Supplemental for

**Preterm Births Attributable to Criteria Air Pollutant Exposure in Bangladesh During 2015-2019**

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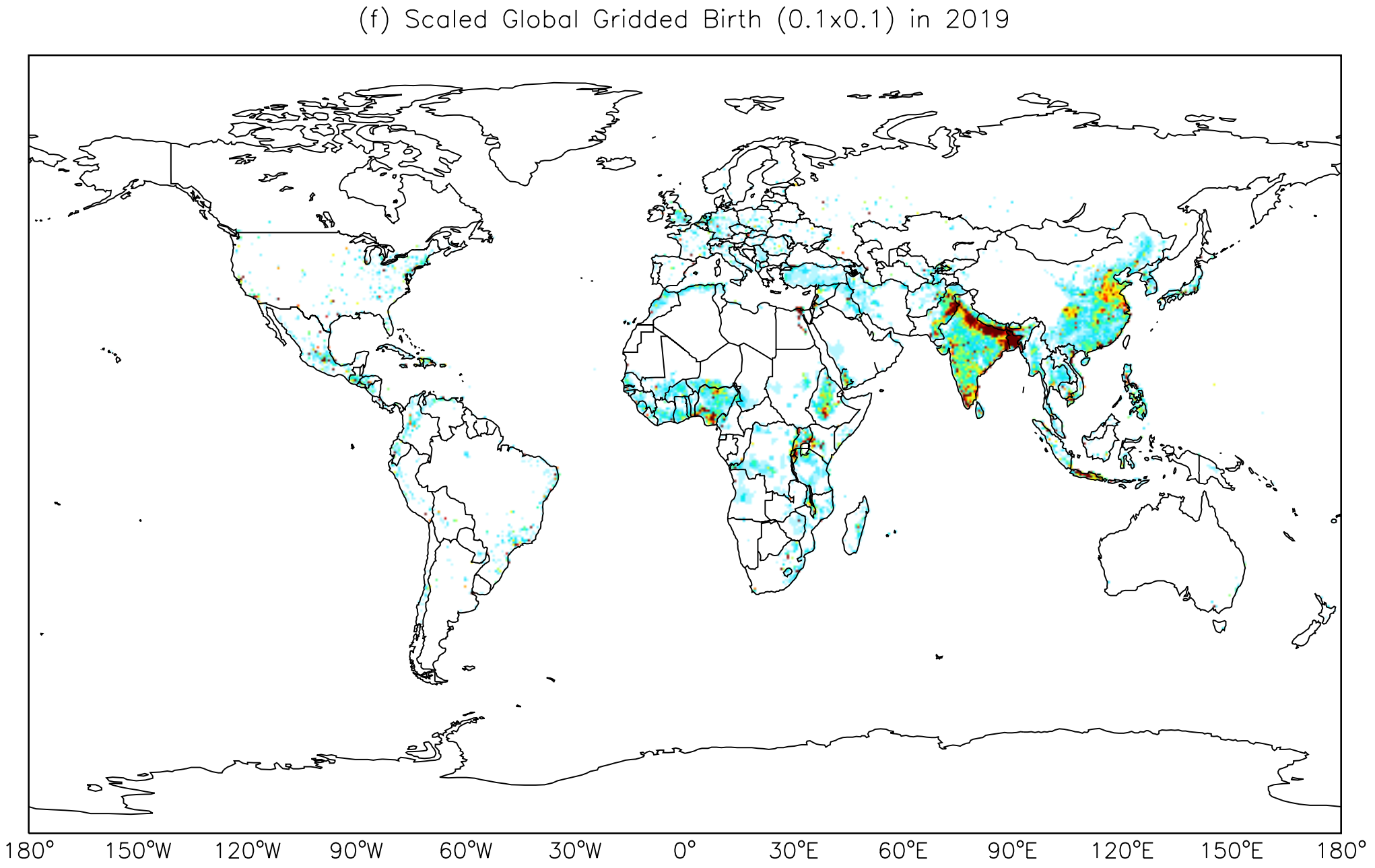
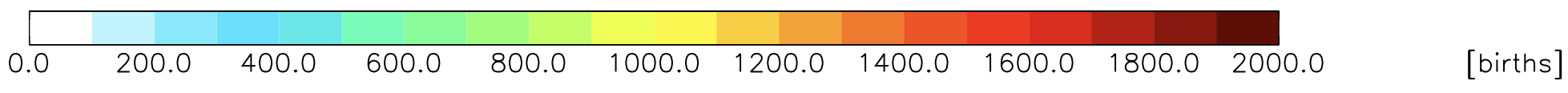
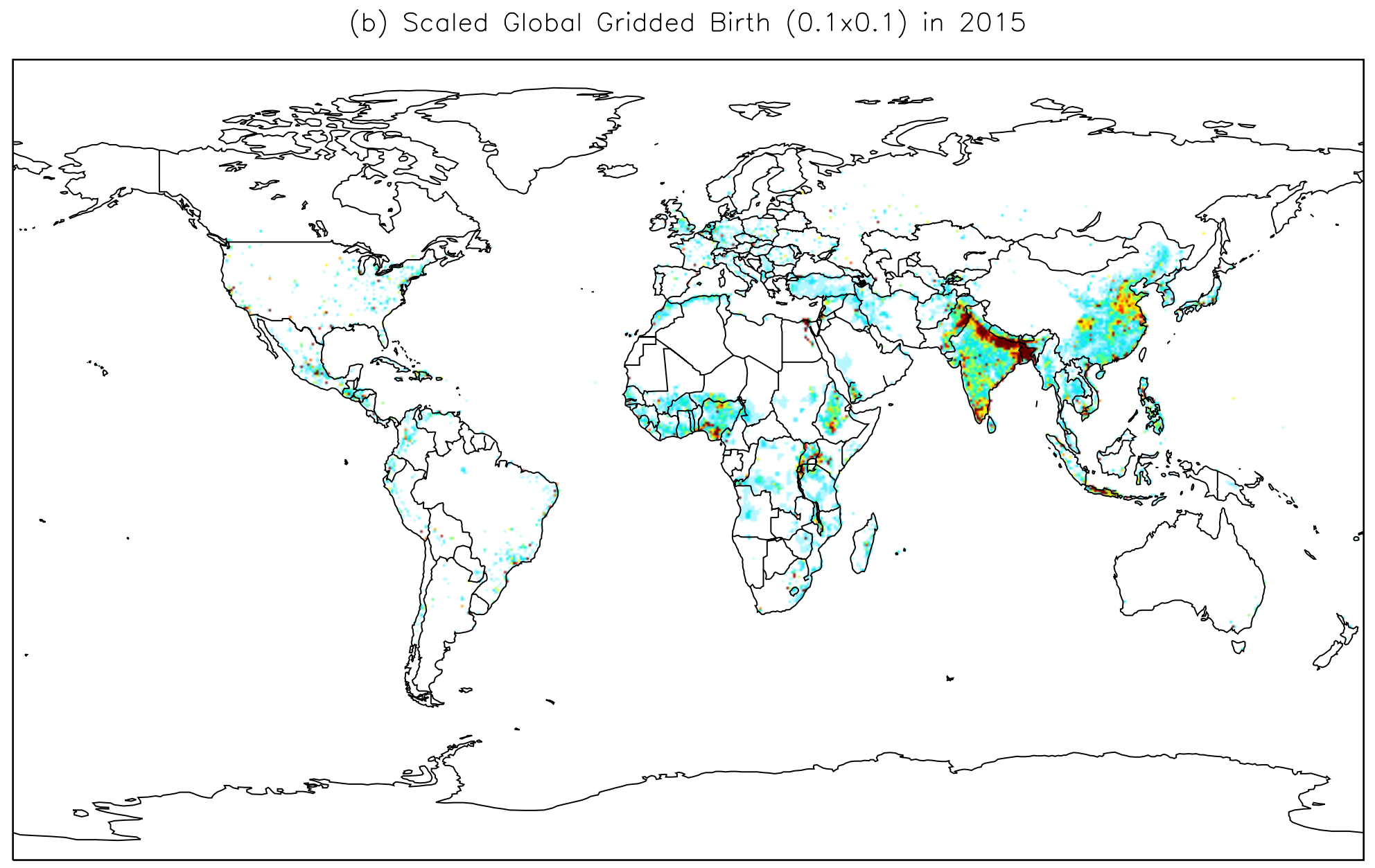
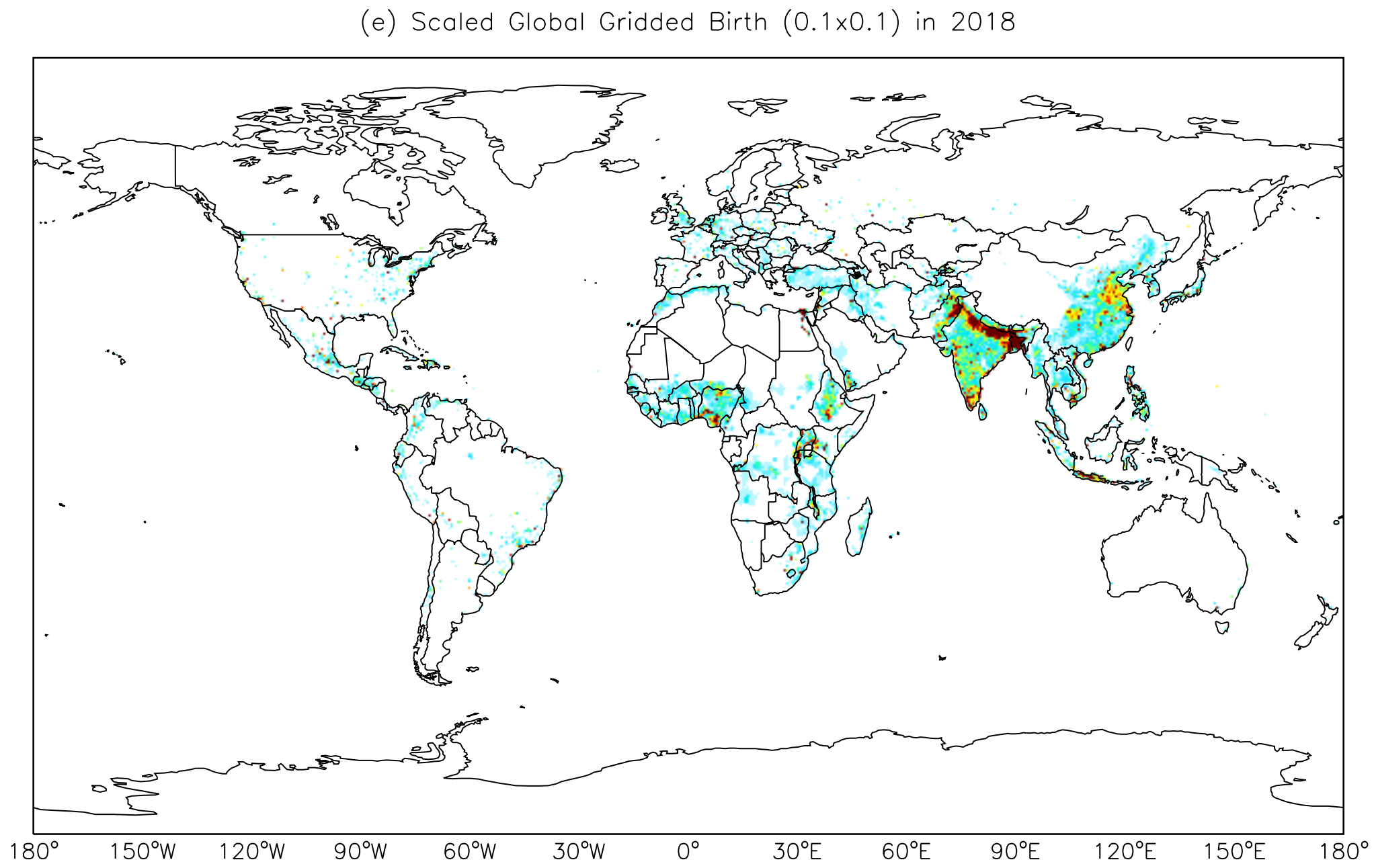
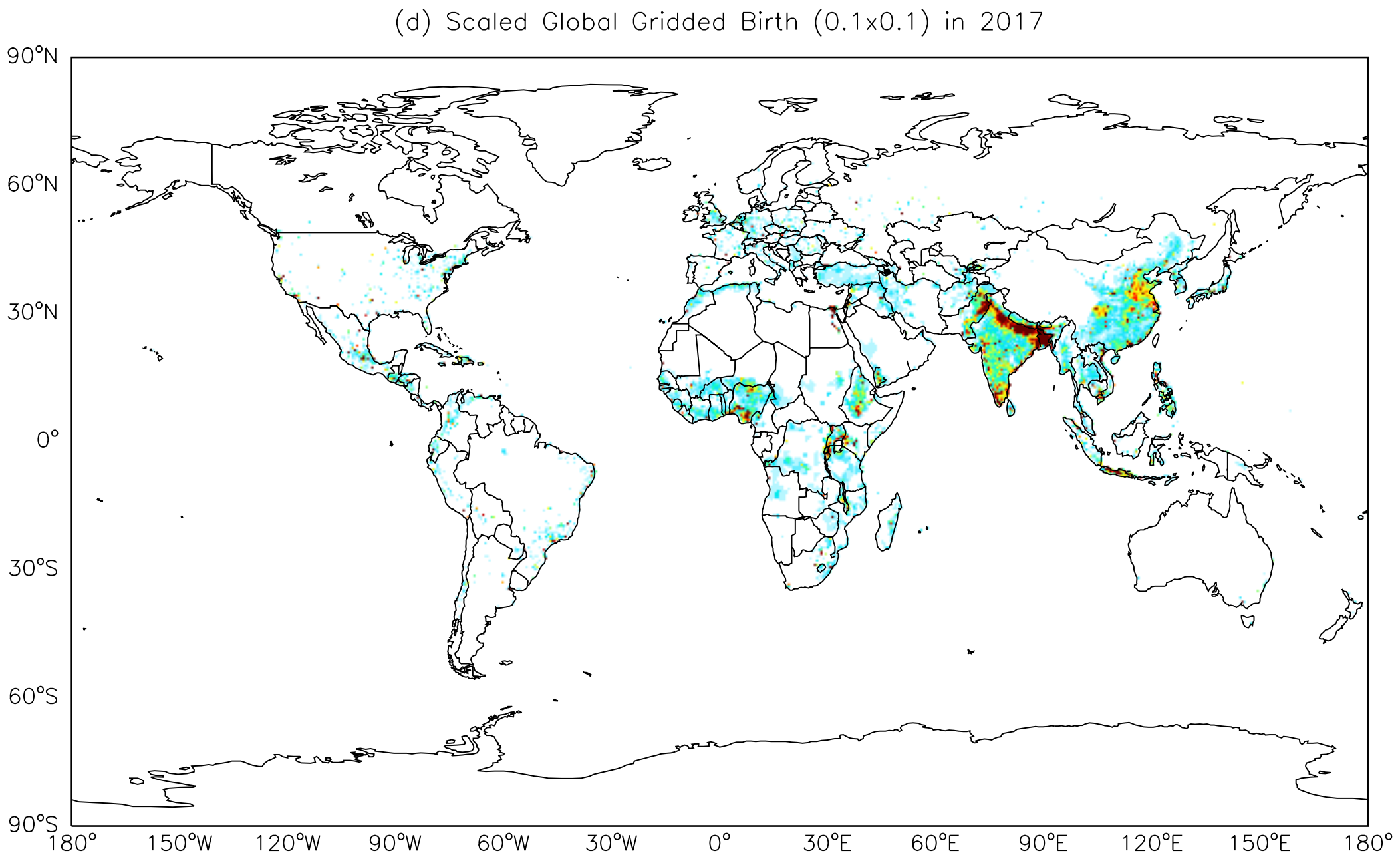
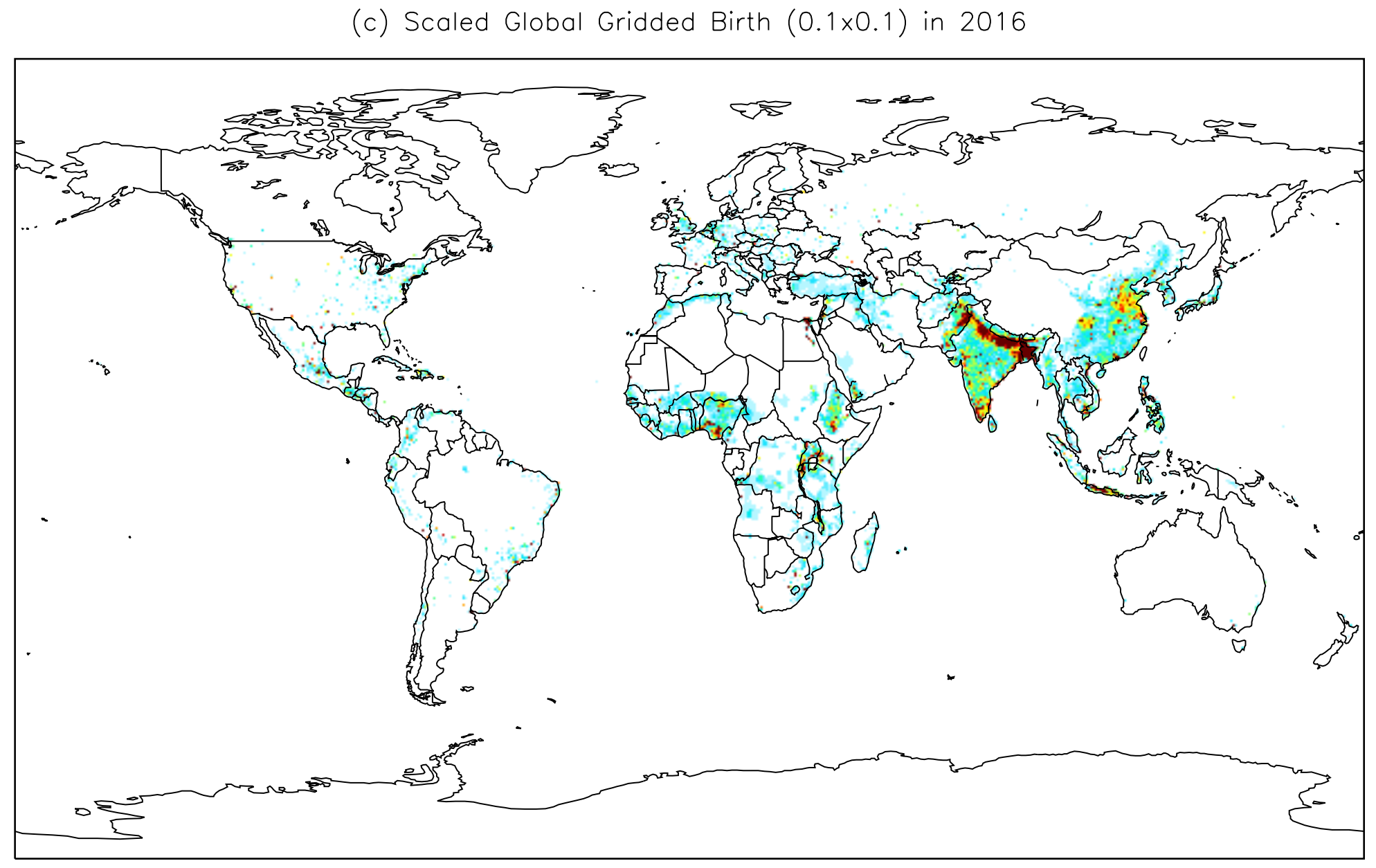
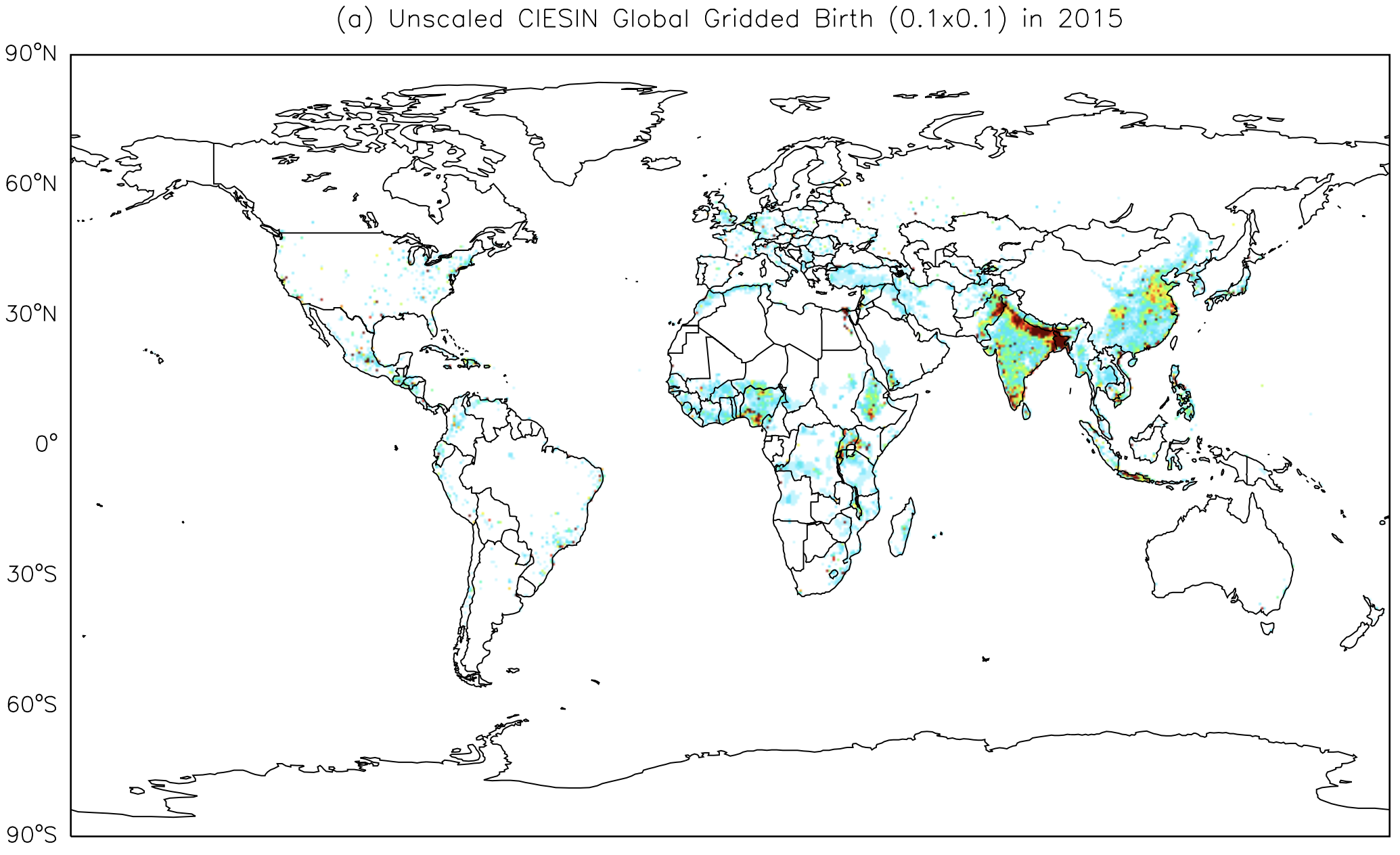
**Text S1. Measurements of Odds ratio and log-linear slope for each criteria air pollutant**

Eqn. (1) & (2) are used to calculate the odds ratio in each grid box and the log-linear slope for CO. With the increase of 100 3 CO exposure, the odds of PTB increased by 1.18 times (95CI: 1.06, 1.32) (Shanshan Li et al., 2016**)**. For the counterfactual concentration of CO in Bangladesh, we have assumed 40 3 under which there may not be any health impacts associated with the exposure.

Eqn. (3) & (4) are used to calculate the odds ratio in each grid box and the log-linear slope for NO2 exposure (in ppbv) associated with PTB. The odds of PTB increased by 1.29 times (95CI: 1.13, 1.46) when the NO2 exposure increased by 13 (0.5 ) (Sabrina Llop et al., 2010). Sabrina Llop et al., 2010 found the counterfactual concentration of NO2 as 46.2 3 (7.6 ppbv) under which there may not be any health impacts associated with the exposure.

The odds ratio in each grid box and the log-linear slope for O3 exposure associated with PTB are calculated using Eqn. (5) & (6). The metal analysis of Kristen M. et al., 2021 found that with the increase of 10 O3 exposure, the odds of PTB increased by 1.06 times (95CI: 1.03, 1.10). For the counterfactual O3 exposure, we have assumed 26.7 ppb similar to the study of Hunag et. al., 2021 under which there may not be any health impacts associated with the exposure.

The odds ratio in each grid box and the log-linear slope for PM2.5 and SO2 exposure associated with PTB are calculated using Eqn. (7) & (8). The metal analysis of Xiaoli Sun et al., 2015 found that with the increase of 10 3 PM2.5 exposure, the odds of PTB increased by 1.13 times (95CI: 1.03, 1.24). On the other hand, Ying Liu et al., 2019 found that with the increase of 10 3 SO2 exposure, the odds of PTB increased by 1.081 times (95CI: 1.01, 1.29). For the counterfactual PM2.5 and SO2 exposure, we have assumed 2.4 3 similar to the study of Hunag et. al., 2021 as SO2 is one of the vital primary organic matters that contributes to the formation of PM2.



Global total live births: 127.3 Million

Global total live births: 141.6 Million

Global total live births: 141.8 Million

Global total live births: 141.9 Million

Global total live births: 142 Million

Global total live births: 141.9 Million

**Figure S1.** Global total gridded live births from (a) unscaled CIESIN for 2015, and scaled total gridded live births for (b) 2015, (c) 2016, (d) 2017, (e) 2018, and (f) 2019.

**Table S1.** Annual mean and maximum exposure of CO, O3, PM2.5, SO2, and NO2 during 2015-2019 in Bangladesh.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | CO | | O3 | | PM2.5 | | SO2 | | NO2 | |
| Year | Mean (g/m3) | Max  (g/m3) | Mean (ppbv) | Max  (ppbv) | Mean (g/m3) | Max  (g/m3) | Mean (g/m3) | Max  (g/m3) | Mean (ppbv) | Max  (ppbv) |
| 2015 | 0.032 | 265.69 | 0.01491 | 84.47 | 0.008400 | 54.67 | 0.001 | 20.29 | 0.000627 | 10.36 |
| 2016 | 0.032 | 250.26 | 0.01481 | 84.04 | 0.008397 | 57.69 | 0.001 | 20.11 | 0.000627 | 10.38 |
| 2017 | 0.031 | 245.16 | 0.01484 | 83.95 | 0.008076 | 53.47 | 0.001 | 19.36 | 0.000664 | 11.43 |
| 2018 | 0.033 | 272.82 | 0.01506 | 88.15 | 0.009671 | 62.94 | 0.001 | 20.49 | 0.000651 | 11.60 |
| 2019 | 0.031 | 240.79 | 0.01486 | 85.66 | 0.008175 | 54.38 | 0.001 | 18.25 | 0.000632 | 11.24 |

**Table S2.** Location-wise total number of PTBs attributable to individual and synergistic effect of CO, O3, PM2.5, SO2, and NO2 exposure during 2015-2019 in Bangladesh.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | CO | | | | | O3 | | | | | PM2.5 | | | | | |
| Area/  Region | Coordi-nates | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Firmgate, Dhaka | 23.76, 90.39E | 268 | 263 | 248 | 268 | 250 | 361 | 350 | 345 | 343 | 338 | 562 | 545 | 538 | 601 | 520 |
| Gazipur | 23.99, 90.42E | 54 | 53 | 50 | 54 | 51 | 77 | 75 | 74 | 73 | 72 | 114 | 111 | 109 | 122 | 105 |
| Narayangonj | 23.63, 90.51E | 152 | 147 | 139 | 151 | 141 | 213 | 207 | 204 | 203 | 200 | 333 | 325 | 316 | 354 | 310 |
| Khulshi, Chattogram | 22.36, 91.80E | 84 | 79 | 78 | 82 | 79 | 143 | 139 | 137 | 135 | 134 | 222 | 208 | 203 | 234 | 197 |
| Agrabad, Chattogram | 22.32, 91.81E | 201 | 188 | 187 | 197 | 190 | 343 | 333 | 328 | 324 | 322 | 532 | 498 | 485 | 560 | 472 |
| Red Crescent Campus, Sylhet | 24.89, 91.87E | 30 | 28 | 27 | 28 | 27 | 48 | 47 | 46 | 46 | 45 | 56 | 52 | 50 | 61 | 49 |
| Baira, Khulna | 22.48, 89.53E | 11 | 10 | 10 | 10 | 10 | 14 | 14 | 13 | 13 | 13 | 24 | 24 | 22 | 25 | 22 |
| Sopura, Rajshahi | 24.38, 88.61E | 49 | 48 | 48 | 48 | 46 | 58 | 57 | 56 | 57 | 55 | 96 | 99 | 91 | 100 | 91 |
| DFO office campus, Barisal | 22.71, 90.36E | 40 | 38 | 36 | 38 | 37 | 62 | 60 | 59 | 58 | 58 | 101 | 101 | 95 | 107 | 95 |
|  |  | SO2 | | | | | NO2 | | | | | Total PTBs from Combined Exposure | | | | | |
| Area/  Region | Coordi-nates | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 | 2015 | 2016 | 2017 | 2018 | 2019 |
| Firmgate, Dhaka | 23.76, 90.39E | 36 | 34 | 30 | 41 | 25 | 0 | 0 | 0 | 0 | 0 | 1227 | 1192 | 1161 | 1253 | 1133 |
| Gazipur | 23.99, 90.42E | 7 | 7 | 6 | 8 | 5 | 0 | 0 | 0 | 0 | 0 | 252 | 246 | 239 | 258 | 234 |
| Narayangonj | 23.63, 90.51E | 21 | 20 | 16 | 24 | 14 | 0 | 0 | 0 | 0 | 0 | 720 | 699 | 675 | 732 | 666 |
| Khulshi, Chattogram | 22.36, 91.80E | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 450 | 426 | 418 | 452 | 411 |
| Agrabad, Chattogram | 22.32, 91.81E | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1076 | 1019 | 1000 | 1081 | 984 |
| Red Crescent Campus, Sylhet | 24.89, 91.87E | 1 | 1 | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 135 | 128 | 125 | 137 | 121 |
| Baira, Khulna | 22.48, 89.53E | 3 | 3 | 2 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 52 | 51 | 47 | 52 | 47 |
| Sopura, Rajshahi | 24.38, 88.61E | 20 | 21 | 19 | 18 | 17 | 0 | 0 | 0 | 0 | 0 | 223 | 224 | 214 | 223 | 209 |
| DFO office campus, Barisal | 22.71, 90.36E | 6 | 5 | 4 | 6 | 3 | 0 | 0 | 0 | 0 | 0 | 209 | 205 | 193 | 210 | 193 |

**Table S3.** Total number of PTBs attributable to CO, O3, PM2.5, SO2, NO2, and combined exposure with 95% confidence interval (CI) during 2015-2019 in Bangladesh.

|  |  |  |
| --- | --- | --- |
| Pollutants | Year | Total number of PTBs (95% CI) |
| CO | 2015 | 41,229 (15,570, 64,510) |
| 2016 | 39,977 (15,080, 62,623) |
| 2017 | 38,132 (14,354, 59,855) |
| 2018 | 40,197 (15,211, 62,771) |
| 2019 | 37,957 (14,299, 59,533) |
| O3 | 2015 | 55,942 (30,496, 83,650) |
| 2016 | 54,551 (29,717, 81,641) |
| 2017 | 53,666 (29,239, 80,302) |
| 2018 | 53,713 (29,313, 80,214) |
| 2019 | 52,657 (28,694, 78,776) |
| PM2.5 | 2015 | 86,370 (25,222, 1,29,635) |
| 2016 | 84,696 (24,741, 1,27,121) |
| 2017 | 81,344 (23,629, 1,22,689) |
| 2018 | 91,680 (27,526, 1,34,252) |
| 2019 | 80,006 (23,268, 1,20,549) |
| SO2 | 2015 | 7684 (1007, 23,568) |
| 2016 | 7375 (967, 22,611) |
| 2017 | 6538 (856, 20,121) |
| 2018 | 7645 (1002, 23,468) |
| 2019 | 5621 (734, 17,399) |
| NO2 | 2015 | 1518 (852, 1985) |
| 2016 | 1794 (1003, 2353) |
| 2017 | 3157 (1785, 4109) |
| 2018 | 2460 (1391, 3205) |
| 2019 | 1782 (1007, 2322) |
| Combined PTBs | 2015 | 1,92,744 (77,382, 3,12,203) |
| 2016 | 1,88,395 (88,144, 3,21,213) |
| 2017 | 1,82,839 (81,397, 3,06,102) |
| 2018 | 1,95,697 (81,282, 3,16,669) |
| 2019 | 1,78,024 (75,409, 2,90,979) |

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