

Forecast Accuracy Report

Q4 2025 (October - December)

Model Evaluation & Performance Analysis | Generated: January 18, 2026

Overall Model Performance

| Metric | Value | Target | Status |
|-------------------------------|-----------|--------|--------|
| MAPE (Mean Absolute % Error) | 8.8% | < 10% | PASS |
| MAE (Mean Absolute Error) | 342 units | < 500 | PASS |
| RMSE (Root Mean Square Error) | 456 units | < 600 | PASS |
| Forecast Bias | -2.1% | +/- 5% | PASS |
| Hit Rate (within 15%) | 87.3% | > 80% | PASS |

Model is performing within acceptable parameters

Monthly Accuracy Trend

| Month | Accuracy | MAPE | MAE | Rating |
|---------------|----------|------|-----|-----------|
| October 2025 | 91.2% | 8.8% | 312 | Good |
| November 2025 | 90.9% | 9.1% | 356 | Good |
| December 2025 | 92.1% | 7.9% | 298 | Excellent |
| Q4 Average | 91.4% | 8.6% | 322 | Good |

Best Predicted Formulas (Top 5)

| Formula | Predicted | Actual | Accuracy | Variance |
|---------------|-----------|--------|----------|----------|
| Paracetamol | 48,200 | 47,456 | 98.5% | +1.5% |
| Metronidazole | 12,300 | 12,087 | 98.3% | +1.7% |
| Omeprazole | 9,800 | 9,612 | 98.1% | +1.9% |
| Ranitidine | 6,500 | 6,721 | 96.6% | -3.4% |
| Domperidone | 5,200 | 5,089 | 97.9% | +2.1% |

Needs Improvement (Bottom 5)

| Formula | Predicted | Actual | Accuracy | Variance |
|-------------|-----------|--------|----------|----------|
| Amoxicillin | 18,500 | 21,234 | 85.2% | -14.8% |
| Ibuprofen | 13,200 | 14,891 | 88.6% | -12.8% |
| Salbutamol | 8,900 | 10,123 | 87.9% | -13.7% |

| | | | | |
|--------------|-------|-------|-------|--------|
| Cetirizine | 4,300 | 4,912 | 87.5% | -14.2% |
| Azithromycin | 3,800 | 4,234 | 89.7% | -11.4% |

Pattern: Antibiotics consistently under-predicted - likely weather correlation

Accuracy by District

| District | Accuracy | MAPE | Rating |
|-----------------|----------|-------|--------------|
| Bahadurabad | 93.2% | 6.8% | Excellent |
| Gulshan | 91.8% | 8.2% | Good |
| Clifton | 90.5% | 9.5% | Good |
| Defence | 89.7% | 10.3% | Acceptable |
| Saddar | 88.9% | 11.1% | Acceptable |
| North Nazimabad | 87.2% | 12.8% | Needs Review |

Weather Impact on Forecast

| Weather Condition | Demand Change | Forecast Status | Affected Categories |
|-------------------------|---------------|-----------------|---------------------------|
| High Temperature (>32C) | +8.2% | Under-predicted | ORS, Antihistamines |
| Low Temperature (<18C) | +5.6% | Under-predicted | Paracetamol, Cough syrups |
| High Humidity (>75%) | +12.4% | Under-predicted | Antibiotics, Antifungals |
| Rain Events | +9.8% | Under-predicted | Antibiotics, Fever meds |

Recommendation: Strengthen weather coefficients in Prophet model

Model Improvement Recommendations

- 1. ANTIBIOTICS: Increase weather sensitivity coefficient by 15% for humidity correlation
- 2. SEASONAL: Add monsoon season indicator variable to model
- 3. DISTRICT: Consider separate models for high-variance districts (North Nazimabad)
- 4. RETRAINING: Schedule monthly model retraining instead of quarterly
- 5. DATA: Include hospital admission data if available for better correlation
- 6. VALIDATION: Implement rolling 7-day validation for early variance detection