Supplemental Material for

Changing travel patterns in China during the early stages of the COVID-19 pandemic

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Geographic and Demographic Characteristics of Prefectures by Cluster

Cluster	Number of Prefectures
A	36
B	34
C	22
D	33
Total	125

Supplemental Table 1. Number of prefectures per cluster.

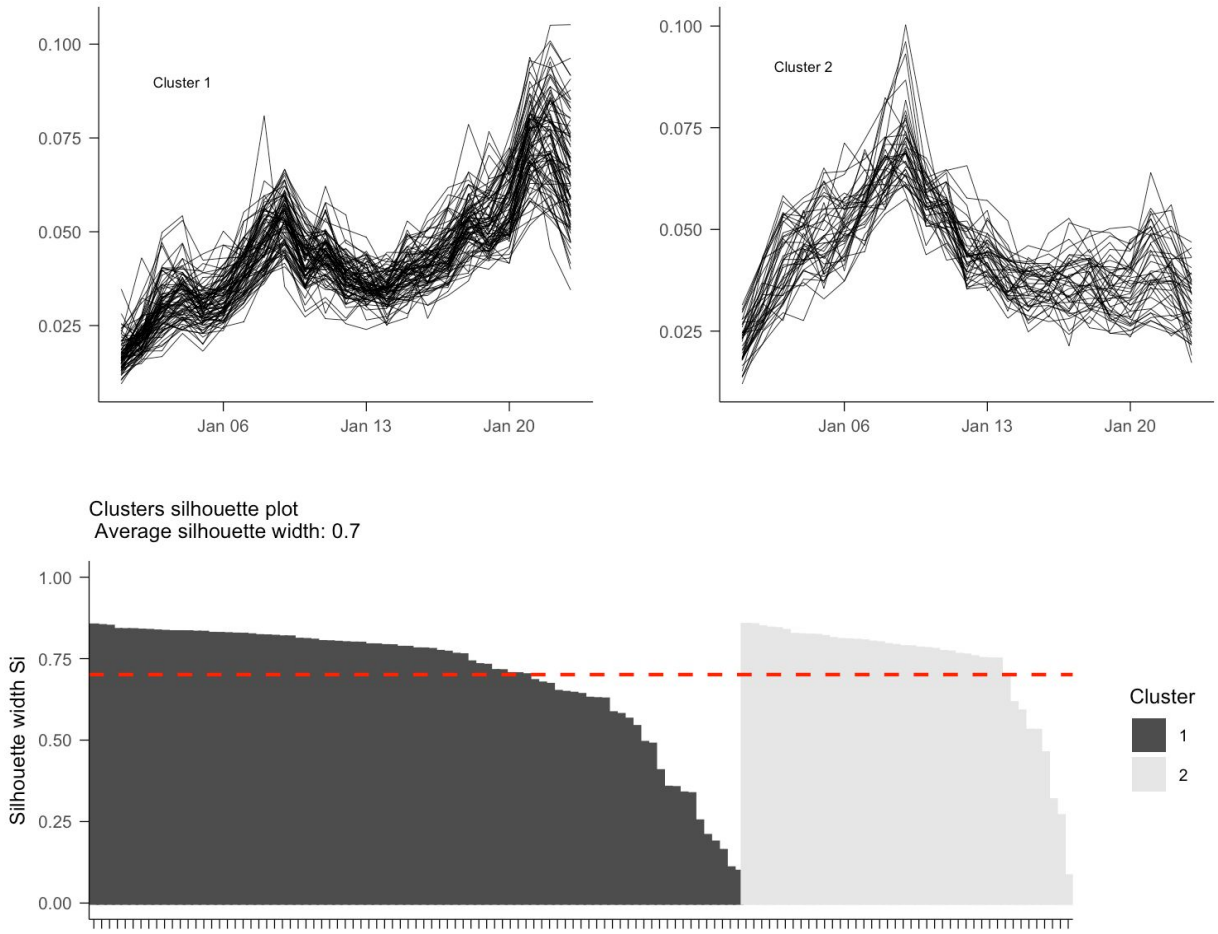
Cluster	Distance from Wuhan (km)
A	259.85
B	505.31
C	707.27
D	829.48

Supplemental Table 2. Average distance to Wuhan from prefectures in each identified cluster. Distances were measured from the centroid location of each prefecture to the centroid location of Wuhan prefecture.

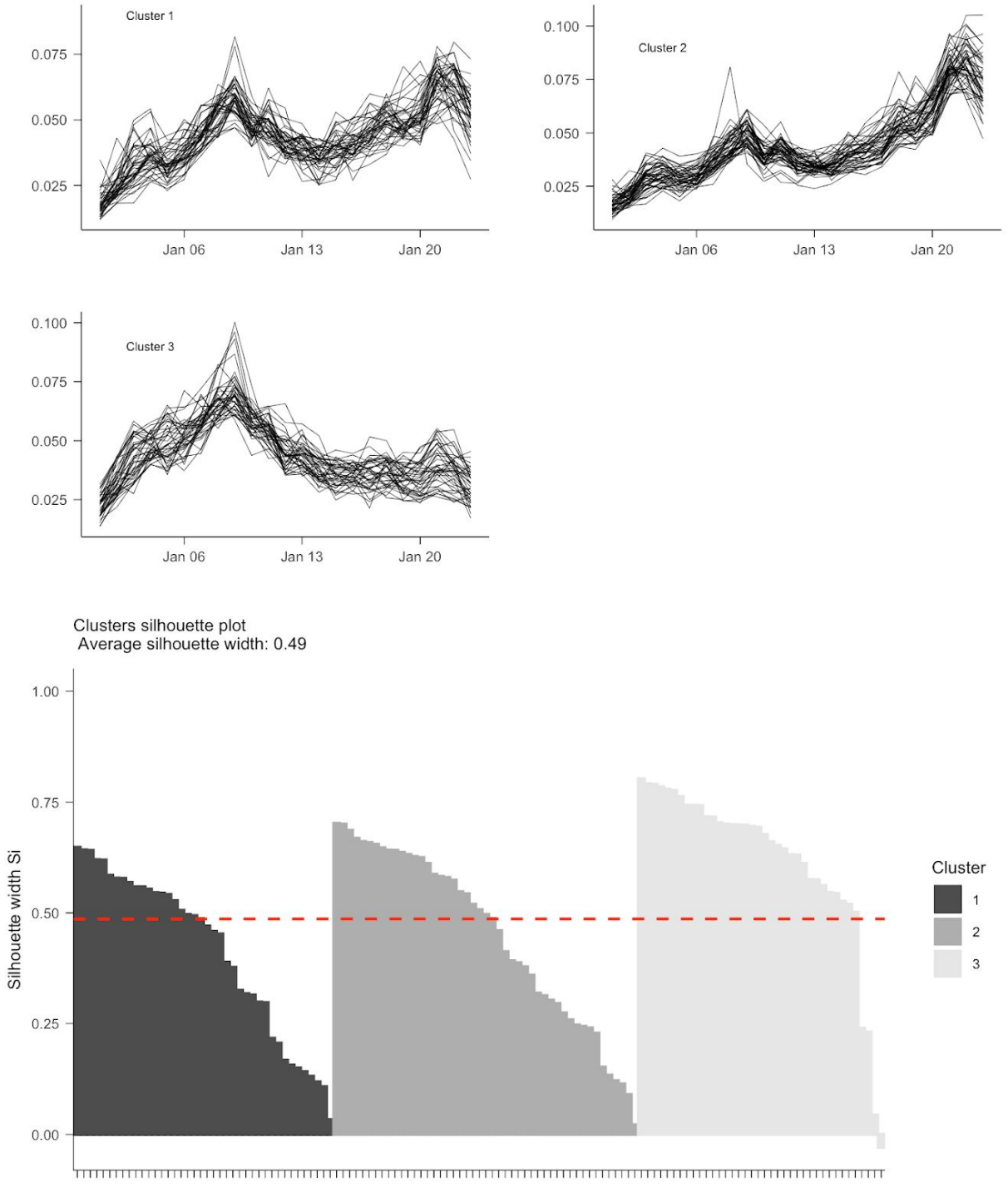
Cluster	Population Density (persons per km^2)
A	422
B	527
C	491
D	1233

Supplemental Table 3. Average population density of prefectures in each cluster. Population density was computed by dividing the population of each prefecture by the area of the prefecture, giving the number of persons per kilometer squared.

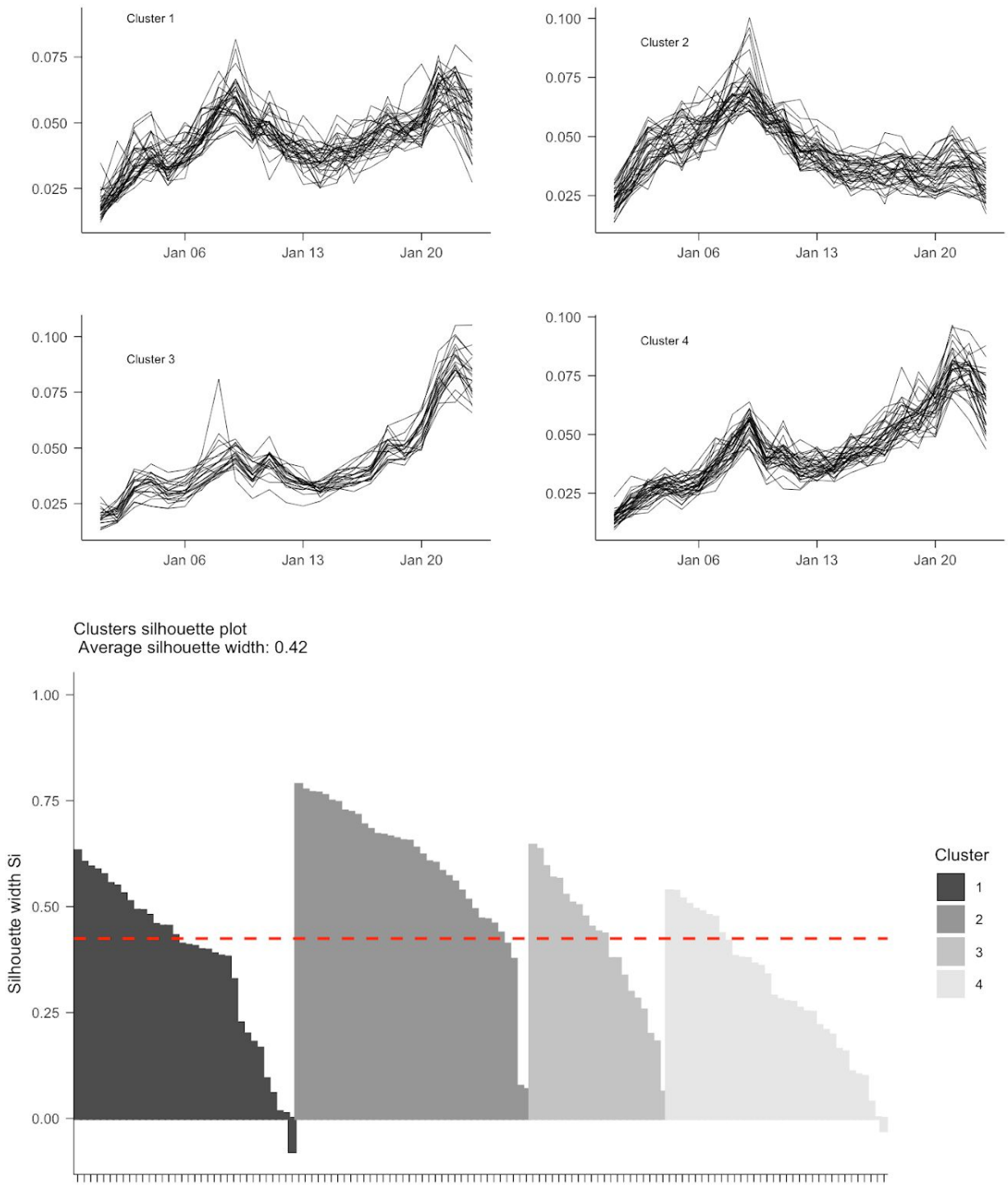
K-Means Trajectory Clustering Analyses: Exploring the Number of Clusters



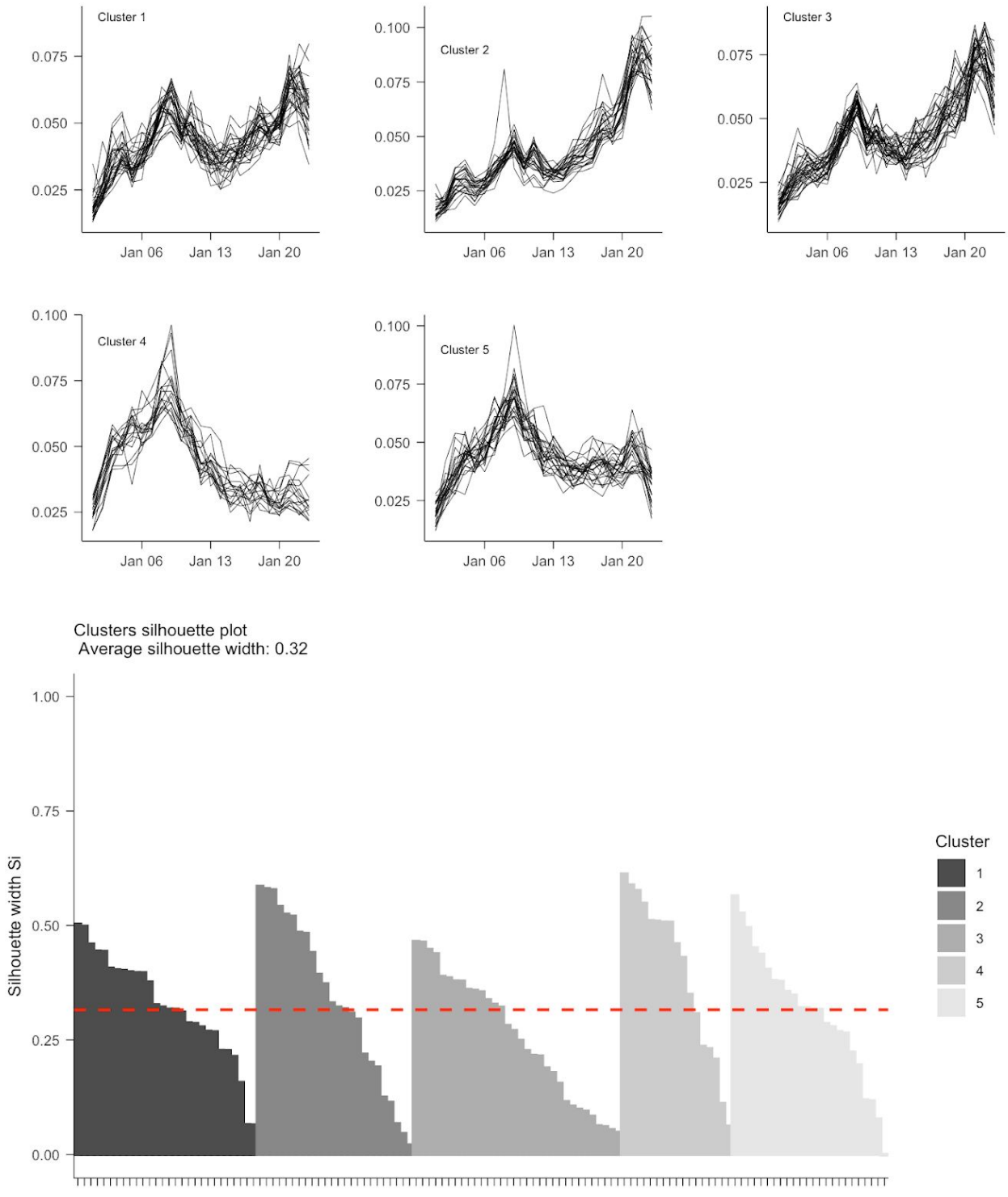
Supplemental Figure 1. Silhouette plot of outflow trajectories from Wuhan, clustered using K-means clustering with 2 clusters.



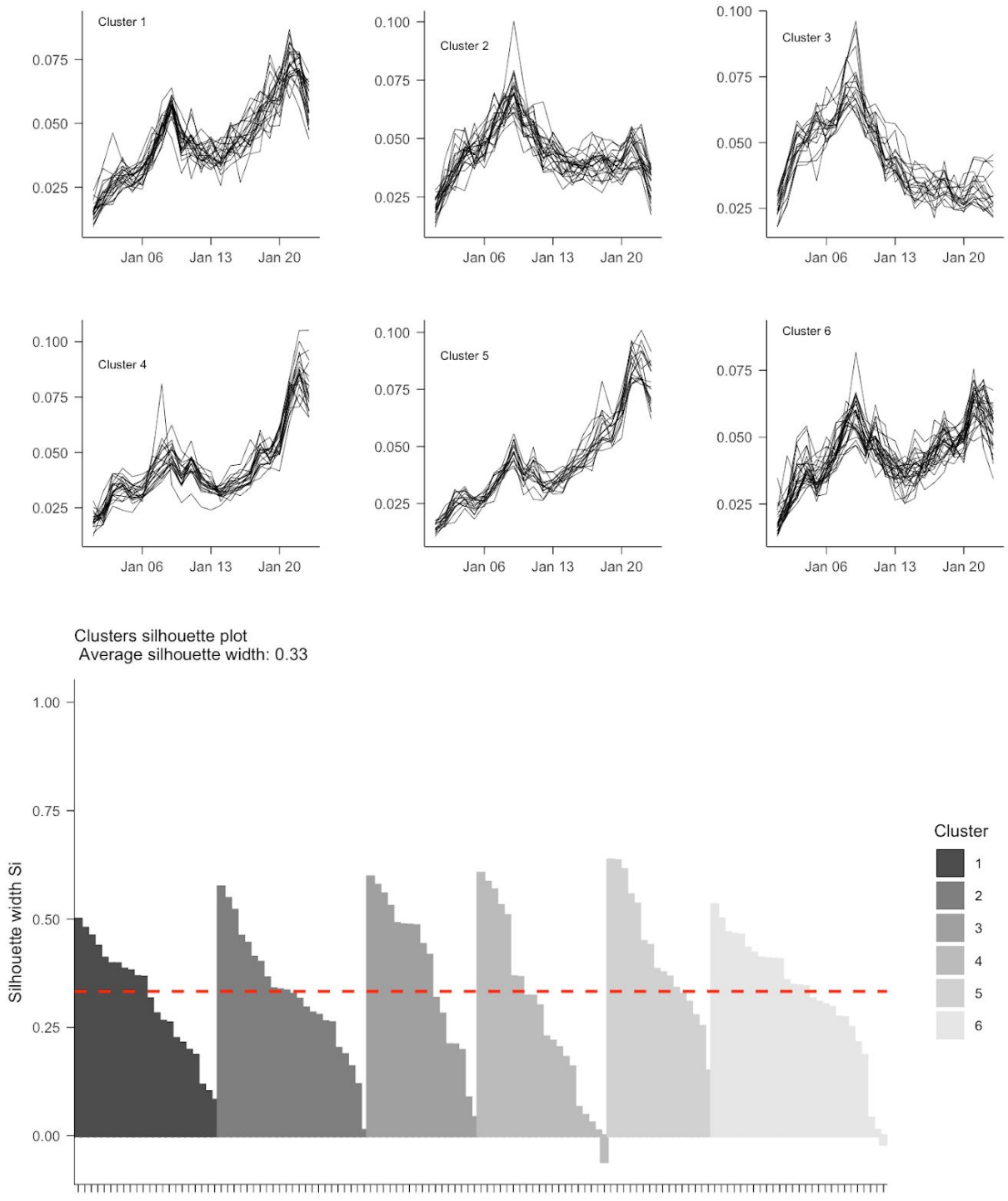
Supplemental Figure 2. Silhouette plot of outflow trajectories from Wuhan, clustered using K-means clustering with 3 clusters.



Supplemental Figure 3. Silhouette plot of outflow trajectories from Wuhan, clustered using K-means clustering with 4 clusters.



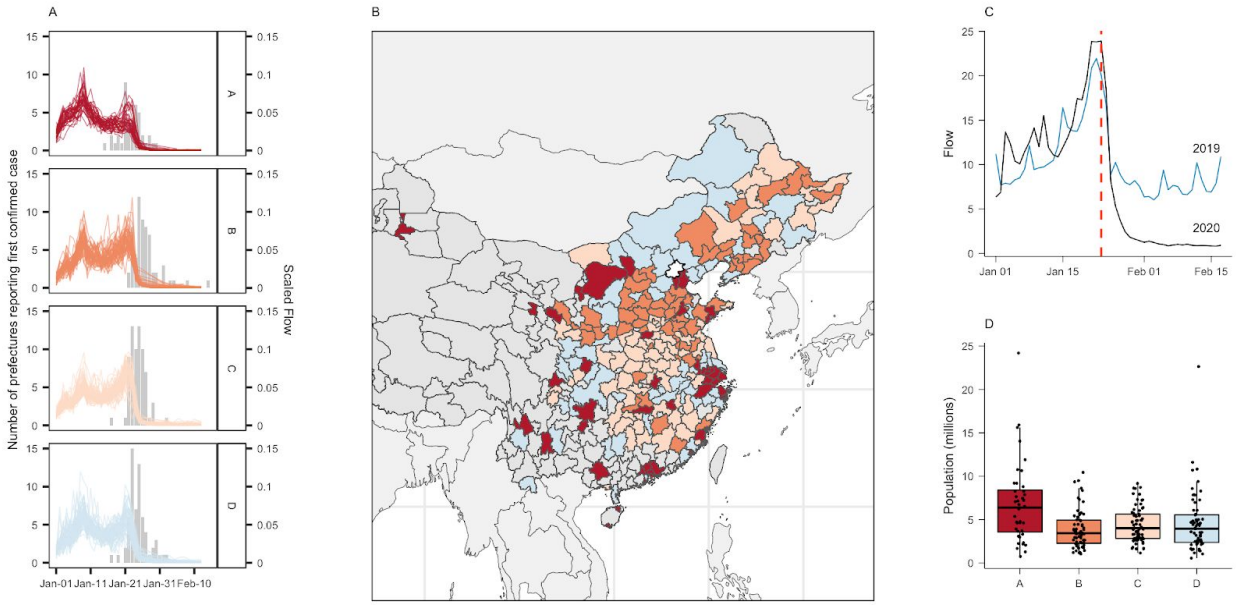
Supplemental Figure 4. Silhouette plot of outflow trajectories from Wuhan, clustered using K-means clustering with 5 clusters.



Supplemental Figure 5. Silhouette plot of outflow trajectories from Wuhan, clustered using K-means clustering with 6 clusters.

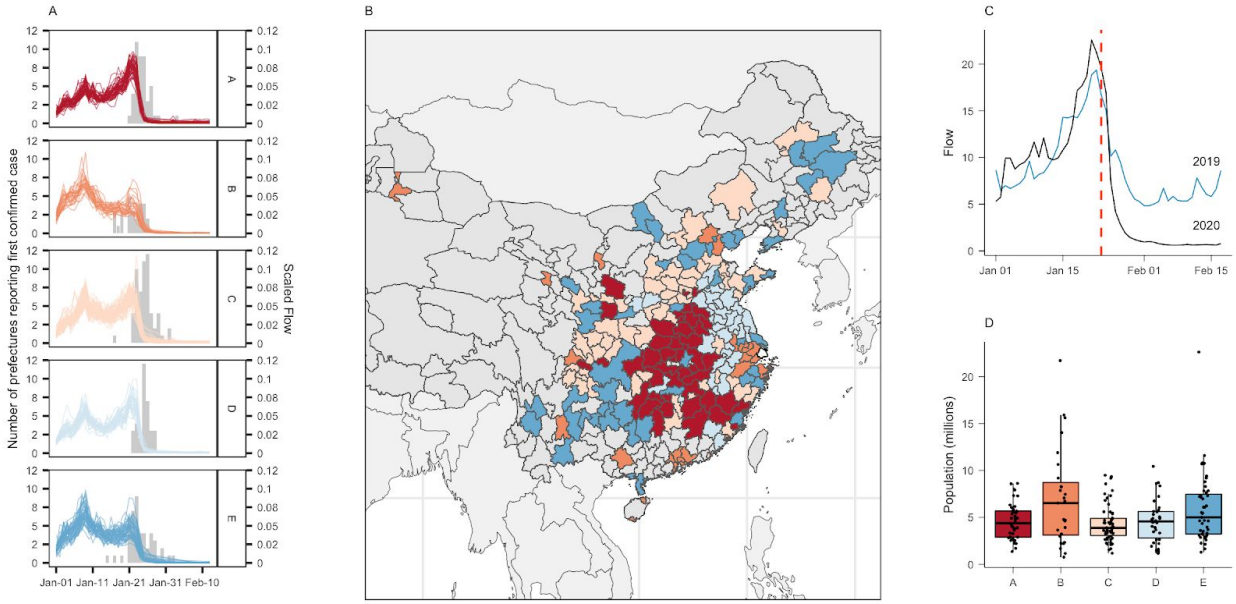
Prefecture/ City specific K-mean Trajectory Clustering Elsewhere

The number of clusters was chosen by comparing silhouette plots of different numbers of clusters, using the same method as that used for trajectory clustering for outgoing travel from Wuhan.



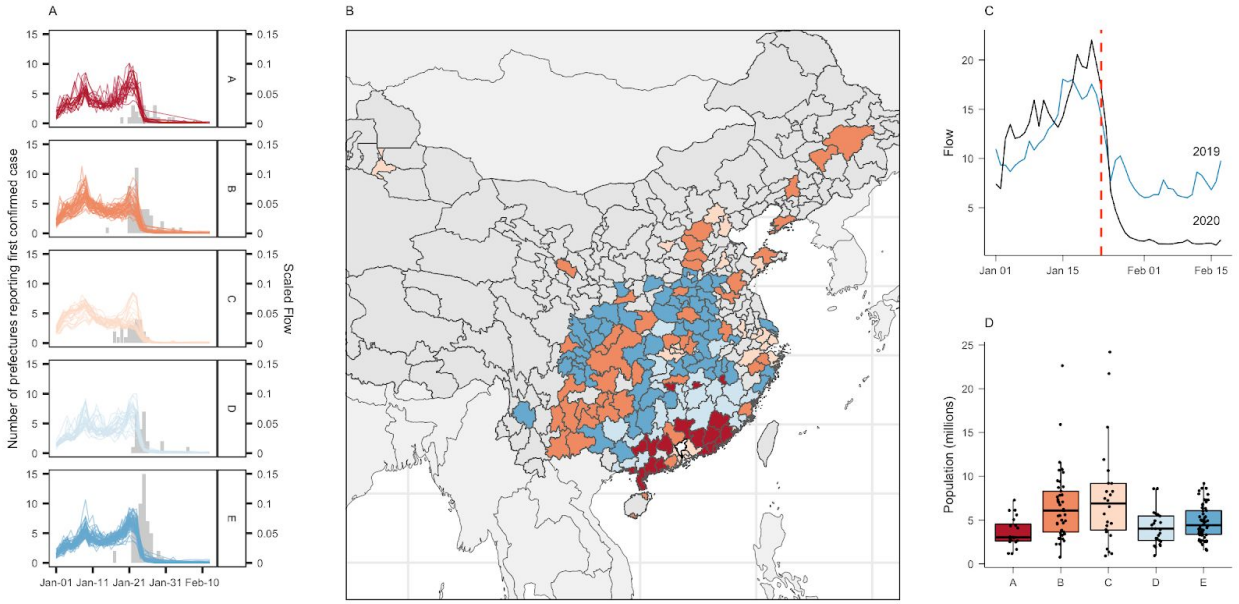
Supplemental Figure 6. Movement characteristics of travel originating in Beijing.

The identified patterns in outbound travel from Beijing: a) pairwise travel trends from Beijing to the most connected prefectures, stratified by cluster. Grey bars show the number of prefectures in that cluster with first confirmed case on each date; b), the spatial distribution of the prefectures in each of the 4 identified clusters; c), the volume of overall outbound travel on each day from Beijing in 2019 and 2020; d), resident population size of prefectures stratified by cluster.



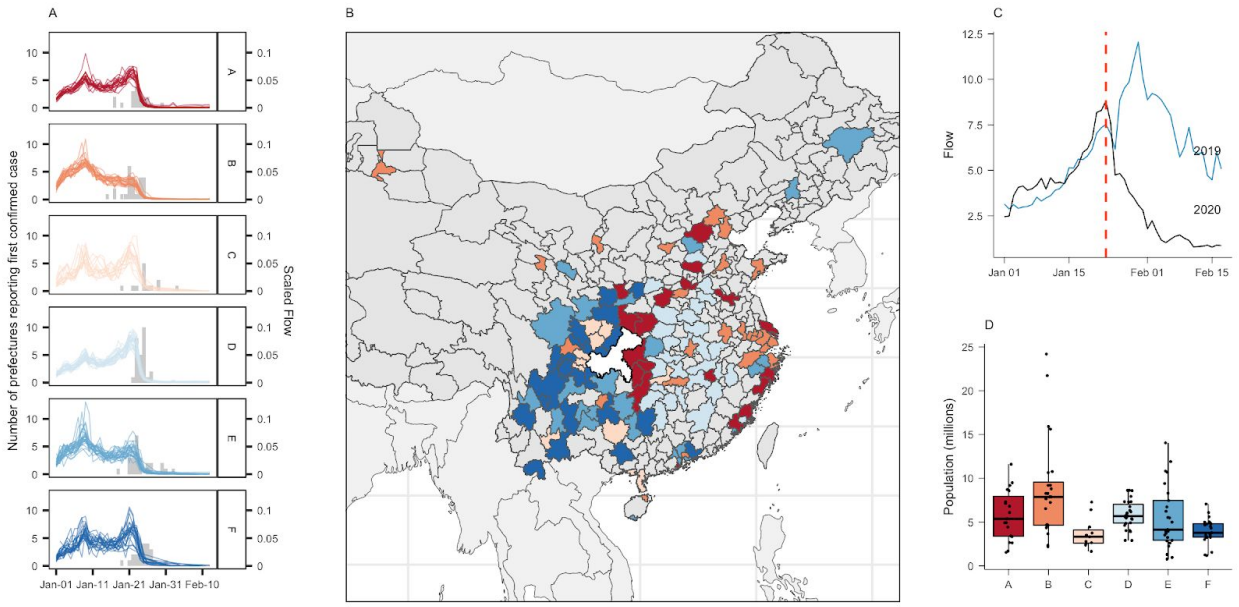
Supplemental Figure 7. Movement characteristics of travel originating in Shanghai.

The identified patterns in outbound travel from Shanghai: a) pairwise travel trends from Shanghai to the most connected prefectures, stratified by cluster. Grey bars show the number of prefectures in that cluster with first confirmed case on each date; b), the spatial distribution of the prefectures in each of the 5 identified clusters; c), the volume of overall outbound travel on each day from Beijing in 2019 and 2020; d), resident population size of prefectures stratified by cluster.



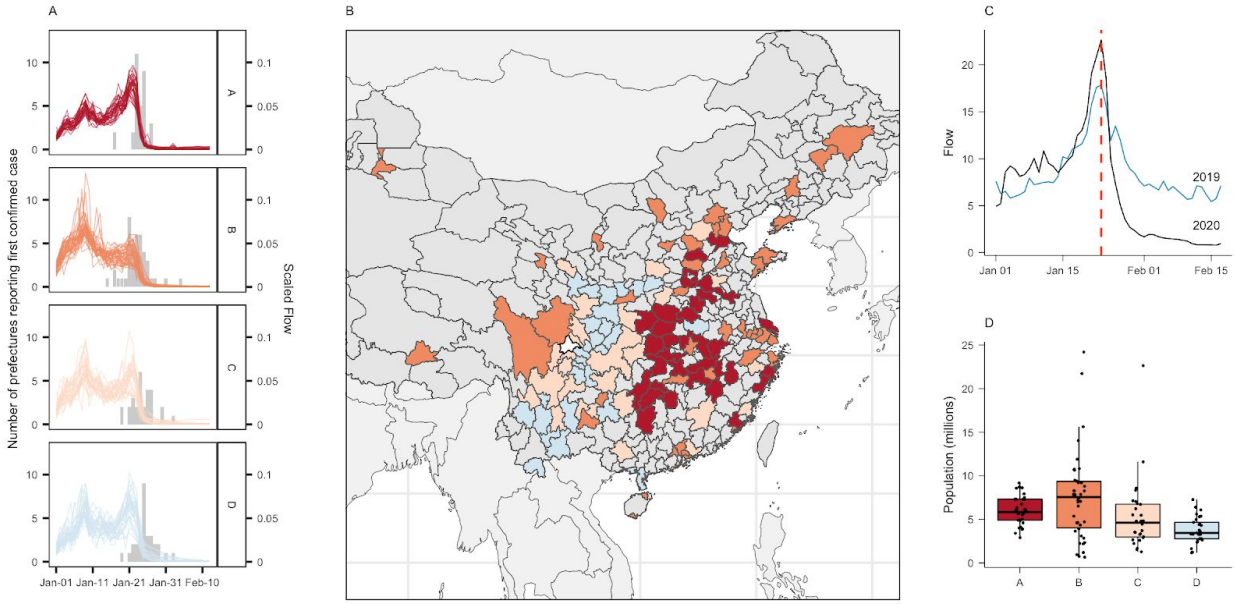
Supplemental Figure 8. Movement characteristics of travel originating in Guangzhou.

The identified patterns in outbound travel from Guangzhou: a) pairwise travel trends from Guangzhou to the most connected prefectures, stratified by cluster. Grey bars show the number of prefectures in that cluster with first confirmed case on each date; b), the spatial distribution of the prefectures in each of the 5 identified clusters; c), the volume of overall outbound travel on each day from Beijing in 2019 and 2020; d), resident population size of prefectures stratified by cluster.



Supplemental Figure 9. Movement characteristics of travel originating in Chongqing.

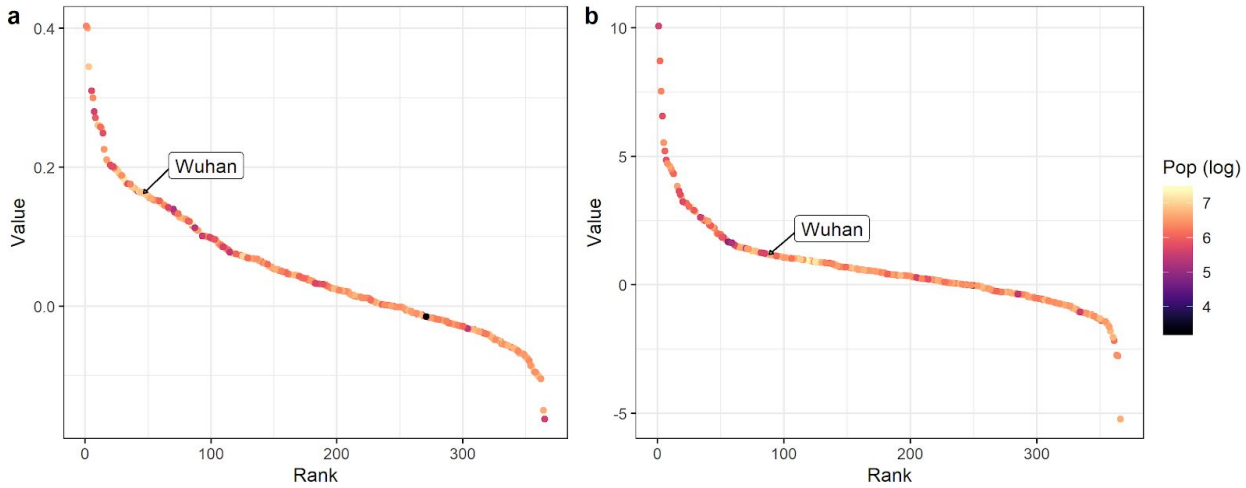
The identified patterns in outbound travel from Chongqing: a) pairwise travel trends from Chongqing to the most connected prefectures, stratified by cluster. Grey bars show the number of prefectures in that cluster with first confirmed case on each date; b), the spatial distribution of the prefectures in each of the 6 identified clusters; c), the volume of overall outbound travel on each day from Beijing in 2019 and 2020; d), resident population size of prefectures stratified by cluster.



Supplemental Figure 10. Movement characteristics of travel originating in Chengdu.

The identified patterns in outbound travel from Chengdu: a) pairwise travel trends from Chengdu to the most connected prefectures, stratified by cluster. Grey bars show the number of prefectures in that cluster with first confirmed case on each date; b), the spatial distribution of the prefectures in each of the 4 identified clusters; c), the volume of overall outbound travel on each day from Beijing in 2019 and 2020; d), resident population size of prefectures stratified by cluster.

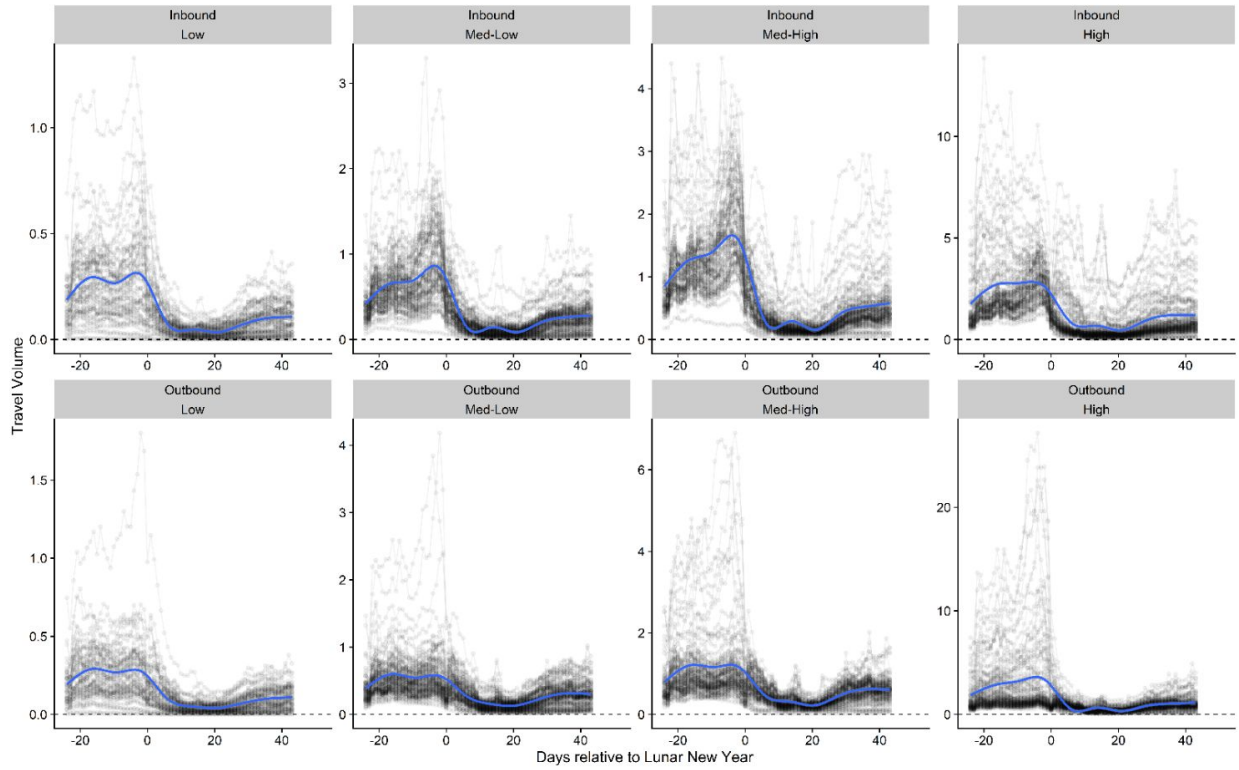
Detecting outbound travel surges preceding LNY



Supplemental Figure 11. The change in outbound travel surges before Lunar New Year between 2020 and 2019 across mainland China.

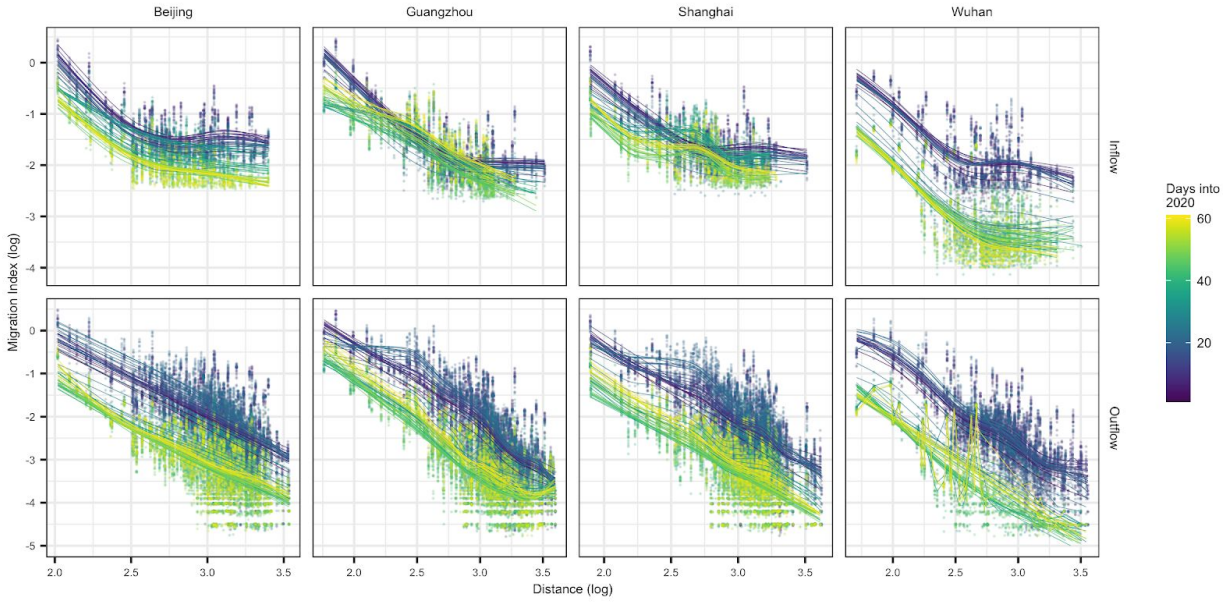
(a) shows the proportion-based variability metric and (b) the anomaly-based variability metric. Color gradient reflects local population sizes (log10-scaled).

The volume of in- and outbound travel between population quartiles in mainland China



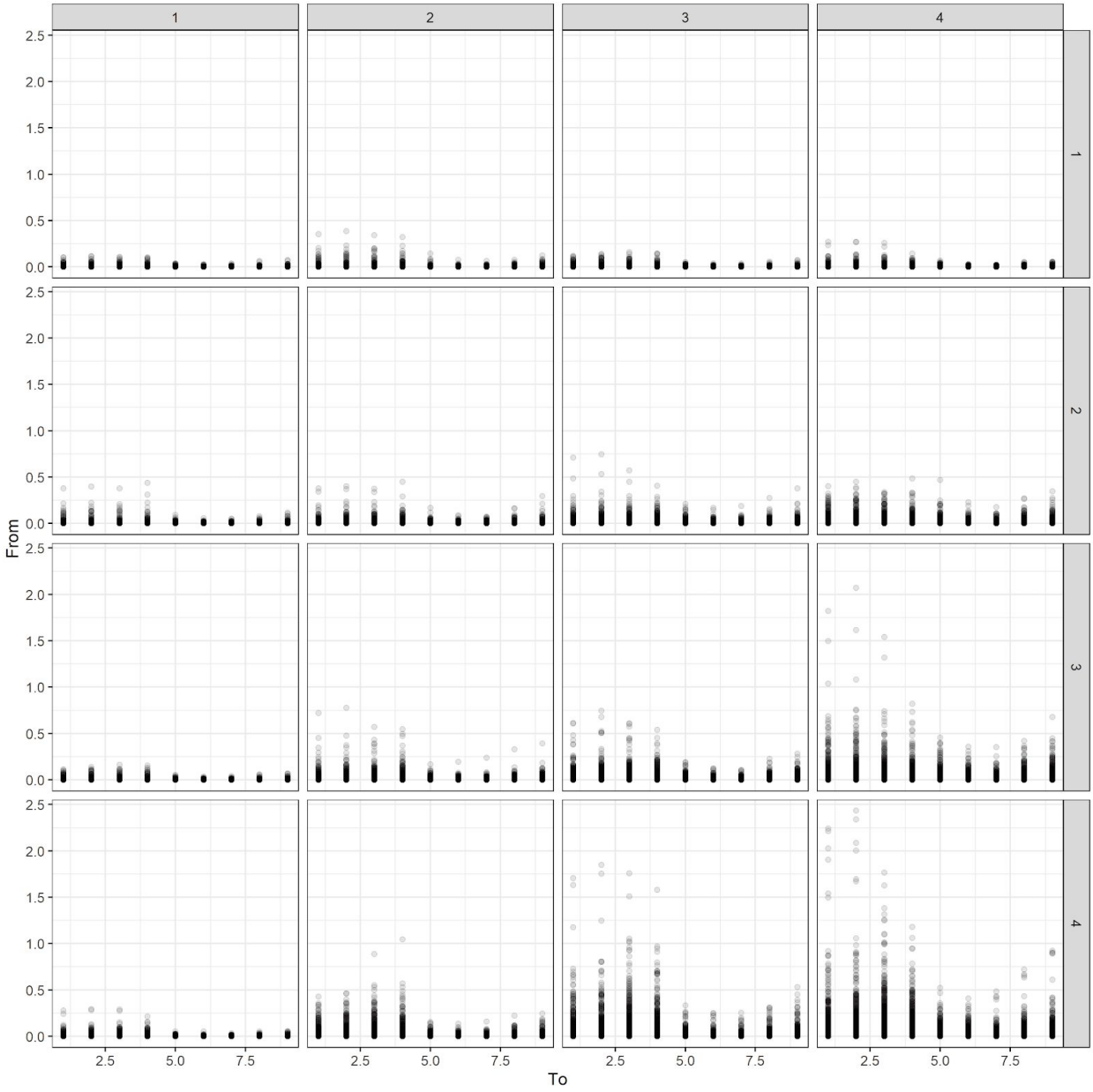
Supplemental Figure 12. In- and outbound travel volumes over time between population quartiles. Travel volume is measured by Baidu's migration Index.

Distance Kernel Plots for Large Cities in Mainland China



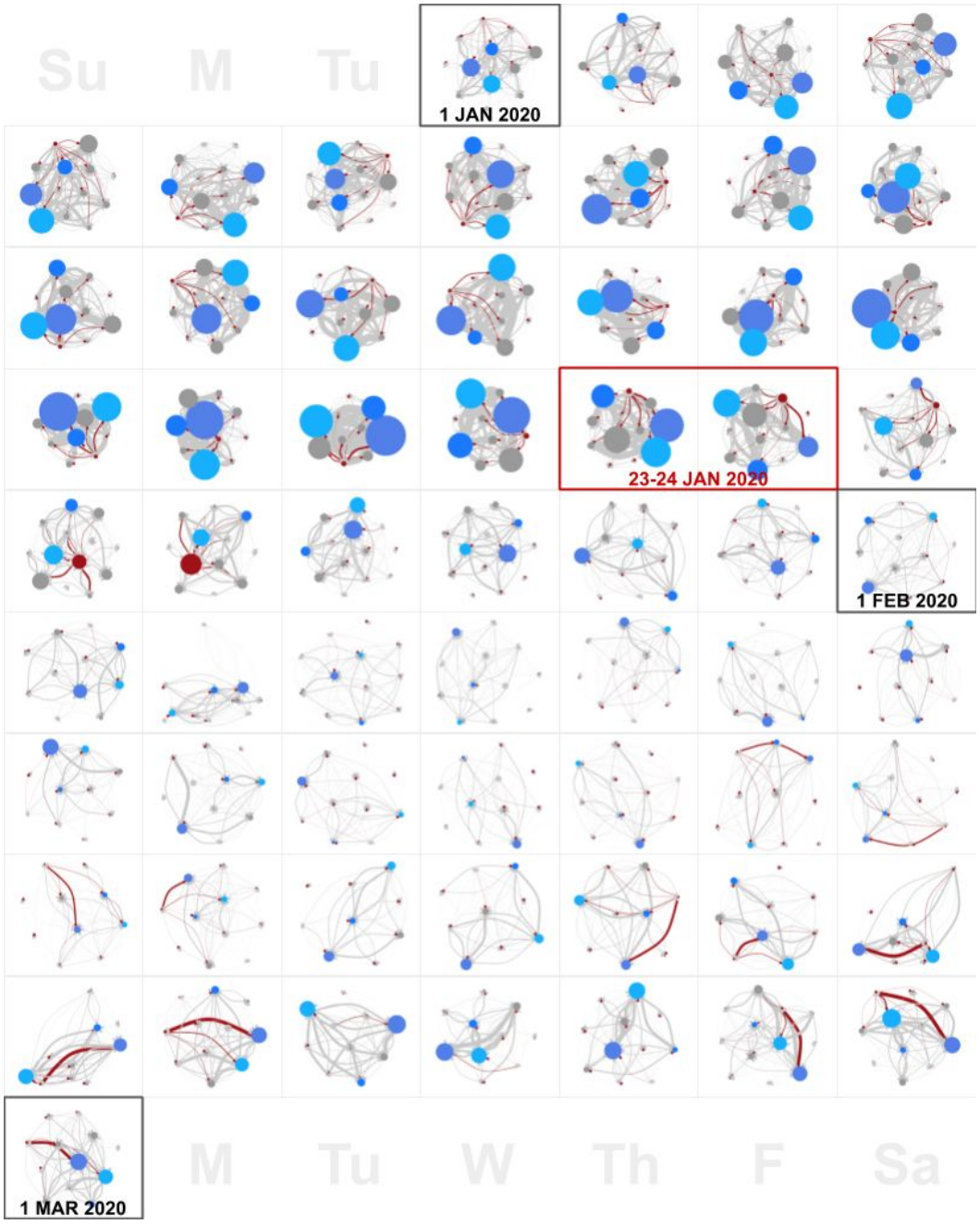
Supplemental Figure 13. Distance kernel plots for Beijing, Guangzhou, Shanghai and Wuhan.

Weekly Pair-wise Mobility by Population Quartile



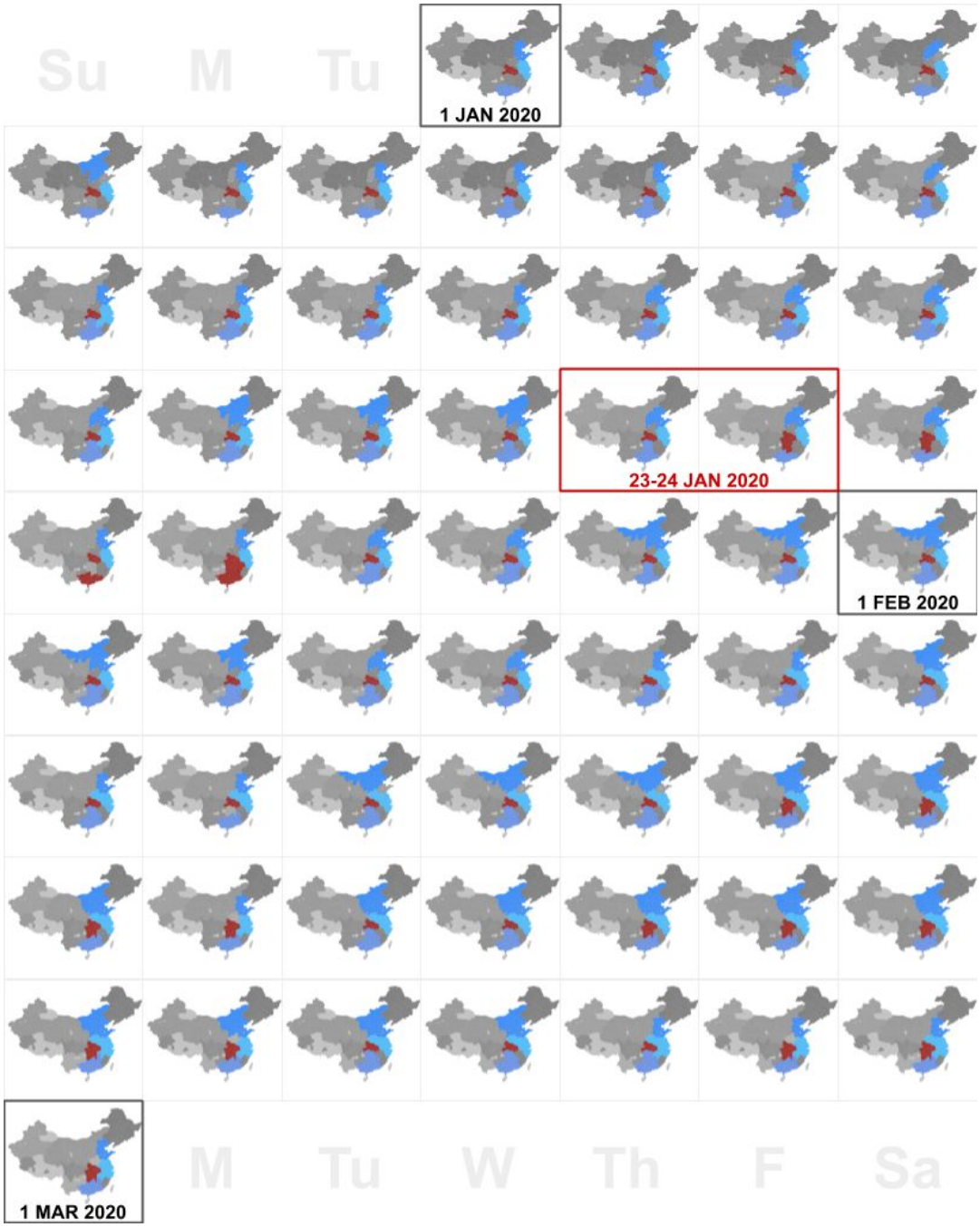
Supplemental Figure 14. Weekly pair-wise mobility by population quartiles. Index 1-4 are lowest-highest population size quartiles.

Community Modularity



Supplemental Figure 15. Full Community Modularity Time Series.

Nodes combine all of the prefectures by community. Node size reflects intra-community travel, while edge size reflects extra-community travel. The red node includes Wuhan, and red edges represent the travel from that community. The blue nodes correspond to communities including major cities: Beijing, Shanghai, and Guangzhou & Shenzhen (always appearing in the same community). The network plots appear on their corresponding calendar days.



Supplemental Figure 16. Full Community Map Time Series.

These maps show the changing geographical regions associated with the identified communities. The coloring scheme is shared with Fig. PREV, and again the small multiples appear on their corresponding calendar days. Prefectures coloured white are those where we have no mobility data, likely due to censoring due to low numbers of travellers.