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Research article

Self-Assessed Antimicrobial Resistance Surveillance Capacity in the WHO Eastern Mediterranean Region: An Internal Validation of the Tracking AMR Country Self-Assessment Survey

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Abstract: Global antimicrobial resistance (AMR) monitoring relies heavily on the Tracking AMR Country Self-Assessment Survey (TrACSS), an unverified annual self-report instrument. This study examined whether Eastern Mediterranean Region (EMR) surveillance self-ratings corresponded with laboratory and programmatic capacities reported by the same respondents and characterized non-response. A cross-sectional analysis used the TrACSS 2025 public dataset, covering 184 responding countries. For 19 EMR respondents, we compared surveillance ratings against four criteria: reference-laboratory susceptibility testing for all 12 priority bacteria, standardized testing guidelines, external quality assurance beyond reference laboratories, and reporting a laboratory count. Ratings were also compared with national action plan (NAP) implementation. Nineteen of 22 EMR member states responded; non-responders, Libya, the Syrian Arab Republic, and the occupied Palestinian territory, were conflict-affected. EMR had the highest proportion reporting standardized national surveillance or better (73.7% versus 58.8% globally). Countries rated D–E met a mean of 3.5 corroborating criteria, compared with 1.6 among those rated A-C. However, only 7/14 countries claiming standardized national surveillance met all four criteria; 5/14 omitted laboratory counts, including three high-income countries. Furthermore, 11/14 reported NAPs at best, partially implemented with limited resources, including one with a plan neither endorsed nor implemented. Two countries provided internally contradictory responses. EMR surveillance self-ratings showed partial internal corroboration, but programmatic discrepancies and conflict-related non-response complicate interpretation. Because corroborating items share the same reporting source, these findings do not independently validate capacity. Analyses should report internal corroboration alongside ratings and distinguish reported surveillance maturity from verified operational capacity.

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Introduction

International monitoring of the response to antimicrobial resistance (AMR) rests to a remarkable degree on a single instrument [1]. The Tracking AMR Country Self-Assessment Survey (TrACSS) is administered annually by the Quadripartite organizations the Food and Agriculture Organization of the United Nations, the United Nations Environment Program, the World Health Organization, and the World Organization for Animal Health and is completed by each country's national AMR focal point as a single consolidated national response [2]. Its results populate the monitoring and evaluation framework of the Global Action Plan on AMR, and the 2024 United Nations

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General Assembly political declaration on AMR sets a target that 95% of countries submit a TrACSS response annually [3-5].

The instrument's reach has grown accordingly. The ninth round, conducted in 2025, received responses from 184 countries and territories, and TrACSS data now underpin the principal published assessments of global AMR governance. Two such analyses appeared in 2026 [3]. Chen and colleagues constructed a One Health governance index across 193 countries drawing on 269 policy documents together with TrACSS, and reported that governance scores rose between 2017 and 2022 while implementation lagged behind policy design [6]. Drake and colleagues analyzed TrACSS rounds three and eight to describe global progress in surveillance governance and to evaluate the effectiveness of a major donor program [7].

Both sets of authors were careful about what their source could bear. Chen and colleagues noted that reliance on self-reported data may introduce optimism bias, since countries may overstate implementation [6]. Drake and colleagues were more explicit still, recording that TrACSS is an unverified self-assessment subject to social desirability bias, that countries receiving donor support may have incentives to report improvement, and, in terms that frame the present study, that no effort was made to triangulate or otherwise validate TrACSS data as part of the analysis [7]. They identified the WHO Global Antimicrobial Resistance and Use Surveillance System (GLASS) and Joint External Evaluation data as the obvious external checks, and left those checks to others [8].

That gap matters because the instrument is consequential. TrACSS ratings inform regional progress reports, donor allocation, and the global narrative about which regions are advancing. If the ratings systematically overstate capacity, the consequence is not merely a measurement error but a misallocation of attention away from the settings that most need it [2]. The Eastern Mediterranean Region is a useful place to examine the question. It carries a substantial and rising AMR burden: an estimated 380,000 deaths were associated with bacterial AMR in the region in 2021, with 752,000 forecast for 2050, and the region records the highest proportion of methicillin resistance in *Staphylococcus aureus* bloodstream infections of any WHO region [9]. The combination of high declared capacity and high measured burden makes the region a natural test of whether declaration corresponds to capability [10].

This study therefore asks a deliberately narrow question. Setting aside external validation, which requires data not currently accessible at country level, are EMR countries' self-rated AMR surveillance capacities corroborated by the laboratory and programmatic capacities that those same countries report in the same questionnaire? Internal corroboration is a weaker test than external validation, but it is a necessary condition: a country reporting a standardized national surveillance system while simultaneously reporting no external quality assurance, or a national action plan it has not implemented, has produced a response that cannot be wholly correct regardless of what any external dataset shows.

Methods

Design and data source

This is a cross-sectional analysis of the TrACSS 2025 public data export, released by the Quadripartite on 1 October 2025 and covering the ninth survey round. The export contains 184 country records across 248 variables. The questionnaire for round nine was issued on 15 April 2025 with a submission deadline of 15 June 2025, and requests one consolidated national response coordinated by the national AMR focal point. No ethical approval was required, as the analysis used aggregated, publicly released country-level data containing no personal information.

Population

The WHO Eastern Mediterranean Region comprises 22 member states and territories. We sought all countries in the export and recorded the three absent as non-responders. Countries were classified by World Bank income group as supplied in the export.

Principal variable

The exposure of interest was item 3.5, national surveillance system for antimicrobial resistance (AMR) in humans, rated on the standard TrACSS five-point scale. The response options, reproduced from the questionnaire, are: A, no capacity for generating or reporting AMR data; B, AMR data collected locally but possibly without a standardized approach; C, AMR data collected nationally but possibly without a standardized approach; D, a standardized national AMR surveillance system collecting data on common bacterial infections in hospitalized and community patients, with a national coordinating center; and E, as D, with the national system additionally linking AMR surveillance to antimicrobial consumption or use data. Ratings of D or E therefore assert a standardized, coordinated national system, and it is that assertion this study examines.

Corroborating criteria

Four further items, answered by the same respondent in the same questionnaire, were selected before analysis as the minimum laboratory substrate that a standardized national surveillance system implies. A country was recorded as meeting a criterion where:

(i) item 3.7 indicated that one or more national bacteriology or AMR reference laboratories perform antimicrobial susceptibility testing (AST) for all 12 listed priority bacteria, rather than only some or none;

(ii) item 3.11 indicated that standardized AST guidelines are used by at least some clinical bacteriology laboratories, rather than by the reference laboratory alone, by none, or being unknown;

(iii) item 3.12 indicated that an external quality assurance (EQA) program extends beyond the national reference laboratory to at least some bacteriology laboratories, rather than to the reference laboratory alone, to none, or being unknown;

(iv) item 3.6 contained a numerical count of public-sector clinical laboratories performing culture and AST, rather than being left blank.

The fourth criterion warrants comment. It is not a capacity measure but a reporting measure: a country operating a coordinated national surveillance system should know, and be able to state, how many laboratories feed it. A blank response to that item from a country claiming a standardized national system is itself informative, and is treated here as a failure of corroboration rather than as missing data to be imputed.

Secondary comparison

Self-rated surveillance capacity was additionally cross-tabulated against item 2.3.a, country progress with development of a national action plan on AMR, on the same five-point scale, where A denotes a plan neither endorsed nor implemented, B a plan endorsed by government, C an endorsed plan partially implemented with limited resources, D full implementation and monitoring with necessary financing available, and E periodic evaluation of implementation with lessons communicated. Two further binary items were examined: item 2.28, whether the country uses AMR surveillance data to inform operational decisions, and item 2.29, whether an integrated AMR surveillance system has been established or begun implementation.

Analysis

Analyses are descriptive. A corroboration score from 0 to 4 was computed for each country as the count of criteria met, and compared between countries rating D or E and those rating A to C. Regional distributions of item 3.5 were computed across all responding countries to situate EMR among WHO regions. No inferential testing was performed: the EMR population is the complete set of responding member states rather than a sample, and the analysis is intended to characterize coherence rather than to estimate an effect. Data were extracted and analyzed in Python 3.13. The coded dataset is provided as a supplementary file so that every value reported here can be traced to the published export.

Results

Response and non-response

Nineteen of the 22 EMR member states and territories appear in the TrACSS 2025 export. The three absent are Libya, the Syrian Arab Republic and the occupied Palestinian territory. All three have experienced sustained armed conflict or occupation, and all three would be expected to have among the most disrupted surveillance systems in the region.

Non-response is therefore not random with respect to the quantity being measured. Any regional summary computed from TrACSS necessarily excludes the states most likely to report weak capacity, and will tend to overstate regional capability for that reason alone, before any question of response bias among those who did respond. The characteristics of respondents and non-respondents are given in Table 1.

Regional position

Among the 182 responding countries that answered item 3.5, 58.8% rated their national AMR surveillance system as a standardised national system or better. In the Eastern Mediterranean Region the figure was 73.7%, the highest of any WHO region, ahead of Europe and South-East Asia at 66.7% each, the Western Pacific at 53.8%, the Americas at 51.5% and Africa at 51.1%. Twelve of 19 EMR respondents rated D and two rated E. The full distribution by region is shown in Figure 1.

This is a notable result in its own right. The region reporting the strongest national AMR surveillance capacity in the world is also a region where the most recent GLASS report records the highest methicillin resistance in *S. aureus* bloodstream infections of any region, and where modeled AMR mortality is projected to double by 2050. High self-rated surveillance capacity and high measured resistance burden are not contradictory; good surveillance detects more, but the

juxtaposition invites the question of how far the self-rating reflects system capability.

Table 1. Characteristics of Eastern Mediterranean Region member states responding and not responding to TrACSS 2025.

Characteristic	Responding states (n = 19)	Non-responding states (n = 3)
Member states	Afghanistan, Bahrain, Djibouti, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Somalia, Sudan, Tunisia, United Arab Emirates, Yemen	Libya, Syrian Arab Republic, occupied Palestinian territory
World Bank income group	High 6; upper-middle 2; lower-middle 7; low 4	Not classified in the export
Conflict-affected	Afghanistan, Somalia, Sudan, Yemen	All three
Rated D or E on item 3.5	14 of 19 (73.7%)	Not applicable
Enrolled in GLASS	19 of 19	3 of 3

Conflict-affected status reflects documented sustained armed conflict or occupation and is included to show the pattern of non-response; it is not a TrACSS variable. GLASS enrolment is for 2024 and covers enrolment only, not whether data were reported.

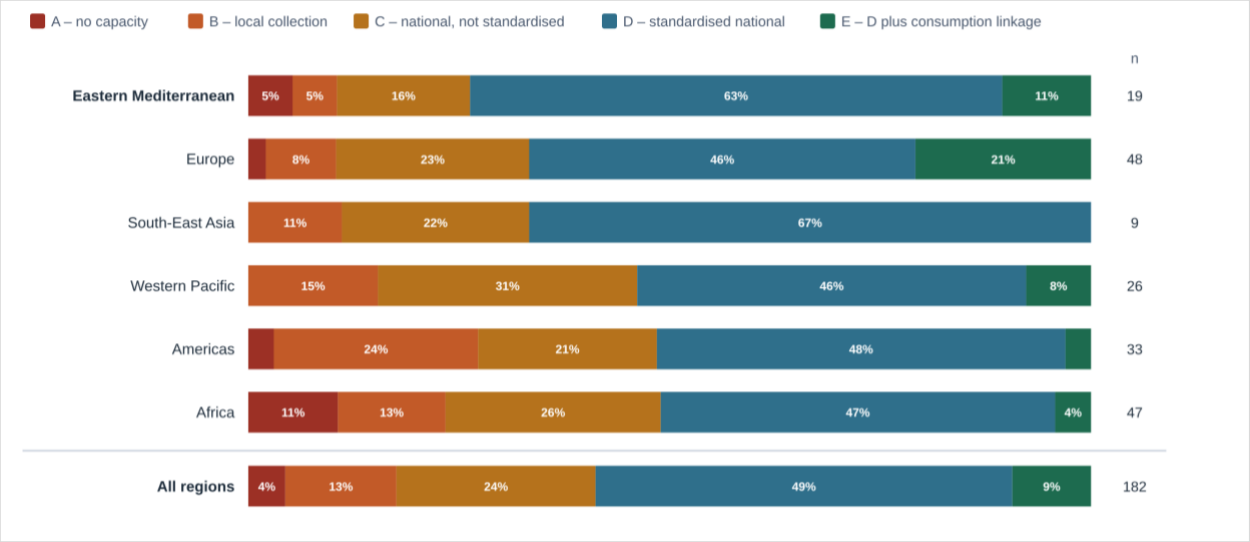


Figure 1. Self-rated national AMR surveillance capacity in humans by WHO region, 2025. Distribution of responses to TrACSS item 3.5 among the 182 responding countries that answered the item. Regions are ordered by the proportion rating D or E, denoting a standardized national surveillance system. The Eastern Mediterranean Region records the highest such proportion of any region. Three EMR member states did not respond to the survey and are not represented. Source: TrACSS 2025 data export, WHO/FAO/UNEP/WOAH.

Corroboration by laboratory capacity

Corroboration was moderate, and the gradient ran in the expected direction. The 14 countries rating D or E met a mean of 3.5 of the four corroborating criteria, against a mean of 1.6 among the five countries rating A to C. That separation is itself evidence that respondents are not answering arbitrarily: self-rated maturity tracks self-reported laboratory substrate.

Within the high-rating group, however, corroboration was incomplete. Only 7 of the 14 countries claiming a standardized national system met all four criteria; the remaining seven met three. Across all 19 respondents, five reported either no EQA program, an EQA program confined to the national reference laboratory, or an unknown EQA status, and seven reported either no national list of essential in vitro diagnostics or an unknown status. Country-level results are shown in Figure 2 and in full in Table 2.

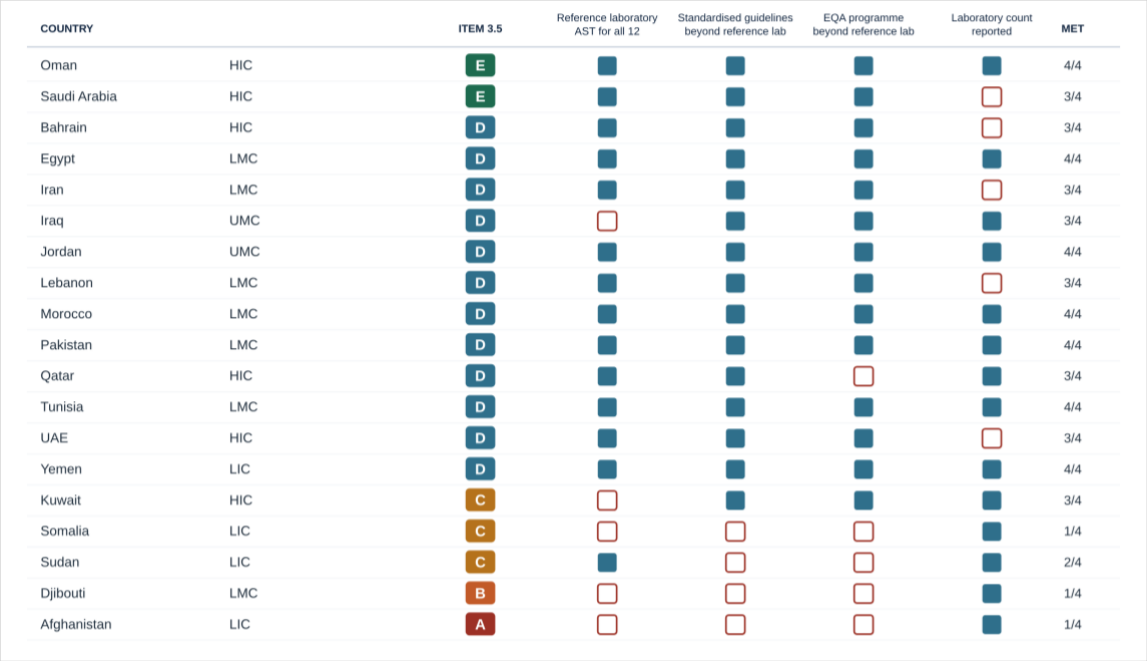


Figure 2. Self-rated surveillance maturity and its corroboration in 19 Eastern Mediterranean countries. For each country, the self-assigned rating on TrACSS item 3.5 is shown beside the four corroborating criteria defined in the Methods, each reported by the same respondent in the same questionnaire. Filled squares indicate that a criterion is met and open squares indicate that it is not. Countries are ordered by self-rating. AST, antimicrobial susceptibility testing; EQA, external quality assurance; HIC, high income; UMC, upper-middle income; LMC, lower-middle income; LIC, low income. Source: TrACSS 2025 data export, WHO/FAO/UNEP/WOAH.

Table 2. Self-rated national AMR surveillance capacity and corroborating laboratory items, 19 responding Eastern Mediterranean countries.

Country	Income	Item 3.5	Reference lab AST	Standardized guidelines	EQA programme	Public labs with AST	Criteria met
Oman	HIC	E	All 12	All labs	All labs	17	4/4
Saudi Arabia	HIC	E	All 12	All labs	All labs	Not reported	3/4
Bahrain	HIC	D	All 12	All labs	Some labs	Not reported	3/4
Egypt	LMC	D	All 12	All labs	Some labs	80	4/4
Iran	LMC	D	All 12	All labs	All labs	Not reported	3/4
Iraq	UMC	D	Some	All labs	Some labs	185	3/4
Jordan	UMC	D	All 12	Some labs	All labs	28	4/4
Lebanon	LMC	D	All 12	Some labs	Some labs	Not reported	3/4
Morocco	LMC	D	All 12	Some labs	All labs	32	4/4
Pakistan	LMC	D	All 12	Some labs	Some labs	12	4/4
Qatar	HIC	D	All 12	All labs	Reference only	2	3/4
Tunisia	LMC	D	All 12	All labs	Some labs	63	4/4
United Arab Emirates	HIC	D	All 12	All labs	All labs	Not reported	3/4
Yemen	LIC	D	All 12	Some labs	Some labs	16	4/4
Kuwait	HIC	C	None	All labs	All labs	15	3/4
Somalia	LIC	C	Some	Reference only; clinical unknown	None	5	1/4
Sudan	LIC	C	All 12	Reference only; clinical unknown	None	32	2/4
Djibouti	LMC	B	None	None	None	3	1/4
Afghanistan	LIC	A	None	Unknown	Unknown	10	1/4

Item 3.5 ratings: A, no capacity; B, local collection; C, national collection without standardisation; D, standardised national system with a national coordinating centre; E, as D with linkage to antimicrobial consumption data. Reference lab AST refers to item 3.7, whether a national reference laboratory performs antimicrobial susceptibility testing for all 12 priority bacteria. Criteria met counts the four corroborating criteria defined in the Methods. Source: TrACSS 2025 data export.

Unreported laboratory counts

Five of the 14 countries claiming a standardized national surveillance system did not report the number of public-sector laboratories performing culture and AST: Bahrain, the Islamic Republic of Iran, Lebanon, Saudi Arabia and the United Arab Emirates. Three of the five are high-income countries, and the group includes both countries that rated E, the highest available rating.

This pattern is the opposite of what a resource explanation would predict. Countries with the least capacity might be expected to be least able to enumerate their laboratory network; here the omission is concentrated among the best-resourced respondents. Among the 14 countries that did report a count, the reported numbers ranged from 2 to 185 public-sector laboratories performing AST, a spread that is not explained by population alone and that suggests heterogeneous interpretation of the question.

Discordance with national action plan implementation

The clearest internal tension lay not in the laboratory items but in the programmatic one. Of the 14 countries rating their surveillance system as a standardised national system or better, 11 simultaneously reported that their national action plan on AMR was at best partially implemented with limited resources. Nine of these rated their plan at C, one at B (indicating a plan endorsed but not yet implemented), and one at A (indicating a plan neither endorsed by government nor implemented).

These positions are difficult to reconcile. A standardized national surveillance system with a national coordinating center is among the more resource-intensive deliverables of a national action plan. A country reporting that its plan remains unendorsed and unimplemented, while simultaneously reporting a functioning standardized national surveillance system, has given two answers that are hard to hold together. Five of the 14 also reported that no integrated AMR surveillance system had been established or begun implementation, and two reported that AMR surveillance data are not used to inform operational decisions a system producing data that do not reach decisions. Table 3 presents the cross-tabulation.

Individual anomalies

Two responses were internally contradictory on their face. Kuwait rated its surveillance system at C while reporting that a standardized AST guideline is used by all clinical bacteriology laboratories and that an EQA program is in place for all bacteriology laboratories in the country, yet also reporting that the country has no national bacteriology or AMR reference laboratory performing AST for any of the 12 priority bacteria. An EQA program covering all laboratories, and universal guideline adherence, are difficult to achieve in the absence of any reference laboratory performing priority-organism AST.

Yemen rated its national surveillance system at D and satisfied all four corroborating criteria, reporting reference-laboratory AST for all 12 priority bacteria, standardized guidelines in some clinical laboratories, EQA extending beyond the reference laboratory, 16 public-sector laboratories performing AST, and a complete national essential in-vitro diagnostics list. Yemen is a low-income country in which sustained armed conflict has caused widely documented collapse of health service delivery. The response may be accurate for a small set of functioning facilities, but as a characterization of national capacity it is difficult to credit, and it illustrates the limits of an instrument with no verification step.

Two further responses are worth noting without being contradictory. Oman rated its system at E, the top rating requiring linkage of resistance to antimicrobial consumption data, while reporting its national action plan only partially implemented with limited resources. The Islamic Republic of Iran rated its system at D while reporting a national action plan neither endorsed nor implemented.

Discussion

The Eastern Mediterranean Region reports the highest national AMR surveillance capacity of any WHO region. That self-report is internally coherent in the aggregate, with a clear gradient between high and low raters on independent laboratory items from the same questionnaire [11]. Yet it remains incompletely corroborated at country level, with half of the countries claiming a standardized national system failing at least one basic laboratory criterion, and a large majority reporting national action plans they describe as not fully implemented [12].

Table 3. Reported national action plan implementation and surveillance use among the 14 countries rating their surveillance system as a standardized national system or better.

Country	Item 3.5	NAP implementation (item 2.3.a)	Integrated surveillance system	Uses surveillance data for decisions
Iran	D	A - not endorsed, not implemented	Yes	Yes
Yemen	D	B - endorsed, not implemented	No	No
Egypt	D	C - partially implemented, limited resources	No	Yes
Iraq	D	C - partially implemented, limited resources	Not answered	Yes
Jordan	D	C - partially implemented, limited resources	No	Yes
Lebanon	D	C - partially implemented, limited resources	Yes	Yes
Morocco	D	C - partially implemented, limited resources	Yes	Yes
Oman	E	C - partially implemented, limited resources	Yes	Yes
Pakistan	D	C - partially implemented, limited resources	Yes	No
Tunisia	D	C - partially implemented, limited resources	Yes	Yes
United Arab Emirates	D	C - partially implemented, limited resources	No	Yes
Bahrain	D	D - fully implemented and financed	Yes	Yes
Qatar	D	E - periodically evaluated	No	Yes
Saudi Arabia	E	E - periodically evaluated	Yes	Yes

Ordered by reported national action plan implementation. Iraq did not answer item 2.29. Eleven of the 14 countries report a national action plan that is, at best, partially implemented with limited resources. Source: TrACSS 2025 data export.

The appropriate conclusion is neither that TrACSS is unreliable nor that it is a measurement of capacity. It is an instrument that behaves as a reasonable self-report behaves: broadly ordered, internally consistent on average, and optimistic at the margin in ways that are patterned rather than random [2]. The patterns identified here non-response concentrated in conflict states, unreported laboratory counts concentrated in high-income states, and surveillance claims outrunning program implementation are each explicable, and each biases the regional picture in the same direction.

Chen and colleagues reported that implementation lags policy design globally and that the EMR implementation domain showed no significant upward trend [6]. The present analysis offers a complementary observation at the level of the instrument itself: within a single questionnaire round, countries' claims about surveillance systems run ahead of their claims about the plans that fund those systems. If that divergence is a general property of the instrument, then aggregate governance indices built partly on TrACSS will inherit it, and the implementation lag such indices detect may be understated rather than overstated.

Drake and colleagues made the case for triangulation and did not attempt it [7]. This study does not supply the external validation they called for; it establishes something logically prior, which is that a meaningful fraction of responses can be shown to be imperfectly corroborated without leaving the dataset. Where internal corroboration already fails, external validation is not required to warrant caution.

The intended external comparator for this study was country-level GLASS performance [8]. All 22 EMR member states and territories are enrolled in GLASS, 19 for both AMR and antimicrobial consumption and three for AMR alone, so enrolment does not discriminate between them. Regional participation in reporting is lower: 76.2%, or 16 of 21 countries, submitted AMR data for 2023. The country-level breakdown that would permit a direct comparison of which specific countries reported, and their national data completeness scores, is referenced in the GLASS 2025 annexes but was not retrievable in a usable form during this study.

That is itself a finding worth recording. Where the principal self-assessment instrument is published as an open country-level export while the principal observational dataset is published chiefly in aggregate, validation of the former against the latter is harder than it should be. Releasing country-level GLASS reporting status and completeness in a machine-readable form would allow the triangulation that Drake and colleagues identified as necessary, and would do so at negligible cost.

Three modest changes would improve the interpretability of TrACSS without altering its purpose or burden [2]. First, responses could carry a corroboration flag computed automatically from the questionnaire's own internal logic, so that a rating of D on item 3.5 accompanied by an absent laboratory count or a report of no EQA is visible as such to users of the data. Second, non-response could be reported alongside regional summaries as a matter of routine, since a regional percentage computed on 19 of 22 states means something different from one computed on all 22. Third, the laboratory count item would benefit from an explicit definition, given the implausibly wide range of reported values.

Study limitations: The corroborating criteria were specified by the authors rather than derived from a validated framework, and a different reasonable specification would yield somewhat different corroboration scores. The criteria were, however, fixed before the data were examined, and the full coded dataset is supplied so that readers may apply alternative rules. Internal corroboration is a weak test. A country may answer every item consistently and still overstate its capacity throughout, and such a country would score four of four here. The analysis can identify incoherence but cannot detect uniform optimism; it therefore provides a lower bound on the extent of overstatement rather than an estimate. Conversely, discordance is not proof of error. Surveillance systems are sometimes financed outside the national action plan, through donor programs or vertical disease initiatives, so a country may genuinely operate a standardized national system while its action plan remains underfunded. The 11 discordant responses identified here should be read as requiring explanation rather than as demonstrated misstatements. The analysis covers one survey round. Whether the patterns described are stable across rounds, or reflect features of the 2025 questionnaire in particular, cannot be determined from these data, and the questionnaire was revised for round nine in the multisector, human health and environment sections.

Conclusion

The Eastern Mediterranean Region reports the strongest national AMR surveillance capacity of any WHO region. That finding rests on a self-assessment completed by the parties being assessed, from which the region's three conflict-affected states are absent, and in which half of the countries claiming a standardized national system fail at least one basic laboratory criterion drawn from their own responses, while 11 of 14 report national action plans they describe as not fully implemented. TrACSS is internally coherent enough to be informative and too weakly corroborated to be treated as a measurement. The distinction matters because the instrument now carries considerable weight in global AMR governance. Analyses built upon it should report corroboration alongside the ratings, and the external validation that two major 2026 studies identified as necessary remains to be done a task that would be substantially easier if country-level GLASS reporting data were released in the same open form as the self-assessment it would be used to check.

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