**Supplementary Table 1: Characteristics of included studies.**

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| **Study (year), country** | **Recruitment and baseline sample size** | **Intervention(s)** | **Control condition(s)** | **Duration of intervention** | **Outcome measure(s)** | **Main findings** |
| Adane, et al. (2020), Northwest Ethiopia | 5,500 households with a child younger than 4 years | Biomass-fueled “Mirt” IBS stove without chimney (n=2,750 children) | Traditional open fire used for cooking (n=2,758 children) | 12 months | Incidence of acute respiratory infections | The intervention did not have a beneficial effect on the incidence of acute lower respiratory infection (AOR=0.95, 95% CI=0.89 to 1.02, p=0.18) and cooking-related burns (IRR=0.80; 95% CI=0.53 to 1.21) compared with open fire. In terms of location of cooking quarter, separate kitchen was associated with lower odds of acute lower respiratory infection (AOR=0.78, 95% CI=0.73 to 0.83, p<0.001). |
| Carrión, et al. (2019), Ghana | 1,414 households with a non-smoking pregnant woman | 1. Improved biomass (Biolite) stove (n=525 households, 486 infants)  2. Liquefied petroleum gas (LPG) stove (n=365 households, 335 infants) | Traditional 3-stone fire stove (n=525 households, 467 infants) | 12 months | Presence of respiratory microbes in nasopharyngeal swabs identified using  MassTag polymerase chain reaction | There were 130 pneumonia cases (63 in LPG stove group versus 67 in 3-stone fire stove group). Infants in 3-stone arm had a higher mean number of microbial species presence than LPG intervention arm (2.71 versus 3.34, p<0.0001). The difference was associated with increased bacterial (p<0.0001) rather than viral species abundance. Results were pronounced in pneumonia cases and attenuated in healthy controls. Three bacteria, namely *Streptococcus pneumoniae, Moraxella catarrhalis,* and *Haemophilus influenzae* appeared more prevalent among cases in the 3-stone arm compared to cases in the LPG arm. |
| Hanna, et al. (2016), India | 44 villages consisting of 2,651 households | Improved stove developed by the Appropriate Rural Technology Institute (ARTI) with a base enclosing the cooking flame, a chimney to direct smoke away from the user, and two pots to potentially reduce cooking time (n=23 households) | Solid-fueled traditional stove with one pot (n=2,458 households) | 48 months | Physician-diagnosed pneumonia | Women who cooked more meals with improved stove had fewer coughs or colds and a lower likelihood of sore eyes and wheezing. Cooking meal with an improved stove was associated with lower smoke exposure, as measured by carbon monoxide for both women and primary cooks. For children, there was a significantly negative correlation between each additional meal cooked with a clean stove in the last week and smoke exposure. Improved stove had no effect on the incidence of physician-diagnosed pneumonia and respiratory syncytial virus infection among children. |
| Hartinger, et al. (2016), Peru | 51 rural communities of 534 households with a child aged 6 to 35 months | Improved solid-fuel  stove (OPTIMA-improved stove) and a kitchen  sink providing piped water within the household’s kitchen (n=25 communities, 267 children) | No intervention (n=26 communities, 267 children) | 12 months | Episodes of acute respiratory infection and acute lower respiratory infection | The total number of episodes of acute respiratory infection was 831 in the intervention group and 877 in the control group (RR=0.95, 95% CI=0.82 to 1.10, p=0.53). The total numbers of acute lower respiratory infection episodes were 25 in the intervention arm versus 10 in the control arm (RR=2.45, 95% CI=0.82 to 7.39, p=0.11). Number of children with at least one acute lower respiratory infection episode was 17/248 (7%) in the intervention group compared to 10/251 (4%) in the control group. |
| Howden-Chapman, et al. (2007), New Zealand | 7 low-income communities containing 1,350 households of 4,407 participants | Installation of ceiling insulation, draught stopping around windows and doors, and fitting sisalated paper beneath floor joists and a polythene moisture barrier on the ground beneath the house (n=679 households, 2,262 participants) | No intervention (n=671 households, 2,145 participants) | 24 months | Incidence of colds or flu | The odds of reporting ineffective heating after intervention was significantly lower for insulated houses (AOR=0.38, 95% CI=0.25 to 0.57, p<0.0001). People in insulated houses had about half the odds of respiratory symptoms, such as recent wheezing (AOR=0.57, 95% CI=0.47 to 0.70, p<0.0001) and winter colds and flu (AOR=0.54, 95% CI=0.43 to 0.66, p<0.0001) as compared to those in the control group. |
| Howden-Chapman, et al. (2008), New Zealand | 409 households in 5 communities containing 409 children aged 6 to 12 years | Installation of a non-polluting, more effective home heater of types such as heat pump, wood pellet burner, or flued gas (n=175 children) | No intervention (n=174 children) | 24 months | Episodes of colds or flu | Children in the intervention group had an average of 0.5 fewer episodes of cold and  flu (95% CI=0.14 to 0.79, p=0.01) and 0.27 fewer visits to the doctor (95% CI=0.01 to 0.46, p=0.04) compared to the control group. Heating intervention was associated with a significant reduction in lower respiratory tract symptoms (AMR=0.77, 95% CI=0.73 to 0.81, p=0.013), cough (AMR=0.75, 95% CI=0.62 to 0.92, p=0.005), and wheeze (AMR=0.67, 95% CI=0.50 to 0.91, p=0.011). |
| Kirby, et al. (2019), Rwanda | 1,582 households with a child under the age of 4 years | Intervention program branded “Tubeho Neza” (“Live Well” in Kinyarwanda), included a free tabletop gravity-based household water filter (the Vestergaard Frandsen LifeStraw Family 2.0) comprising 5.5 liters of built-in safe storage with a tap as well as a portable high-efficiency wood-burning cookstove (Eco-Zoom Dura), community and household education (e.g., via skits and radio songs), and behavior  change messaging using culturally appropriate prepiloted materials informed by focus groups (n=789 households, 1,073 children) | No intervention (n=793 households, 1,101 children) | 12 months | Caregiver-reported acute respiratory infection in the past 7 days among all children younger than 5 years | The prevalence of caretaker-reported acute respiratory infection among children was 9.9% in the intervention arm and 14.3% in the control arm, implying a 25% decline in prevalence after adjusting for age and gender (PR=0.75, 95% CI=0.60 to 0.93, p=0.009). Current pneumonia was diagnosed in 41/2,574 children in the intervention group (1.6%) and in 55/2,829 children in the control group (1.9%). After adjusting for age and gender, the difference was not significant (PR=0.87, 95% CI=0.58 to 1.30, p=0.491). Prevalence of reported burns was lower in the intervention arm compared to controls, with 1.8% prevalence in the intervention arm and 3.6% prevalence in the control arm (PR=0.51, 95% CI=0.36 to 0.74, p<0.001). |
| Mortimer, et al. (2017 & 2020), Malawi | 8,626 households across 150 community-level clusters, involving 10,750 children under the age of 4.5 years | Two cleaner burning biomass-fueled cookstoves (Philips HD4012LS), a solar panel to charge the battery for the stove fan, and user training (n=4,339 households, 5,400 children) | Traditional cooking methods, typically  open fires (n=4,287 households, 5,350 children) | 24 months | WHO Integrated Management of Childhood Illness (IMCI)-defined pneumonia in children under 5 years of age  diagnosed by physicians, medical officers, or other appropriately trained staff at local health care facilities | The IMCI pneumonia incidence rate in the intervention group was 15.76 (95% CI=14.89 to 16.63) per 100 child-years compared to 15.58 (95% CI=14.72 to 16.45) per 100 child-years in the control group, with an IRR of 1.01 (95% CI=0.91 to 1.13, p=0·80). Cooking-related serious burns were seen 9 children in the intervention and 10 (1 death) in the control group (IRR=0.91, 95% CI=0.37 to 2.23, p=0.83). There was a significant 42% reduction (IRR=0.58, 95% CI=0.51 to 0.65, p<0·0001) in risk of non-serious burns in the intervention group (549 in the intervention group and 956 in the control group). The second study found no association between carbon monoxide exposure (IRR=1.00, 95% CI=0.967 to 1.014, p=0.53) and pneumonia incidence. |
| Najnin, et al. (2019), Bangladesh | 60,000 low-income households (n=237,216 people) | 1. Handwashing and  water treatment intervention hardware which included a bucket with a tap, soapy water bottle, and a bowl to collect rinse water after  washing hands at the compound level and cholera-vaccine (n=80,634 people)  2. Cholera-vaccine-alone (n=80,161 people) | Regular habits and practices without any intervention (n=76,421 people) | 24 months | Acute respiratory infections | Respiratory illness prevalence was similar across the groups. People who had soap and water present in the handwashing station reported lower respiratory illness prevalence (2.4% versus 3.0%, p<0.001). |
| Ram, et al. (2015), Bangladesh | 766 index-case patients with influenza-like illness (fever with cough or sore throat) who were the only symptomatic person in their household (384 household compounds) | Provision of a handwashing station that consisted of a large water container with a tap, a plastic case for soap, and a bar of soap, in tandem with intensive handwashing promotion (n=193 patients) | No intervention (n=184 patients) | 12 months | Influenza-like illness and laboratory-confirmed influenza infection | Influenza infection was confirmed in 20% of controls and 12% of intervention index case-patients. 158/1,661 (9.5%) susceptible household members were identified with influenza-like illness in the intervention arm in comparison to 115/1,498 (7.7%) in the control arm.  The secondary attack ratio for influenza infection was 9.6% in the intervention  arm and 4.0% in the control arm (SAR ratio=2.40, 95% CI=0.68 to 8.47, p=0.17). Influenza infection was  transmitted similarly among both intervention and control groups to members of all households in the compounds and to members of index case-patient households. |
| Schilmann, et al. (2014), Mexico | 668 households with a woman and a child under 4 years | Patsari multi-pot wood-burning efficient chimney stove (n=338 children) | Traditional wood fire (n=330 children) | 10 months | Upper and lower respiratory infection duration | The children of households using Patsari stove had reduced risks of upper respiratory infection (OR=0.840, 95% CI=0.689 to 1.025) and lower respiratory infection episodes (OR=0.612, 95% CI=0.207 to 1.805) compared to the control group. Children of mothers who were using Patsari stove had a 28% decrease (IRR=0.789, 95% CI=0.701 to 0.888, p<0.001) for the mean duration of upper respiratory infection episodes compared to those using the open fire, while the mean duration of lower respiratory infection episodes was more than twofold shorter (IRR=0.411, 95% CI=0.212 to 0.796, p=0.008). Those who were using combined Patsari and open fire also showed a trend toward the reduction of upper respiratory infection duration compared to households using open fire alone. |
| Smith, et al. (2011), Guatemala | 534 households with a pregnant woman or child younger than 4 months | Woodstove with chimney (n=269 households, 265 children) | Traditional open fire used for cooking (n=265 households, 253 children) | 12 months | Physician-diagnosed pneumonia | There were 72 cases of severe (hypoxemic) pneumonia in the intervention group and 101 in the control group (RR=0.67, 95% CI=0.45 to 0.98, p=0.042). A significant reduction in the intervention group was observed for respiratory syncytial virus-negative cases, but not for respiratory syncytial virus-positive cases. Use of the intervention stove was not associated with any important adverse events, including burns. |
| Tielsch, et al. (2014 & 2016), Nepal | 51 sectors of 20 to 30 households that had at least one child aged younger than 36 months or a married woman aged 15 to 30 years | Improved biomass stove with chimney (n=3,376 households, 5,254 children) | Traditional open burning biomass cookstove (n=3,376 households, 5,254 children, standard step-wedge trial design) | 6 months | Incidence of acute lower respiratory infection | The intervention was associated with a 13% reduction in the incidence of acute lower respiratory infection (RO=0.87, 95% CI=0.67 to 1.13). There were statistically significant reductions in persistent cough (RO=0.91, 0.85 to 0.97), wheeze (RO=0.87, 95% CI=0.78 to 0.97), and burn injury (RO=0.68, 95% CI=0.48 to 0.95), but not for fever, severe acute lower respiratory infection, or ear discharge. |
| Wafula, et al. (2000), Kenya | 400 households that had a woman aged between 15 and  60 years and all children aged below 5 years | Improved stove (n=200 households, 321 participants) | Traditional 3-stone stove (n=200 households, 327 participants) | 2 months | Occurrence of acute respiratory infection | The weekly prevalence for acute respiratory infection among children aged below 5 years from households with improved stove was significantly lower than those from households using traditional 3-stone stove (28/121 versus 75/127, RR=2.6, 95% CI=1.86 to 3.63, p<0.0001). Similar benefit was observed among women aged between 15 and 60 years (27/200 versus 76/200, RR=2.8, 95% CI= 1.93 to 4.06, p<0.0001). |

**CI**: Confidence interval; **RR**: Relative risk; **IRR**: Incidence rate ratio; **AOR**: Adjusted odds ratio; **PR**: Prevalence ratio; **RO**: Relative odds; **AMR**: Adjusted mean ratio.

**Supplementary Table 2: Certainty assessment of the included evidence via the GRADE approach.**

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| **Certainty assessment** | | | | | | | **№ of patients** | | **Effect** | | **Certainty** | **Importance** |
| **№ of studies** | **Study design** | **Risk of bias** | **Inconsistency** | **Indirectness** | **Imprecision** | **Other considerations** | **Housing intervention** | **Control** | **Relative**  **(95% CI)** | **Absolute**  **(95% CI)** |
| **Any respiratory tract infection (primary outcome)** | | | | | | | | | | | | |
| 10 | Randomized trials | Not serious | Serious | Not serious | Not serious | None | 4386/54997 (8.0%) | 4467/42488 (10.5%) | **RR 0.89** (0.78 to 1.01) | **12 fewer per 1,000** (from 23 fewer to 1 more) | ⨁⨁⨁◯ MODERATE | CRITICAL |
| **Upper respiratory tract infection / lower respiratory tract infection** | | | | | | | | | | | | |
| 7 | Randomized trials | Not serious | Serious | Not serious | Not serious | None | 3215/26867 (12.0%) | 3427/26573 (12.9%) | **RR 0.94** (0.84 to 1.05) | **8 fewer per 1,000** (from 21 fewer to 6 more) | ⨁⨁⨁◯ MODERATE | IMPORTANT |
| **Pneumonia** | | | | | | | | | | | | |
| 4 | Randomized trials | Not serious | Serious | Not serious | Not serious | None | 414/23535 (1.8%) | 316/20651 (1.5%) | **RR 1.01** (0.70 to 1.47) | **0 fewer per 1,000** (from 5 fewer to 7 more) | ⨁⨁⨁◯ MODERATE | IMPORTANT |
| **Severe pneumonia** | | | | | | | | | | | | |
| 3 | Randomized trials | Not serious | Not serious | Not serious | Serious | None | 103/23424 (0.4%) | 127/22966 (0.6%) | **RR 0.84** (0.59 to 1.20) | **1 fewer per 1,000 (from 2 fewer to 1 more)** | ⨁⨁⨁◯ MODERATE | IMPORTANT |
| **Cooking-related burns** | | | | | | | | | | | | |
| 2 | Randomized trials | Not serious | Not serious | Not serious | Serious | None | 50/15157 (0.3%) | 61/15178 (0.4%) | **RR 0.82** (0.57 to 1.20) | **1 fewer per 1,000** (from 2 fewer to 1 more) | ⨁⨁⨁◯ MODERATE | IMPORTANT |
| **Any adverse event** | | | | | | | | | | | | |
| 3 | Randomized trials | Not serious | Not serious | Not serious | Serious | None | 359/29913 (1.2%) | 329/29547 (1.1%) | **RR 1.01** (0.74 to 1.38) | **0 fewer per 1,000** (from 3 fewer to 4 more) | ⨁⨁⨁◯ MODERATE | IMPORTANT |

**CI**: Confidence interval; **RR**: Risk ratio.