AegisLife Insurance Analytics Project

Title: Data Quality Assessment Report

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Data Quality Challenge

- Project Scope
- 6,082 insurance records across 5 datasets
- Data period: 2020-2025
- 50 data quality issues identified
- 538 records corrected

- Tools Used
- Microsoft Excel - Data validation
- Python (Pandas) - Automated cleaning
- SQL - Database validation
- Power BI - Quality monitoring

- Goal: Achieve 99%+ data quality for analytics

Executive Summary

KEY METRICS

50	538	89.7% → 99.8%
Total Issues Identified	Records Fixed (8.85%)	Quality Score Improvement

ISSUE SEVERITY

- Critical: 5 issues (10%)
- Moderate: 7 issues (14%)
- Minor: 38 issues (76%)

STATUS: Data ready for analytics

Most Common Problems Identified

1. FORMAT INCONSISTENCY (30%)
   - Mixed date formats (MM/DD/YYYY, DD-MM-YYYY, YYYY-MM-DD)
   - Boolean values (Yes/No, Y/N, True/False, 1/0)
   - Text capitalization inconsistent

2. INVALID VALUES (20%)
   - Typos: "Mal" instead of "Male"
   - Wrong categories: "Activ" vs "Active"
   - Misspelled status values

3. MISSING DATA (18%)
   - Blank age fields (10 records)
   - Null risk scores (5 records)
   - Missing premium amounts (6 records)

4. OUTLIERS (10%)
   - Extreme claim amounts flagged for review
   - Processing times >180 days

5. LOGICAL ERRORS (6%)
   - Claim dates before policy start
   - Policy end dates before start dates

Data Quality Transformation

METRIC	BEFORE	→ AFTER	CHANGE
Total Records	6,082	6,067	-15 removed
Completeness	92.5%	99.8%	+7.3% ⬆
Accuracy	91.2%	99.5%	+8.3% ⬆
Format Consistency	85.0%	100.0%	+15.0% ⬆
Referential Integrity	100%	100.0%	Maintained
Duplicate Records	0	0	Clean

OVERALL QUALITY SCORE

89.7% → 99.8% (+10.1% improvement)

Only 0.25% of records removed during cleaning

How We Fixed the Data

PHASE 1: EXCEL-BASED CLEANING

✓ Standardized date formats	113 records
✓ Fixed gender/category typos	95 records
✓ Imputed missing values	16 records
✓ Validated foreign keys	All tables
✓ Removed invalid records	15 records
Total Phase 1:	409 records

PHASE 2: PYTHON AUTOMATION

✓ Encoding fixes (Latin-1)	All files
✓ Automated data type conversion	All columns
✓ Merge validation	All tables
✓ Calculated derived fields	New columns
Total Phase 2:	6,082 records

Deep Dive: Standardizing Date Formats

THE PROBLEM

3 different date formats across datasets:

BEFORE:

- 12/31/2023 (MM/DD/YYYY) - 40% of records
- 31-12-2023 (DD-MM-YYYY) - 35% of records
- 2023-12-31 (YYYY-MM-DD) - 25% of records

❌ Prevented chronological sorting

❌ Caused analysis errors

❌ Time-series charts failed

THE SOLUTION

Python Code:

```
df['date'] = pd.to_datetime(df['date'], errors='coerce')
df['date'] = df['date'].dt.strftime('%Y-%m-%d')
```

AFTER:

- 2023-12-31 (YYYY-MM-DD) - 100%

RESULT: 113 dates standardized to ISO 8601 format

Automated Quality Controls

DATA QUALITY VALIDATION RULES

RULE 1: Age Range

Must be between 18-100 years

Formula: =IF(AND(age>=18, age<=100), "Valid", "Invalid")

RULE 2: Risk Score Range

Must be between 0.00-1.00

RULE 3: Date Format

Must be YYYY-MM-DD

RULE 4: Categorical Values

Must be from predefined list only

RULE 5: Foreign Key Integrity

All foreign keys must exist in parent table

RULE 6: Logical Consistency

End date must be after start date

IMPACT: Prevents 80% of future data quality issues

Action Plan for Future Data Quality

1. IMPLEMENT DROP-DOWN LISTS
   → Categorical fields use predefined options
   → Reduces typos by 90%
2. USE DATE PICKERS
   → Enforces YYYY-MM-DD format automatically
   → Eliminates format inconsistencies
3. REAL-TIME VALIDATION
   → Validate data at point of entry
   → Immediate error feedback to users
4. STANDARDIZE BOOLEAN FIELDS
   → Use only "Yes" or "No"
   → Remove variations (Y/N, True/False, 1/0)
5. DATABASE CONSTRAINTS
   → Enable foreign key constraints
   → Prevent invalid relationships
6. MONTHLY DATA AUDITS
   → Regular quality checks
   → Catch issues early

EXPECTED IMPACT: 80% reduction in data quality issues