## Correlates of mobility trajectory cluster membership

**<Summary>**

**The most significant features for classifying each cluster between reference model and model with regional dummies**

* G1 (London): Share of share of self-employed, cumulative COVID-19 infection rates before lockdown, and percentage of Black African (all positive)
* G2 (East of England): Share of households with more than three vehicles in household (positive)
* G3 (North East): Share of median-income households (negative)
* G4 (Yorkshire and the Humber, East Midlands, and South West): Percentage of Black Caribbean (negative)

**<Contents>**

Table 1 and 2 presents the classification model estimation results. These results were used to assess and compare the performance of each model. The model with regional dummies had smaller Akaike information corrected criterion (AICc) and Bayesian information criterion (BIC) scores than the reference model. However, there is marginal difference between two model performance. Given two model estimation results, usual residency (i.e., regional dummies) was the most effective variable for grouping the trajectories of mobility reductions during England’s first nationwide lockdown period, followed by the share of self-employed workers, car availability, and income levels with estimated coefficients varying over clusters (see Figure 1).

Two model estimation results are also likely to be relevant. Table 2 shows the estimation results of model with regional dummies. Positive coefficients for the share of high-income households and self-employed workers were observed in G1 and G2. Based on the sign of coefficients, it can be inferred that the patterning of mobility reductions in those local authorities was likely to be correlated with high levels of affluent populations and self-employed workers. Conversely, negative coefficients were indicated in G3 and G4 that high-income households and self-employed workers were negligible in areas where relatively higher proportions of lower-middle workers. In addition, the positive coefficients for the share of households with one vehicle were observed in G2 and G4, while negative coefficients were indicated in G1 and G3. This result is also stable in the estimation results in the reference model, which does not include regional dummies (see Table 1). The positive coefficients for the share of self-employed workers were observed in G1 and G2, while negative coefficients were indicated in G3 and G4.

Note that two model estimation results showed that the temporal pattern of mobility reductions are likely to be correlated with the characteristics of each region in England. For example, people living in London were more likely to experience an extensive reduction in mobility, with a sharp decline but a slow recovery during lockdown. In contrast, people living in Yorkshire and the Humber were more likely to experience a marginal reduction in mobility, with a gradual decline but a rapid recovery in the same period.

Table 2 shows the estimated coefficients for selected factors correlated with the classification of generated clusters. People living in London were generally classified as G1, followed by high cumulative COVID-19 infection rates before the lockdown and relatively higher clinical capacity (i.e., density of hospitals). On the contrary, people living in Yorkshire and the Humber, and parts of East Midlands and South West were more likely classified as G4, where there were relatively lower self-employed workers and lower middle class (i.e., Social Grade C1). Among the remaining clusters, high levels of the share of high-income households and households with more than three vehicles were more likely classified as G2. Finally, G3 was more likely located in local authorities in the North East, where the share of median-income households and more than three bedrooms in the house were dominant.

Also, Table 1 displays the estimated coefficients for selected factors correlated with the classification of generated clusters without regional dummies. These clusters were generally classified as G4, where the share of households with more than three vehicles, self-employed workers, and people in the lower middle class (i.e., social grade C1) were substantially lower. In contrast, G1 was more likely located in the local authorities; the share of high-income households, cumulative COVID-19 infection rates before the lockdown, and minority ethnic groups were comparatively high. Among the remaining clusters, high levels of the share of middle-income households, and more than three bedrooms in the house were more likely classified as G3. At the same time, G2 was more likely located in local authorities; the share of high-income households, lower middle class, and Black African were relatively higher.

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Figure 1. Estimated coefficients of explanatory variables to predict the clusters (left: reference, right: reference with regional dummies)

Table 1. Estimated coefficients of explanatory variables to classify clusters (reference model).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Domains | | Variable | G1 | G2 | G3 | G4 |
| Constant | | | -0.59 | 0.41 | 0.53 | -0.34 |
| Socioeconomic | Income | Share of households in the lowest household  income quintile at the national level |  |  |  | 0.03 |
| Share of households in median household  income quintile at the national level | -0.08 |  | 0.38 |  |
| Share of households in top household  income quintile at national level | 0.19 | 0.47 | -0.23 | -0.19 |
| Occupation | Share of Social Grade C1 (lower middle class) |  | 0.3 |  | -0.23 |
| Housing type | Share of dwellings with ≥3 bedrooms |  |  | 0.25 |  |
| Residential density | Resident population density  (1,000 inhabitants per km2) |  | -0.02 |  |  |
| Accessibility | Car availability | Share of households with 1 vehicle | -0.35 | 0.04 | -0.04 | 0.18 |
| Share of households with ≥3 vehicles |  | 0.39 |  | -0.64 |
| Clinical capacity and Allowed premises | Hospitals (per 1,000 inhabitants) | 0.07 | -0.15 |  |  |
| Activity commitment | Economic activity | Share of self-employed workers in the resident  population aged 16-74 | 0.71 | 0.02 | -0.02 | -0.26 |
| Perceived risk of COVID-19 | Infection rates | Cumulative COVID-19 reported cases per 100,000  resident population before lockdown | 0.24 |  |  | -0.01 |
| Mortality rates | Cumulative COVID-19 reported deaths per 100,000  resident population before lockdown |  |  |  | -0.2 |
| Ethnic composition | Bangladeshi | Percentage Bangladeshi | 0.08 |  |  | -0.06 |
| Other Asian | Percentage Other Asian |  | 0.06 | -0.01 |  |
| African | Percentage Black African |  | 0.43 |  |  |
| Caribbean | Percentage Black Caribbean | 0.09 |  |  | -0.19 |
| Other Black | Percentage Other Black | 0.12 |  |  | -0.03 |
| Model criteria information | | | | | | |
| AICc (Akaike's Information Corrected Criterion) | | -222.91 | | | | |
| BIC (Bayesian information criterion) | | -161.18 | | | | |

Table 2. Estimated coefficients of explanatory variables to classify clusters (model with regional dummies).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Domains | | Variable | G1 | G2 | G3 | G4 |
| Constant | | | -0.597 | 0.518 | 0.628 | -0.549 |
| Regions in England | North East | |  |  | 0.439 |  |
| Yorkshire and the Humber | |  | -0.072 |  | 1.665 |
| East Midlands | |  |  |  | 0.356 |
| West Midlands | | -0.418 |  | 0.038 |  |
| East of England | |  | 0.044 | -0.034 |  |
| London | | 1.770 |  | -0.148 |  |
| South West | | -0.561 | -0.037 | 0.037 | 1.010 |
| Socioeconomic | Income | Share of households in lowest household income quintile at national level |  | 0.408 | -0.286 |  |
| Share of households in median household income quintile at national level | -0.006 |  | 0.403 |  |
| Share of households in top household income quintile at national level |  |  |  | 0.092 |
| Occupation | Share of Social Grade C1 (lower middle class) |  | 0.313 |  | -0.089 |
| Housing type | Share of dwellings with ≥3 bedrooms |  |  | 0.266 |  |
| Accessibility | Residential density | Resident population density (1,000 inhabitants per km2) |  | -0.180 |  |  |
| Car availability | Share of households with 1 vehicle | -0.479 | 0.013 | -0.013 | 0.145 |
| Share of households with ≥3 vehicles |  | 0.255 |  | -0.842 |
| Clinical capacity and  Allowed premises | Hospitals (per 1,000 inhabitants) | 0.097 | -0.206 | -0.009 | 0.009 |
| Parks (per 1,000 inhabitants) |  | -0.033 |  |  |
| Activity commitment | Economic activity | Share of self-employed workers in the resident population aged 16-74 | 0.688 | 0.073 | -0.073 | -0.533 |
| Perceived risk of COVID-19 | Infection rates | Cumulative COVID-19 reported cases per 100,000 population before lockdown | 0.117 |  |  |  |
| Mortality rates | Cumulative COVID-19 reported deaths per 100,000 population before lockdown | 0.011 | -0.011 | 0.020 | -0.088 |
| Ethnic composition | Bangladeshi | Percentage Bangladeshi | 0.001 | -0.001 | 0.043 | -0.054 |
| Other Asian | Percentage Other Asian |  | 0.153 |  |  |
| African | Percentage Black African |  | 0.493 |  |  |
| Caribbean | Percentage Black Caribbean |  |  |  | -0.203 |
| Other Black | Percentage Other Black |  |  |  | -0.114 |
| Model criteria information | | | | | | |
| AICc (Akaike's Information Corrected Criterion) | | | -236.969 | | | |
| BIC (Bayesian information criterion) | | | -147.653 | | | |

**<Supplements>**

**Reference model**

* G1: Share of self-employed workers (0.71), households with one vehicle (0.35), cumulative COVID-19 infection rates before lockdown (0.24), high-income households (0.19), and percentage Other Black (0.12).
* G2: Share of high-income households (0.47), percentage Black African (0.43), households with more than three vehicles (0.39), more than three bedrooms in the house (0.30), and Hospital density per 1,000 population (0.15).
* G3: Share of medium-income households (0.38), social grade C1 (0.25), high-income households (0.23), more than three bedrooms in the house (0.25), households with one vehicle (0.04), and self-employed workers (0.02).
* G4: Share of households with more than three vehicles (0.64), self-employed workers (0.26), more than three bedrooms in the house (0.23), cumulative COVID-19 mortality rates before lockdown (0.20), and percentage Black Caribbean (0.19).Chart, box and whisker chart

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**Modell with regional dummies**

* G1: residency in London (1.77) and share of self-employed (0.688) / household with one vehicle (-0.479), residency in West Midlands (-0.418) and South West (-0.561)
* G2: Percentage of Black African (0.493), Share of high-income households (0.408), social grade C1 (0.313), and more than three vehicles in household / Hospitals (-0.206)
* G3: residency in North East (0.439), Share of median-income households (0.403), and more than three bed rooms in house / Share of high-income households (-0.286) and residency in London (-0.148)
* G4: residency in Yorkshire and the Humber (1.665), South West (1.01), and East Midlands (0.356) / Share of more than three vehicles in household (-0.842) and self-employed worker (-0.533)

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