVM database, December 2018

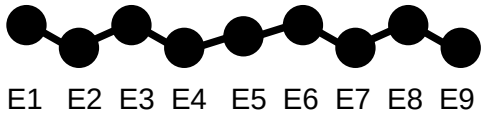
Mean criterion scores (57 countries)



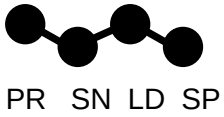


1st Assessments

Last Assessments



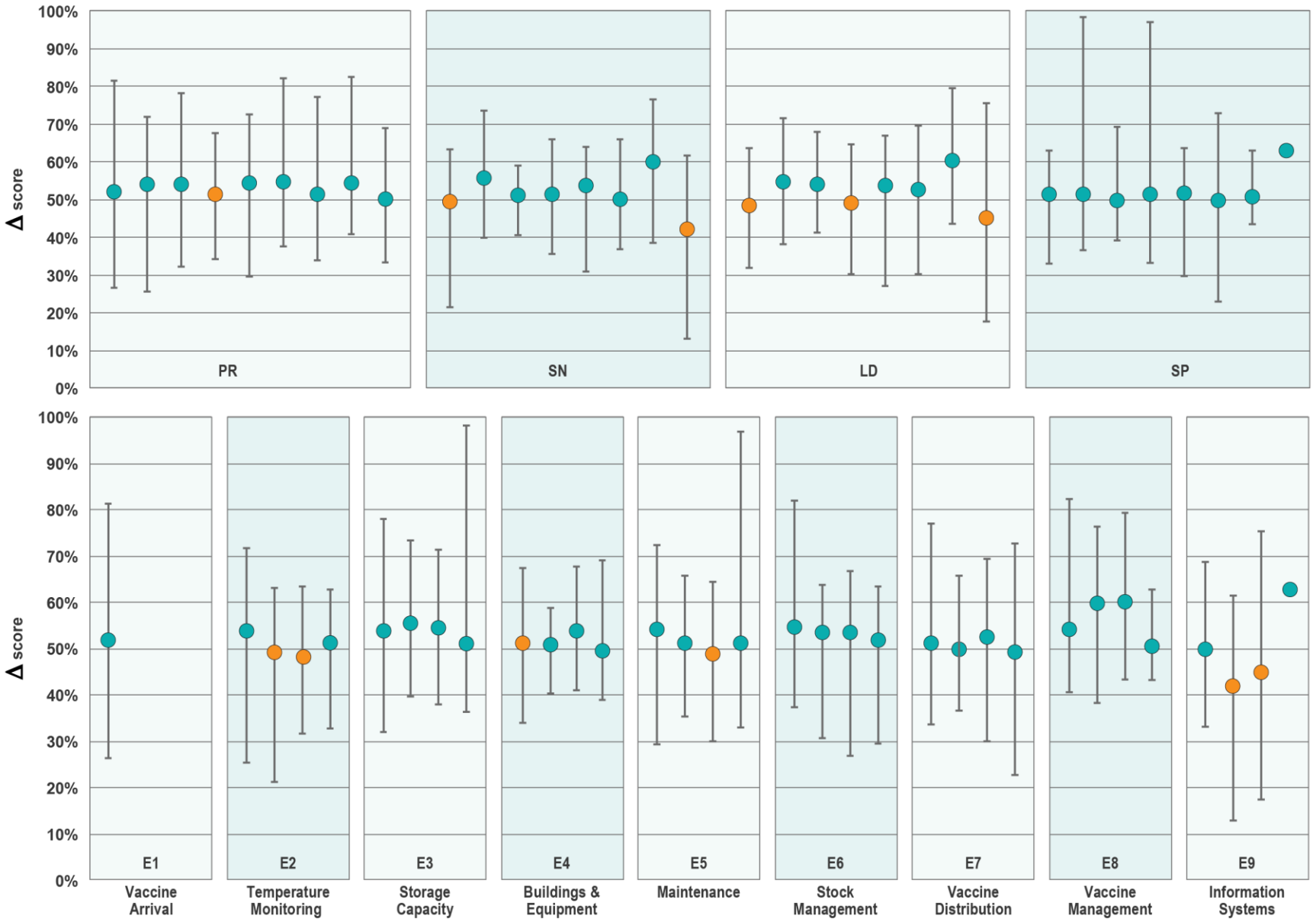
- ❑ Moderate improvement at PR, SN and LD levels.
- ❑ Little or no improvement at SP level.



- ❑ Significant improvement in E3 and E8.
- ❑ Moderate improvement in E6 and E7.
- ❑ Small improvement in E1 and E2
- ❑ No improvement in E5 and E9.

*The E2 and E9 standards were set higher in 2012.

Change in criterion scores (57 countries)



most progress

median progress

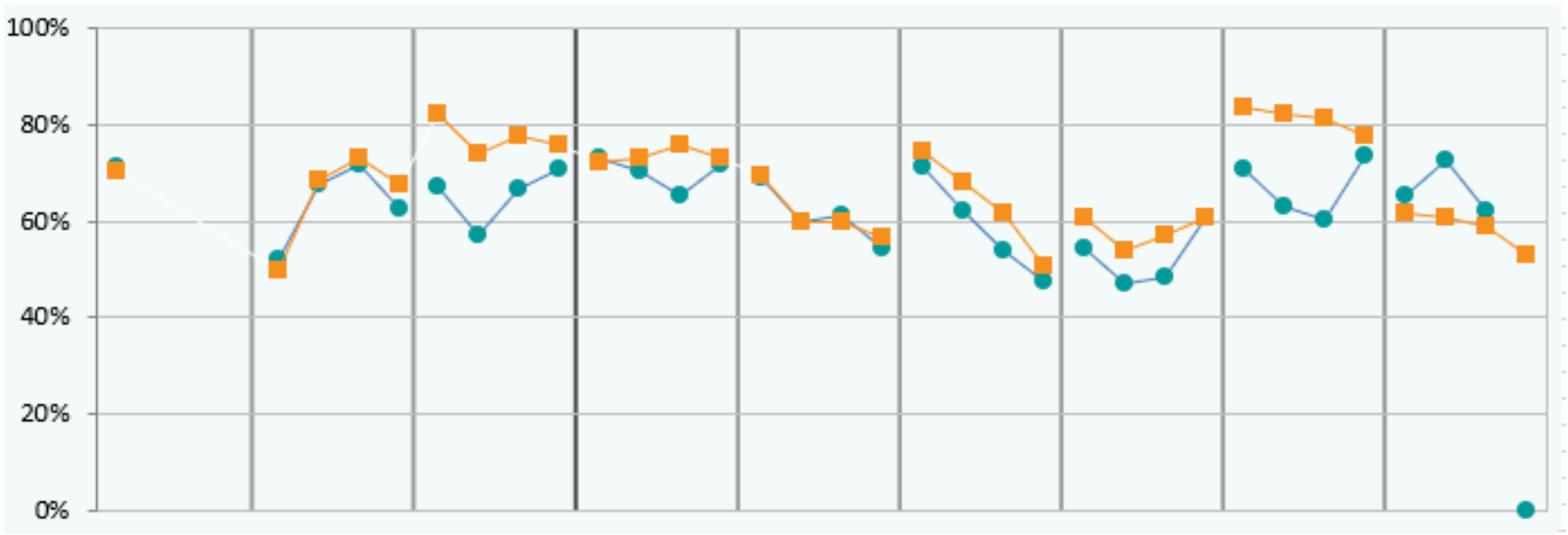
least progress

Key observations:

- ❑ For each of the 33 criteria many of the 57 countries have managed to significantly improve their scores but many have seen their scores decline.
- ❑ Most improvement is seen in E3 at PR and SN levels (median change ~10%) and in E8 at PR, SN and LD (median change ~20%) .
- ❑ There is little or no progress at SP level in any criteria.
- ❑ The median change across all countries, levels and criteria is +5% (percentage points).

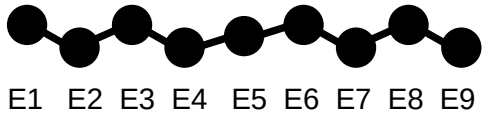
*The E2 and E9 standards were set higher in 2012.

AFR mean criterion scores (32 countries)

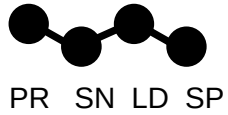


1st Assessments

Last Assessments

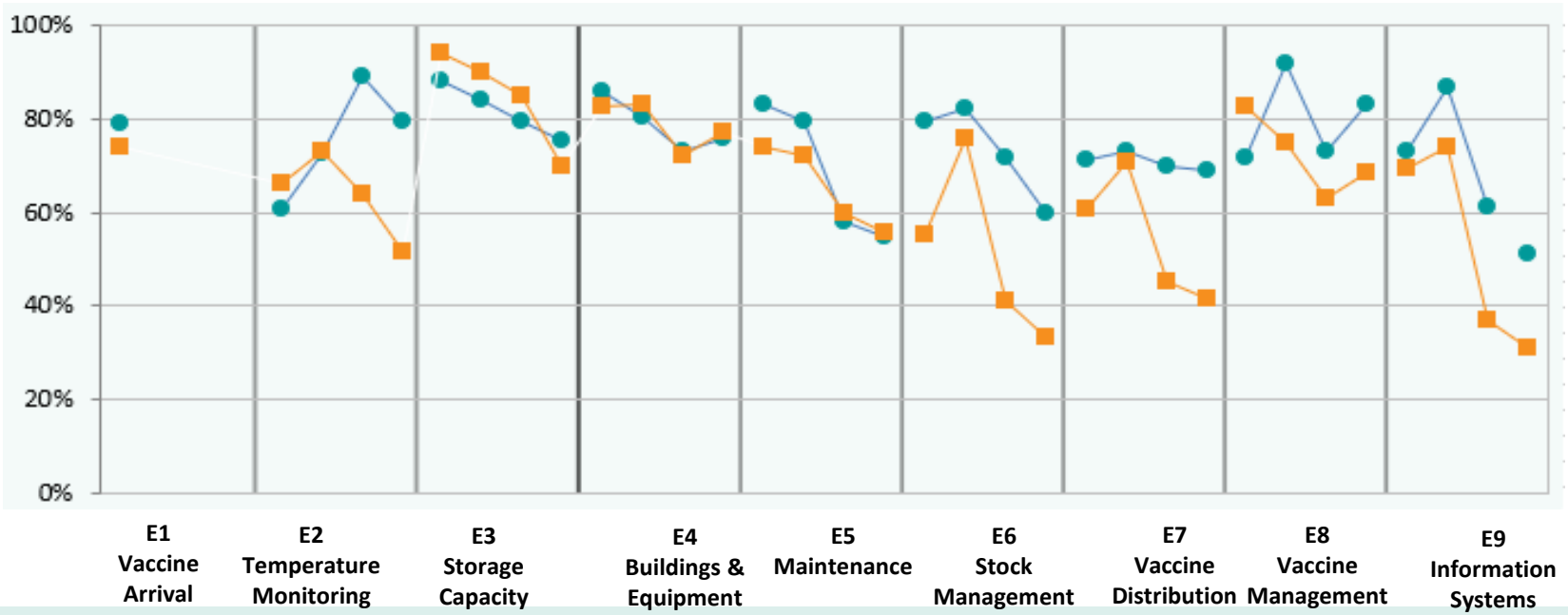


- Moderate improvement at PR, SN and LD levels.
- Little to no improvement at SP level.



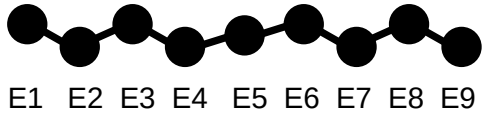
- Significant improvement in E3, E7 and E8.
- Moderate improvement in E4, E6 and E9.
- Little or no improvement in E1, E2, E5.

EMR mean criterion scores (4 countries)

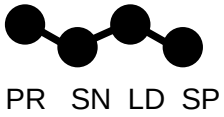


1st Assessments

Last Assessments

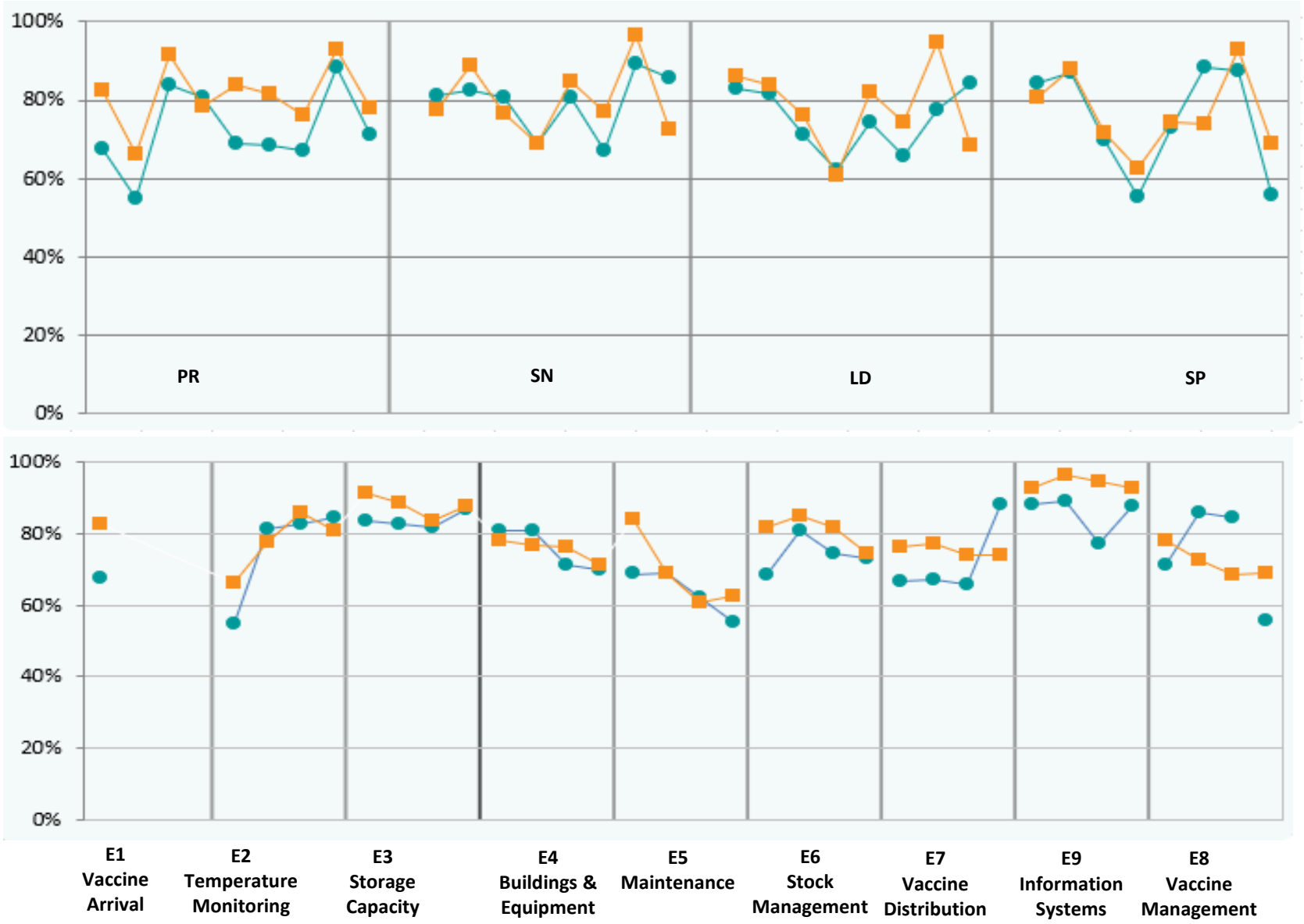


- Some improvement at PR level.
- Deterioration at SN, LD and SP levels.



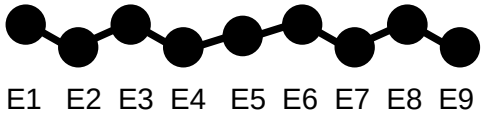
- Significant improvement in E1 and E3.
- Some improvement at E4.
- Deterioration in E2, E6, E7 and E9.
- Little change in E5 and E8.

EUR mean criterion scores (8 countries)

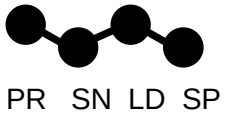


1st Assessments

Last Assessments

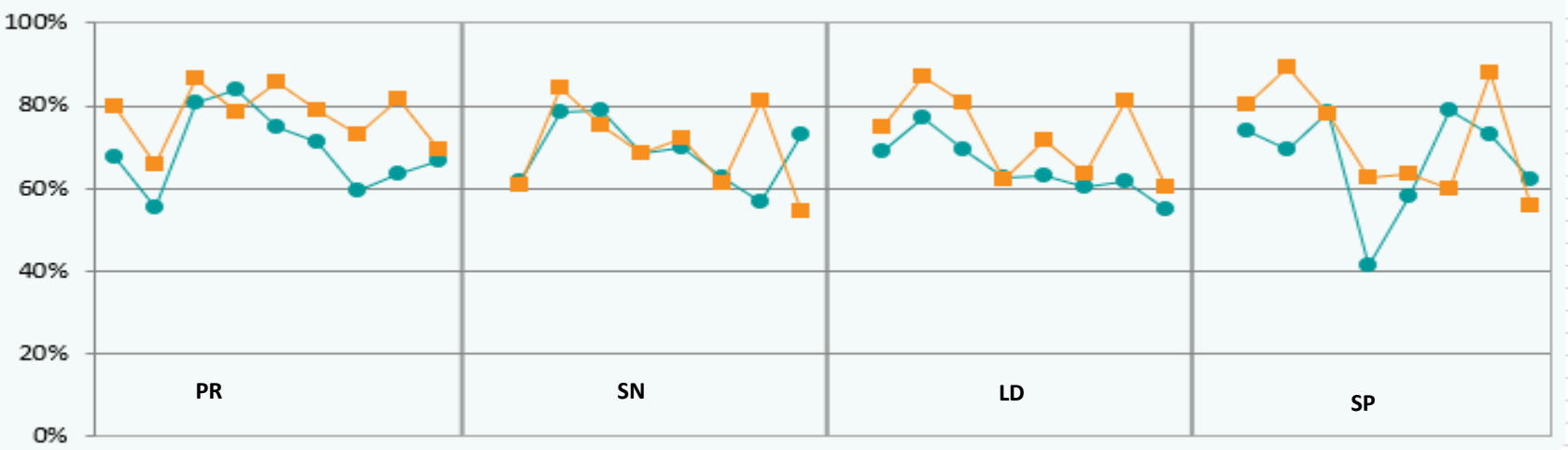


- Limited improvement at PR level.
- Deterioration at SN and SP levels.
- Little change at LD level.



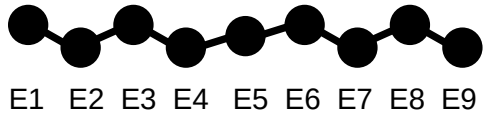
- Deterioration in E2, E7 and E9.
- Little change in other criteria.

SEAR mean criterion scores (6 countries)

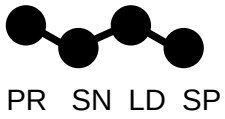


1st Assessments

Last Assessments

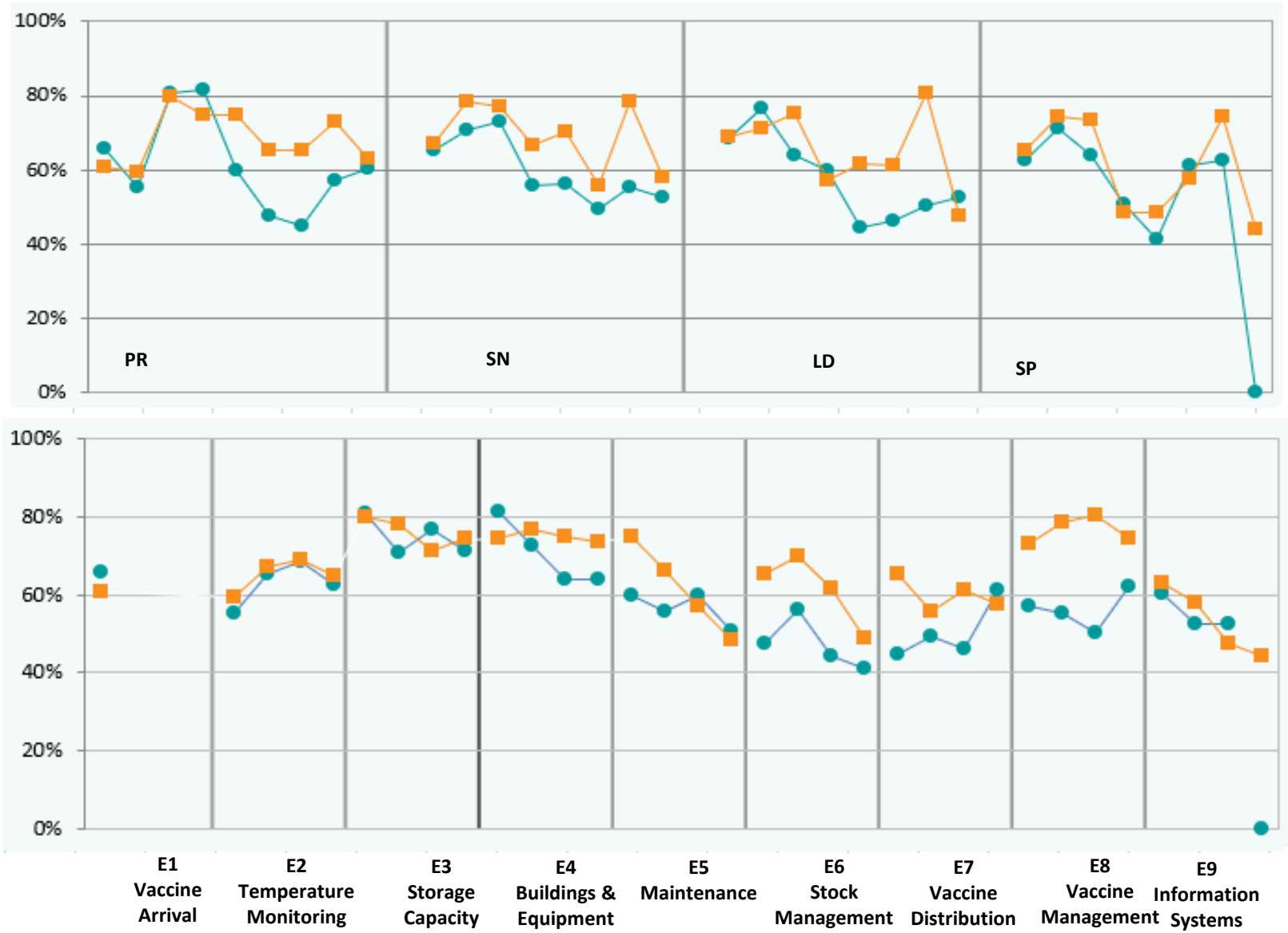


- Moderate improvement at PR, LD and SP levels.
- Little or no improvement at SN level.



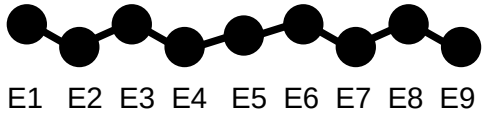
- Significant improvement in E1, E3 and E8.
- Little to no change in other criteria.

WPR mean criterion scores (6 countries)

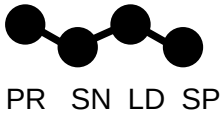


1st Assessments

Last Assessments



- Some improvement at all levels.



- Significant improvement in E4, E7 and E8.

Selected Indicator Scores

1st assessment versus
last assessment (54 countries)

2009-2018

Update: WHO EVM database, June 2018
(June 2018 data on facilities have been used due to unavailability of detailed locations for some assessments)

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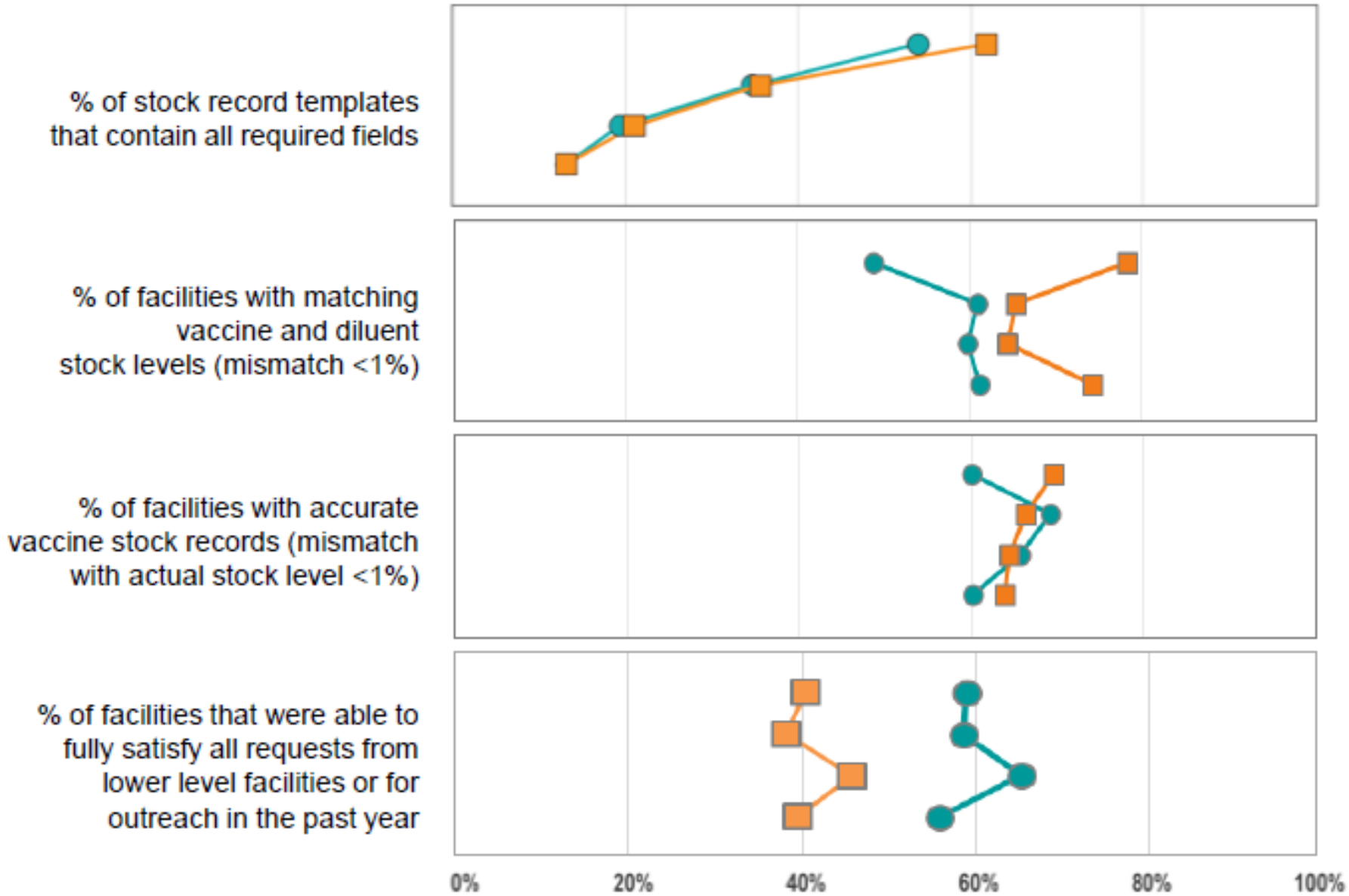
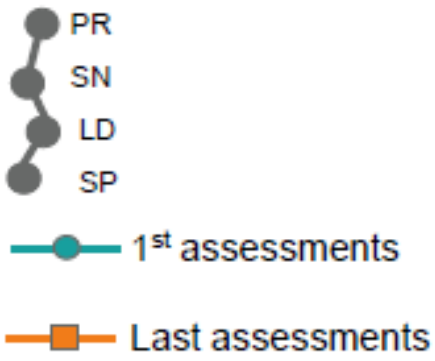
Availability indicators (54 countries)





Key observations:

- Many stores and facilities still do not have adequate stock management systems.
- National stores are better managing the distribution of vaccines and their diluents. However, more than two in five stores and facilities still have significant vaccine-diluent stock mismatches.
- Deterioration in facilities with accurate stock records.
- Deterioration in facilities that were able to fully satisfy all requests from lower level facilities or outreach

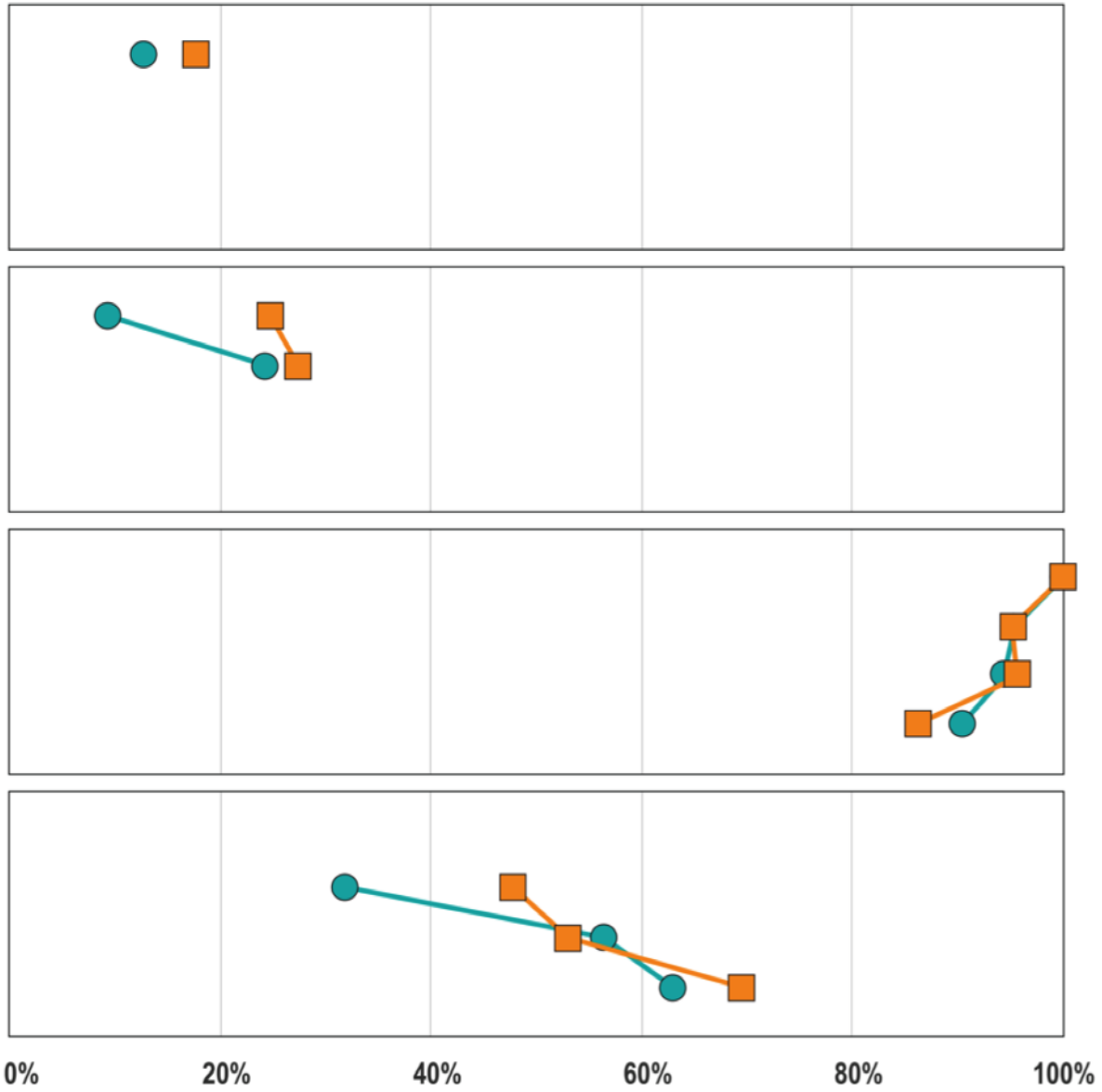
Quality indicators 1 (54 countries)

% of countries that have carried out a systematic temperature monitoring study within the past 5 years

% of cold rooms for which a fully documented temperature mapping report is available

% of facilities in which all vaccine refrigerators comply with WHO specifications

% of facilities for which kerosene or gas is always available (where absorption refrigerators are used)



PR
SN
LD
SP

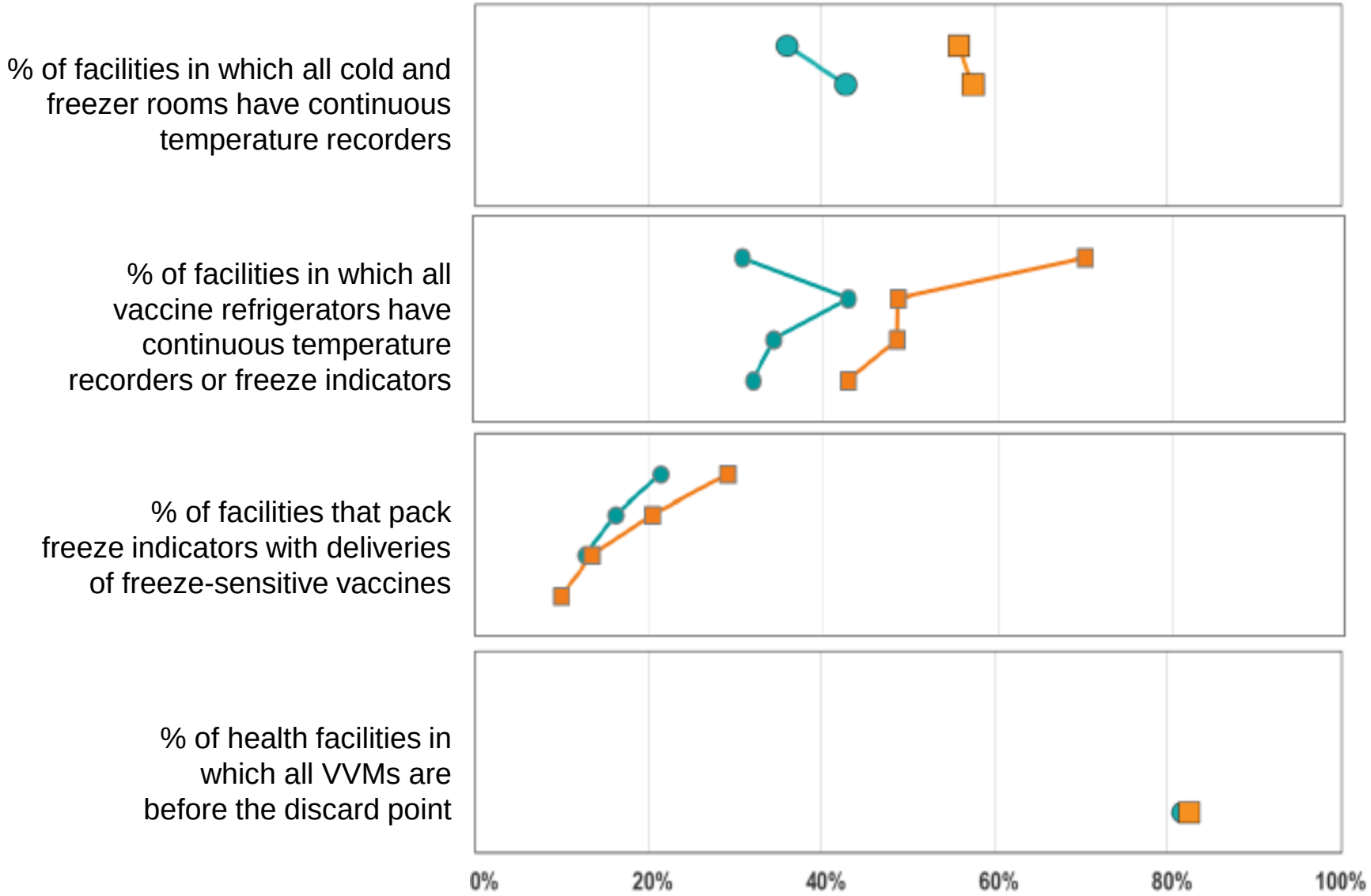
1st assessments

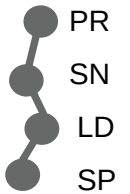
Last assessments

Key observations:

- Less than one in five countries have conducted a temperature monitoring study in the past 5 years.
- A higher % of national store cold rooms have been mapped recently.
- The % of refrigerators complying with WHO specifications remains high at all levels.
- Supply of kerosene for absorption refrigerators remains insecure.

Quality indicators 2 (54 countries)





1st assessments

Last assessments

Key observations:

- ❑ More cold rooms are being equipped with continuous temperature monitoring systems.
- ❑ Countries are equipping refrigerators with 30DTRs at all levels of the supply chain.
- ❑ Freeze indicators are still not being routinely packed with freeze sensitive vaccine when transported with conditioned ice-packs.

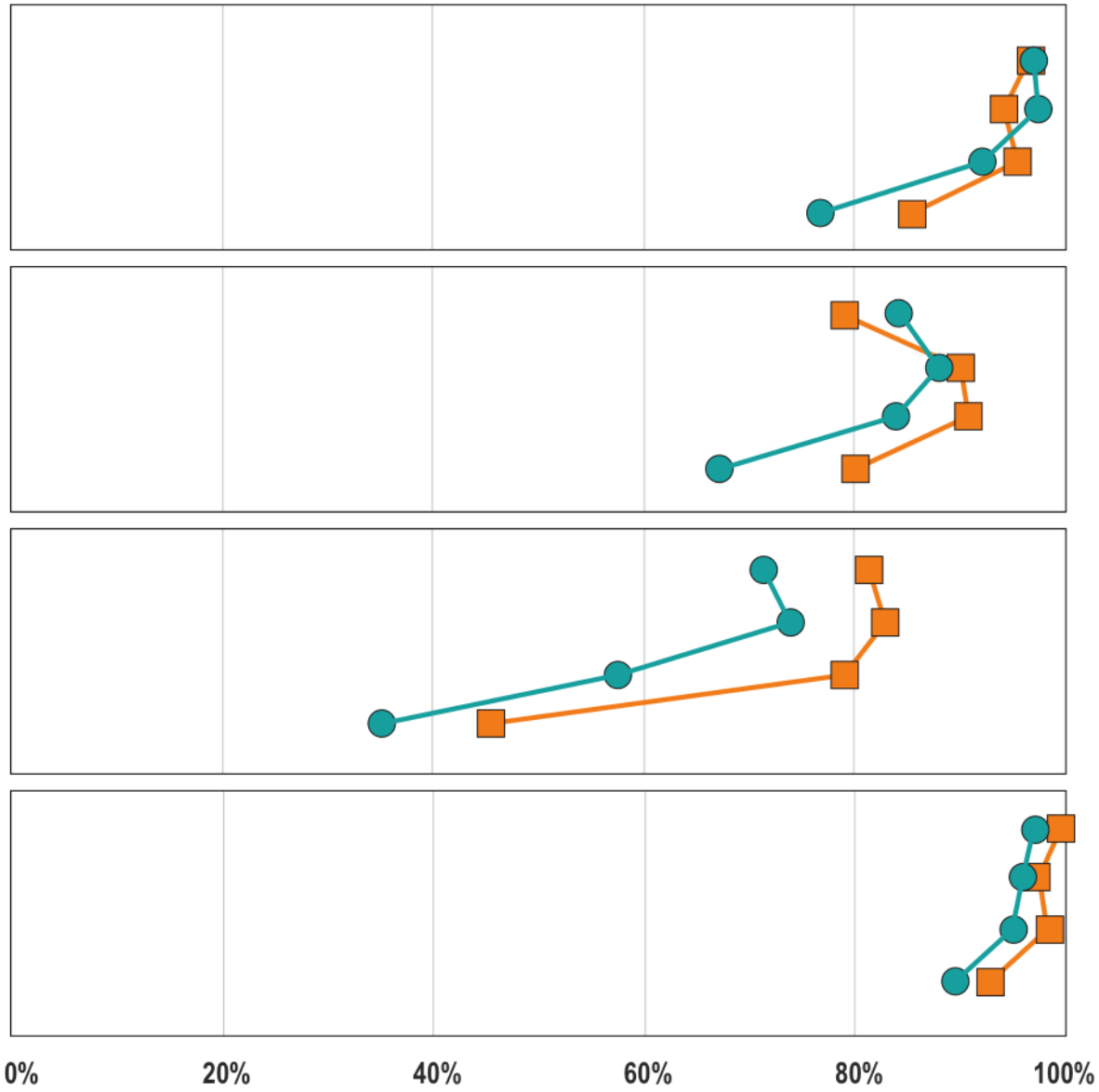
Quality indicators 3 (54 countries)

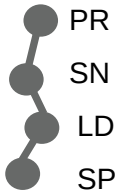
% of storekeepers and health workers that know which vaccines on the schedule can be damaged by temperatures below 0°C

% of storekeepers and health workers that can condition icepacks or cool chilled water packs in accordance with WHO guidelines

% of storekeepers and health workers that know when and how to conduct the shake test

% of storekeepers and health workers that know how to read VVMs





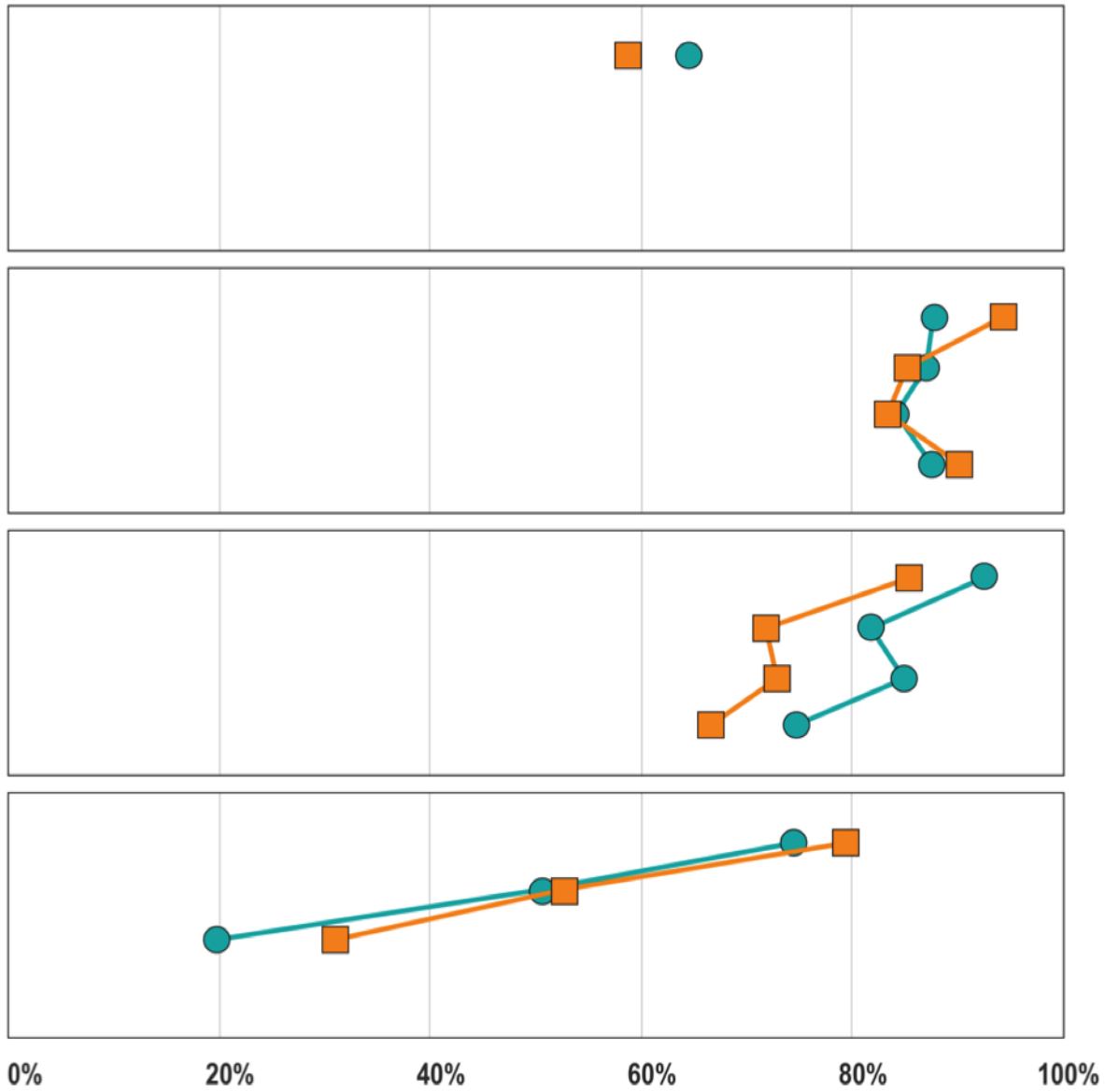
1st assessments

Last assessments

Key observations:

- Health workers are better informed of the temperature sensitivities of the vaccines.
- Health workers and district store managers are better trained in how to prepare icepacks and chilled water packs.
- Store managers and health workers are better trained in how and when to conduct the shake test.
- Knowledge of how to read VVMs is now almost universal.

Efficiency indicators 1 (54 countries)



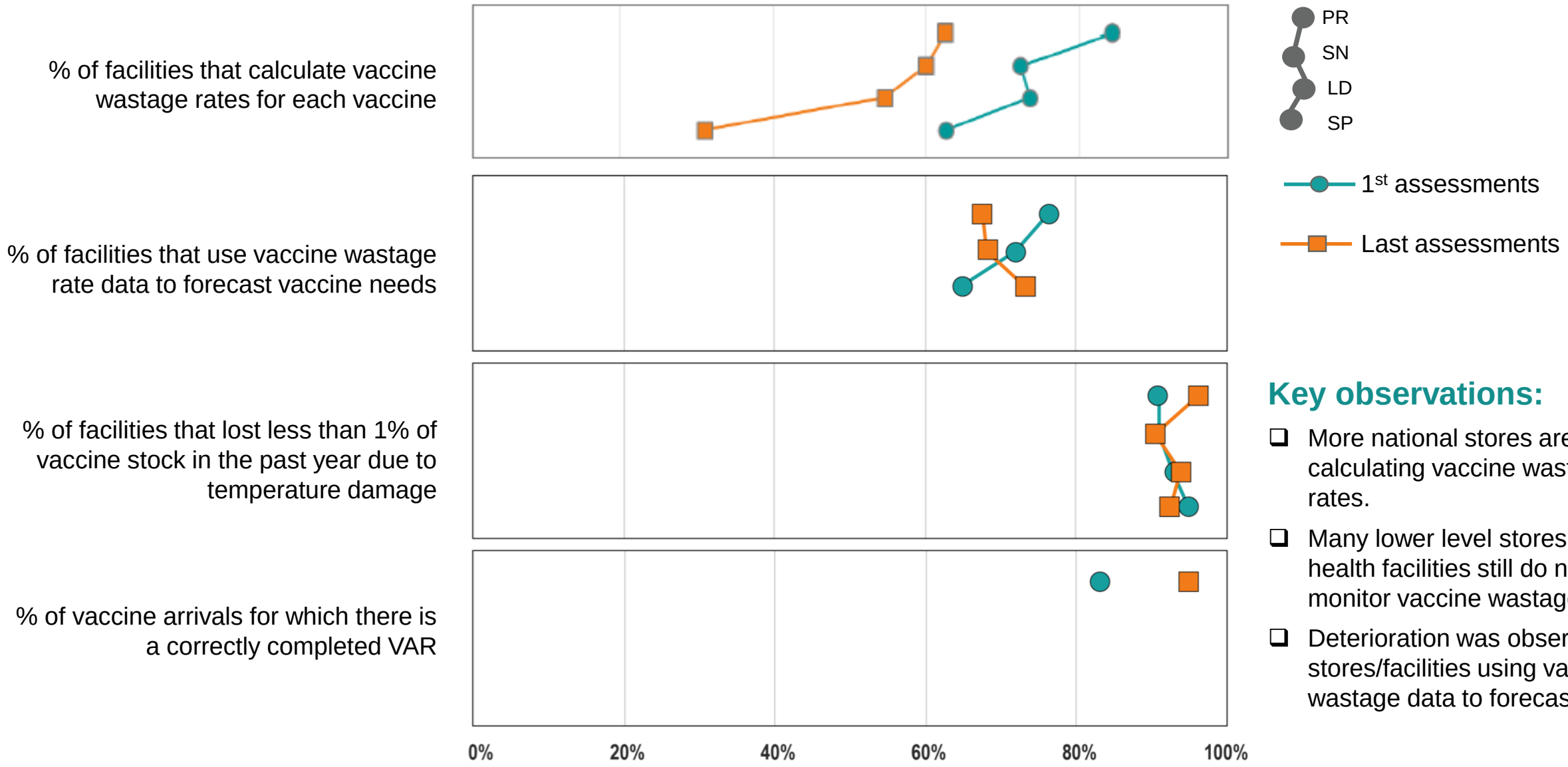
1st assessments

Last assessments

Key observations:

- Less countries are keeping up-to-date cold chain equipment inventories.
- The maintenance of cold chain equipment remains over 80%
- Deterioration of health facilities with adequate telecommunication links was observed.
- Slight improvements observed in the percent of national stores still using paper based stock management systems.

Efficiency indicators 2 (54 countries)



Key observations:

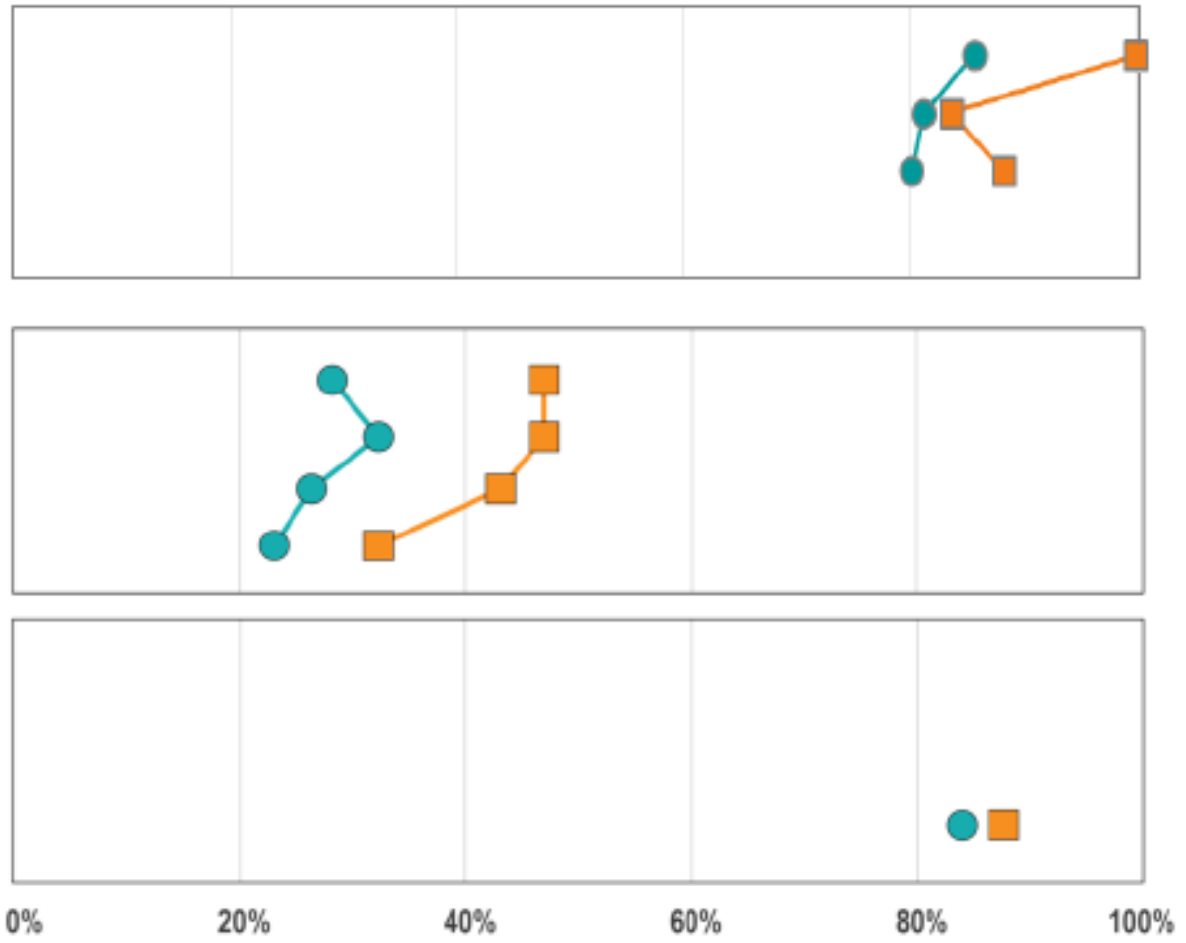
- More national stores are calculating vaccine wastage rates.
- Many lower level stores and health facilities still do not monitor vaccine wastage.
- Deterioration was observed in stores/facilities using vaccine wastage data to forecast needs.

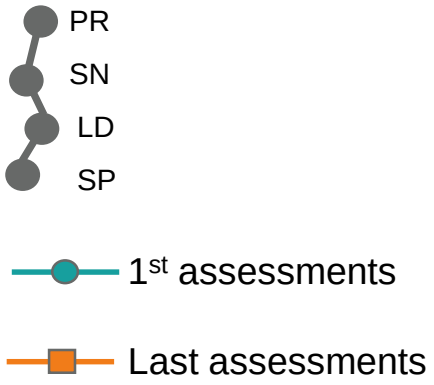
Efficiency indicators 3 (54 countries)

% of facilities with a Standard Operating Procedures (SOP) manual

% of facilities with a satisfactory SOP describing a contingency plan in the event of equipment failure or other emergency

% of health workers that know how to apply the MDVP

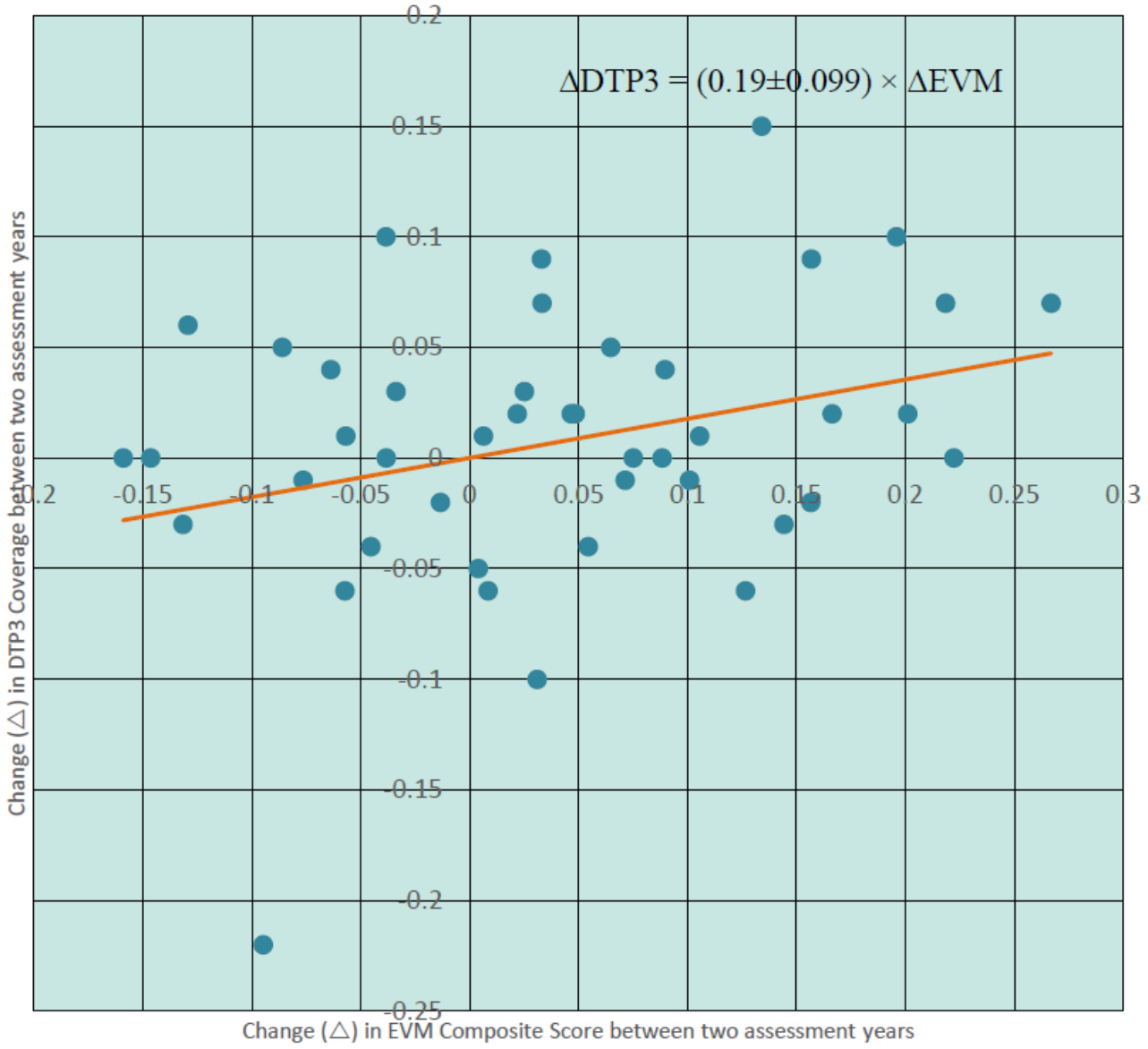




Key observations:

- ❑ Deterioration was observed in the percentage of stores with SOP manuals.
- ❑ Vaccine stores are significantly better prepared for power loss or equipment failure.
- ❑ Many health workers know how to apply the MDVP.

ΔEVM versus ΔDTP3 (54 countries)



Key observations:

- If a country increases its EVM composite score between 2 assessments by 10% more than another country, then it will increase its DPT3 coverage by 1.9% more than the other country will increase its DTP3 coverage.*

*Assumptions:

- ΔDTP3 coverage is directly proportional to the ΔEVM composite score
- All other changes that could cause ΔDTP3 are not correlated with ΔEVM
- Each assessment's composite score (evaluated using a sample of facilities) is an unbiased estimate of the actual composite score (evaluated using all facilities).

Links

EVM public access website (http://www.who.int/immunization/programmes_systems/supply_chain/evm/en/)

A one-stop shop for all things EVM:

- Download EVM tools and user guides:
  - Background EVM documents
  - EVM assessor training materials
  - EVM assessment report template
  - **EVM site selection tool** and user guide
  - **EVM Assistant tool** and user guide
    This tool facilitates the calculation of available and required storage and transport capacities.
  - **EVM Analysis & Recommendations tool**
    This tool facilitates the identification of gaps and drafting of recommendations.
- Link to **EVM Assessors website** (https://extranet.who.int/evm/)
  - Download latest versions of the offline assessment tool and questionnaire.
  - Upload completed EVM assessment reports and datasets.
  - This website is for registered EVM assessors only. To register you must first complete a WHO EVM assessor training course.
- Link to **EVM e-learning website**
  (http://apps.who.int/immunization_delivery/systems_policy/logistics/evmlearning/index_0_1_1.php)
  - An online training course on how to use the EVM assessment tools.
  - This course compliments the formal WHO training course, it does not replace it.
  - It is highly recommended that you complete this training BEFORE you start using the EVM tools.

Update: WHO EVM database, December 2016

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Additional Notes

Slide Notes

Slide 2

Each criterion is assessed at each level by observation, inspection and interview:

- Inspection of cold chain equipment, transport vehicles and buildings
- Inspection of records (temperature, stock, wastage, …) for the previous 12 months
- Interview of responsable staff to assess knowledge, understanding and practice

Note that E1 is assessed at the Primary level only, and E9 was not assessed at the Service Point level in the original version of the questionnaire (version 1.0), but is in the new questionnaire (version 2.1)

Indicators are evaluated in each of the 9 EVM criterias at each level.

- ~400 indicators at PR level, 300 at SN, 200 at LD, 150 at SP
- “Critical” indicators are given a weight of 5, non-critical indicators are given a weight of 1

Each criterion at each level is scored out of 100%. Each criterion score is the weighted average of its constituent indicator scores

Slide 10

Countries are assessed in 9 areas of vaccine management, the 9 EVM criteria: E1 Vaccine arrivals, E2 Temperature monitoring, E3 Storage and transport capacity, E4 Buildings and equipment, E5 Maintenance, E6 Stock management, E7 Vaccine distribution, E8 Vaccine management, E9 Information systems. Note that E1 is assessed at the Primary level only

Criterion score data is available for 85 of the 87 countries that have conducted at least one assessment. There are 83 assessment scores in the PR distributions, 83 in the LD and SP distributions, and 83 in the SN distributions levels.

The box and whisker plot shows the median scores, the inter-quartile range (the range of scores of the central half) and the maximum and minimum scores. Consider the E1 PR box and whisker for example: the median score is about 72%, the central half of countries have scores between about 64% and 82%, slightly less than a quarter of the countries have scores above the target score of 80%, a quarter have scores below 64%. At least one country scored 100% (maximum), and the lowest score was about 23% (minimum).

Slide Notes

Slide 12

A country's EVM composite score is defined as the geometric mean of the country's 32 individual criterion scores (PR E1, PR E2, …, SP E9). The EVM composite score is used to represent the overall strength of a country's immunization supply chain. In the understanding that an immunization supply chain is "only as strong as its weakest link", the geometric mean is preferred to the arithmetic mean, as low criterion scores have a stronger effect on the geometric mean (weak links have a more significant effect on the strength of the overall chain).

This map presents the overall distribution of countries' EVM composite scores by quartiles. The bottom 25% are the poorest performing relative to other countries who have conducted EVM assessments over the period 2010-2013, while the top 25% can be considered those countries who have the highest performing immunisation supply chain systems relative to other countries.

If a country has completed more than one assessment, the score of the most recent assessment is used.

17 countries (Afghanistan, Albania, Bangladesh, Bolivia, China, Democratic Republic of Korea, Eritrea, Honduras, Guyana, Malawi, Moldova, Nicaragua, Rwanda, Tanzania, Turkmenistan, Viet Nam, Yemen) have country composite scores above the target score of 80%.

Slide 15

AFR = Africa Region, EMR = Easter Mediterranean Region, EUR = Europe Region, AMR = Americas Region, SEAR = South East Asia Region, WPR = Western Pacific Region.
The assessment of vaccine arrivals procedures applies to the primary level only.

Slide 16

There are more stringent temperature monitoring requirements at the PR level than at the lower levels due to the higher volume of vaccine stored at that level. This partially explains the relatively low scores at the PR level compared to the other levels.

Slide 22

The SP level has stricter requirements in vaccine management than the other levels, given that vaccines are administered at this level.

Slide 23

78 of the 90 countries were assessed using the new questionnaire (version 2.1) , in which E9 is assessed at SP level.

Slides 26-35

The data was collected between 2010 and 2018 in 90 countries in 6 WHO regions (42 AFR, 9 EMR, 13 EUR, 5 AMR, 9 SEAR, 11 WPR).

Results are based on 152 primary stores, 1067 sub-national stores, 2125 lowest distribution stores, and 3266 immunization service facilities.