Ashley Asmus, Liz Roten, Jonathan Ehrlich

Monitoring adherence to social distancing guidelines with traffic data

AMPO, October 28, 2020

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Data and modeling

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Traffic as a measure of social distancing

- Minnesota Management and Budget office (MMB) asked MnDOT, Metropolitan Council and Metro Transit for measures of social distancing
- Measures meant to inform disease modeling efforts and evaluate effectiveness of social distancing policies
- Traffic and ridership data provide near-real-time measures of change
- Existing research was quickly re-tooled

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Sources of traffic data

MnDOT

- 100+ Automated Traffic Recorders (ATRs) spread across the state on various roadway types

Metropolitan Council

- 2,700+ MnDOT Regional Transportation Management Center (RTMC) traffic sensors on metro area freeways
- Data pulled using an open-source R package written by council staff, `{tc.sensors}`

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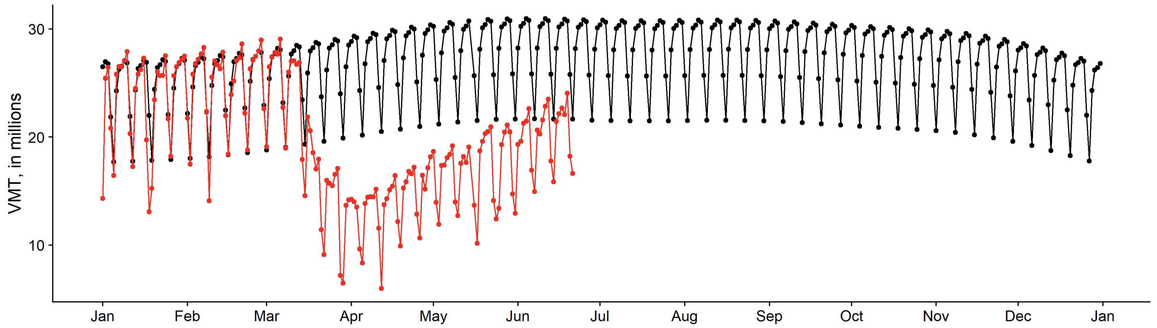
Approach to estimate “typical” traffic

Selecting a robust baseline was of key importance.

- Used Generalized Additive Models (GAMs)
  - Ideal for data with non-linear trends
  - Accounts for weekday trends and seasonal trends
  - Relies on 3 years of data (January 2018 – early March 2020)
- Created one model for each traffic node



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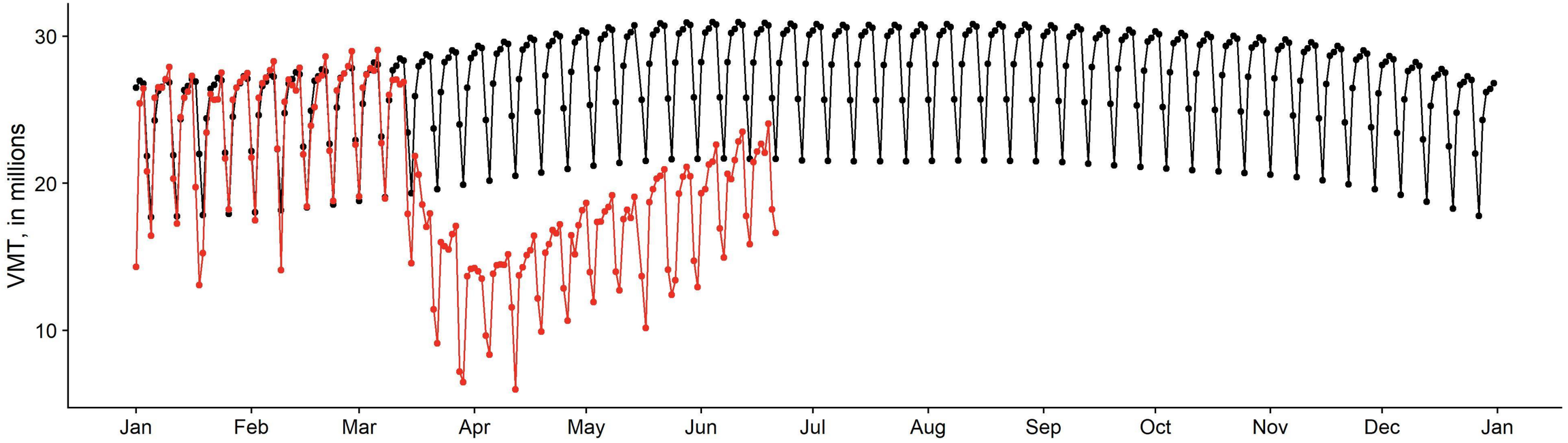
Under the hood: predicted & observed traffic volumes



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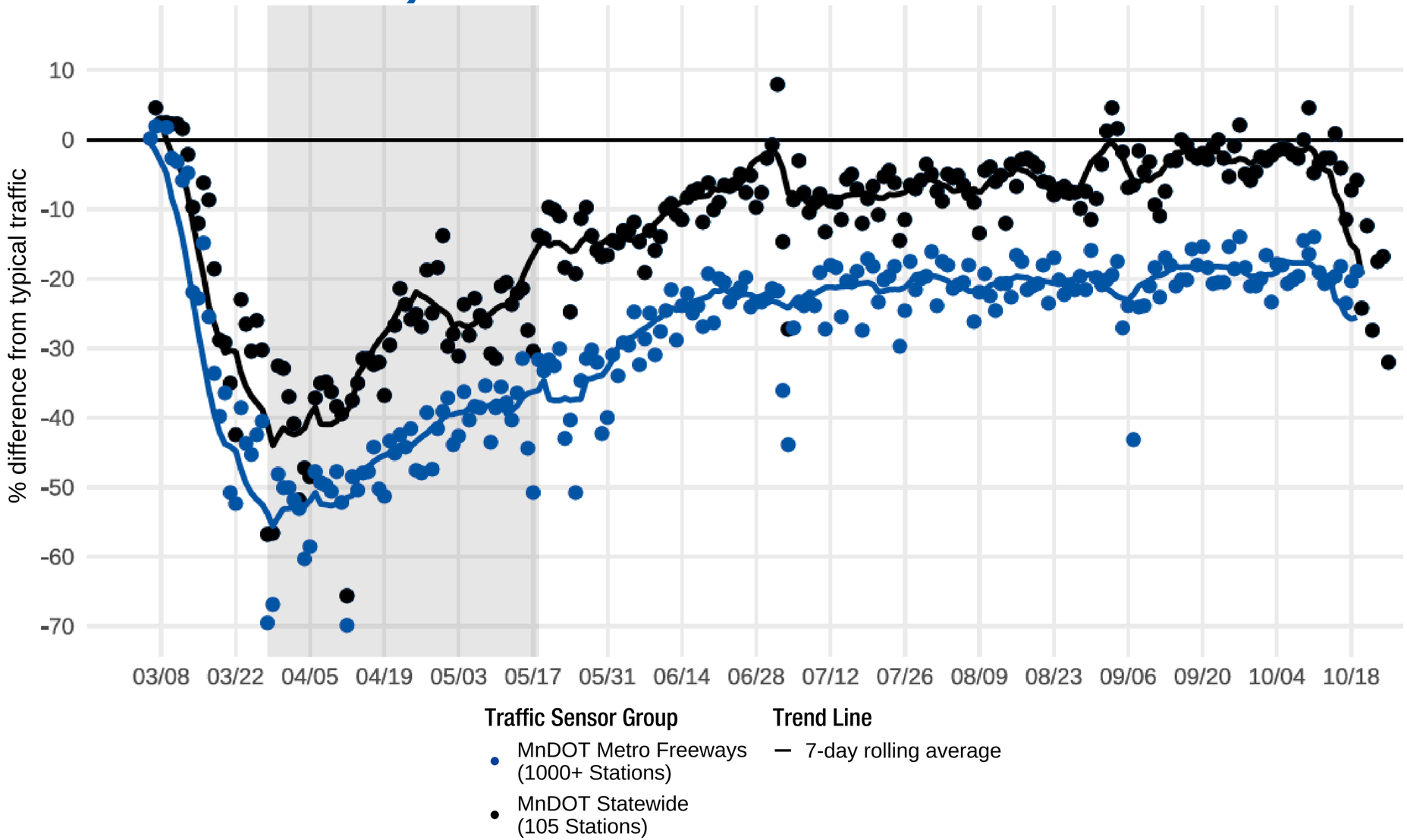
Traffic trends, March 8 - Present



Sharing and collaborating

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Interactive visualization

Principles

- Make the data and code available to everyone
- Make space for feedback

Goals

- Plot and map the most recent data
- View and download tabular data
- Share detailed methodology

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R and Shiny

- R is a free software environment for statistical computing and graphics.
  - Used in academic and industry settings
  - Strong support for large spatial data
- Shiny is an open-source R package that makes it easy to build interactive web applications with R
  - No fancy JavaScript needed

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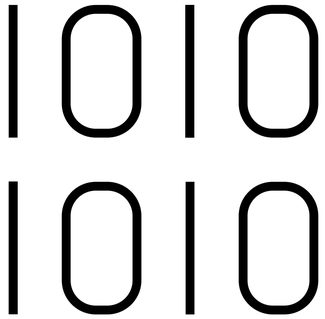
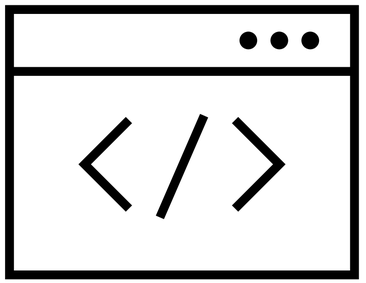
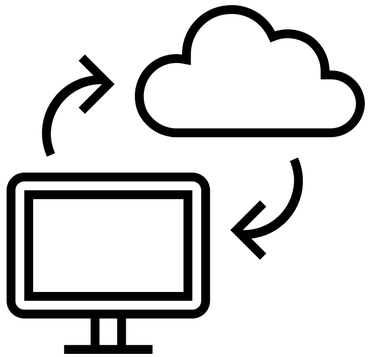
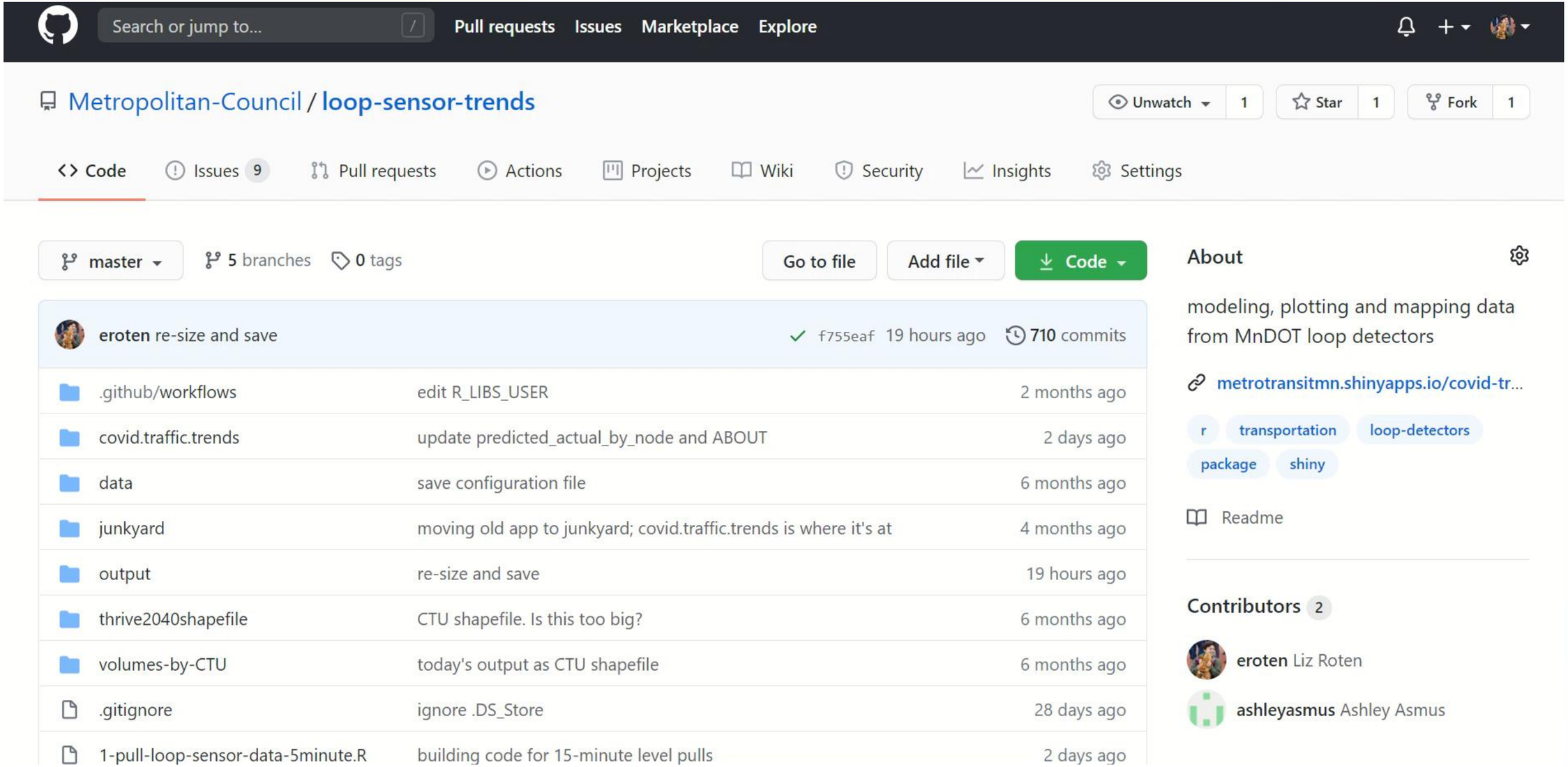
Reproducible research

- The data for this project is massive
  - 292 million observations in 2020 alone
  - Downloaded data from a public feed
- We store the data locally
- Run code to generate the final data tables
- We made the code publicly available in our R package, `{tc.sensors}`.





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.gitignore ignore .DS_Store 28 days ago
1-pull-loop-sensor-data-5minute.R building code for 15-minute level pulls 2 days ago
About
modeling, plotting and mapping data from MnDOT loop detectors
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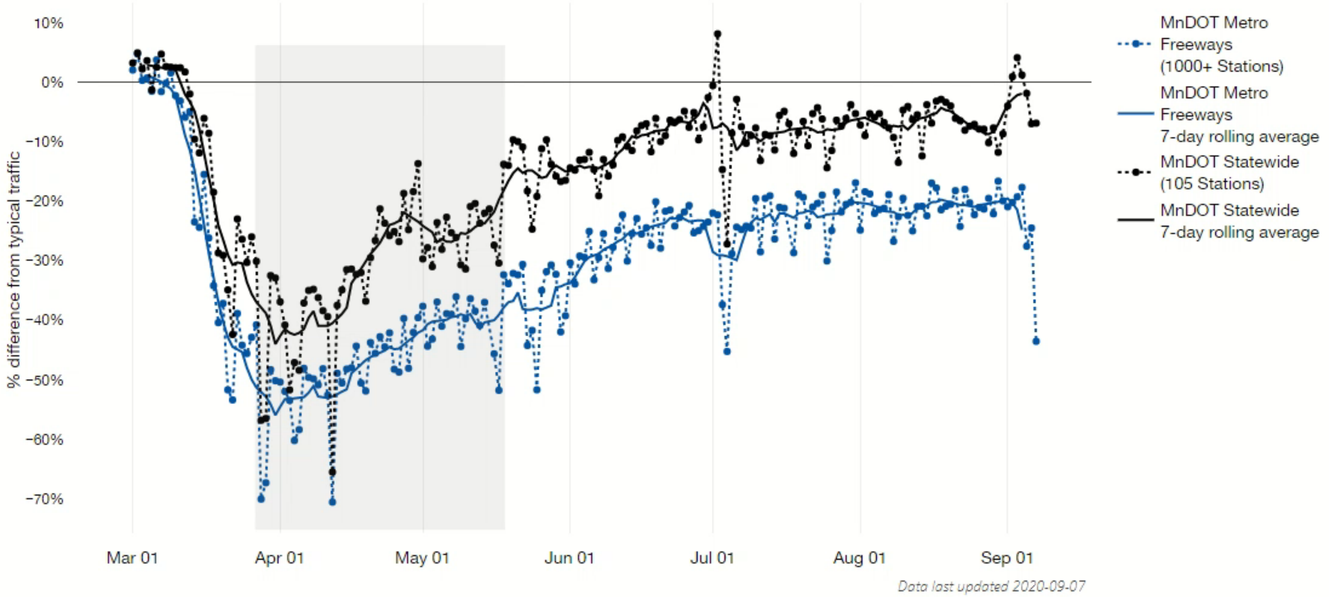
COVID-19 Outbreak – Metro Area Travel Declines

Traffic data show more metro area residents are staying home

MAP & PLOT DOWNLOAD DATA ABOUT

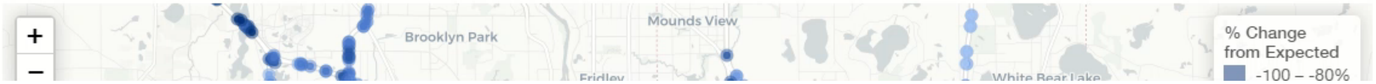
Twin Cities' freeway travel decreasing across COVID-19 timeline

This plot shows the daily relative decrease in freeway travel over time across the Twin Cities metropolitan region after March 1. Points that fall below the zero-line represent decreases in travel relative to typical travel on that day of the year and day of the week. Typical travel is estimated using a statistical analysis of traffic volumes from 2018, 2019, and 2020 prior to March 1.



Decreases in freeway travel are occuring across the Twin Cities metropolitan region

The map shows the decreases in travel at individual traffic monitoring sites



Project management and coordination

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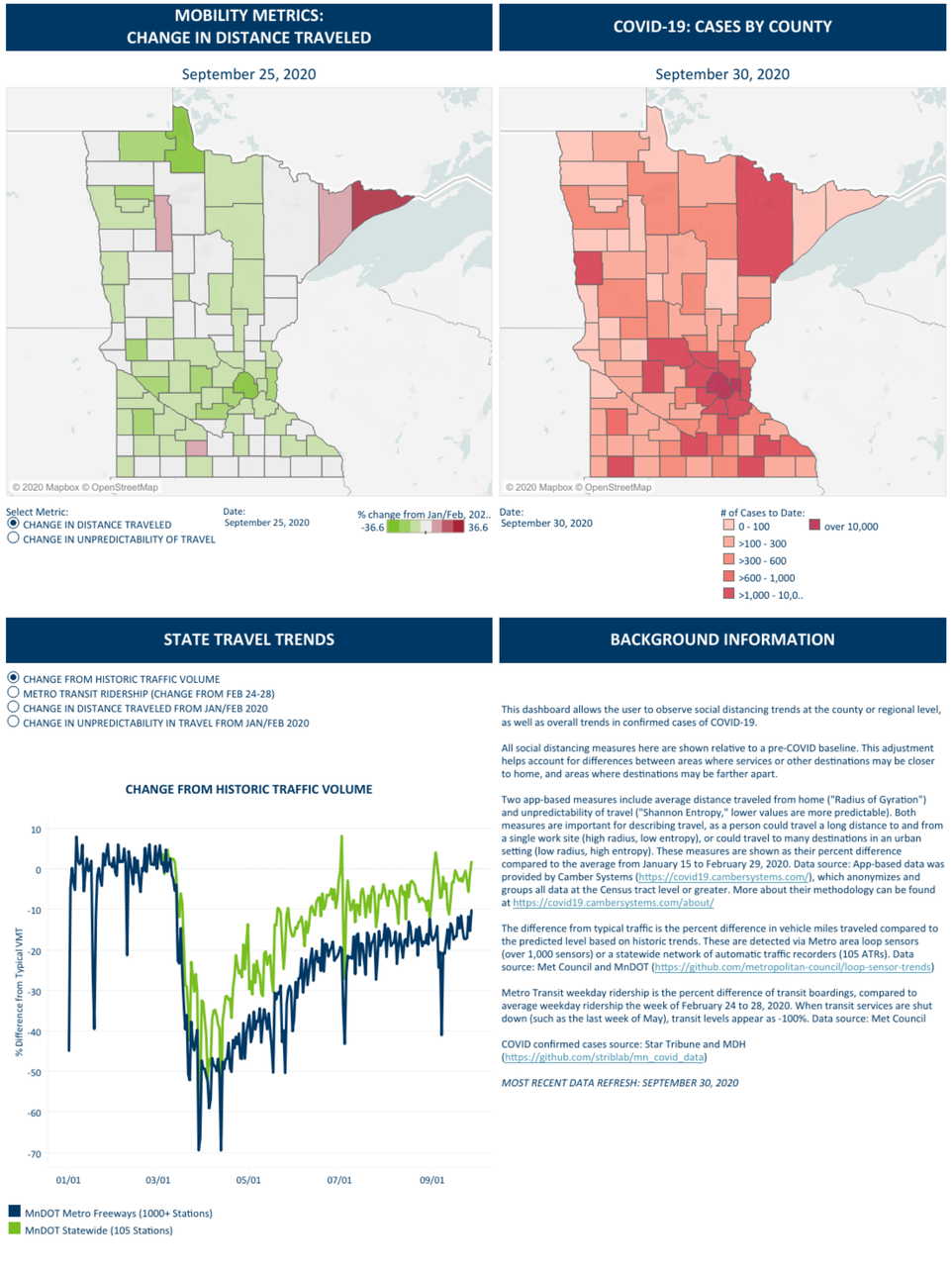
Communication and Coordination

- Purpose
  - Usefulness of health researchers
  - Public communication
  - Decision-making
  - Morale / curiosity
- Coordinating data & interpretation
- Integration into JIC and Council communication
- Speed/agility
- Uncertainty



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- Jonathan Ehrlich, Jonathan.Ehrlich@metc.state.mn.us

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Sources

- COVID Traffic Trends app, https://metrotransitmn.shinyapps.io/covid-traffic-trends/
- COVID Traffic Trends repository, https://github.com/Metropolitan-Council/loop-sensor-trends
- tc.sensors R package repository, https://github.com/Metropolitan-Council/tc.sensors
- R Logo © 2016 The R Foundation. https://www.r-project.org/logo/
- GitHub Logo https://github.com/logos
- Open source software definition https://opensource.org/
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