

# Claims Integrity & Risk Analysis

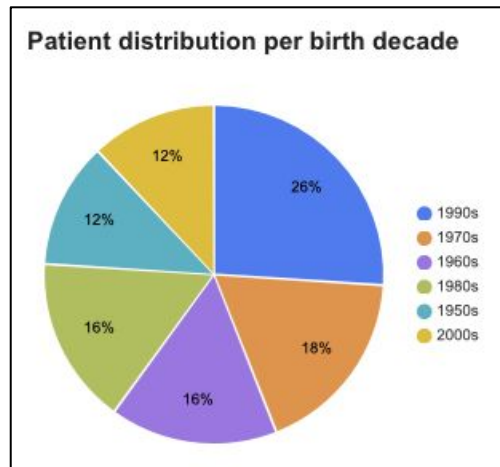
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8<sup>th</sup> Oct 2025

Project in Data Analytics Bootcamp, TechNative

# Age Demographic Analysis

```
-- What is the distribution of patients in different birth decades?  
SELECT  
CASE  
  WHEN EXTRACT(YEAR from date_of_birth) BETWEEN 1950 AND 1959 THEN '1950s'  
  ...  
  ELSE '2000s'  
END AS birth_decade,  
count(patient_id) number_of_patients  
FROM patients  
GROUP BY birth_decade  
ORDER BY birth_decade;
```

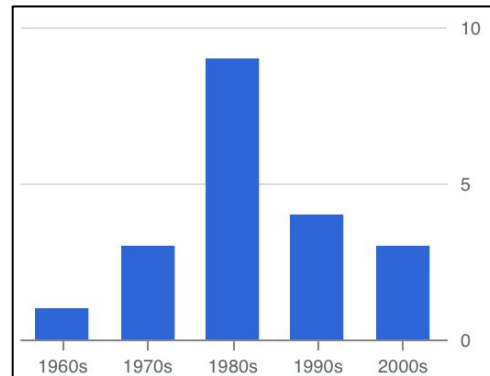


```
-- What are the claim approval rates for different birth decades?
```

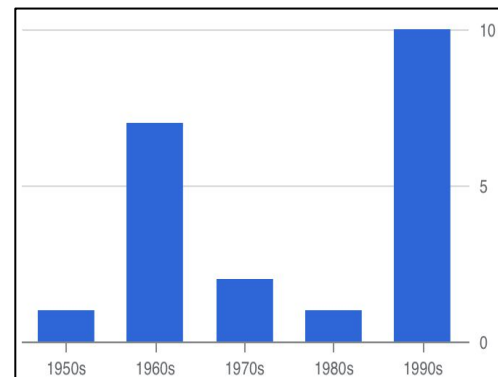
# Age Demographic Insights

-- What are the claim frequencies for paid / failed bills in different birth decades?

```
SELECT
  CASE
    WHEN EXTRACT(YEAR from date_of_birth) BETWEEN 1950 AND 1959 THEN '1950s'
    ...
    ELSE '2000s'
  END AS birth_decade,
  count(patients.patient_id) number_of_patients
FROM billing
LEFT JOIN patients
  ON billing.patient_id = patients.patient_id
GROUP BY birth_decade, billing.payment_method, billing.payment_status
HAVING billing.payment_method = 'Insurance' AND billing.payment_status IN ('Paid')
ORDER BY birth_decade;
```



Number of paid claims in birth decade



Number of failed claims in birth decade

# Payout Efficiency

-- What is the overall payment efficiency in the billing department?

```
SELECT ROUND(SAFE_DIVIDE(SUM(CASE WHEN payment_status = 'Paid' THEN 1 ELSE 0 END),  
                        COUNT(bill_id))*100, 2) Payout_Efficiency
```

```
FROM billing;
```

-- Overall payment efficiency = 32%

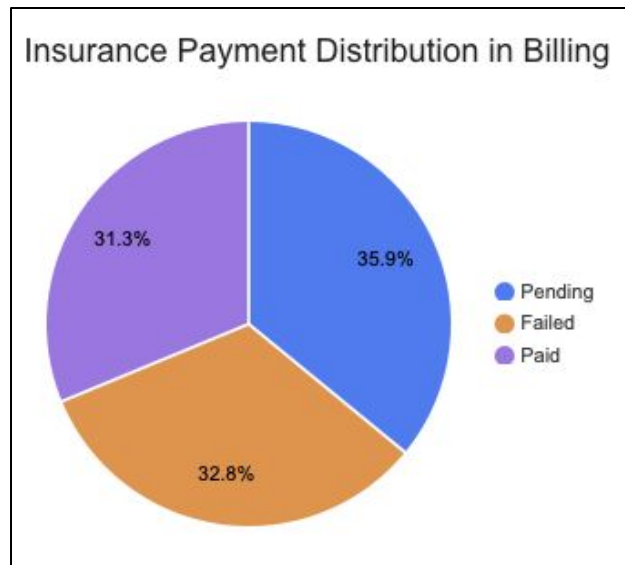
-- What are the payment situations for the bills submitted to the insurance

```
SELECT payment_status, COUNT(bill_id) Number_of_bills
```

```
FROM billing
```

```
WHERE payment_method = 'Insurance'
```

```
GROUP BY payment_status;
```

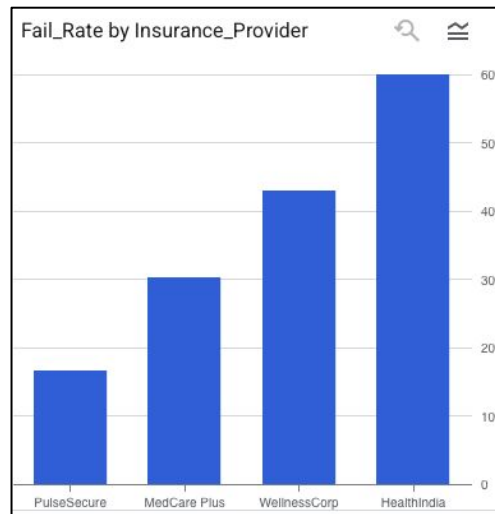
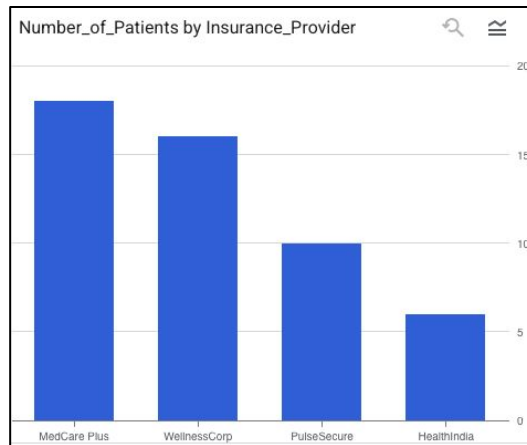


# Claim Rejection Rate Measures

Rejection Rate = (Number of failed payments / Total Number of bills)%

-- Get the fail rates for insurance providers

```
SELECT p.insurance_provider  
      ROUND(SAFE_DIVIDE(  
          SUM(CASE WHEN b.payment_status = 'Failed' THEN 1 ELSE 0 END),  
          COUNT(b.bill_id))*100, 1) Fail_Rate  
FROM billing b  
LEFT JOIN patients p  
ON b.patient_id = p.patient_id  
WHERE b.payment_method = 'Insurance'  
GROUP BY p.insurance_provider;
```



# Verification of Claims

-- 103 / 200 Appointments were No-shows or Cancellations

-- Show billing data for the appointments which were 'No-show' or 'Cancelled'

```
SELECT b.bill_id, b.payment_status, b.payment_method, b.amount
FROM billing b
INNER JOIN treatments t
    ON billing.treatment_id = treatments.treatment_id
WHERE t.appointment_id IN
    (SELECT appointment_id
     FROM appointments
     WHERE status IN ('No-show', 'Cancelled'));
```

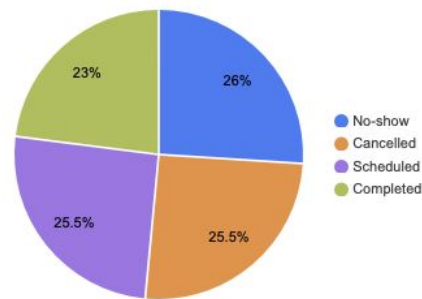
Query results

Save results • Open in •

Job information		Results	Visualization	JSON	Execution details	Execution graph
Row	bill_id	payment_status	payment_method	amount		
1	B197	Pending	Cash	975.49		
2	B188	Paid	Cash	616.15		
3	B166	Failed	Cash	4055.14		
4	B095	Failed	Cash	2007.48		
5	B175	Paid	Cash	4201.16		
6	B105	Pending	Cash	1959.5		
7	B062	Paid	Cash	3139.74		
8	B140	Pending	Cash	4019.13		
9	B154	Failed	Cash	4637.25		
10	B174	Paid	Cash	3384.37		
11	B008	Failed	Cash	3413.64		
12	B052	Paid	Cash	2090.4		
13	B086	Pending	Cash	3759.52		

Results per page: 50 • 1 - 50 of 103 |< < > >|

Appointments by Status



-- What is the payment status for the bills relevant to No-show/Cancelled appointments?

# Fraud Detection

-- Find the number of paid bills for the No-shows/Cancellations grouped on payment method

```
SELECT b.payment_method, COUNT(b.bill_id) Number_of_bills_paid
FROM billing b
INNER JOIN treatments t
ON b.treatment_id = t.treatment_id
WHERE appointment_id in (SELECT appointment_id
                        FROM appointments
                        WHERE status IN ('No-show', 'Cancelled'))
GROUP BY b.payment_method, b.payment_status
HAVING b.payment_status = 'Paid';
```

Method	No-show	Cancellation
Cash	5	7
Credit Card	7	5
Insurance	6	5

Number of paid No-show / Cancelled bills in each payment method

-- Insurance should not be liable to pay for the No-show/Cancelled appointments.

-- More hidden risk if the patients claim for the paid bills for cancellations or No-shows.

-- Is it due to low quality in data or the No-show/Cancellation policy in the hospital?

# Thank you!

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# Data Links

[Claims-Integrity-and-Risk-Analysis---Enhancing-Payout-Efficiency](#)

# Gender Demographic Analysis

```
-- Find the gender distribution for the patients
```

```
SELECT gender,  
       COUNT(patient_id) AS number_of_patients
```

```
FROM patients
```

```
GROUP BY gender;
```

```
-- 19 are female patients & 31 are male patients
```

```
-- Find the gender distribution over billings
```

```
SELECT p.gender,  
       COUNT(b.bill_id) number_of_bills
```

```
FROM billing b
```

```
LEFT JOIN patients p
```

```
  ON b.patient_id = p.patient_id
```

```
GROUP BY p.gender;
```

```
-- 70 bills from Female patients & 130 bills are from Male patients
```