**Table 1.** Spatial characteristics of eight environmental scenarios (ESs) based on their variability components and variance parameters used for simulating true PM10 annual average concentrations

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ES | Variability componenta | | | Variance parameter | | |
| Mean  structure | Spatial variability | Non-spatial variability | Nugget | Partial sill | Range (m) |
| ES1 | None | Dominant | Little | 1.00 | 30.94 | 5,885 |
| ES2 | None | High | Low | 6.86 | 28.98 | 9,609 |
| ES3 | None | Low | High | 11.51 | 34.71 | 20,355 |
| ES4 | None | Little | Dominant | 22.00 | 13.77 | 27,000 |
| ES5 | Moderate | High | Low | 1.00 | 16.98 | 2,524 |
| ES6 | Moderate | Low | High | 6.86 | 12.17 | 4,820 |
| ES7 | Dominant | High | Low | 1.00 | 10.00 | 1,100 |
| ES8 | Dominant | Low | High | 6.86 | 3.60 | 1,004 |

aSpatial characteristics determined by contribution of three variability components (mean structure, and spatial and non-spatial variability) to total variability

**Table 2.** Estimated Relative Risks and their properties (Bias, RMSE, ASE, and CP) of health effect estimates of true and predicted PM10 concentrations on low birth weight over 1,000 simulations by address availability, exposure prediction methods, and environmental scenarios (ES2, ES3, ES5, and ES8)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | ES2 |  | |  | |  |  | | ES3 |  |  | |  | |  | |
| Address  availability | Exposure  prediction | a | Biasb | RMSEc | | ASEd | | | CPe |  | Bias | | RMSE | | ASE | | CP |
|  | TE | 1.0029 | -0.04 | 1.48 | | 0.78 | | | 0.95 | 1.0036 | 0.03 | | 1.48 | | 0.75 | | 0.95 |
| Complete | UK | 1.0030 | -0.03 | 2.41 | | 1.45 | | | 0.94 | 1.0028 | -0.05 | | 2.72 | | 1.58 | | 0.94 |
| Incomplete | AA  UKD  UKNA  UKCA  UKGA | 1.0018  1.0025  1.0032  1.0033  1.0042 | -0.15  -0.08  -0.01  0.00  0.09 | 1.55  2.42  3.27  2.84  3.83 | | 0.83  1.41  1.95  1.74  2.38 | | | 0.94  0.94  0.94  0.94  0.94 | 1.0019  1.0024  1.0040  1.0038  1.0037 | -0.14  -0.09  0.07  0.05  0.04 | | 1.56  2.75  4.08  3.32  4.83 | | 0.80  1.62  2.67  2.00  3.63 | | 0.95  0.94  0.94  0.95  0.94 |
|  |  | ES5 |  |  | |  | | |  | ES8 |  | |  | |  | |  |
| Address  availability | Exposure  prediction |  | Bias | RMSE | | ASE | | | CP |  | Bias | | RMSE | | ASE | | CP |
|  | TE | 1.0036 | 0.03 | 1.50 | | 0.78 | | | 0.95 | 1.0033 | 0.00 | | 1.40 | | 0.71 | | 0.95 |
| Complete | UK | 1.0034 | 0.01 | 2.06 | | 1.10 | | | 0.95 | 1.0032 | -0.01 | | 1.73 | | 0.88 | | 0.96 |
| Incomplete | AA  UKD  UKNA  UKCA  UKGA | 1.0014  1.0017  1.0037  1.0038  1.0037 | -0.19  -0.16  0.04  0.01  0.05 | 1.76  2.02  3.10  2.33  3.71 | | 0.95  1.07  1.68  1.26  2.04 | | | 0.95  0.94  0.94  0.94  0.95 | 1.0008  1.0009  1.0039  1.0035  1.0022 | -0.25  -0.24  0.06  0.02  -0.11 | | 2.04  1.93  4.07  2.23  3.31 | | 1.05  1.03  2.14  1.16  1.73 | | 0.95  0.95  0.94  0.96  0.95 |

a Estimated Average Relative Risk (True Relative Risk = 1.0033)

b Bias multiplied by 100

c Root mean square error (RMSE) multiplied by 100

d Average standard error (ASE) multiplied by 100

e Coverage probability (CP) of 95% confidence interval

f TE: true exposure; UK: universal kriging; AA: area-average UKD: UK prediction at governmental offices without aggregation; UKNA: district average based on UK predictions at 422 neighbourhood community centers; UKCA: district average of UK predictions at 16,230 census tract centroids; UKGA: district average of UK predictions at 610 1-km grid coordinates