

Supplemental Material

Biogas stoves reduce firewood use, household air pollution, and hospital visits in Odisha, India

Jessica J. Lewis, John W. Hollingsworth, Ryan T. Chartier, Ellen M. Cooper, William Michael Foster, Genna L. Gomes, Peter S. Kussin, John J. MacInnis, Bijaya K. Padhi, Pinaki Panigrahi, Charles E. Rodes, Ian T. Ryde, Ashok K. Singha, Heather M. Stapleton, Jonathan Thornburg, Cora J. Young, Joel N. Meyer, Subhrendu K. Pattanayak¹

Supplementary Information (25 pages) includes 1 figure and 17 tables

¹ Send correspondence to subhrendu.pattanayak@duke.edu | 919-613-9306 | 126 Rubenstein Hall, Sanford School of Public Policy, Duke University, Durham, NC 27708, USA.

PM Measurement

The sampling units were attached with Teflon tubing to pumps (SKC, Eighty Four, PA) running at 2 liters per minute. Sampling flow rates were measured thrice prior to the start of sampling and thrice when the sampling unit was removed using VWR acrylic flow meter #97004-644 (VWR, Radnor, PA). Flow rate was calculated as the average of the pre-flow and post-flow averages. The volume of air sampled was calculated by multiplying the flow rate by the total pump run time. The weight of accumulated particles was calculated by subtracting the weight of the filter before exposure from the weight of the filter after sampling, with each measurement done in triplicate on a microbalance that was zeroed between filters. At high filter loadings, collection efficiency will increase. Three samples were not included in the data analysis due to a negative net filter weight; 5 were excluded because the pump was stopped when the sample was collected due to filter loading. The PM_{2.5} concentration was calculated as the weight of accumulated particles divided by the volume of air sampled.

Finally, outdoor ambient PM_{2.5} exposure was measured over 24 hours at one randomly selected household in each village via a sampling unit placed on the roof of a house; therefore, nine outdoor samples were collected, ranging from 10 to 170 µg/m³. One sample was dropped due to missing weight data.

Filters were sealed in cassettes after pre-weighing and after exposure in the field, and frozen at -20°C after being returned to Duke University.

PAH Measurement

The PAH methods were developed in-house. They are modified (to extract filters instead of sediment) from those used by Clark et al. (2013). Dried air filter samples containing the collected particulates were cut in half and weighed. For PAH extraction, half of each filter

sample was placed in a glass centrifuge tube with 1:1 acetone: hexane and spiked with a surrogate standard mix containing 6 deuterated PAHs (D10-2-methylnaphthalene, D10-fluorene, D10-fluoranthene, D12-chrysene, D12-perylene, and D12-indeno[1,2,3-c,d]pyrene) to assess recoveries. Samples were extracted by sonication, and the extract was concentrated to 0.2-0.5 mL using rapid evaporation under N₂ (SpeedVac (ThermoSavant, Holbrook, NY, USA). Extracts were cleaned with solid phase extraction using activated silica and eluted with hexane. Purified extracts were concentrated under N₂ to approximately 0.5 mL, and spiked with an internal standard mix containing D8-naphthalene, D10-anthracene, D10-pyrene, D12-benz[a]anthracene, and D12-benzo[a]pyrene. Prior to extraction, samples were randomized and split into 15 test batch sets. Each batch set included blanks (n=3), a matrix spike containing 100 µL of a PAH calibration standard (n=6) and extracted alongside samples, and a quality assurance/quality control sample consisting of an autosampler vial containing all surrogates, internal standards, and amount of PAH standard used for the matrix spike.

Samples were analyzed for 35 PAHs by gas chromatograph mass spectrometer (GC/MS; Agilent GC 6890N, MS 5975C mass selective detector. Agilent Newark, DE) in electron ionization mode (GC/EIMS) using select ion monitoring and pulsed splitless injection at 250 °C. Analytes were separated on a DB-5 column (30 m, 0.25 µm film thickness) using a thermal gradient (40 °C for 0.6 min, increase to 280 °C over 14.6 min, hold at 280 °C for 24 min). GC/MS data were quantified using MSD chemstation software, and for each batch, samples were blank-corrected by subtracting the average value of the blanks. Method detection limits (MDLs) were calculated for each PAH ($MDL = (3 * \text{standard deviation of the analyte in the 3 blanks}) / (\text{average sample mass})$). PAH samples with values that were <MDL were replaced with MDL/2 for statistical calculations.

Water Soluble Organic Carbon and Nitrogen

The concentration of WSOC and WSON (mass divided by total air sampled) as well as the fraction of total particulate that was WSOC or WSON were analyzed.

Prior to sample extraction, 24 mL glass vials were thoroughly rinsed well with tap water, NanoUV water (Barnstead Infinity™ Ultrapure Water System, Thermo Scientific, $17.3 \text{ M}\Omega\text{cm}^{-1}$) then placed in an acid bath of 5% HCl and rinsed three additional times with NanoUV water. The vials were wrapped in aluminum foil and placed in a muffle furnace (Thermolyne™, Thermo Scientific) overnight to remove any organic matter remaining on the glassware. This protocol was applied to all glassware used during the experiment, while all other materials that came into contact with the filters were washed in a hot soap and water bath, then rinsed with water, then acetone (BDH, ASC Grade). Sub-samples were collected from each Teflon filter using an arch punch (C.S. Osborne & CO.) of 3/8" diameter. Each sub-sample was added to a pre-cleaned 24 mL glass vial and materials were re-cleaned to avoid cross contamination between samples, as described above. After the sample collection, 15 mL of NanoUV water was added to each vial using a volumetric pipette. To ensure the sample was completely embedded in the water, needles (BD PrecisionGlide™) were used to push the filters below the meniscus. The needles were held above the water by placing the end of the needle into a piece of Parafilm, which was wrapped around the neck of the vial. Sub-samples then were subjected to sonication for 30 minutes (Branson 8510 Ultrasonic Cleaner). Teflon filters (Pall Corporation) were prepared and treated in an identical way as a method blank. Samples were analyzed using a total carbon analyzer (TOC-V_{CHS}, Shimadzu). An ASI-V autosampler was used to inject the samples into the TOC interface. A calibration curve was generated through a series of auto dilutions from a 10ppm stock solution of potassium hydrogen phthalate (KHP, Fisher Scientific) using the TOC Control-V software. NanoUV water samples were run to assess the concentrations of dissolved organics in the water

and 5ppm check standards of KHP were run every 10 samples to assess the variability in the TOC measurements. The remaining fractions from the TOC analysis were diluted by adding 8 mL of NanoUV water to the each vial using a volumetric pipette and analyzed using a total nitrogen-measuring unit (TNM, Shimadzu). A calibration curve was generated through a series of auto dilutions from a 20ppm stock solution of glutamic acid. Glutamic acid and EDTA were check standards in this analysis. Check standards were run after every 10 samples. Filter loadings were determined by scaling the surface area of the sub-samples to the total surface area of the samples.

Five samples were unable to be analyzed; 93 filters were analyzed for WSOC and WSON mass. Samples with WSOC or WSON as a fraction of total PM that exceeded 100% were dropped leaving a 68 WSOC and 88 WSON.

Spirometry

The spirometer was calibrated daily using a 3L syringe (MicroLoop Spirometer, CareFusion, San Diego, CA). Spirometry was conducted on participants while sitting and wearing a nose clip, or pinching nose closed if facial jewelry interfered with the clip. Subjects completed at the spirometry test at least three times. Spirometry that met ATS criteria was included in the data analysis. Spirometry was collected from 102 cooks; 70 were dropped because they failed to meet American Thoracic Society (ATS) criteria, leaving 32 cooks (26 primary, 6 secondary; all but 1 female). Some of the challenges with obtaining spirometry data that satisfied the ATS criteria include: 1) cooks had difficulty taking multiple deep breaths with their mouth around the mouthpiece (perhaps using a smaller-diameter mouthpiece would address this problem in the future); 2) nervousness performing the test in front of others; 3) custom of wearing nose rings, which made it challenging to prevent air from escaping through nasal passages during exhalation. Blood pressure was collected from 113 cooks (95 primary, 18 secondary); self-

reported time spent in the hospital due to ARI was collected from each household (n=105) and 114 cooks answered the questions about incidence of cold/cough.

Supplemental Figures and Tables

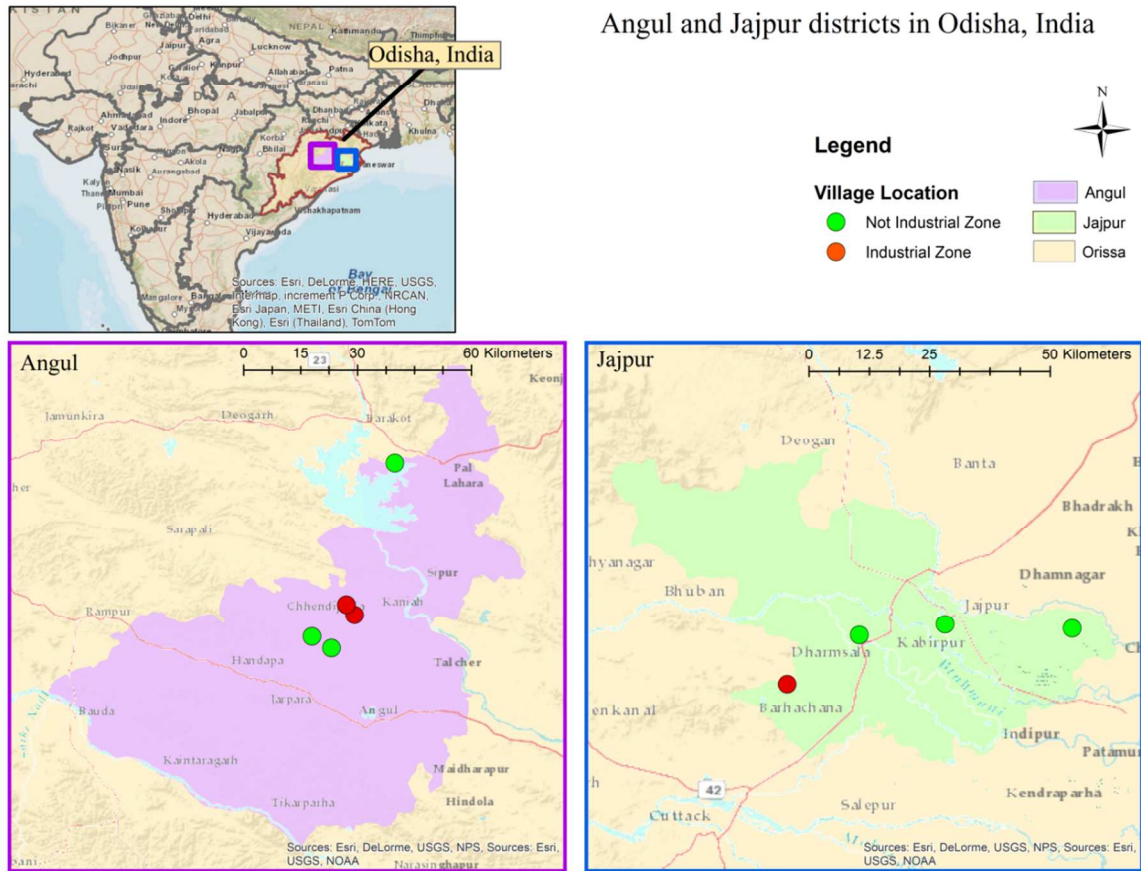


Figure S1. Map of Project Area and villages

Table S1. Ordinary Least Squares regressions for firewood consumption (in kilograms; Models 1-3), household PM_{2.5} (in log µg/m³; Models 4-6), total of 35 measured PAHs (in log ng/m³; Models 7-9), and water soluble organic nitrogen (in log µg/m³; Models 10-12) with robust standard errors.

VARIABLES	(1) Firewood	(2) Firewood	(3) Firewood	(4) PM _{2.5}	(5) PM _{2.5}	(6) PM _{2.5}	(7) PAH ²	(8) PAH ¹	(9) PAH ¹	(10) WSON	(11) WSON	(12) WSON
Uses any improved stove ³	-4.77*** (0.00)	-5.33*** (0.00)	-5.19*** (0.00)	-1.56*** (0.00)	-1.83*** (0.00)	-1.87*** (0.00)	-1.52*** (0.00)	-1.79*** (0.00)	-1.64*** (0.00)	-0.46** (0.02)	-0.62*** (0.00)	-0.58*** (0.01)
Education of primary cook		-0.02 (0.86)	-0.08 (0.39)		0.01 (0.88)	-0.01 (0.91)		0.03 (0.43)	0.02 (0.61)		-0.01 (0.72)	-0.02 (0.49)
Outdoor PM value			0.01 (0.06)			0.01** (0.04)			0.00 (0.54)			0.00 (0.59)
Log of total monthly expenditure		0.63 (0.27)	0.45 (0.47)		0.58** (0.01)	0.52** (0.05)		0.40 (0.08)	0.15 (0.62)		0.15 (0.28)	0.14 (0.37)
Household size			-0.02 (0.94)			0.08 (0.34)			0.16* (0.05)			0.01 (0.88)
Electricity main source of lighting			-1.76 (0.39)			0.15 (0.73)			0.36 (0.53)			0.40 (0.12)
Constant	5.22*** (0.00)	0.03 (0.99)	2.57 (0.64)	5.52*** (0.00)	0.66 (0.71)	0.13 (0.95)	6.08*** (0.00)	2.66 (0.17)	3.25 (0.17)	2.41*** (0.00)	1.22 (0.29)	0.89 (0.46)
Observations	105	92	82	99	89	80	87	77	71	85	76	69
R-squared	0.28	0.39	0.44	0.25	0.30	0.34	0.25	0.30	0.30	0.07	0.12	0.13

Robust p values in parentheses

*** p<0.01, ** p<0.05

² Results similarly significant for 7 PAHs considered individually: chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, dibenzo[a,h]anthracene, indeno[1,2,3-cd]pyrene, benzo[a]anthracene

³ Results similarly significant for use of biogas stove

Table S2. Ordinary Least Squares regressions for household PM_{2.5} with location interaction terms (in log µg/m³; Models 1-2), and total of 35 measured PAHs (in log ng/m³; Models 3-4) with robust standard errors.

LABELS	(1) PM _{2.5}	(2) PM _{2.5}	(3) Total PAH	(4) Total PAH
Use of any improved stove	-1.14*** (0.00)	-1.38*** (0.00)	-1.03*** (0.00)	-1.09*** (0.01)
Location in industrial area	0.83*** (0.00)	0.81*** (0.01)	1.15*** (0.00)	1.22*** (0.00)
Use of any improved stove in industrial area	-1.38 (0.06)	-1.09 (0.14)	-1.60*** (0.00)	-1.55*** (0.01)
Education of primary cook		0.00 (0.99)		0.01 (0.73)
Log of total monthly expenditure		0.41 (0.05)		0.03 (0.90)
Household size		0.06 (0.42)		0.16** (0.03)
Electricity main source of lighting		0.22 (0.53)		0.69 (0.06)
Constant	5.26*** (0.00)	1.27 (0.42)	5.75*** (0.00)	3.82 (0.06)
Observations	99	89	87	77
R-squared	0.30	0.35	0.34	0.42

Robust p values in parentheses
*** p<0.01, ** p<0.05

Table S3. Regressions for stove use and health, by age of cook: all ages⁴

LABELS	(1) Systolic BP	(2) Systolic BP	(3) Diastolic BP	(4) Diastolic BP	(5) FEV1	(6) FEV1	(7) FVC	(8) FVC	(9) Cold	(10) Cold	(11) Hospital	(12) Hospital
Use of any improved stove	-3.27 (0.38)	-1.21 (0.79)	-2.86 (0.17)	-3.12 (0.19)	-0.19 (0.12)	-0.15 (0.34)	-0.17 (0.19)	-0.13 (0.39)	0.31 (0.48)	0.77 (0.18)	-1.22** (0.03)	-1.85 (0.08)
Education of primary cook		-0.46 (0.38)		-0.01 (0.96)		-0.02 (0.35)		-0.03 (0.20)		0.08 (0.32)		-0.03 (0.60)
Log of total monthly expenditure		-1.54 (0.67)		0.80 (0.64)		0.11 (0.51)		0.20 (0.25)		-0.30 (0.56)		1.63 (0.09)
Outdoor PM value ($\mu\text{g}/\text{m}^3$)		-0.01 (0.73)		-0.02 (0.38)		-0.00 (0.18)		-0.00 (0.26)		-0.01** (0.03)		0.01 (0.28)
Household size		0.34 (0.72)		0.33 (0.52)		0.05 (0.28)		0.04 (0.41)		0.15 (0.25)		0.05 (0.80)
Electricity main source of lighting		3.79 (0.56)		-0.06 (0.98)		-0.41 (0.21)		-0.31 (0.32)		0.60 (0.69)		0.84 (0.36)
Constant	80.64*** (0.00)	89.49*** (0.00)	54.20*** (0.00)	49.80*** (0.00)	2.10*** (0.00)	2.04 (0.17)	2.10*** (0.00)	1.01 (0.51)	-3.88*** (0.01)	-4.49 (0.19)	2.22*** (0.00)	-12.86 (0.84)
Observations	113	89	113	89	32	24	32	24	114	90	105	82
R-squared	0.13	0.13	0.12	0.14	0.37	0.55	0.45	0.63	0.05	0.16	0.03	0.18

Robust p values in parentheses
*** p<0.01, ** p<0.05

⁴ Columns 1-4 report blood pressure; columns 5-8 observed lung function; columns 9-10 binary incidence of cold/cough; columns 11-12 number of days household members spent in the hospital for the last episode of ARI. All analyses also control for age, BMI and gender except hospital days (because it was measured at the household not individual level). BP, spirometry, and days in hospital were analyzed using OLS models with robust standard errors (R² reported). Incidence of cold/cough was modeled with logit (pseudo-R² reported).

Results were similar for hypertension (no significant association between use of ICS and hypertension). Regressions were underspecified for normal FEV1.

Table S4. Regressions for stove use and health, by age of cook: <35⁵

LABELS	(1) Systolic BP	(2) Systolic BP	(3) Diastolic BP	(4) Diastolic BP	(5) FEV1	(6) FEV1	(7) FVC	(8) FVC	(9) Cold	(10) Cold	(11) Hospital	(12) Hospital
Use of any improved stove	-4.49 (0.20)	-3.38 (0.43)	-3.38 (0.27)	-6.78** (0.01)	0.08 (0.36)	0.47 (0.08)	0.16 (0.18)	0.68 (0.10)	0.77 (0.31)	1.57 (0.21)	-1.87** (0.04)	-1.65** (0.03)
Education of primary cook		-0.02 (0.97)		0.20 (0.54)		-0.06 (0.09)		-0.09 (0.10)		-0.07 (0.51)		-0.05 (0.68)
Log of total monthly expenditure		-1.26 (0.78)		1.84 (0.53)		0.63 (0.11)		1.00 (0.13)		1.63 (0.15)		1.87 (0.05)
Outdoor PM value		0.02 (0.75)		-0.01 (0.72)		-0.00 (0.23)		-0.00 (0.35)		-0.00 (0.97)		-0.00 (0.63)
Household size		0.39 (0.80)		-0.06 (0.95)		-0.14 (0.15)		-0.22 (0.18)		-0.21 (0.45)		0.02 (0.93)
Electricity main source of lighting		8.21 (0.45)		4.08 (0.26)		1.15 (0.13)		1.85 (0.15)		-1.45 (0.35)		0.91 (0.40)
Constant	83.93*** (0.00)	101.28** (0.03)	34.51** (0.01)	25.74 (0.19)	4.23*** (0.00)	1.69 (0.11)	4.85*** (0.00)	0.22 (0.76)	-8.59* (0.06)	-20.49** (0.04)	2.53*** (0.01)	-13.76** (0.04)
Observations	49	37	49	37	14	10	14	10	49	37	42	30
R-squared	0.12	0.21	0.17	0.31	0.71	1.00	0.63	1.00	0.13	0.26	0.04	0.36

Robust p values in parentheses

*** p<0.01, ** p<0.05

⁵ Columns 1-4 report blood pressure; columns 5-8 observed lung function; columns 9-10 binary incidence of cold/cough; columns 11-12 number of days household members spent in the hospital for the last episode of ARI. All analyses also control for age, BMI and gender except hospital days (because it was measured at the household not individual level). BP, spirometry, and days in hospital were analyzed using OLS models with robust standard errors (R² reported). Incidence of cold/cough was modeled with logit (pseudo-R² reported).

Results were similar for hypertension (no significant association between use of ICS and hypertension). Regressions were underspecified for normal FEV1

Table S5. Regressions for stove use and health, by age of cook: $\geq 35^6$

LABELS	(1) Systolic BP	(2) Systolic BP	(3) Diastolic BP	(4) Diastolic BP	(5) FEV1	(6) FEV1	(7) FVC	(8) FVC	(9) Cold	(10) Cold	(11) Hospital	(12) Hospital
Use of any improved stove	-3.60 (0.54)	-1.44 (0.85)	-2.72 (0.36)	-3.19 (0.37)	-0.29* (0.09)	0.00 (0.99)	-0.29 (0.10)	-0.09 (0.71)	0.32 (0.57)	2.07* (0.06)	-0.81 (0.27)	-2.02 (0.22)
Education of primary cook		-0.72 (0.42)		-0.05 (0.91)		0.00 (0.94)		0.01 (0.87)		0.17 (0.17)		-0.04 (0.71)
Log of total monthly expenditure		-0.27 (0.96)		1.59 (0.54)		0.11 (0.61)		0.18 (0.41)		- 1.59** (0.02)		1.43 (0.24)
Outdoor PM value		-0.07 (0.20)		-0.04 (0.19)		-0.00* (0.06)		-0.00* (0.07)		- 0.02** (0.02)		0.02 (0.14)
Household size		0.33 (0.80)		0.57 (0.43)		0.12 (0.17)		0.08 (0.31)		0.21 (0.25)		0.07 (0.78)
Electricity main source of lighting		4.81 (0.30)		-3.44 (0.12)		-0.69** (0.02)		-0.65** (0.02)				
Constant	71.50*** (0.00)	67.90 (0.11)	55.09*** (0.00)	51.39** (0.01)	1.28** (0.01)	3.74* (0.07)	1.31** (0.02)	2.65 (0.17)	- 6.93*** (0.00)	-0.46 (0.93)	1.97*** (0.00)	-10.62 (0.23)
Observations	64	52	64	52	18	14	18	14	64	50	63	52
R-squared	0.12	0.18	0.09	0.14	0.44	0.84	0.57	0.88	0.09	0.35	0.02	0.17

Robust p values in parentheses

*** p<0.01, ** p<0.05, * p<0.1

⁶ Columns 1-4 report blood pressure; columns 5-8 observed lung function; columns 9-10 binary incidence of cold/cough; columns 11-12 number of days household members spent in the hospital for the last episode of ARI. All analyses also control for age, BMI and gender except hospital days (because it was measured at the household not individual level). BP, spirometry, and days in hospital were analyzed using OLS models with robust standard errors (R² reported). Incidence of cold/cough was modeled with logit (pseudo-R² reported).

Results were similar (not significant) for hypertension and underspecified for normal FEV1.

Table S6. Regressions for household PM_{2.5} and health by age: all ages⁷

LABELS	(1) Systolic BP	(2) Systolic BP	(3) Diastolic BP	(4) Diastolic BP	(5) FEV1	(6) FEV1	(7) FVC	(8) FVC	(9) Cold	(10) Cold	(11) Hospital	(12) Hospital
Household PM _{2.5} (log µg/m ³)	0.78 (0.41)	0.66 (0.55)	0.67 (0.24)	0.67 (0.24)	0.09 (0.14)	0.00 (0.99)	0.10 (0.13)	-0.02 (0.86)	-0.04 (0.73)	-0.01 (0.93)	0.47** (0.03)	0.38* (0.09)
Education of primary cook		-0.53 (0.34)		-0.10 (0.72)		-0.04 (0.13)		-0.04 (0.10)		0.07 (0.35)		-0.06 (0.36)
Log of total monthly expenditure		-1.98 (0.58)		-0.12 (0.95)		0.12 (0.51)		0.22 (0.26)		-0.00 (0.99)		1.16 (0.15)
Outdoor PM value (µg/m ³)		-0.02 (0.54)		-0.03 (0.20)		-0.00 (0.12)		-0.00 (0.24)		-0.01** (0.02)		0.01 (0.44)
Household size		0.20 (0.84)		0.28 (0.59)		0.05 (0.34)		0.05 (0.42)		0.09 (0.48)		0.05 (0.79)
Electricity main source of lighting		3.89 (0.55)		-0.36 (0.87)		-0.41 (0.28)		-0.31 (0.39)		0.58 (0.68)		0.57 (0.45)
Constant	75.44*** (0.00)	91.81*** (0.00)	51.13*** (0.00)	55.70*** (0.00)	1.53*** (0.00)	2.25 (0.20)	1.47*** (0.00)	1.19 (0.52)	-4.08** (0.02)	-6.08* (0.06)	-0.55 (0.53)	-10.84* (0.10)
Observations	107	87	107	87	28	22	28	22	108	88	99	80
R-squared	0.13	0.14	0.12	0.13	0.39	0.57	0.48	0.64	0.05	0.15	0.04	0.14

Robust p values in parentheses

*** p<0.01, ** p<0.05, * p<0.1

⁷ Columns 1-4 report blood pressure; columns 5-8 observed lung function; columns 9-10 binary incidence of cold/cough; columns 11-12 number of days household members spent in the hospital for the last episode of ARI. All analyses also control for age, BMI and gender except hospital days (because it was measured at the household not individual level). BP, spirometry, and days in hospital were analyzed using OLS models with robust standard errors (R² reported). Incidence of cold/cough was modeled with logit (pseudo-R² reported).

Results were similar (not significant) for association between household PM_{2.5} and hypertension; PM_{2.5} was not significantly associated with normal FEV1 in the regression with the smallest set of controls, and underspecified when all controls were added.

Table S7. Regressions for household PM_{2.5} and health by age: <35 years ⁸

LABELS	(1) Systolic BP	(2) Systolic BP	(3) Diastolic BP	(4) Diastolic BP	(5) FEV1 ⁹	(6) FVC ⁸	(7) Cold	(8) Cold	(9) Hospital	(10) Hospital
Log PM _{2.5}	0.59 (0.53)	0.08 (0.93)	0.06 (0.93)	0.07 (0.92)	-0.03 (0.49)	-0.03 (0.68)	0.07 (0.71)	-0.13 (0.50)	0.34** (0.02)	0.26 (0.10)
Education of primary cook		-0.24 (0.73)		-0.11 (0.73)				-0.03 (0.75)		-0.13 (0.31)
Log of total monthly expenditure		-2.11 (0.68)		0.52 (0.87)				1.77 (0.11)		1.55 (0.10)
Outdoor PM value		0.01 (0.89)		-0.02 (0.57)				-0.00 (0.92)		-0.01 (0.48)
Household size		0.47 (0.76)		0.15 (0.87)				-0.25 (0.32)		0.07 (0.78)
Electricity main source of lighting		7.18 (0.50)		1.74 (0.63)				-0.64 (0.67)		0.47 (0.64)
Constant	84.06*** (0.00)	111.38** (0.02)	36.17** (0.01)	41.77* (0.09)	4.59*** (0.00)	5.29*** (0.01)	-8.57** (0.02)	-20.49** (0.03)	-0.12 (0.88)	-11.70* (0.08)
Observations	47	36	47	36	12	12	47	36	40	29
R-squared	0.13	0.21	0.16	0.22	0.73	0.58	0.10	0.22	0.02	0.32

Robust p values in parentheses

*** p<0.01, ** p<0.05, * p<0.1

⁸ Columns 1-4 report blood pressure; columns 5-8 observed lung function; columns 9-10 binary incidence of cold/cough; columns 11-12 number of days household members spent in the hospital for the last episode of ARI. All analyses also control for age, BMI and gender except hospital days (because it was measured at the household not individual level). BP, spirometry, and days in hospital were analyzed using OLS models with robust standard errors (R² reported). Incidence of cold/cough was modeled with logit (pseudo-R² reported).

Results for PM_{2.5} were negatively associated with hypertension in univariate models (controlling for age, BMI, gender); multivariate models underspecified due to limited incidence of hypertension. Normal FEV1 was not modeled because all middle aged cooks have normal FEV1.

⁹ Multivariate regressions were underspecified due to limited small sample size

Table S8. Regressions for household PM_{2.5} and health by age: ≥35 years of age¹⁰

LABELS	(1) Systolic BP	(2) Systolic BP	(3) Diastolic BP	(4) Diastolic BP	(5) FEV1	(6) FEV1	(7) FVC	(8) FVC	(9) Cold	(10) Cold	(11) Hospital	(12) Hospital
Log PM _{2.5}	1.57 (0.39)	1.75 (0.42)	1.47 (0.16)	1.67 (0.14)	0.11 (0.14)	-0.09 (0.75)	0.13 (0.10)	-0.02 (0.95)	-0.26 (0.20)	-0.07 (0.80)	0.59 (0.16)	0.51 (0.29)
Education of primary cook		-0.67 (0.47)		0.00 (1.00)		-0.02 (0.78)		0.00 (0.99)		0.14 (0.23)		-0.03 (0.73)
Log of total monthly expenditure		-0.89 (0.86)		0.26 (0.91)		0.22 (0.62)		0.18 (0.71)		-0.64 (0.16)		0.86 (0.35)
Outdoor PM value		-0.08 (0.18)		-0.05 (0.13)		-0.00 (0.22)		-0.01 (0.24)		-0.02** (0.02)		0.01 (0.18)
Household size		-0.07 (0.96)		0.27 (0.73)		0.15 (0.47)		0.09 (0.68)		0.05 (0.77)		0.05 (0.83)
Electricity main source of lighting		5.42 (0.16)		-2.41 (0.28)		-0.72 (0.11)		-0.64 (0.18)				0.12 (0.88)
Constant	60.35** (0.01)	62.64* (0.09)	44.95*** (0.00)	50.77*** (0.01)	0.83* (0.07)	3.49* (0.07)	0.83* (0.08)	2.84 (0.15)	-6.29** (0.03)	-5.36 (0.26)	-1.22 (0.48)	-9.24 (0.28)
Observations	60	51	60	51	16	13	16	13	60	49	59	51
R-squared	0.12	0.19	0.11	0.17	0.39	0.85	0.56	0.88	0.13	0.30	0.06	0.14

Robust p values in
parentheses

*** p<0.01, ** p<0.05, * p<0.1

¹⁰ Columns 1-4 report blood pressure; columns 5-8 observed lung function; columns 9-10 binary incidence of cold/cough; columns 11-12 number of days household members spent in the hospital for the last episode of ARI. All analyses also control for age, BMI and gender except hospital days (because it was measured at the household not individual level). BP, spirometry, and days in hospital were analyzed using OLS models with robust standard errors (R² reported). Incidence of cold/cough was modeled with logit (pseudo-R² reported).

Results were similar (not significant) for hypertension and normal FEV1 (in the univariate model (controlling for age, BMI, gender); multivariate model was underspecified).

Table S9. Regressions for high household PM_{2.5} (above the WHO interim target of 35 µg/m³ for 24 hours) and health, by age of cook: all ages¹¹

LABELS	(1) Systolic BP	(2) Systolic BP	(3) Diastolic BP	(4) Diastolic BP	(5) FEV1	(6) FEV1	(7) FVC	(8) FVC	(9) Cold	(10) Cold	(11) Hospital	(12) Hospital
High PM _{2.5}	4.81 (0.17)	7.06* (0.09)	3.01 (0.20)	4.72* (0.06)	0.15 (0.41)	-0.07 (0.71)	0.15 (0.46)	-0.12 (0.58)	-0.94* (0.08)	-0.72 (0.22)	0.85 (0.15)	0.34 (0.51)
Education of primary cook		-0.48 (0.37)		-0.08 (0.78)		-0.04 (0.14)		-0.05 (0.13)		0.07 (0.39)		-0.08 (0.24)
Log of total monthly expenditure		-1.81 (0.61)		0.05 (0.98)		0.12 (0.47)		0.21 (0.24)		-0.00 (1.00)		1.18 (0.15)
Outdoor PM value (µg/m ³)		-0.03 (0.37)		-0.03* (0.10)		-0.00 (0.12)		-0.00 (0.25)		-0.01** (0.04)		0.01 (0.38)
Household size		0.15 (0.88)		0.29 (0.58)		0.06 (0.30)		0.05 (0.36)		0.10 (0.43)		0.10 (0.56)
Electricity main source of lighting		5.03 (0.44)		0.38 (0.87)		-0.44 (0.24)		-0.36 (0.31)		0.43 (0.76)		0.55 (0.48)
Constant	75.56*** (0.00)	87.71*** (0.00)	51.69*** (0.00)	53.57*** (0.00)	1.84*** (0.00)	2.35 (0.17)	1.85*** (0.00)	1.34 (0.44)	-3.35* (0.05)	-5.63* (0.08)	1.06*** (0.01)	-9.72 (0.13)
Observations	107	87	107	87	28	22	28	22	108	88	99	80
R-squared	0.13	0.16	0.12	0.16	0.34	0.58	0.43	0.65	0.07	0.16	0.01	0.10

Robust p values in parentheses

*** p<0.01, ** p<0.05, * p<0.1

¹¹ Columns 1-4 report blood pressure; columns 5-8 observed lung function; columns 9-10 binary incidence of cold/cough; columns 11-12 number of days household members spent in the hospital for the last episode of ARI. All analyses also control for age, BMI and gender except hospital days (because it was measured at the household not individual level). BP, spirometry, and days in hospital were analyzed using OLS models with robust standard errors (R² reported). Incidence of cold/cough was modeled with logit (pseudo-R² reported).

Results were similar (not significant) for association between high PM_{2.5} and hypertension and univariate regressions for normal FEV1 (multivariate was underspecified).

Table S10. Regressions for high household PM_{2.5} (above the WHO interim target of 35 µg/m³ for 24 hours) and health, by age of cook: <35 years of age¹²

LABELS	(1) Systolic BP	(2) Systolic BP	(3) Diastolic BP	(4) Diastolic BP	(5) FEV1	(6) FVC	(7) Cold	(8) Cold	(9) Hospital	(10) Hospital
High PM _{2.5}	-1.91 (0.59)	-1.82 (0.68)	-1.53 (0.63)	-1.27 (0.73)	-0.22* (0.07)	-0.30 (0.11)	-0.91 (0.38)	-1.65 (0.23)	2.35*** (0.00)	1.76*** (0.00)
Education of primary cook		-0.26 (0.71)		-0.12 (0.71)				-0.04 (0.71)		-0.11 (0.38)
Log of total monthly expenditure		-1.94 (0.69)		0.66 (0.83)				1.88* (0.07)		1.64* (0.08)
Outdoor PM value		0.01 (0.83)		-0.01 (0.66)				0.00 (0.90)		-0.01 (0.56)
Household size		0.50 (0.75)		0.17 (0.85)				-0.25 (0.32)		0.02 (0.94)
Electricity main source of lighting		6.71 (0.54)		1.41 (0.72)				-1.19 (0.41)		0.89 (0.41)
Constant	88.89*** (0.00)	111.68** (0.02)	37.98*** (0.01)	41.97* (0.09)	4.80*** (0.00)	5.59*** (0.00)	-7.02* (0.07)	-21.12** (0.01)	0.00* (0.09)	-12.90* (0.06)
Observations	47	36	47	36	12	12	47	36	40	29
R-squared	0.13	0.21	0.16	0.23	0.78	0.64	0.12	0.26	0.04	0.38

Robust p values in parentheses
*** p<0.01, ** p<0.05

¹² Columns 1-4 report blood pressure; columns 5-8 observed lung function; columns 9-10 binary incidence of cold/cough; columns 11-12 number of days household members spent in the hospital for the last episode of ARI. All analyses also control for age, BMI and gender except hospital days (because it was measured at the household not individual level). BP, spirometry, and days in hospital were analyzed using OLS models with robust standard errors (R² reported). Incidence of cold/cough was modeled with logit (pseudo-R² reported). Multivariate regressions for FEV1 and FVC were underspecified. High PM_{2.5} has a significant negative association with hypertension in the univariate model; underspecified for multivariate. FEV1 normal is underspecified in all models because all middle aged cooks have normal FEV1.

Table S11. Regressions for high household PM_{2.5} (above the WHO interim target of 35 µg/m³ for 24 hours) and health, by age of cook: ≥35 years of age¹³

LABELS	(1) Systolic BP	(2) Systolic BP	(3) Diastolic BP	(4) Diastolic BP	(5) FEV1	(6) FEV1	(7) FVC	(8) FVC	(9) Cold	(10) Cold	(11) Hospital	(12) Hospital
High PM _{2.5}	10.44*	15.02**	6.36*	10.00***	0.10	-0.62	0.11	-0.69	-1.26*	-0.69	-0.09	-0.89
	(0.05)	(0.01)	(0.05)	(0.00)	(0.59)	(0.13)	(0.59)	(0.13)	(0.07)	(0.38)	(0.91)	(0.23)
Education of primary cook		-0.59		0.02		-0.05		-0.06		0.14		-0.08
		(0.51)		(0.96)		(0.32)		(0.34)		(0.23)		(0.31)
Log of total monthly expenditure		-0.25		0.80		0.54		0.68		-0.66		0.89
		(0.96)		(0.72)		(0.12)		(0.12)		(0.14)		(0.32)
Outdoor PM value		-0.11*		-0.06**		-0.00		-0.00		-0.02**		0.02
		(0.05)		(0.03)		(0.63)		(0.87)		(0.02)		(0.14)
Household size		-0.06		0.38		0.31*		0.32*		0.06		0.12
		(0.96)		(0.56)		(0.05)		(0.07)		(0.74)		(0.54)
Electricity main source of lighting		6.69		-1.76		-1.19**		-1.21**				-0.29
		(0.18)		(0.38)		(0.02)		(0.02)				(0.77)
Constant	57.82**	53.91	47.26***	46.86***	1.09**	3.26**	1.14*	2.43	-6.84**	-5.28	1.70***	-6.40
	(0.01)	(0.15)	(0.00)	(0.01)	(0.04)	(0.04)	(0.05)	(0.13)	(0.02)	(0.30)	(0.00)	(0.37)
Observations	60	51	60	51	16	13	16	13	60	49	59	51
R-squared	0.15	0.24	0.12	0.25	0.32	0.90	0.48	0.92	0.14	0.31	0.00	0.11

¹³ Columns 1-4 report blood pressure; columns 5-8 observed lung function; columns 9-10 binary incidence of cold/cough; columns 11-12 number of days household members spent in the hospital for the last episode of ARI. All analyses also control for age, BMI and gender except hospital days (because it was measured at the household not individual level). BP, spirometry, and days in hospital were analyzed using OLS models with robust standard errors (R² reported). Incidence of cold/cough was modeled with logit (pseudo-R² reported). Multivariate regressions for FEV1 and FVC were underspecified. Results were similar (no significant association with high PM_{2.5}) with hypertension in both regressions and normal FEV1 in the univariate regression (underspecified for multivariate).

Robust p values in parentheses

*** p<0.01, ** p<0.05

Table S12. Regressions for total household PAH and health, by age of cook: all ages¹⁴

LABELS	(1) Systolic BP	(2) Systolic BP	(3) Diastolic BP	(4) Diastolic BP	(5) FEV1	(6) FEV1	(7) FVC	(8) FVC	(9) Cold	(10) Cold	(11) Hospital	(12) Hospital
Total PAH (log µg/m³)	1.80 (0.13)	1.54 (0.28)	1.38** (0.02)	0.98 (0.17)	0.05 (0.23)	-0.00 (0.94)	0.05 (0.24)	-0.01 (0.87)	0.02 (0.87)	0.06 (0.74)	0.27 (0.25)	0.56*** (0.01)
Education of primary cook		-0.45 (0.50)		-0.21 (0.48)		-0.04 (0.24)		-0.05 (0.17)		-0.00 (0.96)		-0.06 (0.37)
Log of total monthly expenditure		-1.91 (0.64)		-0.89 (0.62)		-0.05 (0.71)		0.00 (0.98)		-0.10 (0.83)		1.37 (0.20)
Outdoor PM value (µg/m³)		-0.02 (0.70)		-0.01 (0.68)		-0.00** (0.05)		-0.00* (0.09)		-0.01** (0.03)		0.01 (0.31)
Household size		0.22 (0.84)		0.45 (0.45)		0.12** (0.01)		0.13*** (0.01)		0.07 (0.63)		-0.02 (0.94)
Electricity main source of lighting		3.27 (0.60)		0.66 (0.76)		-0.63 (0.12)		-0.54 (0.14)		0.39 (0.77)		0.58 (0.45)
Constant	66.93*** (0.00)	82.05** (0.02)	49.46*** (0.00)	60.34*** (0.00)	1.74*** (0.00)	4.37*** (0.01)	1.74*** (0.00)	3.59** (0.02)	-4.56** (0.03)	-5.35 (0.14)	0.35 (0.81)	-13.53 (0.11)
Observations	93	76	93	76	24	19	24	19	94	77	87	71
R-squared	0.14	0.15	0.12	0.12	0.33	0.69	0.44	0.75	0.04	0.12	0.01	0.17

Robust p values in parentheses

*** p<0.01, ** p<0.05

¹⁴ Columns 1-4 report blood pressure; columns 5-8 observed lung function; columns 9-10 binary incidence of cold/cough; columns 11-12 number of days household members spent in the hospital for the last episode of ARI. All analyses also control for age, BMI and gender except hospital days (because it was measured at the household not individual level). BP, spirometry, and days in hospital were analyzed using OLS models with robust standard errors (R² reported). Incidence of cold/cough was modeled with logit (pseudo-R² reported).

Results were similar (not significant) for association between PAH concentration and hypertension and univariate regressions for normal FEV1 (multivariate was underspecified).

Table S13. Regressions for total household PAH and health, by age of cook: <35 years of age¹⁵

LABELS	(1) Systolic BP	(2) Systolic BP	(3) Diastolic BP	(4) Diastolic BP	(5) FEV1 ⁴	(6) FVC ⁴	(7) Cold	(8) Cold	(9) Hospital	(10) Hospital
Total PAH (log µg/m ³)	2.96** (0.03)	1.65 (0.26)	1.51 (0.13)	0.76 (0.48)	-0.04 (0.43)	-0.07 (0.41)	0.12 (0.59)	0.37 (0.36)	-0.05 (0.91)	0.63 (0.05)
Education of primary cook		0.02 (0.98)		-0.24 (0.45)				-0.19 (0.23)		-0.19 (0.17)
Log of total monthly expenditure		0.58 (0.92)		-0.99 (0.76)				2.62** (0.04)		1.75 (0.11)
Outdoor PM value (µg/m ³)		-0.01 (0.93)		-0.02 (0.45)				-0.01 (0.66)		-0.01 (0.39)
Household size		0.40 (0.77)		0.43 (0.63)				-0.59** (0.04)		-0.04 (0.90)
Electricity main source of lighting		5.29 (0.60)		4.25 (0.32)				-1.24 (0.42)		0.61 (0.59)
Constant	62.28** (0.04)	76.59 (0.20)	40.79** (0.03)	65.80** (0.04)	4.56*** (0.00)	5.38*** (0.01)	-11.89** (0.05)	-34.30** (0.03)	2.44 (0.44)	-14.34* (0.06)
Observations	39	30	39	30	10	10	39	30	34	25
R-squared	0.25	0.23	0.15	0.23	0.72	0.57	0.15	0.30	0.00	0.42

Robust p values in parentheses

*** p<0.01, ** p<0.05

¹⁵ Columns 1-4 report blood pressure; columns 5-8 observed lung function; columns 9-10 binary incidence of cold/cough; columns 11-12 number of days household members spent in the hospital for the last episode of ARI. All analyses also control for age, BMI and gender except hospital days (because it was measured at the household not individual level). BP, spirometry, and days in hospital were analyzed using OLS models with robust standard errors (R² reported). Incidence of cold/cough was modeled with logit (pseudo-R² reported).

Multivariate results underspecified for FEV1 and FVC. Results were similar (not significant) for association between PAH concentration and the univariate model for hypertension; and univariate regression for normal FEV1 and multivariate models for normal FEV1 and hypertension were underspecified).

Table S14. Regressions for total household PAH and health, by age of cook: ≥ 35 years of age¹⁶

LABELS	(1) Systolic BP	(2) Systolic BP	(3) Diastolic BP	(4) Diastolic BP	(5) FEV1	(6) FEV1	(7) FVC	(8) FVC	(9) Cold	(10) Cold	(11) Hospital	(12) Hospital
Total PAH (log $\mu\text{g}/\text{m}^3$)	0.57 (0.76)	0.18 (0.94)	1.12 (0.16)	0.65 (0.53)	0.06 (0.31)	0.03 (0.32)	0.07 (0.21)	0.04 (0.49)	-0.02 (0.91)	0.02 (0.94)	0.51** (0.02)	0.62 (0.08)
Education of primary cook		-1.14 (0.35)		-0.39 (0.52)		-0.03 (0.24)		-0.03 (0.40)		0.07 (0.62)		-0.03 (0.78)
Log of total monthly expenditure		-2.45 (0.64)		-0.90 (0.69)		0.27 (0.13)		0.32 (0.24)		-1.00* (0.06)		1.02 (0.40)
Outdoor PM value ($\mu\text{g}/\text{m}^3$)		-0.06 (0.40)		-0.01 (0.73)		-0.01** (0.03)		-0.01* (0.07)		-0.01* (0.08)		0.02 (0.11)
Household size		0.72 (0.67)		0.74 (0.45)		0.21* (0.07)		0.20 (0.16)		0.14 (0.44)		0.02 (0.94)
Electricity main source of lighting		6.15 (0.18)		-2.36 (0.30)		-0.80** (0.03)		-0.76* (0.07)				0.03 (0.96)
Constant	68.06*** (0.00)	76.79* (0.06)	44.65*** (0.00)	56.55*** (0.00)	0.77 (0.19)	4.38** (0.05)	0.73 (0.24)	3.63 (0.13)	-7.62** (0.02)	-3.14 (0.54)	-1.18 (0.26)	-11.79 (0.27)
Observations	54	46	54	46	14	11	14	11	54	44	53	46
R-squared	0.12	0.20	0.14	0.18	0.38	1.00	0.56	0.99	0.09	0.25	0.05	0.17

Robust p values in parentheses

*** $p < 0.01$, ** $p < 0.05$

¹⁶ Columns 1-4 report blood pressure; columns 5-8 observed lung function; columns 9-10 binary incidence of cold/cough; columns 11-12 number of days household members spent in the hospital for the last episode of ARI. All analyses also control for age, BMI and gender except hospital days (because it was measured at the household not individual level). BP, spirometry, and days in hospital were analyzed using OLS models with robust standard errors (R² reported). Incidence of cold/cough was modeled with logit (pseudo-R² reported).

Results were similar (not significant) for association between PAH concentration and hypertension or normal FEV1.

**Table S15. Regressions for water soluble organic nitrogen (WSON) concentration (log µg/m3) and health, by age of cook:
all ages¹⁷**

LABELS	(1) Systolic BP	(2) Systolic BP	(3) Diastolic BP	(4) Diastolic BP	(5) FEV1	(6) FEV1	(7) FVC	(8) FVC	(9) Cold	(10) Cold	(11) Hospital	(12) Hospital
WSON (log µg/m3)	3.84 (0.07)	5.46 (0.08)	1.66 (0.21)	3.34** (0.01)	0.11 (0.12)	-0.12 (0.35)	0.11 (0.19)	-0.17 (0.20)	-0.28 (0.35)	-0.31 (0.38)	0.86** (0.01)	0.81 (0.05)
Education of primary cook		-0.05 (0.95)		-0.03 (0.92)		-0.04 (0.29)		-0.05 (0.23)		0.09 (0.31)		-0.06 (0.42)
Log of total monthly expenditure		-1.26 (0.76)		-0.33 (0.86)		0.12 (0.46)		0.22 (0.22)		-0.21 (0.63)		1.17 (0.17)
Outdoor PM value		-0.05 (0.32)		-0.04* (0.06)		-0.00* (0.09)		-0.00 (0.14)		-0.01 (0.18)		0.01 (0.48)
Household size		0.69 (0.56)		0.76 (0.20)		0.09 (0.10)		0.10 (0.11)		0.06 (0.66)		0.08 (0.70)
Electricity main source of lighting		-1.04 (0.87)		-1.92 (0.35)		-0.59 (0.17)		-0.53 (0.21)		0.76 (0.59)		0.33 (0.68)
Constant	66.79*** (0.00)	67.06** (0.03)	52.38*** (0.00)	50.05*** (0.00)	2.49*** (0.00)	3.61 (0.05)	2.93*** (0.00)	3.17 (0.10)	-3.57 (0.07)	-3.67 (0.30)	0.02 (0.98)	-10.82 (0.11)
Observations	89	72	89	72	25	19	25	19	90	73	85	69
R-squared	0.18	0.21	0.12	0.21	0.30	0.57	0.33	0.59	0.05	0.12	0.03	0.13

Robust p values in parentheses
*** p<0.01, ** p<0.05

¹⁷ Columns 1-4 report blood pressure; columns 5-8 observed lung function; columns 9-10 binary incidence of cold/cough; columns 11-12 number of days household members spent in the hospital for the last episode of ARI. All analyses also control for age, BMI and gender except hospital days (because it was measured at the household not individual level). BP, spirometry, and days in hospital were analyzed using OLS models with robust standard errors (R² reported). Incidence of cold/cough was modeled with logit (pseudo-R² reported). Results were similar (no significant association with WSON concentration) for hypertension and normal FEV1.

**Table S16. Regressions for water soluble organic nitrogen (WSON) concentration (log µg/m3) and health, by age of cook:
<35 years of age¹⁸**

LABELS	(1) Systolic BP	(2) Systolic BP	(3) Diastolic BP	(4) Diastolic BP	(5) FEV1	(6) FVC	(7) Cold	(8) Cold	(9) Hospital	(10) Hospital
WSON (log µg/m3)	1.34 (0.53)	3.55 (0.38)	-0.61 (0.72)	1.13 (0.60)	0.00 (0.97)	0.02 (0.77)	0.26 (0.59)	-0.37 (0.61)	0.72 (0.22)	0.67 (0.29)
Education of primary cook		0.27 (0.74)		-0.22 (0.55)				-0.05 (0.66)		-0.14 (0.35)
Log of total monthly expenditure		-1.47 (0.83)		-1.63 (0.65)				1.26 (0.23)		1.47 (0.17)
Outdoor PM value		0.01 (0.94)		-0.03 (0.37)				0.00 (0.74)		-0.01 (0.59)
Household size		1.22 (0.53)		0.68 (0.49)				-0.20 (0.44)		0.11 (0.70)
Electricity main source of lighting		3.05 (0.76)		3.91 (0.36)				-0.25 (0.89)		0.28 (0.81)
Constant	109.36*** (0.00)	112.03* (0.05)	68.83*** (0.00)	85.59*** (0.01)	4.19*** (0.00)	4.85** (0.01)	-6.94* (0.10)	-16.61* (0.09)	0.49 (0.78)	-11.42 (0.13)
Observations	38	28	38	28	11	11	39	29	35	25
R-squared	0.05	0.11	0.02	0.15	0.72	0.58	0.06	0.14	0.02	0.29

Robust p values in parentheses
*** p<0.01, ** p<0.05

¹⁸ Columns 1-4 report blood pressure; columns 5-8 observed lung function; columns 9-10 binary incidence of cold/cough; columns 11-12 number of days household members spent in the hospital for the last episode of ARI. All analyses also control for age, BMI and gender except hospital days (because it was measured at the household not individual level). BP, spirometry, and days in hospital were analyzed using OLS models with robust standard errors (R² reported). Incidence of cold/cough was modeled with logit (pseudo-R² reported). Results were similar (no significant association with WSON concentration) for hypertension and normal FEV1. Multivariate results underspecified for FEV1 and FVC. Results were not significant for univariate model for hypertension (multivariate model and all normal FEV models underspecified).

**Table S17. Regressions for water soluble organic nitrogen (WSON) concentration (log µg/m3) and health, by age of cook:
≥35 years of age¹⁹**

LABELS	(1) Systolic BP	(2) Systolic BP	(3) Diastolic BP	(4) Diastolic BP	(5) FEV1	(6) FEV1	(7) FVC	(8) FVC	(9) Cold	(10) Cold	(11) Hospital	(12) Hospital
WSON (log µg/m3)	5.73 (0.09)	7.52 (0.10)	3.35 (0.09)	4.86** (0.01)	0.11 (0.45)	-0.30 (0.22)	0.06 (0.71)	-0.34 (0.14)	-0.64 (0.13)	-0.56 (0.25)	0.90 (0.07)	0.91 (0.17)
Education of primary cook		-0.43 (0.70)		0.07 (0.90)		0.01 (0.90)		0.01 (0.92)		0.22* (0.08)		-0.01 (0.93)
Log of total monthly expenditure		-0.97 (0.86)		0.13 (0.96)		0.02 (0.93)		0.09 (0.64)		-0.80* (0.09)		0.83 (0.37)
Outdoor PM value		-0.12* (0.10)		-0.07** (0.05)		-0.01 (0.27)		-0.01 (0.23)		-0.02* (0.08)		0.02 (0.30)
Household size		0.37 (0.82)		0.74 (0.39)		0.15 (0.15)		0.14 (0.15)		0.08 (0.69)		0.09 (0.71)
Electricity main source of lighting		4.48 (0.31)		-3.51 (0.14)		-1.00* (0.07)		-0.98* (0.06)				-0.24 (0.81)
Constant	38.14 (0.15)	34.15 (0.37)	35.18** (0.03)	35.60** (0.05)	1.71** (0.02)	5.08** (0.04)	2.20*** (0.01)	4.92* (0.05)	-7.44** (0.03)	-4.35 (0.46)	-0.20 (0.79)	-8.72 (0.27)
Observations	51	44	51	44	14	11	14	11	51	42	50	44
R-squared	0.20	0.29	0.17	0.32	0.11	0.89	0.13	0.92	0.18	0.31	0.05	0.14

Robust p values in parentheses
*** p<0.01, ** p<0.05

¹⁹ Columns 1-4 report blood pressure; columns 5-8 observed lung function; columns 9-10 binary incidence of cold/cough; columns 11-12 number of days household members spent in the hospital for the last episode of ARI. All analyses also control for age, BMI and gender except hospital days (because it was measured at the household not individual level). BP, spirometry, and days in hospital were analyzed using OLS models with robust standard errors (R² reported). Incidence of cold/cough was modeled with logit (pseudo-R² reported). Results were similar (non-significant) for hypertension and normal FEV1.