MRF Quality Report

s3://talon-storage-private/mrf-feed-uploads/2026-02/2026-03-01_CRTA_Health-Alliance-Plan.json.gz

Size: 43.41 MB • MD5: 8baca1e0b8388318c3b35435bea1c1bc

Payer: **Health Alliance Plan** • File Date: **2026-03-01** • Generated: **2026-04-24 12:52 EDT** • Tool Version: **1.0.0** • Elapsed: **669.30s**

65.0

Limited Reliability

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

Errors: 1 • Warnings: 7 • Info: 3

TOC Plan References

TOC: s3://talon-storage-private/mrf-feed-uploads/2026-02/2026-02_plan_ref_cff6f1a4b3fbd3810c4722edde594511_index.json • Talon - HAP

Canonical: s3://talon-storage-private/mrf-feed-uploads/2026-02/2026-03-01_CRTA_Health-Alliance-Plan.json.gz

Plan Name	Plan ID	Issuer / Sponsor	Market
ELECTRICAL WORKERS INSURANCE FUND	381393235	—	group

CMS Official Schema Validation

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

Validator output:

```
warn  Schema version v2.0.0 was provided, but file indicates it conforms to schema version 2.0.0. v2.0.0
will be used.
info  Running validator container...
info
```

Dimension Scores

Dimension	Score	Weight	Findings
Schema Integrity	70.0	30%	2

Dimension	Score	Weight	Findings
Provider Mapping	**100.0**	15%	3
Code Coverage	**97.5**	15%	1
Pricing Sanity	**69.1**	40%	5

Schema Integrity — Findings

Score: 70.0

WARNING `file_freshness`

File is 54 days old (last_updated_on exceeds the 45-day threshold)

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

WARNING `npi_validity`

0.00% of NPIs failed Luhn checksum validation (2 of 106436)

- 1685961700

WARNING `ein_validity`

0.25% of EINs failed IRS prefix validation (63 of 25409)

- 001468376
- 071649500
- 076501987
- 077701981
- 080380433
- *… and 5 more*

INFO `duplicate_npis`

26992 NPIs appear in more than one provider group

Code Coverage — Findings

Score: 97.5

WARNING `billing_code_format`

906 CPT codes do not match expected format

Pricing Sanity — Findings

Score: 69.1

INFO `per_diem_rates`

3691 per-diem rates (0.1%) — not dollar amounts; excluded from spread analysis

INFO `percentage_rates`

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

WARNING `rate_spread_by_class`

billing_class='professional' / negotiated_type='fee schedule': P95/P50 spread is 14.2x (threshold: 5x, N=2,806,691 (1,000 sampled), high confidence)

WARNING `rate_spread_by_class`

billing_class='institutional' / negotiated_type='fee schedule': P95/P50 spread is 19.3x (threshold: 10x, N=178,492 (1,000 sampled), high confidence)

WARNING `per_code_rate_spread`

65739 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
Q2042	HCPCS	fee schedule	professional	ffs	outpatient	$2.06	$603355.83	$651824.70	$1982859.55	**962553.2×**	101
Q2042	HCPCS	fee schedule	professional	ffs	outpatient	$2.06	$594857.86	$651824.70	$1982859.55	**962553.2×**	101
Q2042	HCPCS	fee schedule	professional	ffs	outpatient	$2.06	$603355.83	$651824.70	$1982859.55	**962553.2×**	101
Q2042	HCPCS	fee schedule	professional	ffs	outpatient	$2.06	$594857.86	$651824.70	$1982859.55	**962553.2×**	101
Q2042	HCPCS	fee schedule	professional	ffs	outpatient	$2.06	$603355.83	$651824.70	$1982859.55	**962553.2×**	101
Q2042	HCPCS	fee schedule	professional	ffs	outpatient	$2.06	$594857.86	$651824.70	$1982859.55	**962553.2×**	101
Q2042	HCPCS	fee schedule	professional	ffs	outpatient	$2.06	$603355.83	$651824.70	$1982859.55	**962553.2×**	101
Q2042	HCPCS	fee schedule	professional	ffs	outpatient	$2.06	$594857.86	$651824.70	$1982859.55	**962553.2×**	101
Q2042	HCPCS	fee schedule	professional	ffs	outpatient	$2.06	$603355.83	$651824.70	$1982859.55	**962553.2×**	101
Q2042	HCPCS	fee schedule	professional	ffs	outpatient	$2.06	$603355.83	$651824.70	$1982859.55	**962553.2×**	101

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. **provider_mapping** `npi_validity` — **P2**

0.00% of NPIs failed Luhn checksum validation (2 of 106436)

3. **provider_mapping** `ein_validity` — **P2**

0.25% of EINs failed IRS prefix validation (63 of 25409)

4. **pricing** `rate_spread_by_class` — **P2**

billing_class='professional' / negotiated_type='fee schedule': P95/P50 spread is 14.2x (threshold: 5x, N=2,806,691 (1,000 sampled), high confidence)

5. **pricing** `rate_spread_by_class` — **P2**

billing_class='institutional' / negotiated_type='fee schedule': P95/P50 spread is 19.3x (threshold: 10x, N=178,492 (1,000 sampled), high confidence)

6. **pricing** `per_code_rate_spread` — **P2**

65739 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. **schema** `file_freshness` — **P2**

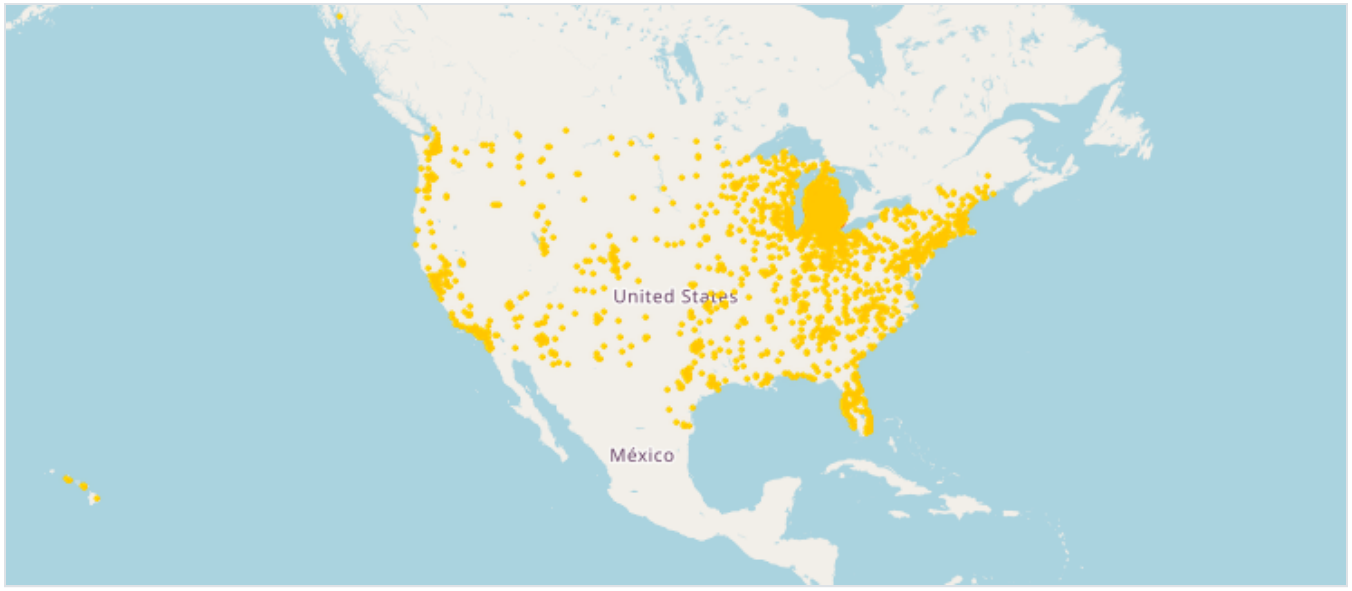
File is 54 days old (last_updated_on exceeds the 45-day threshold)

8. **code_coverage** `billing_code_format` — **P3**

906 CPT codes do not match expected format

Provider Geographic Coverage

55280 unique NPIs found — 55140 geocoded (100%) — 3218 zip codes represented.



Schema Integrity — Metrics

header_missing_fields	
header_conditional_issues	
file_age_days	54
items_total	18421
items_missing_required_pct	0.0
items_empty_rates	0
prices_total	3035392
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** 17640
	bundle 781

billing_code_types	CPT	10390
	ICD	1877
	HCPCS	5216
	RC	156
	CSTM-ALL	1
	MS-DRG	781
expired_prices	0	
invalid_expiration_format	0	

Provider Mapping — Metrics

provider_references_in_file	1134
provider_group_ids_referenced	1134
unresolved_references	0
resolution_rate_pct	100.0
npis_validated	106436
invalid_npi_count	2
npi_validity_rate_pct	100.0
invalid_npi_examples	1685961700, 1685961700
eins_validated	25409
invalid_ein_count	63
ein_validity_rate_pct	99.75
invalid_ein_examples	001468376, 001468376, 071649500, 076501987, 077701981, 080380433, 080380433, 080385842, 080385842, 080660230
empty_npi_groups	0
groups_without_tin	0
npis_in_multiple_groups	26992

Code Coverage — Metrics

unique_codes_total	18421
duplicate_codes	0
duplicate_pct	0.0

by_code_type	CPT	10390
	ICD	1877
	HCPCS	5216
	RC	156
	CSTM-ALL	1
	MS-DRG	781
unknown_code_types		
format_invalid_by_type	CPT	906
codes_not_in_reference	reference_not_loaded	

most_frequent_codes

Type	Code	Occurrences
CPT	55920	1
CPT	0697T	1
CPT	50700	1
CPT	21088	1
CPT	27066	1
CPT	0258U	1
CPT	90833	1
ICD	S22079B	1
CPT	66820	1
CPT	0406U	1
CPT	23616	1
CPT	97129	1
CPT	29823	1
HCPCS	G2025	1
CPT	90734	1
CPT	86022	1
CPT	80332	1
HCPCS	E0265	1
HCPCS	E0766	1
CPT	54860	1

Pricing Sanity — Metrics

total_prices_checked	3035392
total_rates	3031421
per_diem_rates	3691
percentage_rates	280

negative_rates	0
zero_rates	0
extreme_high_rates	5268
extreme_low_rates	0

rate_distribution

sample_n	3031421
sample_k	5000
confidence	high
p5	5.24
p25	42.03
p50	218.94
p75	855.7674999999999
p95	3243.8860000000036
p99	16630.88210000024

by_billing_class

Class / Type	Count	Median	p25	p75	p95	Confidence
`professional/ fee schedule`	2,806,691	194.5	44.8	813.5	2756.2	high
`institutional/ fee schedule`	178,492	138.9	26.5	729.6	2685.7	high
`institutional/ negotiated`	46,238	22400.0	13638.0	35472.5	81767.5	high

negotiated_types

fee schedule	2985183
negotiated	46238

unique_rate_contexts	1180631

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%)	`resolution_rate% × 0.60`
npi_validity (30%)	`(100 − invalid_npi_pct × 5) × 0.30`
ein_validity (10%)	`10 − (invalid_ein_pct × 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/HCPCS/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	`× 0.5 (cap 10)`
duplicate_code_pct	`× 2 (cap 20)`
codes_not_in_reference_pct	`× 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	`× 5 (cap 20)`
zero_rate_pct	`× 3 (cap 15)`
extreme_rate_pct	`× 5 (cap 25) — ffs only`
class_spread_excess	`(spread − threshold) × 2, max across (billing_class, negotiated_type) buckets (cap 15)`
per_code_high_spread_count	`× 0.1 (cap 15)`
invalid_negotiated_type_pct	`× 3 (cap 10) — rates silently dropped`
invalid_setting_pct	`× 1 (cap 5) — silently defaults to wildcard`
invalid_severity_pct	`× 1 (cap 5) — silently normalised to ''`
institutional_with_service_codes_pct	`× 1 (cap 5) — extra key variation`
invalid_service_code_pct	`× 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 `reporting_entity_name` and `plan_id` are present. Key input: `plan|<entity>|<plan_id_type>|<plan_id>`. Stable across monthly re-exports.
Tier 2 — URL hash	Fallback when `plan_id` 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 `plan_id` 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 = `8d87fc7a7bf45880` · entity = Health Alliance Plan · 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.