**Supplementary Material**

Manuscript: An Analytical Framework for Measuring Inequality in the Public Opinions on Policing – Assessing the impacts of COVID-19 Pandemic using Twitter Data

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**1. ‘Observation’ Table**:

The observation table show the computed opinion scores based on the observed and expected tweet documents (i.e. OSD and ESD). The ‘Mean Opinion score\_ESD’ is the average score over 999 replications. See the source code on how to generate the table.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PFA** | **Negative OSD** | **Positive OSD** | **Opinion scores OSD** | **Negative ESD** | **Positive ESD** | **Mean Opinion scores ESD** | **Time Steps** | **Region** |
| Cheshire | 55.93 | 44.07 | -11.86 | 56.24 | 43.76 | -12.48 | t1 | North West |
| Cheshire | 55.15 | 44.85 | -10.30 | 54.79 | 45.21 | -9.58 | t2 | North West |
| Cheshire | 54.35 | 45.65 | -8.70 | 54.17 | 45.83 | -8.33 | t3 | North West |
| Cumbria | 62.13 | 37.87 | -24.26 | 62.32 | 37.68 | -24.64 | t1 | North West |
| Cumbria | 66.63 | 33.37 | -33.26 | 66.47 | 33.53 | -32.93 | t2 | North West |
| Cumbria | 63.83 | 36.17 | -27.66 | 63.85 | 36.15 | -27.70 | t3 | North West |
| Greater.Manchester | 65.55 | 34.45 | -31.10 | 65.30 | 34.70 | -30.59 | t1 | North West |
| Greater.Manchester | 61.97 | 38.03 | -23.94 | 61.96 | 38.04 | -23.92 | t2 | North West |
| Greater.Manchester | 64.72 | 35.28 | -29.44 | 64.64 | 35.36 | -29.28 | t3 | North West |
| Lancashire | 63.14 | 36.86 | -26.28 | 63.29 | 36.71 | -26.58 | t1 | North West |
| Lancashire | 64.65 | 35.35 | -29.30 | 63.86 | 36.14 | -27.72 | t2 | North West |
| Lancashire | 63.02 | 36.98 | -26.04 | 63.14 | 36.86 | -26.28 | t3 | North West |
| Merseyside | 64.58 | 35.42 | -29.16 | 64.73 | 35.27 | -29.47 | t1 | North West |
| Merseyside | 63.90 | 36.10 | -27.80 | 64.19 | 35.81 | -28.38 | t2 | North West |
| Merseyside | 62.77 | 37.23 | -25.54 | 62.77 | 37.23 | -25.54 | t3 | North West |
| Cleveland | 57.89 | 42.11 | -15.78 | 57.40 | 42.60 | -14.80 | t1 | North East |
| Cleveland | 61.51 | 38.49 | -23.02 | 62.25 | 37.75 | -24.51 | t2 | North East |
| Cleveland | 56.31 | 43.69 | -12.62 | 55.71 | 44.29 | -11.43 | t3 | North East |
| Durham | 62.30 | 37.70 | -24.60 | 61.66 | 38.34 | -23.33 | t1 | North East |
| Durham | 64.04 | 35.96 | -28.08 | 63.98 | 36.02 | -27.97 | t2 | North East |
| Durham | 62.68 | 37.32 | -25.36 | 62.24 | 37.76 | -24.47 | t3 | North East |
| Northumbria | 61.14 | 38.86 | -22.28 | 61.24 | 38.76 | -22.48 | t1 | North East |
| Northumbria | 59.78 | 40.22 | -19.56 | 60.54 | 39.46 | -21.08 | t2 | North East |
| Northumbria | 63.32 | 36.68 | -26.64 | 62.17 | 37.83 | -24.33 | t3 | North East |
| Humberside | 62.84 | 37.16 | -25.68 | 61.84 | 38.16 | -23.68 | t1 | Yorkshire and the Humber |
| Humberside | 68.60 | 31.40 | -37.20 | 69.54 | 30.46 | -39.08 | t2 | Yorkshire and the Humber |
| Humberside | 60.11 | 39.89 | -20.22 | 60.27 | 39.73 | -20.54 | t3 | Yorkshire and the Humber |
| North.Yorkshire | 64.35 | 35.65 | -28.70 | 63.29 | 36.71 | -26.57 | t1 | Yorkshire and the Humber |
| North.Yorkshire | 61.87 | 38.13 | -23.74 | 61.59 | 38.41 | -23.18 | t2 | Yorkshire and the Humber |
| North.Yorkshire | 60.94 | 39.06 | -21.88 | 60.32 | 39.68 | -20.63 | t3 | Yorkshire and the Humber |
| South.Yorkshire | 64.74 | 35.26 | -29.48 | 64.15 | 35.85 | -28.31 | t1 | Yorkshire and the Humber |
| South.Yorkshire | 65.79 | 34.21 | -31.58 | 66.16 | 33.84 | -32.31 | t2 | Yorkshire and the Humber |
| South.Yorkshire | 62.42 | 37.58 | -24.84 | 62.58 | 37.42 | -25.17 | t3 | Yorkshire and the Humber |
| West.Yorkshire | 62.31 | 37.69 | -24.62 | 64.11 | 35.89 | -28.23 | t1 | Yorkshire and the Humber |
| West.Yorkshire | 62.76 | 37.24 | -25.52 | 63.21 | 36.79 | -26.42 | t2 | Yorkshire and the Humber |
| West.Yorkshire | 61.59 | 38.41 | -23.18 | 61.47 | 38.53 | -22.93 | t3 | Yorkshire and the Humber |
| Staffordshire | 84.75 | 15.25 | -69.50 | 75.54 | 24.46 | -51.09 | t1 | West Midlands |
| Staffordshire | 87.13 | 12.87 | -74.26 | 75.83 | 24.17 | -51.66 | t2 | West Midlands |
| Staffordshire | 78.65 | 21.35 | -57.30 | 68.95 | 31.05 | -37.91 | t3 | West Midlands |
| Warwickshire | 66.77 | 33.23 | -33.54 | 68.55 | 31.45 | -37.11 | t1 | West Midlands |
| Warwickshire | 67.11 | 32.89 | -34.22 | 68.14 | 31.86 | -36.28 | t2 | West Midlands |
| Warwickshire | 59.96 | 40.04 | -19.92 | 59.94 | 40.06 | -19.88 | t3 | West Midlands |
| West.Mercia | 63.19 | 36.81 | -26.38 | 63.04 | 36.96 | -26.07 | t1 | West Midlands |
| West.Mercia | 61.54 | 38.46 | -23.08 | 61.77 | 38.23 | -23.53 | t2 | West Midlands |
| West.Mercia | 62.37 | 37.63 | -24.74 | 62.46 | 37.54 | -24.91 | t3 | West Midlands |
| West.Midlands | 60.77 | 39.23 | -21.54 | 60.75 | 39.25 | -21.49 | t1 | West Midlands |
| West.Midlands | 63.06 | 36.94 | -26.12 | 62.61 | 37.39 | -25.23 | t2 | West Midlands |
| West.Midlands | 60.88 | 39.12 | -21.76 | 61.29 | 38.71 | -22.58 | t3 | West Midlands |
| Derbyshire | 60.22 | 39.78 | -20.44 | 60.23 | 39.77 | -20.46 | t1 | East Midlands |
| Derbyshire | 61.94 | 38.06 | -23.88 | 60.75 | 39.25 | -21.51 | t2 | East Midlands |
| Derbyshire | 60.84 | 39.16 | -21.68 | 60.01 | 39.99 | -20.01 | t3 | East Midlands |
| Leicestershire | 61.93 | 38.07 | -23.86 | 62.11 | 37.89 | -24.21 | t1 | East Midlands |
| Leicestershire | 66.58 | 33.42 | -33.16 | 66.60 | 33.40 | -33.20 | t2 | East Midlands |
| Leicestershire | 64.97 | 35.03 | -29.94 | 65.46 | 34.54 | -30.92 | t3 | East Midlands |
| Lincolnshire | 60.39 | 39.61 | -20.78 | 60.21 | 39.79 | -20.43 | t1 | East Midlands |
| Lincolnshire | 63.96 | 36.04 | -27.92 | 64.23 | 35.77 | -28.45 | t2 | East Midlands |
| Lincolnshire | 63.30 | 36.70 | -26.60 | 63.92 | 36.08 | -27.84 | t3 | East Midlands |
| Northamptonshire | 55.33 | 44.67 | -10.66 | 54.54 | 45.46 | -9.07 | t1 | East Midlands |
| Northamptonshire | 54.39 | 45.61 | -8.78 | 54.22 | 45.78 | -8.44 | t2 | East Midlands |
| Northamptonshire | 57.59 | 42.41 | -15.18 | 57.06 | 42.94 | -14.12 | t3 | East Midlands |
| Nottinghamshire | 59.28 | 40.72 | -18.56 | 58.62 | 41.38 | -17.25 | t1 | East Midlands |
| Nottinghamshire | 59.66 | 40.34 | -19.32 | 59.42 | 40.58 | -18.85 | t2 | East Midlands |
| Nottinghamshire | 59.97 | 40.03 | -19.94 | 60.53 | 39.47 | -21.06 | t3 | East Midlands |
| Bedfordshire | 60.19 | 39.81 | -20.38 | 59.51 | 40.49 | -19.03 | t1 | Eastern |
| Bedfordshire | 54.49 | 45.51 | -8.98 | 54.39 | 45.61 | -8.78 | t2 | Eastern |
| Bedfordshire | 59.67 | 40.33 | -19.34 | 59.43 | 40.57 | -18.86 | t3 | Eastern |
| Cambridgeshire | 66.27 | 33.73 | -32.54 | 66.58 | 33.42 | -33.17 | t1 | Eastern |
| Cambridgeshire | 64.26 | 35.74 | -28.52 | 64.17 | 35.83 | -28.35 | t2 | Eastern |
| Cambridgeshire | 63.43 | 36.57 | -26.86 | 63.90 | 36.10 | -27.79 | t3 | Eastern |
| Essex | 64.43 | 35.57 | -28.86 | 64.72 | 35.28 | -29.44 | t1 | Eastern |
| Essex | 61.24 | 38.76 | -22.48 | 61.40 | 38.60 | -22.80 | t2 | Eastern |
| Essex | 62.88 | 37.12 | -25.76 | 64.22 | 35.78 | -28.44 | t3 | Eastern |
| Hertfordshire | 61.89 | 38.11 | -23.78 | 61.88 | 38.12 | -23.76 | t1 | Eastern |
| Hertfordshire | 60.30 | 39.70 | -20.60 | 59.96 | 40.04 | -19.92 | t2 | Eastern |
| Hertfordshire | 61.25 | 38.75 | -22.50 | 61.40 | 38.60 | -22.79 | t3 | Eastern |
| Norfolk | 65.83 | 34.17 | -31.66 | 65.28 | 34.72 | -30.55 | t1 | Eastern |
| Norfolk | 63.87 | 36.13 | -27.74 | 64.57 | 35.43 | -29.13 | t2 | Eastern |
| Norfolk | 62.74 | 37.26 | -25.48 | 63.08 | 36.92 | -26.16 | t3 | Eastern |
| Suffolk | 64.44 | 35.56 | -28.88 | 64.55 | 35.45 | -29.11 | t1 | Eastern |
| Suffolk | 62.30 | 37.70 | -24.60 | 63.29 | 36.71 | -26.58 | t2 | Eastern |
| Suffolk | 63.18 | 36.82 | -26.36 | 63.05 | 36.95 | -26.11 | t3 | Eastern |
| Dyfed.Powys | 63.84 | 36.16 | -27.68 | 64.81 | 35.19 | -29.61 | t1 | Wales |
| Dyfed.Powys | 62.78 | 37.22 | -25.56 | 62.53 | 37.47 | -25.07 | t2 | Wales |
| Dyfed.Powys | 59.75 | 40.25 | -19.50 | 59.18 | 40.82 | -18.36 | t3 | Wales |
| Gwent | 58.04 | 41.96 | -16.08 | 57.53 | 42.47 | -15.06 | t1 | Wales |
| Gwent | 61.34 | 38.66 | -22.68 | 61.07 | 38.93 | -22.13 | t2 | Wales |
| Gwent | 61.14 | 38.86 | -22.28 | 61.24 | 38.76 | -22.48 | t3 | Wales |
| North.Wales | 83.24 | 16.76 | -66.48 | 73.97 | 26.03 | -47.93 | t1 | Wales |
| North.Wales | 86.44 | 13.56 | -72.88 | 75.28 | 24.72 | -50.56 | t2 | Wales |
| North.Wales | 77.38 | 22.62 | -54.76 | 67.66 | 32.34 | -35.33 | t3 | Wales |
| South.Wales | 66.82 | 33.18 | -33.64 | 66.99 | 33.01 | -33.98 | t1 | Wales |
| South.Wales | 62.15 | 37.85 | -24.30 | 62.13 | 37.87 | -24.26 | t2 | Wales |
| South.Wales | 62.38 | 37.62 | -24.76 | 62.68 | 37.32 | -25.37 | t3 | Wales |
| Avon.and.Somerset | 64.63 | 35.37 | -29.26 | 64.36 | 35.64 | -28.73 | t1 | South West |
| Avon.and.Somerset | 63.12 | 36.88 | -26.24 | 63.14 | 36.86 | -26.28 | t2 | South West |
| Avon.and.Somerset | 61.98 | 38.02 | -23.96 | 62.36 | 37.64 | -24.72 | t3 | South West |
| Devon.and.Cornwall | 62.17 | 37.83 | -24.34 | 62.23 | 37.77 | -24.47 | t1 | South West |
| Devon.and.Cornwall | 61.71 | 38.29 | -23.42 | 61.15 | 38.85 | -22.30 | t2 | South West |
| Devon.and.Cornwall | 58.82 | 41.18 | -17.64 | 58.43 | 41.57 | -16.86 | t3 | South West |
| Dorset | 66.96 | 33.04 | -33.92 | 67.15 | 32.85 | -34.29 | t1 | South West |
| Dorset | 64.68 | 35.32 | -29.36 | 64.56 | 35.44 | -29.12 | t2 | South West |
| Dorset | 62.80 | 37.20 | -25.60 | 62.81 | 37.19 | -25.63 | t3 | South West |
| Gloucestershire | 65.64 | 34.36 | -31.28 | 65.85 | 34.15 | -31.71 | t1 | South West |
| Gloucestershire | 59.32 | 40.68 | -18.64 | 59.30 | 40.70 | -18.60 | t2 | South West |
| Gloucestershire | 62.83 | 37.17 | -25.66 | 62.60 | 37.40 | -25.20 | t3 | South West |
| Wiltshire | 64.30 | 35.70 | -28.60 | 65.10 | 34.90 | -30.20 | t1 | South West |
| Wiltshire | 64.57 | 35.43 | -29.14 | 65.15 | 34.85 | -30.29 | t2 | South West |
| Wiltshire | 62.57 | 37.43 | -25.14 | 62.52 | 37.48 | -25.04 | t3 | South West |
| Metropolitan.Police | 65.96 | 34.04 | -31.92 | 66.16 | 33.84 | -32.32 | t1 | South East |
| Metropolitan.Police | 65.59 | 34.41 | -31.18 | 65.80 | 34.20 | -31.59 | t2 | South East |
| Metropolitan.Police | 65.62 | 34.38 | -31.24 | 65.89 | 34.11 | -31.79 | t3 | South East |
| Hampshire | 62.92 | 37.08 | -25.84 | 63.74 | 36.26 | -27.48 | t1 | South East |
| Hampshire | 62.64 | 37.36 | -25.28 | 61.71 | 38.29 | -23.42 | t2 | South East |
| Hampshire | 57.94 | 42.06 | -15.88 | 58.45 | 41.55 | -16.90 | t3 | South East |
| Kent | 64.10 | 35.90 | -28.20 | 64.71 | 35.29 | -29.42 | t1 | South East |
| Kent | 63.17 | 36.83 | -26.34 | 62.88 | 37.12 | -25.76 | t2 | South East |
| Kent | 61.96 | 38.04 | -23.92 | 61.81 | 38.19 | -23.61 | t3 | South East |
| Surrey | 62.56 | 37.44 | -25.12 | 61.80 | 38.20 | -23.61 | t1 | South East |
| Surrey | 60.99 | 39.01 | -21.98 | 61.55 | 38.45 | -23.11 | t2 | South East |
| Surrey | 58.98 | 41.02 | -17.96 | 58.63 | 41.37 | -17.27 | t3 | South East |
| Sussex | 58.02 | 41.98 | -16.04 | 57.13 | 42.87 | -14.26 | t1 | South East |
| Sussex | 57.74 | 42.26 | -15.48 | 56.99 | 43.01 | -13.98 | t2 | South East |
| Sussex | 56.87 | 43.13 | -13.74 | 56.62 | 43.38 | -13.24 | t3 | South East |
| Thames.Valley | 88.25 | 11.75 | -76.50 | 79.52 | 20.48 | -59.05 | t1 | South East |
| Thames.Valley | 90.26 | 9.74 | -80.52 | 80.54 | 19.46 | -61.08 | t2 | South East |
| Thames.Valley | 83.27 | 16.73 | -66.54 | 73.32 | 26.68 | -46.65 | t3 | South East |

**2. ‘P-values’ and ‘Position’ Tables (Combined)**

The table below shows the statistical significant values of observed opinion scores (columns 2 - 4), as well as the position of the observed opinion scores (columns 5 - 7) in relation to the mean of the ‘999’ expected opinion scores computed. A position value is set as ‘TRUE’ if the observed opinion score is greater than the mean expectation, and “0” if less or equal to the mean expectation.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| PFA | p\_value\_t1 | p\_value\_t2 | p\_value\_t3 | Position\_t1 | Position\_t2 | Position\_t3 | Region |
| Cheshire | 0.268 | 0.079 | 0.31 | TRUE | 0 | 0 | North West |
| Cumbria | 0.32 | 0.328 | 0.452 | TRUE | 0 | TRUE | North West |
| Greater Manchester | 0.204 | 0.475 | 0.373 | 0 | 0 | 0 | North West |
| Lancashire | 0.337 | 0.009 | 0.336 | TRUE | 0 | TRUE | North West |
| Merseyside | 0.323 | 0.125 | 0.467 | TRUE | TRUE | TRUE | North West |
| Cleveland | 0.281 | 0.16 | 0.221 | 0 | TRUE | 0 | North East |
| Durham | 0.164 | 0.417 | 0.196 | 0 | 0 | 0 | North East |
| Northumbria | 0.377 | 0.085 | 0.047 | TRUE | TRUE | 0 | North East |
| Humberside | 0.088 | 0.046 | 0.379 | 0 | TRUE | TRUE | Yorkshire and the Humber |
| North Yorkshire | 0.006 | 0.188 | 0.045 | 0 | 0 | 0 | Yorkshire and the Humber |
| South Yorkshire | 0.041 | 0.083 | 0.285 | 0 | TRUE | TRUE | Yorkshire and the Humber |
| West Yorkshire | 0.001 | 0.043 | 0.326 | TRUE | TRUE | 0 | Yorkshire and the Humber |
| Staffordshire | 0.001 | 0.001 | 0.001 | 0 | 0 | 0 | West Midlands |
| Warwickshire | 0.006 | 0.01 | 0.436 | TRUE | TRUE | 0 | West Midlands |
| West Mercia | 0.305 | 0.226 | 0.366 | 0 | TRUE | TRUE | West Midlands |
| West Midlands | 0.442 | 0.032 | 0.071 | 0 | 0 | TRUE | West Midlands |
| Derbyshire | 0.444 | 0.007 | 0.062 | TRUE | 0 | 0 | East Midlands |
| Leicestershire | 0.285 | 0.456 | 0.036 | TRUE | TRUE | TRUE | East Midlands |
| Lincolnshire | 0.309 | 0.162 | 0.015 | 0 | TRUE | TRUE | East Midlands |
| Northamptonshire | 0.111 | 0.346 | 0.156 | 0 | 0 | 0 | East Midlands |
| Nottinghamshire | 0.091 | 0.231 | 0.077 | 0 | 0 | TRUE | East Midlands |
| Bedfordshire | 0.137 | 0.375 | 0.317 | 0 | 0 | 0 | Eastern |
| Cambridgeshire | 0.244 | 0.366 | 0.145 | TRUE | 0 | TRUE | Eastern |
| Essex | 0.204 | 0.326 | 0.006 | TRUE | TRUE | TRUE | Eastern |
| Hertfordshire | 0.43 | 0.24 | 0.336 | 0 | 0 | TRUE | Eastern |
| Norfolk | 0.118 | 0.07 | 0.24 | 0 | TRUE | TRUE | Eastern |
| Suffolk | 0.369 | 0.036 | 0.367 | TRUE | TRUE | 0 | Eastern |
| Dyfed-Powys | 0.138 | 0.307 | 0.198 | TRUE | 0 | 0 | Wales |
| Gwent | 0.189 | 0.338 | 0.394 | 0 | 0 | TRUE | Wales |
| North Wales | 0.001 | 0.001 | 0.001 | 0 | 0 | 0 | Wales |
| South Wales | 0.325 | 0.45 | 0.224 | TRUE | 0 | TRUE | Wales |
| Avon and Somerset | 0.206 | 0.42 | 0.107 | 0 | TRUE | TRUE | South West |
| Devon and Cornwall | 0.389 | 0.01 | 0.076 | TRUE | 0 | 0 | South West |
| Dorset | 0.314 | 0.371 | 0.467 | TRUE | 0 | TRUE | South West |
| Gloucestershire | 0.257 | 0.454 | 0.251 | TRUE | 0 | 0 | South West |
| Wiltshire | 0.065 | 0.097 | 0.413 | TRUE | TRUE | 0 | South West |
| Metropolitan Police | 0.105 | 0.073 | 0.037 | TRUE | TRUE | TRUE | South East |
| Hampshire | 0.034 | 0.012 | 0.114 | TRUE | 0 | TRUE | South East |
| Kent | 0.074 | 0.196 | 0.345 | TRUE | 0 | 0 | South East |
| Surrey | 0.098 | 0.128 | 0.274 | 0 | TRUE | 0 | South East |
| Sussex | 0.013 | 0.019 | 0.241 | 0 | 0 | 0 | South East |
| Thames Valley | 0.001 | 0.001 | 0.001 | 0 | 0 | 0 | South East |