Reading Between the Tweets

Using Twitter to Gauge Customer Satisfaction Response to a Major Transit Service Change in Calgary, Canada

Rami Al-Sahar, **Willem Klumpenhouwer**, Amer Shalaby, Tamer El-Diraby

TAL
TRANSIT ANALYTICS LAB

UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING
Transportation Research Institute

Photo Credit: Souvik Banjeree

Calgary to get three new rapid bus transit lines starting next month
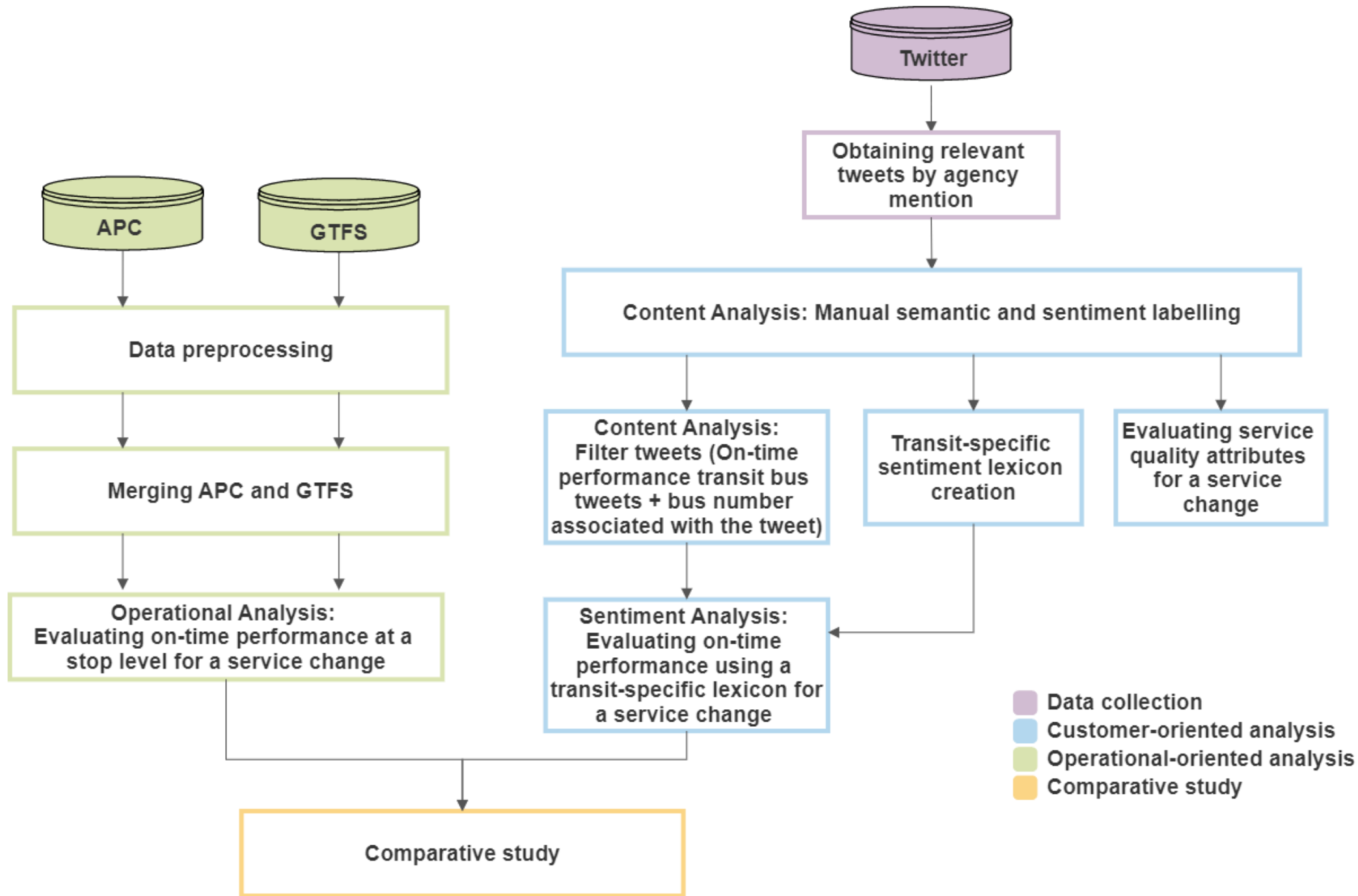
DH Calgary Staff | Oct 12 2018, 1:27 am

Calgary Transit Bus / Shutterstock

fewer stops

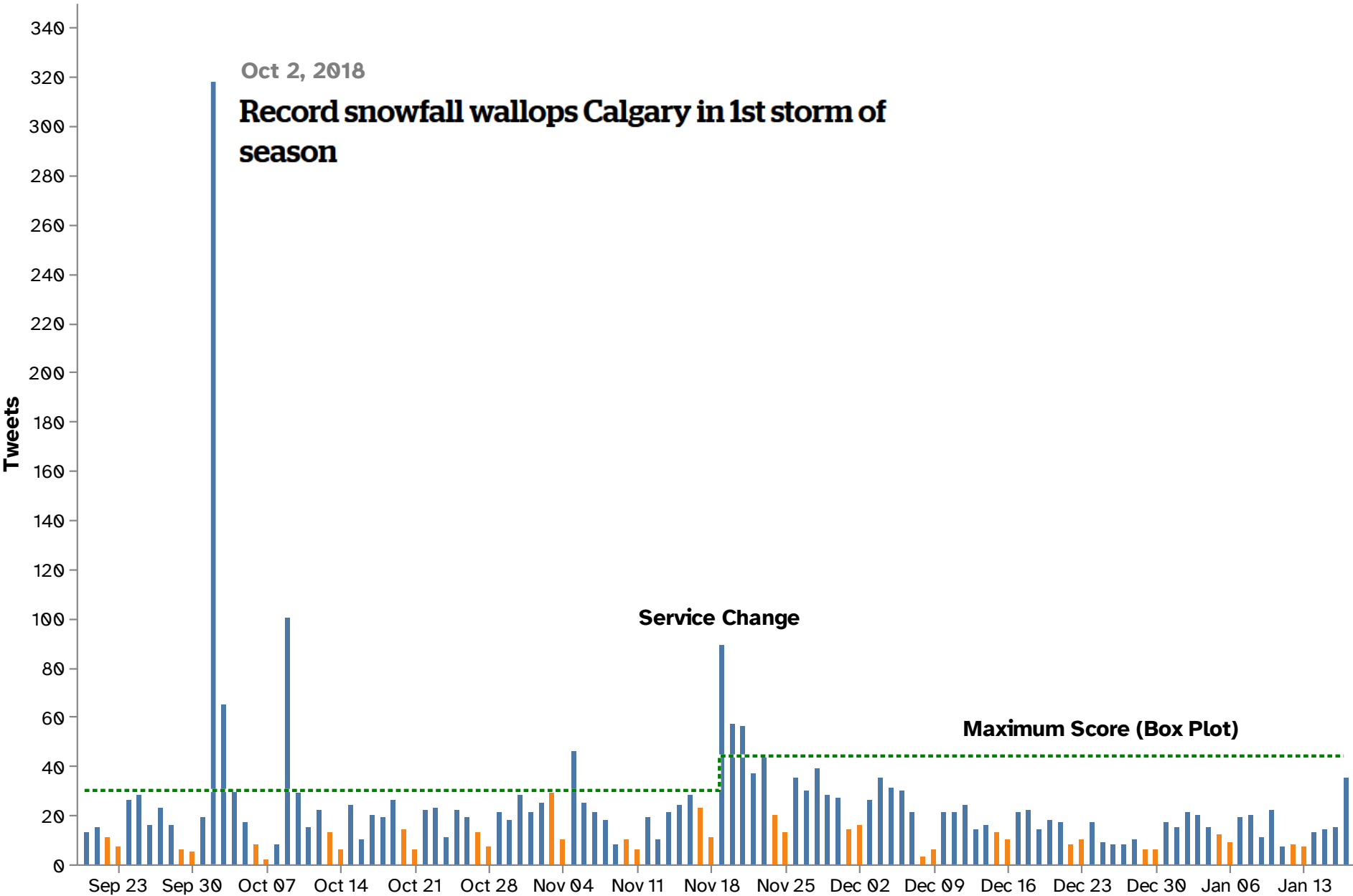(some) dedicated rights of way

major network reconfiguration

reliability improvements?

Article from Daily Hive

Daily Bus Tweet Counts Around Service Change

■ Weekday ■ Weekend

@calgarytransit

Oct 2, 2018

Record snowfall wallops Calgary in 1st storm of season

Service Change

Maximum Score (Box Plot)

1.Bus related tweet?

2.News or advertisement?

3.Question or notice?

4.Positive or negative language?

Frequency Approach

$$S(w) = \frac{|w_+| - |w_-|}{|w_+| + |w_-|}$$

Polarity Score

$$S(w) \in [-1, 1]$$

Bayes Approach

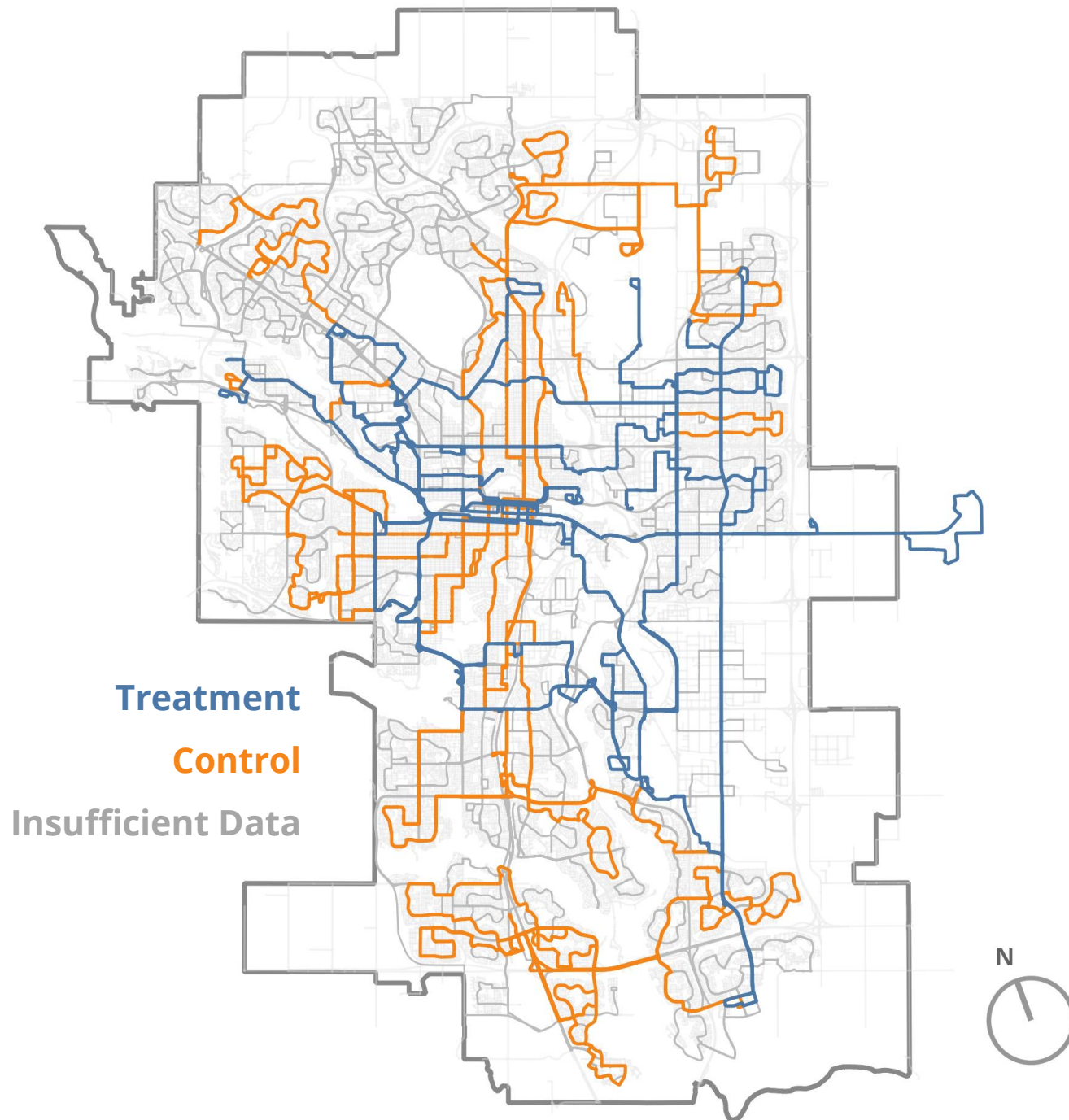$$S(w) = P(+|w) - P(-|w)$$

$$P(+|W) = \frac{P(+)P(W|+)}{P(W)}$$

$$P(W|+) = \frac{P(W_+)}{P(+)}$$

$$P(-|W) = \frac{P(-)P(W|-)}{P(W)}$$

$$P(W|-) = \frac{P(W_-)}{P(-)}$$

On-Time Performance

- Uses automated passenger counter data

- Stop event level

- % of buses arriving within -1 to +5 minutes of scheduled time
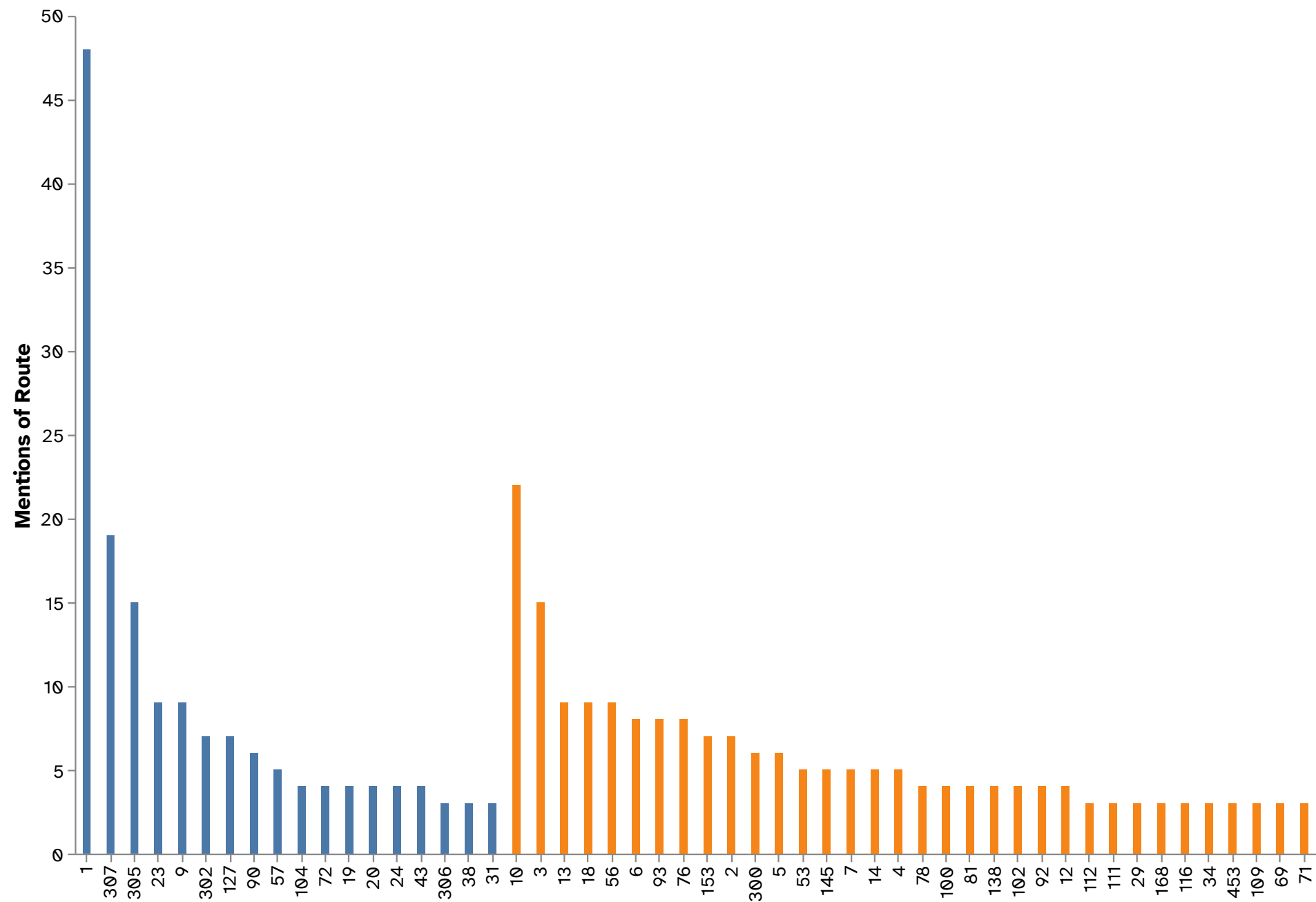
- 2-tailed 2-sample z-test

Treatment (18): Route configuration changed

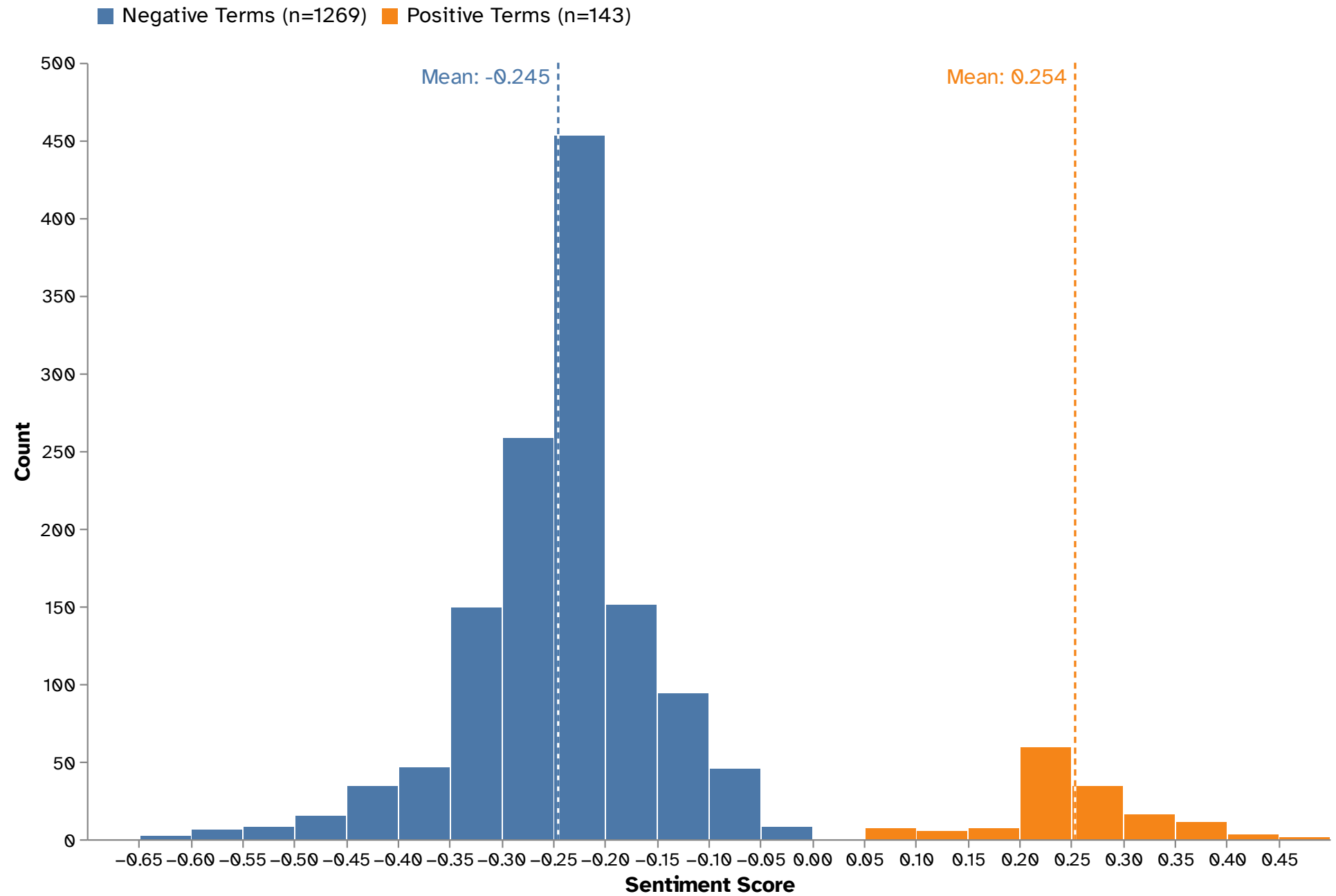**Control (34)**: Route configuration remained the same

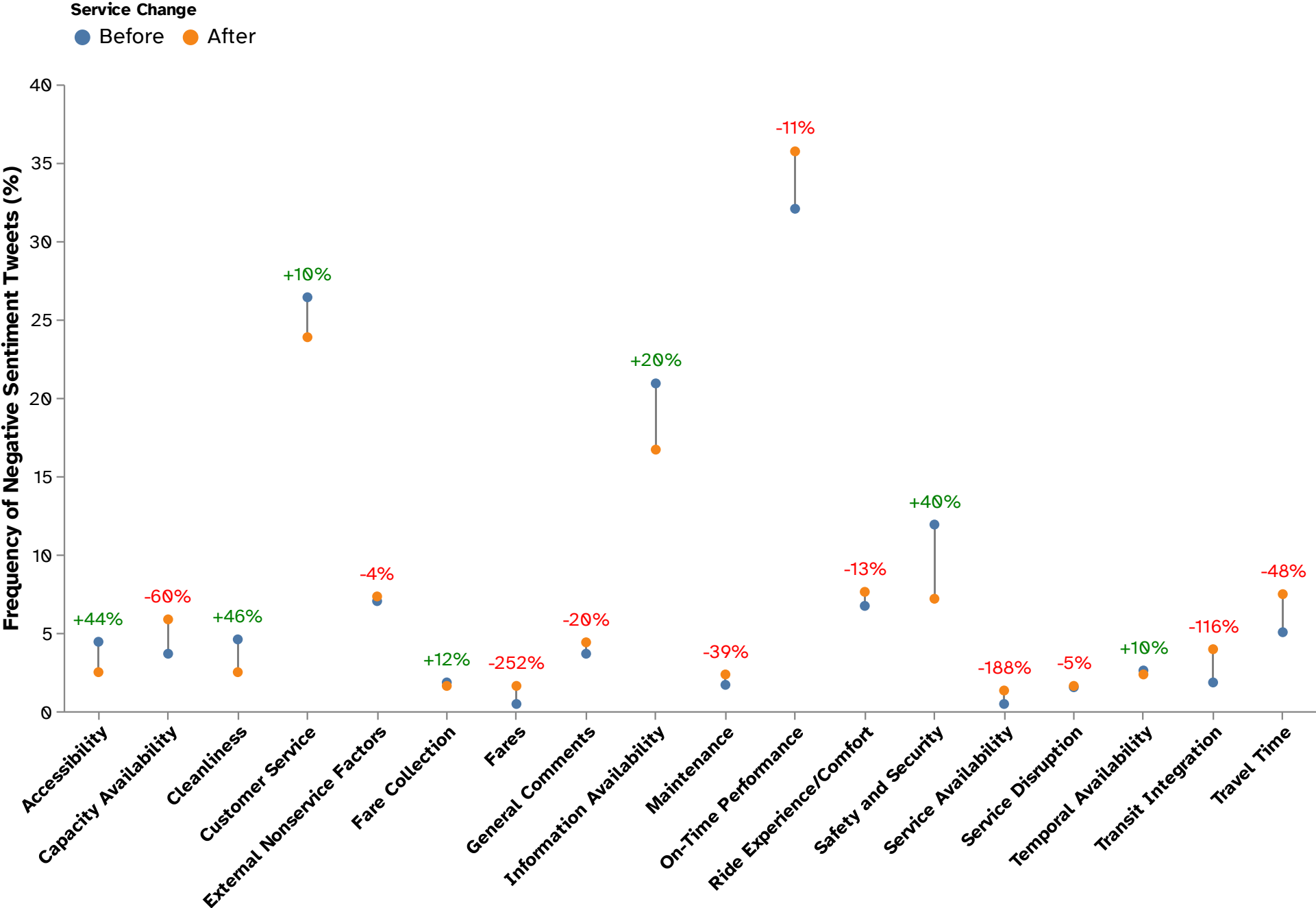Routes with < 3 tweets excluded

Total Mentions by Bus Route

■ Treatment ■ Control

Mentions of Route

Distribution of Sentiment Scores

Negative Bus Tweets Before and After MAX BRT Service Change

Service Change
- Before
- After

Frequency of Negative Sentiment Tweets (%)

- Accessibility: +44%
- Capacity Availability: -60%
- Cleanliness: +46%
- Customer Service: +10%
- External Nonservice Factors: -4%
- Fare Collection: +12%
- Fares: -252%
- General Comments: -20%
- Information Availability: +20%
- Maintenance: -39%
- On-Time Performance: -11%
- Ride Experience/Comfort: -13%
- Safety and Security: +40%
- Service Availability: -188%
- Service Disruption: -5%
- Temporal Availability: +10%
- Transit Integration: -116%
- Travel Time: -48%

Service Change Sentiment and Performance Measures

Measure
— Average Negative Sentiment
— Negative Tweet Frequency
— On-Time Performance

Scenario
— Control $p > 0.05$
-- Treatment $p < 0.05$

Observations
Before
Control OTP: 3,196,090
Treatment OTP: 2,015,586
Control Sentiment: 117
Treatment Sentiment: 46
After
Control OTP: 2,844,021
Treatment OTP: 2,450,215
Control Sentiment: 80
Treatment Sentiment: 113

OTP
(Change in %)

-8
-4
4
8

N
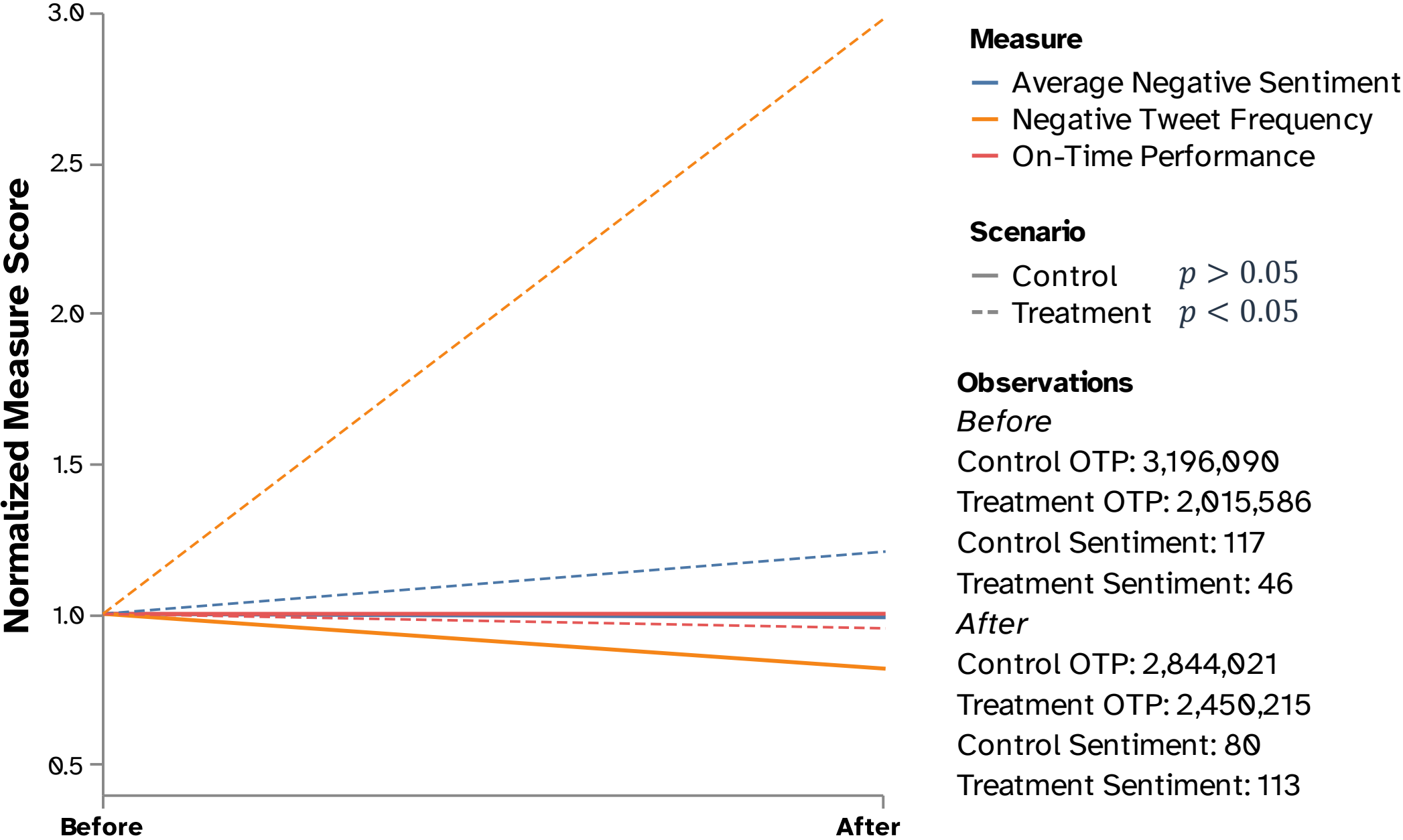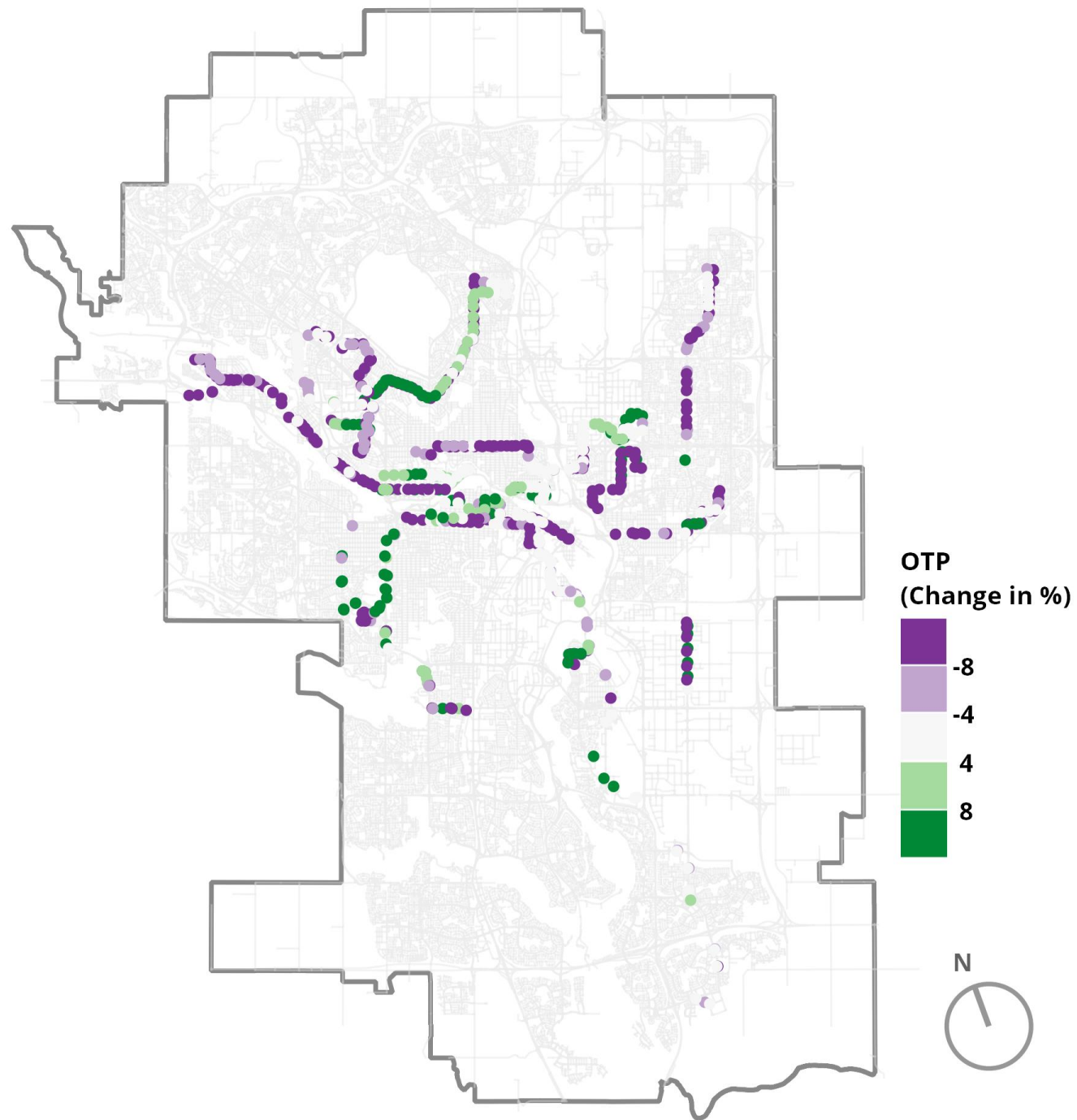
On-Time Performance and Negative Tweets Before and After MAX BRT Service Change

Routes and directions are normalized by total number of stops with 50% indicating the middle of the route.

Service Change: After, Before

# of Negative Tweets: 1 2 3 4 5 6

Eastbound towards Forest Lawn | Westbound towards Bowness

On-Time Performance (%)

Percentage of Total Route Stops
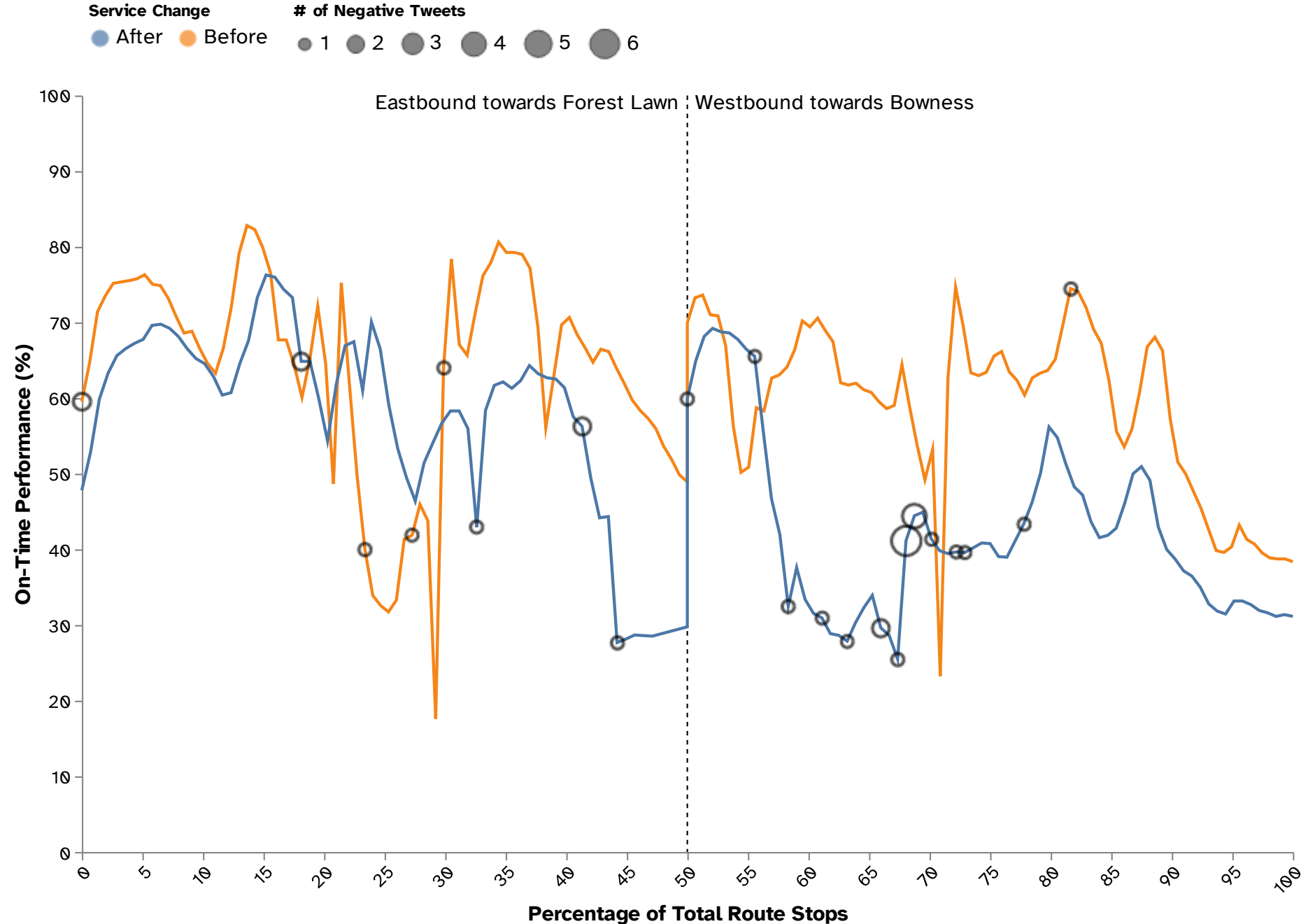
- Sentiment analysis requires some transit-specific adjustments

- Can use sentiment analysis to *supplement* customer survey data

- Change in route performance can be connected to change in Twitter sentiment

Special thanks to: Calgary Transit