Food Delivery Performance

What drives delivery time — and where the gap is

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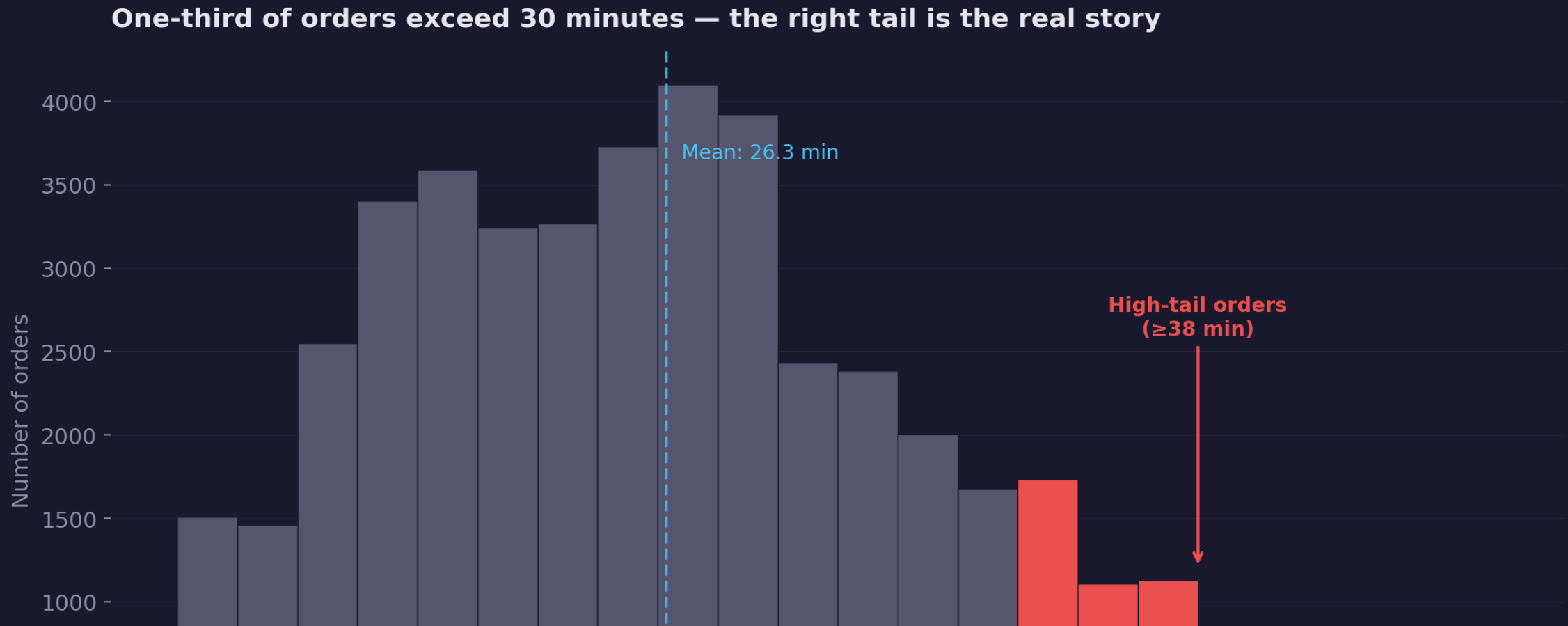
Context

45,593 orders across Indian cities. One headline metric. What's underneath it?

45,500 deliveries, 26 minutes average — the surface looks fine

The headline metric — average delivery time — sits at 26.3 minutes. Acceptable on the surface. But delivery times in this dataset run from 10 minutes to 54 minutes. The distribution isn't centred. There's a right tail, and it matters.

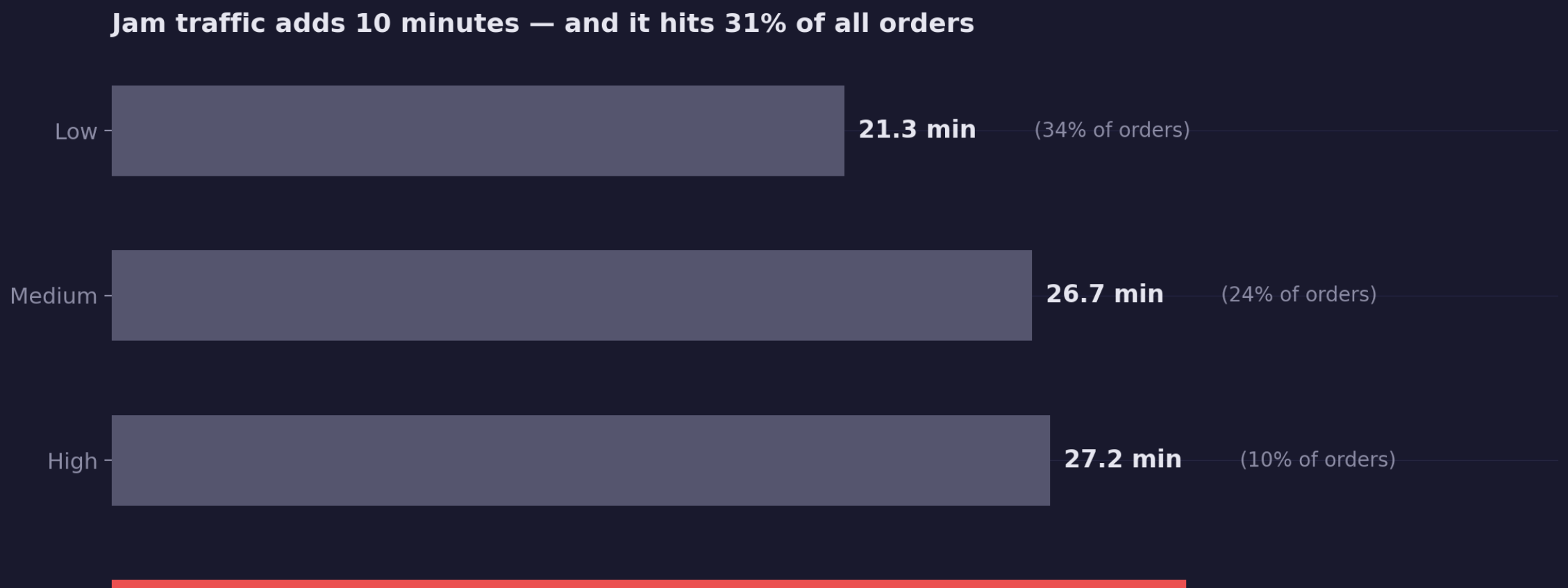


The drivers

Three factors account for most of the variation. Two are at least partially controllable.

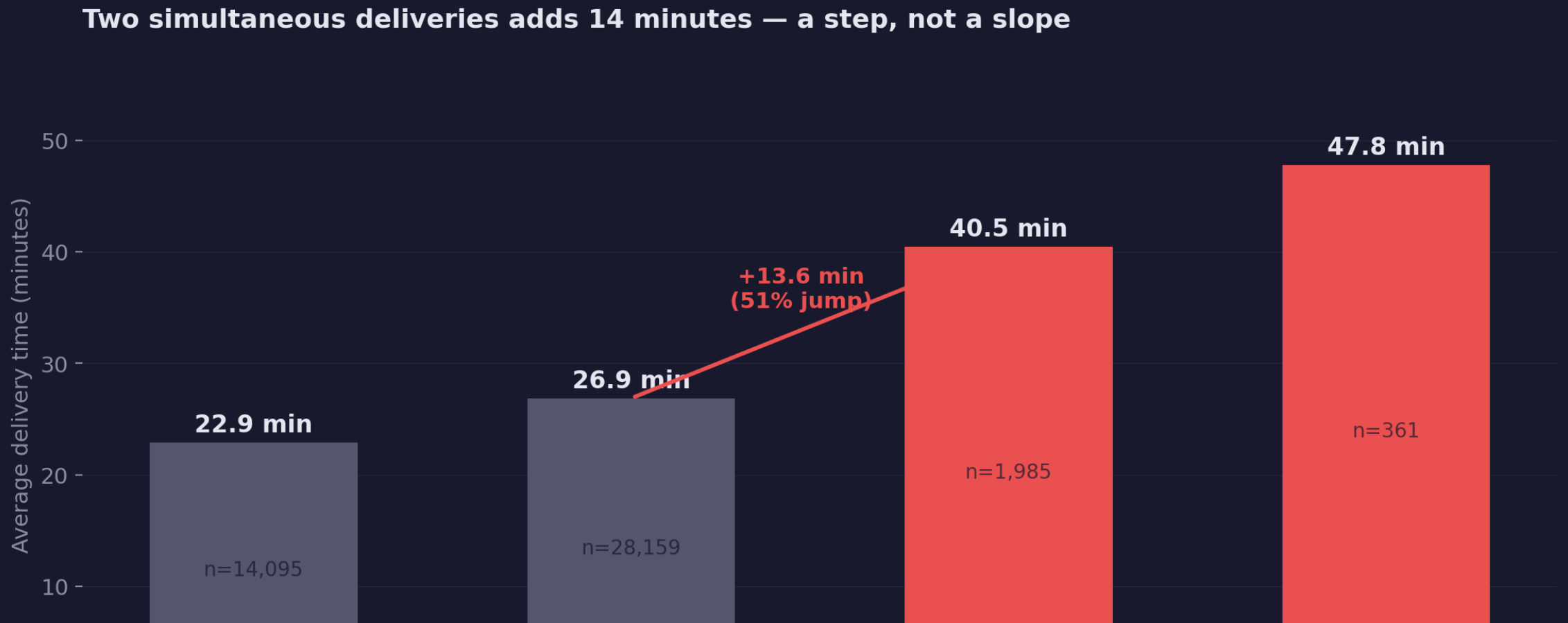
Jam traffic adds 10 minutes — and it hits 31% of all orders

Traffic density is the single strongest predictor of delivery time. Orders in Jam conditions average 31.2 minutes — 9.9 minutes longer than Low traffic (21.3 min). This isn't a tail event. Jam is the second most common traffic state in the dataset, affecting nearly a third of all orders.



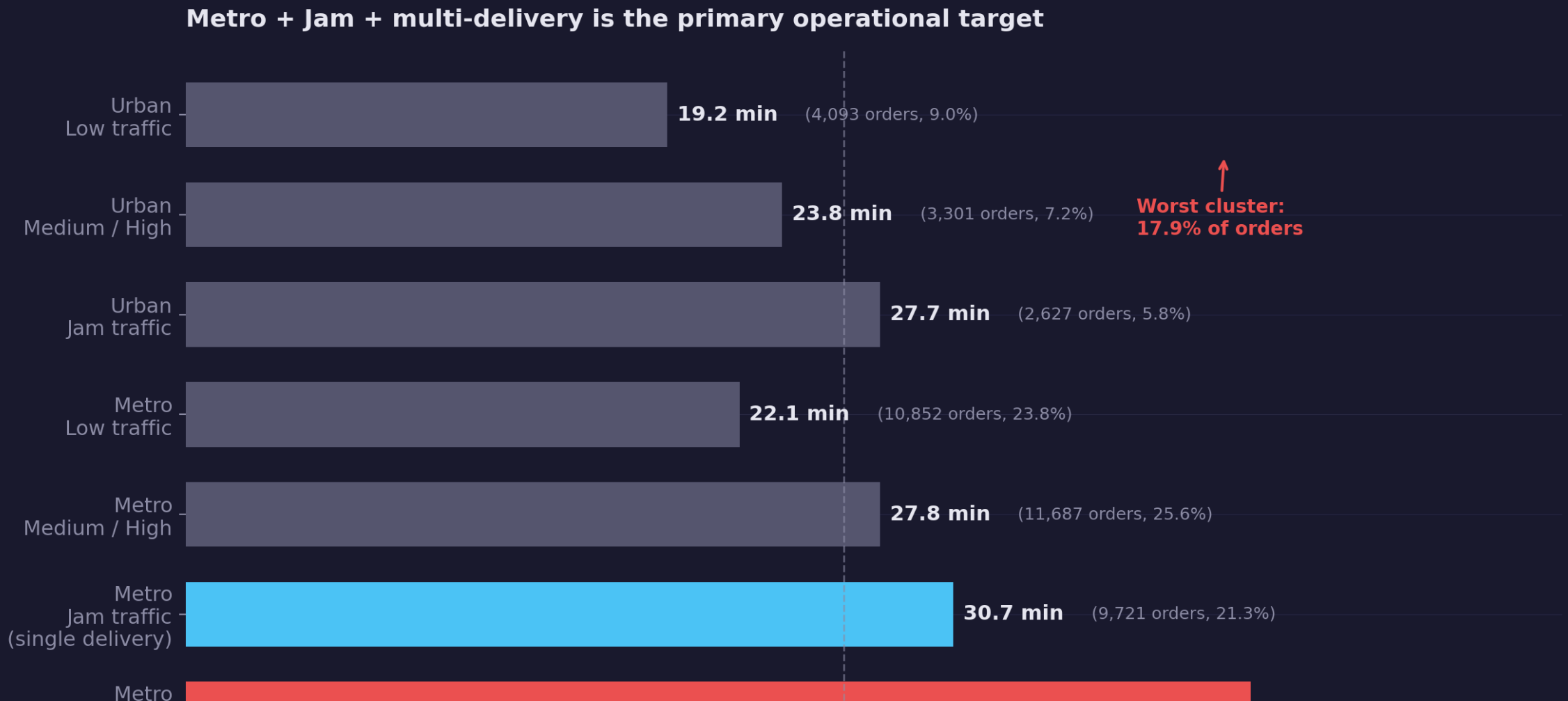
Two simultaneous deliveries adds 14 minutes — a step, not a slope

Multiple deliveries per run show a non-linear threshold: moving from 1 to 2 orders per run adds 13.6 minutes — a 51% jump. Three deliveries average 47.8 minutes. This isn't a continuous trade-off. It's a constraint. And it's fully within operations' control.



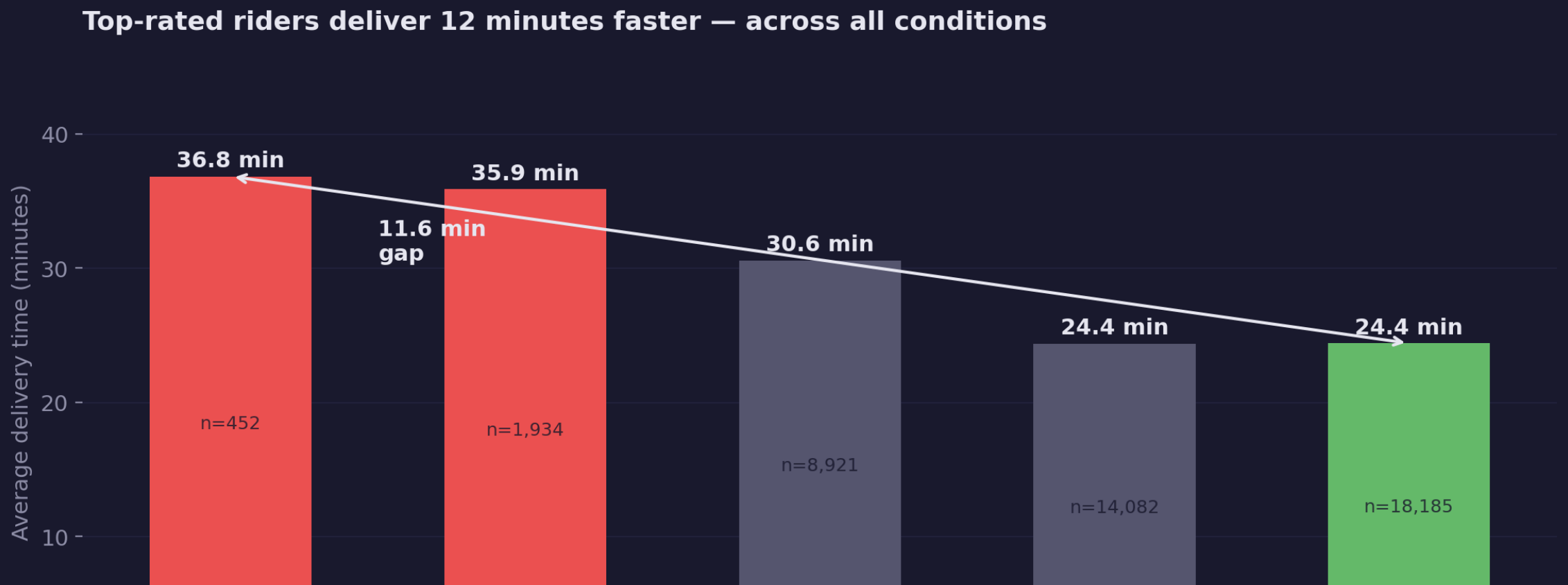
One in five orders sits in the worst combination

Metropolitan city + Jam traffic + batching = 17.9% of all orders (8,151). Average delivery time in this segment: 33.1 minutes — 7 minutes above the overall mean, and nearly double what the same rider achieves on a single run in low traffic (17.4 min).



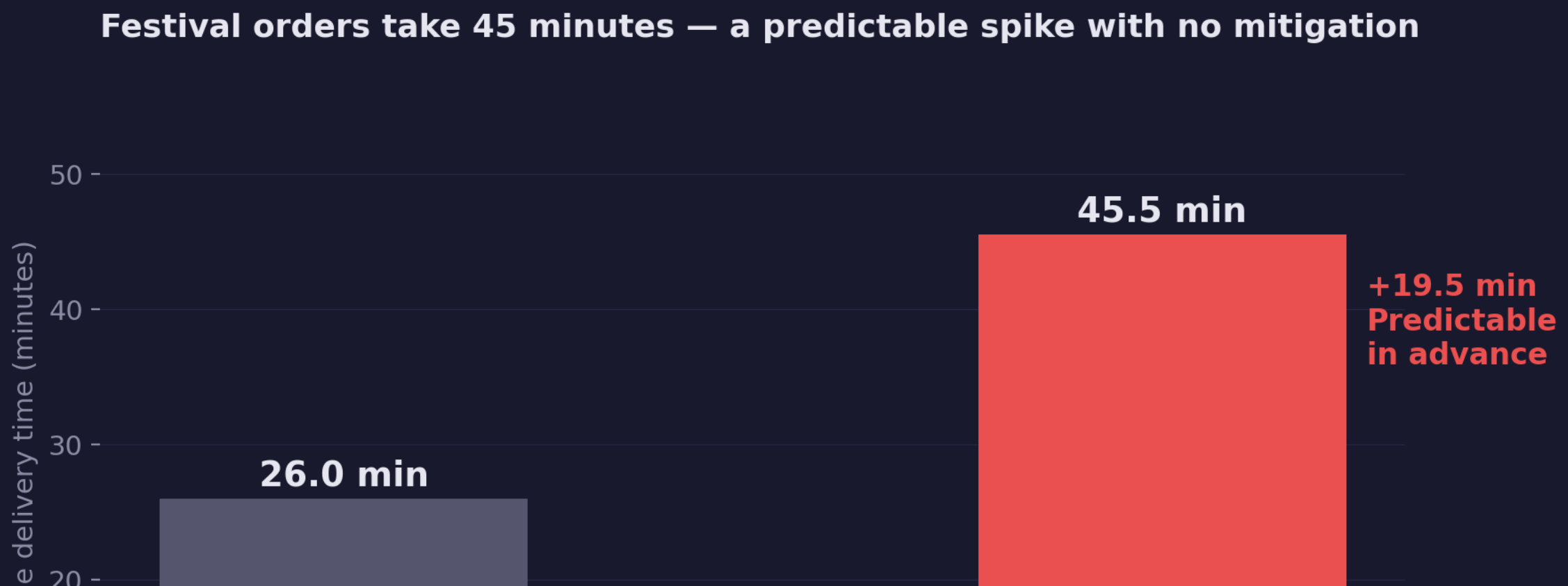
Top-rated riders deliver 12 minutes faster — and they're not selectively assigned

Rider rating correlates meaningfully with delivery time (r = –0.34). Top-rated riders (≥4.75) average 24.4 minutes. Low-rated riders (≤3.5) average 36.0 minutes — an 11.6-minute gap. In the absence of quality-aware dispatching, low-rated riders are equally likely to be assigned to the hardest routes.



Festival orders take 45 minutes — a predictable spike with no visible mitigation

Festival orders average 45.5 minutes: 19.5 minutes above the non-festival baseline. Unlike weather or traffic, festivals are knowable in advance. These 896 orders are predictable from the public calendar. The data shows no flattening of this spike — suggesting no structured pre-staffing or routing adjustment is currently in place.



What we should do

Three levers. One priority order. A conservative 42,000 minutes to recover.

Cap batching, pre-staff festivals, and match riders to conditions

Three targeted changes can recover the majority of the identified gap without capital investment in infrastructure. The primary lever — capping batch size in Metro + Jam conditions — addresses the segment responsible for the largest total time loss.

Three targeted actions can recover 42,000+ minutes at conservative assumptions

Recommendation	Affected Orders	Conservative Save	Base Save	Confidence	Decision Owner
Cap batch at 1 in Metro + Jam zones	8,151 orders (17.9%)	24,453 min (3 min/order)	42,383 min (5.2 min/order)	Medium	Head of Dispatch Ops
Pre-staff & single-route festivals	896 orders (2.0%)	8,960 min (10 min/order)	17,472 min (19.5 min cap)	Medium	City Ops Manager
Quality-aware dispatching	8,151 orders (complex runs)	~32,000 min (est.)	~48,000 min (est.)	Low–Med	PM, Dispatch Algo

Recommendation 1 — Cap batch size at 1 for Metro + Jam

Action: In Metropolitan cities under Jam traffic conditions, dispatch routing should enforce a maximum of 1 delivery per run.

Field	Detail
Decision owner	Head of Dispatch Operations
Success metric	Metro/Jam avg delivery time: 31.9 min → ≤28 min within 60 days
Timeline	Implement in dispatch logic within 30 days
Confidence	Medium
Key risk	Rider utilisation may drop in Metro/Jam zones at peak; model capacity impact before full rollout

Recommendation 2 — Pre-staff and single-route festival orders

Action: Define a festival calendar trigger; during festival periods, route all orders as singles and increase rider capacity in impacted cities.

Field	Detail
Decision owner	City Operations Manager
Success metric	Festival order avg delivery time: 45.5 min → ≤35 min in next festival period
Timeline	Define festival criteria in 14 days; pilot in one city at next event
Confidence	Medium
Key risk	Festival definitions vary by city; require city-level calendar input

Recommendation 3 — Implement quality-aware dispatching for complex runs

Action: Prioritise riders rated ≥4.5 for Metro + Jam + multi-delivery assignments; monitor routing fairness for lower-rated riders.

Field	Detail
Decision owner	Product Manager, Dispatch Algorithms
Success metric	Avg rider rating in Metro/Jam/multi segment: current mix → ≥4.5 within 45 days
Timeline	Algorithm update within 45 days
Confidence	Low–Medium (pilot recommended before full rollout)
Key risk	High-rated rider availability may not match Metro/Jam peak demand timing

Appendix

Data profile and quality notes

Field	Detail
Dataset	Food delivery orders, India
Date range	11 Feb – 6 Apr 2022 (44 distinct days)
Rows	45,593
Grain	One row = one delivery order
Null rates	Age: 4.1%, Ratings: 4.2%, Traffic: 1.3%, City: 2.6% — all manageable
Data quality verdict	🟡 Caution — 98.7% of rows clean; Semi-Urban excluded (n=164, statistically insufficient)
Key cleaning steps	Stripped whitespace from all categoricals; replaced string "NaN" with null; extracted numeric time from `(min) XX` format

Finding not in main deck: Vehicle type confound

Motorcycles show a higher average delivery time (27.6 min) than scooters/electric scooters (~24.5 min) — counter-intuitive at first. However, motorcycles represent 58% of all riders and are disproportionately deployed in Metropolitan + high-traffic zones. Within each city-traffic combination, vehicle type explains negligible additional variance. **This is a city-routing mix effect, not a vehicle capability finding.** No vehicle recommendation is warranted from this data.

Finding not in main deck: Alternating daily pattern

The dataset shows a perfectly alternating day-level pattern: 22 "fast days" averaging 23.3 minutes and 22 "slow days" averaging 29.9 minutes — with no intermediate days. This is driven by traffic composition differences (Jam = 43% of orders on slow days vs 21% on fast days) and batching depth (2+ deliveries = 9% vs 2%). This structural variation is captured by the main findings; it does not change the recommendations.

Hypothesis register — final status

#	Hypothesis	Status	Evidence
H1	Metro cities have longer delivery times	✅ Confirmed	Metro = 27.3 min vs Urban = 23.0 min
H2	Jam traffic adds significant time	✅ Confirmed	+9.9 min vs Low; consistent within both cities
H3	Bad weather adds delivery time	⚠️ Partial	Cloudy/Fog = 28.9 min vs Sunny = 21.9 min; but Stormy = 25.9 min (no spike)
H4	Multiple deliveries increase time	✅ Confirmed	Step-change at 2 deliveries: +13.6 min
H5	Festival periods slow delivery	✅ Confirmed	+19.5 min during festivals
H6	Motorcycles are faster	❌ Rejected	Motorcycles are SLOWER; confounded by city-routing mix
H7	Low-rated riders deliver slower	✅ Confirmed	11.6 min gap; r = –0.34
H8	Data has trailing whitespace / string NaN	✅ Confirmed	All categoricals had whitespace; "NaN" strings present in 5 columns