Temperature, Day Type, and Bike-Sharing Ridership

Comparing New York City and Washington, DC

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Research Question and Motivation

How do temperature, day type, and holidays relate to bike-sharing ridership in New York City and Washington, DC?

Bike-sharing provides flexible urban transportation, but usage patterns may vary depending on weather and daily routines.

Our analysis focuses on three questions:

- How does temperature relate to daily ridership?
- Do weekday and weekend patterns differ between cities?
- How does ridership change on holidays?

Goal: Understand how environmental conditions and daily routines relate to bike-sharing activity across two cities.

Data and Methodology

New York City

Citi Bike

- 883 daily observations
- Beginning July 2013
- Average: 25,201 trips/day

Washington, DC

Capital Bikeshare

- 731 daily observations
- 2011–2012
- Average: 4,504 trips/day

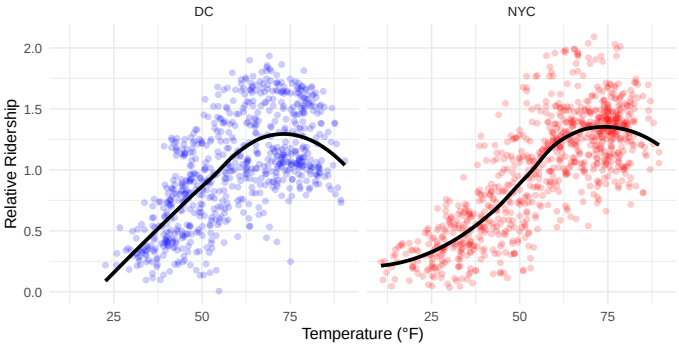
Total sample: 1,614 daily observations

We standardized temperatures, identified weekdays and holidays, and normalized ridership to account for differences in city size.

$$\text{Relative Ridership} = \frac{\text{Daily Trips}}{\text{City Average Daily Trips}}$$

A value of 1.4 means ridership is 40% above that city's daily average.

Temperature and Overall Ridership

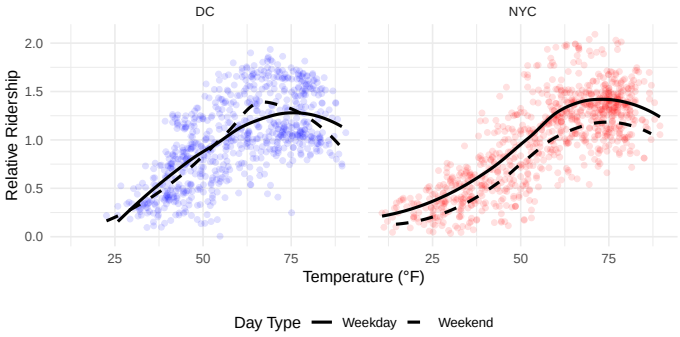


Key Findings

- Ridership generally increases as temperatures rise.
- Both cities exhibit nonlinear patterns.
- Ridership peaks around 60–75°F before leveling off or declining.

Takeaway: Warmer weather is associated with greater ridership, but only up to a point.

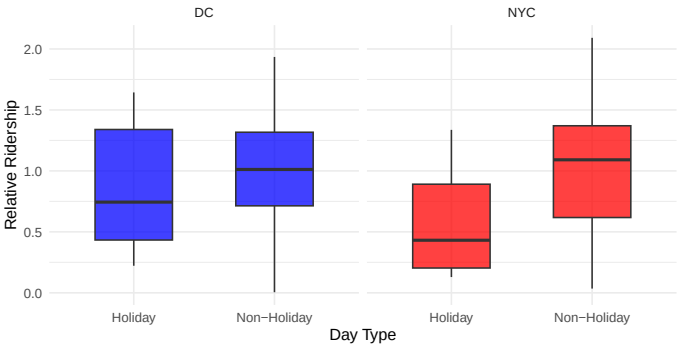
Weekday vs. Weekend Ridership



Key Findings

- NYC shows consistently higher weekday ridership.
- DC has smaller weekday–weekend differences.
- At 60–79°F, NYC averages **1.40** on weekdays versus **1.15** on weekends.
- DC averages **1.24** on weekdays versus **1.30** on weekends.

Holiday Ridership



Key Findings

- NYC holiday ridership is approximately **46% lower** than on non-holidays.
- DC holiday ridership is approximately **17% lower**.
- NYC experiences a substantially larger holiday decline.

Limitation: The data includes only 24 NYC holidays and 21 DC holidays.

Conclusions and Future Research

Main Findings

- **Temperature:** Ridership rises with warmer temperatures before leveling off or declining.
- **Day Type:** NYC has stronger weekday-oriented ridership patterns than DC.
- **Holidays:** Ridership declines in both cities, especially NYC.

Limitations

- The datasets cover different years.
- Trip purpose cannot be directly identified.
- Other weather conditions may influence ridership.

Future Research

Compare matching years, incorporate precipitation, and use trip-level data to distinguish commuting from recreational trips.

Final takeaway: Bike-sharing patterns depend on both environmental conditions and daily routines.