

Insurance Data Analytics

Power BI Project Documentation

Data source: InsuranceData (CSV) imported into SQL Server

Last Updated: January 17, 2026

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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: Insurededb

Schema/Table: dbo.InsuranceData

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

The screenshot shows the Microsoft SQL Server Management Studio (SSMS) interface. On the left, the Object Explorer displays the database structure for 'TOMA-YOGA' (SQL Server 17.0.1000.7 - Toma-Yoga\csiba). It includes nodes for Databases, Tables, Views, and other objects. A specific table named 'dbo.InsuranceData' is selected under the 'Tables' node. On the right, the main area shows a query window titled 'SQLQuery1.cs...siba (107)*'. The query is:

```
select * from [dbo].[InsuranceData]
```

The results grid displays 10,004 rows of data from the 'InsuranceData' table. The columns are: PolicyNumber, CustomerID, Gender, Age, PolicyType, PolicyStatus, PolicyEndDate, PremiumAmount, CoverageAmount, ClaimNumber, ClaimDate, ClaimAmount, and ClaimStatus. The data includes various policy types like Auto, Travel, Health, and Life, with ages ranging from 28 to 83, and claim amounts ranging from 0 to over \$100,000. Some rows show 'Rejected' or 'Pending' status. The bottom of the results grid shows a message: 'Query executed successfully.'

Figure 1 - `InsuranceData` successfully imported into SQL Server (`Insurededb.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: Insurededb.dbo.InsuranceData

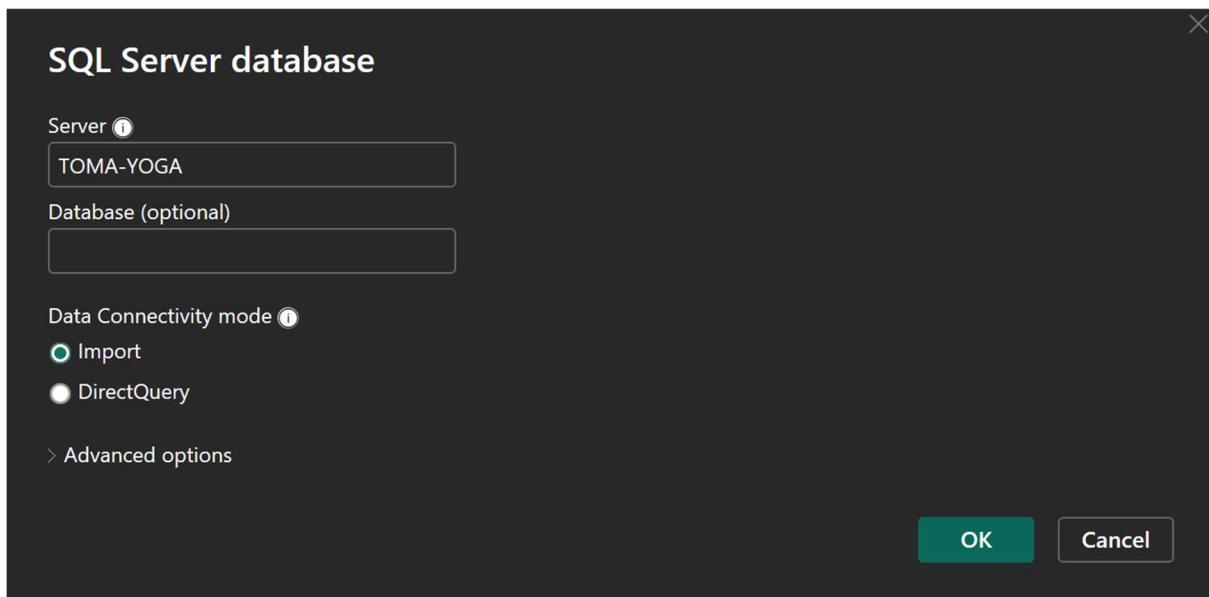


Figure 2 - Power BI SQL Server connector settings used for importing the dataset.

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

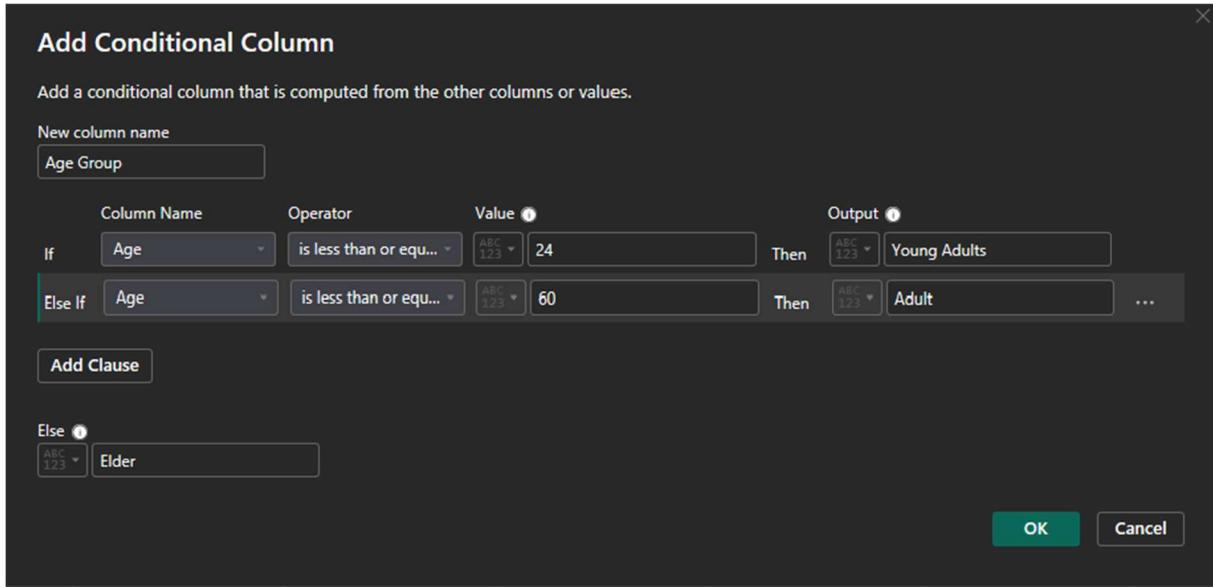


Figure 3 - Power Query Conditional Column: Age Group derivation.

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

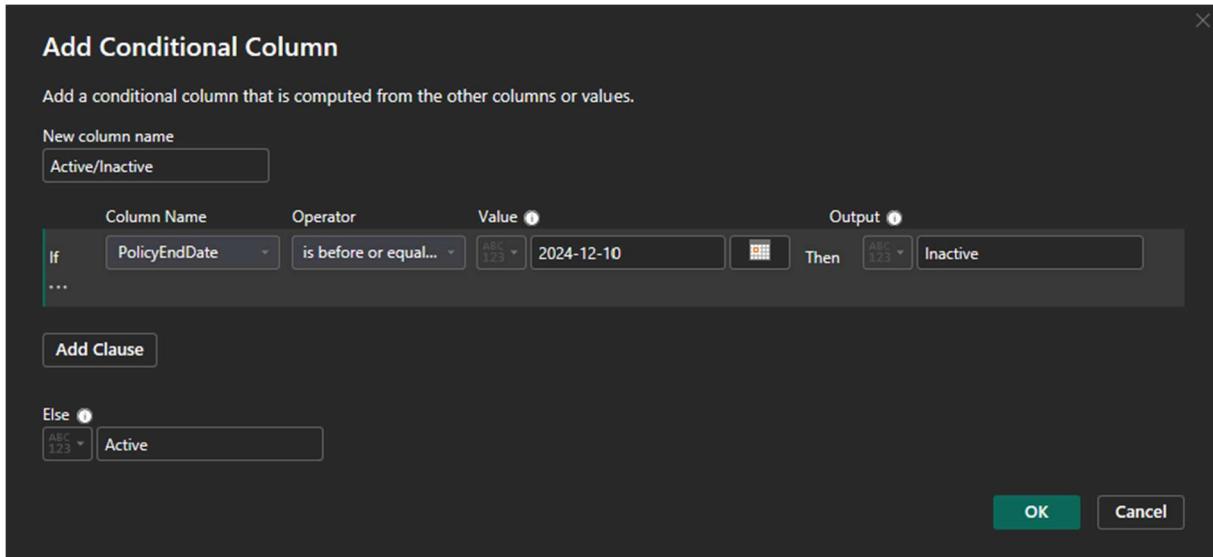


Figure 4 - Power Query Conditional Column: Active vs Inactive policy status.

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.

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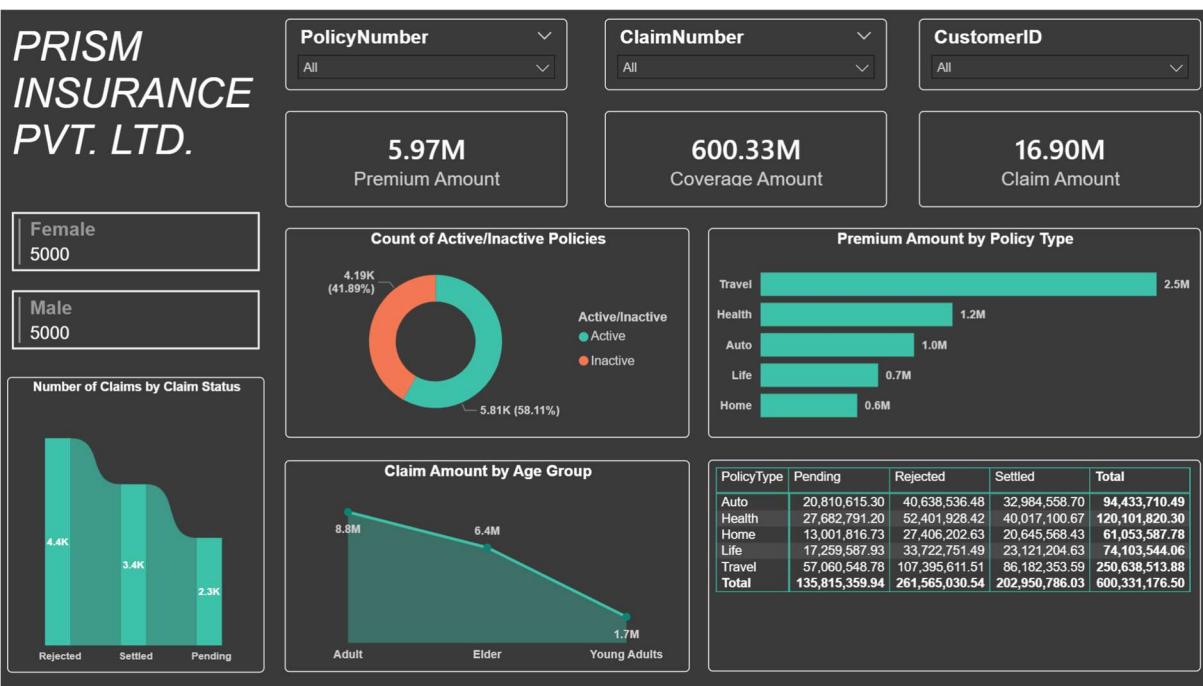


Figure 5 - Power BI report view: Overview dashboard summarizing portfolio KPIs and breakdowns.

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
P10	C10	C10	44	Male	68,203.38	607.42	Thursday, August 15, 2024	Tuesday, August 15, 2023	Travel	Pending	31-11
P100	C100	C100	23	Male	67,942.50	690.52	Friday, December 06, 2024	Wednesday, December 06, 2023	Travel	Settled	19-04
P1006	C1006	C1006	46	Male	53,043.28	208.67	Wednesday, September 11, 2024	Monday, September 11, 2023	Travel	Rejected	
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	28,386.56	213.26	Friday, August 16, 2024	Wednesday, August 16, 2023	Travel	Pending	19-11
P1011	C1011	C1011	66	Female	96,734.00	439.00	Monday, November 13, 2024	Saturday, November 11, 2023	Travel	Pending	25-01
P1012	C1012	C1012	68	Male	65,171.57	104.85	Saturday, March 26, 2025	Friday, March 25, 2024	Travel	Settled	16-04
P1014	C1014	C1014	53	Male	30,079.07	707.11	Monday, January 20, 2025	Saturday, January 20, 2024	Travel	Pending	22-02
P1017	C1017	C1017	32	Female	23,782.16	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	26-01
P1021	C1021	C1021	29	Female	102,242.05	594.64	Tuesday, March 25, 2025	Monday, March 25, 2023	Travel	Settled	22-03
P1023	C1023	C1023	45	Female	21,260.00	1,071.56	Monday, December 02, 2024	Saturday, December 02, 2023	Travel	Rejected	
P1028	C1028	C1028	36	Female	107,525.23	353.75	Friday, May 02, 2024	Thursday, May 02, 2023	Travel	Rejected	
P103	C103	C103	51	Male	71,319.90	335.96	Tuesday, July 30, 2024	Sunday, July 30, 2023	Travel	Rejected	
P1031	C1031	C1031	20	Female	26,044.73	1,060.13	Friday, November 15, 2024	Wednesday, November 15, 2023	Travel	Settled	13-06
P1036	C1036	C1036	33	Male	31,850.89	1,044.00	Monday, October 07, 2024	Friday, October 06, 2023	Travel	Pending	20-03
P104	C104	C104	41	Male	72,872.72	659.38	Saturday, April 19, 2025	Friday, April 19, 2024	Travel	Settled	18-11
P1040	C1040	C1040	62	Male	51,936.46	1,013.12	Friday, April 11, 2025	Thursday, April 11, 2024	Travel	Pending	08-04
P1041	C1041	C1041	52	Male	20,539.19	929.81	Thursday, April 03, 2025	Wednesday, April 03, 2024	Travel	Settled	23-01
P1043	C1043	C1043	50	Female	41,057.92	570.80	Monday, October 28, 2024	Saturday, October 28, 2023	Travel	Rejected	
P1045	C1045	C1045	76	Female	40,477.52	228.74	Sunday, May 11, 2025	Saturday, May 11, 2024	Travel	Settled	04-01
P1047	C1047	C1047	61	Female	83,741.63	253.85	Monday, July 22, 2024	Saturday, July 22, 2023	Travel	Rejected	
P1048	C1048	C1048	47	Female	39,883.98	688.53	Wednesday, November 20, 2024	Mondays, November 20, 2023	Travel	Pending	30-08
P1049	C1049	C1049	56	Male	44,786.30	442.55	Sunday, February 16, 2025	Friday, February 16, 2024	Travel	Rejected	
P105	C105	C105	68	Female	108,791.26	231.83	Monday, October 17, 2024	Saturday, October 17, 2023	Travel	Rejected	
P1054	C1054	C1054	64	Male	95,100.67	514.00	Monday, February 25, 2025	Sunday, February 25, 2024	Travel	Pending	20-02
P1056	C1056	C1056	59	Male	69,236.88	433.15	Sunday, April 25, 2024	Friday, April 25, 2023	Travel	Rejected	
P1058	C1058	C1058	56	Male	47,517.70	778.19	Monday, August 12, 2024	Sunday, August 12, 2023	Travel	Rejected	
P106	C106	C106	20	Male	59,257.97	319.44	Friday, November 29, 2024	Wednesday, November 29, 2023	Travel	Settled	07-01
P1062	C1062	C1062	54	Male	76,065.86	528.78	Tuesday, July 08, 2025	Monday, July 08, 2024	Travel	Pending	07-07
P1063	C1063	C1063	77	Female	74,102.38	675.04	Thursday, May 22, 2025	Wednesday, May 22, 2024	Travel	Settled	03-03
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.

The screenshot shows the 'Manage security roles' dialog in Power BI Desktop. On the left, the 'Roles' section lists 'Health Role' and 'Travel Role'. In the center, the 'Tables' section shows the 'InsuranceData' table selected. On the right, the 'Rules' section displays two rules for the 'InsuranceData' table. The first rule, 'Health', is defined as 'Show data if All of these rules are true' with a single condition: 'PolicyType Equals Health'. The second rule, 'Travel', is defined similarly. At the bottom right are 'Save' and 'Close' buttons.

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** (Insurededb.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.