

# MRF Quality Report

s3://talon-storage-private/mrf-feed-uploads/2025-11/FP\_in-network-rates\_1.json

Size: 952.00 MB • MD5: 072a1dd65531aaa388b51b0eca713cb3

Payer: **FrontPath** • File Date: **2025-10-24** • Generated: **2026-04-24 23:16 EDT** • Tool Version: **1.0.0** • Elapsed: **391.00s**

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**65.0**

**Limited Reliability**

score capped at 65.0 — CMS official schema validation failed (see meta for details)

Errors: 3 • Warnings: 5 • Info: 1

## CMS Official Schema Validation

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**FAILED** (exit code 1) — File does not conform to the CMS schema.

Validator output:

```
error Could not find a schema version named "1.0.0". Available versions are:  
v2.0.0  
v0.1  
v0.2  
v0.3  
v0.3.1  
v0.3.2  
v0.4.0  
v0.4.1  
v0.5.0  
v0.5.3  
v0.7.0  
v0.8.0  
v0.8.1  
v0.9.0  
v0.9.1  
v0.10.0  
v0.10.1  
v0.11.0  
v0.12.0  
v0.13.0  
v1.0.0  
v0.10.3  
v1.0.4  
v1.0.6  
v1.0.7  
v1.1.0  
v1.1.1  
v1.1.2  
v1.2.0  
v1.3.0  
v1.3.1  
v1.3.2  
v1.3.3  
v1.4.0  
v1.5.0  
v1.6.0  
v1.6.1  
v1.6.2  
v2.0.1  
v2.1.0  
v2.2.0  
v2.2.1
```

# Dimension Scores

Dimension	Score	Weight	Findings
Schema Integrity	70.0	30%	2
Provider Mapping	100.0	15%	0
Code Coverage	70.0	15%	2
Pricing Sanity	69.3	40%	5

## Schema Integrity — Findings

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Score: 70.0

**ERROR** `file_freshness`

File is 182 days old (last\_updated\_on exceeds the 90-day threshold)

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**ERROR** `cms_schema_validation`

CMS official schema validator FAILED (exit code 1). File does not conform to the TIC in-network-rates schema.

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# Code Coverage — Findings

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Score: 70.0

**WARNING** `billing_code_format`

75332 CPT codes do not match expected format

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**WARNING** `duplicate_billing_codes`

17476 billing codes appear in more than one `in_network` item (96.2%)

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## Pricing Sanity — Findings

Score: 69.3

**INFO** `percentage_rates`

173 percentage rates (0.0%) — values represent % of a reference rate, not dollar amounts; excluded from spread analysis

**ERROR** `zero_rates`

1870 zero-dollar rates (0.23%) — CMS schema requires `negotiated_rate > 0` (exclusiveMinimum)

**WARNING** `rate_spread_by_class`

`billing_class='institutional' / negotiated_type='negotiated'`: P95/P50 spread is 12.5x (threshold: 10x, N=63,373 (1,000 sampled), high confidence)

**WARNING** `rate_spread_by_class`

`billing_class='professional' / negotiated_type='fee schedule'`: P95/P50 spread is 13.8x (threshold: 5x, N=743,377 (1,000 sampled), high confidence)

**WARNING** `per_code_rate_spread`

183583 rate contexts have a max/min ratio exceeding the type-specific threshold (20x professional / 50x facility, min 3 occurrences required). Each context is a unique combination of all 10 rate-key dimensions. n= shows how many distinct provider rates exist for that exact context.

Code	Code Type	Neg. Type	Billing Class	Arrangement	Setting	Min	Median	Mean	Max	Ratio	n
J0461	CPT	fee schedule	professional	ffs	—	\$0.02	\$8883.19	\$9666.98	\$20901.50	1045075.0x	4
J0461	CPT	fee schedule	professional	ffs	—	\$0.02	\$8883.19	\$9666.98	\$20901.50	1045075.0x	4
J0461	CPT	fee schedule	professional	ffs	—	\$0.02	\$8883.19	\$9666.98	\$20901.50	1045075.0x	4
J0461	CPT	fee schedule	professional	ffs	—	\$0.02	\$8883.19	\$9666.98	\$20901.50	1045075.0x	4
J0461	CPT	fee schedule	professional	ffs	—	\$0.02	\$8883.19	\$9666.98	\$20901.50	1045075.0x	4
J0461	CPT	fee schedule	professional	ffs	—	\$0.02	\$8883.19	\$9666.98	\$20901.50	1045075.0x	4
J0461	CPT	fee schedule	professional	ffs	—	\$0.02	\$8883.19	\$9666.98	\$20901.50	1045075.0x	4
J0461	CPT	fee schedule	professional	ffs	—	\$0.02	\$8883.19	\$9666.98	\$20901.50	1045075.0x	4
J0461	CPT	fee schedule	professional	ffs	—	\$0.02	\$8883.19	\$9666.98	\$20901.50	1045075.0x	4
J0461	CPT	fee schedule	professional	ffs	—	\$0.02	\$8883.19	\$9666.98	\$20901.50	1045075.0x	4

## Recommended Actions

1. **schema** `file_freshness`

**P1**

File is 182 days old (`last_updated_on` exceeds the 90-day threshold)

2. **schema** cms\_schema\_validation

P1

CMS official schema validator FAILED (exit code 1). File does not conform to the TIC in-network-rates schema.

3. **pricing** zero\_rates

P1

1870 zero-dollar rates (0.23%) — CMS schema requires negotiated\_rate > 0 (exclusiveMinimum)

4. **pricing** rate\_spread\_by\_class

P2

billing\_class='institutional' / negotiated\_type='negotiated': P95/P50 spread is 12.5x (threshold: 10x, N=63,373 (1,000 sampled), high confidence)

5. **pricing** rate\_spread\_by\_class

P2

billing\_class='professional' / negotiated\_type='fee schedule': P95/P50 spread is 13.8x (threshold: 5x, N=743,377 (1,000 sampled), high confidence)

6. **pricing** per\_code\_rate\_spread

P2

183583 rate contexts have a max/min ratio exceeding the type-specific threshold (20x professional / 50x facility, min 3 occurrences required). Each context is a unique combination of all 10 rate-key dimensions. n= shows how many distinct provider rates exist for that exact context.

7. **code\_coverage** billing\_code\_format

P3

75332 CPT codes do not match expected format

8. **code\_coverage** duplicate\_billing\_codes

P3

17476 billing codes appear in more than one in\_network item (96.2%)

## Provider Geographic Coverage

0 unique NPIs found — 0 geocoded (0%) — 0 zip codes represented.

## Schema Integrity — Metrics

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header_missing_fields		
header_conditional_issues		
file_age_days	182	
items_total	772880	
items_missing_required_pct	0.0	
items_empty_rates	0	
prices_total	806931	
prices_missing_required_pct	0.0	
prices_missing_field_breakdown		
prices_missing_service_code	0	
prices_invalid_billing_class	0	
rates_without_providers	0	
negotiation_arrangements	ffs	772880
billing_code_types	CPT	766682
	MS-DRG	6120
	RC	78
expired_prices	0	
invalid_expiration_format	0	

## Provider Mapping — Metrics

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provider_references_in_file	121
provider_group_ids_referenced	121
unresolved_references	0
resolution_rate_pct	100.0
npis_validated	0
invalid_npi_count	0
npi_validity_rate_pct	None
invalid_npi_examples	

eins_validated	0
invalid_ein_count	0
ein_validity_rate_pct	None
invalid_ein_examples	
empty_npi_groups	0
groups_without_tin	0
npi_in_multiple_groups	0

## Code Coverage — Metrics

unique_codes_total	18174	
duplicate_codes	17476	
duplicate_pct	96.16	
by_code_type	CPT	17386
	MS-DRG	765
	RC	23
unknown_code_types		
format_invalid_by_type	CPT	75332
codes_not_in_reference	reference_not_loaded	

most_frequent_codes	Type	Code	Occurrences
	CPT	85576	205
	CPT	95819	170
	CPT	95816	170
	CPT	95813	170
	CPT	73610	169
	CPT	73080	169
	CPT	73630	169
	CPT	72110	169
	CPT	72100	169
	CPT	72020	169
	CPT	73110	169
	CPT	72120	169
	CPT	72040	169
	CPT	73120	169
	CPT	73562	169
	CPT	72170	169
	CPT	72070	169
	CPT	73590	169
	CPT	76942	168
	CPT	77003	168

## Pricing Sanity — Metrics

total_prices_checked	806931
total_rates	806758
per_diem_rates	0
percentage_rates	173
negative_rates	0
zero_rates	1870
extreme_high_rates	77
extreme_low_rates	0

<b>rate_distribution</b>	<b>sample_n</b>	806758
	<b>sample_k</b>	5000
	<b>confidence</b>	high
	<b>p5</b>	8.4195
	<b>p25</b>	43.3475
	<b>p50</b>	232.985
	<b>p75</b>	955.09
	<b>p95</b>	3103.135500000001
	<b>p99</b>	8325.133800000014

<b>by_billing_class</b>	<b>Class / Type</b>	<b>Count</b>	<b>Median</b>	<b>p25</b>	<b>p75</b>	<b>p95</b>	<b>Confidence</b>
	institutional/ negotiated	63,373	1558.8	1042.2	3613.8	19500.0	high
	professional/ fee schedule	743,377	179.6	36.0	712.0	2478.7	high
	professional/ negotiated	8	90.0	43.0	90.0	96.5	low

<b>negotiated_types</b>	<b>negotiated</b>	63381
	<b>fee schedule</b>	743377

<b>unique_rate_contexts</b>	1786981
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<b>rate_key_dimension_validity</b>	<b>invalid_negotiated_type</b>	0
	<b>invalid_negotiated_types_seen</b>	{}
	<b>invalid_setting</b>	0
	<b>invalid_settings_seen</b>	{}
	<b>invalid_severity_of_illness</b>	0
	<b>severity_on_non_apr_drg</b>	0
	<b>institutional_with_service_codes</b>	0
	<b>invalid_service_code_format</b>	0
	<b>billing_code_modifier_too_long</b>	0

# Scoring Methodology

Embedded in this report at generation time.

## Overall Score

Weighted sum of four structural dimensions, normalized to a 0–100 scale.

Normalized Weights		
	Schema Integrity	30%
	Provider Mapping	15%
	Code Coverage	15%
	Pricing Sanity	40%

  

Confidence Bands		
	High	≥90
	Usable With Caution	≥75
	Limited Reliability	≥60
	Not Usable	<60

  

Score Caps		
	Raw Json Errors Only → 74.0	Native JSON syntax errors in the unpatched source file. File must be re-exported by the payer; scoring reflects auto-patched data only.
	Cms Validation Failure Only → 65.0	CMS official schema validator reports the file does not conform to the TIC spec.
	Both Raw Json Errors And Cms Failure → 59.0	Both native JSON syntax errors and CMS schema validation failure present.

## Rate Context Key — 14-Tuple Field Coverage

Every rate in a CMS TIC MRF file is described by a 14-field tuple. Fields 1–10 form the rate-context key used to group and compare rates across the system. Fields 11–12 (provider, expiration date) are validated separately and excluded from the grouping key for analytical reasons. Each of the four scoring dimensions validates a distinct slice of this tuple — together they cover all 14 fields.

Field	Validated by
1 billing_code_type	Schema (required field) + Code Coverage (enum + format validation)
2 billing_code_type_version	Schema (required field)
3 billing_code	Schema (required field) + Code Coverage (format, duplicates, reference lookup)
4 billing_code_modifier	Pricing (modifier length, key normalization)
5 service_code	Pricing (POS format, normalization, institutional-class check)
6 negotiated_type	Pricing (CMS TIC enum validation)
7 billing_class	Schema (CMS TIC enum validation) + Pricing (spread thresholds)
8 negotiation_arrangement	Schema (CMS TIC enum validation) + Pricing (FFS vs bundle/capitation gating)
9 severity_of_illness	Pricing (APR-DRG only, valid values 1–4)

Field	Validated by
10 setting	Pricing (CMS TIC enum validation)
11 provider (NPI/EIN)	Provider Mapping (Luhn checksum, IRS prefix, group resolution) — excluded from grouping key
12 expiration_date	Schema (date validity, far-future sanity) — excluded from grouping key
13 additional_generic_notes	not validated (free-text)
14 negotiated_rate	Pricing (negative/zero/extreme-value checks, spread analysis)

- Fields 1–10 are the grouping key. Each unique combination is a distinct rate context — rates with different modifiers, POS codes, or arrangements land in separate buckets and are never compared against each other.
- Provider (field 11) is excluded from the key: the spread check is cross-provider by design. Partitioning by provider produces singleton buckets and eliminates the spread signal.
- Expiration date (field 12) is excluded because it is a contract lifecycle attribute, not a clinical context. Rates for the same service should be comparable regardless of when they expire.
- service\_code (field 5) arrays are flattened and normalized before keying: '1' → '01', and a rate with ['11','22'] contributes to both the '11' and '22' buckets so rates are compared apples-to-apples by place of service.

## Schema Integrity

Validates required fields, enum values, conditional requirements, and date validity per the CMS TIC in-network-rates schema. Also checks file freshness and expiration date sanity.

**Method:** Penalty-based deductions from 100, capped per category.

per_missing_required_header_field	5
per_header_conditional_issue	2
freshness_warn	5
freshness_error	10
item_missing_fields_pct	×5 (cap 30)
empty_rates_pct	×0.5 (cap 5)
price_missing_fields_pct	×10 (cap 30)
rates_without_providers_rate	×200 (cap 20)
expired_prices_pct	×0.5 (cap 5)
file freshness warn days	45
file freshness error days	90
expiry far future years	3

## Provider Mapping

Verifies that all provider\_group\_id references in in\_network items resolve to an entry in the provider\_references array. Validates NPI integrity via Luhn checksum and EIN integrity via IRS-issued 2-digit prefix.

**Method:** Weighted component sum (not purely penalty-based).

<b>provider_resolution (60%)</b>	$\text{resolution\_rate\%} \times 0.60$
<b>npi_validity (30%)</b>	$(100 - \text{invalid\_npi\_pct} \times 5) \times 0.30$
<b>ein_validity (10%)</b>	$10 - (\text{invalid\_ein\_pct} \times 0.1)$ [0% invalid → 10 pts, 100% invalid → 0 pts, linear]

## Code Coverage

Tracks every (billing\_code\_type, billing\_code) pair and flags unrecognized CMS TIC code types, format violations for CPT/HCCPS/NDC, and duplicates (same code appearing in multiple in\_network items).

**Method:** Penalty-based deductions from 100.

<b>per_unknown_code_type</b>	3 pts each (cap 20)
<b>format_invalid_pct</b>	$\times 0.5$ (cap 10)
<b>duplicate_code_pct</b>	$\times 2$ (cap 20)
<b>codes_not_in_reference_pct</b>	$\times 0.5$ (cap 30) — only when reference set is loaded

## Pricing Sanity

Detects invalid rates (negative, zero, extreme-value) and distribution anomalies (per-class P95/P50 spread, per-code max/min ratio, flat-rate distributions). Exact counts are used for all validity checks (negative, zero, extreme, dimension validity). Percentile-based checks (spread, IQR) use reservoir sampling —  $k=5\,000$  global,  $k=1\,000$  per (billing\_class, negotiated\_type) bucket — so memory stays bounded on large files. Per-code max/min spread is exact (all rates seen, no sampling).

**Method:** Penalty-based deductions from 100.

<b>negative_rate_pct</b>	$\times 5$ (cap 20)
<b>zero_rate_pct</b>	$\times 3$ (cap 15)
<b>extreme_rate_pct</b>	$\times 5$ (cap 25) — ffs only
<b>class_spread_excess</b>	$(\text{spread} - \text{threshold}) \times 2$ , max across (billing_class, negotiated_type) buckets (cap 15)
<b>per_code_high_spread_count</b>	$\times 0.1$ (cap 15)
<b>invalid_negotiated_type_pct</b>	$\times 3$ (cap 10) — rates silently dropped
<b>invalid_setting_pct</b>	$\times 1$ (cap 5) — silently defaults to wildcard
<b>invalid_severity_pct</b>	$\times 1$ (cap 5) — silently normalised to ''
<b>institutional_with_service_codes_pct</b>	$\times 1$ (cap 5) — extra key variation
<b>invalid_service_code_pct</b>	$\times 2$ (cap 5) — encode raises ValueError
<b>extreme high by billing class</b>	professional: 25000.0, institutional: 2000000.0, both: 2000000.0, default: 500000.0

<b>extreme low</b>	0.01
<b>spread warn p95 over p50 by class</b>	professional: 5, institutional: 10, both: 10, default: 5
<b>per rate context max min ratio</b>	professional_codes: 20, facility_drg_codes: 50
<b>flat rate iqr p75 threshold pct</b>	5.0
<b>flat rate min rates to check</b>	100
<b>spread min n to flag</b>	50
<b>per code min n to flag</b>	3

## Dashboard: MRF Identity Key

(ingest-time — not stored in report JSON)

The dashboard assigns a persistent `mrf_key` to each MRF so that all validation runs of the same file are grouped together in the score-history view, even if the payer re-exports the file at a new URL.

<b>Tier 1 — entity + plan_id</b>	Used when both <code>reporting_entity_name</code> and <code>plan_id</code> are present. Key input: <code>plan &lt;entity&gt; &lt;plan_id_type&gt; &lt;plan_id&gt;</code> . Stable across monthly re-exports.
<b>Tier 2 — URL hash</b>	Fallback when <code>plan_id</code> is absent. Key input: the raw file location URL/path. Entity name alone is not used — a payer publishes multiple distinct plans under the same entity name and without <code>plan_id</code> they cannot be safely distinguished. A URL change produces a different key.

The key is a 16-character MD5 hex digest of the input string (case-insensitive, whitespace-stripped). **This run:** `mrf_key = 0672c48ec3767cc2 · entity = FrontPath · tier = 2 (URL hash)`

## Provider Geographic Coverage

(supplemental — does not affect score)

Geographic analysis is a supplemental feature computed on demand after scoring completes. It does not affect any scoring dimension — it is an observational overlay to assess the breadth and distribution of in-network providers.

<b>NPPES</b>	CMS National Plan and Provider Enumeration System — monthly full-replacement CSV. Maps each NPI to its primary registered ZIP code.
<b>ZCTA centroids</b>	GeoNames US postal code file. Maps each 5-digit ZIP to a (latitude, longitude) centroid for map placement.

**Process:** Extract all NPIs from the MRF file → resolve each NPI to its primary practice ZIP via NPPES → aggregate provider count per ZIP → map each ZIP to a lat/lon centroid via ZCTA → render as a weighted heatmap (intensity ∝ provider count per ZIP).

**Limitations:** NPIs absent from NPPES (recently issued, test NPIs, EINs) are excluded and reduce the geocoding match rate. Location reflects the provider's NPPES-registered primary address, not necessarily where they accept this specific plan. Map viewport covers the bounding box of ZIP codes representing 90% of total provider count, dropping sparse geographic outliers.