

Insurance Data Analytics

Power BI Project Documentation

Data source: InsuranceData (CSV) imported into SQL Server

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Author: Mgr. Tamás Csiba

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1. Introduction

This Power BI project analyzes an insurance portfolio by combining policy-level information with claim outcomes to produce interactive insights. The report is designed to support day-to-day monitoring (premium volume, coverage exposure, and claim status distribution) and exploratory analysis (claim patterns across policy types, age groups, and customer segments).

As a first step, the raw dataset was loaded from a CSV file into Microsoft SQL Server to create a structured, reusable source table for Power BI modeling, DAX measures, and dashboard development.

2. Data Source and SQL Server Import

2.1 Data Source

The project is based on a CSV file named InsuranceData, which contains records related to insurance policies and claims.

2.2 Import into SQL Server

The CSV file was imported into Microsoft SQL Server and loaded into:

Database: Insuredcdb

Schema/Table: dbo.InsuranceData

Row count: 10,004 rows (confirmed after import)

PolicyNumber	CustomerID	Gender	Age	PolicyType	PolicyStartDate	PolicyEndDate	PremiumAmount	CoverageAmount	ClaimNumber	ClaimDate	ClaimAmount	ClaimStatus
P1	C1	Female	73	Auto	2024-02-13	2025-02-13	240.639999389648	33176.1015625	C1	NULL	0	Rejected
P2	C2	Male	44	Travel	2024-03-03	2025-03-03	1088.72999944678	85046.421875	C2	22-06-2024	1493.06005859375	Pending
P3	C3	Female	28	Travel	2024-06-15	2025-06-15	1019.59002688647	68525.53125	C3	NULL	0	Rejected
P4	C4	Male	85	Travel	2024-06-03	2025-06-03	549.700012207031	17053.26953125	C4	25-02-2025	5021.33884375	Pending
P5	C5	Female	57	Travel	2024-06-13	2025-06-13	841.150024414063	55007.26953125	C5	30-11-2024	1347.4599909375	Pending
P6	C6	Male	59	Travel	2024-02-04	2025-02-04	264.549993896484	26899.240234375	C6	09-06-2024	2969.8010742188	Settled
P7	C7	Female	38	Travel	2024-05-14	2025-05-14	573.25	91251.703125	C7	29-11-2024	5431.7900390625	Pending
P8	C8	Male	26	Health	2024-06-29	2025-06-29	925.25	46080.19140625	C8	25-02-2025	2275.2399023438	Settled
P9	C9	Female	42	Travel	2023-12-26	2024-12-26	1006.21997070313	37869.48046875	C9	16-06-2024	2682.626828125	Settled
P10	C10	Male	44	Travel	2023-09-15	2024-09-15	607.419826301016	82203.9325152	C10	31-10-2023	5318.020718125	Pending
P11	C11	Female	65	Health	2023-08-04	2024-08-04	333.200012207031	46868.19140625	C11	NULL	0	Rejected
P12	C12	Male	47	Home	2023-09-16	2024-09-16	645.72988046875	67012.84375	C12	NULL	0	Rejected
P13	C13	Female	46	Travel	2023-08-17	2024-08-17	646.140814648438	87453.8125	C13	NULL	0	Rejected
P14	C14	Male	45	Health	2023-09-26	2024-09-26	142.270004272461	96524.1328125	C14	26-11-2023	3560.56005859375	Settled
P15	C15	Female	23	Home	2023-09-27	2024-09-27	386.429992675781	97215.0234375	C15	NULL	0	Rejected
P16	C16	Male	48	Travel	2024-06-04	2025-06-04	638.789978227344	49649.71875	C16	18-01-2025	2081.580078125	Settled
P17	C17	Female	59	Travel	2024-02-06	2025-02-06	231.940004414063	92185.53125	C17	NULL	0	Rejected
P18	C18	Male	74	Life	2023-08-01	2024-08-01	362.07986572266	31710.349609375	C18	NULL	0	Rejected
P19	C19	Female	25	Life	2024-01-18	2025-01-18	854.049867792969	80203.5	C19	26-06-2024	2293.169921875	Settled
P20	C20	Male	63	Life	2023-07-18	2024-07-18	446.32986572266	18320.58694375	C20	29-03-2024	4076.8009765625	Pending
P21	C21	Female	51	Health	2023-11-02	2024-11-02	473.190004414063	54516.05884375	C21	NULL	0	Rejected

Figure 1 - InsuranceData successfully imported into SQL Server (Insuredcdb.dbo.InsuranceData).

2.3 Validation Query

After loading the table, a direct query was executed to confirm that the data is accessible and returns the expected records:

```
SELECT *  
FROM [dbo].[InsuranceData];
```

2.4 Main Columns (High Level)

The dbo.InsuranceData table includes the key attributes required for reporting and analysis:

PolicyNumber - Unique policy identifier

CustomerID - Customer identifier

Gender - Customer gender

Age - Customer age

PolicyType - Insurance product category (e.g., Auto, Travel, Health, Home, Life)

PolicyStartDate - Policy start date

PolicyEndDate - Policy end date

PremiumAmount - Premium value associated with the policy

CoverageAmount - Coverage/insured amount (exposure)

ClaimNumber - Claim identifier (when applicable)

ClaimDate - Date of the claim event (when applicable)

ClaimAmount - Monetary value of the claim (when applicable)

ClaimStatus - Claim processing status (e.g., Pending / Settled / Rejected)

2.5 Data Quality Notes

Claim-related fields can contain NULL values (commonly ClaimDate and ClaimAmount) when a policy has no associated claim.

Date fields will be typed and validated as proper dates to support filtering and time intelligence.

Monetary columns (PremiumAmount, CoverageAmount, ClaimAmount) will be treated as decimal/currency to ensure correct aggregation.

3. Power BI - SQL Server Connection

To build the report on a reliable and reusable data source, the Insurance dataset was connected to Power BI directly from Microsoft SQL Server. The connection was created using the native 'SQL Server database' connector. The server name used was 'TOMA-YOGA' and the data was imported in Import mode, enabling fast in-memory analytics, DAX calculations, and interactive visuals.

Connection details (high level):

- Server: TOMA-YOGA
- Connectivity mode: Import
- Source table: Insurancedb.dbo.InsuranceData



Figure 2 - Power BI SQL Server connector settings used for importing the dataset.

4. Data Preparation (Power Query)

To support segmentation and clearer reporting, two additional derived columns were created in Power Query using Conditional Column rules. These columns are used for filtering, grouping, and high-level analysis in the report.

4.1 Age Group (Conditional Column)

An 'Age Group' column was created from the 'Age' field to enable demographic segmentation in visuals and slicers. The following business rules were applied:

- Young Adults: Age <= 24
- Adult: Age <= 60
- Elder: Age > 60

Add Conditional Column

Add a conditional column that is computed from the other columns or values.

New column name
Age Group

	Column Name	Operator	Value	Then	Output
If	Age	is less than or equ...	24	Then	Young Adults
Else If	Age	is less than or equ...	60	Then	Adult

Add Clause

Else
Elder

OK Cancel

Figure 3 - Power Query Conditional Column: Age Group derivation.

4.2 Active vs Inactive Policy (Conditional Column)

An 'Active/Inactive' status column was created based on 'PolicyEndDate' to differentiate active policies from expired ones. A cut-off date was used to classify policies:

- Inactive: PolicyEndDate <= 2024-12-10
- Active: otherwise

Add Conditional Column

Add a conditional column that is computed from the other columns or values.

New column name
Active/Inactive

	Column Name	Operator	Value	Then	Output
If	PolicyEndDate	is before or equal...	2024-12-10	Then	Inactive

...

Add Clause

Else
Active

OK Cancel

Figure 4 - Power Query Conditional Column: Active vs Inactive policy status.

5. Report Pages (Report View)

This section documents the Power BI report view pages and explains the purpose of each visual, the interactive filtering behavior, and the business questions supported by the dashboard.

5.1 Overview Dashboard

The Overview Dashboard provides a single-page summary of the insurance portfolio, combining policy-level exposure (premium and coverage) with claim outcomes to support fast monitoring and exploratory analysis.

Key objectives

- Provide an executive snapshot using KPI cards (Premium Amount, Coverage Amount, Claim Amount).
- Enable quick filtering by PolicyNumber, ClaimNumber, and CustomerID for case-level analysis.
- Highlight portfolio composition and performance by policy lifecycle status, product type, demographics, and claim status.

Visuals and interactions

- Slicers: PolicyNumber, ClaimNumber, CustomerID - filter the entire page context.
- KPI Cards: Total Premium Amount, Total Coverage Amount, Total Claim Amount - update dynamically based on filters and selections.
- Donut Chart: Count of Active/Inactive Policies - summarizes policy lifecycle status using the derived Active/Inactive column.
- Bar Chart: Premium Amount by Policy Type - ranks product categories by premium volume.
- Column Chart: Number of Claims by Claim Status - shows the distribution of Rejected, Settled, and Pending claims.
- Line/Area Chart: Claim Amount by Age Group - compares claim cost across Young Adults, Adult, and Elder segments.
- Matrix: Amounts by Policy Type and Claim Status - detailed breakdown to validate KPI totals and identify concentration areas.

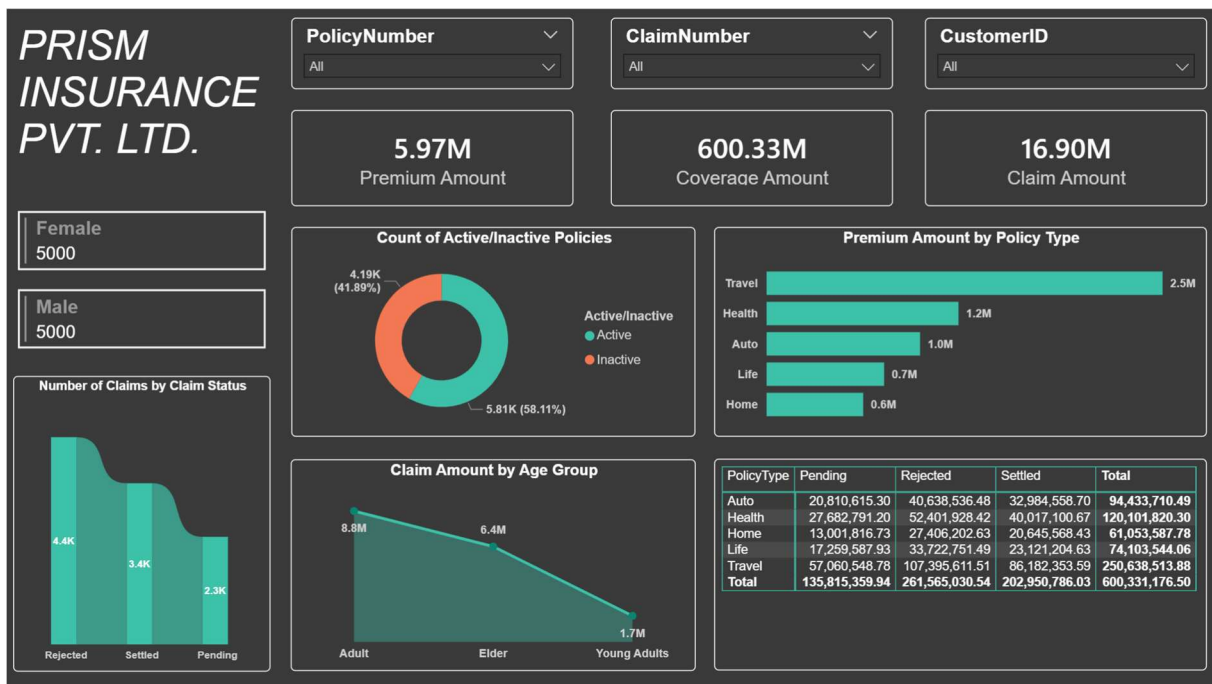


Figure 5 - Power BI report view: Overview dashboard summarizing portfolio KPIs and breakdowns.

5.2 Drill Through Table

This page is configured as a drill-through target to support record-level investigation behind the summary visuals. It displays the underlying rows in a table format and applies the drill-through filter context from the originating visual.

Drill-through configuration:

- Drill-through field: PolicyType
- The page receives the selected PolicyType value (e.g., Travel) and filters the detail table accordingly.
- This enables validation of totals and quick identification of outliers (e.g., high claims, rejected claims, unusual coverage or premium values).

The table includes key policy and claim attributes such as PolicyNumber, CustomerID, ClaimNumber, Age, Gender, CoverageAmount, PremiumAmount, PolicyStartDate, PolicyEndDate, ClaimStatus, and ClaimDate.

PolicyNumber	CustomerID	ClaimNumber	Sum of Age	Gender	CoverageAmount	PremiumAmount	PolicyEndDate	PolicyStartDate	PolicyType	ClaimStatus	ClaimDate
P100	C100	C100	44	Male	88,203.38	607.42	Thursday, August 15, 2024	Tuesday, August 15, 2023	Travel	Pending	31-10-2023
P1006	C1006	C1006	46	Male	53,043.28	208.67	Wednesday, September 11, 2024	Monday, September 11, 2023	Travel	Rejected	19-09-2023
P1009	C1009	C1009	34	Female	18,900.37	367.12	Friday, August 09, 2024	Wednesday, August 09, 2023	Travel	Rejected	
P1010	C1010	C1010	50	Male	28,388.56	213.26	Friday, August 16, 2024	Wednesday, August 16, 2023	Travel	Pending	19-11-2023
P1011	C1011	C1011	40	Female	96,734.30	439.88	Monday, November 11, 2024	Saturday, November 11, 2023	Travel	Pending	25-07-2023
P1012	C1012	C1012	66	Male	85,012.57	104.86	Saturday, March 23, 2025	Friday, March 23, 2024	Travel	Settled	16-04-2024
P1014	C1014	C1014	53	Male	30,079.07	707.11	Monday, January 20, 2025	Saturday, January 20, 2024	Travel	Pending	22-02-2024
P1017	C1017	C1017	32	Female	23,762.16	803.14	Saturday, July 05, 2025	Friday, July 05, 2024	Travel	Rejected	
P1018	C1018	C1018	61	Male	102,577.04	406.41	Tuesday, September 24, 2024	Sunday, September 24, 2023	Travel	Rejected	
P1019	C1019	C1019	19	Female	32,892.17	321.82	Tuesday, January 14, 2025	Sunday, January 14, 2024	Travel	Settled	26-03-2024
P1021	C1021	C1021	29	Female	102,242.05	584.64	Tuesday, March 25, 2025	Monday, March 25, 2024	Travel	Settled	22-04-2024
P1023	C1023	C1023	45	Female	21,260.00	1,071.56	Monday, December 02, 2024	Saturday, December 02, 2023	Travel	Rejected	
P1025	C1025	C1025	36	Female	107,525.23	353.75	Friday, May 02, 2025	Thursday, May 02, 2024	Travel	Rejected	
P1028	C1028	C1028	51	Male	71,319.90	335.96	Tuesday, July 30, 2024	Sunday, July 30, 2023	Travel	Rejected	
P103	C103	C103	20	Female	26,044.73	1,038.13	Friday, November 15, 2024	Wednesday, November 15, 2023	Travel	Settled	13-06-2023
P1031	C1031	C1031	31	Female	81,807.89	1,044.05	Monday, October 07, 2024	Saturday, October 07, 2023	Travel	Pending	02-01-2024
P1036	C1036	C1036	41	Male	72,672.72	650.38	Saturday, April 19, 2025	Friday, April 19, 2024	Travel	Settled	18-10-2023
P104	C104	C104	62	Male	51,939.46	1,013.12	Friday, April 11, 2025	Thursday, April 11, 2024	Travel	Pending	08-04-2024
P1040	C1040	C1040	52	Male	20,539.19	929.81	Thursday, April 03, 2025	Wednesday, April 03, 2024	Travel	Settled	23-01-2024
P1041	C1041	C1041	59	Female	41,057.92	570.80	Monday, October 28, 2024	Saturday, October 28, 2023	Travel	Rejected	
P1043	C1043	C1043	76	Female	40,477.52	228.74	Sunday, May 11, 2025	Saturday, May 11, 2024	Travel	Settled	04-06-2023
P1045	C1045	C1045	61	Female	83,741.63	253.85	Monday, July 22, 2024	Saturday, July 22, 2023	Travel	Rejected	
P1047	C1047	C1047	47	Female	39,883.98	688.53	Wednesday, November 20, 2024	Monday, November 20, 2023	Travel	Pending	30-01-2024
P1048	C1048	C1048	56	Male	44,786.30	442.55	Sunday, February 16, 2025	Friday, February 16, 2024	Travel	Rejected	
P1049	C1049	C1049	68	Female	108,791.26	231.83	Monday, February 17, 2025	Saturday, February 17, 2024	Travel	Rejected	
P105	C105	C105	49	Female	95,108.67	318.40	Monday, February 03, 2025	Saturday, February 03, 2024	Travel	Settled	13-06-2023
P1054	C1054	C1054	64	Male	69,838.88	433.15	Sunday, August 25, 2024	Friday, August 25, 2023	Travel	Rejected	
P1056	C1056	C1056	59	Male	47,517.70	778.19	Monday, August 12, 2024	Saturday, August 12, 2023	Travel	Settled	27-11-2023
P1058	C1058	C1058	56	Male	96,713.33	783.15	Monday, May 05, 2025	Sunday, May 05, 2024	Travel	Rejected	
P106	C106	C106	20	Male	56,257.97	319.44	Friday, November 28, 2024	Wednesday, November 29, 2023	Travel	Settled	07-06-2023
P1062	C1062	C1062	54	Male	76,065.86	528.78	Tuesday, July 08, 2025	Monday, July 08, 2024	Travel	Pending	07-01-2024
P1063	C1063	C1063	77	Female	74,102.38	675.04	Thursday, May 22, 2025	Wednesday, May 22, 2024	Travel	Settled	03-01-2024
Total			218563								

Figure 6 - Drill Through Table page filtered by PolicyType to show record-level policy and claim details.

6. Row-Level Security (RLS)

To demonstrate secure data access in Power BI, Row-Level Security (RLS) was implemented using role-based filters. RLS ensures that different user groups can only see the subset of records they are authorized to access, while using the same report and data model.

6.1 Security roles based on PolicyType

Two sample roles were created in Power BI Desktop under Manage roles. Each role restricts rows in the InsuranceData table by filtering the PolicyType column:

- Health Role: PolicyType equals "Health"
- Travel Role: PolicyType equals "Travel"

With these roles in place, the same visuals and measures automatically recalculate based on the role filter, providing a realistic example of how department- or product-specific access can be enforced in a shared reporting solution.

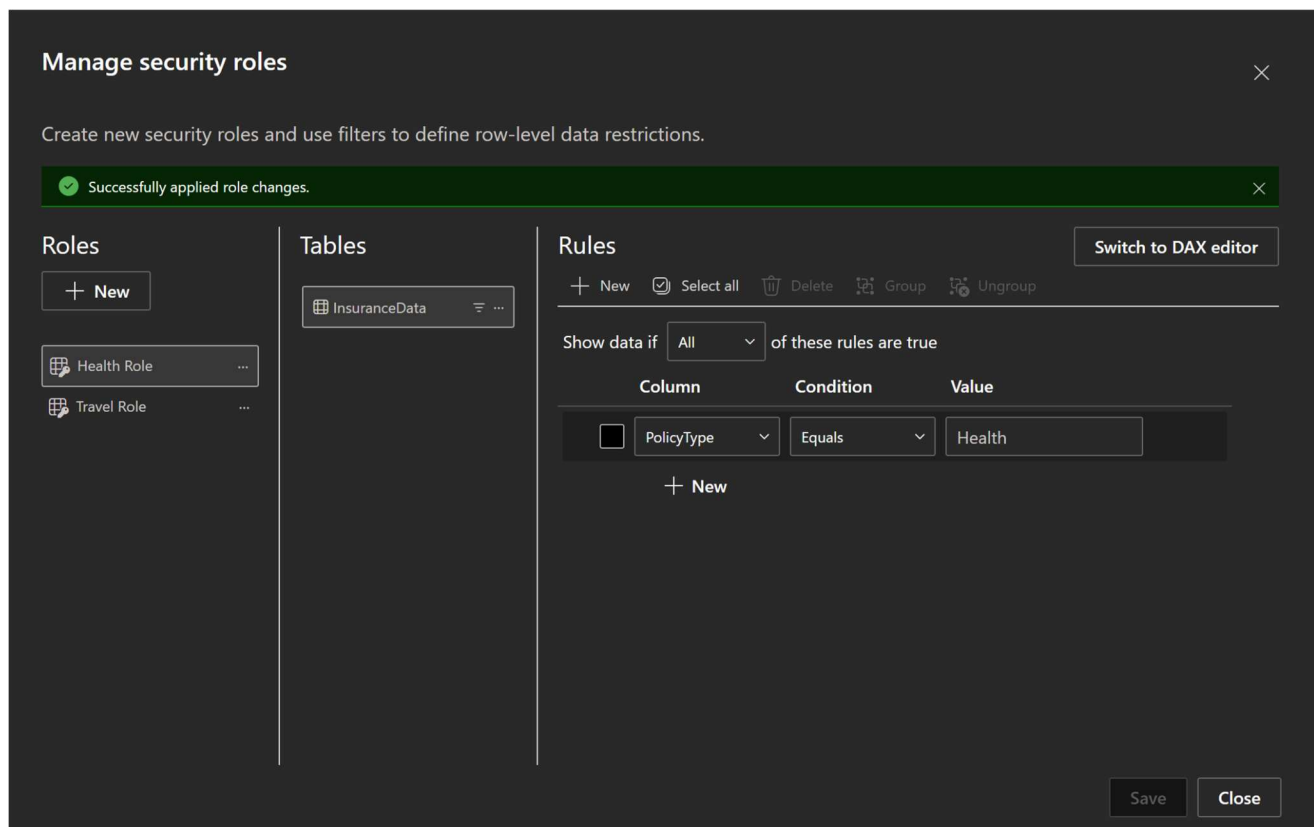


Figure 7 - Power BI Manage roles: example RLS roles filtering InsuranceData by PolicyType.

Summary

This project delivers an end-to-end **Power BI insurance analytics report** built on a structured SQL Server data source. The workflow starts with loading the InsuranceData CSV into **SQL Server** (Insuredb.dbo.InsuranceData, 10,004 rows), providing a stable, reusable backend for reporting. The dataset includes essential policy, customer, and claim attributes (premium, coverage, claim status, dates, demographics), enabling both portfolio monitoring and deeper claim analysis.

In Power BI, the data is connected via the **SQL Server connector in Import mode**, ensuring fast in-memory performance for interactive visuals and DAX calculations. During preparation, two additional derived columns were created in **Power Query** to support segmentation and clearer reporting: **Age Group** (Young Adults / Adult / Elder) and **Active/Inactive** policy status based on PolicyEndDate. The report's main **Overview dashboard** presents key KPIs (Premium, Coverage, Claim Amount) and multiple analytical breakdowns (Active vs Inactive distribution, premium by policy type, claim status counts, claim amount by age group, and a detailed matrix). For detailed investigation, a **Drill Through Table** page was implemented using PolicyType as the drill-through field, enabling users to trace summary insights back to individual records. Finally, **Row-Level Security (RLS)** was configured with sample roles (e.g., Health Role, Travel Role) to demonstrate secure, role-based access control within the same report.