

Supporting information for  
**Exposure Contrasts of Women aged 40-79 years during the Household Air Pollution Intervention Network  
Randomized Controlled Trial**

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**Table S1. Selected characteristics of households and participants with and without PM<sub>2.5</sub> exposure measurements by visit and study arm**

| During Pregnancy  | Baseline    |             | P1           |             |             |             | P2           |             |             |             |              |             |
|---|-------------|-------------|--------------|-------------|-------------|-------------|--------------|-------------|-------------|-------------|--------------|-------------|
|   | Control     |             | Intervention |             | Control     |             | Intervention |             | Control     |             | Intervention |             |
|   | Missing     | Not Missing | Missing      | Not Missing | Missing     | Not Missing | Missing      | Not Missing | Missing     | Not Missing | Missing      | Not Missing |
| N   | 17          | 192         | 19           | 190         | 33          | 160         | 34           | 164         | 36          | 148         | 43           | 149         |
| <b>Education</b>  | n (%)       |             |              |             |             |             |              |             |             |             |              |             |
| No formal education or Primary school incomplete                      | 14 (82.4%)  | 153 (79.7%) | 13 (68.4%)   | 155 (81.6%) | 27 (81.8%)  | 129 (80.6%) | 28 (82.4%)   | 133 (81.1%) | 28 (77.8%)  | 119 (80.4%) | 34 (79.1%)   | 119 (79.9%) |
| Primary school complete or Secondary school incomplete                | 2 (11.8%)   | 29 (15.1%)  | 6 (31.6%)    | 28 (14.7%)  | 4 (12.1%)   | 22 (13.8%)  | 5 (14.7%)    | 26 (15.9%)  | 5 (13.9%)   | 21 (14.2%)  | 8 (18.6%)    | 25 (16.8%)  |
| Secondary school complete or Vocational or Some college or university | 0           | 7 (3.6%)    | 0            | 3 (1.6%)    | 1 (3.0%)    | 6 (3.8%)    | 1 (2.9%)     | 2 (1.2%)    | 2 (5.6%)    | 5 (3.4%)    | 0            | 2 (1.3%)    |
| Missing   | 1 (5.9%)    | 3 (1.6%)    | 0            | 4 (2.1%)    | 1 (3.0%)    | 3 (1.9%)    | 0            | 3 (1.8%)    | 1 (2.8%)    | 3 (2.0%)    | 1 (2.3%)     | 3 (2.0%)    |
| <b>Diet Diversity Score</b>   | n (%)       |             |              |             |             |             |              |             |             |             |              |             |
| High (<5)   | 3 (17.6%)   | 16 (8.3%)   | 6 (31.6%)    | 11 (5.8%)   | 4 (12.1%)   | 14 (8.8%)   | 5 (14.7%)    | 11 (6.7%)   | 5 (13.9%)   | 11 (7.4%)   | 3 (7.0%)     | 13 (8.7%)   |
| Medium (4-5)  | 9 (52.9%)   | 57 (29.7%)  | 6 (31.6%)    | 49 (25.8%)  | 10 (30.3%)  | 49 (30.6%)  | 10 (29.4%)   | 39 (23.8%)  | 16 (44.4%)  | 42 (28.4%)  | 14 (32.6%)   | 39 (26.2%)  |
| Low (0-3)   | 5 (29.4%)   | 119 (62.0%) | 7 (36.8%)    | 130 (68.4%) | 19 (57.6%)  | 97 (60.6%)  | 19 (55.9%)   | 114 (69.5%) | 15 (41.7%)  | 95 (64.2%)  | 26 (60.5%)   | 97 (65.1%)  |
| <b>Food Insecurity Score</b>  | n (%)       |             |              |             |             |             |              |             |             |             |              |             |
| Mild (1-3)  | 1 (5.9%)    | 63 (32.8%)  | 4 (21.1%)    | 59 (31.1%)  | 15 (45.5%)  | 45 (28.1%)  | 13 (38.2%)   | 47 (28.7%)  | 14 (38.9%)  | 41 (27.7%)  | 12 (27.9%)   | 49 (32.9%)  |
| Moderate/Severe (4-8)   | 3 (17.6%)   | 35 (18.2%)  | 0            | 19 (10.0%)  | 9 (27.3%)   | 26 (16.2%)  | 2 (5.9%)     | 15 (9.1%)   | 6 (16.7%)   | 30 (20.3%)  | 1 (2.3%)     | 15 (10.1%)  |
| None (0)  | 12 (70.6%)  | 91 (47.4%)  | 14 (73.7%)   | 111 (58.4%) | 9 (27.3%)   | 85 (53.1%)  | 19 (55.9%)   | 100 (61.0%) | 15 (41.7%)  | 74 (50.0%)  | 30 (69.8%)   | 83 (55.7%)  |
| Missing   | 1 (5.9%)    | 3 (1.6%)    | 1 (5.3%)     | 1 (0.5%)    | 0           | 4 (2.5%)    | 0            | 2 (1.2%)    | 1 (2.8%)    | 3 (2.0%)    | 0            | 2 (1.3%)    |
| <b>Age, Mean (SD)</b>   | 52.3 (7.41) | 51.8 (7.5)  | 51.8 (8.14)  | 52.3 (8.27) | 51.3 (7.57) | 51.8 (7.48) | 50.8 (7.31)  | 52.5 (8.4)  | 50.4 (8.25) | 52 (7.06)   | 50.6 (6.13)  | 52.5 (8.7)  |
| <b>BMI, Mean (SD)</b>   | 25.7 (5.35) | 25.5 (5.15) | 26.8 (5.76)  | 25 (4.99)   | 25.3 (5.65) | 25.4 (5.03) | 26 (5)       | 25 (5.12)   | 27.3 (4.03) | 24.6 (5.09) | 25.5 (4.9)   | 25.3 (4.97) |
| Post-birth  | B1          |             | B2           |             |             |             | B4           |             |             |             |              |             |
|   | Control     |             | Intervention |             | Control     |             | Intervention |             | Control     |             | Intervention |             |
|   | Missing     | Not Missing | Missing      | Not Missing | Missing     | Not Missing | Missing      | Not Missing | Missing     | Not Missing | Missing      | Not Missing |
| N   | 59          | 114         | 65           | 124         | 53          | 118         | 65           | 116         | 56          | 119         | 62           | 128         |
| <b>Education</b>  | n (%)       |             |              |             |             |             |              |             |             |             |              |             |
| No formal education or Primary school incomplete                      | 43 (72.9%)  | 96 (84.2%)  | 46 (70.8%)   | 105 (84.7%) | 38 (71.7%)  | 98 (83.1%)  | 51 (78.5%)   | 93 (80.2%)  | 42 (75.0%)  | 97 (81.5%)  | 47 (75.8%)   | 105 (82.0%) |
| Primary school complete or Secondary school incomplete                | 14 (23.7%)  | 11 (9.6%)   | 17 (26.2%)   | 15 (12.1%)  | 13 (24.5%)  | 14 (11.9%)  | 11 (16.9%)   | 20 (17.2%)  | 10 (17.9%)  | 16 (13.4%)  | 14 (22.6%)   | 18 (14.1%)  |

|   |             |             |             |             |             |             |             |             |             |             |             |            |
|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|
| Secondary school complete or Vocational or Some college or university | 2 (3.4%)    | 5 (4.4%)    | 2 (3.1%)    | 1 (0.8%)    | 1 (1.9%)    | 5 (4.2%)    | 3 (4.6%)    | 0           | 3 (5.4%)    | 3 (2.5%)    | 1 (1.6%)    | 2 (1.6%)   |
| Missing   | 0           | 2 (1.8%)    | 0           | 3 (2.4%)    | 1 (1.9%)    | 1 (0.8%)    | 0           | 3 (2.6%)    | 1 (1.8%)    | 3 (2.5%)    | 0           | 3 (2.3%)   |
| <b>Diet Diversity</b>   |             |             |             |             |             |             |             | n (%)       |             |             |             |            |
| High (<5)   | 7 (11.9%)   | 7 (6.1%)    | 6 (9.2%)    | 10 (8.1%)   | 10 (18.9%)  | 5 (4.2%)    | 5 (7.7%)    | 9 (7.8%)    | 7 (12.5%)   | 9 (7.6%)    | 9 (14.5%)   | 7 (5.5%)   |
| Medium (4-5)  | 23 (39.0%)  | 28 (24.6%)  | 25 (38.5%)  | 23 (18.5%)  | 19 (35.8%)  | 34 (28.8%)  | 27 (41.5%)  | 23 (19.8%)  | 22 (39.3%)  | 32 (26.9%)  | 23 (37.1%)  | 28 (21.9%) |
| Low (0-3)   | 29 (49.2%)  | 79 (69.3%)  | 34 (52.3%)  | 91 (73.4%)  | 24 (45.3%)  | 79 (66.9%)  | 33 (50.8%)  | 84 (72.4%)  | 27 (48.2%)  | 78 (65.5%)  | 30 (48.4%)  | 93 (72.7%) |
| <b>Food Insecurity</b>  |             |             |             |             |             |             |             | n (%)       |             |             |             |            |
| Mild (1-3)  | 22 (37.3%)  | 31 (27.2%)  | 18 (27.7%)  | 38 (30.6%)  | 20 (37.7%)  | 34 (28.8%)  | 21 (32.3%)  | 33 (28.4%)  | 17 (30.4%)  | 36 (30.3%)  | 20 (32.3%)  | 38 (29.7%) |
| Moderate/Severe (4-8)   | 9 (15.3%)   | 23 (20.2%)  | 5 (7.7%)    | 9 (7.3%)    | 10 (18.9%)  | 21 (17.8%)  | 4 (6.2%)    | 10 (8.6%)   | 17 (30.4%)  | 14 (11.8%)  | 7 (11.3%)   | 9 (7.0%)   |
| None (0)  | 27 (45.8%)  | 58 (50.9%)  | 41 (63.1%)  | 76 (61.3%)  | 22 (41.5%)  | 61 (51.7%)  | 38 (58.5%)  | 73 (62.9%)  | 19 (33.9%)  | 68 (57.1%)  | 34 (54.8%)  | 80 (62.5%) |
| Missing   | 1 (1.7%)    | 2 (1.8%)    | 1 (1.5%)    | 1 (0.8%)    | 1 (1.9%)    | 2 (1.7%)    | 2 (3.1%)    | 0           | 3 (5.4%)    | 1 (0.8%)    | 1 (1.6%)    | 1 (0.8%)   |
| <b>Age, Mean (SD)</b>   | 50.9 (8.05) | 52.3 (7.2)  | 51.4 (8.05) | 52.5 (8.24) | 52.3 (7.73) | 51.6 (7.12) | 52.2 (8.07) | 51.7 (7.92) | 50.7 (7.92) | 52.4 (7.25) | 51.3 (7.29) | 51.8 (8.3) |
| <b>BMI, Mean (SD)</b>   | 26.4 (5.09) | 24.6 (4.84) | 26.2 (5.15) | 24.8 (5.01) | 26.9 (4.33) | 24.6 (5.15) | 25.3 (4.51) | 24.9 (5.26) | 26 (5.04)   | 24.7 (4.87) | 26.3 (5.19) | 25 (4.83)  |

**Table S2. Overall exposure data completeness of other adult women participants in HAPIN Trial**

| Visit | IRC       | Enrolled | Exposure Visit Made | Exposure Data Available | % Total Enrolled with Exposure Measurement | % Total Visit Made with Exposure |
|-------|-----------|----------|---------------------|-------------------------|--|----------------------------------|
| BL    | Guatemala | 138      | 138                 | 130                     | 94.2                                       | 94.2                             |
|       | India     | 104      | 104                 | 90                      | 86.5                                       | 86.5                             |
|       | Peru      | 133      | 132                 | 107                     | 80.5                                       | 81.1                             |
|       | Rwanda    | 43       | 43                  | 32                      | 74.4                                       | 74.4                             |
| P1    | Guatemala | 138      | 125                 | 112                     | 81.2                                       | 89.6                             |
|       | India     | 104      | 96                  | 86                      | 82.7                                       | 89.6                             |
|       | Peru      | 133      | 106                 | 87                      | 65.4                                       | 82.1                             |
|       | Rwanda    | 43       | 33                  | 30                      | 69.8                                       | 90.9                             |
| P2    | Guatemala | 138      | 120                 | 106                     | 76.8                                       | 88.3                             |
|       | India     | 104      | 81                  | 67                      | 64.4                                       | 82.7                             |
|       | Peru      | 133      | 89                  | 74                      | 55.6                                       | 83.1                             |
|       | Rwanda    | 43       | 37                  | 29                      | 67.4                                       | 78.4                             |
| B1    | Guatemala | 138      | 100                 | 90                      | 65.2                                       | 90                               |
|       | India     | 104      | 84                  | 63                      | 60.6                                       | 75                               |
|       | Peru      | 133      | 63                  | 49                      | 36.8                                       | 77.8                             |
|       | Rwanda    | 43       | 26                  | 20                      | 46.5                                       | 76.9                             |
| B2    | Guatemala | 138      | 87                  | 74                      | 53.6                                       | 85.1                             |
|       | India     | 104      | 84                  | 70                      | 67.3                                       | 83.3                             |
|       | Peru      | 133      | 70                  | 53                      | 39.8                                       | 75.7                             |
|       | Rwanda    | 43       | 31                  | 21                      | 48.8                                       | 67.7                             |
| B4    | Guatemala | 138      | 100                 | 85                      | 61.6                                       | 85                               |
|       | India     | 104      | 91                  | 80                      | 76.9                                       | 87.9                             |
|       | Peru      | 133      | 70                  | 46                      | 34.6                                       | 65.7                             |
|       | Rwanda    | 43       | 22                  | 14                      | 32.6                                       | 63.6                             |

Note: BL - baseline, P1 – prenatal visit 1, P2 – prenatal visit 2, B1 – post-birth visit 1, B2 – post-birth visit 2, and B4 – post-birth visit 3.

**Table S3. Gravimetric sample validity**

| IRC       | Valid Gravimetric Samples, N (%) | Valid Nephelometric Samples, N (%) | Valid Samples, N (%) | % Flow Issues | % Pressure Issues | % Duration Issues | % Filter Damaged |
|-----------|----------------------------------|------------------------------------|----------------------|---------------|-------------------|-------------------|------------------|
| Guatemala | 556 (85.4%)                      | 616 (94.6%)                        | 617 (94.8%)          | 14 (2.2%)     | 6 (0.9%)          | 30 (4.6%)         | 10 (1.5%)        |
| India     | 454 (86.1%)                      | 472 (89.6%)                        | 474 (89.9%)          | 9 (1.7%)      | 10 (1.9%)         | 47 (8.9%)         | 4 (0.8%)         |
| Peru      | 435 (82.7%)                      | 468 (89.0%)                        | 470 (89.4%)          | 16 (3%)       | 12 (2.3%)         | 52 (9.9%)         | 16 (3%)          |
| Rwanda    | 152 (82.6%)                      | 165 (89.7%)                        | 170 (92.4%)          | 4 (2.2%)      | 2 (1.1%)          | 14 (7.6%)         | 11 (6%)          |

**Table S4. Summary of valid personal exposure to PM<sub>2.5</sub>, BC, and CO of adult women aged 40-79 by country and study group.**

|                                  | PM <sub>2.5</sub> Exposure (µg/m <sup>3</sup> ) |                  | BC Exposure (µg/m <sup>3</sup> ) |               | CO Exposure (ppm) |              |
|----------------------------------|---|------------------|----------------------------------|---------------|-------------------|--------------|
|                                  | Control   | Intervention     | Control                          | Intervention  | Control           | Intervention |
| <b>Post-intervention Visit 1</b> |   |                  |                                  |               |                   |              |
| N                                | 160   | 164              | 148                              | 155           | 148               | 152          |
| Average (SD)                     | 110.2 (129.5)                                   | 36.8 (50.1)      | 10.2 (7.7)                       | 3.1 (2.5)     | 2.2 (2.8)         | 0.8 (1.8)    |
| Range                            | 10.2 - 946.4                                    | 10 - 464.2       | 1 - 40.1                         | 0.9 - 16.9    | 0 - 17            | 0 - 14.5     |
| Median (IQR)                     | 64.8 (32.9-143.5)                               | 21.8 (15.1-35.6) | 8.8 (4.4-13.8)                   | 1.7 (1.5-3.6) | 1.2 (0.4-2.7)     | 0.2 (0-0.7)  |
| <b>Post-intervention Visit 2</b> |   |                  |                                  |               |                   |              |
| N                                | 148   | 149              | 131                              | 144           | 136               | 137          |
| Average (SD)                     | 104.9 (121.1)                                   | 37.6 (63)        | 10.8 (10.8)                      | 3.9 (3.8)     | 2 (3.4)           | 1 (2)        |
| Range                            | 10 - 793.8                                      | 10 - 725         | 1 - 83.9                         | 0.9 - 28.5    | 0 - 24.2          | 0 - 13.7     |
| Median (IQR)                     | 66.2 (34.2-110.6)                               | 23.4 (15.2-41.8) | 8.6 (4.3-13.5)                   | 2.6 (1.6-4.7) | 1 (0.3-2.2)       | 0.2 (0-1)    |
| <b>Post-intervention Visit 3</b> |   |                  |                                  |               |                   |              |
| N                                | 114   | 124              | 100                              | 113           | 98                | 114          |
| Average (SD)                     | 102.1 (104.2)                                   | 37 (68.4)        | 12 (10.9)                        | 4.8 (7.9)     | 1.7 (2.3)         | 1.3 (3.2)    |
| Range                            | 10 - 520.4                                      | 11.2 - 718.3     | 1.4 - 76                         | 0.9 - 70.6    | 0 - 15.5          | 0 - 18.9     |
| Median (IQR)                     | 72.2 (37.4-119.4)                               | 24.4 (14.4-35.4) | 9.7 (4.8-15.2)                   | 2.4 (1.6-4.4) | 0.9 (0.2-2.5)     | 0.2 (0-0.9)  |
| <b>Post-intervention Visit 4</b> |   |                  |                                  |               |                   |              |
| N                                | 118   | 116              | 110                              | 107           | 117               | 107          |
| Average (SD)                     | 121.4 (194.5)                                   | 43.2 (96.3)      | 10 (7.1)                         | 3.6 (4.1)     | 2.1 (3.1)         | 1.5 (3)      |
| Range                            | 10.6 - 1447.6                                   | 11 - 969.1       | 1 - 31.9                         | 0.9 - 24.4    | 0 - 16            | 0 - 17.8     |
| Median (IQR)                     | 70.6 (32.2-123.7)                               | 18.7 (13.6-38.2) | 8.5 (4.5-13.6)                   | 1.7 (1.5-3.5) | 0.8 (0.2-2.4)     | 0.3 (0-1.2)  |
| <b>Post-intervention Visit 5</b> |   |                  |                                  |               |                   |              |
| N                                | 119   | 128              | 94                               | 112           | 105               | 116          |
| Average (SD)                     | 114.1 (156.3)                                   | 37.1 (35.9)      | 9.4 (8)                          | 5 (6.7)       | 1.9 (3.5)         | 1 (2.4)      |
| Range                            | 11 - 1062.3                                     | 10 - 227         | 1 - 56.4                         | 0.9 - 53.3    | 0 - 28.2          | 0 - 15.2     |
| Median (IQR)                     | 54.4 (28.4-133.3)                               | 24.8 (13.4-43.7) | 7.9 (3.8-12.8)                   | 2.9 (1.6-5.2) | 0.9 (0.3-2.2)     | 0.2 (0-0.6)  |

**Table S5. Summary of personal exposure to PM<sub>2.5</sub> of other adult women participants by IRC and study group**

| PM <sub>2.5</sub><br>Exposure<br>(µg/m <sup>3</sup> ) | Guatemala          |                  | India             |                   | Peru              |                  | Rwanda             |                  | Overall           |                  |
|---|--------------------|------------------|-------------------|-------------------|-------------------|------------------|--------------------|------------------|-------------------|------------------|
|   | Control            | Intervention     | Control           | Intervention      | Control           | Intervention     | Control            | Intervention     | Control           | Intervention     |
| <b>Baseline</b>                                       |                    |                  |                   |                   |                   |                  |                    |                  |                   |                  |
| N   | 64                 | 70               | 47                | 46                | 58                | 56               | 23                 | 18               | 192               | 190              |
| Average (SD)  | 130.4 (108.3)      | 154 (139.9)      | 101 (93)          | 120.1 (152.3)     | 100.4 (104.6)     | 111.3 (135.3)    | 118.1 (77)         | 60.5 (39.3)      | 112.7 (100.4)     | 124.4 (137.5)    |
| Range   | 13.7 - 660.8       | 17.3 - 803.4     | 10 - 531.4        | 10 - 759.6        | 12.5 - 427.4      | 12.5 - 698.1     | 14.7 - 312.1       | 19.8 - 166.2     | 10 - 660.8        | 10 - 803.4       |
| Median (IQR)  | 107.2 (69.6-140.5) | 115.6 (75-178.5) | 75.2 (44.1-123.8) | 70.9 (40.3-128.4) | 67.1 (27.7-124.3) | 59 (29.3-122.6)  | 101.8 (56.6-160.3) | 51.9 (32.4-78.2) | 89.4 (44.2-135.6) | 79.8 (43-148.5)  |
| <b>Post-intervention Visit 1</b>                      |                    |                  |                   |                   |                   |                  |                    |                  |                   |                  |
| N   | 56                 | 59               | 41                | 46                | 47                | 47               | 16                 | 12               | 160               | 164              |
| Average (SD)  | 145.5 (161.2)      | 31.6 (31.2)      | 96.9 (104.9)      | 35.8 (66.1)       | 82.9 (111.2)      | 44.6 (56.3)      | 100.4 (87.1)       | 35.1 (21.1)      | 110.2 (129.5)     | 36.8 (50.1)      |
| Range   | 11.8 - 946.4       | 10 - 176.1       | 10.2 - 407.3      | 10.1 - 464.2      | 13.1 - 531.2      | 12.4 - 289.8     | 23 - 318.1         | 20 - 92.2        | 10.2 - 946.4      | 10 - 464.2       |
| Median (IQR)  | 96.9 (55.4-173.5)  | 24.6 (11.9-30.4) | 49.1 (32.3-122.5) | 19.5 (17.7-34)    | 41.3 (14.9-97.4)  | 15.7 (14.8-53.1) | 73.1 (51.4-99.3)   | 28.3 (20.3-41.6) | 64.8 (32.9-143.5) | 21.8 (15.1-35.6) |
| <b>Post-intervention Visit 2</b>                      |                    |                  |                   |                   |                   |                  |                    |                  |                   |                  |
| N   | 52                 | 61               | 40                | 32                | 35                | 44               | 21                 | 12               | 148               | 149              |
| Average (SD)  | 140.4 (147.2)      | 37.1 (35.6)      | 108.2 (106.1)     | 25.8 (12.2)       | 65.7 (108.1)      | 48.5 (107.4)     | 76.3 (62.5)        | 31.9 (11.3)      | 104.9 (121.1)     | 37.6 (63)        |
| Range   | 11.8 - 793.8       | 10 - 222.7       | 10 - 396.9        | 10 - 59.7         | 12.3 - 541.3      | 12.5 - 725       | 30.5 - 295.6       | 20.2 - 49.1      | 10 - 793.8        | 10 - 725         |
| Median (IQR)  | 83.6 (52.4-164.6)  | 24.6 (11.9-46.5) | 72.9 (38-114.2)   | 18 (17.8-35.6)    | 29.9 (15-59.3)    | 21.7 (14.8-46.8) | 61.1 (43.7-72.3)   | 29.3 (21.5-42)   | 66.2 (34.2-110.6) | 23.4 (15.2-41.8) |
| <b>Post-intervention Visit 3</b>                      |                    |                  |                   |                   |                   |                  |                    |                  |                   |                  |
| N   | 45                 | 47               | 33                | 36                | 21                | 32               | 15                 | 9                | 114               | 124              |
| Average (SD)  | 134.3 (112.6)      | 35.6 (31.1)      | 87.2 (93.8)       | 46.4 (116.4)      | 47 (44.5)         | 28.4 (39.9)      | 115.6 (127.2)      | 37.5 (11.3)      | 102.1 (104.2)     | 37 (68.4)        |
| Range   | 21.5 - 520.4       | 11.2 - 171.4     | 10 - 412.3        | 13.1 - 718.3      | 12.7 - 188.5      | 12.5 - 233.6     | 18.8 - 508.4       | 20.8 - 55.5      | 10 - 520.4        | 11.2 - 718.3     |
| Median (IQR)  | 105.7 (59.5-169.8) | 29.1 (12.6-39.8) | 66.8 (26.1-94.2)  | 19.4 (17.6-32.4)  | 27.8 (15.3-60.4)  | 14.8 (14.2-27.5) | 78 (50.4-105.4)    | 34.6 (33.1-42.2) | 72.2 (37.4-119.4) | 24.4 (14.4-35.4) |
| <b>Post-intervention Visit 4</b>                      |                    |                  |                   |                   |                   |                  |                    |                  |                   |                  |
| N   | 42                 | 33               | 33                | 38                | 25                | 37               | 18                 | 8                | 118               | 116              |
| Average (SD)  | 115 (101.9)        | 40.9 (37.6)      | 116.6 (245.8)     | 27.1 (27)         | 151.6 (284)       | 60.9 (164.2)     | 103.3 (77.5)       | 46.9 (18.8)      | 121.4 (194.5)     | 43.2 (96.3)      |
| Range   | 11.8 - 458         | 11.1 - 162.9     | 11.8 - 1447.6     | 13.4 - 138.3      | 10.6 - 1065.1     | 11 - 969.1       | 23.5 - 355.6       | 19.8 - 72.8      | 10.6 - 1447.6     | 11 - 969.1       |
| Median (IQR)  | 80.3 (53-150.6)    | 27.8 (15.8-41.8) | 67.9 (32.3-103.1) | 17.9 (14.6-27.6)  | 42.8 (15.2-106.9) | 15.1 (12.6-34.5) | 88.7 (54.8-120.5)  | 49.4 (32.1-60.1) | 70.6 (32.2-123.7) | 18.7 (13.6-38.2) |
| <b>Post-intervention Visit 5</b>                      |                    |                  |                   |                   |                   |                  |                    |                  |                   |                  |
| N   | 43                 | 45               | 41                | 41                | 24                | 36               | 11                 | 6                | 119               | 128              |
| Average (SD)  | 116.5 (134.3)      | 34.9 (32.9)      | 104.1 (100.7)     | 49.9 (43.4)       | 143.8 (269.1)     | 23.5 (26.2)      | 77.8 (39.9)        | 47.7 (22.2)      | 114.1 (156.3)     | 37.1 (35.9)      |
| Range   | 12 - 598.9         | 11 - 137.5       | 13.2 - 434.6      | 10 - 227          | 11 - 1062.3       | 10.5 - 136       | 39.4 - 158.3       | 14 - 68.2        | 11 - 1062.3       | 10 - 227         |
| Median (IQR)  | 57.1 (34.5-136.2)  | 22.6 (14.4-34.9) | 56.5 (33.5-131.2) | 39.2 (17.9-55.9)  | 19.9 (13.7-81.6)  | 14.1 (11-23.2)   | 67.6 (53.2-80.4)   | 57 (33.6-62.5)   | 54.4 (28.4-133.3) | 24.8 (13.4-43.7) |



**Table S6. Summary of personal exposure to BC of other adult women participants by IRC and study group**

| BC Exposure (µg/m <sup>3</sup> ) | Guatemala       |                 | India          |                | Peru           |                 | Rwanda          |               | Overall         |               |
|----------------------------------|-----------------|-----------------|----------------|----------------|----------------|-----------------|-----------------|---------------|-----------------|---------------|
|                                  | Control         | Intervention    | Control        | Intervention   | Control        | Intervention    | Control         | Intervention  | Control         | Intervention  |
| <b>Baseline</b>                  |                 |                 |                |                |                |                 |                 |               |                 |               |
| N                                | 54              | 66              | 46             | 44             | 48             | 47              | 18              | 10            | 166             | 167           |
| Average (SD)                     | 12.3 (5.8)      | 13.4 (6.6)      | 14.2 (11.6)    | 12.6 (10.8)    | 11.6 (14)      | 14.7 (16.6)     | 12.3 (4.5)      | 6.4 (3.1)     | 12.6 (10.3)     | 13.1 (11.3)   |
| Range                            | 1.1 - 29        | 4.3 - 46.8      | 1.6 - 69.2     | 1.4 - 47.8     | 1.4 - 72.3     | 1.3 - 93.3      | 3.5 - 20.1      | 2.8 - 12.3    | 1.1 - 72.3      | 1.3 - 93.3    |
| Median (IQR)                     | 11.5 (8.8-15.7) | 12.5 (9.8-15.3) | 11.5 (6.9-18)  | 7.9 (3.8-20.9) | 6.3 (2.1-15.4) | 10.6 (3.8-16.5) | 11 (10-15.8)    | 5.8 (4.1-8.5) | 10.7 (6.2-16.1) | 10.9 (6.7-16) |
| <b>Post-intervention Visit 1</b> |                 |                 |                |                |                |                 |                 |               |                 |               |
| N                                | 54              | 56              | 40             | 45             | 38             | 44              | 16              | 10            | 148             | 155           |
| Average (SD)                     | 11.8 (6.2)      | 4 (3.2)         | 10.9 (9.5)     | 2.7 (2)        | 7.1 (6.6)      | 1.9 (1.5)       | 10.9 (8.1)      | 4.2 (1.6)     | 10.2 (7.7)      | 3.1 (2.5)     |
| Range                            | 1 - 33.1        | 0.9 - 16.9      | 1.6 - 40.1     | 1.4 - 9.5      | 1.3 - 24.8     | 1.3 - 10.6      | 2.9 - 37.7      | 2.8 - 6.6     | 1 - 40.1        | 0.9 - 16.9    |
| Median (IQR)                     | 11.1 (8-13.3)   | 2.9 (1.7-5.5)   | 7.1 (4-16.8)   | 1.6 (1.6-3.2)  | 4.1 (1.5-11.3) | 1.5 (1.5-1.5)   | 8.6 (7.1-12.9)  | 3.7 (2.9-5.4) | 8.8 (4.4-13.8)  | 1.7 (1.5-3.6) |
| <b>Post-intervention Visit 2</b> |                 |                 |                |                |                |                 |                 |               |                 |               |
| N                                | 47              | 60              | 38             | 32             | 29             | 40              | 17              | 12            | 131             | 144           |
| Average (SD)                     | 11.6 (5.4)      | 5.3 (4.9)       | 13.3 (11.7)    | 3.3 (2.9)      | 8.3 (16.7)     | 2.3 (2)         | 6.9 (2.8)       | 4 (1.4)       | 10.8 (10.8)     | 3.9 (3.8)     |
| Range                            | 1 - 26.5        | 0.9 - 28.5      | 1.6 - 59.9     | 1.6 - 16.1     | 1.4 - 83.9     | 1.4 - 11.9      | 3.4 - 15.9      | 2.8 - 6.6     | 1 - 83.9        | 0.9 - 28.5    |
| Median (IQR)                     | 11.3 (8.5-14)   | 3.5 (2.4-7)     | 10.2 (5.2-18)  | 2.3 (1.6-3.8)  | 1.5 (1.4-6.4)  | 1.5 (1.5-2.3)   | 6.2 (5.3-8.1)   | 3 (2.9-5.1)   | 8.6 (4.3-13.5)  | 2.6 (1.6-4.7) |
| <b>Post-intervention Visit 3</b> |                 |                 |                |                |                |                 |                 |               |                 |               |
| N                                | 37              | 42              | 29             | 32             | 19             | 32              | 15              | 7             | 100             | 113           |
| Average (SD)                     | 14.2 (8.1)      | 5.7 (4.6)       | 13.3 (15.3)    | 4.1 (6.6)      | 7.3 (8.2)      | 4.4 (12.2)      | 10.3 (7.8)      | 3.6 (1.1)     | 12 (10.9)       | 4.8 (7.9)     |
| Range                            | 5.5 - 52.3      | 0.9 - 19.6      | 1.6 - 76       | 1.6 - 36.5     | 1.4 - 28.2     | 1.4 - 70.6      | 2.8 - 33.3      | 2.9 - 5.9     | 1.4 - 76        | 0.9 - 70.6    |
| Median (IQR)                     | 12.5 (9.8-17.4) | 3.6 (2.5-9.3)   | 8 (4.4-15.4)   | 1.6 (1.6-3.6)  | 2.8 (1.5-10.3) | 1.5 (1.5-2.2)   | 8.8 (4.6-11.7)  | 3 (3-3.7)     | 9.7 (4.8-15.2)  | 2.4 (1.6-4.4) |
| <b>Post-intervention Visit 4</b> |                 |                 |                |                |                |                 |                 |               |                 |               |
| N                                | 36              | 28              | 32             | 37             | 25             | 34              | 17              | 8             | 110             | 107           |
| Average (SD)                     | 11.4 (6)        | 6.4 (6.3)       | 10.1 (8)       | 2.1 (1.3)      | 7.5 (8.4)      | 2.5 (2.7)       | 10.3 (4.6)      | 5.2 (2)       | 10 (7.1)        | 3.6 (4.1)     |
| Range                            | 1 - 27.7        | 0.9 - 24.4      | 1.4 - 31.7     | 1.4 - 8.9      | 1.4 - 31.9     | 1.4 - 13.2      | 3.7 - 17.9      | 2.8 - 8.9     | 1 - 31.9        | 0.9 - 24.4    |
| Median (IQR)                     | 11.3 (7.8-13.8) | 3.6 (2.2-7.5)   | 7.7 (4.7-12.4) | 1.6 (1.6-1.8)  | 3.7 (1.5-10)   | 1.5 (1.5-1.8)   | 10.7 (5.8-13.7) | 4.7 (4.3-5.7) | 8.5 (4.5-13.6)  | 1.7 (1.5-3.5) |
| <b>Post-intervention Visit 5</b> |                 |                 |                |                |                |                 |                 |               |                 |               |
| N                                | 29              | 38              | 38             | 40             | 17             | 29              | 10              | 5             | 94              | 112           |
| Average (SD)                     | 10.1 (5.7)      | 5.5 (4.7)       | 11.1 (10.4)    | 5.7 (9.7)      | 4.8 (4.9)      | 3.1 (3.7)       | 9.3 (4.3)       | 5.2 (1.8)     | 9.4 (8)         | 5 (6.7)       |
| Range                            | 1 - 18.9        | 0.9 - 17.4      | 1.6 - 56.4     | 1.4 - 53.3     | 1.4 - 15.2     | 1.4 - 20.4      | 4.1 - 17.6      | 2.9 - 7.8     | 1 - 56.4        | 0.9 - 53.3    |
| Median (IQR)                     | 9.9 (5.5-15.7)  | 3.4 (2-7.8)     | 8.4 (4-14.5)   | 2.3 (1.6-5.2)  | 1.7 (1.5-7.9)  | 2.3 (1.5-2.9)   | 8.4 (6.3-12.2)  | 5.1 (4.3-6.1) | 7.9 (3.8-12.8)  | 2.9 (1.6-5.2) |

**Table S7. Summary of personal exposure to CO of other adult women participants by IRC and study group**

| CO Exposure (ppm)                | Guatemala     |               | India         |               | Peru          |               | Rwanda        |               | Overall       |               |
|----------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
|                                  | Control       | Intervention  | Control       | Intervention  | Control       | Intervention  | Control       | Intervention  | Control       | Intervention  |
| <b>Baseline</b>                  |               |               |               |               |               |               |               |               |               |               |
| N                                | 58            | 66            | 45            | 43            | 45            | 48            | 21            | 17            | 169           | 174           |
| Average (SD)                     | 1.9 (2)       | 1.7 (1.5)     | 1.2 (1.3)     | 2 (3.8)       | 4 (3.8)       | 4 (6.3)       | 1.1 (1)       | 1.5 (2.4)     | 2.2 (2.7)     | 2.4 (4.1)     |
| Range                            | 0.1 - 9.5     | 0 - 7.5       | 0 - 6.3       | 0 - 21.4      | 0 - 18.1      | 0 - 38.7      | 0.1 - 3.8     | 0 - 8.9       | 0 - 18.1      | 0 - 38.7      |
| Median (IQR)                     | 1.3 (0.6-2.5) | 1.4 (0.5-2.6) | 0.6 (0.2-1.7) | 0.7 (0.2-2.1) | 2.9 (1.5-5.8) | 2 (0.9-4.3)   | 0.7 (0.3-1.7) | 0.3 (0.1-1.3) | 1.3 (0.5-2.9) | 1.4 (0.4-2.7) |
| <b>Post-intervention Visit 1</b> |               |               |               |               |               |               |               |               |               |               |
| N                                | 56            | 55            | 41            | 47            | 35            | 40            | 16            | 10            | 148           | 152           |
| Average (SD)                     | 2 (1.9)       | 0.6 (1)       | 2.4 (3.8)     | 0.3 (1.4)     | 2.7 (3)       | 1.7 (2.9)     | 1.1 (1)       | 0.4 (0.5)     | 2.2 (2.8)     | 0.8 (1.8)     |
| Range                            | 0 - 9.4       | 0 - 4.6       | 0 - 17        | 0 - 9.5       | 0 - 10.6      | 0 - 14.5      | 0 - 2.9       | 0 - 1.4       | 0 - 17        | 0 - 14.5      |
| Median (IQR)                     | 1.5 (0.6-2.8) | 0.3 (0-0.6)   | 0.8 (0.1-2.5) | 0 (0-0.1)     | 1.6 (0.3-3.9) | 0.6 (0.2-1.9) | 0.8 (0.2-1.8) | 0.3 (0.1-0.4) | 1.2 (0.4-2.7) | 0.2 (0-0.7)   |
| <b>Post-intervention Visit 2</b> |               |               |               |               |               |               |               |               |               |               |
| N                                | 50            | 54            | 36            | 35            | 31            | 39            | 19            | 9             | 136           | 137           |
| Average (SD)                     | 2.2 (3.3)     | 0.7 (0.9)     | 2.5 (4.4)     | 0.3 (1.2)     | 1.8 (2.8)     | 2 (2.7)       | 0.8 (1.3)     | 1.7 (4)       | 2 (3.4)       | 1 (2)         |
| Range                            | 0 - 20.7      | 0 - 3.6       | 0 - 24.2      | 0 - 6.7       | 0 - 13.9      | 0 - 13.7      | 0 - 4.9       | 0 - 12.3      | 0 - 24.2      | 0 - 13.7      |
| Median (IQR)                     | 1.3 (0.7-2.2) | 0.2 (0-1)     | 1.4 (0.3-2.3) | 0 (0-0.1)     | 1 (0.2-2.1)   | 0.7 (0.2-3.2) | 0.2 (0.1-0.9) | 0 (0-1)       | 1 (0.3-2.2)   | 0.2 (0-1)     |
| <b>Post-intervention Visit 3</b> |               |               |               |               |               |               |               |               |               |               |
| N                                | 39            | 41            | 32            | 38            | 14            | 29            | 13            | 6             | 98            | 114           |
| Average (SD)                     | 1.8 (2)       | 0.5 (0.9)     | 1.6 (1.8)     | 0.4 (0.9)     | 2.8 (4.1)     | 3.6 (5.6)     | 1 (1.2)       | 1.5 (2)       | 1.7 (2.3)     | 1.3 (3.2)     |
| Range                            | 0.1 - 8.6     | 0 - 3.9       | 0 - 5.6       | 0 - 4.1       | 0 - 15.5      | 0 - 18.9      | 0.1 - 2.9     | 0 - 5.4       | 0 - 15.5      | 0 - 18.9      |
| Median (IQR)                     | 1.1 (0.3-2.4) | 0.1 (0-0.5)   | 0.6 (0.2-2.5) | 0.1 (0-0.2)   | 1.9 (0.2-2.7) | 0.7 (0.4-4)   | 0.3 (0.1-2.5) | 1 (0.2-1.5)   | 0.9 (0.2-2.5) | 0.2 (0-0.9)   |
| <b>Post-intervention Visit 4</b> |               |               |               |               |               |               |               |               |               |               |
| N                                | 41            | 31            | 36            | 39            | 22            | 27            | 18            | 10            | 117           | 107           |
| Average (SD)                     | 1.6 (1.7)     | 0.7 (1.8)     | 1.4 (1.8)     | 0.4 (1.1)     | 4.2 (5.2)     | 4 (4.6)       | 2 (3.3)       | 1.7 (1.4)     | 2.1 (3.1)     | 1.5 (3)       |
| Range                            | 0 - 6.5       | 0 - 10.1      | 0 - 6.4       | 0 - 4.7       | 0 - 16        | 0 - 17.8      | 0 - 13.5      | 0.2 - 4.8     | 0 - 16        | 0 - 17.8      |
| Median (IQR)                     | 0.9 (0.3-2.3) | 0.1 (0-0.5)   | 0.7 (0.1-1.5) | 0.1 (0-0.3)   | 2.3 (0.4-5.9) | 3.4 (0.6-5.1) | 0.5 (0.2-2.5) | 1.1 (0.9-2)   | 0.8 (0.2-2.4) | 0.3 (0-1.2)   |
| <b>Post-intervention Visit 5</b> |               |               |               |               |               |               |               |               |               |               |
| N                                | 40            | 46            | 41            | 41            | 12            | 22            | 12            | 7             | 105           | 116           |
| Average (SD)                     | 1.6 (2.4)     | 0.6 (1.1)     | 1.6 (2.3)     | 0.7 (1.8)     | 4.9 (7.8)     | 3 (4.3)       | 0.9 (1)       | 0.2 (0.2)     | 1.9 (3.5)     | 1 (2.4)       |
| Range                            | 0 - 12.2      | 0 - 5.6       | 0 - 8.6       | 0 - 10.7      | 0 - 28.2      | 0 - 15.2      | 0 - 3.5       | 0 - 0.6       | 0 - 28.2      | 0 - 15.2      |
| Median (IQR)                     | 0.7 (0.2-2.3) | 0.2 (0-0.5)   | 0.9 (0.1-2)   | 0 (0-0.3)     | 2.3 (0.8-5.7) | 0.7 (0.4-4.2) | 0.7 (0.3-1.2) | 0.1 (0-0.2)   | 0.9 (0.3-2.2) | 0.2 (0-0.6)   |

**Table S8. Correlations (Spearman's  $\rho$ ) between pollutants by stove type and IRC**

| IRC       | PM-BC |             | PM-CO |             | BC-CO |             |
|-----------|-------|-------------|-------|-------------|-------|-------------|
|           | LPG   | Traditional | LPG   | Traditional | LPG   | Traditional |
| All       | 0.60  | 0.76        | 0.11  | 0.53        | 0.07  | 0.49        |
| Guatemala | 0.85  | 0.67        | 0.40  | 0.67        | 0.34  | 0.50        |
| India     | 0.40  | 0.73        | -0.02 | 0.59        | 0.17  | 0.55        |
| Peru      | 0.34  | 0.78        | 0.03  | 0.56        | 0.13  | 0.61        |
| Rwanda    | 0.77  | 0.85        | 0.01  | 0.53        | -0.15 | 0.50        |

Note: Traditional stove includes measurements from the intervention group at baseline and all measurements from the control group. LPG stove includes all post-intervention measurements from the intervention group.

**Table S9. Correlations (Spearman's  $\rho$ ) of personal exposure to PM<sub>2.5</sub>, BC, and CO between measurement rounds**

| Group 1                 | Group 2 | Correlation Coefficient | p-value | Correlation Coefficient | p-value |
|-------------------------|---------|-------------------------|---------|-------------------------|---------|
| <i>PM<sub>2.5</sub></i> |         | <i>Control</i>          |         | <i>Intervention</i>     |         |
| P1                      | BL      | 0.43                    | 0.000   | 0.20                    | 0.014   |
| P2                      | BL      | 0.42                    | 0.000   | 0.04                    | 0.639   |
| B1                      | BL      | 0.29                    | 0.002   | 0.02                    | 0.839   |
| B2                      | BL      | 0.37                    | 0.000   | 0.11                    | 0.250   |
| B4                      | BL      | 0.26                    | 0.006   | 0.17                    | 0.056   |
| P2                      | P1      | 0.45                    | 0.000   | 0.35                    | 0.000   |
| B1                      | P1      | 0.43                    | 0.000   | 0.15                    | 0.129   |
| B2                      | P1      | 0.42                    | 0.000   | 0.17                    | 0.104   |
| B4                      | P1      | 0.33                    | 0.001   | 0.12                    | 0.214   |
| B1                      | P2      | 0.41                    | 0.000   | 0.30                    | 0.004   |
| B2                      | P2      | 0.40                    | 0.000   | 0.27                    | 0.012   |
| B4                      | P2      | 0.34                    | 0.001   | 0.25                    | 0.013   |
| B2                      | B1      | 0.43                    | 0.000   | 0.14                    | 0.216   |
| B4                      | B1      | 0.24                    | 0.039   | 0.28                    | 0.011   |
| B4                      | B2      | 0.19                    | 0.104   | 0.27                    | 0.013   |
| <i>BC</i>               |         | <i>Control</i>          |         | <i>Intervention</i>     |         |
| P1                      | BL      | 0.26                    | 0.005   | 0.17                    | 0.066   |
| P2                      | BL      | 0.38                    | 0.000   | 0.13                    | 0.165   |
| B1                      | BL      | 0.32                    | 0.004   | 0.11                    | 0.298   |
| B2                      | BL      | 0.17                    | 0.111   | 0.05                    | 0.622   |
| B4                      | BL      | 0.43                    | 0.000   | 0.35                    | 0.001   |
| P2                      | P1      | 0.38                    | 0.000   | 0.53                    | 0.000   |
| B1                      | P1      | 0.54                    | 0.000   | 0.43                    | 0.000   |
| B2                      | P1      | 0.26                    | 0.017   | 0.38                    | 0.000   |
| B4                      | P1      | 0.38                    | 0.001   | 0.19                    | 0.071   |
| B1                      | P2      | 0.56                    | 0.000   | 0.46                    | 0.000   |
| B2                      | P2      | 0.33                    | 0.003   | 0.30                    | 0.010   |
| B4                      | P2      | 0.46                    | 0.000   | 0.40                    | 0.000   |
| B2                      | B1      | 0.34                    | 0.005   | 0.31                    | 0.006   |
| B4                      | B1      | 0.33                    | 0.013   | 0.38                    | 0.002   |
| B4                      | B2      | 0.29                    | 0.033   | 0.48                    | 0.000   |

| <i>CO</i> |    | <i>Control</i> |       | <i>Intervention</i> |       |
|-----------|----|----------------|-------|---------------------|-------|
| P1        | BL | 0.15           | 0.095 | 0.24                | 0.005 |
| P2        | BL | 0.23           | 0.014 | 0.26                | 0.004 |
| B1        | BL | 0.26           | 0.016 | 0.20                | 0.053 |
| B2        | BL | 0.13           | 0.190 | -0.04               | 0.689 |
| B4        | BL | 0.18           | 0.084 | -0.09               | 0.404 |
| P2        | P1 | 0.42           | 0.000 | 0.32                | 0.001 |
| B1        | P1 | 0.32           | 0.003 | 0.36                | 0.001 |
| B2        | P1 | 0.17           | 0.101 | 0.20                | 0.071 |
| B4        | P1 | 0.06           | 0.576 | 0.13                | 0.252 |
| B1        | P2 | 0.39           | 0.001 | 0.29                | 0.009 |
| B2        | P2 | 0.27           | 0.014 | 0.29                | 0.010 |
| B4        | P2 | 0.42           | 0.000 | 0.23                | 0.035 |
| B2        | B1 | 0.10           | 0.423 | 0.16                | 0.182 |
| B4        | B1 | 0.18           | 0.164 | 0.18                | 0.120 |
| B4        | B2 | 0.39           | 0.001 | 0.08                | 0.516 |

Note: BL - baseline, P1 – prenatal visit 1, P2 – prenatal visit 2, B1 – post-birth visit 1, B2 – post-birth visit 2, and B4 – post-birth visit 3.

For PM<sub>2.5</sub> in the control group, the correlations ranged from 0.19 to 0.45. Correlations for BC (range: 0.17 – 0.56) in the control group were similar to PM<sub>2.5</sub> but were weaker for CO (range: 0.06 – 0.42). Generally, the correlations between measurement rounds in the intervention group are weaker compared to that in the control group, even between the post-intervention measurement rounds. Among intervention households, correlations between all measurement rounds ranged from 0.02 – 0.35, 0.05 – 0.53, and -0.04 – 0.36 for PM<sub>2.5</sub>, BC, and CO exposures, respectively. Among the consecutive visits, the two follow-up visits during pregnancy (P1 and P2) tend to have stronger correlations for all three pollutants in the intervention group. In the control group, stronger correlations are observed between the last follow-up visit during pregnancy (P2) and the first follow-up visit post-birth (B1).

**Table S10. Percent decreases in PM<sub>2.5</sub>, BC, and CO exposure associated with LPG intervention (trial-wide)**

| Model Type            | Details      | % Decrease in PM <sub>2.5</sub> exposure | % Decrease in BC exposure | % Decrease in CO exposure |
|-----------------------|--------------|--|---------------------------|---------------------------|
|                       |              | Estimate (CI)                            | Estimate (CI)             | Estimate (CI)             |
| Between Groups        | –            | 59 (55, 63)                              | 60 (56, 65)               | 73 (65, 80)               |
| Before and After      | Control      | 20 (9, 29)                               | 25 (15, 33)               | 21 (-5, 40)               |
|                       | Intervention | 67 (63, 71)                              | 70 (67, 74)               | 79 (70, 85)               |
| Comparison of Changes | Overall      | 59 (51, 65)                              | 61 (54, 67)               | 74 (60, 83)               |
|                       | Visit P1     | 61 (51, 69)                              | 67 (60, 73)               | 77 (60, 87)               |
|                       | Visit P2     | 58 (67, 47)                              | 60 (68, 50)               | 81 (89, 65)               |
|                       | Visit B1     | 61 (69, 49)                              | 65 (72, 56)               | 75 (87, 53)               |
|                       | Visit B2     | 60 (69, 48)                              | 63 (70, 53)               | 63 (80, 31)               |
|                       | Visit B4     | 51 (62, 37)                              | 47 (58, 33)               | 70 (84, 43)               |

**Table S11.** Comparison of personal exposures to PM<sub>2.5</sub>, BC, and CO between non-pregnant and pregnant adult women in the same households by arm and study period.

|                   | PM <sub>2.5</sub> (µg/m <sup>3</sup> ) |                   |                   |                   | BC (µg/m <sup>3</sup> ) |                 |                 |                 | CO (ppm)      |               |               |               |
|-------------------|--|-------------------|-------------------|-------------------|-------------------------|-----------------|-----------------|-----------------|---------------|---------------|---------------|---------------|
|                   | Control                                |                   | Intervention      |                   | Control                 |                 | Intervention    |                 | Control       |               | Intervention  |               |
|                   | OAW                                    | PW                | OAW               | PW                | OAW                     | PW              | OAW             | PW              | OAW           | PW            | OAW           | PW            |
| <b>Baseline</b>   |  |                   |                   |                   |                         |                 |                 |                 |               |               |               |               |
| N                 | 180                                    | 180               | 174               | 174               | 148                     | 148             | 152             | 152             | 151           | 151           | 151           | 151           |
| Average (SD)      | 110.7 (93.7)                           | 96.8 (92.3)       | 148.3 (242.4)     | 131.6 (157.7)     | 12.7 (10.3)             | 11.8 (9.6)      | 12.5 (9.2)      | 13.6 (11.4)     | 2.2 (2.7)     | 1.8 (2.5)     | 2.3 (4.1)     | 2.6 (4.4)     |
| Range             | 10 - 531.4                             | 10 - 568.1        | 10 - 2063.2       | 10 - 1382.2       | 1.1 - 72.3              | 1.5 - 66.1      | 1.4 - 49.3      | 1.4 - 77.2      | 0 - 18.1      | 0 - 16.8      | 0 - 38.7      | 0 - 32.4      |
| Median (IQR)      | 89.3 (44.3-135.6)                      | 72.6 (35.5-116.1) | 83.5 (43.5-159.2) | 83.9 (42.9-159.6) | 11 (6.2-16.1)           | 10.5 (6.4-14.5) | 10.9 (6.7-15.7) | 11.2 (6.3-16.6) | 1.4 (0.5-2.9) | 0.9 (0.4-2.1) | 1.4 (0.4-2.7) | 1.3 (0.4-2.8) |
| <b>Pregnancy</b>  |  |                   |                   |                   |                         |                 |                 |                 |               |               |               |               |
| N                 | 175                                    | 175               | 177               | 177               | 166                     | 166             | 172             | 172             | 159           | 159           | 173           | 173           |
| Average (SD)      | 111.3 (136.5)                          | 110.4 (132.2)     | 49.1 (117.3)      | 25.7 (15.1)       | 10.5 (8.6)              | 11 (8.3)        | 3.5 (2.6)       | 3.1 (2.5)       | 2 (2.9)       | 2.1 (3.5)     | 0.9 (1.9)     | 0.5 (1)       |
| Range             | 10.2 - 1041.1                          | 11.8 - 1116.9     | 10 - 1271         | 10 - 102.4        | 1 - 83.9                | 1.3 - 65.3      | 0.9 - 16.6      | 0.9 - 19.1      | 0 - 20.7      | 0 - 27.6      | 0 - 14.1      | 0 - 6.7       |
| Median (IQR)      | 69.7 (37.5-131.4)                      | 74.5 (38.6-131)   | 26.6 (16.6-42.1)  | 20.6 (14.8-32.6)  | 9.5 (4.8-13.9)          | 10.2 (5.2-14.2) | 2.7 (1.6-4.6)   | 2.3 (1.5-4.1)   | 1.2 (0.4-2.6) | 1 (0.4-2.2)   | 0.2 (0-0.9)   | 0.2 (0-0.6)   |
| <b>Post Birth</b> |  |                   |                   |                   |                         |                 |                 |                 |               |               |               |               |
| N                 | 163                                    | 163               | 164               | 164               | 109                     | 109             | 123             | 123             | 150           | 150           | 148           | 148           |
| Average (SD)      | 117.9 (164.9)                          | 91.5 (120)        | 56.3 (164.7)      | 49.9 (185.6)      | 9.9 (7.7)               | 8.6 (10.1)      | 3.9 (6)         | 3 (4)           | 2 (2.6)       | 1.7 (2.3)     | 1.3 (2.6)     | 0.7 (1.4)     |
| Range             | 10.5 - 1551.7                          | 10.8 - 910.8      | 10 - 1905.2       | 10.4 - 2240.5     | 1.4 - 49.9              | 1.4 - 91.2      | 0.9 - 53.3      | 0.9 - 41.1      | 0 - 15.8      | 0 - 16.7      | 0 - 17.8      | 0 - 12.4      |
| Median (IQR)      | 75.6 (36.4-126.8)                      | 54.9 (28.9-109)   | 26.1 (14.9-43.2)  | 20.3 (14.9-30.3)  | 8.1 (4.3-13.6)          | 5.9 (2.6-11.7)  | 2 (1.6-3.8)     | 1.6 (1.5-3)     | 1.2 (0.4-2.7) | 0.8 (0.3-2.2) | 0.3 (0.1-1.3) | 0.2 (0-0.7)   |

**Table S12. Comparison of personal exposures to PM<sub>2.5</sub> between pregnant and non-pregnant adult women in the same households by arm and study period**

| PM2.5 Exposure (µg/m <sup>3</sup> ) | Guatemala         |                   |                  |                    | India             |                 |                   |                   | Peru              |                  |                   |                   | Rwanda           |                   |                   |                   | Overall           |                   |                   |                  |
|-------------------------------------|-------------------|-------------------|------------------|--------------------|-------------------|-----------------|-------------------|-------------------|-------------------|------------------|-------------------|-------------------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------|
|                                     | Control           |                   | Intervention     |                    | Control           |                 | Intervention      |                   | Control           |                  | Intervention      |                   | Control          |                   | Intervention      |                   | Control           |                   | Intervention      |                  |
|                                     | OAW               | MOM               | OAW              | MOM                | OAW               | MOM             | OAW               | MOM               | OAW               | MOM              | OAW               | MOM               | OAW              | MOM               | OAW               | MOM               | OAW               | MOM               | OAW               | MOM              |
| <b>Baseline</b>                     |                   |                   |                  |                    |                   |                 |                   |                   |                   |                  |                   |                   |                  |                   |                   |                   |                   |                   |                   |                  |
| N                                   | 63                | 63                | 68               | 68                 | 43                | 43              | 41                | 41                | 51                | 51               | 49                | 49                | 23               | 23                | 16                | 16                | 180               | 180               | 174               | 174              |
| Average (SD)                        | 125.4 (86.7)      | 113.3 (92.6)      | 156.6 (141.2)    | 139.4 (95.8)       | 99.4 (95.9)       | 111.8 (113.1)   | 118.4 (146.5)     | 153.4 (245.4)     | 95.3 (97.8)       | 61.1 (66.7)      | 148.4 (292.8)     | 105.2 (143.9)     | 125.6 (96.4)     | 102.6 (80.3)      | 189.9 (502.6)     | 123.1 (121.7)     | 110.7 (93.7)      | 96.8 (92.3)       | 148.3 (242.4)     | 131.6 (157.7)    |
| Range                               | 13.7 - 471.8      | 10 - 374.7        | 17.3 - 803.4     | 10 - 429.2         | 10 - 531.4        | 11.5 - 568.1    | 10 - 759.6        | 10 - 1382.2       | 12.5 - 427.4      | 12.5 - 310.7     | 12.5 - 1916.7     | 12.6 - 788        | 14.7 - 458.2     | 20.5 - 405.8      | 19.8 - 2063.2     | 20.8 - 399.3      | 10 - 531.4        | 10 - 568.1        | 10 - 2063.2       | 10 - 1382.2      |
| Median (IQR)                        | 108.5 (73.1-145)  | 83.1 (49.1-155.9) | 121 (76.8-181.4) | 130.7 (66.8-179.9) | 69.6 (38.5-123.8) | 76 (54.6-122.3) | 72.1 (40.7-133.9) | 83.6 (46.1-128.6) | 60.3 (28.1-123.9) | 35.4 (14.9-82.6) | 59.3 (24.6-123.2) | 51.4 (21.9-118.9) | 101.8 (61-160.3) | 84.2 (48.7-134)   | 52.4 (43.4-170.5) | 89.3 (44.3-135.6) | 72.6 (35.5-116.1) | 83.5 (43.5-159.2) | 83.9 (42.9-159.6) |                  |
| <b>Pregnancy</b>                    |                   |                   |                  |                    |                   |                 |                   |                   |                   |                  |                   |                   |                  |                   |                   |                   |                   |                   |                   |                  |
| N                                   | 60                | 60                | 62               | 62                 | 44                | 44              | 48                | 48                | 49                | 49               | 51                | 51                | 22               | 22                | 16                | 16                | 175               | 175               | 177               | 177              |
| Average (SD)                        | 158.5 (191)       | 127.2 (105.2)     | 34.9 (25.4)      | 26.2 (14.9)        | 105.1 (94.4)      | 122.7 (100.9)   | 50.4 (120.9)      | 29.1 (15.6)       | 73.7 (91.4)       | 88.7 (195)       | 69.6 (181.7)      | 19.5 (13.9)       | 78.4 (61.2)      | 88.4 (56.1)       | 35.5 (19.1)       | 33 (11.6)         | 111.3 (136.5)     | 110.4 (132.2)     | 49.1 (117.3)      | 25.7 (15.1)      |
| Range                               | 11.8 - 1041.1     | 11.8 - 513.7      | 10 - 120.2       | 10 - 62.6          | 10.2 - 375.7      | 26.1 - 506.1    | 10.1 - 745.6      | 11.7 - 87         | 13.1 - 531.2      | 12.5 - 1116.9    | 12.4 - 1271       | 12.1 - 102.4      | 23 - 295.6       | 37.2 - 209        | 14.6 - 92.2       | 12.5 - 55.1       | 10.2 - 1041.1     | 11.8 - 1116.9     | 10 - 1271         | 10 - 102.4       |
| Median (IQR)                        | 99.4 (58.7-178)   | 91.1 (52.7-155.2) | 28.1 (17.4-42.1) | 22.1 (12.6-32.6)   | 72.2 (36.9-122.7) | 85.4 (56.7-179) | 25.5 (17.7-38.5)  | 26 (17.8-34.5)    | 45.4 (17.2-79.9)  | 30.5 (15-54.4)   | 24.6 (14.7-53.7)  | 15 (14.2-19)      | 65.4 (44.4-76.9) | 60.2 (46.2-112.6) | 30.2 (21.2-43.8)  | 33.1 (23.9-38.8)  | 69.7 (37.5-131.4) | 74.5 (38.6-131)   | 26.6 (16.6-42.1)  | 20.6 (14.8-32.6) |
| <b>Post Birth</b>                   |                   |                   |                  |                    |                   |                 |                   |                   |                   |                  |                   |                   |                  |                   |                   |                   |                   |                   |                   |                  |
| N                                   | 59                | 59                | 49               | 49                 | 47                | 47              | 48                | 48                | 38                | 38               | 56                | 56                | 19               | 19                | 11                | 11                | 163               | 163               | 164               | 164              |
| Average (SD)                        | 138 (134.8)       | 103 (113.2)       | 39.5 (33.8)      | 24.7 (20.8)        | 87.6 (68.7)       | 103.4 (89.9)    | 47.6 (60.1)       | 43.4 (45.6)       | 137.2 (282.7)     | 63.1 (163.9)     | 82 (274.3)        | 40.7 (109.1)      | 92.3 (68)        | 83.4 (99.8)       | 38.6 (16.3)       | 238.1 (664.2)     | 117.9 (164.9)     | 91.5 (120)        | 56.3 (164.7)      | 49.9 (185.6)     |
| Range                               | 12 - 756.5        | 20.1 - 788.1      | 11.1 - 171.4     | 11.6 - 158.1       | 13.7 - 292.4      | 12.7 - 423.9    | 10 - 368.1        | 13.5 - 235.5      | 10.5 - 1551.7     | 10.8 - 910.8     | 10.7 - 1905.2     | 10.4 - 647.1      | 29.7 - 335.2     | 21.2 - 471.4      | 19.9 - 64.7       | 15.5 - 2240.5     | 10.5 - 1551.7     | 10.8 - 910.8      | 10 - 1905.2       | 10.4 - 2240.5    |
| Median (IQR)                        | 92.1 (64.2-167.5) | 69.5 (41-128.3)   | 28.6 (15.5-44.7) | 20.5 (17.2-26.4)   | 67.9 (42.7-108.7) | 90.1 (39.4-127) | 27.4 (21.3-43.9)  | 28.5 (21.6-51)    | 30.8 (16.9-95.8)  | 14.9 (12.3-28.9) | 15.5 (12.5-36.1)  | 13.9 (11.8-16.9)  | 73 (56.5-94.8)   | 54.9 (41.7-80.1)  | 37.7 (23.5-51.7)  | 42.4 (26.9-52)    | 75.6 (36.4-126.8) | 54.9 (28.9-109)   | 26.1 (14.9-43.2)  | 20.3 (14.9-30.3) |

Note: OAW – non-pregnant other adult women, MOM – pregnant women.

**Table S13. Comparison of personal exposures to BC between pregnant and non-pregnant adult women in the same households by arm and study period**

| BC Exposure (µg/m <sup>3</sup> ) | Guatemala       |                 |                 |                 | India           |                 |               |                | Peru          |               |                 |                 | Rwanda           |               |               |                | Overall        |                 |                 |                 |             |
|----------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|---------------|----------------|---------------|---------------|-----------------|-----------------|------------------|---------------|---------------|----------------|----------------|-----------------|-----------------|-----------------|-------------|
|                                  | Control         |                 | Intervention    |                 | Control         |                 | Intervention  |                | Control       |               | Intervention    |                 | Control          |               | Intervention  |                | Control        |                 | Intervention    |                 |             |
|                                  | OAW             | MOM             | OAW             | MOM             | OAW             | MOM             | OAW           | MOM            | OAW           | MOM           | OAW             | MOM             | OAW              | MOM           | OAW           | MOM            | OAW            | MOM             | OAW             | MOM             |             |
| <b>Baseline</b>                  |                 |                 |                 |                 |                 |                 |               |                |               |               |                 |                 |                  |               |               |                |                |                 |                 |                 |             |
| N                                | 52              | 52              | 64              | 64              | 41              | 41              | 39            | 39             | 40            | 40            | 41              | 41              | 15               | 15            | 8             | 8              | 148            | 148             | 152             | 152             |             |
| Average (SD)                     | 12.7 (5.6)      | 11.9 (7.8)      | 13.3 (6.7)      | 13.2 (9.5)      | 13.6 (11.3)     | 13.6 (11)       | 12.1 (9.5)    | 12.3 (12.3)    | 14.2 (14.8)   | 11.7 (14.8)   | 10.1 (11.6)     | 13.7 (13.5)     | 12.9 (4.2)       | 11.7 (4.5)    | 5.9 (2.6)     | 10.8 (10.8)    | 12.3 (10.3)    | 12.7 (10.3)     | 11.8 (9.6)      | 12.5 (9.2)      | 13.6 (11.4) |
| Range                            | 1.1 - 29        | 1.7 - 55        | 4.3 - 46.8      | 1.5 - 77.2      | 1.6 - 69.2      | 1.6 - 54        | 1.5 - 33.3    | 1.4 - 48.8     | 1.4 - 72.3    | 1.5 - 66.1    | 1.4 - 49.3      | 1.4 - 65.7      | 6.2 - 20.1       | 4.8 - 20.3    | 2.8 - 8.9     | 2.9 - 31.9     | 1.1 - 72.3     | 1.5 - 66.1      | 1.4 - 49.3      | 1.4 - 77.2      |             |
| Median (IQR)                     | 11.6 (9.3-15.9) | 10.9 (7.8-13.3) | 12.4 (9.7-14.9) | 11.5 (9.2-14.7) | 11.7 (6.2-17.2) | 10.5 (8.8-15.8) | 8 (4.2-20.6)  | 7.6 (4.9-24.1) | 6 (1.6-14.8)  | 6.3 (2-13.3)  | 10.1 (3.4-16.1) | 10.6 (2.3-19.7) | 11.1 (10.1-15.9) | 11.8 (9-14.8) | 5.8 (3.8-8.4) | 6.8 (4.8-19.2) | 11 (6.2-16.1)  | 10.5 (6.4-14.5) | 10.9 (6.7-15.7) | 11.2 (6.3-16.6) |             |
| <b>Pregnancy</b>                 |                 |                 |                 |                 |                 |                 |               |                |               |               |                 |                 |                  |               |               |                |                |                 |                 |                 |             |
| N                                | 60              | 60              | 61              | 61              | 44              | 44              | 48            | 48             | 43            | 43            | 49              | 49              | 19               | 19            | 14            | 14             | 166            | 166             | 172             | 172             |             |
| Average (SD)                     | 11.8 (4.9)      | 11.3 (4.8)      | 4.7 (3.3)       | 4 (3.1)         | 11.7 (7.8)      | 13.3 (7.9)      | 3 (2)         | 3.2 (2.3)      | 8.6 (13.3)    | 8 (12)        | 2.2 (1.6)       | 1.8 (0.9)       | 8.3 (4.6)        | 11.2 (6.5)    | 4.2 (1.5)     | 4 (1.3)        | 10.5 (8.6)     | 11 (8.3)        | 3.5 (2.6)       | 3.1 (2.5)       |             |
| Range                            | 1 - 23.7        | 2.1 - 22.3      | 0.9 - 16.6      | 0.9 - 19.1      | 1.6 - 33.8      | 2.6 - 35.2      | 1.4 - 9.1     | 1.4 - 11.7     | 1.4 - 83.9    | 1.3 - 65.3    | 1.4 - 10.6      | 1.4 - 7.7       | 3.4 - 21.5       | 4.3 - 28.1    | 2.8 - 6.6     | 2.5 - 6.3      | 1 - 83.9       | 1.3 - 65.3      | 0.9 - 16.6      | 0.9 - 19.1      |             |
| Median (IQR)                     | 11.4 (8.8-14.5) | 11.3 (7.4-14.3) | 3.5 (2.2-6.3)   | 3.4 (2.1-5)     | 11.1 (5.2-16.1) | 12.5 (7.3-15.1) | 2.2 (1.6-3.9) | 2.3 (1.6-3.6)  | 5.4 (1.5-9.7) | 3.9 (1.5-8.6) | 1.5 (1.5-2.2)   | 1.5 (1.5-1.6)   | 7.6 (5.2-9.5)    | 9 (6.5-14.9)  | 3.8 (2.9-5.1) | 3.8 (2.9-5)    | 9.5 (4.8-13.9) | 10.2 (5.2-14.2) | 2.7 (1.6-4.6)   | 2.3 (1.5-4.1)   |             |
| <b>Post Birth</b>                |                 |                 |                 |                 |                 |                 |               |                |               |               |                 |                 |                  |               |               |                |                |                 |                 |                 |             |
| N                                | 12              | 12              | 16              | 16              | 47              | 47              | 48            | 48             | 32            | 32            | 50              | 50              | 18               | 18            | 9             | 9              | 109            | 109             | 123             | 123             |             |
| Average (SD)                     | 14.5 (4.6)      | 11.2 (4.8)      | 5 (4.6)         | 3.7 (3.3)       | 10.9 (9.5)      | 12.4 (13.6)     | 4.2 (7.6)     | 3.8 (5.8)      | 6.9 (6.2)     | 2.7 (1.8)     | 3.2 (5.2)       | 1.7 (0.6)       | 9.3 (3.9)        | 7.6 (3.3)     | 4.3 (1.2)     | 4.2 (1.1)      | 9.9 (7.7)      | 8.6 (10.1)      | 3.9 (6)         | 3 (4)           |             |
| Range                            | 7.7 - 23        | 5 - 20.2        | 0.9 - 17.4      | 0.9 - 12.1      | 1.6 - 49.9      | 2 - 91.2        | 1.5 - 53.3    | 1.6 - 41.1     | 1.4 - 25.1    | 1.4 - 7.5     | 1.4 - 36.1      | 1.4 - 4         | 2.8 - 17.2       | 2.8 - 14.4    | 2.9 - 6.6     | 2.8 - 5.7      | 1.4 - 49.9     | 1.4 - 91.2      | 0.9 - 53.3      | 0.9 - 41.1      |             |
| Median (IQR)                     | 13.1 (12-16)    | 10.8 (7.4-13.2) | 3.3 (1.7-5.9)   | 2.2 (1.5-4.5)   | 8.1 (4.4-14.8)  | 8.8 (4.9-15.9)  | 2.1 (1.6-3.6) | 2.3 (1.6-4)    | 4.9 (2.2-9.9) | 1.5 (1.5-4.2) | 1.5 (1.5-2.5)   | 1.5 (1.5-1.5)   | 8.7 (6.7-12.3)   | 6.9 (5.6-9.6) | 4 (3.6-4.9)   | 4.4 (3-5)      | 8.1 (4.3-13.6) | 5.9 (2.6-11.7)  | 2 (1.6-3.8)     | 1.6 (1.5-3)     |             |

Note: OAW – non-pregnant other adult women, MOM – pregnant women.

**Table S14. Comparison of personal exposures to CO between pregnant and non-pregnant adult women in the same households by arm and study period**

| CO Exposure (ppm) | Guatemala     |               |               |               | India         |               |               |               | Peru          |               |               |               | Rwanda        |               |               |               | Overall       |               |               |               |
|-------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
|                   | Control       |               | Intervention  |               | Control       |               | Intervention  |               | Control       |               | Intervention  |               | Control       |               | Intervention  |               | Control       |               | Intervention  |               |
|                   | OAW           | MOM           | OAW           | MOM           | OAW           | MOM           | OAW           | MOM           | OAW           | MOM           | OAW           | MOM           | OAW           | MOM           | OAW           | MOM           | OAW           | MOM           | OAW           | MOM           |
| <b>Baseline</b>   |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |
| N                 | 57            | 57            | 61            | 61            | 40            | 40            | 36            | 36            | 39            | 39            | 37            | 37            | 15            | 15            | 17            | 17            | 151           | 151           | 151           | 151           |
| Average (SD)      | 1.9 (2)       | 1.6 (2.1)     | 1.7 (1.5)     | 1.6 (1.5)     | 1.3 (1.4)     | 1.5 (1.8)     | 1.9 (3.9)     | 2.8 (4)       | 4.1 (4)       | 2.7 (3.6)     | 3.9 (6.6)     | 3.9 (6.7)     | 1.1 (1)       | 1 (1.1)       | 1.5 (2.4)     | 2.6 (5.4)     | 2.2 (2.7)     | 1.8 (2.5)     | 2.3 (4.1)     | 2.6 (4.4)     |
| Range             | 0.1 - 9.5     | 0 - 12.6      | 0 - 7.5       | 0 - 8.3       | 0 - 6.3       | 0 - 10        | 0 - 21.4      | 0 - 19.9      | 0 - 18.1      | 0 - 16.8      | 0 - 38.7      | 0 - 32.4      | 0.1 - 3.8     | 0 - 3.5       | 0 - 8.9       | 0 - 22.5      | 0 - 18.1      | 0 - 16.8      | 0 - 38.7      | 0 - 32.4      |
| Median (IQR)      | 1.3 (0.6-2.4) | 0.7 (0.4-1.9) | 1.4 (0.5-2.6) | 1.2 (0.5-2.2) | 0.8 (0.3-2.1) | 1.1 (0.3-2)   | 0.8 (0.2-2.1) | 1.4 (0.2-3.6) | 2.9 (1.5-6.4) | 1.4 (0.5-2.8) | 2 (1.2-3.3)   | 1.5 (0.9-3.6) | 0.9 (0.4-1.5) | 0.6 (0.3-1.1) | 0.3 (0.1-1.3) | 0.3 (0.2-2.5) | 1.4 (0.5-2.9) | 0.9 (0.4-2.1) | 1.4 (0.4-2.7) | 1.3 (0.4-2.8) |
| <b>Pregnancy</b>  |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |
| N                 | 59            | 59            | 65            | 65            | 45            | 45            | 49            | 49            | 33            | 33            | 46            | 46            | 22            | 22            | 13            | 13            | 159           | 159           | 173           | 173           |
| Average (SD)      | 2.1 (2.9)     | 1.7 (1.6)     | 0.6 (0.8)     | 0.5 (0.8)     | 2.4 (3.6)     | 2.7 (4.2)     | 0.4 (1.4)     | 0.2 (0.3)     | 2.1 (2.4)     | 2.5 (5.5)     | 1.8 (2.4)     | 1 (1.2)       | 0.8 (0.9)     | 1.3 (1.3)     | 1.3 (3.3)     | 0.8 (1.8)     | 2 (2.9)       | 2.1 (3.5)     | 0.9 (1.9)     | 0.5 (1)       |
| Range             | 0 - 20.7      | 0 - 8         | 0 - 3.6       | 0 - 4.5       | 0 - 17        | 0 - 24.7      | 0 - 9.5       | 0 - 1.4       | 0 - 10.6      | 0 - 27.6      | 0 - 14.1      | 0 - 5.3       | 0 - 2.8       | 0 - 4.9       | 0 - 12.3      | 0 - 6.7       | 0 - 20.7      | 0 - 27.6      | 0 - 14.1      | 0 - 6.7       |
| Median (IQR)      | 1.5 (0.6-2.6) | 1.3 (0.6-2.2) | 0.3 (0.1-0.8) | 0.2 (0.1-0.5) | 1.1 (0.3-2.8) | 1.2 (0.4-2.8) | 0 (0-0.1)     | 0 (0-0.3)     | 1.3 (0.4-3.3) | 1 (0.3-1.6)   | 0.9 (0.3-2.6) | 0.5 (0.1-1.4) | 0.4 (0.1-1.4) | 0.8 (0.3-1.8) | 0.3 (0.1-0.7) | 0.1 (0.1-0.4) | 1.2 (0.4-2.6) | 1 (0.4-2.2)   | 0.2 (0-0.9)   | 0.2 (0-0.6)   |
| <b>Post Birth</b> |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |
| N                 | 57            | 57            | 48            | 48            | 47            | 47            | 50            | 50            | 29            | 29            | 37            | 37            | 17            | 17            | 13            | 13            | 150           | 150           | 148           | 148           |
| Average (SD)      | 1.5 (1.7)     | 1.2 (1.2)     | 0.5 (0.5)     | 0.3 (0.6)     | 1.6 (1.4)     | 2.2 (3.3)     | 0.5 (0.9)     | 0.3 (0.4)     | 3.8 (4.4)     | 2.3 (2.6)     | 3.5 (4.4)     | 1.5 (2.3)     | 1.7 (1.8)     | 0.8 (0.8)     | 1.5 (1.8)     | 0.9 (1.6)     | 2 (2.6)       | 1.7 (2.3)     | 1.3 (2.6)     | 0.7 (1.4)     |
| Range             | 0 - 8.6       | 0 - 5         | 0 - 2         | 0 - 3.2       | 0 - 5.1       | 0 - 16.7      | 0 - 4.1       | 0 - 1.8       | 0 - 15.8      | 0.1 - 8.2     | 0 - 17.8      | 0 - 12.4      | 0 - 6.8       | 0 - 2.5       | 0 - 5.4       | 0 - 5.9       | 0 - 15.8      | 0 - 16.7      | 0 - 17.8      | 0 - 12.4      |
| Median (IQR)      | 1 (0.4-1.9)   | 0.8 (0.3-1.8) | 0.3 (0.1-0.6) | 0.1 (0-0.4)   | 1.4 (0.4-2.5) | 1.1 (0.5-2.7) | 0.2 (0-0.7)   | 0.1 (0-0.4)   | 2.7 (0.5-5.2) | 0.8 (0.4-3.3) | 1.7 (0.5-5)   | 0.7 (0.3-2)   | 1.2 (0.4-2.4) | 0.6 (0.1-1.4) | 0.8 (0.2-1.7) | 0.3 (0.1-0.9) | 1.2 (0.4-2.7) | 0.8 (0.3-2.2) | 0.3 (0.1-1.3) | 0.2 (0-0.7)   |

Note: OAW – non-pregnant other adult women, MOM – pregnant women.



**Table S15. Correlation (Spearman’s  $\rho$ ) of personal measures of exposure between non-pregnant and pregnant adult women by pollutant, stove-type, IRC, and study period**

| IRC                      | PM2.5 |             | BC   |             | CO   |             |
|--------------------------|-------|-------------|------|-------------|------|-------------|
|                          | LPG   | Traditional | LPG  | Traditional | LPG  | Traditional |
| <b>Baseline Period</b>   |       |             |      |             |      |             |
| All                      | ---   | 0.63        | ---  | 0.66        | ---  | 0.54        |
| Guatemala                | ---   | 0.73        | ---  | 0.54        | ---  | 0.48        |
| India                    | ---   | 0.71        | ---  | 0.72        | ---  | 0.56        |
| Peru                     | ---   | 0.48        | ---  | 0.70        | ---  | 0.54        |
| Rwanda                   | ---   | 0.36        | ---  | 0.23        | ---  | 0.61        |
| <b>Pregnancy Period</b>  |       |             |      |             |      |             |
| All                      | 0.52  | 0.68        | 0.74 | 0.80        | 0.44 | 0.51        |
| Guatemala                | 0.72  | 0.70        | 0.70 | 0.73        | 0.27 | 0.69        |
| India                    | 0.55  | 0.80        | 0.72 | 0.87        | 0.15 | 0.72        |
| Peru                     | 0.39  | 0.47        | 0.30 | 0.75        | 0.45 | 0.13        |
| Rwanda                   | 0.42  | 0.46        | 0.68 | 0.40        | 0.62 | 0.23        |
| <b>Post-birth Period</b> |       |             |      |             |      |             |
| All                      | 0.39  | 0.53        | 0.71 | 0.62        | 0.35 | 0.46        |
| Guatemala                | 0.43  | 0.68        | 0.84 | 0.22        | 0.19 | 0.45        |
| India                    | 0.61  | 0.82        | 0.84 | 0.81        | 0.26 | 0.48        |
| Peru                     | 0.18  | -0.14       | 0.40 | 0.09        | 0.17 | 0.38        |
| Rwanda                   | 0.72  | 0.25        | 0.73 | 0.38        | 0.21 | 0.61        |

Trial-wide, we observed moderate to strong correlations (Spearman’s  $\rho$  range: 0.39 – 0.80) for all three pollutants between non-pregnant and pregnant participants living in the same household (**Table S11**). At baseline, the correlations between participant types were 0.63, 0.66, and 0.54 for PM2.5, BC, and CO exposures, respectively. During the pregnancy period, we observed slightly lower, yet still moderate, correlations among participants in LPG-using households compared to those using biomass for PM2.5 (0.52 vs. 0.68), BC (0.74 vs. 0.80), and CO (0.44 vs. 0.51) alike. During the post-birth period, correlations between participant types remained lower among LPG users compared to those using biomass for PM2.5 (0.39 vs. 0.53) and CO (0.35 vs. 0.46); however, the contrary was true for BC (0.71 vs. 0.62).

**Table S16. Personal exposures from comparable household air pollution studies**

| Author                | Yr   | Study Location      | Study Population    | Age (years)       | Fuel    | Descriptive Statistic | PM ( $\mu\text{g}/\text{m}^3$ ) | BC ( $\mu\text{g}/\text{m}^3$ ) | CO (ppm)                         |
|-----------------------|------|---------------------|---------------------|-------------------|---------|-----------------------|---------------------------------|---------------------------------|----------------------------------|
| Johnson et al.        | 2022 | All study sites     | Pregnant Women      | 18 - 35           | LPG     | Median                | 23.7 - 24.1                     | 2.7 - 2.8                       | 0.2                              |
|                       |      | Guatemala           |                     |                   |         |                       | 23.3 - 23.8                     | 2.7 - 2.9                       | 0.1 - 0.2                        |
|                       |      | India               |                     |                   |         |                       | 25.3 - 28.7                     | 2.1 - 2.5                       | 0                                |
|                       |      | Peru                |                     |                   |         |                       | 14.6                            | 1.6                             | 0                                |
|                       |      | Rwanda              |                     |                   |         |                       | 28.2 - 33.6                     | 3.8 - 4.2                       | 0.2                              |
| Fandino et al.        | 2022 | Peru                | Nonpregnant Women   | 25 - 64           | LPG     | Arithmetic Mean       | 17 - 26                         | 2                               | 3                                |
| Fandino et al.        | 2022 | Peru                | Nonpregnant Women   | 25 - 64           | Biomass | Arithmetic Mean       | 104 - 126                       | 2                               | 3                                |
| Young et al.          | 2019 | Honduras            | Nonpregnant Women   | 25 - 56           | Biomass | Arithmetic Mean       | 101                             | 17                              |                                  |
| Okello et al.         | 2018 | Uganda and Ethiopia | Elderly Women       | >50               | Biomass | Geometric Mean        | 45.6 - 63.9                     |                                 | 0.2 - 0.5                        |
| Thornburg et al.      | 2022 | Bangladesh          | Pregnant Women      | 15 - 37           | Biomass | Arithmetic Mean       | 81.3                            | 56.4                            |                                  |
| Thornburg et al.      | 2022 | Bangladesh          | Pregnant Women      | 15 - 37           | LPG     | Arithmetic Mean       | 63.1                            | 54                              |                                  |
| Raqib et al.          | 2023 | Bangladesh          | Adult Women         | 25 - 65           | Biomass | Arithmetic Mean       | 158.9                           | 7.4                             | 1.0 ( $\mu\text{g}/\text{m}^3$ ) |
| Raqib et al.          | 2023 | Bangladesh          | Adult Women         | 25 - 65           | LPG     | Arithmetic Mean       | 85.6                            | 6.3                             | 0.3 ( $\mu\text{g}/\text{m}^3$ ) |
| Chillrud et al.       | 2021 | Ghana               | Pregnant Women      | 27 - 28 (Average) | Biomass | Arithmetic Mean       | 73 - 77                         |                                 | 1.1 - 1.3                        |
| Chillrud et al.       | 2021 | Ghana               | Pregnant Women      | 27 - 28 (Average) | LPG     | Arithmetic Mean       | 52                              |                                 | 0.9                              |
| Estevez-Garcia et al. | 2020 | Mexico              | Women               | N/A               | Biomass | Arithmetic Mean       | 69.4                            |                                 |                                  |
| Estevez-Garcia et al. | 2020 | Mexico              | Women               | N/A               | LPG     | Arithmetic Mean       | 51.9                            |                                 |                                  |
| Gould et al.          | 2020 | Ecuador             | Adult Men and Women | 18 - 84           | Biomass | Arithmetic Mean       | 50.8                            |                                 |                                  |
| Gould et al.          | 2020 | Ecuador             | Adult Men and Women | 18 - 84           | LPG     | Arithmetic Mean       | 22.4                            |                                 |                                  |
| Pillarsetti et al.    | 2019 | India               | Pregnant Women      | 22 - 24 (Average) | Biomass | Arithmetic Mean       | 520                             |                                 |                                  |
| Pillarsetti et al.    | 2019 | India               | Pregnant Women      | 22 - 24 (Average) | LPG     | Arithmetic Mean       | 72                              |                                 |                                  |

|                    |      |                  |                    |              |         |                 |              |                      |  |
|--------------------|------|------------------|--------------------|--------------|---------|-----------------|--------------|----------------------|--|
| Weinstein et al.   | 2020 | Guatemala        | Pregnant Women     | 18 - 39      | Biomass | Median          | 102          |                      |  |
| Weinstein et al.   | 2020 | Guatemala        | Pregnant Women     | 18 - 39      | LPG     | Median          | 45           |                      |  |
| Grajeda et al.     | 2020 | Guatemala        | Pregnant Women     | 18 - 40      | Biomass | Median          | 78           |                      |  |
| Grajeda et al.     | 2020 | Guatemala        | Pregnant Women     | 18 - 40      | LPG     | Media           | 55           |                      |  |
| Curto et al.       | 2019 | Mozambique       | Childbearing Women | Dec-49       | Biomass | Arithmetic Mean |              | 18.6                 |  |
| Alexander et al.   | 2018 | Nigeria          | Pregnant Women     | 14 - 44      | Biomass | Arithmetic Mean | 66 - 364     |                      |  |
| Alexander et al.   | 2018 | Nigeria          | Pregnant Women     | 14 - 44      | Ethanol | Arithmetic Mean | 61 - 352     |                      |  |
| Shupler et al.     | 2020 | Overall          | Adult Women        | 43 - 84      | Biomass | Geometric Mean  | 71 - 147     |                      |  |
| Shupler et al.     | 2020 | Overall          | Adult Women        | 43 - 84      | LPG     | Geometric Mean  | 48           |                      |  |
| Shupler et al.     | 2020 | India            | Adult Women        | 43 - 84      | Biomass | Geometric Mean  | 89 - 150     |                      |  |
| Shupler et al.     | 2020 | India            | Adult Women        | 43 - 84      | LPG     | Geometric Mean  | 56           |                      |  |
| Shupler et al.     | 2020 | Other South Asia | Adult Women        | 43 - 84      | Biomass | Geometric Mean  | 147 - 183    |                      |  |
| Shupler et al.     | 2020 | South America    | Adult Women        | 43 - 84      | Biomass | Geometric Mean  | 39           |                      |  |
| Shupler et al.     | 2020 | South America    | Adult Women        | 43 - 84      | LPG     | Geometric Mean  | 23           |                      |  |
| Shupler et al.     | 2020 | Africa           | Adult Women        | 43 - 84      | Biomass | Geometric Mean  | 153          |                      |  |
| Shupler et al.     | 2024 | Africa           | Cooks              | 35 (SD 11)   | LPG     | Geometric Mean  | 43 (23-76)   | 0.57<br>(0.12–2.49)  |  |
| Shupler et al.     | 2024 | Africa           | Children           | 3.1 (SD 1.3) | LPG     | Geometric Mean  | 47 (18–128)  |                      |  |
| Shupler et al.     | 2024 | Africa           | Cooks              | 37 (SD 12)   | Wood    | Geometric Mean  | 101 (55–194) | 2.52<br>(0.56–14.09) |  |
| Shupler et al.     | 2024 | Africa           | Children           | 3.1 (SD 1.3) | Wood    | Geometric Mean  | 107 (32–275) |                      |  |
| Benka-Coker et al. | 2021 | Honduras         | Adult Women        | 24 - 59      | Biomass | Median          | 37 - 47      |                      |  |
| Benka-Coker et al. | 2021 | Honduras         | Adult Women        | 24 - 59      | Biomass | Median          | 76 - 86      |                      |  |
| Young et al.       | 2022 | Honduras         | Adult Women        | 24 - 59      | Biomass | Median          |              | 3.5                  |  |
| Young et al.       | 2022 | Honduras         | Adult Women        | 24 - 59      | Biomass | Median          |              | 11.8                 |  |

**Table S17. Household and participants characteristics at baseline, by IRC and study arm**

| Variable                                     | Guatemala           |                          | India               |                          | Peru                |                          | Rwanda              |                          | Overall              |                           |
|--|---------------------|--------------------------|---------------------|--------------------------|---------------------|--------------------------|---------------------|--------------------------|----------------------|---------------------------|
|  | Control<br>(n = 67) | Intervention<br>(n = 71) | Control<br>(n = 51) | Intervention<br>(n = 53) | Control<br>(n = 67) | Intervention<br>(n = 66) | Control<br>(n = 24) | Intervention<br>(n = 19) | Control<br>(n = 209) | Intervention<br>(n = 209) |
| <i>Household and kitchen characteristics</i> |                     |                          |                     |                          |                     |                          |                     |                          |                      |                           |
| <b>Hosuehold Size</b>                        |                     |                          |                     |                          |                     |                          |                     |                          |                      |                           |
| Mean (SD)                                    | 7.8 (3.0)           | 7.7 (2.8)                | 4.3 (1.4)           | 4.4 (1.3)                | 5.8 (1.9)           | 5.4 (1.7)                | 6.1 (2.2)           | 5.7 (2.2)                | 6.1 (2.6)            | 5.9 (2.5)                 |
| Range  | 3-18                | 3-17                     | 2-8                 | 2-9                      | 3-12                | 2-10                     | 3-10                | 2-10                     | 2-18                 | 2-17                      |
| <b>Access to electricity (n (%))</b>         |                     |                          |                     |                          |                     |                          |                     |                          |                      |                           |
| No   | 2 (3%)              | 5 (7%)                   | 2 (3.9%)            | 1 (1.9%)                 | 6 (9%)              | 2 (3%)                   | 16 (66.7%)          | 12 (63.2%)               | 26 (12.4%)           | 20 (9.6%)                 |
| Yes  | 65 (97%)            | 66 (93%)                 | 49 (96.1%)          | 52 (98.1%)               | 61 (91%)            | 64 (97%)                 | 7 (29.2%)           | 5 (26.3%)                | 182 (87.1%)          | 187 (89.5%)               |
| Missing                                      | 0                   | 0                        | 0                   | 0                        | 0                   | 0                        | 1 (4.2%)            | 2 (10.5%)                | 1 (0.5%)             | 2 (1.0%)                  |
| <b>Kitchen volume (m3)</b>                   |                     |                          |                     |                          |                     |                          |                     |                          |                      |                           |
| Mean (SD)                                    | 41.4 (17.7)         | 38.7 (14.0)              | 18.3 (13.0)         | 18.5 (13.8)              | 20.5 (9.9)          | 18.1 (10)                | 12.4 (5.7)          | 12.4 (4.5)               | 26.4 (17.6)          | 25.1 (16.1)               |
| Range  | 12.2-85.8           | 10.3-69.9                | 4.2-64.6            | 1.8-61.2                 | 4.4-47              | 4-39.2                   | 4.8-23.5            | 5.5-23.5                 | 4.2 (85.8)           | 1.8 (69.9)                |
| n  | 63                  | 67                       | 51                  | 52                       | 49                  | 51                       | 18                  | 16                       | 180                  | 186                       |
| Missing (n)                                  | 4                   | 4                        | 0                   | 1                        | 19                  | 15                       | 6                   | 3                        | 29                   | 23                        |
| <b>Roof in the kitchen (n (%))</b>           |                     |                          |                     |                          |                     |                          |                     |                          |                      |                           |
| No   | 66 (98.5%)          | 70 (98.6%)               | 0                   | 0                        | 15 (22.4%)          | 10 (15.2%)               | 6 (25%)             | 3 (15.8%)                | 21 (10.0%)           | 14 (6.7%)                 |
| Yes  | 0                   | 1 (1.4%)                 | 51 (100%)           | 53 (100%)                | 52 (77.6%)          | 56 (84.8%)               | 18 (75%)            | 16 (84.2%)               | 187 (89.5%)          | 195 (93.3%)               |
| Missing                                      | 1 (1.5%)            | 0                        | 0                   | 0                        | 0                   | 0                        | 0                   | 0                        | 1 (0.5%)             | 0                         |
| <b>Number of stoves (n (%))</b>              |                     |                          |                     |                          |                     |                          |                     |                          |                      |                           |
| One  | 12 (17.9%)          | 14 (19.7%)               | 29 (56.9%)          | 32 (60.4%)               | 19 (28.4%)          | 18 (27.3%)               | 14 (58.3%)          | 10 (52.6%)               | 74 (35.4%)           | 74 (35.4%)                |
| Two  | 43 (64.2%)          | 40 (56.3%)               | 21 (41.2%)          | 20 (37.7%)               | 41 (61.2%)          | 44 (66.7%)               | 8 (33.3%)           | 8 (42.1%)                | 113 (54.1%)          | 112 (53.6%)               |
| Three or more                                | 12 (17.9%)          | 17 (23.9%)               | 1 (2%)              | 1 (1.9%)                 | 7 (10.4%)           | 4 (6.1%)                 | 1 (4.2%)            | 1 (5.3%)                 | 21 (10.0%)           | 23 (11.0%)                |
| Missing                                      | 0                   | 0                        | 0                   | 0                        | 0                   | 0                        | 1 (4.2%)            | 0                        | 1 (0.5%)             | 0                         |
| <b>Primary stove has a chimney (n (%))</b>   |                     |                          |                     |                          |                     |                          |                     |                          |                      |                           |
| No   | 51 (76.1%)          | 55 (77.5%)               | 51 (100%)           | 52 (98.1%)               | 38 (56.7%)          | 41 (62.1%)               | 22 (91.7%)          | 19 (100%)                | 162 (77.5%)          | 167 (79.9%)               |
| Yes  | 16 (23.9%)          | 16 (22.5%)               | 0                   | 1 (1.9%)                 | 29 (43.3%)          | 25 (37.9%)               | 1 (4.2%)            | 0                        | 46 (22.0%)           | 42 (20.1%)                |
| Missing                                      | 0                   | 0                        | 0                   | 0                        | 0                   | 0                        | 1 (4.2%)            | 0                        | 1 (0.5%)             | 0                         |
| <b>Primary Cook (n (%))</b>                  |                     |                          |                     |                          |                     |                          |                     |                          |                      |                           |
| Pregnant women                               | 37 (55.2%)          | 39 (54.9%)               | 46 (90.2%)          | 48 (90.6%)               | 10 (14.9%)          | 13 (19.7%)               | 17 (73.9%)          | 15 (78.9%)               | 110 (52.9%)          | 115 (55.0%)               |
| Other adult women                            | 29 (43.3%)          | 32 (45.1%)               | 4 (7.8%)            | 5 (9.4%)                 | 56 (83.6%)          | 53 (80.3%)               | 3 (13.0%)           | 1 (5.3%)                 | 92 (44.2%)           | 91 (43.5%)                |
| Other/Missing                                | 1 (1.5%)            | 0                        | 1 (2.0%)            | 0                        | 1 (1.5%)            | 0                        | 3 (13.0%)           | 3 (15.8%)                | 6 (2.9%)             | 3 (1.4%)                  |

**Primary fuel type (n (%))**

|          |           |           |           |           |            |            |            |            |             |             |
|----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|-------------|-------------|
| Cow dung | 0         | 0         | 0         | 0         | 62 (93.9%) | 54 (81.8%) | 0          | 0          | 63 (30.1%)  | 54 (25.8%)  |
| Wood     | 67 (100%) | 70 (100%) | 51 (100%) | 53 (100%) | 4 (6.1%)   | 8 (12.1%)  | 23 (95.8%) | 16 (84.2%) | 145 (69.4%) | 148 (70.8%) |
| Charcoal | 0         | 0         | 0         | 0         | 0          | 0          | 0          | 3 (15.8%)  | 0           | 3 (1.4%)    |
| Other    | 0         | 0         | 0         | 0         | 0          | 4 (6.1%)   | 0          | 0          | 0           | 4 (1.9%)    |
| Missing  | 0         | 0         | 0         | 0         | 0          | 0          | 1 (4.2%)   | 0          | 1 (0.5%)    | 0           |

**Primary stove location (n (%))**

|   |            |            |            |            |            |            |            |            |            |            |
|---|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| In participant's bedroom                                      | 1 (1.5%)   | 1 (1.4%)   | 7 (10%)    | 11 (20.8%) | 0          | 0          | 0          | 1 (5.3%)   | 8 (3.8%)   | 13 (6.2%)  |
| Room immediately adjacent to the participant's bedroom        | 21 (31.3%) | 18 (25.4%) | 22 (43.1%) | 13 (24.5%) | 1 (1.5%)   | 4 (6.1%)   | 0          | 0          | 44 (21.1%) | 35 (16.7%) |
| Separated from the participant's bedroom but inside the house | 27 (40.3%) | 32 (45.1%) | 9 (17.6%)  | 11 (20.8%) | 9 (13.4%)  | 13 (19.7%) | 0          | 2 (10.5%)  | 45 (21.5%) | 58 (27.8%) |
| Outside the house (outdoors)                                  | 1 (1.5%)   | 1 (1.4%)   | 0          | 0          | 18 (26.9%) | 10 (15.2%) | 6 (25%)    | 3 (15.8%)  | 25 (12.0%) | 14 (6.7%)  |
| In a separate building detached from the bedroom-main home    | 17 (25.4%) | 19 (26.8%) | 13 (25.5%) | 18 (34%)   | 39 (58.2%) | 39 (59.1%) | 17 (70.8%) | 13 (68.4%) | 86 (41.1%) | 89 (42.6%) |
| Missing   | 0          | 0          | 0          | 0          | 0          | 0          | 1 (4.2%)   | 0          | 1 (0.5%)   | 0          |

**Primary light source (n (%))**

|                 |          |            |            |            |            |            |            |           |             |             |
|-----------------|----------|------------|------------|------------|------------|------------|------------|-----------|-------------|-------------|
| Torch (battery) | 0        | 0          | 0          | 1 (1.9%)   | 0          | 0          | 4 (16.7%)  | 5 (26.3%) | 4 (1.9%)    | 6 (2.9%)    |
| Kerosene lamp   | 0        | 0          | 3 (5.9%)   | 3 (5.7%)   | 0          | 0          | 1 (4.2%)   | 1 (5.3%)  | 4 (1.9%)    | 4 (1.9%)    |
| Solar light     | 0        | 0          | 0          | 0          | 3 (4.5%)   | 3 (4.5%)   | 10 (41.7%) | 7 (36.8%) | 13 (6.2%)   | 10 (4.8%)   |
| Electricity     | 65 (97%) | 65 (91.5%) | 48 (94.1%) | 49 (92.5%) | 60 (89.6%) | 60 (90.9%) | 6 (25%)    | 4 (21.1%) | 179 (85.6%) | 178 (85.2%) |
| Other           | 2 (3%)   | 6 (8.5%)   | 0          | 0          | 4 (6.0%)   | 3 (4.5%)   | 2 (8.3%)   | 2 (10.5%) | 8 (3.8%)    | 11 (5.3%)   |
| Missing         | 0        | 0          | 0          | 0          | 0          | 0          | 1 (4.2%)   | 0         | 1 (0.5%)    | 0           |

**Presence of a smoker in home (n (%))**

|         |            |            |            |          |           |           |            |            |             |            |
|---------|------------|------------|------------|----------|-----------|-----------|------------|------------|-------------|------------|
| No      | 58 (86.6%) | 64 (90.1%) | 32 (62.7%) | 35 (66%) | 67 (100%) | 66 (100%) | 22 (91.7%) | 17 (89.5%) | 179 (85.6%) | 182 (87.1) |
| Yes     | 9 (13.4%)  | 7 (9.9%)   | 19 (37.3%) | 18 (34%) | 0         | 0         | 1 (4.2%)   | 2 (10.5%)  | 29 (13.9%)  | 27 (12.9%) |
| Missing | 0          | 0          | 0          | 0        | 0         | 0         | 1 (4.2%)   | 0          | 1 (0.5%)    | 0          |

*Participant characteristics***Age (year)**

|           |            |            |            |            |            |            |            |            |            |            |
|-----------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Mean (SD) | 53.3 (6.7) | 53.8 (9.1) | 49.5 (5.7) | 48.6 (7.2) | 52.3 (8.7) | 52.8 (6.9) | 51.0 (8.3) | 55.2 (8.9) | 51.8 (7.5) | 52.3 (8.2) |
| Range     | 41.5-73.8  | 40.4-74.2  | 40.6-68    | 40.2-71.6  | 40.1-73.5  | 40.9-73.6  | 40.5-66.1  | 42.6-74.3  | 40.1-73.8  | 40.2-74.3  |

**Occupation (n (%))**

|   |            |            |            |            |            |            |            |            |             |             |
|---|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|
| Agriculture   | 0          | 1 (1.4%)   | 41 (80.4%) | 38 (71.7%) | 9 (13.4%)  | 14 (21.2%) | 21 (87.5%) | 12 (63.2%) | 71 (34.0%)  | 65 (31.1%)  |
| Commercial  | 1 (1.5%)   | 3 (4.2%)   | 1 (2%)     | 2 (3.8%)   | 2 (3.0%)   | 2 (3.0%)   | 1 (4.2%)   | 3 (15.8%)  | 5 (2.4%)    | 10 (4.8%)   |
| Household   | 65 (97%)   | 66 (93%)   | 4 (7.8%)   | 7 (13.2)   | 53 (79.1%) | 46 (69.7%) | 0          | 1 (5.3%)   | 122 (58.4%) | 120 (57.4%) |
| Other   | 1 (1.5%)   | 1 (1.4%)   | 2 (3.9%)   | 2 (3.8%)   | 3 (4.5%)   | 3 (4.5%)   | 2 (8.3%)   | 1 (5.3%)   | 8 (3.8%)    | 7 (3.3%)    |
| Unemployed  | 0          | 0          | 3 (5.9%)   | 4 (7.5%)   | 0          | 1 (1.5%)   | 0          | 2 (10.5%)  | 3 (1.4%)    | 7 (3.3%)    |
| <b>Education (n (%))</b>                                  |            |            |            |            |            |            |            |            |             |             |
| No formal education or primary school incomplete          | 62 (92.5%) | 64 (90.1%) | 49 (96.1%) | 50 (94.3%) | 42 (62.7%) | 38 (57.6%) | 14 (58.3%) | 16 (84.2%) | 167 (79.9%) | 168 (80.4%) |
| Primary school or secondary school incomplete             | 1 (1.5%)   | 3 (4.2%)   | 2 (3.9%)   | 3 (5.7%)   | 23 (34.3%) | 26 (39.4%) | 5 (20.8%)  | 2 (10.5%)  | 31 (14.8%)  | 34 (16.3%)  |
| Secondary school or vocational or some college/university | 0          | 1 (1.4%)   | 0          | 0          | 2 (3.0%)   | 1 (1.5%)   | 5 (20.8%)  | 1 (5.3%)   | 7 (3.3%)    | 3 (1.4%)    |
| Missing   | 4 (6.0%)   | 3 (4.2%)   | 0          | 0          | 0          | 1 (1.5%)   | 0          | 0          | 4 (1.9%)    | 4 (1.9%)    |

**Table S18. PM2.5 exposures by specific household / participants characteristics for each country, study arm, and study period**

| PM2.5 Exposure  | Guatemala               |                         | India                  |                        | Peru                    |                         | Rwanda                  |                       | Overall                 |                         |
|---|-------------------------|-------------------------|------------------------|------------------------|-------------------------|-------------------------|-------------------------|-----------------------|-------------------------|-------------------------|
|   | Control                 | Intervention            | Control                | Intervention           | Control                 | Intervention            | Control                 | Intervention          | Control                 | Intervention            |
| <b>Baseline</b>   |                         |                         |                        |                        |                         |                         |                         |                       |                         |                         |
| Cooking Activity  |                         |                         |                        |                        |                         |                         |                         |                       |                         |                         |
| Older Adult Woman   | 108.5 (69.3-145) [63]   | 115.3 (77.7-180.8) [65] | 72.4 (41.9-119.9) [42] | 71.6 (39.1-134.9) [44] | 44.3 (16-123) [37]      | 55.5 (24.6-122.4) [37]  | 103.9 (62.3-158.9) [20] | 43.6 (27.8-60.2) [15] | 90 (41.9-134.6) [162]   | 82.2 (40.7-149.1) [161] |
| Other   | 95.6 (95.6-95.6) [1]    | 127.7 (66.5-127.8) [5]  | 89.1 (66.7-127) [5]    | 54.9 (47.6-62.3) [2]   | 86.8 (46-146.7) [20]    | 65.7 (43.9-148.1) [19]  | 57.5 (52.2-114.9) [3]   | 95.5 (85.2-130.9) [3] | 89.1 (50.4-137.3) [29]  | 69.6 (45-127.8) [29]    |
| Missing   |                         |                         |                        |                        | 12.5 (12.5-12.5) [1]    |                         |                         |                       | 12.5 (12.5-12.5) [1]    |                         |
| Kitchen Location  |                         |                         |                        |                        |                         |                         |                         |                       |                         |                         |
| In participant's bedroom                                      | 120.9 (120.9-120.9) [1] | 127.8 (127.8-127.8) [1] | 120.6 (75.9-169.9) [7] | 75.7 (65.2-89.6) [9]   | 116.6 (116.6-116.6) [1] |                         | 54.1 (54.1-54.1) [1]    |                       | 118.6 (70.5-154.7) [10] | 79.7 (66.9-118.2) [10]  |
| Room immediately adjacent to the participant's bedroom        | 105.7 (79-121.8) [19]   | 123 (77.7-189.2) [17]   | 69.6 (44.1-93.1) [19]  | 89 (44.3-135) [12]     | 51.3 (23.9-98.9) [4]    | 55.5 (33.7-75.3) [7]    |                         |                       | 88.4 (45.7-115.7) [42]  | 92.4 (52.8-175.9) [36]  |
| Separated from the participant's bedroom but inside the house | 105.8 (77.1-154.1) [29] | 104.3 (71.4-153.7) [34] | 56.5 (33.3-118.3) [8]  | 53.9 (40.7-70.8) [9]   | 33.8 (16-123.4) [12]    | 42.1 (22.4-118.6) [12]  | 118 (118-118) [1]       | 36.9 (36.9-36.9) [1]  | 96.2 (40.3-130.3) [50]  | 83.8 (43.8-138.5) [56]  |
| In a separate building detached from the bedroom (main house) | 112.3 (36.4-158) [15]   | 133.4 (94-184.9) [16]   | 89.1 (52.1-127) [13]   | 60.9 (25.8-197.1) [16] | 86.7 (32.5-136.6) [27]  | 73.7 (46.5-178.1) [28]  | 101.8 (61-170.3) [15]   | 40.7 (24.1-67.1) [12] | 89.2 (45-143) [70]      | 77.5 (35.2-168) [72]    |
| Outside the house (outdoors)                                  |                         | 264.2 (155.3-373.1) [2] |                        |                        | 54.8 (28.6-85) [12]     | 34.5 (19.6-58.8) [9]    | 100.8 (62.1-144.7) [6]  | 74.9 (60.2-79.4) [5]  | 66.6 (30.1-103.4) [18]  | 53.6 (32.1-83.7) [16]   |
| Other   |                         |                         |                        |                        |                         |                         |                         |                       |                         |                         |
| Missing   |                         |                         |                        |                        | 220 (116.2-323.7) [2]   |                         |                         |                       | 220 (116.2-323.7) [2]   |                         |
| Ventilation   |                         |                         |                        |                        |                         |                         |                         |                       |                         |                         |
| Window/opening above stove                                    | 110.9 (76.4-149.5) [58] | 115.3 (77.8-182) [63]   | 63.2 (34-110.9) [9]    | 62.4 (41.4-128.1) [14] | 67.9 (32.4-123.6) [26]  | 62 (32.7-84.1) [30]     | 101.8 (61-151) [11]     | 51.9 (40.4-67.1) [8]  | 97.6 (56.4-136.3) [104] | 87.4 (52-162.4) [115]   |
| None  | 45.6 (38.2-95.8) [5]    | 115.9 (44-127.8) [5]    | 80.9 (44.9-126.9) [38] | 73.4 (32.4-117.4) [32] | 91.1 (22.5-149.2) [19]  | 109.1 (37.2-298.5) [18] | 86.8 (54.5-162.7) [6]   | 36.9 (23.5-49) [7]    | 86.6 (37.6-133.1) [68]  | 72.9 (28.6-138.7) [62]  |
| Missing   | 93.6 (93.6-93.6) [1]    | 264.2 (155.3-373.1) [2] |                        |                        | 38.5 (25.7-84.2) [13]   | 29.6 (22.3-46.9) [8]    | 100.8 (89.4-144.7) [6]  | 79.4 (77.1-102.2) [3] | 79 (31.3-108.6) [20]    | 46.3 (24.6-79.4) [13]   |
| <b>Pregnancy</b>  |                         |                         |                        |                        |                         |                         |                         |                       |                         |                         |

|                  |   |                         |                        |                        |                       |                        |                       |                        |                       |                         |                        |                      |
|------------------|---|-------------------------|------------------------|------------------------|-----------------------|------------------------|-----------------------|------------------------|-----------------------|-------------------------|------------------------|----------------------|
| Cooking Activity | Older adult woman   | 90.5 (53.9-173.9) [104] | 25.5 (11.9-40.1) [114] | 68.7 (37.2-122.8) [76] | 18.1 (17.8-35.5) [74] | 39.9 (15-91.8) [54]    | 17 (14.7-45) [78]     | 64.1 (36-77.4) [25]    | 26.6 (20.3-41.5) [19] | 69.7 (36.7-138.7) [259] | 23.7 (15.2-39) [285]   |                      |
|                  | Other person  | 71.2 (51.5-102) [4]     | 14.5 (13.2-15.9) [2]   | 32.3 (29.9-36.7) [5]   | 19.4 (17-21.8) [4]    | 37.9 (19.8-63.9) [26]  | 21 (15.1-60.3) [13]   | 81.2 (55.2-134.5) [11] | 26.6 (21-34.7) [4]    | 44.6 (29.7-78.1) [46]   | 21 (15.1-37.3) [23]    |                      |
|                  | Missing   |                         | 22.4 (19-26.5) [4]     |                        |                       | 14.9 (14.9-15) [2]     |                       | 34.5 (34.5-34.5) [1]   | 47.9 (47.9-47.9) [1]  | 15 (14.9-24.7) [3]      | 23.5 (21.4-35.7) [5]   |                      |
| Kitchen Location | In participant's bedroom                                      | 160.9 (160.9-160.9) [1] | 72 (56.4-87.6) [2]     | 85.5 (43.6-104.2) [11] | 17.9 (17.6-35.7) [19] |                        |                       |                        | 41.1 (41.1-41.1) [1]  | 85.5 (47.1-105.5) [12]  | 18 (17.7-39.7) [22]    |                      |
|                  | Room immediately adjacent to the participant's bedroom        | 84.4 (49.4-179.6) [40]  | 23.4 (11.7-40.5) [37]  | 67.4 (38.6-120.8) [38] | 26.1 (17.9-38.1) [39] | 93.1 (64.8-171.5) [5]  | 15.5 (14.7-20.9) [4]  |                        | 37.1 (20.3-42.9) [9]  | 76.5 (45.3-166.7) [83]  | 24.5 (17.6-40.5) [89]  |                      |
|                  | Separated from the participant's bedroom but inside the house | 93.1 (54.1-149.5) [45]  | 26.9 (11.9-38.3) [44]  | 68.3 (29.9-143.2) [12] | 17.8 (13.6-24.7) [11] | 91.6 (36.1-153.8) [12] | 15.2 (14.5-41.2) [20] |                        | 27.9 (21-38.2) [8]    | 87.5 (47.4-149.5) [69]  | 24.5 (14-38.5) [83]    |                      |
|                  | In a separate building detached from the bedroom (main house) | 85.2 (58.8-180.5) [21]  | 24.2 (14.9-32.4) [32]  | 60.6 (30.8-147.7) [16] | 17.8 (17.8-19.8) [7]  | 26.1 (14.9-61.4) [42]  | 22.1 (14.9-54.2) [65] |                        | 66.4 (42.7-89.3) [24] | 20.7 (20.2-26.6) [5]    | 55.9 (24.6-97.1) [103] | 22.1 (15-42.4) [109] |
|                  | Outside the house (outdoors)                                  | 257.5 (257.5-257.5) [1] |                        | 19 (16.3-36.2) [3]     |                       | 41.6 (15.7-64.5) [17]  |                       |                        | 63 (53.4-84.3) [12]   |                         | 56.6 (29.9-67.5) [33]  |                      |
|                  | Other   |                         |                        |                        |                       | 15 (15-15) [1]         | 35.7 (35.7-35.7) [1]  |                        |                       | 15 (15-15) [1]          | 35.7 (35.7-35.7) [1]   |                      |
|                  | Missing   |                         | 21.4 (17.2-23.5) [5]   | 29.9 (29.9-29.9) [1]   | 19.4 (18.6-20.2) [2]  | 15 (14.8-19.8) [5]     | 15.2 (15.2-15.2) [1]  | 34.5 (34.5-34.5) [1]   | 47.9 (47.9-47.9) [1]  | 19.8 (14.9-30.1) [7]    | 21 (17.2-23.5) [9]     |                      |
| Ventilation      | Window/opening above stove                                    | 38.2 (27.9-48.5) [2]    | 28.4 (18.1-30.7) [10]  | 85.5 (85.5-85.5) [1]   | 26.7 (21-35) [7]      | 27.2 (20.7-33.7) [2]   | 112.6 (16.9-228) [4]  |                        | 20.7 (20.3-38.9) [4]  | 40.2 (17.6-58.8) [5]    | 26.7 (17.8-35.6) [25]  |                      |
|                  | None  |                         | 26.5 (26.5-26.5) [1]   | 67.4 (67.4-67.4) [1]   | 17.9 (17.6-45.1) [18] | 21.4 (21.4-21.4) [1]   | 31.5 (14.8-61.5) [19] |                        | 36.2 (23.8-40.1) [6]  | 44.4 (32.9-55.9) [2]    | 23 (16-50.7) [44]      |                      |
|                  | Missing   | 90.5 (54.4-172.1) [106] | 24.5 (11.8-38.7) [109] | 61.3 (32.8-122.1) [79] | 18 (17.8-32.2) [53]   | 38.4 (15-82.1) [79]    | 16 (14.7-40.4) [68]   | 65 (43.7-87.3) [37]    | 29.3 (21-42.5) [14]   | 65.4 (34.5-124.1) [301] | 22.6 (15-38.3) [244]   |                      |

**Post-birth**

|                  |                   |                         |                      |                         |                        |                       |                       |                        |                      |                         |                       |
|------------------|-------------------|-------------------------|----------------------|-------------------------|------------------------|-----------------------|-----------------------|------------------------|----------------------|-------------------------|-----------------------|
| Cooking Activity | Older Adult Woman | 88.7 (45.5-154.6) [126] | 26.6 (13-41.6) [119] | 67.9 (32.2-106.5) [101] | 21.6 (16.2-40.3) [114] | 29.2 (14.8-91.7) [59] | 14.7 (12.6-26.7) [89] | 72.7 (58.9-116.4) [34] | 39 (33.1-56.6) [17]  | 68.7 (32.1-130.8) [320] | 21.7 (13.7-39) [339]  |
|                  | Other             | 61.8 (42.2-85.4) [3]    | 29.8 (12.6-32.4) [5] | 36.4 (20.8-125.5) [6]   | 30 (30-30) [1]         | 19.8 (15.1-35.6) [11] | 15.7 (13.1-27.9) [16] | 92.2 (89.7-105.4) [3]  | 42.2 (26.2-50.6) [5] | 33.5 (16.1-96.2) [23]   | 21.2 (13.6-34.6) [27] |



|                  |   |                         |                         |                            |                        |                       |                         |                         |                      |                         |                        |
|------------------|---|-------------------------|-------------------------|----------------------------|------------------------|-----------------------|-------------------------|-------------------------|----------------------|-------------------------|------------------------|
| Kitchen Location | Missing   | 66 (66-66) [1]          | 37.8 (37.8-37.8) [1]    |                            |                        |                       |                         | 47.5 (40.6-104.4) [7]   | 64.3 (64.3-64.3) [1] | 56.8 (41.2-101.8) [8]   | 51 (44.4-57.7) [2]     |
|                  | In participant's bedroom                                      | 134.9 (132.8-136.9) [2] | 37.9 (33.1-56.9) [4]    | 48.1 (25.7-97.2) [23]      | 17.9 (13.6-40.5) [49]  | 32.9 (16.9-252.8) [8] | 13.8 (12.4-15.3) [2]    |                         |                      | 48.1 (22.9-126.7) [33]  | 18 (13.6-40.8) [55]    |
|                  | Room immediately adjacent to the participant's bedroom        | 74.8 (41.2-136.5) [49]  | 26.6 (12.5-38.3) [44]   | 74 (38.2-117) [52]         | 27.4 (17.8-39.2) [46]  | 79.1 (79.1-79.1) [1]  | 14.4 (12.8-18.4) [10]   |                         | 39 (25.9-55.5) [5]   | 75.7 (38.4-128.3) [102] | 26.2 (15.8-38.6) [105] |
|                  | Separated from the participant's bedroom but inside the house | 92.1 (50.7-164.2) [55]  | 25.4 (12.6-34.9) [41]   | 77.8 (51.3-94.5) [15]      | 27 (14.5-45.3) [11]    | 20.1 (13.4-74.7) [22] | 14.4 (12.5-21.1) [35]   |                         | 42.4 (33.4-58) [10]  | 68.4 (28.5-122.8) [92]  | 21.2 (12.9-34.9) [97]  |
|                  | In a separate building detached from the bedroom (main house) | 108.9 (41.3-200.7) [23] | 27.5 (16.8-45.6) [35]   | 51.7 (17.6-93.2) [16]      | 29.1 (18.1-31.3) [9]   | 34 (15.3-70.1) [28]   | 15 (12.7-31.7) [54]     | 71.9 (57.4-89.8) [24]   | 42.2 (30.2-50.1) [7] | 62.6 (27.5-103.6) [91]  | 21 (14.1-38.4) [105]   |
|                  | Outside the house (outdoors)                                  |                         |                         |                            |                        | 27.8 (12.6-63.1) [11] |                         | 118.5 (67.6-158.3) [13] |                      | 66.6 (25.8-147.4) [24]  |                        |
|                  | Other   |                         |                         |                            |                        |                       | 81.3 (81.3-81.3) [1]    |                         |                      |                         | 81.3 (81.3-81.3) [1]   |
| Ventilation      | Missing   | 66 (66-66) [1]          | 37.8 (37.8-37.8) [1]    | 1447.6 (1447.6-1447.6) [1] |                        |                       | 25.2 (18.4-30.6) [3]    | 47.5 (40.6-104.4) [7]   | 64.3 (64.3-64.3) [1] | 66 (41.8-109.6) [9]     | 35.9 (25.2-37.8) [5]   |
|                  | Window/opening above stove                                    | 110 (43.8-141.3) [8]    | 52.2 (24-104.4) [5]     | 38.3 (38.3-38.3) [1]       |                        | 37.3 (25-67.8) [3]    | 109.3 (109.3-109.3) [1] |                         |                      | 71.6 (38.1-124.8) [12]  | 78.3 (31-108.1) [6]    |
|                  | None  | 250.6 (250.6-250.6) [1] | 171.4 (171.4-171.4) [1] | 25.2 (17.6-40.3) [5]       | 24.9 (15.7-54) [11]    | 29.2 (22.9-214) [7]   | 19.5 (14.1-25.2) [9]    |                         | 52.1 (52.1-52.1) [1] | 29.2 (19.9-105.6) [13]  | 22.5 (14.2-49.4) [22]  |
|                  | Missing   | 82.5 (45.5-147.1) [121] | 26.6 (12.7-38) [119]    | 71.1 (32.3-111.8) [101]    | 21.6 (16.2-39.1) [104] | 25.4 (14.8-80.6) [60] | 14.7 (12.6-26.9) [95]   | 74.6 (51.8-111.8) [44]  | 40.6 (28-57.2) [22]  | 68 (31.5-126.1) [326]   | 21.3 (13.6-38.2) [340] |
|                  |   |                         |                         |                            |                        |                       |                         |                         |                      |                         |                        |

**Table S19. CO exposures by specific household / participants characteristics for each country, study arm, and study period**

| CO Exposure   | Guatemala             |                       | India                 |                       | Peru                  |                       | Rwanda                |                       | Overall                |                        |  |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|------------------------|--|
|   | Control               | Intervention          | Control               | Intervention          | Control               | Intervention          | Control               | Intervention          | Control                | Intervention           |  |
| <b>Baseline</b>   |                       |                       |                       |                       |                       |                       |                       |                       |                        |                        |  |
| Cooking Activity  |                       |                       |                       |                       |                       |                       |                       |                       |                        |                        |  |
| Older Adult Woman   | 1.3 (0.6-2.4)<br>[57] | 1.4 (0.5-2.6)<br>[61] | 0.7 (0.2-1.7)<br>[40] | 0.6 (0.2-2)<br>[42]   | 2.6 (1.6-5.3)<br>[27] | 1.9 (0.7-5)<br>[34]   | 0.8 (0.4-1.8)<br>[18] | 0.3 (0.1-1.3)<br>[14] | 1.2 (0.5-2.4)<br>[142] | 1.3 (0.3-2.6)<br>[151] |  |
| Other   | 2.9 (2.9-2.9)<br>[1]  | 1.4 (0.6-1.7)<br>[5]  | 0.5 (0.3-2.4)<br>[5]  | 4 (4-4) [1]           | 3.3 (1.5-8)<br>[17]   | 2 (1.6-3.4)<br>[14]   | 0.5 (0.4-0.9)<br>[3]  | 0.4 (0.4-1.6)<br>[3]  | 2.6 (0.6-3.8)<br>[26]  | 1.8 (1.2-3.1)<br>[23]  |  |
| Missing   |                       |                       |                       |                       | 0.2 (0.2-0.2)<br>[1]  |                       |                       |                       | 0.2 (0.2-0.2)<br>[1]   |                        |  |
| Kitchen Location  |                       |                       |                       |                       |                       |                       |                       |                       |                        |                        |  |
| In participant's bedroom                                      | 3.8 (3.8-3.8)<br>[1]  | 1.4 (1.4-1.4)<br>[1]  | 1 (0.7-1.8) [8]       | 0.8 (0.3-1.8)<br>[8]  | 1.8 (1.8-1.8)<br>[1]  |                       | 1.9 (1.9-1.9)<br>[1]  |                       | 1.4 (0.8-2.4)<br>[11]  | 0.9 (0.4-1.7)<br>[9]   |  |
| Room immediately adjacent to the participant's bedroom        | 1 (0.3-1.7)<br>[15]   | 1.5 (0.2-2.8)<br>[16] | 0.4 (0.2-1.8)<br>[20] | 0.8 (0.3-2.1)<br>[13] | 1.5 (0.7-4.2)<br>[3]  | 1.8 (1.6-3.3)<br>[5]  |                       |                       | 0.6 (0.2-1.7)<br>[38]  | 1.5 (0.4-2.2)<br>[34]  |  |
| Separated from the participant's bedroom but inside the house | 1.3 (0.6-2.4)<br>[26] | 1.4 (0.6-2.5)<br>[31] | 0.4 (0.1-0.9)<br>[6]  | 0.5 (0.1-1.6)<br>[8]  | 3.6 (2.6-5.1)<br>[11] | 1.5 (0.6-3.2)<br>[12] |                       | 3.8 (3.8-3.8)<br>[1]  | 1.7 (0.6-3.3)<br>[43]  | 1.4 (0.5-2.5)<br>[52]  |  |
| In a separate building detached from the bedroom (main house) | 1.3 (0.7-2.5)<br>[16] | 1.1 (0.5-2.2)<br>[16] | 1 (0.4-2.7)<br>[11]   | 0.6 (0.2-3.7)<br>[14] | 4.7 (2.4-6.9)<br>[19] | 2.5 (1.2-4.7)<br>[23] | 0.8 (0.5-1.8)<br>[14] | 0.3 (0.1-0.4)<br>[11] | 1.7 (0.7-3.5)<br>[60]  | 1.3 (0.3-3)<br>[64]    |  |
| Outside the house (outdoors)                                  |                       | 2.3 (1.2-3.5)<br>[2]  |                       |                       | 0.8 (0.5-2) [9]       | 1.8 (1-3.1) [8]       | 0.5 (0.1-1.1)<br>[6]  | 1.3 (0.4-5.4)<br>[5]  | 0.8 (0.5-1.6)<br>[15]  | 1.6 (0.4-5)<br>[15]    |  |
| Other   |                       |                       |                       |                       |                       |                       |                       |                       |                        |                        |  |
| Missing   |                       |                       |                       |                       | 6.2 (3.2-9.2)<br>[2]  |                       |                       |                       | 6.2 (3.2-9.2)<br>[2]   |                        |  |
| Ventilation   |                       |                       |                       |                       |                       |                       |                       |                       |                        |                        |  |
| Window/opening above stove                                    | 1.3 (0.6-2.4)<br>[52] | 1.4 (0.5-2.5)<br>[59] | 0.7 (0.4-1.8)<br>[11] | 1.4 (0.2-3.6)<br>[14] | 3.8 (2.1-6.1)<br>[20] | 1.5 (0.7-3.2)<br>[26] | 1 (0.6-2.2)<br>[10]   | 0.3 (0.1-0.3)<br>[7]  | 1.4 (0.6-3.2)<br>[93]  | 1.4 (0.5-2.6)<br>[106] |  |
| None  | 1 (0.3-2.9) [5]       | 1.4 (0.3-1.7)<br>[5]  | 0.6 (0.2-1.7)<br>[34] | 0.5 (0.2-1.7)<br>[29] | 4 (1.9-7.5)<br>[14]   | 2.7 (1.7-6.8)<br>[15] | 0.3 (0.1-0.7)<br>[5]  | 0.5 (0.1-3.3)<br>[7]  | 1 (0.3-2.7)<br>[58]    | 1.2 (0.2-2.9)<br>[56]  |  |
| Missing   | 0.6 (0.6-0.6)<br>[1]  | 2.3 (1.2-3.5)<br>[2]  |                       |                       | 1.8 (0.5-2.1)<br>[11] | 1.8 (1.4-2) [7]       | 1 (0.4-1.3) [6]       | 1.3 (0.8-3.4)<br>[3]  | 1 (0.5-1.9)<br>[18]    | 1.7 (1-2.7)<br>[12]    |  |
| <b>Pregnancy</b>  |                       |                       |                       |                       |                       |                       |                       |                       |                        |                        |  |

|                  |   |                     |                   |                    |                   |                    |                    |                    |                   |                     |                     |
|------------------|---|---------------------|-------------------|--------------------|-------------------|--------------------|--------------------|--------------------|-------------------|---------------------|---------------------|
| Cooking Activity | Older adult woman   | 1.4 (0.7-2.6) [101] | 0.3 (0-0.8) [104] | 1.2 (0.3-2.5) [73] | 0 (0-0.1) [77]    | 1.2 (0.3-2.7) [45] | 0.7 (0.2-2.8) [73] | 0.3 (0.1-1.5) [24] | 0.1 (0-0.4) [15]  | 1.2 (0.4-2.6) [243] | 0.2 (0-0.8) [269]   |
|                  | Other person  | 1.4 (0.8-1.6) [5]   | 1.5 (1.5-1.5) [1] | 0 (0-0) [4]        | 0.1 (0.1-0.9) [5] | 0.9 (0.2-2.8) [20] | 0.5 (0.2-1.2) [6]  | 0.5 (0.3-1.6) [10] | 1 (0.5-1) [3]     | 0.6 (0.2-1.7) [39]  | 0.7 (0.1-1.2) [15]  |
|                  | Missing   |                     | 0 (0-0.2) [4]     |                    |                   | 6.1 (6.1-6.1) [1]  |                    | 0.2 (0.2-0.2) [1]  | 0.5 (0.5-0.5) [1] | 3.2 (1.7-4.6) [2]   | 0 (0-0.5) [5]       |
| Kitchen Location | In participant's bedroom                                      | 2.8 (2.8-2.8) [1]   | 0.3 (0.3-0.3) [1] | 1.4 (0.9-2.1) [8]  | 0 (0-0) [21]      |                    |                    |                    | 0 (0-0) [1]       | 1.5 (0.9-2.7) [9]   | 0 (0-0) [23]        |
|                  | Room immediately adjacent to the participant's bedroom        | 0.9 (0.6-2.4) [40]  | 0.2 (0-0.4) [32]  | 0.8 (0.3-2.1) [41] | 0 (0-0.1) [39]    | 1.6 (0.2-3.1) [4]  | 1.4 (1.2-3) [4]    | 4.9 (4.9-4.9) [1]  | 0.2 (0.1-0.4) [7] | 0.9 (0.3-2.4) [86]  | 0.1 (0-0.3) [82]    |
|                  | Separated from the participant's bedroom but inside the house | 1.6 (0.7-2.8) [43]  | 0.5 (0-1.3) [39]  | 1.1 (0.6-2.3) [11] | 0 (0-0.2) [11]    | 3.8 (1-6.7) [9]    | 0.2 (0.1-0.9) [18] |                    | 1 (0.1-1.1) [5]   | 1.6 (0.7-3) [63]    | 0.3 (0-1.1) [73]    |
|                  | In a separate building detached from the bedroom (main house) | 1.3 (0.8-2.3) [21]  | 0.2 (0-0.7) [32]  | 1.5 (0-4.5) [15]   | 0 (0-0.1) [8]     | 1.2 (0.2-2.5) [36] | 0.7 (0.3-2.9) [56] | 0.3 (0.1-1.3) [21] | 0.1 (0-1) [5]     | 1 (0.1-2.5) [93]    | 0.4 (0.1-1.4) [101] |
|                  | Outside the house (outdoors)                                  | 2.1 (2.1-2.1) [1]   |                   | 0.4 (0.4-0.4) [1]  |                   | 1.2 (0.5-1.8) [13] |                    | 0.5 (0.1-1.6) [12] |                   | 0.7 (0.3-1.7) [27]  |                     |
|                  | Other   |                     |                   |                    |                   | 0.2 (0.2-0.2) [1]  | 4.4 (4.4-4.4) [1]  |                    |                   | 0.2 (0.2-0.2) [1]   | 4.4 (4.4-4.4) [1]   |
|                  | Missing   |                     | 0 (0-0.5) [5]     | 0 (0-0) [1]        | 0.1 (0-0.5) [3]   | 1.1 (0.7-3.6) [3]  |                    | 0.2 (0.2-0.2) [1]  | 0.5 (0.5-0.5) [1] | 0.3 (0.2-1.1) [5]   | 0.1 (0-0.5) [9]     |
| Ventilation      | Window/opening above stove                                    | 0.8 (0.3-1.7) [4]   | 0.1 (0-0.7) [22]  | 0.2 (0.1-0.3) [2]  | 0.3 (0-0.6) [9]   | 2.7 (2.7-2.7) [1]  | 0 (0-0.1) [7]      | 1.3 (1.3-1.3) [1]  | 1.2 (0.6-2) [4]   |                     | 0.2 (0.1-0.3) [2]   |
|                  | None  | 0.2 (0.1-0.3) [2]   | 0.3 (0-0.6) [9]   | 2.7 (2.7-2.7) [1]  | 0 (0-0.1) [7]     | 1.3 (1.3-1.3) [1]  | 1.2 (0.6-2) [4]    |                    | 0.2 (0.1-0.3) [2] | 0.8 (0.3-1.7) [4]   | 0.1 (0-0.7) [22]    |
|                  | Missing   | 1.4 (0.7-2.6) [104] | 0.3 (0-0.9) [99]  | 1 (0.1-2.3) [75]   | 0 (0-0.1) [57]    | 1.2 (0.3-3) [64]   | 0.5 (0.2-2.7) [59] | 0.4 (0.1-1.6) [35] | 0.1 (0-1) [11]    | 1.2 (0.3-2.5) [278] | 0.2 (0-0.9) [226]   |

### Post-birth

|                  |                   |                   |                   |                     |                   |                   |                    |                    |                    |                     |                   |
|------------------|-------------------|-------------------|-------------------|---------------------|-------------------|-------------------|--------------------|--------------------|--------------------|---------------------|-------------------|
| Cooking Activity | Older Adult Woman | 1 (0.3-2.4) [116] | 0.1 (0-0.5) [114] | 0.7 (0.2-2.1) [104] | 0.1 (0-0.3) [117] | 1.6 (0.3-5) [41]  | 1 (0.4-5) [67]     | 0.8 (0.3-2.5) [33] | 0.8 (0.1-1.5) [16] | 0.9 (0.2-2.5) [294] | 0.2 (0-0.8) [314] |
|                  | Other             | 0.1 (0.1-0.3) [3] | 0 (0-0) [3]       | 0.1 (0-1.4) [5]     | 0 (0-0) [1]       | 2.5 (1.5-5.8) [7] | 1.4 (0.8-4.4) [11] | 0.3 (0.2-0.5) [4]  | 0.6 (0.1-3) [5]    | 0.6 (0.1-2.4) [19]  | 0.8 (0-2.8) [20]  |
|                  | Missing           | 0.5 (0.5-0.5) [1] | 0 (0-0) [1]       |                     |                   |                   |                    | 0.2 (0.1-0.5) [6]  | 0.6 (0.4-0.8) [2]  | 0.3 (0.1-0.6) [7]   | 0.2 (0.1-0.6) [3] |

|                     |   |                     |                    |                     |                   |                    |                    |                    |                     |                     |                    |
|---------------------|---|---------------------|--------------------|---------------------|-------------------|--------------------|--------------------|--------------------|---------------------|---------------------|--------------------|
| Kitchen<br>Location | In participant's bedroom                                      | 0.8 (0.8-0.8) [1]   | 0.1 (0.1-0.2) [3]  | 0.7 (0.1-2.2) [22]  | 0.1 (0-0.4) [48]  | 2 (0.4-6.6) [4]    | 0.6 (0.6-0.6) [1]  |                    | 0.8 (0.2-2.3) [27]  | 0.1 (0-0.4) [52]    |                    |
|                     | Room immediately adjacent to the participant's bedroom        | 0.8 (0.2-2.2) [46]  | 0.3 (0-0.5) [43]   | 0.8 (0.2-2.1) [55]  | 0 (0-0.2) [49]    |                    | 1 (0.6-4.6) [8]    | 0.5 (0.1-0.9) [4]  | 0.8 (0.2-2.2) [101] | 0.1 (0-0.5) [104]   |                    |
|                     | Separated from the participant's bedroom but inside the house | 1.1 (0.3-2.9) [51]  | 0.2 (0.1-0.5) [37] | 1.1 (0.4-2) [15]    | 0.1 (0-0.7) [11]  | 0.9 (0.1-2.5) [17] | 2.4 (0.5-5.3) [26] |                    | 1.3 (0.2-1.9) [11]  | 1.1 (0.3-2.7) [83]  | 0.4 (0.1-2) [85]   |
|                     | In a separate building detached from the bedroom (main house) | 1 (0.5-1.9) [21]    | 0.1 (0-0.4) [34]   | 0.2 (0.1-1.3) [16]  | 0 (0-0.2) [10]    | 1.1 (0.5-5.3) [19] | 1.7 (0.3-4.7) [41] | 0.4 (0.1-1.1) [26] | 0.6 (0.2-1.3) [6]   | 0.6 (0.2-1.9) [82]  | 0.3 (0-1.8) [91]   |
|                     | Outside the house (outdoors)                                  |                     |                    |                     |                   | 4.7 (2.7-6.8) [8]  |                    | 2.1 (1-2.7) [11]   | 2.7 (1.9-4.4) [19]  |                     |                    |
|                     | Other   |                     |                    |                     |                   |                    | 0.7 (0.7-0.7) [1]  |                    |                     |                     | 0.7 (0.7-0.7) [1]  |
|                     | Missing   | 0.5 (0.5-0.5) [1]   | 0 (0-0) [1]        | 0.1 (0.1-0.1) [1]   |                   |                    | 0 (0-0) [1]        | 0.2 (0.1-0.5) [6]  | 0.6 (0.4-0.8) [2]   | 0.2 (0.1-0.5) [8]   | 0.1 (0-0.4) [4]    |
| Ventilation         | Window/opening above stove                                    | 1.3 (0.3-2.1) [8]   | 0.8 (0.1-1.6) [4]  | 0.3 (0.3-0.3) [1]   | 0.1 (0.1-0.1) [1] | 0.9 (0.9-0.9) [1]  | 0 (0-0) [1]        |                    | 0 (0-0) [1]         | 0.7 (0.3-2.1) [10]  | 0.1 (0-0.8) [7]    |
|                     | None  | 2 (2-2) [1]         | 3.3 (3.3-3.3) [1]  | 0.8 (0.2-1.6) [4]   | 0.1 (0.1-2.2) [9] | 10 (5.8-12.4) [3]  | 3.9 (1-5.4) [6]    |                    | 5.4 (5.4-5.4) [1]   | 1.8 (1-4.4) [8]     | 2.2 (0.1-4.4) [17] |
|                     | Missing   | 0.9 (0.3-2.4) [111] | 0.1 (0-0.5) [113]  | 0.7 (0.1-2.1) [104] | 0 (0-0.3) [108]   | 2.2 (0.4-5.1) [44] | 1.2 (0.4-4.8) [71] | 0.5 (0.2-1.9) [43] | 0.6 (0.2-1.4) [21]  | 0.8 (0.2-2.5) [302] | 0.2 (0-0.8) [313]  |

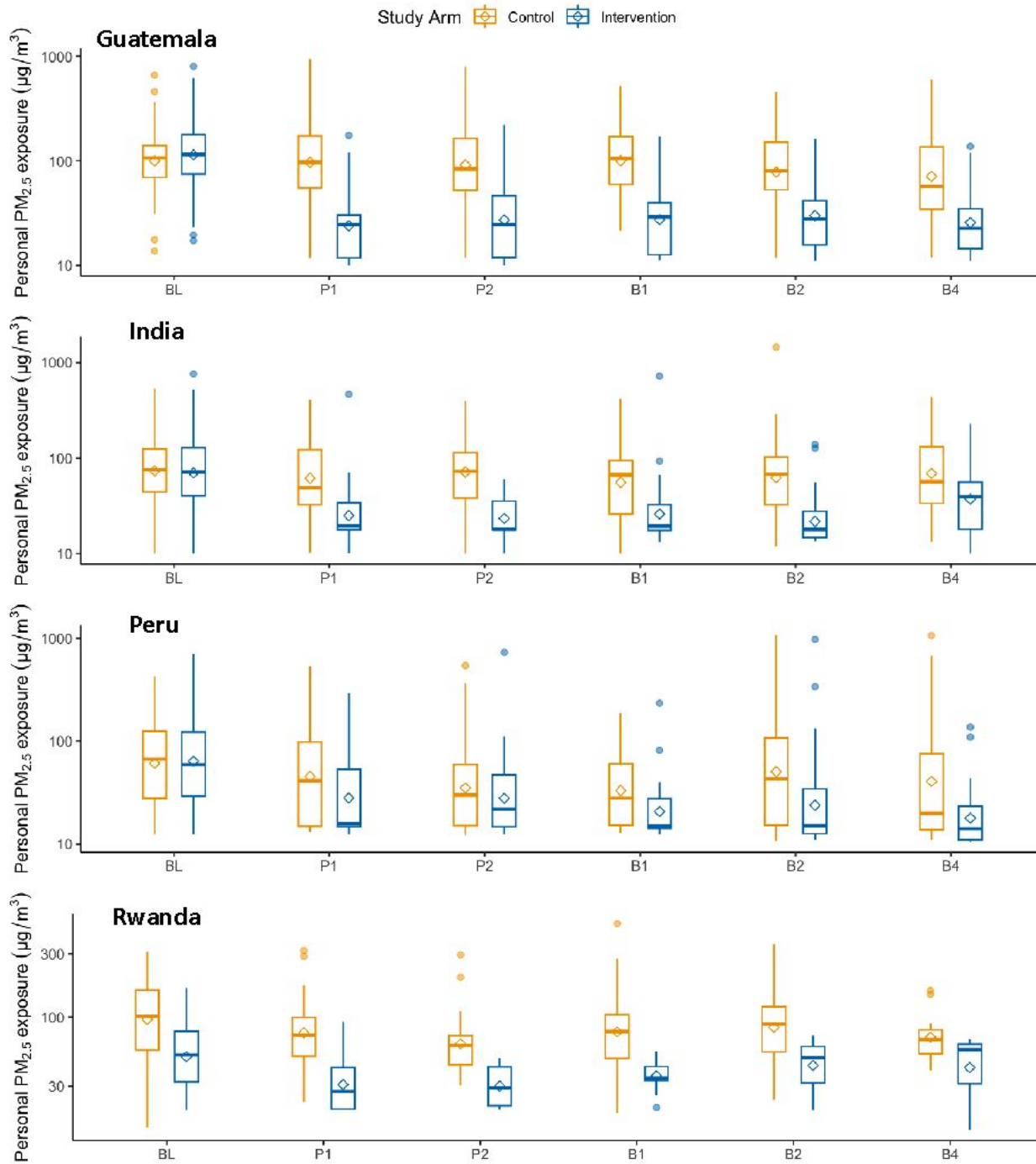
**Table S20. BC exposures by specific household / participants characteristics for each country, study arm, and study period**

| BC Exposure   | Guatemala             |                       | India                |                      | Peru                 |                      | Rwanda                |                    | Overall               |                       |
|---|-----------------------|-----------------------|----------------------|----------------------|----------------------|----------------------|-----------------------|--------------------|-----------------------|-----------------------|
|   | Control               | Intervention          | Control              | Intervention         | Control              | Intervention         | Control               | Intervention       | Control               | Intervention          |
| <b>Baseline</b>   |                       |                       |                      |                      |                      |                      |                       |                    |                       |                       |
| Cooking Activity  |                       |                       |                      |                      |                      |                      |                       |                    |                       |                       |
| Older Adult Woman   | 11.4 (8.7-15.1) [53]  | 12.6 (9.8-15.6) [62]  | 11.7 (7.2-17.2) [41] | 7.9 (3.7-21.2) [42]  | 4.2 (1.6-16.4) [30]  | 11.2 (3.1-16.7) [30] | 12.1 (10.4-15.9) [16] | 5.8 (4.1-8.5) [10] | 10.9 (6.7-16.1) [140] | 10.9 (6.8-16.5) [144] |
| Other   | 17.8 (17.8-17.8) [1]  | 11.1 (9.5-12.1) [4]   | 9.1 (6.1-24.2) [5]   | 9.6 (8-11.2) [2]     | 9.6 (5.8-15.2) [17]  | 9.4 (4.5-15.9) [17]  | 6.8 (5.2-8.5) [2]     |                    | 9.6 (5.8-16.1) [25]   | 11 (5.1-14.2) [23]    |
| Missing   |                       |                       |                      |                      | 1.5 (1.5-1.5) [1]    |                      |                       |                    | 1.5 (1.5-1.5) [1]     |                       |
| Kitchen Location  |                       |                       |                      |                      |                      |                      |                       |                    |                       |                       |
| In participant's bedroom                                      | 8.3 (8.3-8.3) [1]     | 11 (11-11) [1]        | 17.2 (15.4-21.2) [7] | 16.6 (10.2-22) [8]   | 15.2 (15.2-15.2) [1] |                      | 7.3 (7.3-7.3) [1]     |                    | 15.6 (9.9-19.2) [10]  | 15.5 (11-21.9) [9]    |
| Room immediately adjacent to the participant's bedroom        | 10.3 (9.5-13.9) [16]  | 12.7 (10.4-15.1) [16] | 11.7 (9-15.5) [19]   | 10 (5-21) [11]       | 4.8 (2.1-9.8) [4]    | 11.8 (4.7-16.2) [7]  |                       |                    | 10.5 (8.2-15.1) [39]  | 12.1 (7.2-16) [34]    |
| Separated from the participant's bedroom but inside the house | 12.4 (10.2-16.2) [24] | 12.4 (10.1-14.6) [32] | 7.2 (6.1-9.7) [7]    | 6.4 (3.6-8) [9]      | 1.6 (1.5-10.8) [9]   | 6.7 (2.8-13.9) [9]   | 11.1 (11.1-11.1) [1]  | 2.8 (2.8-2.8) [1]  | 11.1 (7.2-15.9) [41]  | 10.9 (6.8-13.9) [51]  |
| In a separate building detached from the bedroom (main house) | 10.3 (7.7-14.3) [13]  | 14.1 (8.7-16.7) [15]  | 11.3 (5.3-18.3) [13] | 7.6 (3.3-23.9) [16]  | 10.2 (4.2-17.2) [22] | 14.9 (8.9-22.2) [24] | 12.6 (10.5-16.2) [12] | 5.8 (4.1-8.4) [8]  | 10.9 (5.9-17.1) [60]  | 10.7 (6.6-17.3) [63]  |
| Outside the house (outdoors)                                  |                       | 11.1 (10.3-11.8) [2]  |                      |                      | 3.7 (2.5-10.7) [10]  | 4.2 (1.5-6.8) [7]    | 11.3 (8.7-13.8) [4]   | 8.9 (8.9-8.9) [1]  | 6 (3-12.9) [14]       | 6.8 (2.3-9) [10]      |
| Other   |                       |                       |                      |                      |                      |                      |                       |                    |                       |                       |
| Missing   |                       |                       |                      |                      | 36.9 (19.2-54.6) [2] |                      |                       |                    | 36.9 (19.2-54.6) [2]  |                       |
| Ventilation   |                       |                       |                      |                      |                      |                      |                       |                    |                       |                       |
| Window/opening above stove                                    | 11.5 (9.3-15.1) [49]  | 12.6 (10.1-15.5) [59] | 11.7 (6.2-16.8) [9]  | 7.5 (6.4-9) [13]     | 6 (2.4-10.8) [22]    | 11.8 (5.5-16.1) [25] | 11 (10.6-16.1) [9]    | 8.3 (4.7-8.5) [5]  | 10.7 (6.3-15.1) [89]  | 11.6 (7.9-15.3) [102] |
| None  | 8.2 (7.6-10.6) [4]    | 11 (7.1-13) [5]       | 11.3 (7.2-18.4) [37] | 12.8 (3.4-21.6) [31] | 14.2 (1.6-20.7) [16] | 15.8 (6-24.1) [16]   | 11.1 (7.3-15.7) [5]   | 3.5 (2.9-4.8) [4]  | 11.2 (6.5-18.3) [62]  | 11 (3.4-21.7) [56]    |
| Missing   | 15.9 (15.9-15.9) [1]  | 11.1 (10.3-11.8) [2]  |                      |                      | 5 (2.6-14.5) [10]    | 2.9 (1.5-4.8) [6]    | 11.5 (9.8-13.8) [4]   | 8.9 (8.9-8.9) [1]  | 9.9 (3.7-15.5) [15]   | 5 (1.6-9) [9]         |

| <b>Pregnancy</b>        |   |                      |                     |                      |                     |                    |                      |                     |                    |                      |                      |
|-------------------------|---|----------------------|---------------------|----------------------|---------------------|--------------------|----------------------|---------------------|--------------------|----------------------|----------------------|
| <b>Cooking Activity</b> |   |                      |                     |                      |                     |                    |                      |                     |                    |                      |                      |
|                         | Older adult woman   | 11.1 (8.4-14.5) [97] | 3.4 (2.1-6) [110]   | 8.7 (4.6-17.2) [73]  | 1.6 (1.6-3.4) [73]  | 3.4 (1.5-11) [47]  | 1.5 (1.5-2.2) [75]   | 7.6 (5.1-8.5) [23]  | 4.4 (2.9-5.1) [17] | 9.6 (5-14) [240]     | 2.4 (1.5-4.4) [275]  |
|                         | Other person  | 9.3 (5.6-12.5) [4]   | 2.5 (2.5-2.5) [2]   | 3.8 (3.2-5.2) [5]    | 3.1 (2.1-4.1) [4]   | 1.5 (1.4-6.9) [19] | 1.5 (1.5-1.5) [9]    | 8.8 (7.2-12.6) [9]  | 2.9 (2.9-3) [4]    | 5.4 (1.5-9.4) [37]   | 1.6 (1.5-2.9) [19]   |
|                         | Missing   |                      | 2.7 (1.5-4) [4]     |                      |                     | 1.5 (1.5-1.5) [1]  |                      | 5.1 (5.1-5.1) [1]   | 6.6 (6.6-6.6) [1]  | 3.3 (2.4-4.2) [2]    | 3.9 (1.6-4.2) [5]    |
| <b>Kitchen Location</b> |   |                      |                     |                      |                     |                    |                      |                     |                    |                      |                      |
|                         | In participant's bedroom                                      | 23.6 (23.6-23.6) [1] | 7.9 (6.7-9.1) [2]   | 13.9 (7.8-18.8) [11] | 1.6 (1.6-2.5) [19]  |                    |                      |                     | 4.9 (4.9-4.9) [1]  | 14.2 (8.7-21.7) [12] | 1.6 (1.6-4.6) [22]   |
|                         | Room immediately adjacent to the participant's bedroom        | 10.8 (8.4-13.3) [37] | 2.9 (2-4.7) [34]    | 8.7 (5.5-20.1) [37]  | 2.8 (1.6-3.9) [38]  | 5.4 (1.9-10.8) [5] | 1.5 (1.5-1.5) [4]    |                     | 4.1 (2.8-5.6) [8]  | 10.4 (6.9-14.5) [79] | 2.8 (1.6-4.3) [84]   |
|                         | Separated from the participant's bedroom but inside the house | 11.1 (8-12.7) [41]   | 3.2 (2.4-6) [43]    | 9.8 (3.2-13.9) [11]  | 1.6 (1.6-2.3) [11]  | 10.6 (5.9-15) [10] | 1.5 (1.5-2.1) [18]   |                     | 3 (2.9-3.5) [8]    | 10.5 (6.8-15) [62]   | 2.7 (1.6-4.8) [80]   |
|                         | In a separate building detached from the bedroom (main house) | 12.1 (8.5-16.4) [21] | 3.4 (2-5.9) [32]    | 5.2 (3.2-11.3) [15]  | 1.6 (1.6-2.2) [7]   | 2.3 (1.5-9.2) [34] | 1.5 (1.5-1.6) [60]   | 7.6 (5.5-8.8) [21]  | 3.6 (2.9-4.5) [4]  | 7.1 (3-12) [91]      | 1.6 (1.5-3.1) [103]  |
|                         | Outside the house (outdoors)                                  | 11.9 (11.9-11.9) [1] |                     | 4.1 (3.8-7.5) [3]    |                     | 1.5 (1.5-5.9) [13] |                      | 7.7 (5.5-10.7) [11] |                    | 5.5 (1.5-9.4) [28]   |                      |
|                         | Other   |                      |                     |                      |                     | 1.5 (1.5-1.5) [1]  | 11.9 (11.9-11.9) [1] |                     |                    | 1.5 (1.5-1.5) [1]    | 11.9 (11.9-11.9) [1] |
|                         | Missing   |                      | 2.5 (1.6-3.9) [5]   | 3.8 (3.8-3.8) [1]    | 3.3 (2.8-3.9) [2]   | 1.5 (1.4-1.5) [4]  | 1.5 (1.5-1.5) [1]    | 5.1 (5.1-5.1) [1]   | 6.6 (6.6-6.6) [1]  | 1.5 (1.5-3.2) [6]    | 2.5 (1.6-4.2) [9]    |
| <b>Ventilation</b>      |   |                      |                     |                      |                     |                    |                      |                     |                    |                      |                      |
|                         | Window/opening above stove                                    | 5.4 (5-5.9) [2]      | 2.9 (1.9-4) [10]    | 14.5 (14.5-14.5) [1] | 3.5 (1.7-3.7) [7]   | 6.6 (4-9.2) [2]    | 2.7 (2.1-6.6) [3]    |                     | 2.9 (2.8-3.8) [4]  | 6.4 (4.5-11.8) [5]   | 2.9 (1.8-4) [24]     |
|                         | None  |                      | 2.7 (2.7-2.7) [1]   | 20.7 (20.7-20.7) [1] | 1.6 (1.6-2.9) [18]  | 1.4 (1.4-1.4) [1]  | 1.5 (1.5-2.4) [17]   |                     | 4.6 (4-5.1) [4]    | 11.1 (6.2-15.9) [2]  | 1.6 (1.5-2.9) [40]   |
|                         | Missing   | 11.2 (8.4-14) [99]   | 3.4 (2.1-6.3) [105] | 8.3 (4.1-16.8) [76]  | 1.6 (1.6-3.4) [52]  | 2.3 (1.5-10) [64]  | 1.5 (1.5-1.5) [64]   | 7.6 (5.4-8.8) [33]  | 3 (2.9-5.1) [14]   | 8.7 (4.4-13.6) [272] | 2.4 (1.5-4.4) [235]  |
| <b>Post-birth</b>       |   |                      |                     |                      |                     |                    |                      |                     |                    |                      |                      |
| <b>Cooking Activity</b> |   |                      |                     |                      |                     |                    |                      |                     |                    |                      |                      |
|                         | Older Adult Woman   | 11.7 (7.4-15.2) [98] | 3.4 (2.2-8.4) [103] | 8.2 (4.6-14.3) [93]  | 1.6 (1.6-3.5) [108] | 2.9 (1.5-9.7) [51] | 1.5 (1.5-2.4) [80]   | 8.9 (5.1-12.4) [33] | 4 (3-4.7) [14]     | 8.9 (4.6-14.1) [275] | 2.3 (1.6-4.5) [305]  |

|                     |   |                         |                        |                        |                       |                       |                        |                         |                         |                         |                        |
|---------------------|---|-------------------------|------------------------|------------------------|-----------------------|-----------------------|------------------------|-------------------------|-------------------------|-------------------------|------------------------|
| Kitchen<br>Location | Other   | 9.8 (7.8-11.5)<br>[3]   | 3.3 (2.7-4.1)<br>[4]   | 3.3 (1.8-17.5)<br>[6]  | 1.6 (1.6-1.6)<br>[1]  | 2.6 (1.8-6.9)<br>[10] | 1.5 (1.5-2.4)<br>[15]  | 11.1 (10-11.7)<br>[3]   | 5.1 (4.6-5.3)<br>[5]    | 5.2 (2.4-12)<br>[22]    | 2.4 (1.5-4.6)<br>[25]  |
|                     | Missing   | 10.4 (10.4-10.4) [1]    | 14.7 (14.7-14.7) [1]   |                        |                       |                       |                        | 9.8 (4.7-14.1)<br>[6]   | 7.8 (7.8-7.8)<br>[1]    | 10.4 (5-14) [7]         | 11.2 (9.5-13)<br>[2]   |
|                     | In participant's bedroom                                      | 12 (11.4-12.7)<br>[2]   | 6.6 (4.4-10.5)<br>[4]  | 7 (3.7-10.4)<br>[21]   | 1.6 (1.6-2.9)<br>[48] | 3 (1.7-7.5) [8]       | 1.5 (1.5-1.5)<br>[1]   |                         |                         | 7 (3-10.6) [31]         | 1.6 (1.6-3.5)<br>[53]  |
|                     | Room immediately adjacent to the participant's bedroom        | 11.2 (7.3-15.4)<br>[35] | 3.2 (2.2-7.2)<br>[39]  | 8.4 (5.7-15.2)<br>[49] | 1.7 (1.6-3.5)<br>[41] | 11.7 (11.7-11.7) [1]  | 1.5 (1.5-2.4)<br>[9]   |                         | 4.4 (3.9-5.5)<br>[4]    | 10.1 (6.3-15.2)<br>[85] | 3 (1.6-4.4)<br>[93]    |
|                     | Separated from the participant's bedroom but inside the house | 11.4 (7.4-15.1)<br>[44] | 3.5 (2.8-6.5)<br>[33]  | 8.7 (6.8-18.5)<br>[13] | 1.9 (1.6-4.3)<br>[11] | 1.6 (1.5-9.3)<br>[19] | 1.5 (1.5-2.3)<br>[33]  |                         | 4.5 (3-5.3) [9]         | 9.1 (4.8-14.1)<br>[76]  | 2.8 (1.5-4.6)<br>[86]  |
|                     | In a separate building detached from the bedroom (main house) | 12.1 (8-13.9)<br>[20]   | 4.3 (1.9-9.6)<br>[31]  | 4.4 (2.5-10)<br>[15]   | 1.6 (1.6-1.7)<br>[9]  | 2.4 (1.5-9.1)<br>[25] | 1.5 (1.5-2.5)<br>[49]  | 8.1 (4.8-11.4)<br>[23]  | 3.9 (2.9-5) [6]         | 7.9 (3-11.8)<br>[83]    | 2.2 (1.5-4.8)<br>[95]  |
|                     | Outside the house (outdoors)                                  |                         |                        |                        |                       | 6.2 (2.5-11.6)<br>[8] |                        | 10.7 (7.4-16.9)<br>[13] |                         | 9.4 (5.1-15.2)<br>[21]  |                        |
| Ventilation         | Other   |                         |                        |                        |                       |                       | 9.4 (9.4-9.4)<br>[1]   |                         |                         |                         | 9.4 (9.4-9.4)<br>[1]   |
|                     | Missing   | 10.4 (10.4-10.4) [1]    | 14.7 (14.7-14.7) [1]   | 31.2 (31.2-31.2) [1]   |                       |                       | 1.5 (1.5-1.5)<br>[2]   | 9.8 (4.7-14.1)<br>[6]   | 7.8 (7.8-7.8)<br>[1]    | 12.1 (5.4-15.1)<br>[8]  | 4.7 (1.5-9.5)<br>[4]   |
|                     | Window/opening above stove                                    | 15.4 (13.4-17.8) [6]    | 7.8 (4.2-13.8)<br>[5]  | 2.6 (2.6-2.6)<br>[1]   |                       | 3.8 (2.7-7.6)<br>[3]  | 20.4 (20.4-20.4) [1]   |                         |                         | 12.1 (5.1-15.5)<br>[10] | 10.8 (5.1-13.9)<br>[6] |
|                     | None  | 12.5 (12.5-12.5) [1]    | 19.6 (19.6-19.6) [1]   | 4.3 (4-5.4) [4]        | 2.6 (1.6-7.6)<br>[11] | 3.7 (1.5-7.9)<br>[5]  | 1.5 (1.5-1.9)<br>[8]   |                         |                         | 4.3 (3.3-8.2)<br>[10]   | 1.6 (1.5-6.6)<br>[20]  |
| Missing             | 11 (7.3-14.7)<br>[95]   | 3.4 (2.2-7.3)<br>[102]  | 8.2 (4.6-15.2)<br>[94] | 1.6 (1.6-3.4)<br>[98]  | 2.4 (1.5-9.4)<br>[53] | 1.5 (1.5-2.4)<br>[86] | 8.9 (5.3-12.4)<br>[42] | 4.4 (3-5.4)<br>[20]     | 8.8 (4.5-13.9)<br>[284] | 2.4 (1.6-4.5)<br>[306]  |                        |

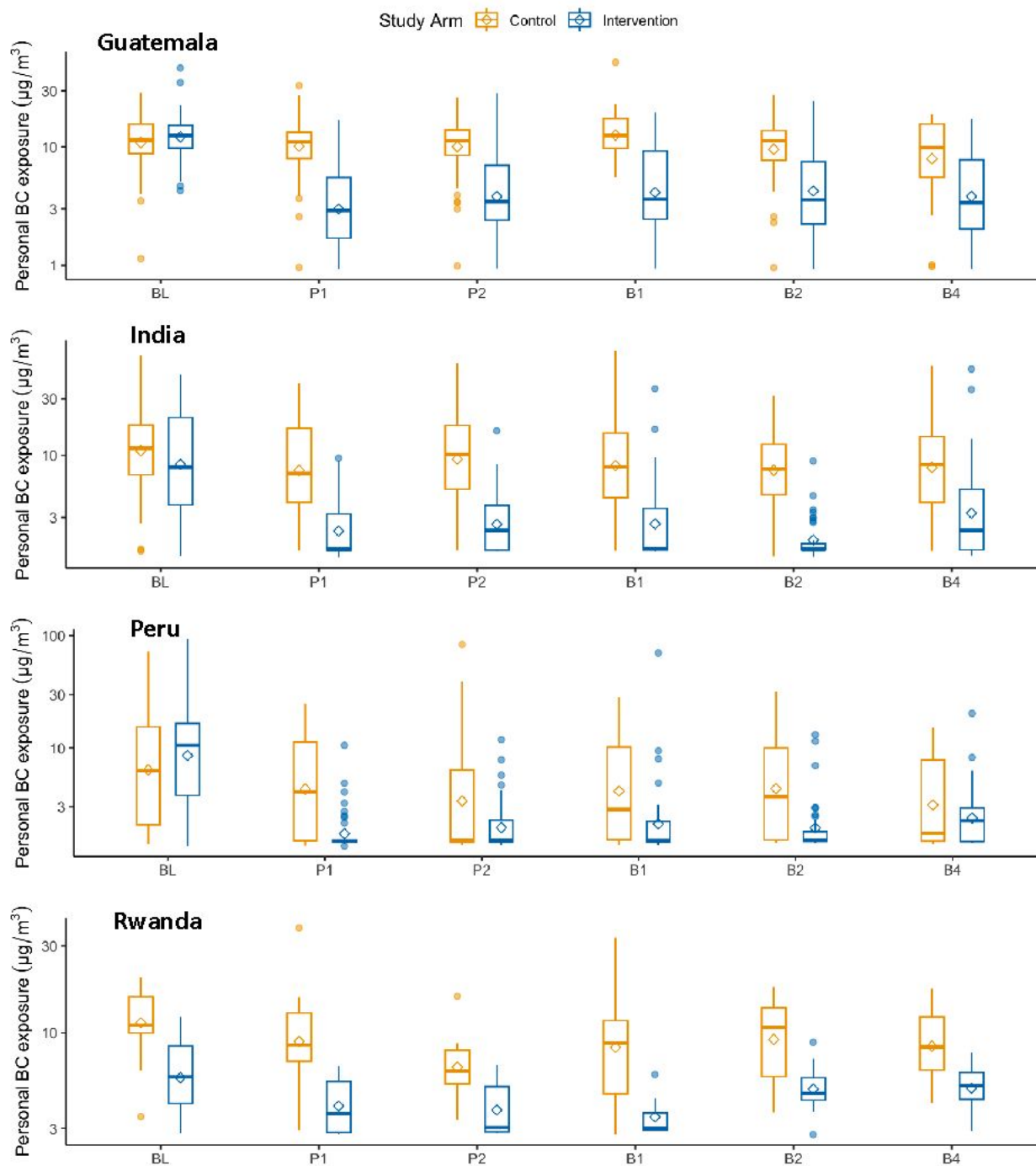
## FIGURES



**Figure S1. Boxplot of personal exposure to PM<sub>2.5</sub> among non-pregnant adult women participants by IRC, study group, and visit.**

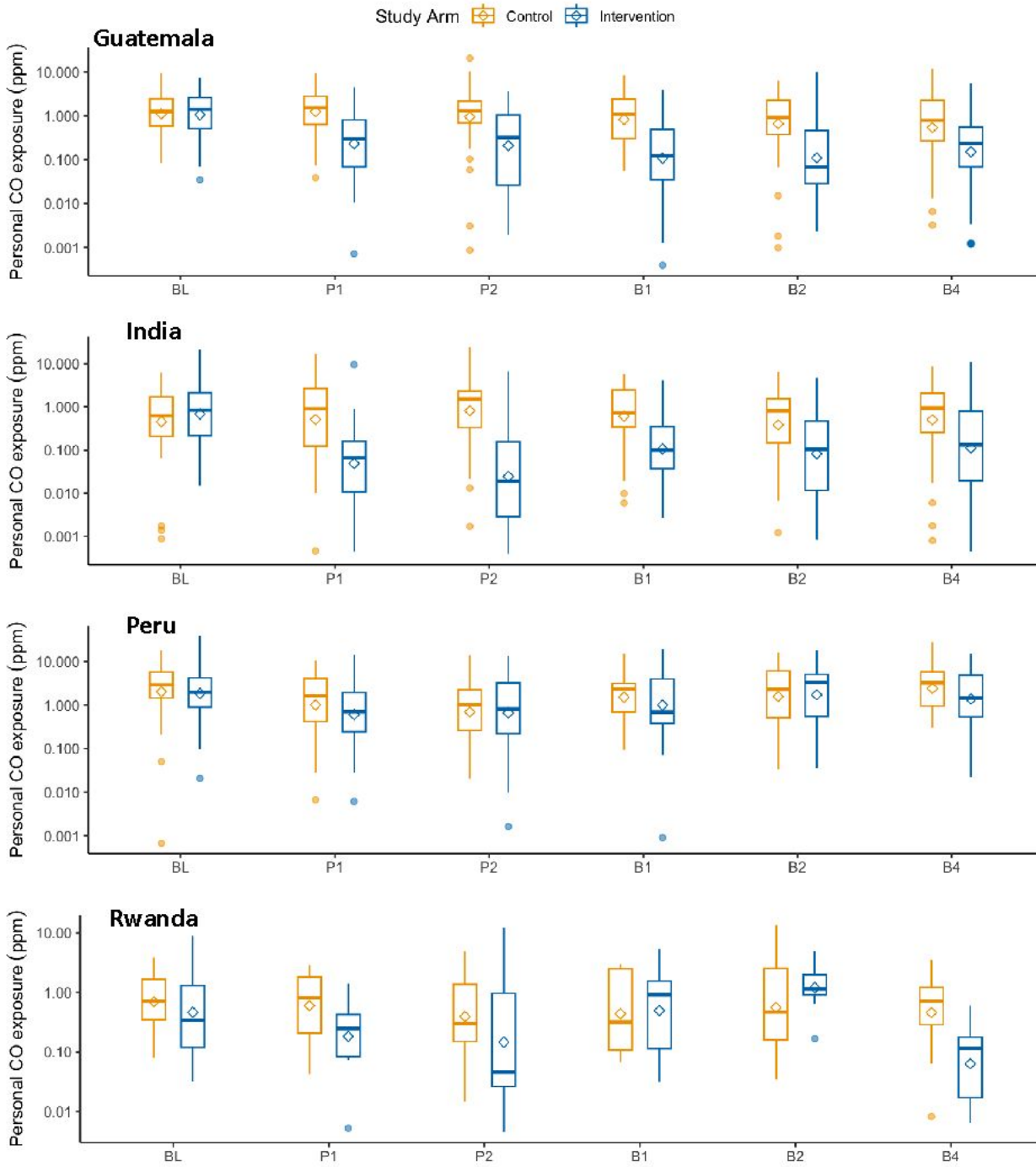
The square in each box indicates the mean value. The highest 2.5% of the datapoints are not shown in the figure.





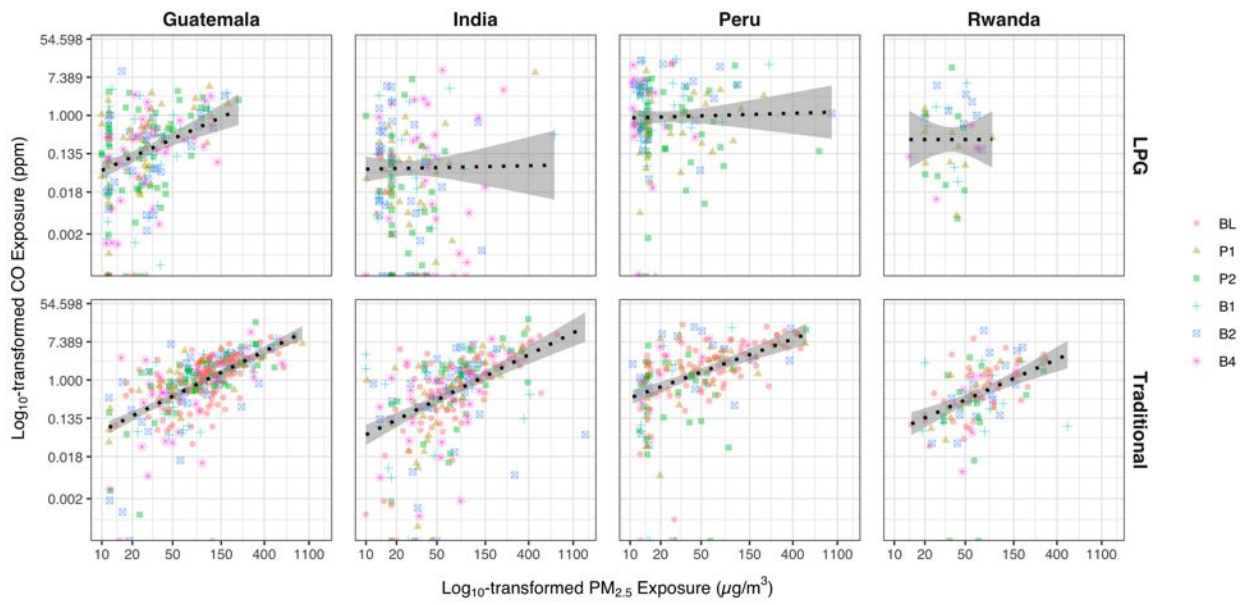
**Figure S2. Boxplot of personal exposure to BC among non-pregnant adult women participants by IRC, study group, and visit.**

The square in each box indicates the mean value. The highest 2.5% of the datapoints are not shown in the figure.

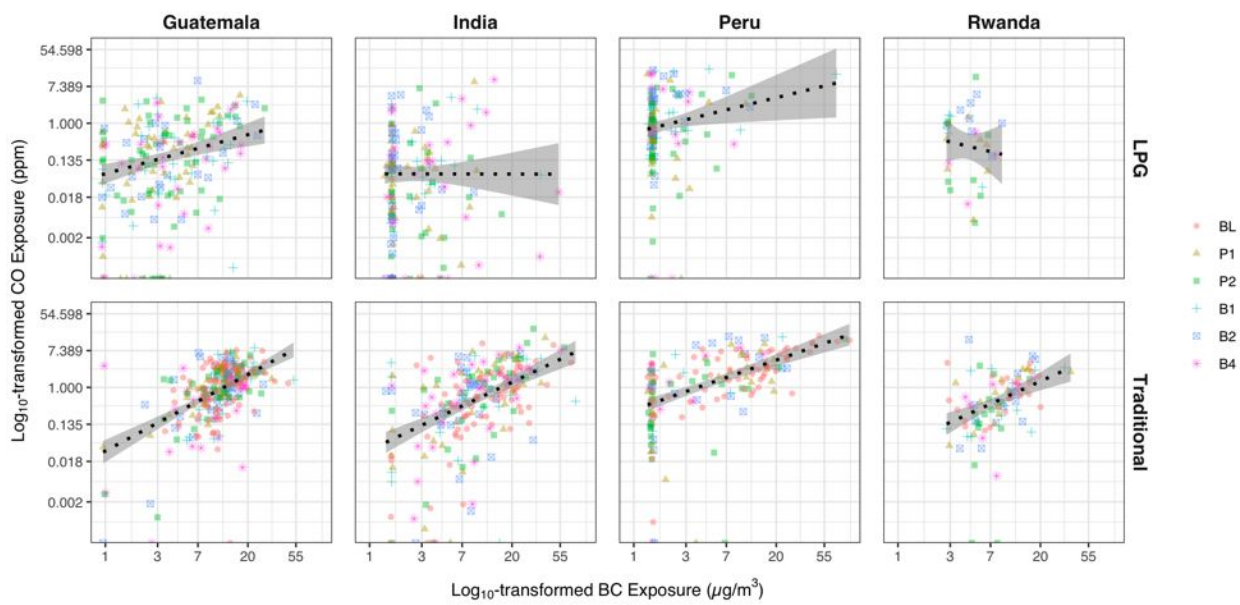


**Figure S3. Boxplot of personal exposure to CO among non-pregnant adult women participants by IRC, study group, and visit.**

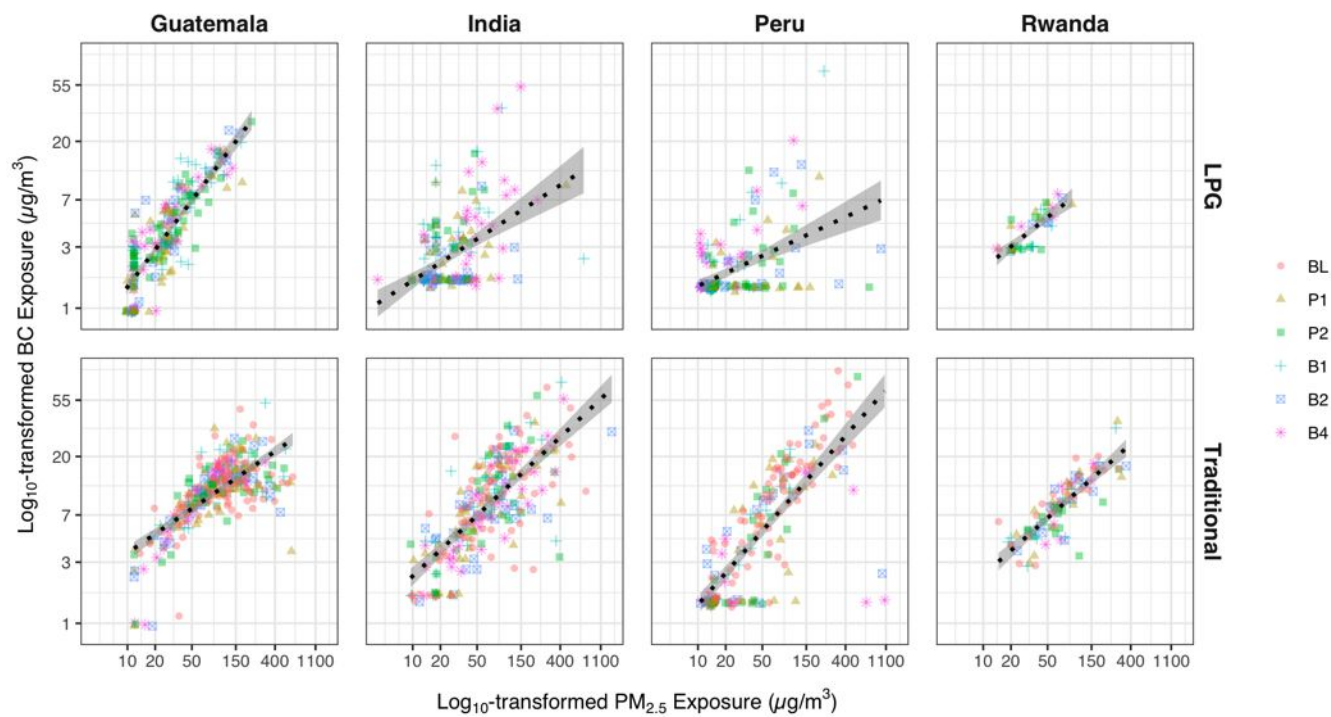
The square in each box indicates the mean value. The highest 2.5% of the datapoints are not shown in the figure.



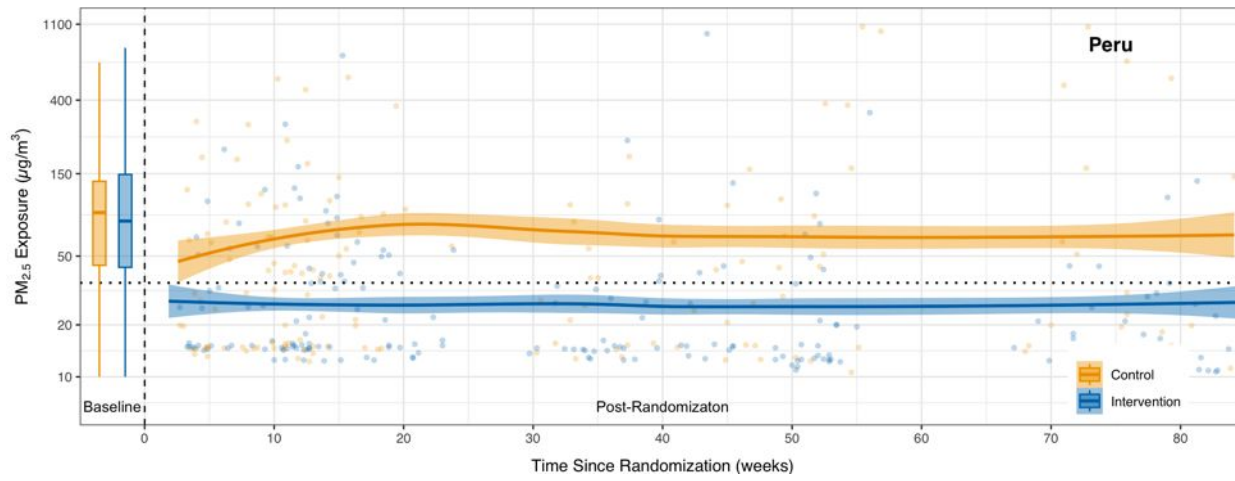
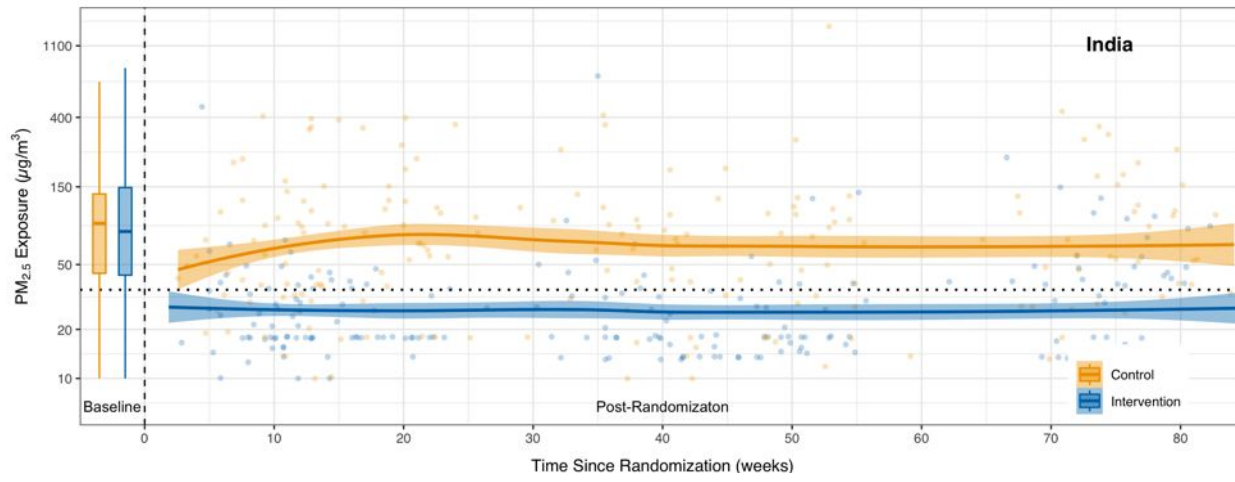
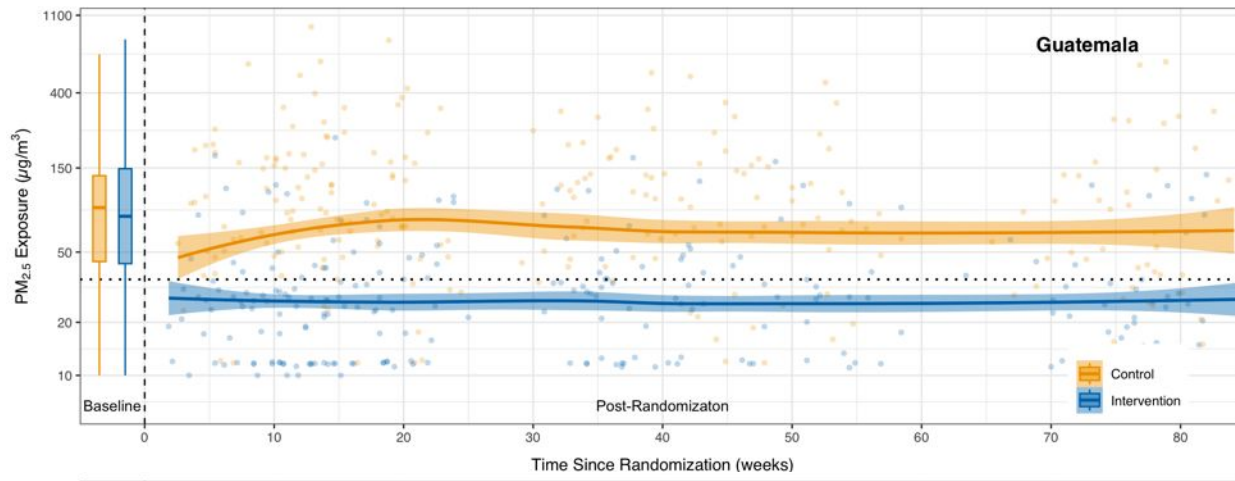
**Figure S4. Correlation between  $\log_{10}$ -transformed  $\text{PM}_{2.5}$  and CO exposure by stove type and IRC**

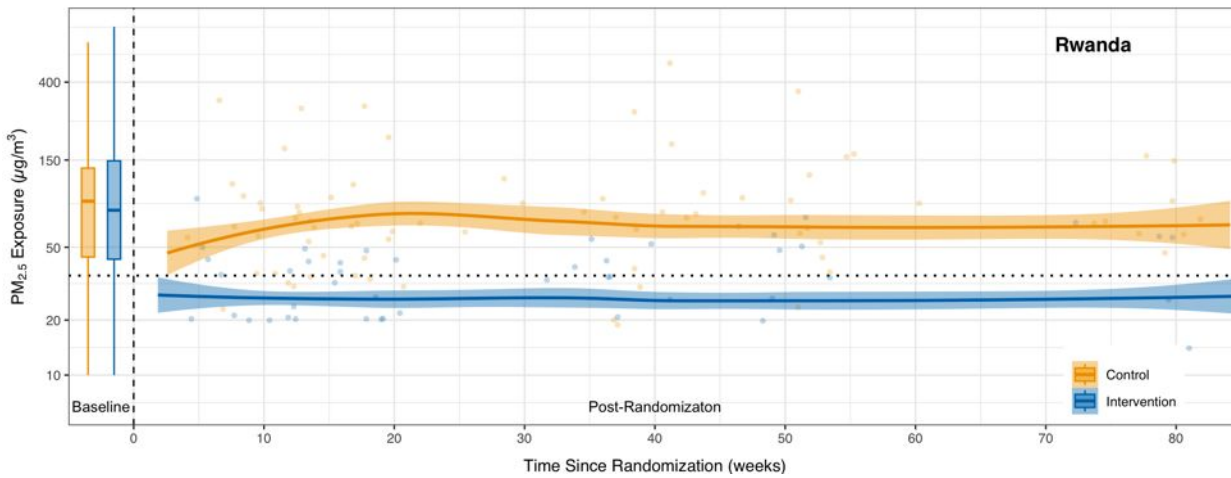


**Figure S5. Correlation between  $\log_{10}$ -transformed BC and CO exposure by stove type and IRC**



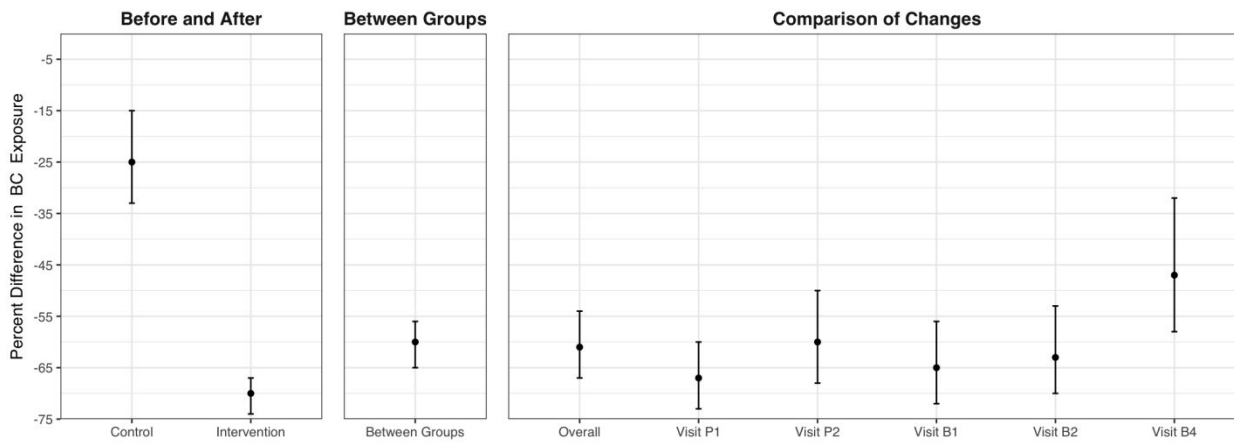
**Figure S6. Correlation between  $\text{log}_{10}$ -transformed  $\text{PM}_{2.5}$  and BC exposure by stove type and IRC**



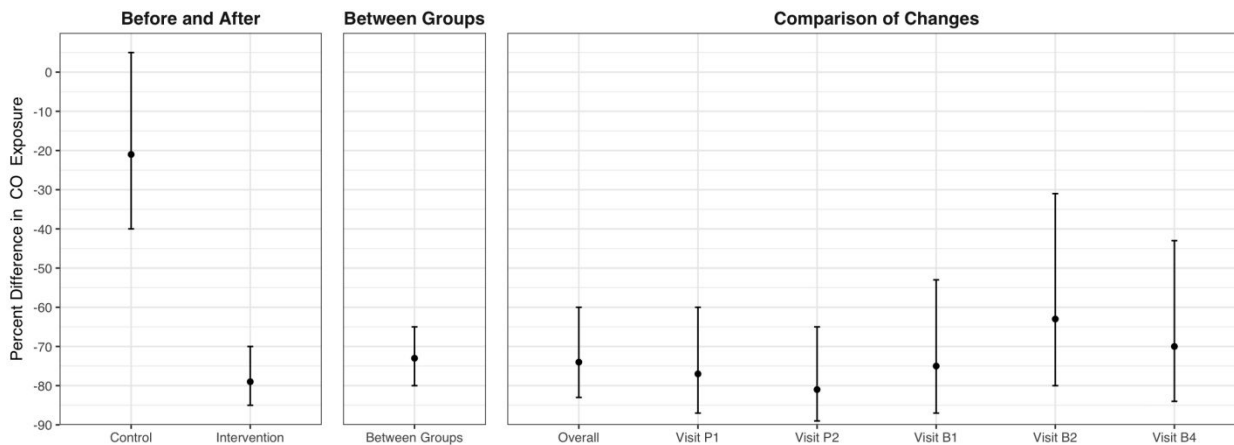


**Figure S7. Trends in personal PM<sub>2.5</sub> exposure among the HAPIN non-pregnant adult women participants in each IRC.**

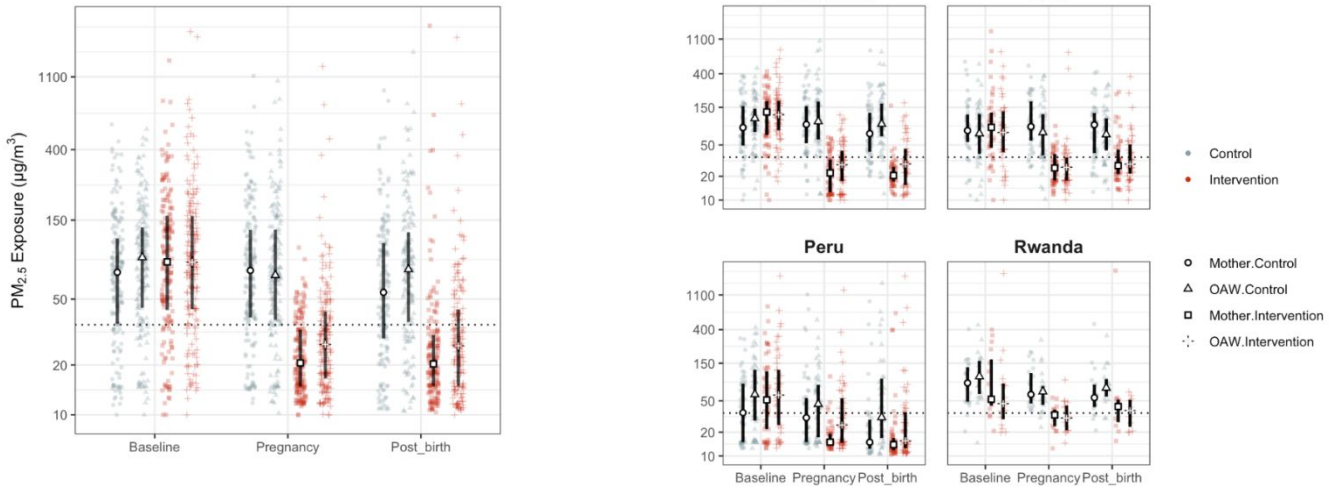
The x-axis is the time since randomization (in weeks); time before 0 indicates the baseline period. Distribution of baseline exposures are presented as box plots. The lower and upper hinges correspond to the first and third quartiles (the 25th and 75th percentiles). The upper and lower whiskers extend  $1.5 \times \text{IQR}$  above and below the upper and lower hinges. Data beyond the whiskers are outliers. Solid lines are a locally weighted smoothing (LOWESS) function. Shaded areas are standard errors. Orange (lighter) points are individual data points from control households; Blue (darker) points are from intervention households. Note: IQR, interquartile range.



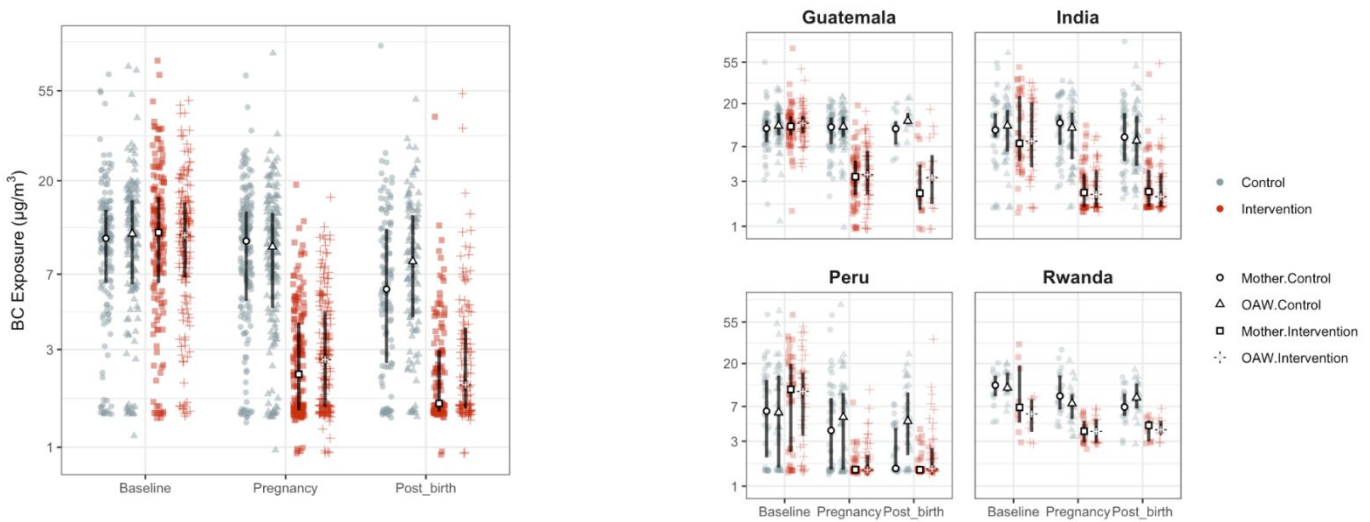
**Figure S8. Estimated effects of the HAPIN LPG stove and fuel intervention on BC exposure.** All linear mixed-effects models used log-transformed BC as the dependent variable. Whiskers indicate the 95% confidence intervals.



**Figure S9. Estimated effects of the HAPIN LPG stove and fuel intervention on CO exposure.** All linear mixed-effects models used log-transformed CO as the dependent variable. Whiskers indicate the 95% confidence intervals.

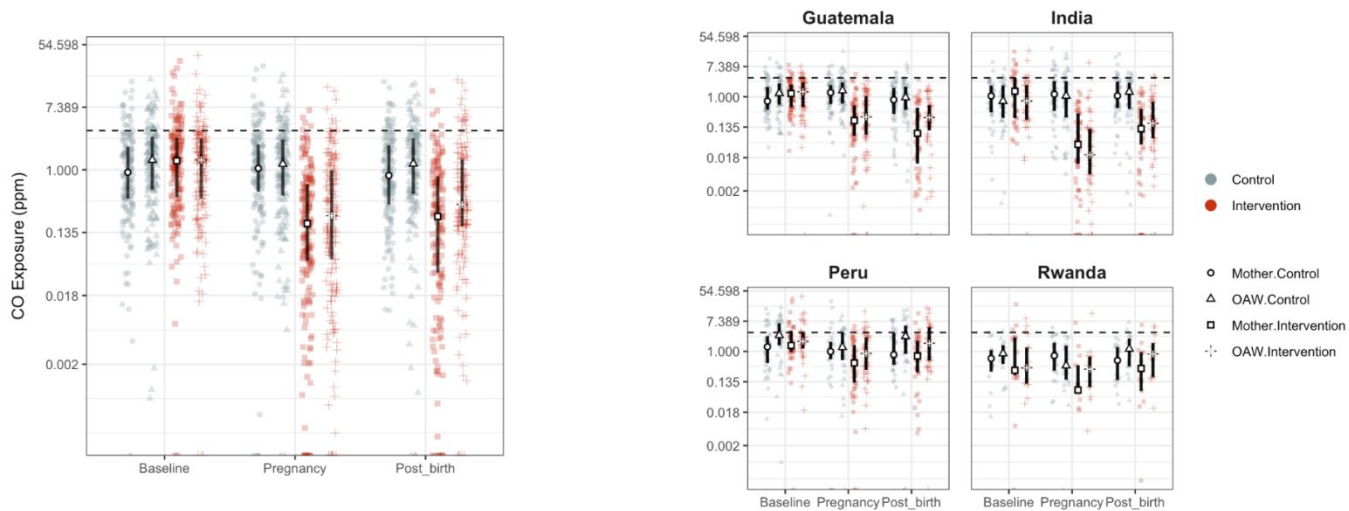


**Figure S10. Trial-wide and IRC-specific comparison of personal exposures to PM<sub>2.5</sub> between pregnant and non-pregnant adult women in the same households by arm and study period**



**Figure S11. Trial-wide and IRC-specific comparison of personal exposures to BC between pregnant and non-pregnant adult women in the same households by arm and study period**



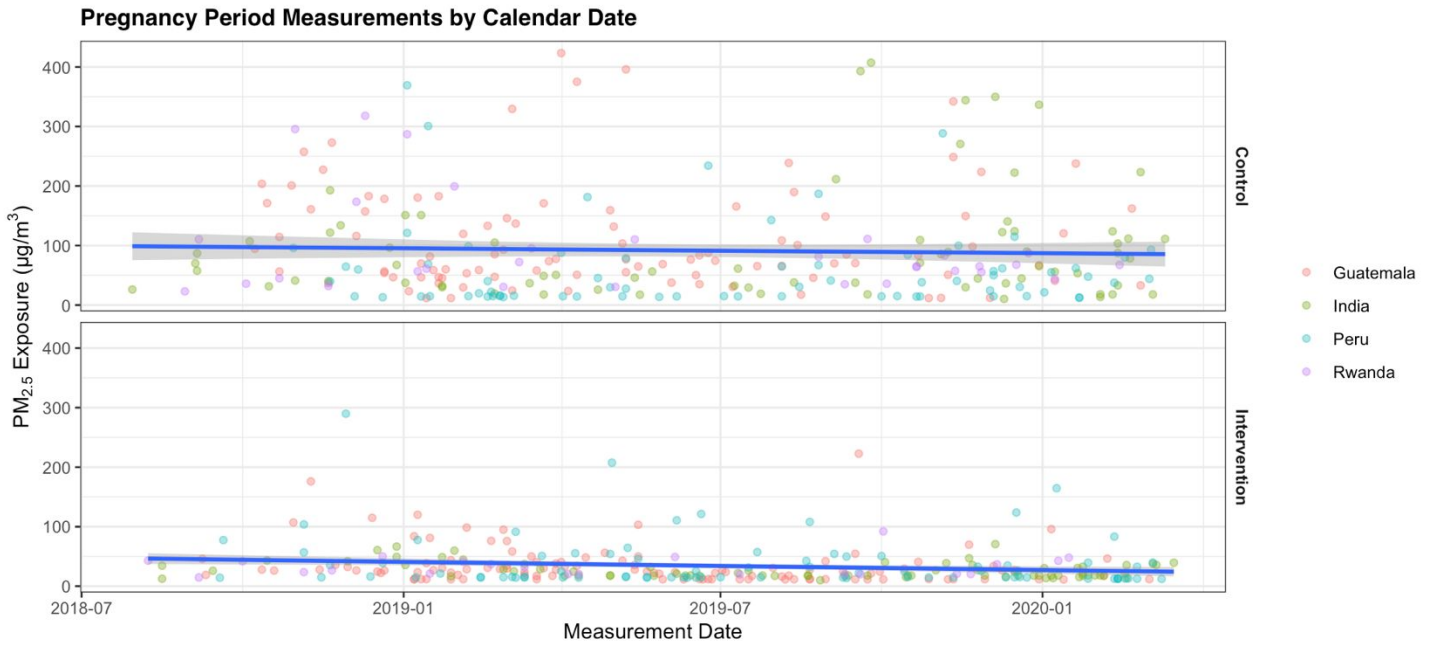


**Figure S12. Trial-wide and IRC-specific comparison of personal exposures to CO between pregnant and non-pregnant adult women in the same households by arm and study period**



**Figure S13. Baseline Measurements by Calendar Date.**

The x-axis is the date of the exposure measurement; the Y axis is the measured PM<sub>2.5</sub> level, and the line is a linear model evaluating time trends. Shaded areas are uncertainty bounds.



**Figure S14. Pregnancy Period Measurements by Calendar Date.**

The x-axis is the date of the exposure measurement; the Y axis is the measured PM<sub>2.5</sub> level, and the line is a linear model evaluating time trends. Shaded areas are uncertainty bounds.



**Figure S15. Post-birth Measurements by Calendar Date.**

The x-axis is the date of the exposure measurement; the Y axis is the measured PM<sub>2.5</sub> level, and the line is a linear model evaluating time trends. Shaded areas are uncertainty bounds.