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Recorded forensic laboratory testing activity in Western Saudi Arabia: an exploratory analysis of tests and samples in the 2024 Ministry of Health yearbook

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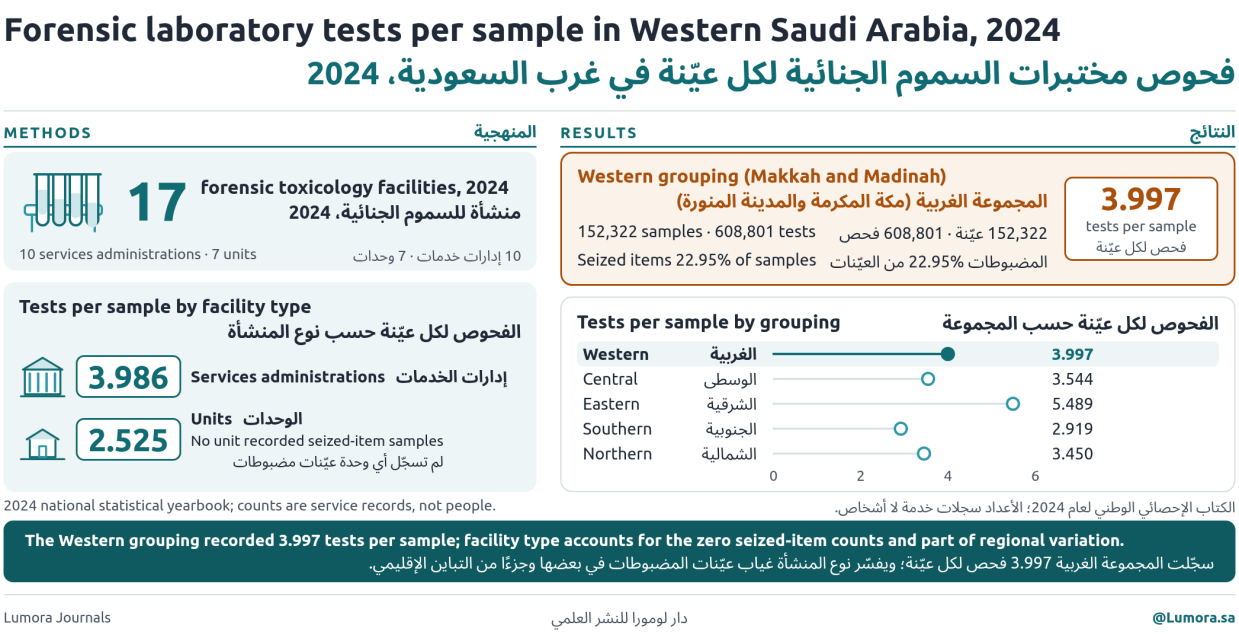
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Graphical abstract



Graphical abstract: The Western grouping recorded 3.997 tests per sample; facility type accounts for the zero seized-item counts and part of regional variation. Designed by the Lumora Journals production team using hand-coded HTML/SVG rendered in Google Chrome.

Abstract

Background: Forensic laboratory activity can be described using samples received and tests performed, but these units do not identify unique individuals or population exposure. Regional comparisons require consistent geographical aggregation and an explicit distinction between biological specimens and seized-item samples. This analysis examines the Western analytical grouping while retaining comparisons across all thirteen Saudi administrative regions.

Methods: We reconstructed the complete Ministry of Health Statistical Yearbook 2024 Table 4-58, covering samples and tests for 17 facilities: 10 Forensic Toxicology Services Administrations (FTSAs) and 7 Forensic Toxicology Units (FTUs). Facilities were mapped to thirteen administrative regions and five analytical groups. We calculated tests per recorded sample and the seized-item share of samples, by region, group and facility type, and reconciled totals with the national row. The source was inspected before the analysis plan was drafted, so the analysis is exploratory. No inferential or patient-level analyses were performed.

Results: The Western grouping (Makkah and Madinah; three FTSAs, two FTUs) recorded 152,322 samples and 608,801 tests, a ratio of 3.997, with seized items 22.95% of samples. Makkah recorded 3.882 tests per sample and Madinah 4.396. Pooled ratios were 3.986 in FTSAs and 2.525 in FTUs, and no FTU recorded seized-item samples. Makkah combines two FTSAs (3.951 pooled) and two FTUs (2.933), whereas Madinah is one FTSA. Across the five groups, the ratio was 3.544 in Central, 5.489 in Eastern, 2.919 in Southern and 3.450 in Northern. All reconstructed national counts matched the published table.

Conclusions: The Western grouping recorded substantial laboratory testing activity, and its regional ratios combine facilities of different types. Facility type accounts for the recorded zero seized-item counts and part of the regional variation. The results support questions about assay mix, referral pathways and counting rules, but do not establish poisoning prevalence, numbers of affected people, laboratory quality or efficiency.

Introduction

Forensic laboratory services contribute evidence to clinical, medicolegal and investigative processes. Their records can include biological specimens, seized material and multiple analytical tests from the same submission, so a regional total is meaningful only when its counting unit is preserved. A complex specimen may need several screening and confirmatory procedures, another a narrower panel. Counting tests and counting samples therefore describe related but different aspects of activity, and this study treats that distinction as the central measurement issue rather than assuming that every test represents a separate person, exposure or diagnosis.

Saudi forensic studies have examined methamphetamine-related postmortem findings in Jeddah, ethanol-, heroin- and methanol-related fatalities, khat-associated deaths in Jazan, immersion deaths and methamphetamine-associated trauma or toxicity, using different periods, matrices and case-selection procedures [1–7]. These selected forensic populations cannot be reconstructed from a national table that contains only sample and test counts: the denominator of a fatality series is not the denominator of all laboratory samples. Laboratory activity itself has been described elsewhere through national surveys of toxicology services, covering budgets, specimen retention, testing practice and turnaround times [8], and through multi-year reviews in which toxicology and seized-drug analyses are reported by separate laboratories of one forensic institute [9].

The analytical methods literature also shows why laboratory activity should not be collapsed into a single clinical interpretation. Studies of broad drug panels and consolidated methods concern the scope and organization of testing [10–12], and confirmatory testing of Saudi urine samples that screened positive by immunoassay has been extended to synthetic cathinones [13]. Good-practice and validation publications address the reliability of methods [14,15]. Neither a large test count nor a high ratio of tests to samples demonstrates that validation requirements were met, and a lower ratio cannot by itself be interpreted as inadequate investigation.

The Ministry of Health yearbook offers a public, reproducible source for describing recorded service activity, with named reporting facilities and published totals against which extracted data can be checked. It does not provide linked data on individual people, test requests, analytical results or confirmed poisoning episodes, and an analysis that respects these boundaries can help formulate operational questions without attributing clinical properties to counts not designed to measure them.

This study focuses on the Western analytical grouping because Makkah and Madinah can be examined together and separately within a source-verified geographical structure. All thirteen regions remain in the comparator tables, and the five-group summary is an additional view. The groups are unequal in structure: some combine several administrative regions and facilities, whereas Eastern is a single administrative region.

A longitudinal analysis of Ministry of Health yearbooks for 2016–2024 examined regional trends in eight capacity and utilization indicators—primary healthcare centres, hospitals, beds, physicians, nurses, primary healthcare encounters, outpatient visits and admissions—and contained no forensic laboratory data [16]. The national totals of Table 4-58 are published in the yearbook itself. The contribution of this article therefore lies in the analysis: the regional and facility-level structure of tests and samples, the distinction between administrations and units, and the decomposition of the Western figures by facility.

Our objectives were to reconcile the published sample and test totals, to describe Western activity relative to the other analytical groupings, to examine whether the combined Western ratio concealed differences between Makkah and Madinah, and to describe how the facility structure of the table relates to these ratios and to the recorded seized-item counts. STROBE and RECORD principles informed the reporting [17,18].

Methods

Design, source and chronology

The study is an exploratory descriptive reanalysis of a completed administrative reporting table. The Statistical Yearbook 2024 workbook was downloaded from the Ministry of Health website and retained unaltered; its Secure Hash Algorithm 256-bit (SHA256) digest is 959a27fbe4a7ef7b5726c679303d3251aea8b638370289b8d055705e53ea2649. Table 4-58, “Number of Samples and Tests Conducted at MoH Forensic Toxicology Services Administrations (FTSA) / Forensic Toxicology Unit (FTU), by MoH Branches & Offices, 2024G”, supplied all variables. The source-row export (Supplementary Material S1) preserves the sheet and row of each value, the facility, its type, the mapped administrative region and the derived values. The workbook is cited as the analytical source [19], and national statistical definitions provide administrative context [20].

The workbook and candidate tables were inspected before the written analysis plan was prepared. The analysis is therefore exploratory; it claims no prospective registration or prespecified confirmatory hypothesis.

The units of analysis are the 17 reporting facilities in the table and the administrative regions and groups to which they belong. No individual-level clinical records, identities or specimen results were accessed. The published total is the total of services recorded in the Ministry of Health reporting framework; coverage outside that framework is not inferred, and “recorded” and “reported” mark the scope of each quantitative statement.

Variables and units

For each facility, five source fields were retained—reported units, biological samples, seized-item samples, total samples and tests—together with its type as named in the source (FTSA or FTU). The total-sample field was checked against the sum of biological and seized-item samples. Biological samples were not relabelled as patients, nor seized-item samples as seizures or cases, because the table has no identifiers linking samples to people, investigations or items.

The primary derived quantity was tests divided by total recorded samples. This aggregate ratio expresses reported tests relative to recorded samples; it is not the mean number of tests per sample, because the table has no sample-to-test linkage and the two counts may differ in counting conventions or period boundaries.

The secondary derived quantity was seized-item samples divided by total samples, reported as a share of recorded samples rather than the prevalence of seized material or drug use. Tests are not cross-tabulated by sample type, so type-specific ratios cannot be computed.

Geographical mapping and aggregation

The thirteen administrative regions were preserved by name: Riyadh, Makkah, Madinah, Qassim, Eastern, Asir, Tabuk, Hail, Northern Borders, Jazan, Najran, Al Baha and Al Jouf. The table lists facilities by Ministry

of Health branch. Branches were assigned to administrative regions by name: the Holy Capital, Jeddah, Qunfudhah and Taif branches to Makkah, and the Dammam and Hafr Al-Batin branches to Eastern; every other branch carries the name of its region. Each facility therefore entered one region once (Tables 2 and 3). The national total row was used for validation and not added to the facility rows.

The analytical groupings were Central (Riyadh, Qassim), Western (Makkah, Madinah), Eastern (Eastern), Southern (Asir, Jazan, Najran, Al Baha) and Northern (Tabuk, Hail, Northern Borders, Al Jouf), following a published five-region convention [21]. The groups are a secondary summary, not a replacement administrative system.

Counts were summed before ratios were calculated, so the Western ratio is the combined test count divided by the combined sample count, not the average of the regional ratios. Facility-type summaries were calculated in the same way nationally, within regions and within groups, and the group ratios were repeated for FTSAs only. Resident-population rates were not calculated because the table has no aligned catchment population.

Source checks and statistical approach

Facility rows were reconciled with the national total for every field, sample-type counts were checked against total samples, and each facility was checked to enter one region once. These checks verify extraction and arithmetic, not the completeness or accuracy of the underlying reporting.

Descriptive counts and ratios were the sole statistical outputs; their definitions and interpretation limits are given in Table 1. No regression, efficiency ranking, causal model or sampling confidence interval was used, because the table reports complete recorded totals rather than a sample, and no outcome or independent sampling unit is defined for a binomial or Poisson model.

Ratios are given to three decimal places and shares to two; calculations used full precision, and unrounded values are in Supplementary Material S1. Differences are arithmetic contrasts, not hypothesis tests.

Table 1. Operational definitions and interpretation limits of the descriptive quantities

Quantity	Source-bound calculation/definition	Claims the quantity does not support
Tests/sample	Reported tests divided by biological plus seized-item samples	Assay accuracy, patient exposure or operational efficiency
Seized-item share (%)	Seized-item samples divided by total samples, × 100	Substance prevalence among residents or positive samples
Biological samples	Source-reported biological sample records	Unique individuals or clinical poisoning cases
Facility type	FTSA or FTU as named in Table 4-58	Defined functions, staffing or analytical scope of the facility

Notes. FTSA, Forensic Toxicology Services Administration; FTU, Forensic Toxicology Unit. The yearbook names the two facility types but does not define their functions. Definitions apply to Tables 2–4 and Figure 1.

Results

Reconciliation of recorded national totals

Across Table 4-58, the reconstruction yielded 17 facilities, 364,165 biological samples, 139,198 seized-item samples, 503,363 total samples and 1,956,353 tests. Each field matched the published national total, and biological and seized-item samples summed to the total in every row.

All thirteen administrative regions are represented (Table 2). The national total row was used only for reconciliation, so no activity was counted twice, and the group totals were built from the regional rows.

Facility structure

The 10 FTSAs recorded 469,211 samples and 1,870,129 tests (3.986 tests per sample), including all 139,198 seized-item samples (29.67% of their samples). The 7 FTUs recorded 34,152 samples, all biological, and 86,224 tests (2.525 tests per sample). No FTU recorded a seized-item sample; among the FTSAs, only Al Baha recorded none. Hail, Al Jouf, Najran and Northern Borders are each served by a single FTU; Makkah by two FTSAs (Makkah and Jeddah) and two FTUs (Qunfudhah and Taif); Eastern by one FTSA (Dammam) and one FTU (Hafr Al-Batin); and each of the other seven regions by one FTSA (Table 3).

Western grouping and its constituent regions

The Western grouping, with three FTSAs and two FTUs, recorded 152,322 total samples (117,357 biological and 34,965 seized-item) and 608,801 tests (Table 4). Its tests-per-sample ratio was 3.997 and its seized-item share 22.95%. The source supplies no positivity, substance distribution or number of people investigated.

Makkah recorded 88,889 biological samples, 29,347 seized-item samples, 118,236 total samples and 458,963 tests; Madinah, served by one FTSA, recorded 28,468, 5,618, 34,086 and 149,838, respectively. The ratios were 3.882 and 4.396, and the seized-item shares 24.82% and 16.48%. The Makkah figure combines facilities with different ratios: Makkah FTSA 4.295, Jeddah FTSA 3.605, Taif FTU 3.026 and Qunfudhah FTU 2.764. The two Makkah FTSAs together recorded 3.951 tests per sample and a seized-item share of 26.64%; the two FTUs recorded 8,065 samples (6.82% of the Makkah total), none of them seized items. Restricted to FTSAs, the Madinah–Makkah difference was 0.445 tests per sample, compared with 0.514 for all facilities.

Comparison with the other broad groupings

Central recorded 142,836 samples and 506,275 tests (3.544 tests per sample), Eastern 82,931 and 455,179 (5.489), Southern 86,794 and 253,331 (2.919) and Northern 38,480 and 132,767 (3.450) (Table 4). Western had the largest test count and Eastern the largest ratio; these are different quantities and do not combine into a statement about burden or performance.

Seized-item shares were 23.00% in Central, 31.45% in Eastern, 42.50% in Southern and 21.85% in Northern, compared with 22.95% in Western. The groups differ in facility mix: Northern has one FTSA and three FTUs, and its seized-item samples all come from Tabuk FTSA. Restricted to FTSAs, the ratios were 3.544 in Central, 4.056 in Western, 5.543 in Eastern, 3.044 in Southern and 4.005 in Northern, and the seized-item shares 23.00%, 24.24%, 32.37%, 47.51% and 35.19%, respectively (Table 4). Because tests

are not cross-tabulated by sample type, the contribution of sample composition to these ratios cannot be determined.

Administrative-region variation

Figure 1 shows the administrative-region and facility ratios within each group. Najran recorded the lowest ratio (1.853) and Eastern the highest (5.489); the other regions recorded 3.526 in Riyadh, 3.644 in Qassim, 3.013 in Asir, 4.005 in Tabuk, 2.877 in Hail, 2.002 in Northern Borders, 2.966 in Jazan, 4.874 in Al Baha and 3.127 in Al Jouf. These are recorded service ratios, not estimates of poisoning risk.

Five administrative regions recorded no seized-item samples: Hail, Al Jouf, Najran and Northern Borders, each served only by an FTU, and Al Baha, served by an FTSA. All seven FTUs, including those in Makkah and Eastern, recorded none. Apart from Al Baha, the zeros therefore coincide with facility type. The zeros were retained as recorded values and are not read as absence of seized material in those regions.

Table 2. Recorded forensic laboratory samples and tests by administrative region, with reporting facilities, 2024

Region	Facilities	Biological samples	Seized-item samples	Total samples	Tests	Tests/sample	Seized-item share (%)
Riyadh	1 FTSA	94,940	26,127	121,067	426,939	3.526	21.58
Makkah	2 FTSA, 2 FTU	88,889	29,347	118,236	458,963	3.882	24.82
Madinah	1 FTSA	28,468	5,618	34,086	149,838	4.396	16.48
Qassim	1 FTSA	15,047	6,722	21,769	79,336	3.644	30.88
Eastern	1 FTSA, 1 FTU	56,847	26,084	82,931	455,179	5.489	31.45
Asir	1 FTSA	19,175	14,033	33,208	100,043	3.013	42.26
Tabuk	1 FTSA	15,485	8,409	23,894	95,692	4.005	35.19
Jazan	1 FTSA	19,209	22,858	42,067	124,776	2.966	54.34
Al Baha	1 FTSA	2,372	0	2,372	11,561	4.874	0.00
Hail	1 FTU	6,797	0	6,797	19,557	2.877	0.00
Al Jouf	1 FTU	1,710	0	1,710	5,348	3.127	0.00
Najran	1 FTU	9,147	0	9,147	16,951	1.853	0.00
Northern Borders	1 FTU	6,079	0	6,079	12,170	2.002	0.00

Notes. FTSA, Forensic Toxicology Services Administration; FTU, Forensic Toxicology Unit. Facilities were assigned to regions by Ministry of Health branch (Makkah: Holy Capital, Jeddah, Qunfudhah and Taif; Eastern: Dammam and Hafr Al-Batin). Tests/sample = tests / total samples; seized-item share = seized-item samples / total samples × 100. Samples are service records, not people. Source: Ministry of Health Statistical Yearbook 2024, Table 4-58.

Table 3. Reporting facilities in Table 4-58 by type and region, 2024

Facility (source label)	Type	Region	Analytical group	Total samples	Seized-item samples	Tests	Tests/ sample	Seized-item share (%)
Riyadh FTSA	FTSA	Riyadh	Central	121,067	26,127	426,939	3.526	21.58
Makkah FTSA	FTSA	Makkah	Western	55,289	11,582	237,462	4.295	20.95
Jeddah FTSA	FTSA	Makkah	Western	54,882	17,765	197,846	3.605	32.37
Taif FTU	FTU	Makkah	Western	5,200	0	15,735	3.026	0.00
Qunfudhah FTU	FTU	Makkah	Western	2,865	0	7,920	2.764	0.00
AlMadina FTSA	FTSA	Madinah	Western	34,086	5,618	149,838	4.396	16.48
Qassim FTSA	FTSA	Qassim	Central	21,769	6,722	79,336	3.644	30.88
Dammam FTSA	FTSA	Eastern	Eastern	80,577	26,084	446,636	5.543	32.37
HafrAlbatin FTU	FTU	Eastern	Eastern	2,354	0	8,543	3.629	0.00
Asser FTSA	FTSA	Asir	Southern	33,208	14,033	100,043	3.013	42.26
Tabouk FTSA	FTSA	Tabuk	Northern	23,894	8,409	95,692	4.005	35.19
Jazan FTSA	FTSA	Jazan	Southern	42,067	22,858	124,776	2.966	54.34
Baha FTSA	FTSA	Al Baha	Southern	2,372	0	11,561	4.874	0.00
Hail FTU	FTU	Hail	Northern	6,797	0	19,557	2.877	0.00
Jouf FTU	FTU	Al Jouf	Northern	1,710	0	5,348	3.127	0.00
Najran FTU	FTU	Najran	Southern	9,147	0	16,951	1.853	0.00
Northern Borders FTU	FTU	Northern Borders	Northern	6,079	0	12,170	2.002	0.00
All FTSAs (10)	FTSA	—	—	469,211	139,198	1,870,129	3.986	29.67
All FTUs (7)	FTU	—	—	34,152	0	86,224	2.525	0.00

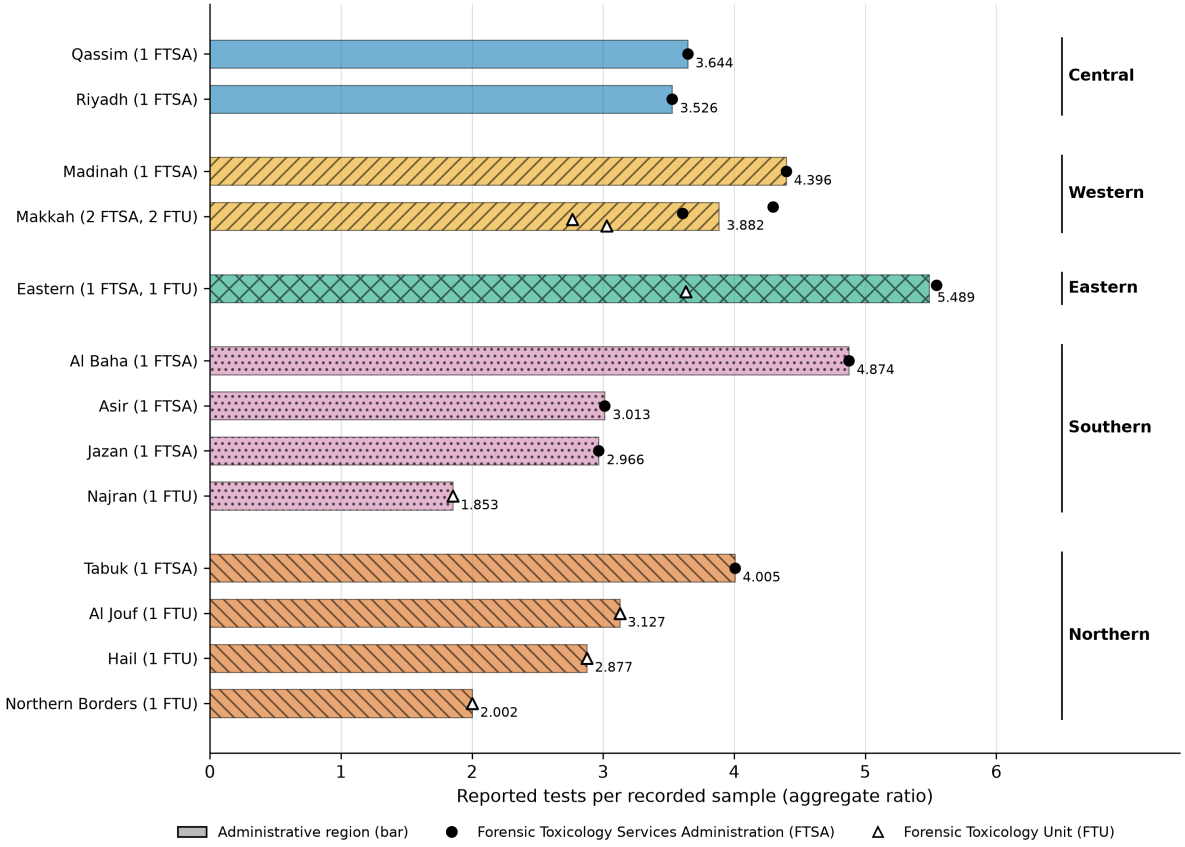
Notes. Facility labels are as given in the source; Makkah FTSA belongs to the Holy Capital branch. Biological samples = total samples − seized-item samples. Rows are ordered by region as in Table 2. Source: Ministry of Health Statistical Yearbook 2024, Table 4-58.

Table 4. Recorded forensic laboratory samples and tests by analytical region and facility type, 2024

Analytical region	Facilities	Total samples	Tests	Tests/sample	Seized-item share (%)	Tests/ sample, FTSAs only	Seized-item share, FTSAs only (%)
Central	2 FTSA	142,836	506,275	3.544	23.00	3.544	23.00
Western	3 FTSA, 2 FTU	152,322	608,801	3.997	22.95	4.056	24.24
Eastern	1 FTSA, 1 FTU	82,931	455,179	5.489	31.45	5.543	32.37
Southern	3 FTSA, 1 FTU	86,794	253,331	2.919	42.50	3.044	47.51
Northern	1 FTSA, 3 FTU	38,480	132,767	3.450	21.85	4.005	35.19

Notes. Analytical regions: Central (Riyadh, Qassim), Western (Makkah, Madinah), Eastern (Eastern), Southern (Asir, Jazan, Najran, Al Baha), Northern (Tabuk, Hail, Northern Borders, Al Jouf). Ratios and shares are computed from summed counts. The FTSA-only columns exclude the seven FTUs. Source: Ministry of Health Statistical Yearbook 2024, Table 4-58.

Figure 1. Reported tests per recorded sample by administrative region and reporting facility, Saudi Arabia, 2024.



Notes. Bars show administrative-region ratios grouped by analytical region; fill pattern distinguishes the groups in greyscale. Filled circles show FTSAs and open triangles FTUs. Ratios describe recorded services, not poisoning prevalence or laboratory quality. Source: Ministry of Health Statistical Yearbook 2024, Table 4-58.

Discussion

Meaning of the Western figures

The Western grouping recorded the largest test count of the five groupings, and its combined ratio conceals differences between and within its two regions. The facility view explains part of this: Makkah combines two administrations and two units with different ratios, whereas Madinah is a single administration. Among administrations only, the Madinah–Makkah difference narrows from 0.514 to 0.445 tests per sample, and the two Makkah administrations differ from each other by 0.690. The Western contrast is therefore partly a contrast between facilities rather than between regions.

Differences between facilities could reflect assay panels, confirmation policies, specimen mixtures, referral patterns, recording conventions or case complexity. The annual table does not distinguish among these explanations, and the differences are prompts for source interpretation rather than performance judgments.

The two facility types also differ in what they record. FTUs recorded only biological samples and fewer tests per sample than FTSAs (2.525 and 3.986). This pattern is consistent with seized-item analysis and broader testing being concentrated in the administrations, as in institutes where toxicology and seized-drug analyses are separate laboratory streams [9], but the yearbook does not define the functions of either facility type, and this interpretation needs confirmation from Ministry of Health service definitions. Groups and regions with more units, such as Northern with three units and one administration, can show lower ratios and seized-item shares through facility mix alone, so group comparisons are partly comparisons of facility mix.

Assay scope, matrices and the number of tests

Method-consolidation and multi-drug studies show that analytical scope and workflow can change without any change in the number of people investigated [10–12]. A panel may be counted as one test or as several analyte tests depending on the data dictionary, and a sample may undergo screening, confirmation and further targeted measurement; confirmatory testing extended to new analytes adds tests to samples already screened [13]. The ratio therefore needs a counting-definition audit, and no specific convention is attributed to any Saudi laboratory.

Specimen matrices also matter. Postmortem studies interpret concentrations in different fluids and tissues [22–24], and several specimens can come from one death, so biological-sample counts cannot be converted into fatal events, nor seized-item counts into products or incidents, without record-level links.

The ratio is thus neither a measure of positivity nor of laboratory effort: an automated broad panel and a complex targeted investigation contribute differently to a test total while requiring different resources. Throughput, turnaround and resources need their own measurements, as in national surveys of toxicology services [8], and analytical performance depends on validated method properties rather than count size [14,15].

Regional case literature and transfer of denominators

The Saudi case literature describes selected fatality populations and particular substances [1–4,6,7]. Its findings belong to their own inclusion rules, periods and matrices, and transferring an association, concentration distribution or case frequency into the yearbook denominator would change the study population without evidence; these studies are therefore cited as context only.

Captagon-related literature and regional forensic reviews address substances and institutions beyond this table [25,26], but they supply no case identifiers or resident denominators. With cross-regional referral and institutional specialization, the table shows where activity was recorded, not where exposures or investigations originated.

Coverage and geographical interpretation

The thirteen-region mapping makes the geographical basis of each total inspectable, and the facility rows show what each regional total contains. The five-group summary compresses within-group variation, as Makkah and Madinah illustrate, so local planning should rely on the regional and facility tables rather than the combined Western label.

The groups differ in the number of regions and facilities they contain, so a larger total may reflect the number and type of contributing facilities or referral patterns rather than a greater exposure burden. No population standardization was attempted: the table defines no catchment population, and a resident count would not resolve cross-boundary referral.

Contribution, reproducibility and limitations

The national totals of Table 4-58 are published in the yearbook, and the longitudinal analysis of Ministry of Health indicators did not include forensic laboratory data [16]. This article adds the regional and facility-level structure of the table: it shows that the recorded seized-item zeros coincide with the units, that regional and group ratios partly reflect facility mix, and that the Western figures combine facilities with different ratios. Other tables of the same yearbook are analysed in separate submissions; none uses Table 4-58.

The workbook digest, source-row export, facility-to-region mapping, code and unrounded result files (Supplementary Material S1) allow the reconstruction to be repeated on the same workbook, and the national reconciliation guards against dropped or double-counted rows. These checks show that the transformation is reviewable, not that the original reporting has been externally validated.

STROBE and RECORD guided the reporting [17,18]; items requiring patient-level linkage or confounding control are reported as not applicable rather than filled with procedures that were not performed.

Several limitations bound the interpretation. The source covers one year and cannot show trends. Tests are not linked to samples, preventing a per-sample distribution, and sample type and assay type are not cross-tabulated. The yearbook does not define the functions, staffing or analytical scope of FTSAs and FTUs. Facility counts do not measure staff, equipment, opening hours or validated scope, and the data contain no positivity, turnaround times or quality indicators.

Operational questions for additional data

A useful follow-up would obtain a source-approved dictionary defining a test, panel, specimen and submission, the functions of FTSAs and FTUs and referral between them, together with anonymous linkage among these units. This would show whether a submission generates several samples, whether a panel counts as one or several tests and whether sample and test counts share a period boundary.

Turnaround times, assay mix, staff hours, equipment and referral origins would describe operations; validated performance criteria and external quality evidence would be needed for quality; and a case definition, results, episode identification and catchment denominators would be needed for exposure or

poisoning. Keeping these questions separate prevents a testing-activity indicator from substituting for a quality or prevalence endpoint.

Conclusions

The 2024 Ministry of Health table records 608,801 tests relative to 152,322 samples in the Western analytical grouping, or 3.997 reported tests per recorded sample. The combined value includes different patterns in Makkah and Madinah, and the Makkah figure combines administrations and units with different ratios. Facility type accounts for the recorded zero seized-item counts and part of the regional variation, so regional and group comparisons should be read with the facility mix in view. The results support operational questions about sample composition, assay scope, facility roles and reporting rules. They cannot establish poisoning prevalence, unique-person burden, laboratory quality or efficiency.

Declarations

Ethics statement: This study analysed published aggregate administrative records from the Ministry of Health Statistical Yearbook 2024 [19]; it involved no participants, no new clinical observations and no identifiable individual records. As a secondary analysis of publicly available data, the study was exempt from ethics review.

Data and code availability: The source workbook is publicly available [19]. The source-row export, facility-to-region mapping, unrounded result files and the Python scripts that reproduce all reported values and Figure 1 are provided as Supplementary Material S1.

Related submissions: Analyses of other tables of the same 2024 yearbook have been submitted separately to this journal and are listed in the cover letter; they concern different services, and none uses Table 4-58.

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Conflicts of interest: The authors declare no competing interests.

Author contributions: [Pending: CRediT author contributions and confirmation that all authors approved the final version — to be supplied by the authors]

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Abbreviations

Abbreviations. FTSA, Forensic Toxicology Services Administration; FTU, Forensic Toxicology Unit; RECORD, REporting of studies Conducted using Observational Routinely-collected health Data; SHA256, Secure Hash Algorithm 256-bit; STROBE, Strengthening the Reporting of Observational Studies in Epidemiology.

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