**Table 1** Results of simulations for NO2 setting: $β\_{1}×10=0.00707,\left[22\right]and β\_{2}×10=0.0227,[23]$

|  |  |  |  |
| --- | --- | --- | --- |
| Correlation between “true” and modelled data ($τ$) | Ratio of variances: modelled vs “true” ($λ$)  | Estimating the health effect of short-term exposure | Estimating the health effect of long-term exposure |
| $\hat{β\_{1}} ×10$¶$(se(\hat{β\_{1}}) ×10)$¶ | Bias§(%) | Coverage probability(%) | Power‡(%) | $\hat{β\_{2}}×10$¶$(se(\hat{β\_{2}}) ×10)$¶ | Bias§(%) | Coverage Probability(%) | Power‡(%) |
| 1 | 1 | 0.00701(0.00226) | -0.8 | 95.4 | 84.8 | 0.0245(0.0348) | 7.9 | 93.8 | 13.4 |
| 0.5 | 2.0 | 0.00247(0.00160) | -65.1 | 19.0 | 32.0 | 0.0060(0.0253) | -73.6 | 91.4 | 8.4 |
| 1.25 | 0.00314(0.00202) | -55.6 | 51.2 | 37.2 | 0.0108(0.0314) | -52.4 | 91.6 | 7.0 |
| 1 | 0.00360(0.00226) | -49.1 | 64.4 | 38.0 | 0.0114(0.0345) | -49.8 | 92.6 | 6.6 |
| 0.75 | 0.00410(0.00261) | -42.0 | 77.8 | 34.4 | 0.0119(0.0395) | -47.6 | 93.4 | 8.6 |
| 0.5 | 0.00510(0.00319) | -27.9 | 89.4 | 36.4 | 0.0134(0.0464) | -41.0 | 92.4 | 8.6 |
| 0.6 | 2.0 | 0.00299(0.00160) | -57.7 | 27.2 | 45.0 | 0.0107(0.0252) | -52.9 | 89.8 | 9.0 |
| 1.25 | 0.00365(0.00202) | -48.4 | 59.4 | 43.6 | 0.0108(0.0314) | -52.4 | 90.2 | 7.4 |
| 1 | 0.00424(0.00226) | -40.0 | 74.8 | 48.8 | 0.0166(0.0347) | -26.9 | 91.8 | 9.8 |
| 0.75 | 0.00519(0.00261) | -26.6 | 90.2 | 51.2 | 0.0142(0.0392) | -37.4 | 92.6 | 9.4 |
| 0.5 | 0.00601(0.00319) | -15.0 | 92.2 | 48.8 | 0.0219(0.0466) | -3.5 | 91.0 | 11.6 |
| 0.7 | 2.0 | 0.00358(0.00160) | -49.4 | 41.0 | 61.0 | 0.0130(0.0253) | -42.7 | 93.2 | 7.6 |
| 1.25 | 0.00441(0.00202) | -37.6 | 74.4 | 59.4 | 0.0138(0.0314) | -39.2 | 92.2 | 8.4 |
| 1 | 0.00478(0.00226) | -32.4 | 82.0 | 57.0 | 0.0168(0.0346) | -26.0 | 92.6 | 9.4 |
| 0.75 | 0.00546(0.00261) | -22.8 | 88.0 | 53.0 | 0.0184(0.0393) | -18.9 | 94.8 | 10.0 |
| 0.5 | 0.00701(0.00320) | -0.8 | 94.6 | 60.6 | 0.0217(0.0467) | -4.4 | 91.6 | 10.6 |
| 0.8 | 2.0 | 0.00406(0.00160) | -42.6 | 50.6 | 71.0 | 0.0131(0.0253) | -42.3 | 93.8 | 7.8 |
| 1.25 | 0.00510(0.00202) | -27.9 | 83.2 | 72.0 | 0.0149(0.0313) | -34.4 | 92.4 | 9.8 |
| 1 | 0.00558(0.00226) | -21.1 | 87.8 | 70.6 | 0.0155(0.0347) | -31.7 | 92.4 | 10.6 |
| 0.75 | 0.00660(0.00261) | -6.6 | 94.2 | 73.6 | 0.0232(0.0391) | **2.2** | 94.6 | 10.6 |
| 0.5 | 0.00791(0.00319) | **11.9** | 95.8 | 69.4 | 0.0260(0.0465) | **14.5** | 93.2 | 11.0 |
| 0.9 | 2.0 | 0.00447(0.00160) | -36.8 | 64.0 | 80.6 | 0.0147(0.0252) | -35.2 | 92.6 | 9.4 |
| 1.25 | 0.00574(0.00202) | -18.8 | 89.6 | 80.0 | 0.0209(0.0315) | -7.9 | 93.4 | 11.6 |
| 1 | 0.00637(0.00226) | -9.9 | 92.0 | 80.2 | 0.0225(0.0346) | -0.9 | 90.6 | 12.8 |
| 0.75 | 0.00722(0.00261) | **2.1** | 94.4 | 79.4 | 0.0237(0.0394) | **4.4** | 91.2 | 13.2 |
| 0.5 | 0.00899(0.00320) | **27.2** | 92.6 | 82.4 | 0.0317(0.0465) | **39.6** | 91.6 | 13.6 |

¶ Coefficients and standard errors are averages of their respective within-simulation estimates. §Percent bias is highlighted in bold when positive (i.e. away from the null). ‡The percentage of effect estimates that were statistically significant (p<0.05).

**Table 2** Results of simulations for PM10 setting: $β\_{1} ×10=0.00509,\left[24\right]and β\_{2}×10=0.0677,[23]$

|  |  |  |  |
| --- | --- | --- | --- |
| Correlation between “true” and modelled data ($τ$) | Ratio of variances: modelled vs “true” ($λ$)  | Estimating the health effect of short-term exposure | Estimating the health effect of long-term exposure |
| $\hat{β\_{1}} ×10$¶$(se(\hat{β\_{1}}) ×10)$¶ | Bias§(%) | Coverage probability(%) | Power‡(%) | $\hat{β\_{2}}×10$¶$(se(\hat{β\_{2}}) ×10)$¶ | Bias§(%) | Coverage Probability(%) | Power‡(%) |
| 1 | 1 | 0.00531(0.00351) | 4.3 | 95.8 | 33.8 | 0.0621(0.0975) | -8.3 | 93.0 | 13.0 |
| 0.5 | 2.0 | 0.00179(0.00248) | -64.8 | 72.8 | 12.0 | 0.0229(0.0725) | -66.2 | 87.8 | 6.4 |
| 1.25 | 0.00233(0.00314) | -54.2 | 85.4 | 10.4 | 0.0268(0.0892) | -60.4 | 89.0 | 8.4 |
| 1 | 0.00266(0.00351) | -47.7 | 91.2 | 12.4 | 0.0424(0.0977) | -37.4 | 90.0 | 11.0 |
| 0.75 | 0.00285(0.00405) | -44.0 | 90.8 | 10.2 | 0.0383(0.1092) | -43.4 | 91.4 | 11.8 |
| 0.5 | 0.00339(0.00496) | -33.4 | 95.8 | 11.0 | 0.0592(0.1271) | -12.6 | 84.6 | 15.2 |
| 0.6 | 2.0 | 0.00232(0.00248) | -54.4 | 79.8 | 17.4 | 0.0305(0.0725) | -54.9 | 90.4 | 8.6 |
| 1.25 | 0.00301(0.00314) | -40.9 | 90.6 | 16.4 | 0.0378(0.0884) | -44.2 | 89.2 | 11.6 |
| 1 | 0.00289(0.00352) | -43.2 | 90.0 | 13.8 | 0.0412(0.0971) | -39.1 | 89.4 | 8.8 |
| 0.75 | 0.00358(0.00406) | -29.7 | 93.4 | 15.4 | 0.0531(0.1097) | -21.6 | 90.4 | 14.2 |
| 0.5 | 0.00422(0.00496) | -17.1 | 95.6 | 14.8 | 0.0594(0.1264) | -12.3 | 89.4 | 13.0 |
| 0.7 | 2.0 | 0.00262(0.00248) | -48.5 | 82.6 | 17.4 | 0.0338(0.0726) | -50.1 | 90.8 | 8.2 |
| 1.25 | 0.00336(0.00314) | -34.0 | 91.4 | 19.2 | 0.0415(0.0884) | -38.7 | 90.8 | 9.4 |
| 1 | 0.00369(0.00351) | -27.5 | 92.0 | 19.6 | 0.0464(0.0968) | -31.5 | 91.8 | 10.4 |
| 0.75 | 0.00407(0.00405) | -20.0 | 94.6 | 17.6 | 0.0591(0.1083) | -12.7 | 91.0 | 12.4 |
| 0.5 | 0.00511(0.00496) | **0.4** | 95.2 | 16.2 | 0.0578(0.1261) | -14.6 | 89.4 | 14.0 |
| 0.8 | 2.0 | 0.00282(0.00248) | -44.6 | 85.0 | 19.4 | 0.0363(0.0727) | -46.4 | 91.8 | 10.2 |
| 1.25 | 0.00378(0.00314) | -25.7 | 94.0 | 23.4 | 0.0532(0.0890) | -21.4 | 93.2 | 11.4 |
| 1 | 0.00395(0.00351) | -22.4 | 93.6 | 20.8 | 0.0633(0.0973) | -6.5 | 90.4 | 13.6 |
| 0.75 | 0.00459(0.00406) | -9.8 | 94.0 | 19.2 | 0.0504(0.1100) | -25.6 | 88.2 | 13.2 |
| 0.5 | 0.00602(0.00496) | **18.3** | 93.8 | 22.6 | 0.0707(0.1269) | **4.4** | 89.0 | 15.0 |
| 0.9 | 2.0 | 0.00329(0.00248) | -35.4 | 87.8 | 25.4 | 0.0458(0.0726) | -32.3 | 91.4 | 10.2 |
| 1.25 | 0.00418(0.00314) | -17.9 | 93.0 | 29.0 | 0.0545(0.0891) | -19.5 | 90.8 | 13.4 |
| 1 | 0.00466(0.00351) | -8.4 | 95.8 | 24.8 | 0.0557(0.0970) | -17.7 | 92.2 | 13.4 |
| 0.75 | 0.00516(0.00405) | **1.4** | 94.8 | 24.8 | 0.0759(0.1096) | **12.1** | 91.2 | 15.6 |
| 0.5 | 0.00667(0.00496) | **31.0** | 95.4 | 27.6 | 0.0909(0.1265) | **34.3** | 89.8 | 16.4 |

¶ Coefficients and standard errors are averages of their respective within-simulation estimates. §Percent bias is highlighted in bold when positive (i.e. away from the null). ‡The percentage of effect estimates that were statistically significant (p<0.05).