

# MRF Quality Report

s3://talon-storage-private/mrf-feed-uploads/2026-02/2026-02-02\_AllianceTrilogy\_in-network\_rates.json  
Size: 529.47 MB • MD5: a3b6c4b931472005f545ff2508d66842

Payer: **Trilogy Health Solutions** • File Date: **2026-02-02** • Generated: **2026-04-24 12:11 EDT** • Tool Version: **1.0.0** • Elapsed: **117.30s**

# 65.0

Limited Reliability

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

Errors: 2 • Warnings: 6 • Info: 4

## TOC Plan References

TOC: s3://talon-storage-private/mrf-feed-uploads/2026-02/2026-02\_plan\_ref\_6d4c20146456785061f8aadd1a445695\_index.json • Talon

Canonical: s3://talon-storage-private/mrf-feed-uploads/2026-02/2026-02-02\_AllianceTrilogy\_in-network\_rates.json

Plan Name	Plan ID	Issuer / Sponsor	Market
ALLIANCE - TRILOGY HEALTH SOLUTIONS	123456789 (custom)	—	—

# CMS Official Schema Validation

---

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

Validator output (truncated at 200 lines):

```
warn Schema version v2.1.0 was provided, but file indicates it conforms to schema version 2.1.0. v2.1.0
will be used.
info Running validator container...
info Input JSON is invalid.
Invalid schema: #
Invalid keyword: errors
Invalid code: -1
Invalid message: One or more validation errors have occurred
Invalid document: #
Error report:
{
  "oneOf": [
    {
      "errors": [
        {
          "pattern": {
            "actual": "59",
            "errorCode": 8,
            "instanceRef": "#/in_network/401/negotiated_rates/0/negotiated_prices/0/
service_code/23",
            "schemaRef": "#/definitions/negotiated_price/properties/service_code/oneOf/0/items"
          }
        },
        {
          "pattern": {
            "actual": "01",
            "errorCode": 8,
            "instanceRef": "#/in_network/401/negotiated_rates/0/negotiated_prices/0/
service_code/0",
            "schemaRef": "#/definitions/negotiated_price/properties/service_code/oneOf/1/items"
          }
        }
      ],
      "errorCode": 21,
      "instanceRef": "#/in_network/401/negotiated_rates/0/negotiated_prices/0/service_code",
      "schemaRef": "#/definitions/negotiated_price/properties/service_code"
    },
    {
      "errors": [
        {
          "pattern": {
            "actual": "59",
            "errorCode": 8,
            "instanceRef": "#/in_network/401/negotiated_rates/2/negotiated_prices/0/
service_code/23",
            "schemaRef": "#/definitions/negotiated_price/properties/service_code/oneOf/0/items"
          }
        },
        {
          "pattern": {
            "actual": "01",
            "errorCode": 8,
            "instanceRef": "#/in_network/401/negotiated_rates/2/negotiated_prices/0/
service_code/0",
            "schemaRef": "#/definitions/negotiated_price/properties/service_code/oneOf/1/items"
          }
        }
      ]
    }
  ]
}
```

```

    }
  },
  "errorCode": 21,
  "instanceRef": "#/in_network/401/negotiated_rates/2/negotiated_prices/0/service_code",
  "schemaRef": "#/definitions/negotiated_price/properties/service_code"
},
{
  "errors": [
    {
      "pattern": {
        "actual": "59",
        "errorCode": 8,
        "instanceRef": "#/in_network/401/negotiated_rates/4/negotiated_prices/1/
service_code/23",
        "schemaRef": "#/definitions/negotiated_price/properties/service_code/oneOf/0/items"
      }
    },
    {
      "pattern": {
        "actual": "01",
        "errorCode": 8,
        "instanceRef": "#/in_network/401/negotiated_rates/4/negotiated_prices/1/
service_code/0",
        "schemaRef": "#/definitions/negotiated_price/properties/service_code/oneOf/1/items"
      }
    }
  ],
  "errorCode": 21,
  "instanceRef": "#/in_network/401/negotiated_rates/4/negotiated_prices/1/service_code",
  "schemaRef": "#/definitions/negotiated_price/properties/service_code"
},
{
  "errors": [
    {
      "pattern": {
        "actual": "59",
        "errorCode": 8,
        "instanceRef": "#/in_network/401/negotiated_rates/7/negotiated_prices/0/
service_code/23",
        "schemaRef": "#/definitions/negotiated_price/properties/service_code/oneOf/0/items"
      }
    },
    {
      "pattern": {
        "actual": "01",
        "errorCode": 8,
        "instanceRef": "#/in_network/401/negotiated_rates/7/negotiated_prices/0/
service_code/0",
        "schemaRef": "#/definitions/negotiated_price/properties/service_code/oneOf/1/items"
      }
    }
  ],
  "errorCode": 21,
  "instanceRef": "#/in_network/401/negotiated_rates/7/negotiated_prices/0/service_code",
  "schemaRef": "#/definitions/negotiated_price/properties/service_code"
},
{
  "errors": [
    {

```

```

        "pattern": {
            "actual": "59",
            "errorCode": 8,
            "instanceRef": "#/in_network/401/negotiated_rates/9/negotiated_prices/0/
service_code/23",
            "schemaRef": "#/definitions/negotiated_price/properties/service_code/oneOf/0/items"
        }
    },
    {
        "pattern": {
            "actual": "01",
            "errorCode": 8,
            "instanceRef": "#/in_network/401/negotiated_rates/9/negotiated_prices/0/
service_code/0",
            "schemaRef": "#/definitions/negotiated_price/properties/service_code/oneOf/1/items"
        }
    }
],
"errorCode": 21,
"instanceRef": "#/in_network/401/negotiated_rates/9/negotiated_prices/0/service_code",
"schemaRef": "#/definitions/negotiated_price/properties/service_code"
},
{
    "errors": [
        {
            "pattern": {
                "actual": "59",
                "errorCode": 8,
                "instanceRef": "#/in_network/401/negotiated_rates/10/negotiated_prices/0/
service_code/23",
                "schemaRef": "#/definitions/negotiated_price/properties/service_code/oneOf/0/items"
            }
        },
        {
            "pattern": {
                "actual": "01",
                "errorCode": 8,
                "instanceRef": "#/in_network/401/negotiated_rates/10/negotiated_prices/0/
service_code/0",
                "schemaRef": "#/definitions/negotiated_price/properties/service_code/oneOf/1/items"
            }
        }
    ],
    "errorCode": 21,
    "instanceRef": "#/in_network/401/negotiated_rates/10/negotiated_prices/0/service_code",
    "schemaRef": "#/definitions/negotiated_price/properties/service_code"
},
{
    "errors": [
        {
            "pattern": {
                "actual": "59",
                "errorCode": 8,
                "instanceRef": "#/in_network/401/negotiated_rates/12/negotiated_prices/0/
service_code/23",
                "schemaRef": "#/definitions/negotiated_price/properties/service_code/oneOf/0/items"
            }
        },
        {
            "pattern": {

```

```

        "actual": "01",
        "errorCode": 8,
        "instanceRef": "#/in_network/401/negotiated_rates/12/negotiated_prices/0/
service_code/0",
        "schemaRef": "#/definitions/negotiated_price/properties/service_code/oneOf/1/items"
    }
}
],
"errorCode": 21,
"instanceRef": "#/in_network/401/negotiated_rates/12/negotiated_prices/0/service_code",
"schemaRef": "#/definitions/negotiated_price/properties/service_code"
},
{
    "errors": [
        {
            "pattern": {
                "actual": "59",
                "errorCode": 8,
                "instanceRef": "#/in_network/401/negotiated_rates/17/negotiated_prices/0/
service_code/23",
                "schemaRef": "#/definitions/negotiated_price/properties/service_code/oneOf/0/items"
            }
        },
        {
            "pattern": {
                "actual": "01",
                "errorCode": 8,
                "instanceRef": "#/in_network/401/negotiated_rates/17/negotiated_prices/0/
service_code/0",
                "schemaRef": "#/definitions/negotiated_price/properties/service_code/oneOf/1/items"
            }
        }
    ],
    "errorCode": 21,
    "instanceRef": "#/in_network/401/negotiated_rates/17/negotiated_prices/0/service_code",
    "schemaRef": "#/definitions/negotiated_price/properties/service_code"
},
{
    "errors": [
        {
            "pattern": {
                "actual": "59",

```

... (truncated)

## Dimension Scores

Dimension	Score	Weight	Findings
Schema Integrity	70.0	30%	4
Provider Mapping	100.0	15%	1
Code Coverage	98.3	15%	1
Pricing Sanity	67.9	40%	6

## Schema Integrity — Findings

---

Score: 70.0

**WARNING** `file_freshness`

File is 81 days old (last\_updated\_on exceeds the 45-day threshold)

---

**WARNING** `expired_prices`

64130 negotiated\_prices have past expiration dates (5.7%)

---

**INFO** `far_future_expiration`

37326 expiration\_dates are more than 3 years in the future

---

**ERROR** `cms_schema_validation`

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

---

# Provider Mapping — Findings

---

Score: 100.0

**INFO** `duplicate_npis`

3358 NPIs appear in more than one provider group

---

# Code Coverage — Findings

---

Score: 98.3

**WARNING** `billing_code_format`

515 CPT codes do not match expected format

---

## Pricing Sanity — Findings

Score: 67.9

### INFO per\_diem\_rates

176 per-diem rates (0.0%) — not dollar amounts; excluded from spread analysis

### INFO percentage\_rates

826 percentage rates (0.1%) — values represent % of a reference rate, not dollar amounts; excluded from spread analysis

### ERROR zero\_rates

6882 zero-dollar rates (0.61%) — CMS schema requires negotiated\_rate > 0 (exclusiveMinimum)

### WARNING rate\_spread\_by\_class

billing\_class='institutional' / negotiated\_type='fee schedule': P95/P50 spread is 11.1x (threshold: 10x, N=273,522 (1,000 sampled), high confidence)

### WARNING rate\_spread\_by\_class

billing\_class='professional' / negotiated\_type='fee schedule': P95/P50 spread is 12.7x (threshold: 5x, N=846,939 (1,000 sampled), high confidence)

### WARNING per\_code\_rate\_spread

23456 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
E0986	HCPCS	fee schedule	institutional	ffs	both	\$0.05	\$3826.78	\$4642.62	\$17286.01	345720.2x	17
E1010	HCPCS	fee schedule	institutional	ffs	both	\$0.02	\$1121.60	\$1415.69	\$5419.54	270977.0x	18
20697	CPT	fee schedule	institutional	ffs	both	\$1.41	\$2689.97	\$16284.89	\$178923.42	126896.0x	13
E1004	HCPCS	fee schedule	institutional	ffs	both	\$0.24	\$4869.04	\$5965.63	\$23070.66	96127.8x	19
91112	CPT	fee schedule	institutional	ffs	both	\$0.94	\$1787.47	\$9158.84	\$76941.47	81852.6x	10
E1230	HCPCS	fee schedule	institutional	ffs	both	\$0.12	\$1994.87	\$2310.06	\$8475.79	70631.6x	23
91111	CPT	fee schedule	institutional	ffs	both	\$0.47	\$1129.25	\$3469.79	\$28326.57	60269.3x	11
J9263	HCPCS	fee schedule	institutional	ffs	both	\$0.05	\$8.77	\$562.81	\$2868.87	57377.4x	9
E1700	HCPCS	fee schedule	institutional	ffs	both	\$0.02	\$230.60	\$279.77	\$1041.67	52083.5x	17
J8540	HCPCS	fee schedule	institutional	ffs	both	\$0.01	\$0.25	\$120.54	\$481.89	48189.0x	7

## Recommended Actions

1. **schema** cms\_schema\_validation

P1

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

2. **pricing** zero\_rates

P1

6882 zero-dollar rates (0.61%) — CMS schema requires negotiated\_rate > 0 (exclusiveMinimum)

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

P2

billing\_class='institutional' / negotiated\_type='fee schedule': P95/P50 spread is 11.1x (threshold: 10x, N=273,522 (1,000 sampled), high confidence)

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

P2

billing\_class='professional' / negotiated\_type='fee schedule': P95/P50 spread is 12.7x (threshold: 5x, N=846,939 (1,000 sampled), high confidence)

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

P2

23456 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.

6. **schema** file\_freshness

P2

File is 81 days old (last\_updated\_on exceeds the 45-day threshold)

7. **schema** expired\_prices

P2

64130 negotiated\_prices have past expiration dates (5.7%)

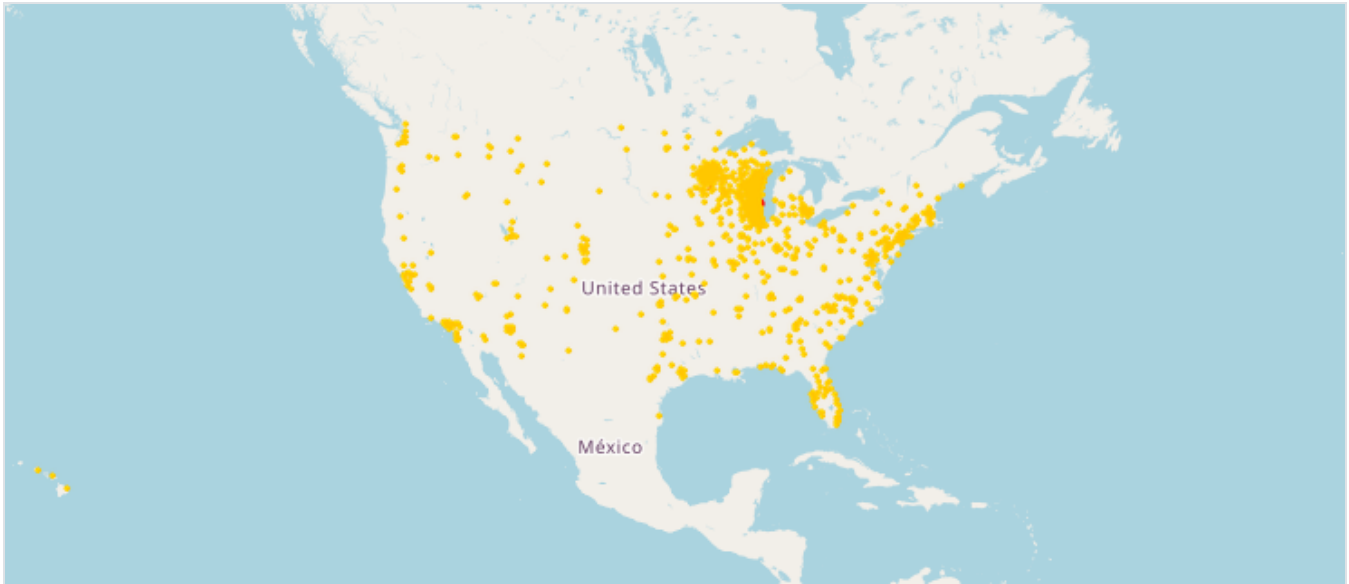
8. **code\_coverage** billing\_code\_format

P3

515 CPT codes do not match expected format

## Provider Geographic Coverage

17442 unique NPIs found — 17422 geocoded (100%) — 1374 zip codes represented.



## Schema Integrity — Metrics

header_missing_fields		
header_conditional_issues		
file_age_days	81	
items_total	14751	
items_missing_required_pct	0.0	
items_empty_rates	0	
prices_total	1121463	
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	14751

billing_code_types	CPT	9771
	CSTM-ALL	1
	HCPCS	4121
	MS-DRG	736
	RC	122
expired_prices	64130	
invalid_expiration_format	0	

## Provider Mapping — Metrics

---

provider_references_in_file	370
provider_group_ids_referenced	370
unresolved_references	0
resolution_rate_pct	100.0
npis_validated	21647
invalid_npi_count	0
npi_validity_rate_pct	100.0
invalid_npi_examples	
eins_validated	1184
invalid_ein_count	0
ein_validity_rate_pct	100.0
invalid_ein_examples	
empty_npi_groups	0
groups_without_tin	0
npis_in_multiple_groups	3358

## Code Coverage — Metrics

---

unique_codes_total	14751
duplicate_codes	0
duplicate_pct	0.0

by_code_type	CPT	9771																																																																
	CSTM-ALL	1																																																																
	HCPCS	4121																																																																
	MS-DRG	736																																																																
	RC	122																																																																
unknown_code_types																																																																		
format_invalid_by_type	CPT	515																																																																
codes_not_in_reference	reference_not_loaded																																																																	
most_frequent_codes	<table border="1"> <thead> <tr> <th>Type</th> <th>Code</th> <th>Occurrences</th> </tr> </thead> <tbody> <tr><td>CPT</td><td>0001A</td><td>1</td></tr> <tr><td>CPT</td><td>0001U</td><td>1</td></tr> <tr><td>CPT</td><td>0002A</td><td>1</td></tr> <tr><td>CPT</td><td>0002M</td><td>1</td></tr> <tr><td>CPT</td><td>0002U</td><td>1</td></tr> <tr><td>CPT</td><td>0003M</td><td>1</td></tr> <tr><td>CPT</td><td>0003U</td><td>1</td></tr> <tr><td>CPT</td><td>0004M</td><td>1</td></tr> <tr><td>CPT</td><td>0005U</td><td>1</td></tr> <tr><td>CPT</td><td>0006M</td><td>1</td></tr> <tr><td>CPT</td><td>0007M</td><td>1</td></tr> <tr><td>CPT</td><td>0007U</td><td>1</td></tr> <tr><td>CPT</td><td>0008U</td><td>1</td></tr> <tr><td>CPT</td><td>0009U</td><td>1</td></tr> <tr><td>CPT</td><td>0010U</td><td>1</td></tr> <tr><td>CPT</td><td>0011A</td><td>1</td></tr> <tr><td>CPT</td><td>0011M</td><td>1</td></tr> <tr><td>CPT</td><td>0011U</td><td>1</td></tr> <tr><td>CPT</td><td>0012A</td><td>1</td></tr> <tr><td>CPT</td><td>0012M</td><td>1</td></tr> </tbody> </table>			Type	Code	Occurrences	CPT	0001A	1	CPT	0001U	1	CPT	0002A	1	CPT	0002M	1	CPT	0002U	1	CPT	0003M	1	CPT	0003U	1	CPT	0004M	1	CPT	0005U	1	CPT	0006M	1	CPT	0007M	1	CPT	0007U	1	CPT	0008U	1	CPT	0009U	1	CPT	0010U	1	CPT	0011A	1	CPT	0011M	1	CPT	0011U	1	CPT	0012A	1	CPT	0012M	1
	Type	Code	Occurrences																																																															
	CPT	0001A	1																																																															
	CPT	0001U	1																																																															
	CPT	0002A	1																																																															
	CPT	0002M	1																																																															
	CPT	0002U	1																																																															
	CPT	0003M	1																																																															
	CPT	0003U	1																																																															
	CPT	0004M	1																																																															
	CPT	0005U	1																																																															
	CPT	0006M	1																																																															
	CPT	0007M	1																																																															
	CPT	0007U	1																																																															
	CPT	0008U	1																																																															
	CPT	0009U	1																																																															
	CPT	0010U	1																																																															
	CPT	0011A	1																																																															
	CPT	0011M	1																																																															
	CPT	0011U	1																																																															
CPT	0012A	1																																																																
CPT	0012M	1																																																																

## Pricing Sanity — Metrics

total_prices_checked	1121463
total_rates	1120461
per_diem_rates	176
percentage_rates	826

negative_rates	0																					
zero_rates	6882																					
extreme_high_rates	657																					
extreme_low_rates	0																					
rate_distribution	<table border="1"> <tr> <td>sample_n</td> <td>1120461</td> </tr> <tr> <td>sample_k</td> <td>5000</td> </tr> <tr> <td>confidence</td> <td>high</td> </tr> <tr> <td>p5</td> <td>9.5855000000000001</td> </tr> <tr> <td>p25</td> <td>77.5975</td> </tr> <tr> <td>p50</td> <td>379.935</td> </tr> <tr> <td>p75</td> <td>1415.6225</td> </tr> <tr> <td>p95</td> <td>4611.88</td> </tr> <tr> <td>p99</td> <td>9778.099100000003</td> </tr> </table>	sample_n	1120461	sample_k	5000	confidence	high	p5	9.5855000000000001	p25	77.5975	p50	379.935	p75	1415.6225	p95	4611.88	p99	9778.099100000003			
sample_n	1120461																					
sample_k	5000																					
confidence	high																					
p5	9.5855000000000001																					
p25	77.5975																					
p50	379.935																					
p75	1415.6225																					
p95	4611.88																					
p99	9778.099100000003																					
by_billing_class	<table border="1"> <thead> <tr> <th>Class / Type</th> <th>Count</th> <th>Median</th> <th>p25</th> <th>p75</th> <th>p95</th> <th>Confidence</th> </tr> </thead> <tbody> <tr> <td>institutional/ fee schedule</td> <td>273,522</td> <td>396.6</td> <td>70.6</td> <td>1303.5</td> <td>4420.5</td> <td>high</td> </tr> <tr> <td>professional/ fee schedule</td> <td>846,939</td> <td>353.8</td> <td>82.4</td> <td>1423.9</td> <td>4490.4</td> <td>high</td> </tr> </tbody> </table>	Class / Type	Count	Median	p25	p75	p95	Confidence	institutional/ fee schedule	273,522	396.6	70.6	1303.5	4420.5	high	professional/ fee schedule	846,939	353.8	82.4	1423.9	4490.4	high
Class / Type	Count	Median	p25	p75	p95	Confidence																
institutional/ fee schedule	273,522	396.6	70.6	1303.5	4420.5	high																
professional/ fee schedule	846,939	353.8	82.4	1423.9	4490.4	high																
negotiated_types	<table border="1"> <tr> <td>fee schedule</td> <td>1120461</td> </tr> </table>	fee schedule	1120461																			
fee schedule	1120461																					
unique_rate_contexts	784883																					
rate_key_dimension_validity	<table border="1"> <tr> <td>invalid_negotiated_type</td> <td>0</td> </tr> <tr> <td>invalid_negotiated_types_seen</td> <td>{}</td> </tr> <tr> <td>invalid_setting</td> <td>0</td> </tr> <tr> <td>invalid_settings_seen</td> <td>{}</td> </tr> <tr> <td>invalid_severity_of_illness</td> <td>0</td> </tr> <tr> <td>severity_on_non_apr_drg</td> <td>0</td> </tr> <tr> <td>institutional_with_service_codes</td> <td>0</td> </tr> <tr> <td>invalid_service_code_format</td> <td>0</td> </tr> <tr> <td>billing_code_modifier_too_long</td> <td>0</td> </tr> </table>	invalid_negotiated_type	0	invalid_negotiated_types_seen	{}	invalid_setting	0	invalid_settings_seen	{}	invalid_severity_of_illness	0	severity_on_non_apr_drg	0	institutional_with_service_codes	0	invalid_service_code_format	0	billing_code_modifier_too_long	0			
invalid_negotiated_type	0																					
invalid_negotiated_types_seen	{}																					
invalid_setting	0																					
invalid_settings_seen	{}																					
invalid_severity_of_illness	0																					
severity_on_non_apr_drg	0																					
institutional_with_service_codes	0																					
invalid_service_code_format	0																					
billing_code_modifier_too_long	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 = 3e8e3e46fe8aed7f · entity = Trilogy Health Solutions · 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.