Understanding Patterns of Human Mobility at Different Time Scales

Lee Fiorio, Emilio Zagheni, Guy Abel, Johnathan Hill, Gabriel Pestre, Emanuel Latouzé, Jixuan Cai

PAA, Denver -- April 2018

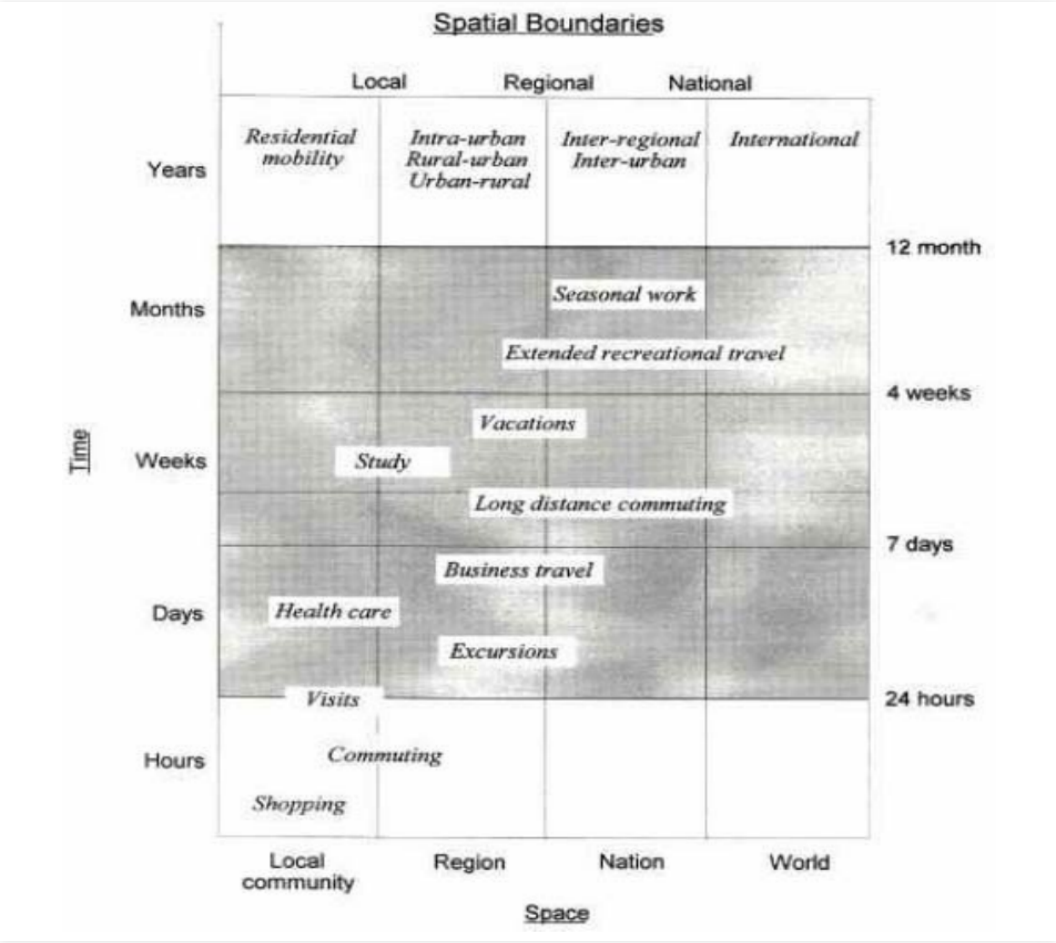
Operationalizing migration is non-trivial

Two dimensions:

1. spatial movement across a boundary
2. for a non-temporary or "permanent" length of time

"[T]here is no theoretically grounded definition of permanence" (Williams and Hall 2002, p. 4)

Bell and Ward (2000)




REMICH 10
152 REMERSCHEN
FRANCE N153 2
B407 DEUTSCHLAND 1
Piste cyclable des Trois Rivières
3
SCHENGEN

Digital Trace Data

< USER ID, TIME, LOCATION >

- No agreed upon standards for how to measure migration from these data
- A new opportunity to reconceptualize migration?

So what?

- Evaluating data quality and biases
- Improving estimates of migration flows
- Forecasting changes in migration patterns
- Harmonizing across different institutional definitions

Looking Ahead

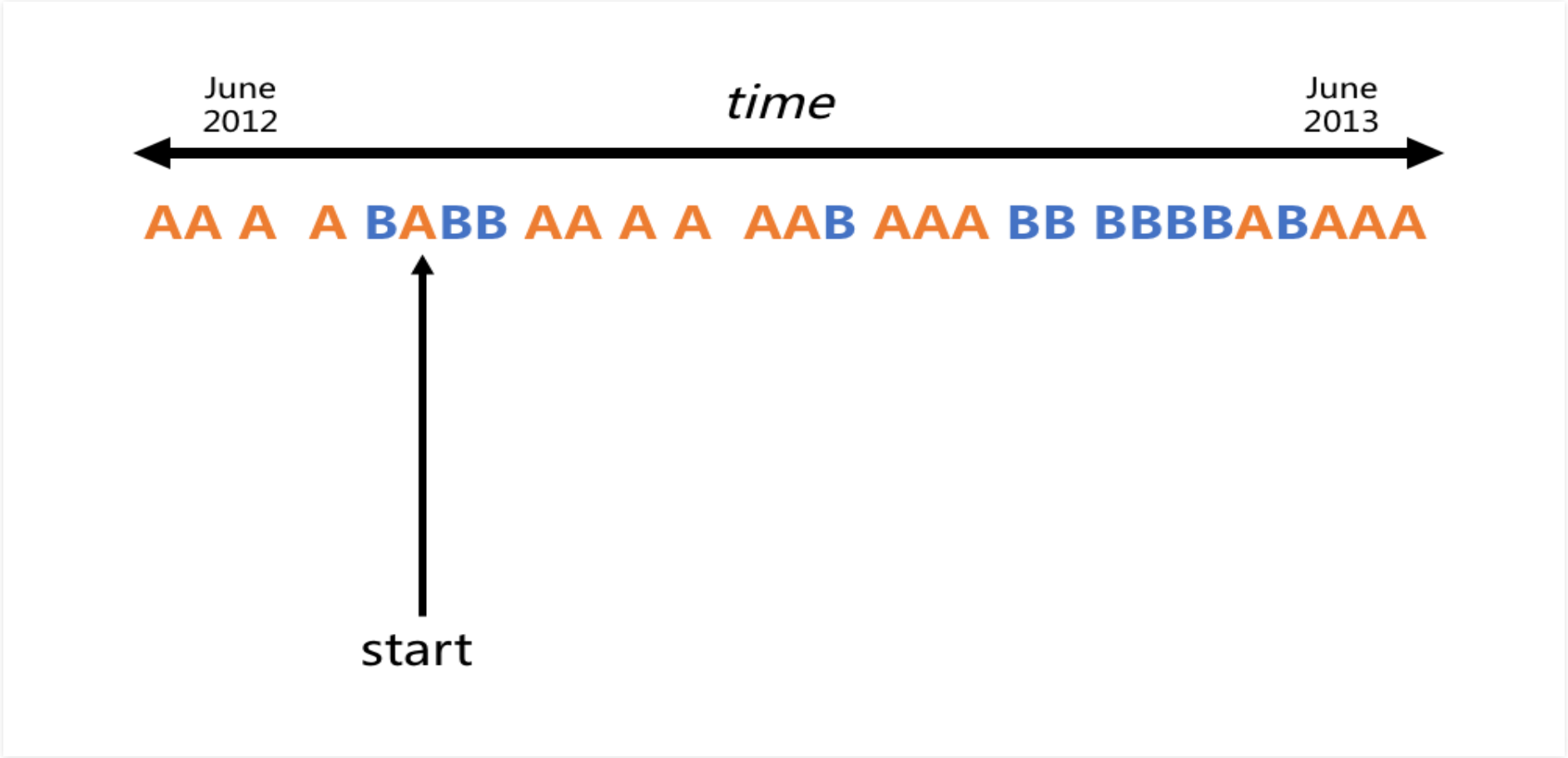
We, as an intellectual community, currently lack:

- methods for measuring migration from “digital trace data”
- an empirical basis for conceptualizing migration and circulation (short-term mobility) in a holistic framework

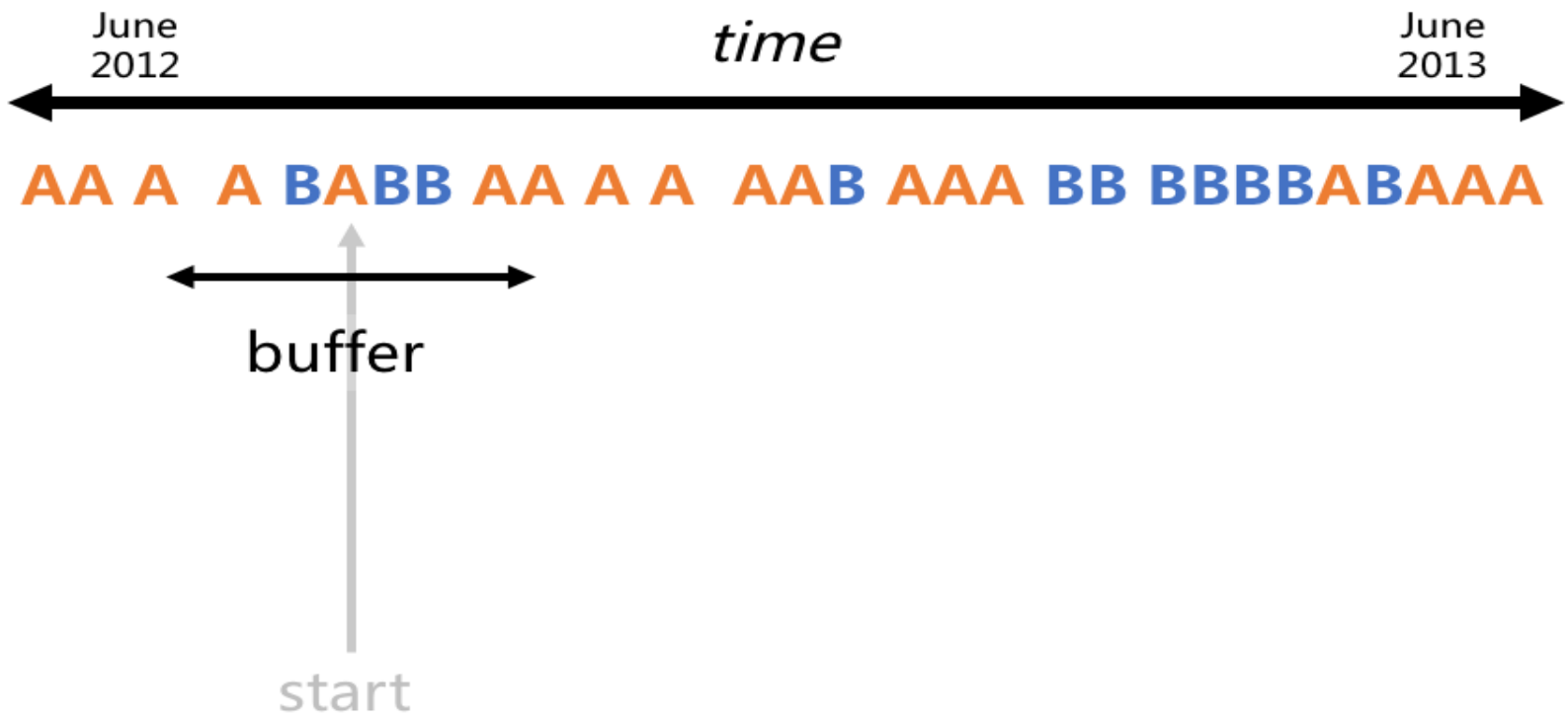
1. Discuss our method
2. Propose hypotheses
3. Present our data
4. Evaluate three internal migration contexts

Imagine a person

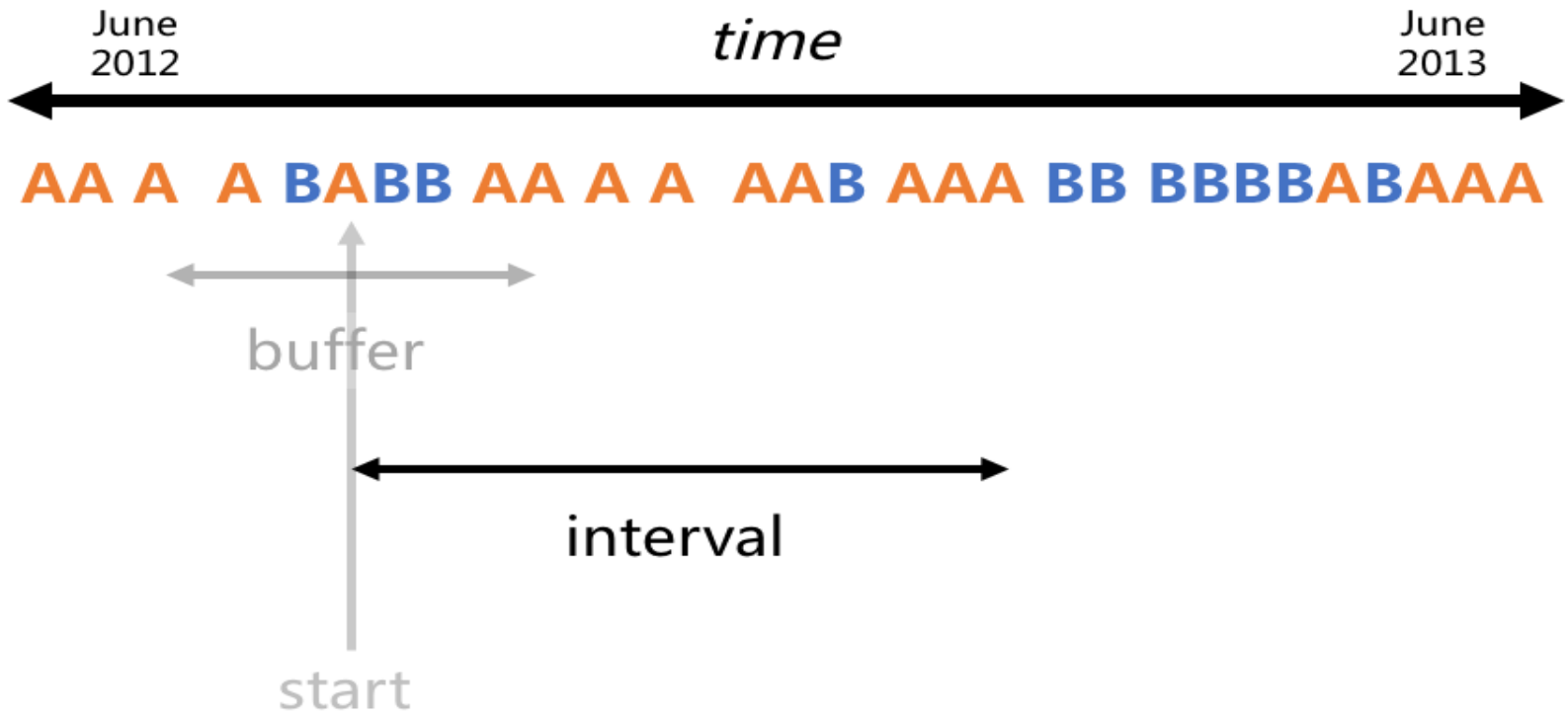
1. Start


June
2012
time
June
2013
AA A A BABB AA A A AAB AAA BB BBBBABAAA
start

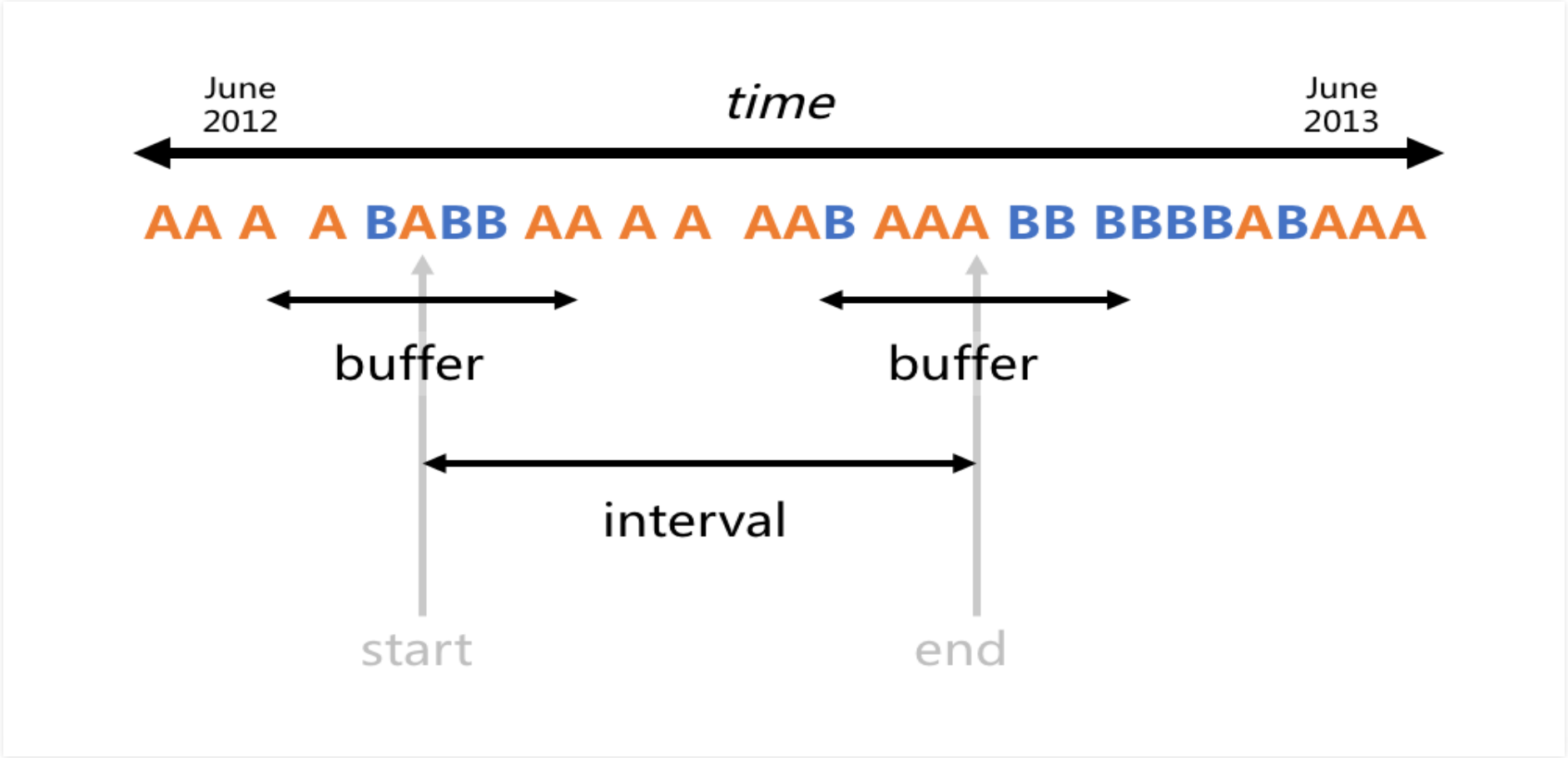
2. Buffer


June
2012
time
June
2013
AA A A BABB AA A A AAB AAA BB BBBBABAAA
buffer
start

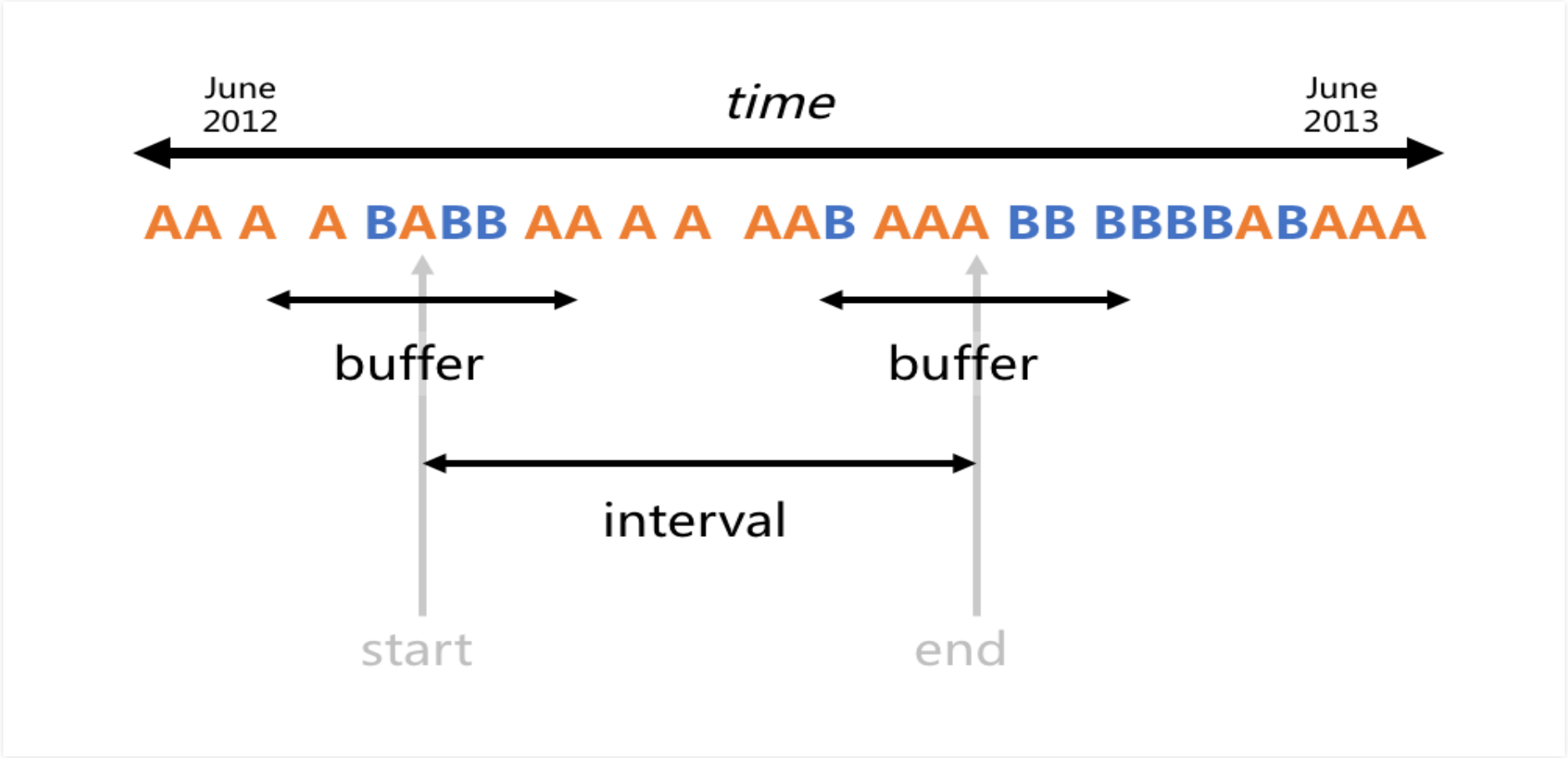
3. Interval


June
2012
time
June
2013
AA A A BABB AA A A AAB AAA BB BBBBABAAA
buffer
interval
start

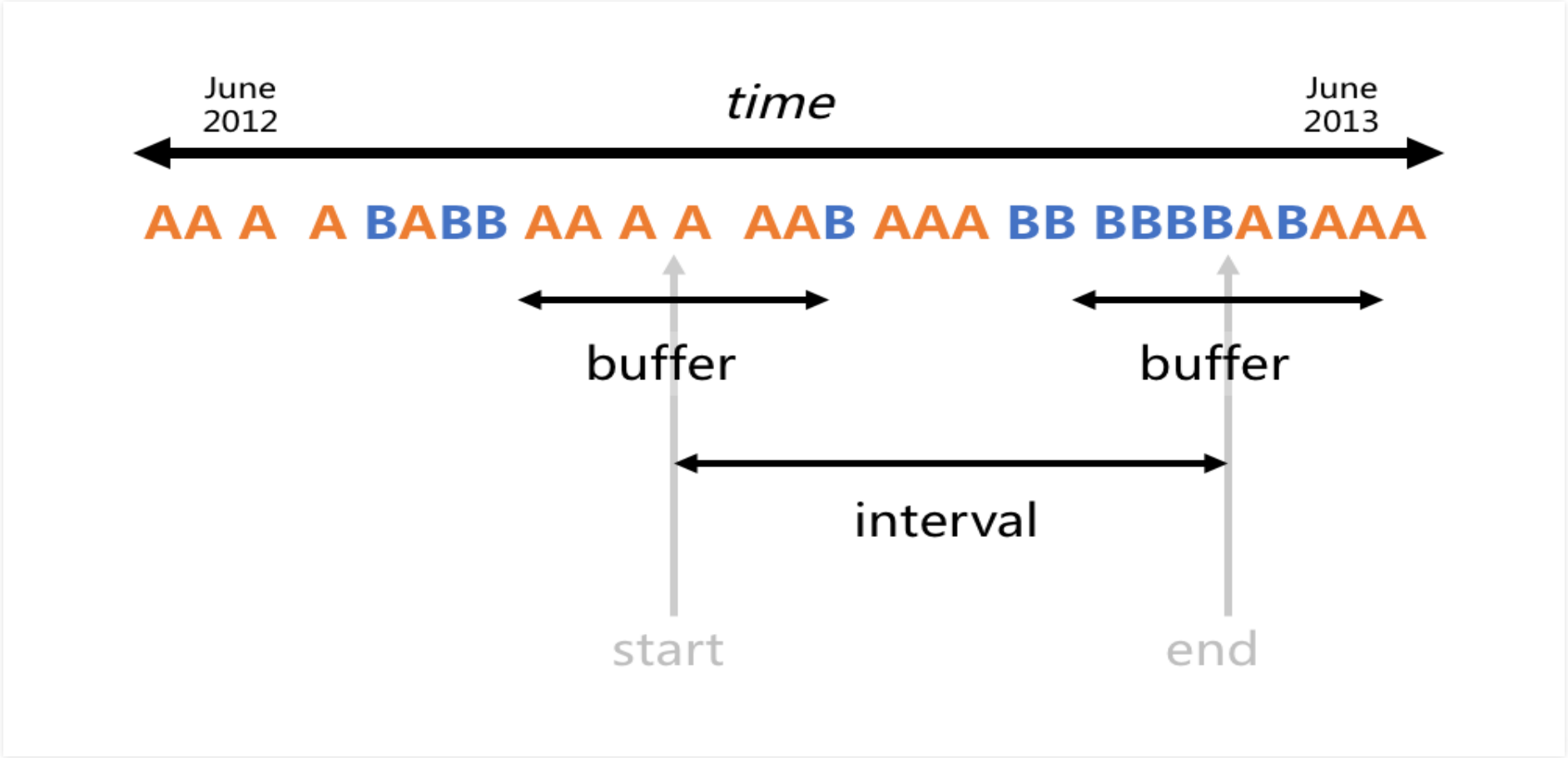
Indentifying Migrants



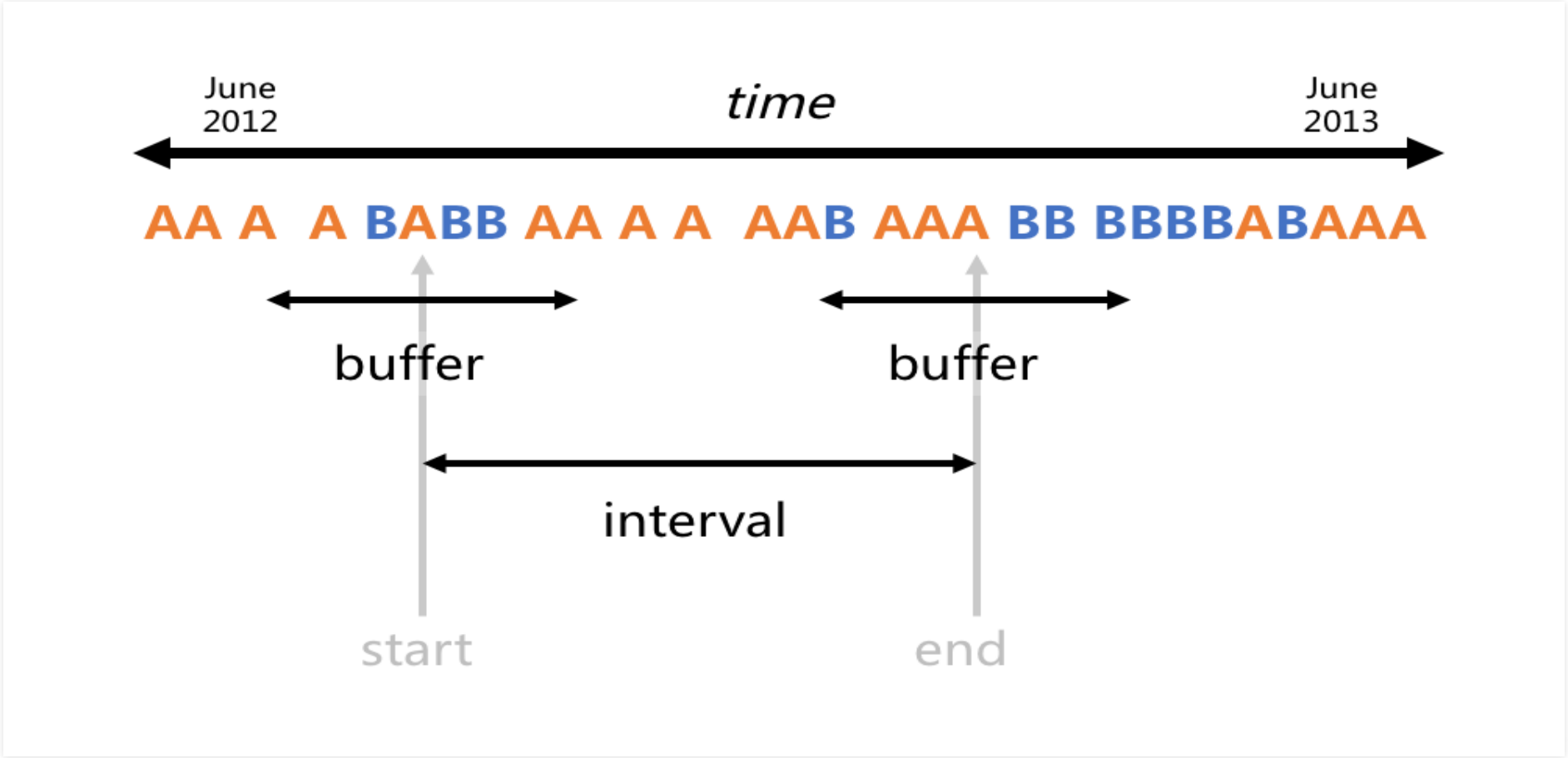
Indentifying Migrants: Changing the Start



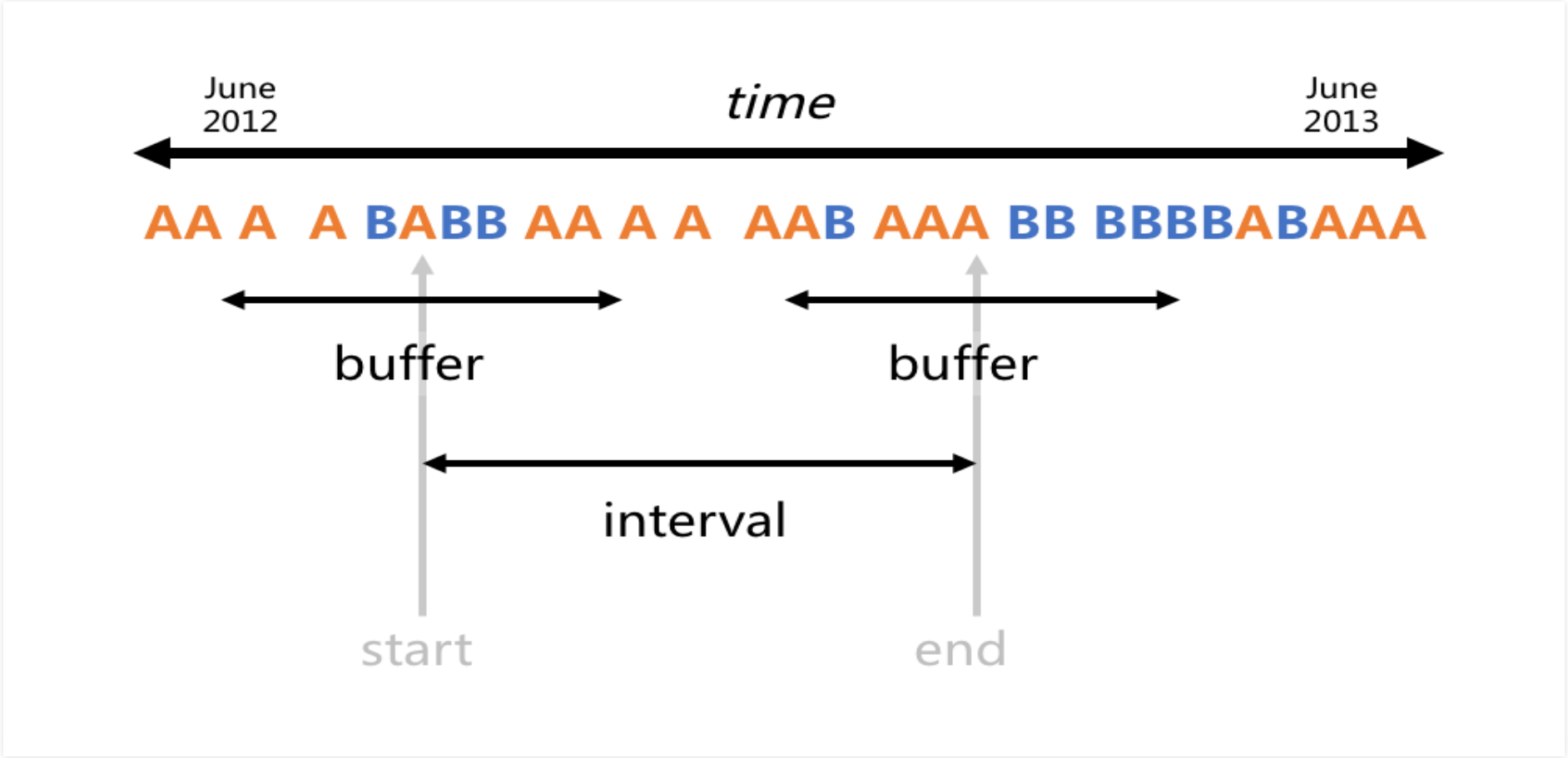
Indentifying Migrants: Changing the Start



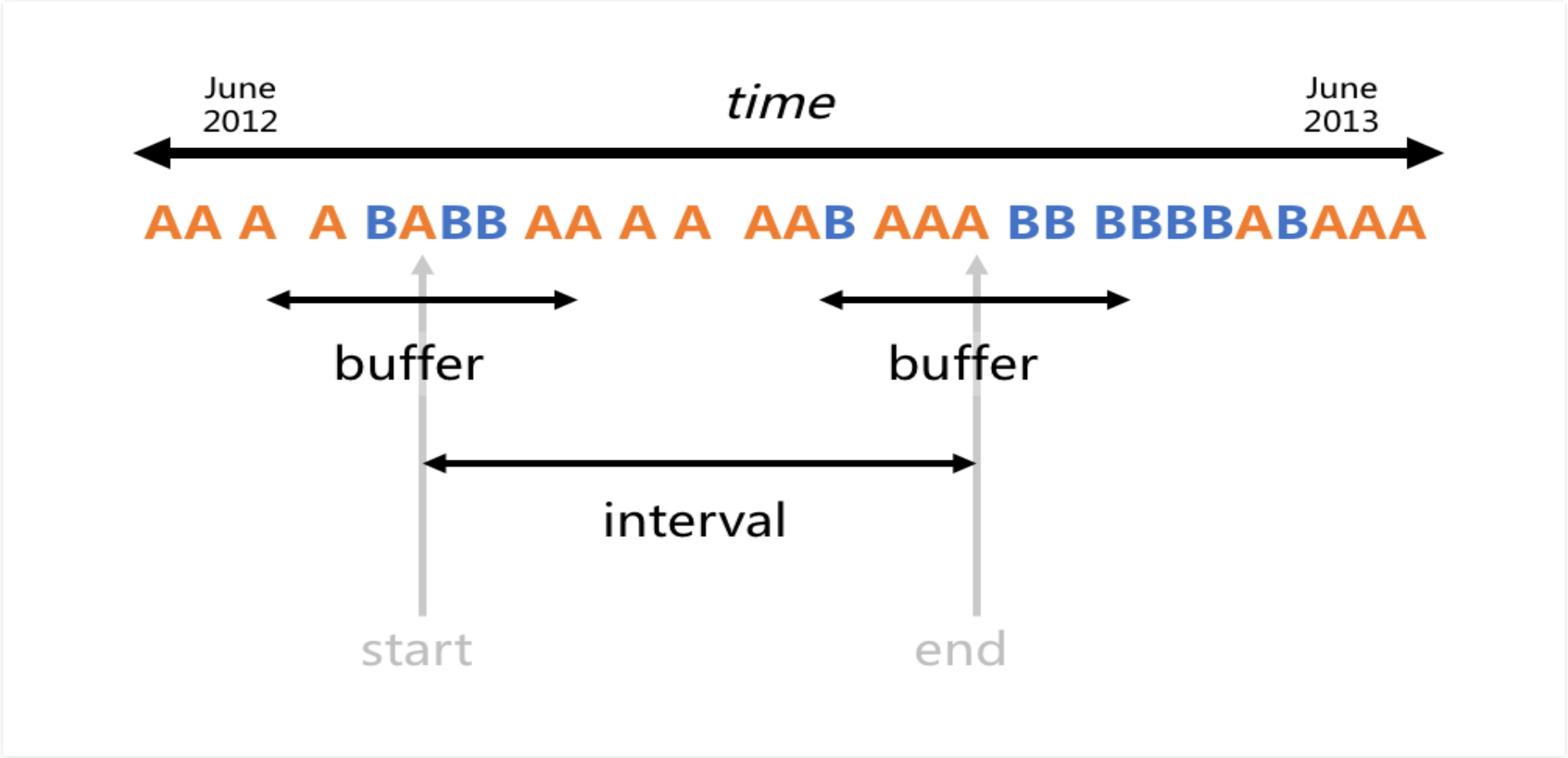
Indentifying Migrants: Changing the Buffer



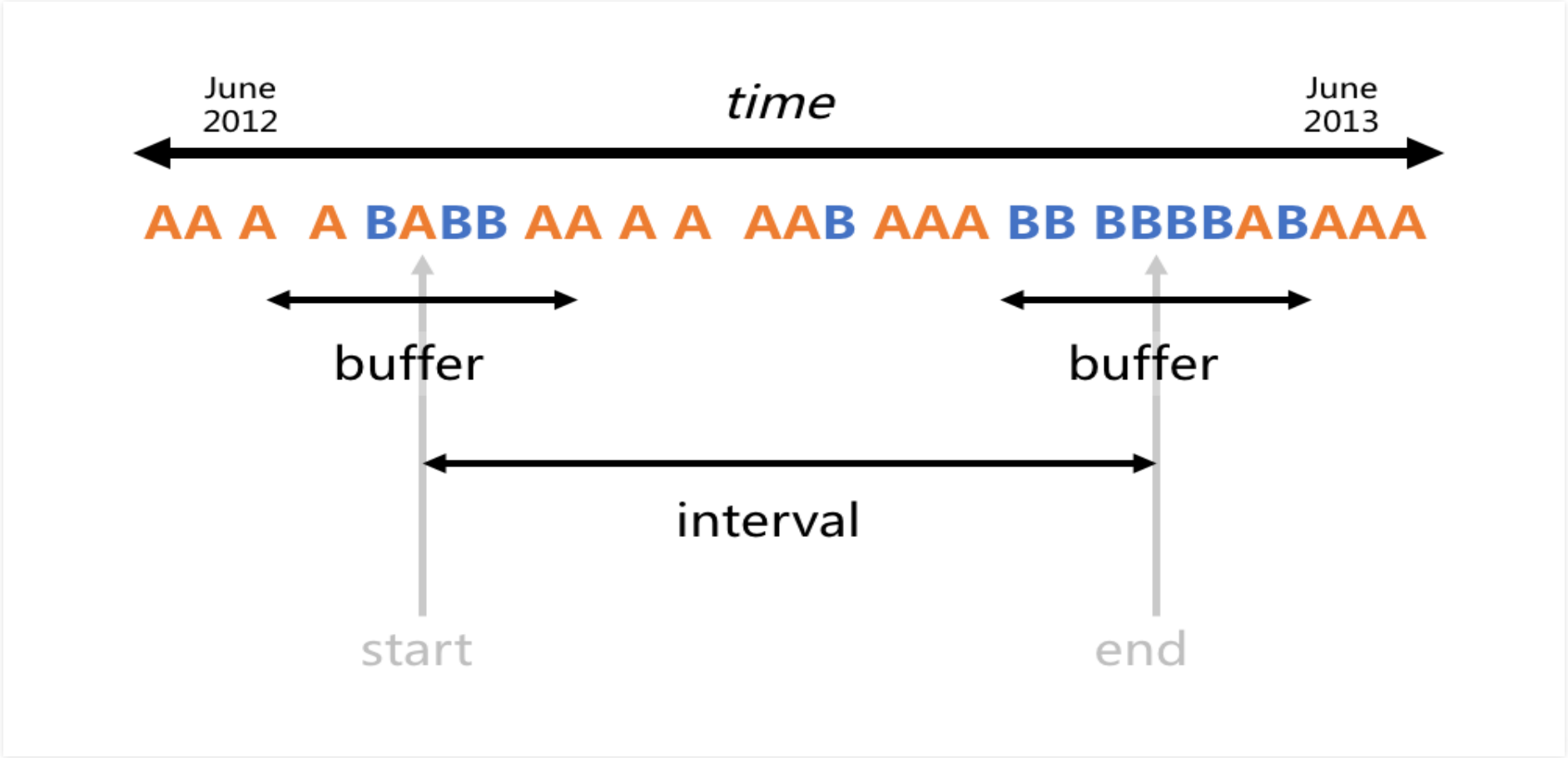
Indentifying Migrants: Changing the Buffer



Indentifying Migrants: Changing the Interval



Indentifying Migrants: Changing the Interval



Reasonable Hypotheses

1. Buffer

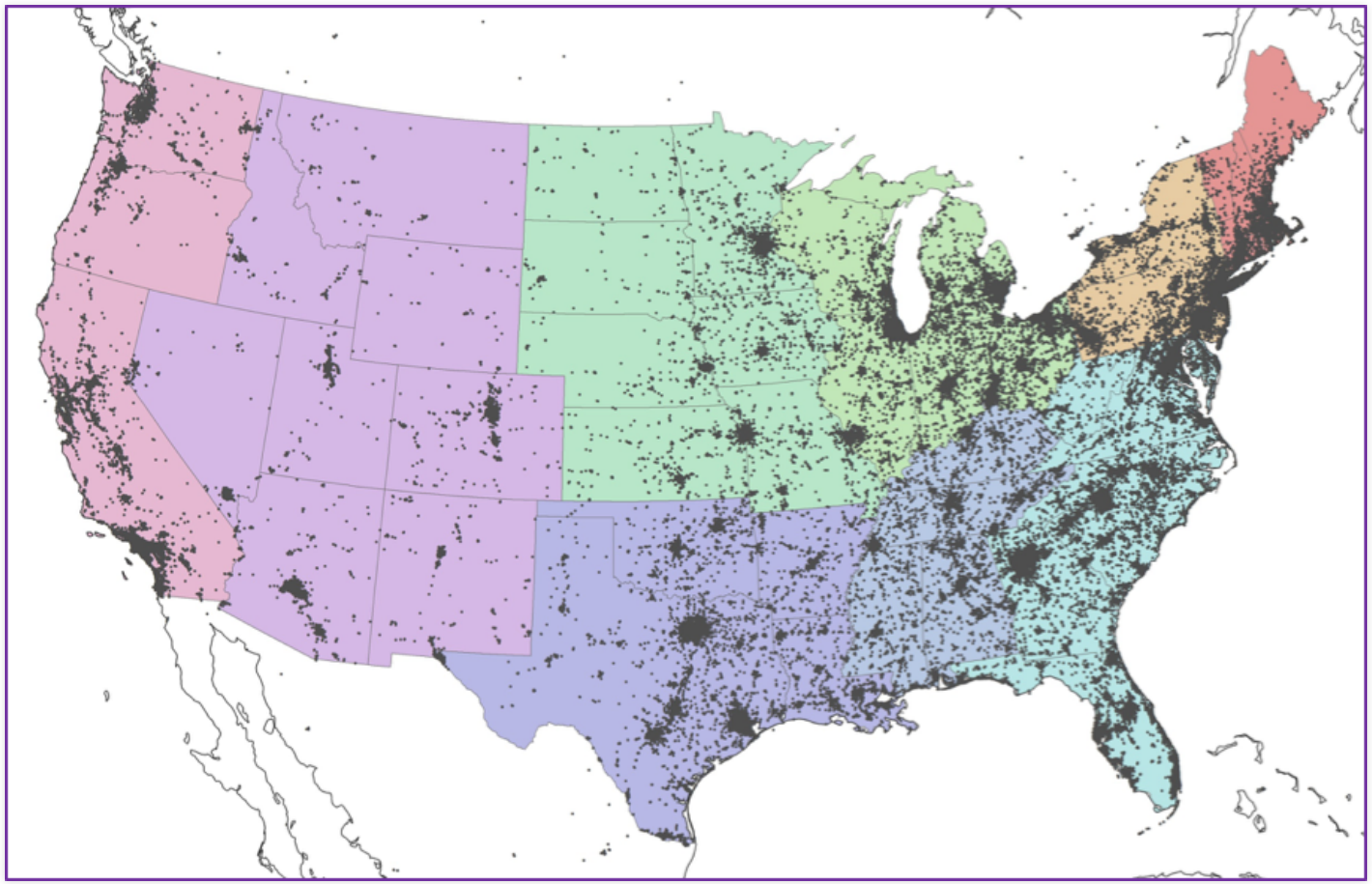
- as the buffer increases in time, there will be less volatility in migration rates.

2. Interval

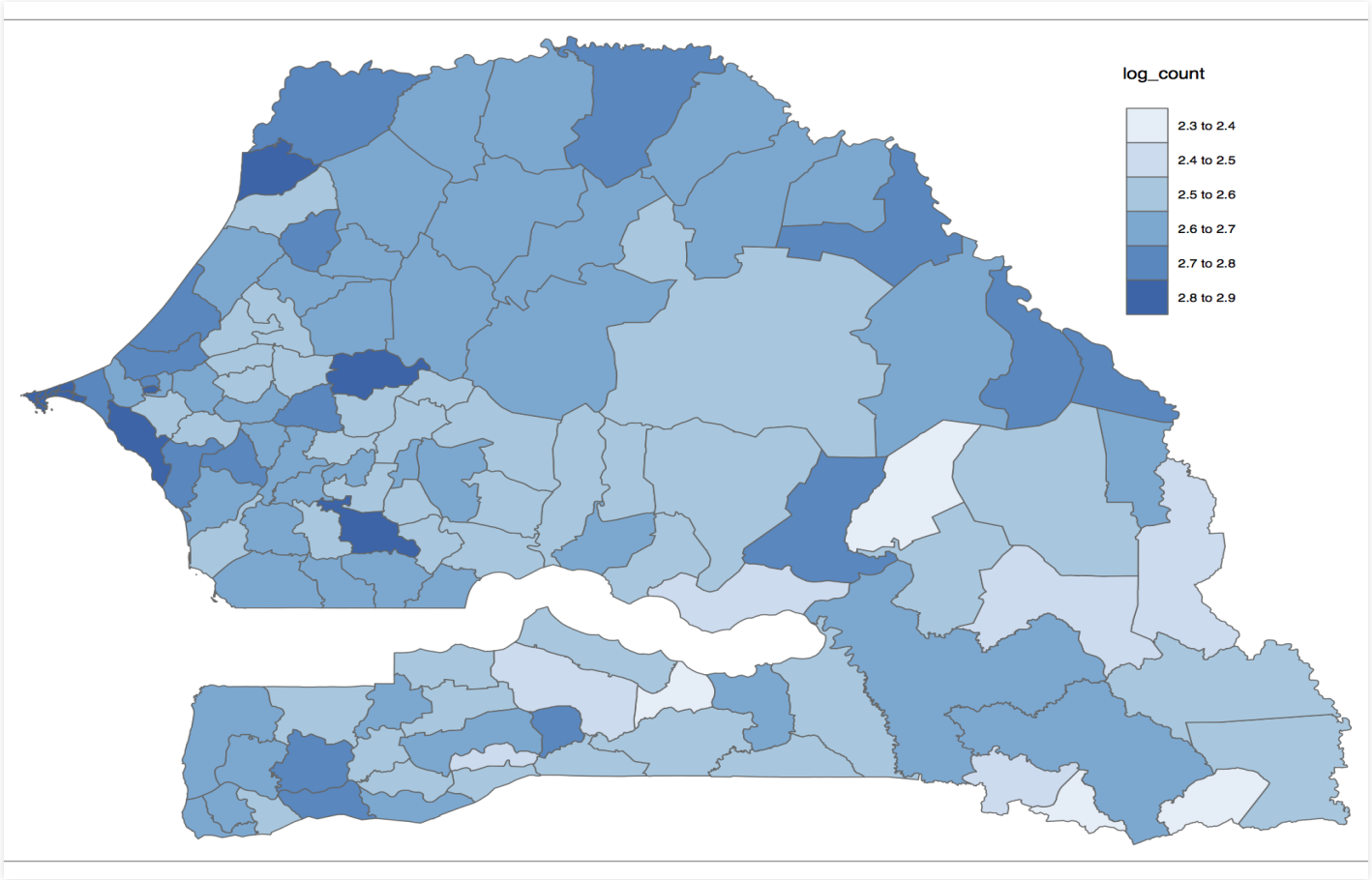
- as the interval increases in time, there will be increasing rate of migration observed

Three Data Sources

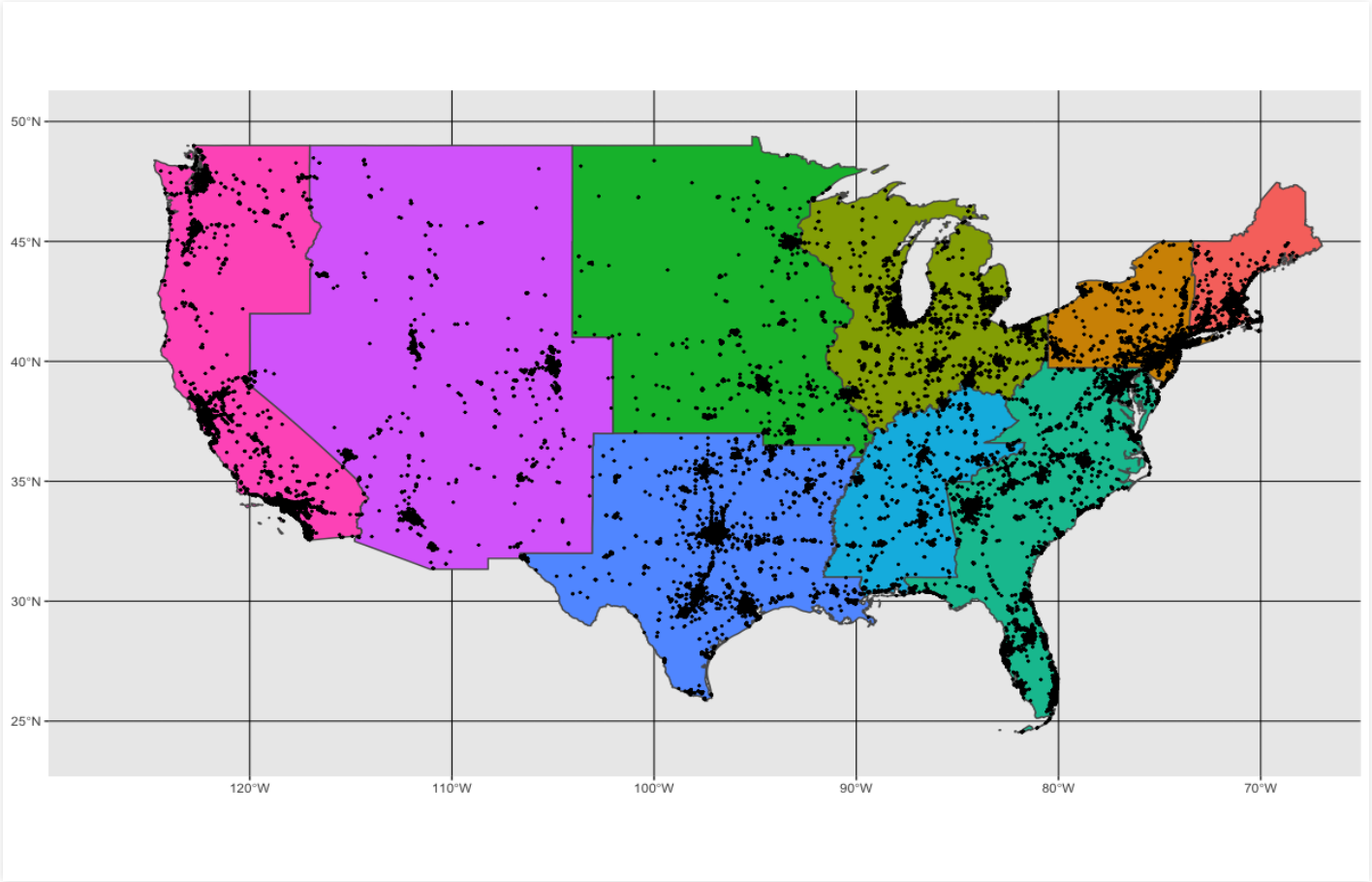
Geo-tagged Tweets in the U.S.



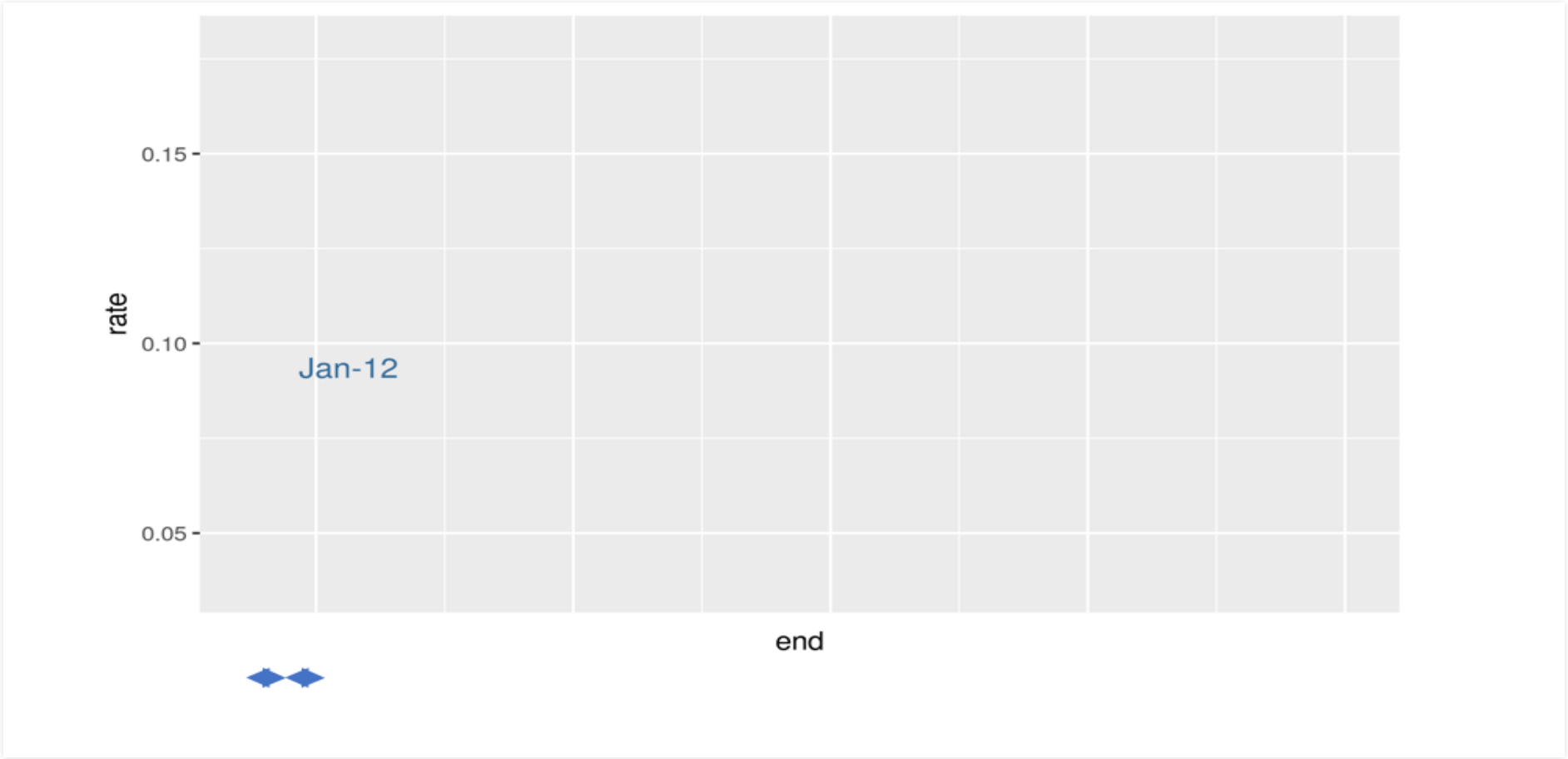
Cellphone Call Detail Records in Senegal



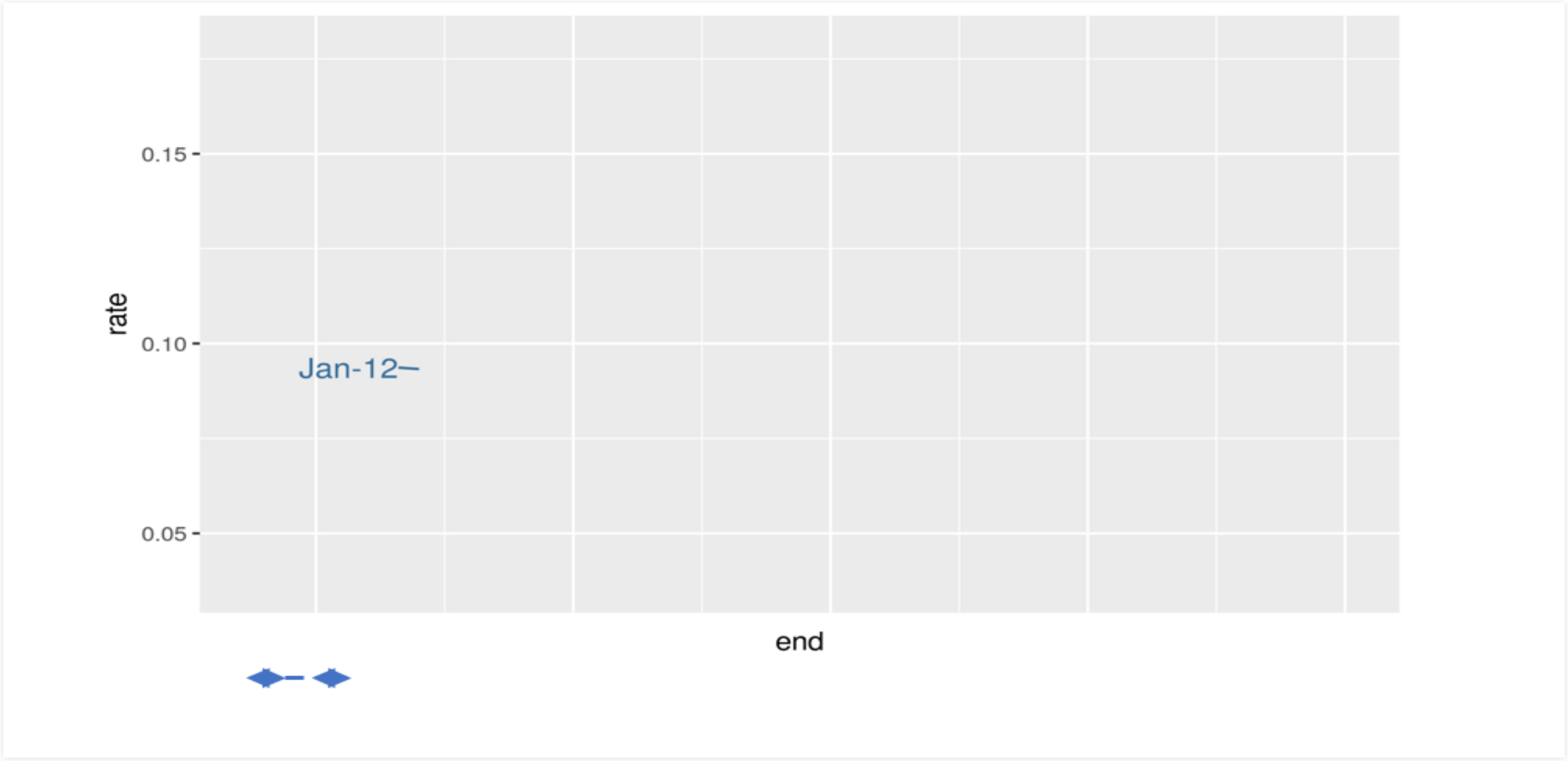
Gowalla Check-ins in the U.S.



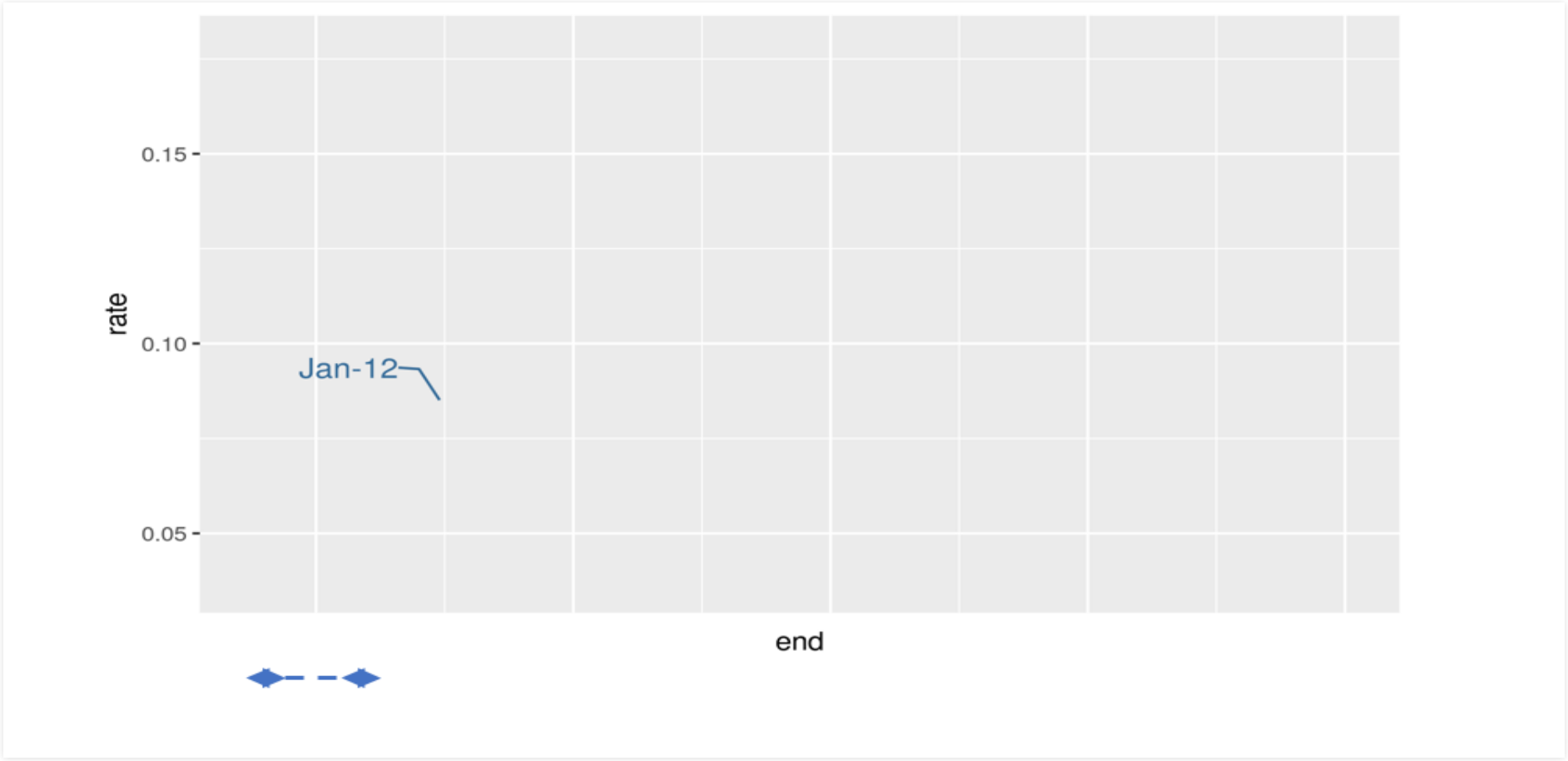
Results: Twitter Data; One Month Buffer



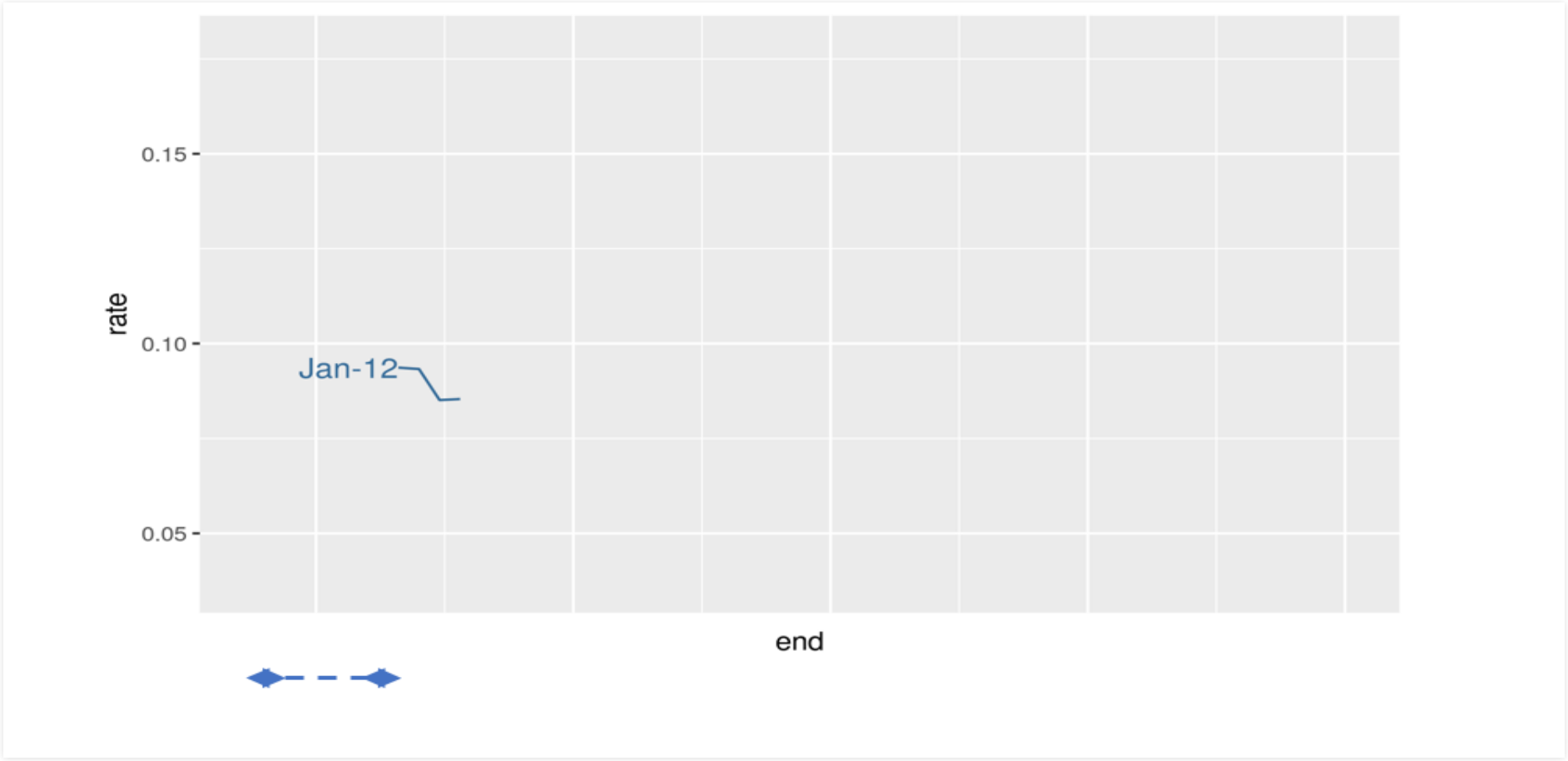
Results: Twitter Data; One Month Buffer



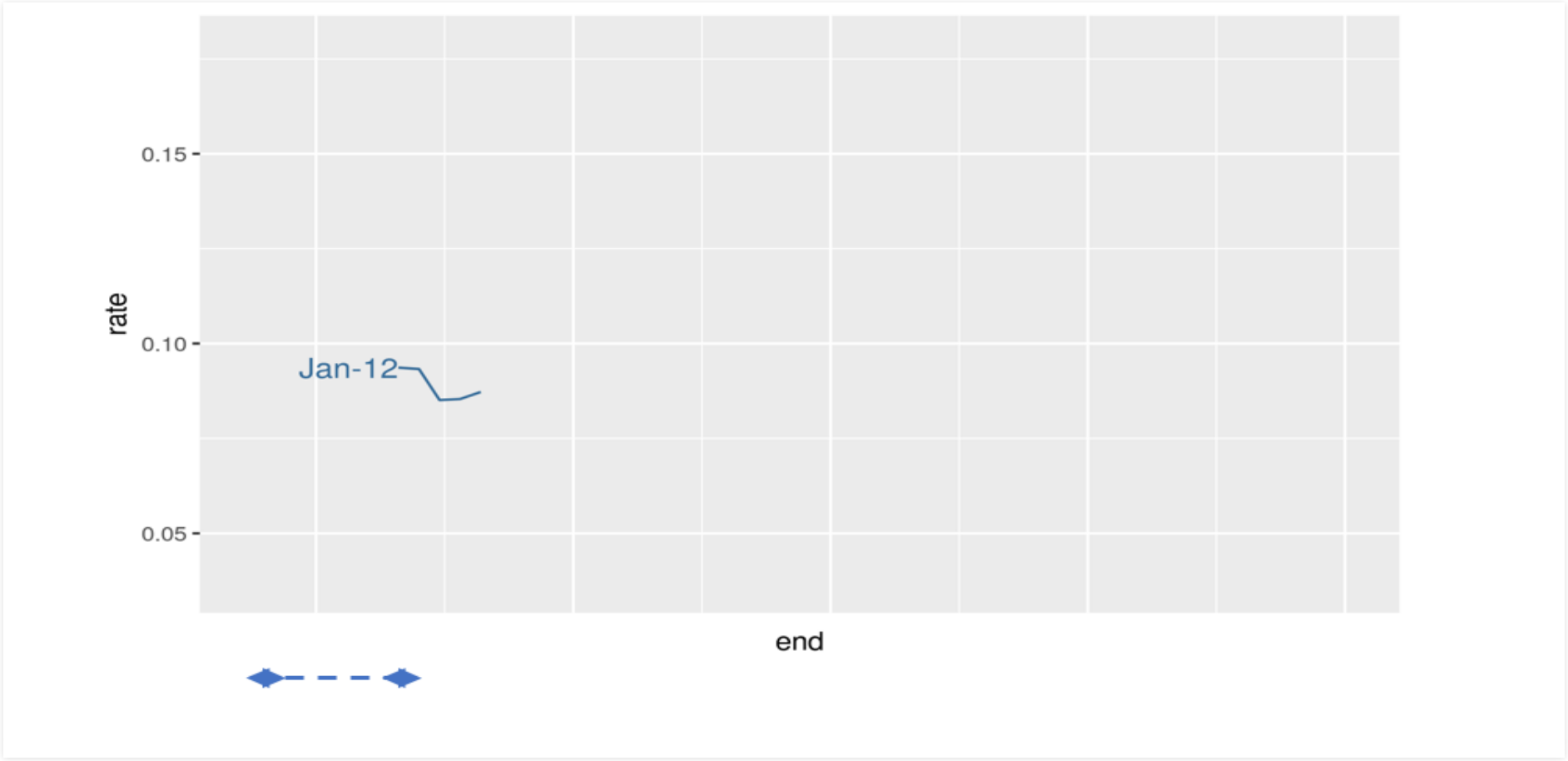
Results: Twitter Data; One Month Buffer



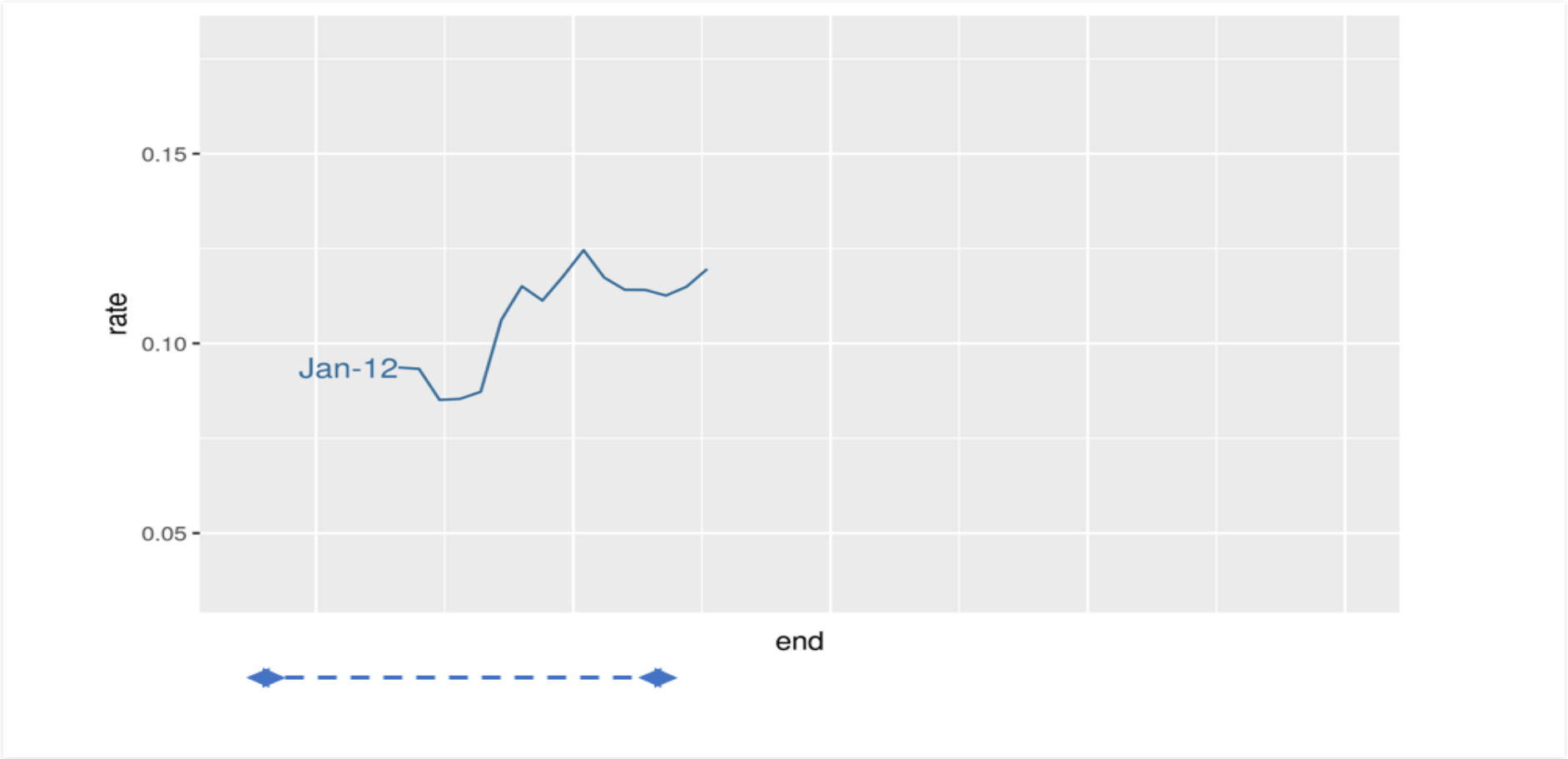
Results: Twitter Data; One Month Buffer



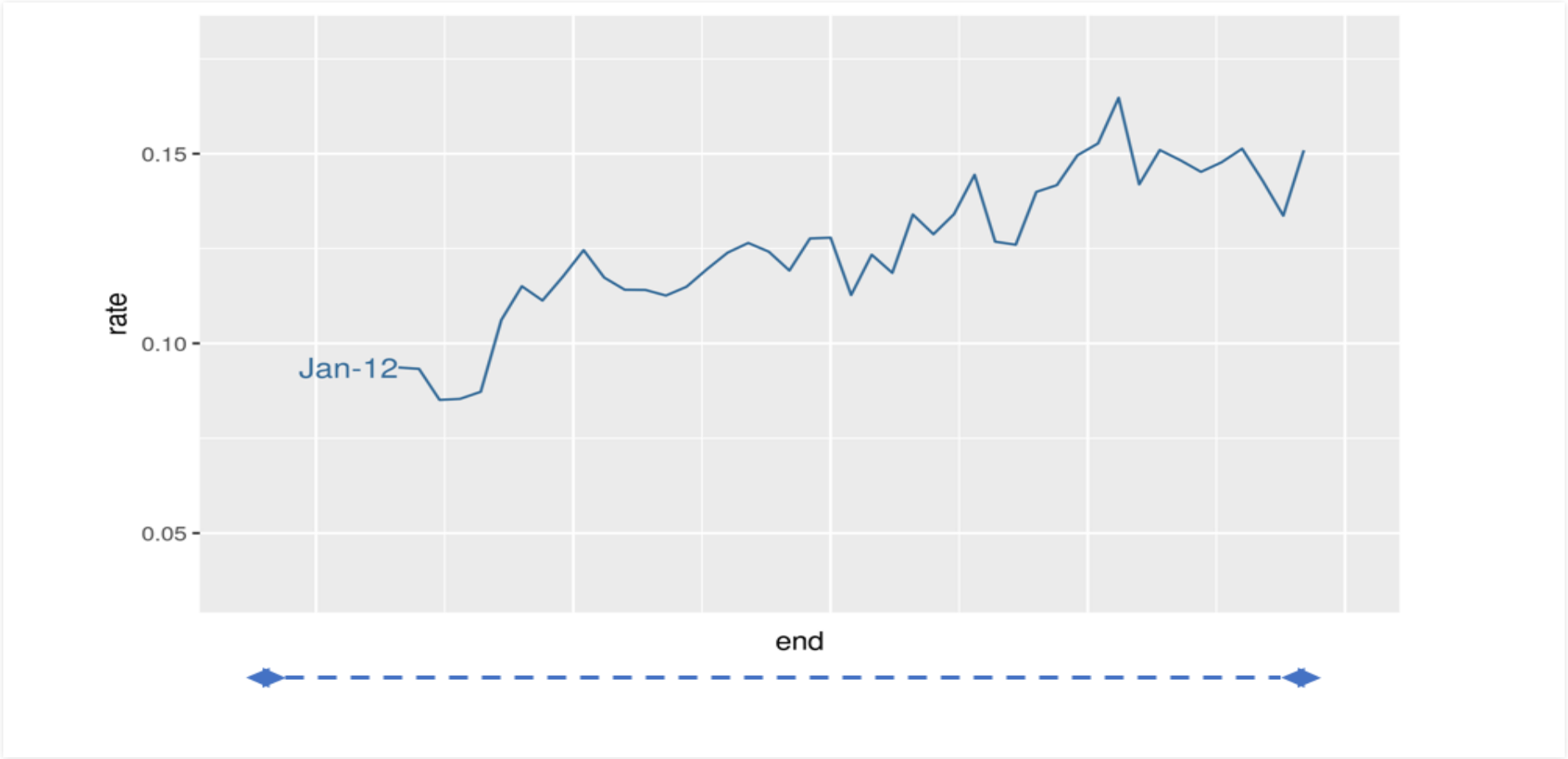
Results: Twitter Data; One Month Buffer



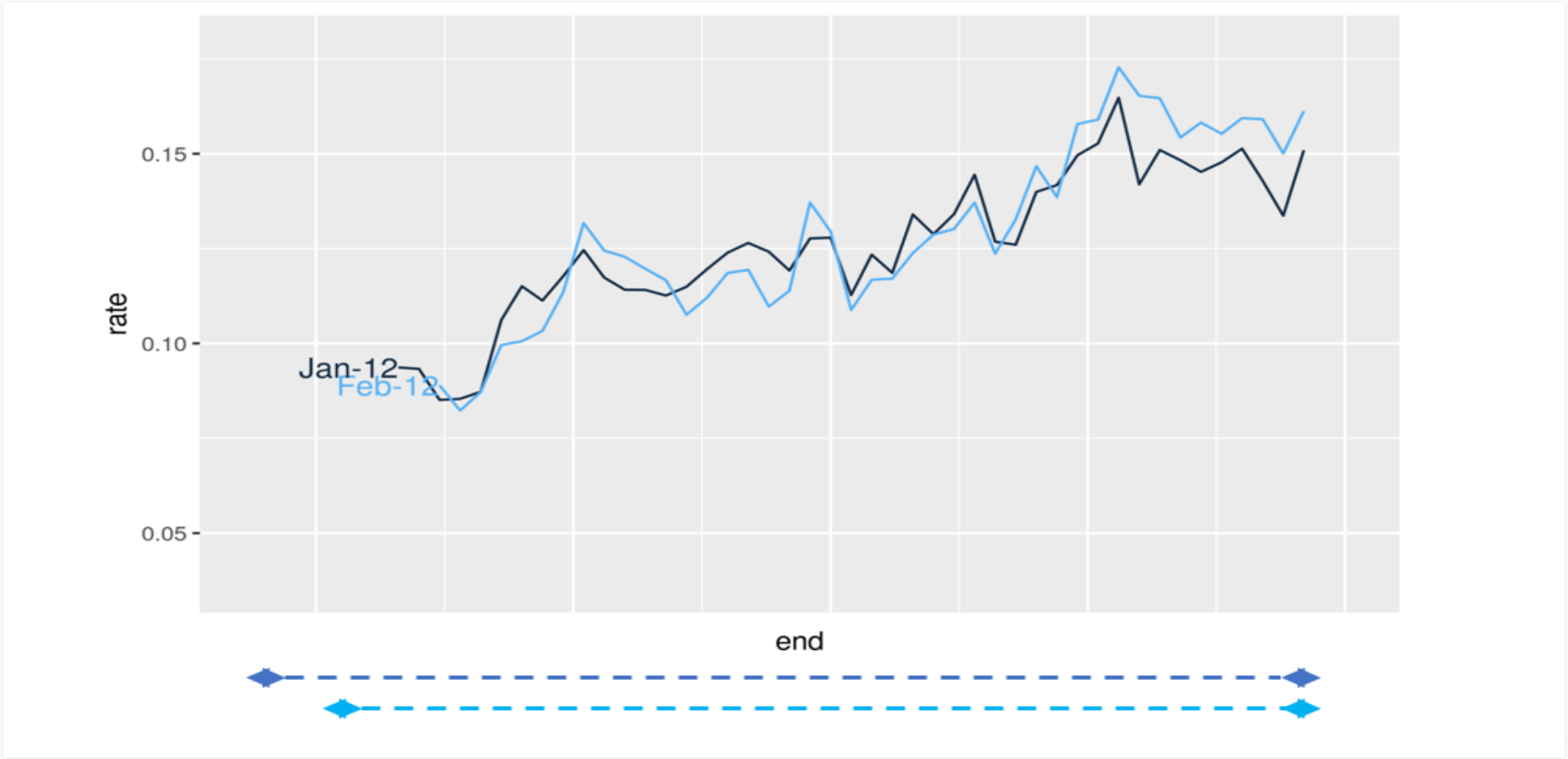
Results: Twitter Data; One Month Buffer



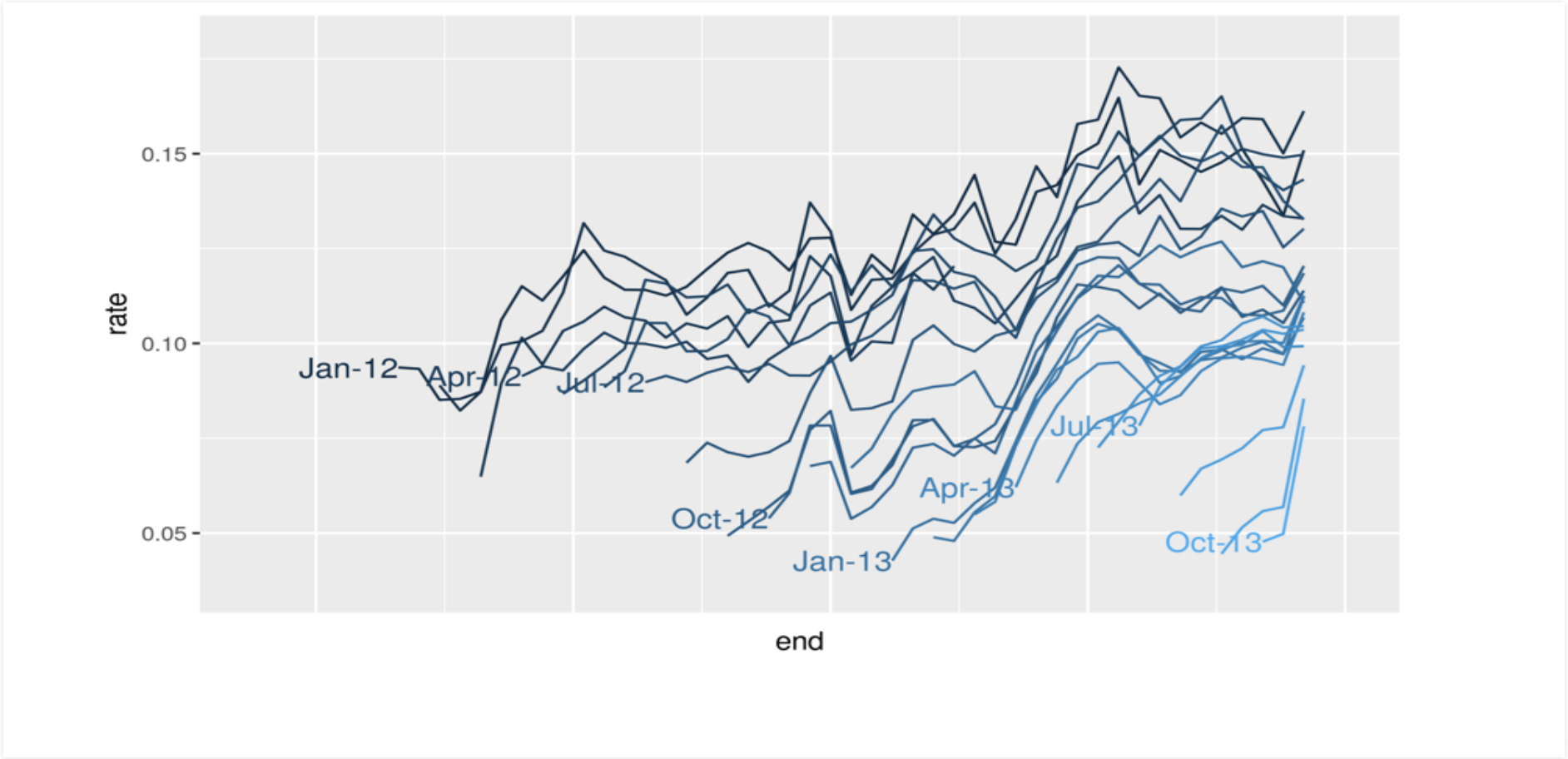
Results: Twitter Data; One Month Buffer



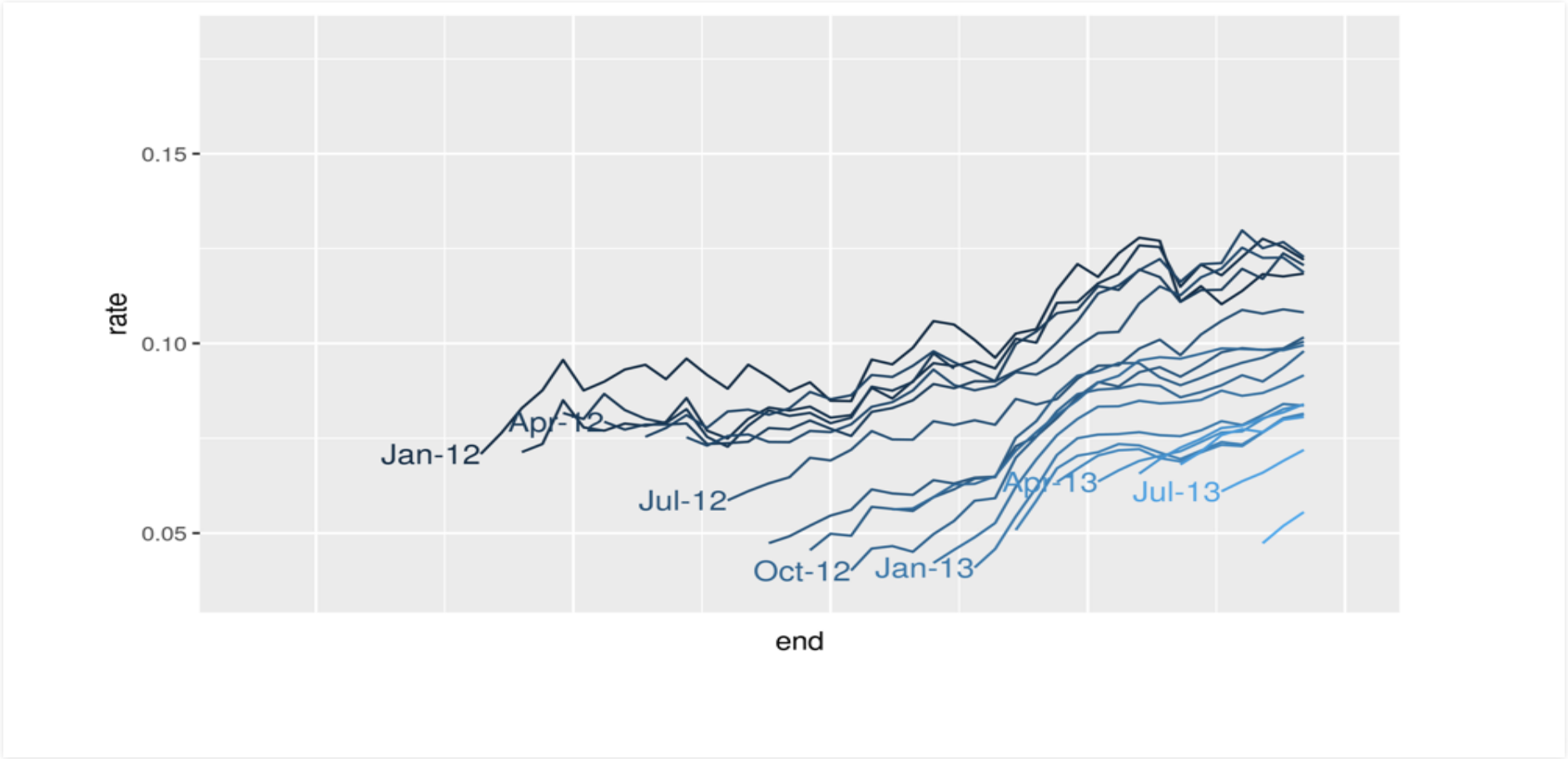
Results: Twitter Data; One Month Buffer



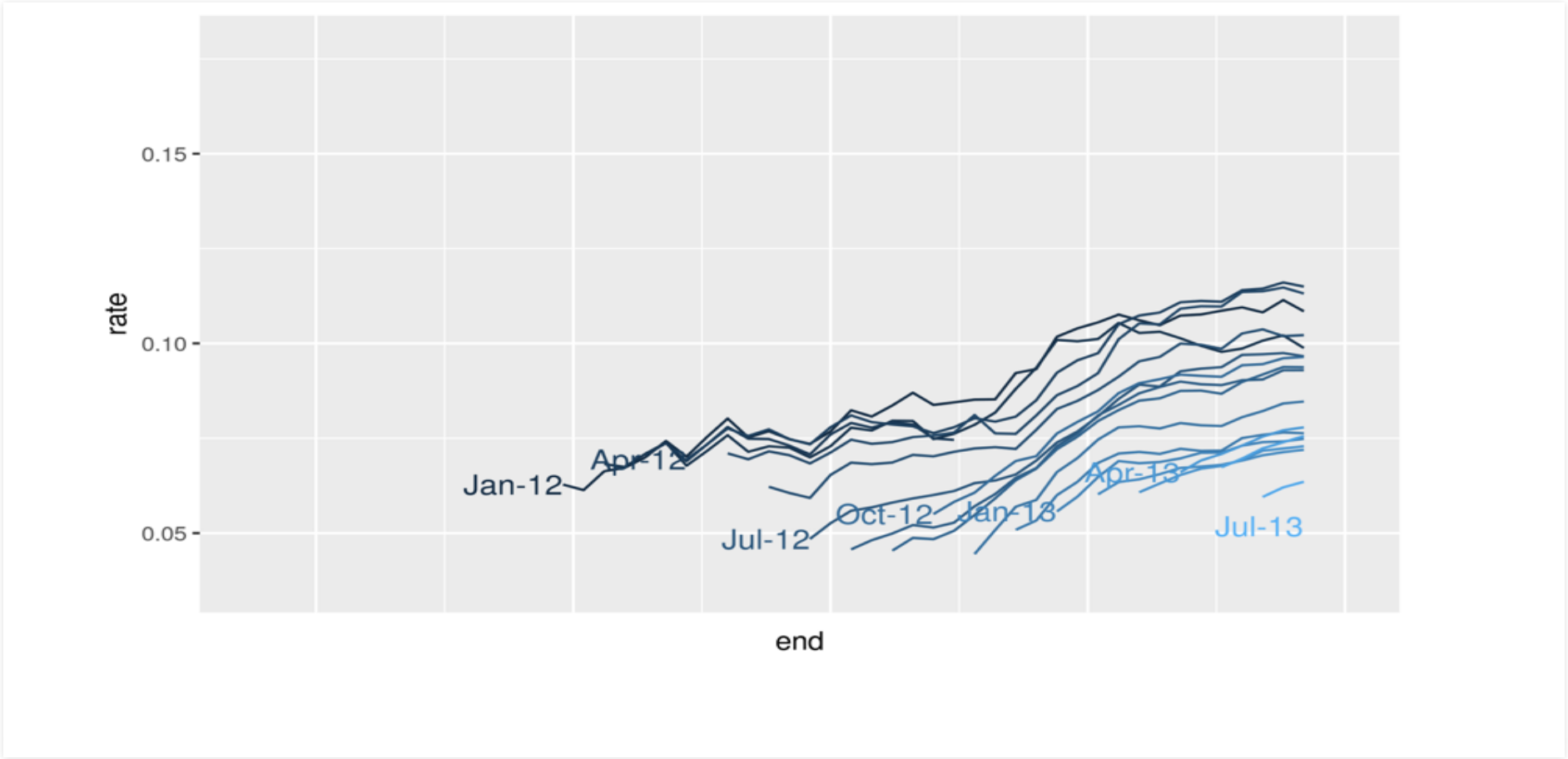
Results: Twitter Data; One Month Buffer



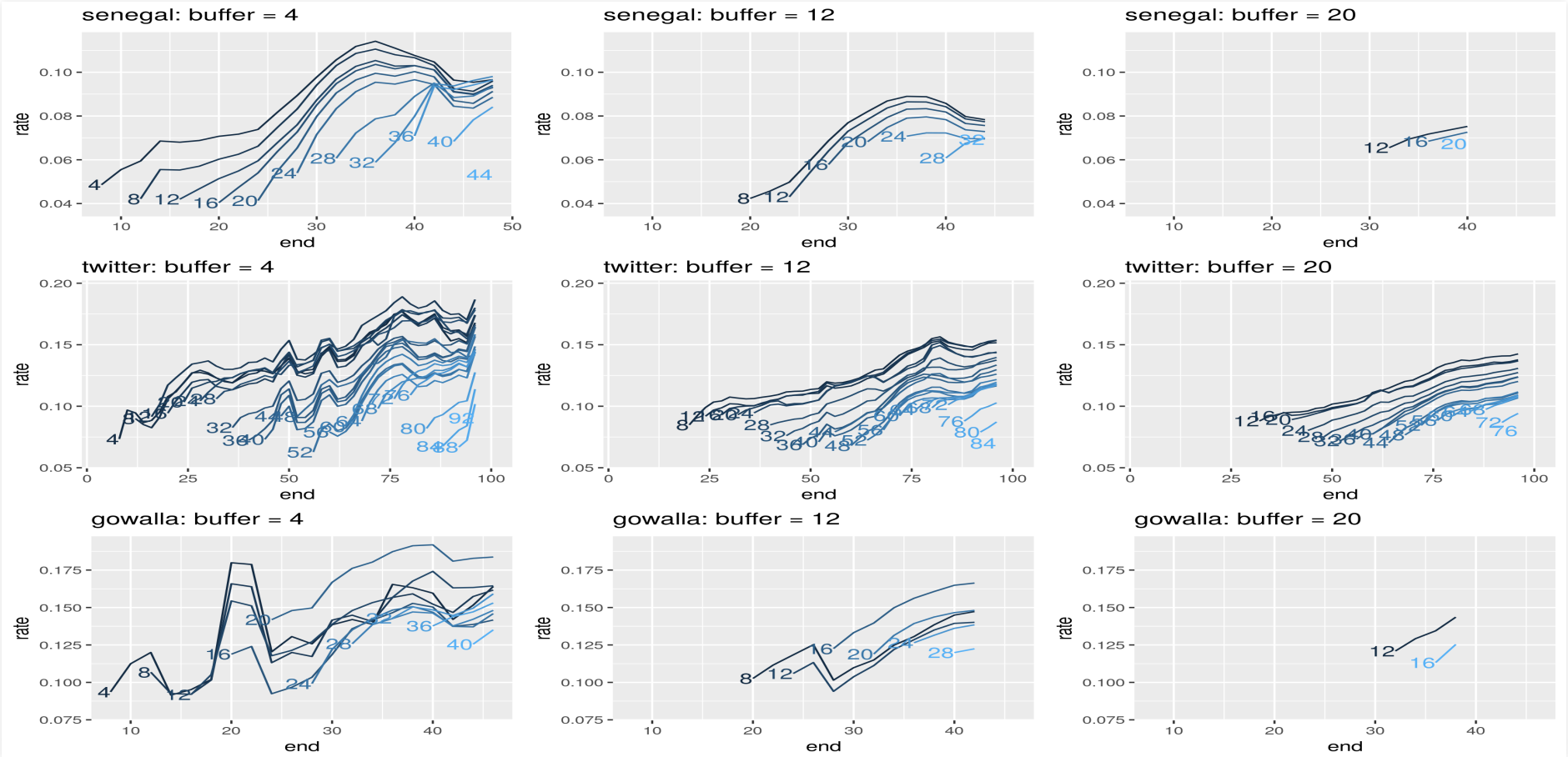
Results: Twitter Data; Three Month Buffer



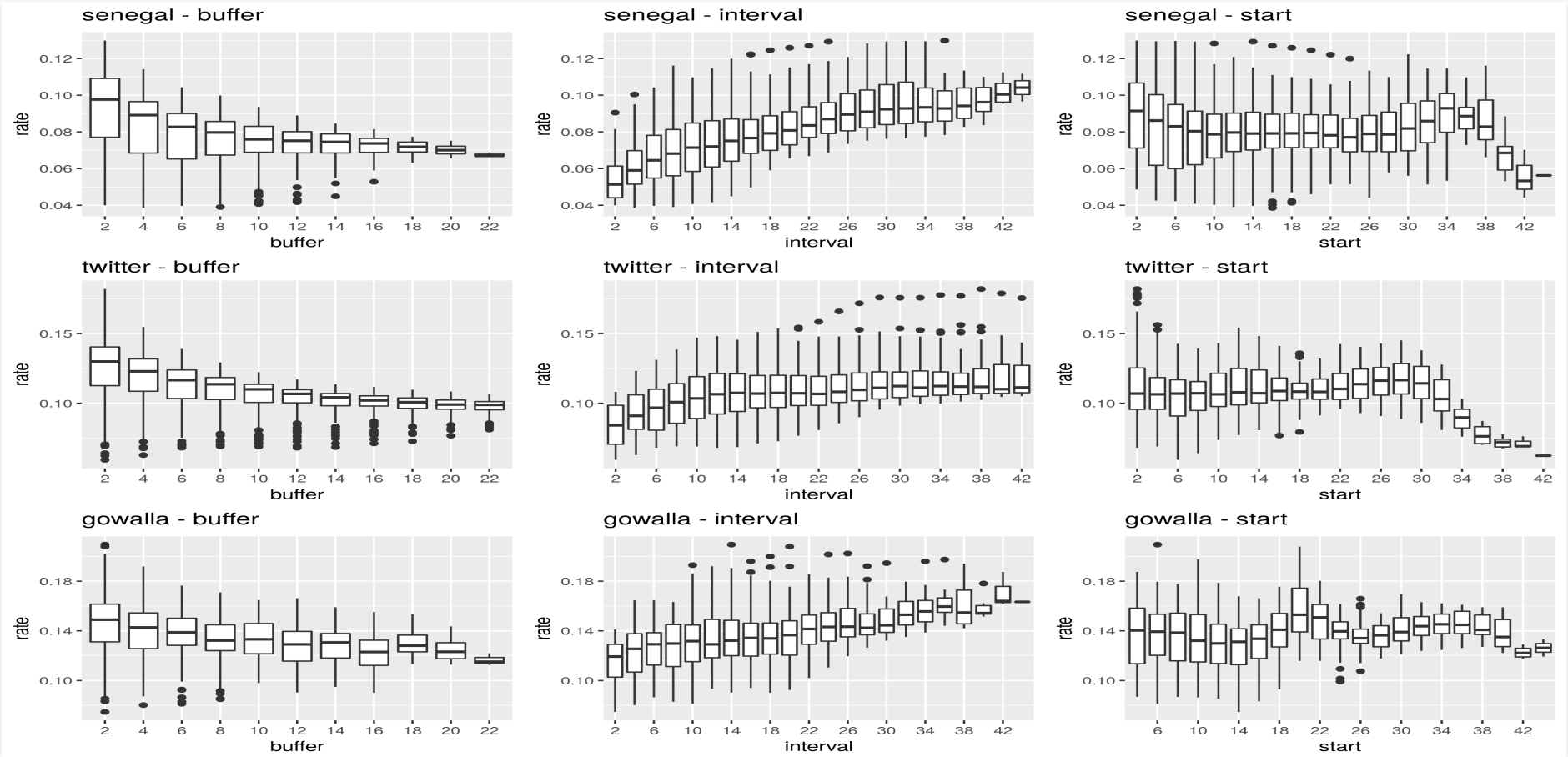
Results: Twitter Data; Five Month Buffer



Results: Senegal, Twitter, Gowalla



Results: Buffer, Interval & Start



Conclusions

- Regularity across three unique datasets
- Increasing the size of the buffer reduces the overall volatility in the migration rate
- Increasing the interval is associated with higher migration rates
- This method offers a means to study circulation and migration in a holistic framework using digital trace data

Contact Information and Acknowledgements

Lee Fiorio

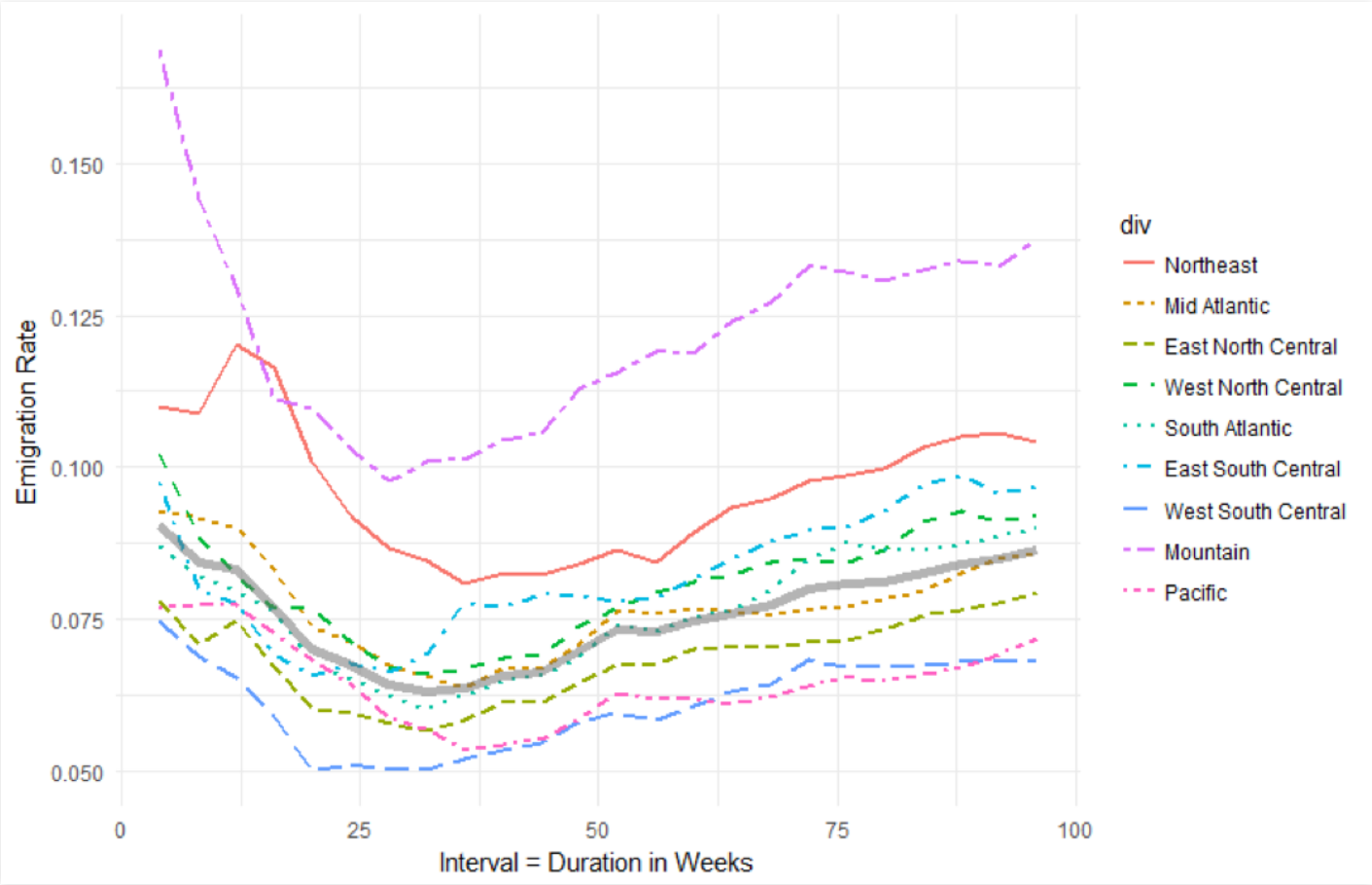
University of Washington

fiorio@uw.edu

Partial support for this research came from a Eunice Kennedy Shriver National Institute of Child Health and Human Development research infrastructure grant, R24 HD042828, to the Center for Studies in Demography & Ecology at the University of Washington.

Partial support for this research came from a Shanahan Endowment Fellowship and a Eunice Kennedy Shriver National Institute of Child Health and Human Development training grant, T32 HD007543, to the Center for Studies in Demography & Ecology at the University of Washington.

Next Steps


Emigration Rate
0.150
0.125
0.100
0.075
0.050
0
25
50
75
100
Interval = Duration in Weeks
div
Northeast
Mid Atlantic
East North Central
West North Central
South Atlantic
East South Central
West South Central
Mountain
Pacific