

MRF Quality Report

s3://talon-storage-private/mrf-feed-uploads/2025-11/2025-11-03_TrilogyDirect_in-network_rates.json

Size: 2.02 GB • MD5: 02b2a64236a6f790e45157cba7622a75

Payer: **Trilogy Health Solutions** • File Date: **2025-11-03** • Generated: **2026-04-24 22:24 EDT** • Tool Version: **1.0.0** • Elapsed: **477.70s**

82.5

Usable w/ Caution

Errors: 2 • Warnings: 5 • Info: 4

TOC Plan References

TOC: s3://talon-storage-private/mrf-feed-uploads/2025-11/2025-11_plan_ref_2ea3bb54f85dabc449591cd1665192f9_index.json • Talon

Canonical: s3://talon-storage-private/mrf-feed-uploads/2025-11/2025-11-03_TrilogyDirect_in-network_rates.json

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

CMS Official Schema Validation

PASSED — File conforms to the CMS in-network-rates schema.

Dimension Scores

Dimension	Score	Weight	Findings
Schema Integrity	85.0	30%	3
Provider Mapping	100.0	15%	1
Code Coverage	98.1	15%	1
Pricing Sanity	68.3	40%	6

Schema Integrity — Findings

Score: 85.0

ERROR `file_freshness`

File is 172 days old (last_updated_on exceeds the 90-day threshold)

WARNING `expired_prices`

535217 negotiated_prices have past expiration dates (27.4%)

INFO `far_future_expiration`

37326 expiration_dates are more than 3 years in the future

Provider Mapping — Findings

Score: 100.0

INFO `duplicate_npis`

9783 NPIs appear in more than one provider group

Code Coverage — Findings

Score: 98.1

WARNING `billing_code_format`

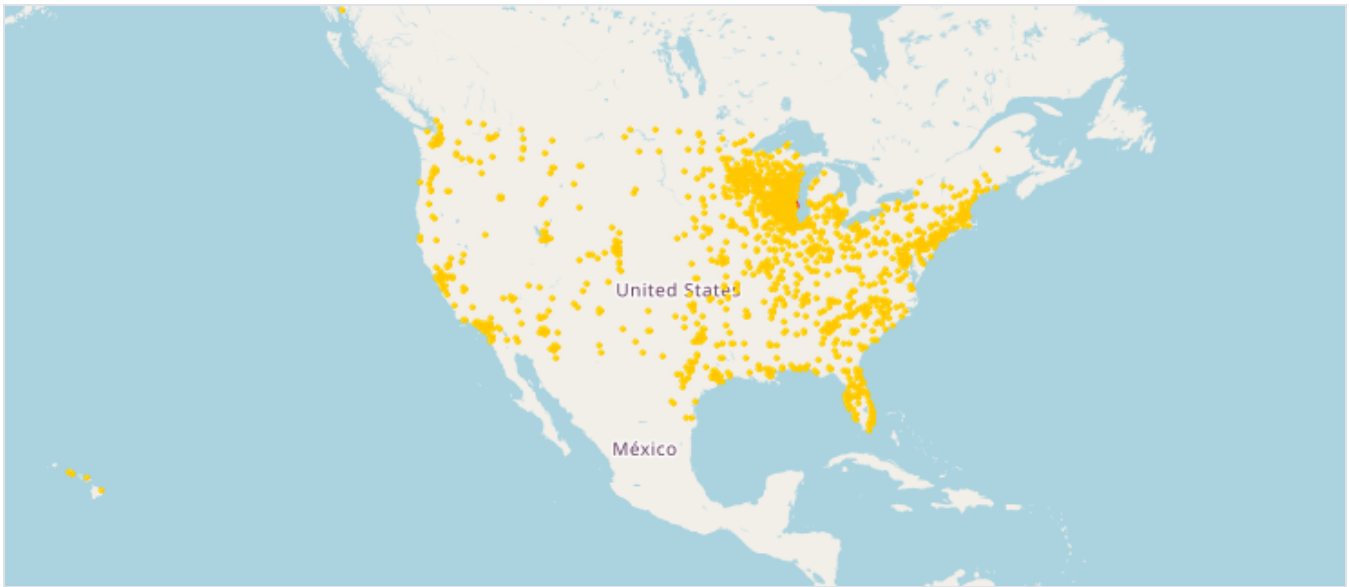
590 CPT codes do not match expected format

Recommended Actions

1.	schema	file_freshness	P1
File is 172 days old (last_updated_on exceeds the 90-day threshold)			
2.	pricing	zero_rates	P1
9372 zero-dollar rates (0.48%) — 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 22.3x (threshold: 10x, N=478,224 (1,000 sampled), high confidence)			
4.	pricing	rate_spread_by_class	P2
billing_class='professional' / negotiated_type='fee schedule': P95/P50 spread is 9.7x (threshold: 5x, N=1,472,731 (1,000 sampled), high confidence)			
5.	pricing	per_code_rate_spread	P2
214997 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	expired_prices	P2
535217 negotiated_prices have past expiration dates (27.4%)			
7.	code_coverage	billing_code_format	P3
590 CPT codes do not match expected format			

Provider Geographic Coverage

39912 unique NPIs found — 39878 geocoded (100%) — 2587 zip codes represented.



Schema Integrity — Metrics

header_missing_fields		
header_conditional_issues		
file_age_days		172
items_total		15427
items_missing_required_pct		0.0
items_empty_rates		0
prices_total		1954110
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	15427
billing_code_types	CPT	9866
	CSTM-ALL	1
	HCPCS	4126
	MS-DRG	769
	RC	665

expired_prices	535217
invalid_expiration_format	0

Provider Mapping — Metrics

provider_references_in_file	584
provider_group_ids_referenced	584
unresolved_references	0
resolution_rate_pct	100.0
npis_validated	55345
invalid_npi_count	0
npi_validity_rate_pct	100.0
invalid_npi_examples	
eins_validated	2400
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	9783

Code Coverage — Metrics

unique_codes_total	15427	
duplicate_codes	0	
duplicate_pct	0.0	
by_code_type	CPT	9866
	CSTM-ALL	1
	HCPCS	4126
	MS-DRG	769
	RC	665
unknown_code_types		

format_invalid_by_type	CPT	590	
codes_not_in_reference	reference_not_loaded		
most_frequent_codes	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	1954110
total_rates	1950955
per_diem_rates	313
percentage_rates	2842
negative_rates	0
zero_rates	9372
extreme_high_rates	1121
extreme_low_rates	0

rate_distribution	sample_n	1950955
	sample_k	5000
	confidence	high
	p5	10.735500000000002
	p25	86.30000000000001
	p50	453.455
	p75	1623.07
	p95	5411.260500000001
	p99	13922.170000000026

by_billing_class	Class / Type	Count	Median	p25	p75	p95	Confidence
	institutional/fee schedule	478,224	525.1	79.1	1850.0	11714.2	high
	professional/fee schedule	1,472,731	437.9	85.3	1552.9	4269.3	high

negotiated_types	fee schedule	1950955
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unique_rate_contexts	999044
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rate_key_dimension_validity	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).

provider_resolution (60%)	$\text{resolution_rate\%} \times 0.60$
npi_validity (30%)	$(100 - \text{invalid_npi_pct} \times 5) \times 0.30$
ein_validity (10%)	$10 - (\text{invalid_ein_pct} \times 0.1)$ [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.

per_unknown_code_type	3 pts each (cap 20)
format_invalid_pct	$\times 0.5$ (cap 10)
duplicate_code_pct	$\times 2$ (cap 20)
codes_not_in_reference_pct	$\times 0.5$ (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.

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

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

Tier 1 — entity + plan_id	Used when both <code>reporting_entity_name</code> and <code>plan_id</code> are present. Key input: <code>plan <entity> <plan_id_type> <plan_id></code> . Stable across monthly re-exports.
Tier 2 — URL hash	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 = 0e5ab5375891ecf0 · 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.

NPPES	CMS National Plan and Provider Enumeration System — monthly full-replacement CSV. Maps each NPI to its primary registered ZIP code.
ZCTA centroids	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.