A SEVERITY-BASED RISK ANALYSIS

India Traffic Accident Risk

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Tableau • SQL • Excel • Data Modeling

Why accident volume alone is a misleading measure of danger

Executive Summary

- High accident counts do **not necessarily indicate higher fatality risk**
- Several Indian regions with moderate accident volume show **disproportionately high severity**
- A severity-first approach reveals **hidden risk hotspots** missed by volume-based analysis
- Road transport is the **dominant driver of fatal outcomes** in high-risk regions
- Severity-based metrics provide **more actionable insight** for policy and safety planning

Business Problem

Traffic safety decisions are often based on:

- Total number of accidents
- Aggregate injury and death counts

Key issue:

- This approach assumes more accidents = more danger
- It ignores how severe each accident is

Risk:

- Misallocation of safety budgets
- Under-prioritisation of structurally dangerous regions
- Ineffective intervention strategies

Key Business Question

Where is traffic accident risk truly highest when severity is considered – not just volume?

Supporting questions:

- Does high accident volume always imply high fatality risk?
- Which regions are dangerous despite lower counts?
- What transport mode actually drives severe outcomes?

Data Overview

Source: Public Indian traffic accident statistics

Coverage: Indian states and Uts

Measures include:

- Road accidents
- Railway accidents
- Railway crossing accidents

Metrics available:

- Cases
- Injured
- Died

Note:

Cities and aggregate totals were excluded to maintain consistent state-level analysis

Source: *https://www.data.gov.in/resource/stateutscity-wise-number-cases-reported-and-persons-injured-died-due-traffic-accidents*

Data Preparation & Validation

Data Preparation & Validation

- Removed non-analytical aggregate rows:
  - Total (India), Total (States), Total (UTs)
- Standardized state-level granularity
- Validated internal consistency:
  - Total cases = Road + Rail + Crossing
  - Same validation for Injured and Died
- Created a clean, analysis-ready dataset

Outcome:
High confidence in data integrity before visual analysis

Why volume is not enough

Why Accident Volume Alone Is Misleading

Two regions can have:

- Similar accident counts
- Very different fatality outcomes

Example scenarios:

- High volume, low fatalities
- Low volume, high fatalities per accident

Conclusion:

Risk must be measured by severity per accident, not just frequency

Introducing the Severity Index

Severity Index (Custom Metric)

The Severity Index captures **risk per accident**, not total volume.

Conceptual components:

- Fatality rate = Deaths / Cases
- Injury rate = Injuries / Cases
- Combined into a severity score

Why this matters:

- Enables fair comparison across regions
- Highlights hidden high-risk areas
- Separates *frequency* from *impact*

Risk Categorisation

Risk Categorisation Framework

Regions classified into:

- **High Risk**
- **Medium Risk**
- **Low Risk**

Based on:

- Severity Index thresholds

Purpose:

- Simplify prioritisation
- Enable consistent filtering across analyses
- Support policy-level decision making

View 1

Top High-risk Regions

What this view shows:

- Regions ranked by Severity Index
- Independent of accident volume

Key insight:

- Several smaller or less-discussed regions rank higher than large states
- High severity risk is not limited to high-volume regions

View 2

Severity Vs Accident Volume

What this view shows:

- Relationship between total accidents and severity
- Median reference lines form risk quadrants

Key insight:

- High accident volume does not always imply higher fatality severity

Implication:

- Volume-only prioritization misses critical risk zones

Risk Quadrant Interpretation

- **High Volume / High Severity**

→ Immediate intervention required

- **Low Volume / High Severity**

→ Hidden structural danger

- **High Volume / Low Severity**

→ Operational improvements working

- **Low Volume / Low Severity**

→ Lower priority zones

This framework enables **targeted policy responses**.

Transport Mode Breakdown
(High-Risk Regions)

What this view shows:

- Contribution of Road, Rail, and Crossing accidents
- Focused only on high-risk states

Key insight:

Road accidents overwhelmingly dominate fatality risk across all high-severity regions

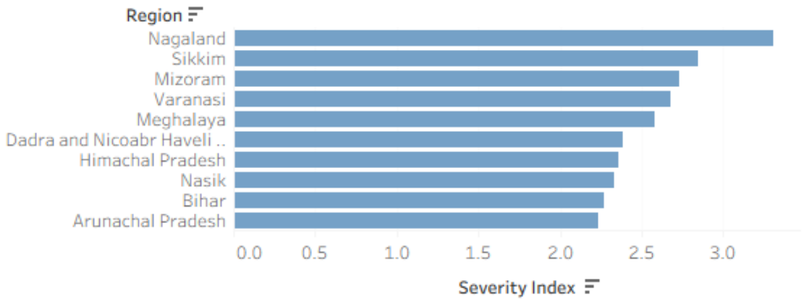
Rail and crossing incidents play a **secondary role.**

Dashboard Overview

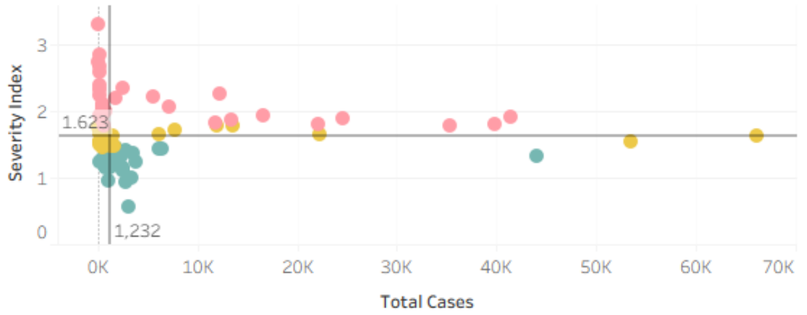
India Traffic Accident Risk — Severity-Based Analysis

High accident volume does not always imply higher fatality severity

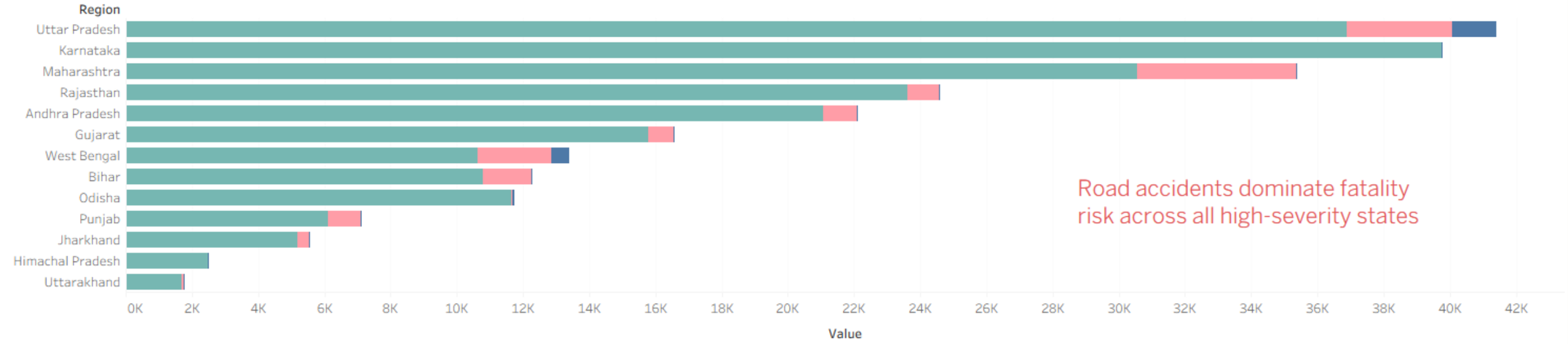
Top 10 High-Risk Regions by Severity



Severity vs Accident Volume (Risk Quadrants)



Transport Mode Breakdown (High-Risk Regions)



Road accidents dominate fatality risk across all high-severity states

KEY INSIGHTS

- Severity and volume are **weakly correlated**
- High-severity risk exists even at moderate volumes
- Road transport is the **primary driver of fatal outcomes**
- Severity-based metrics outperform raw counts for prioritisation

Business & Policy Implications

- Safety budgets should prioritise **severity hotspots**
- Road-focused interventions yield highest impact
- Volume-based KPIs risk misallocation
- Severity metrics should be integrated into safety planning

LIMITATIONS & ASSUMPTIONS

- Cross-sectional analysis (no time trends)
- No exposure normalisation (population, vehicle density)
- Severity Index uses simplified weighting
- Analysis focuses on state-level aggregation

These do not invalidate insights, but define scope.

CONCLUSION

Accident risk is a **severity problem**, not just a volume problem

Severity-based analysis reveals **hidden danger zones**

Road transport dominates fatal outcomes

Data-driven prioritisation enables **smarter safety decisions**