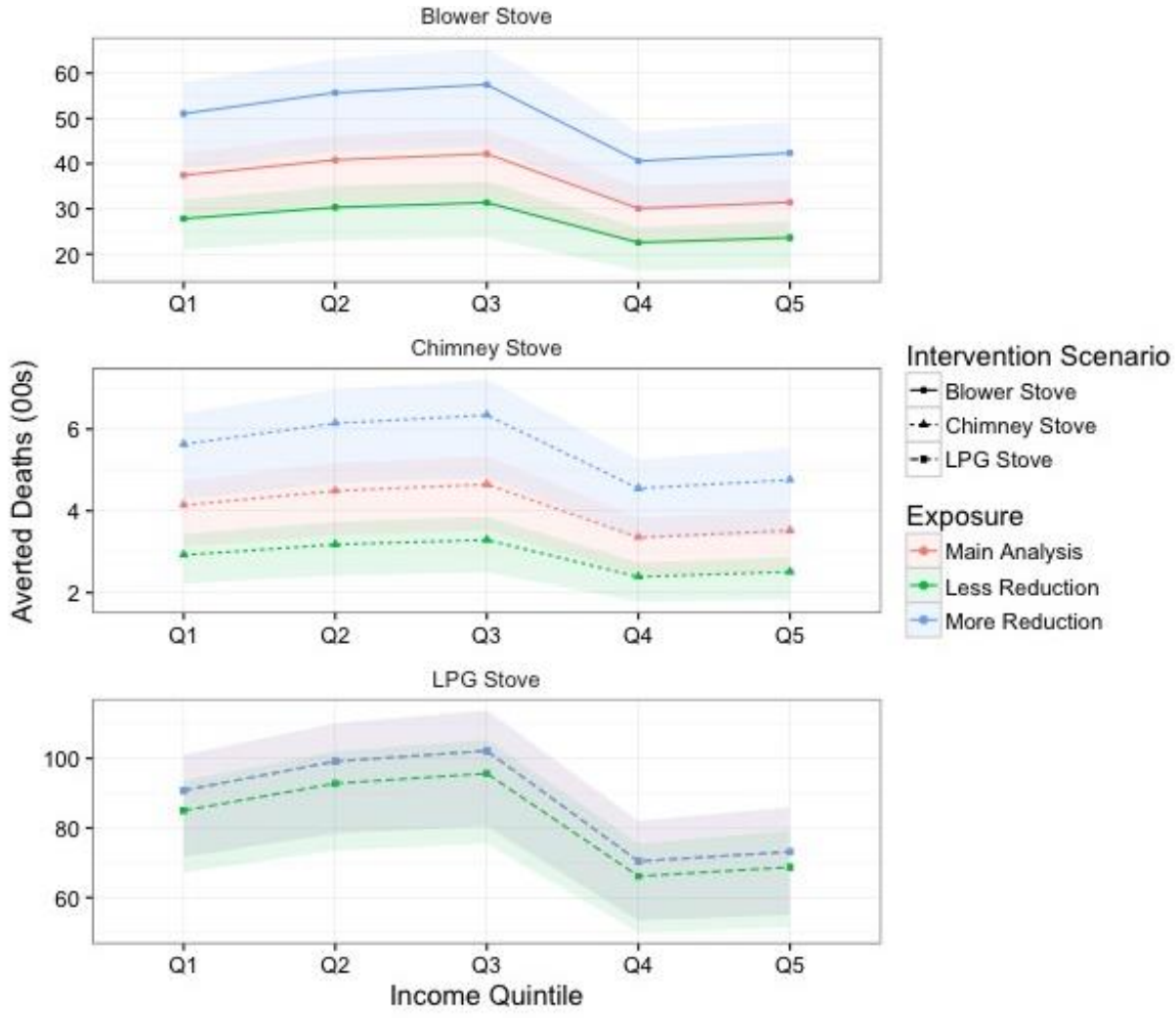
Annex 12A. Supporting Information

Supplemental material for: Pillarisetti, A., D.T. Jamison, and K.R. Smith. 2017. "The Impact of Household Energy Interventions on Health and Finances in Haryana: An Extended Cost-Effectiveness Analysis." In *Disease Control Priorities* (third edition): Volume 7, *Injury Prevention and Environmental Health*, edited by C.N. Mock, R. Nugent, O. Kobusingye, and K.R. Smith. Washington, DC: World Bank.

Sensitivity of Ill Health Averted to Changes in Exposure

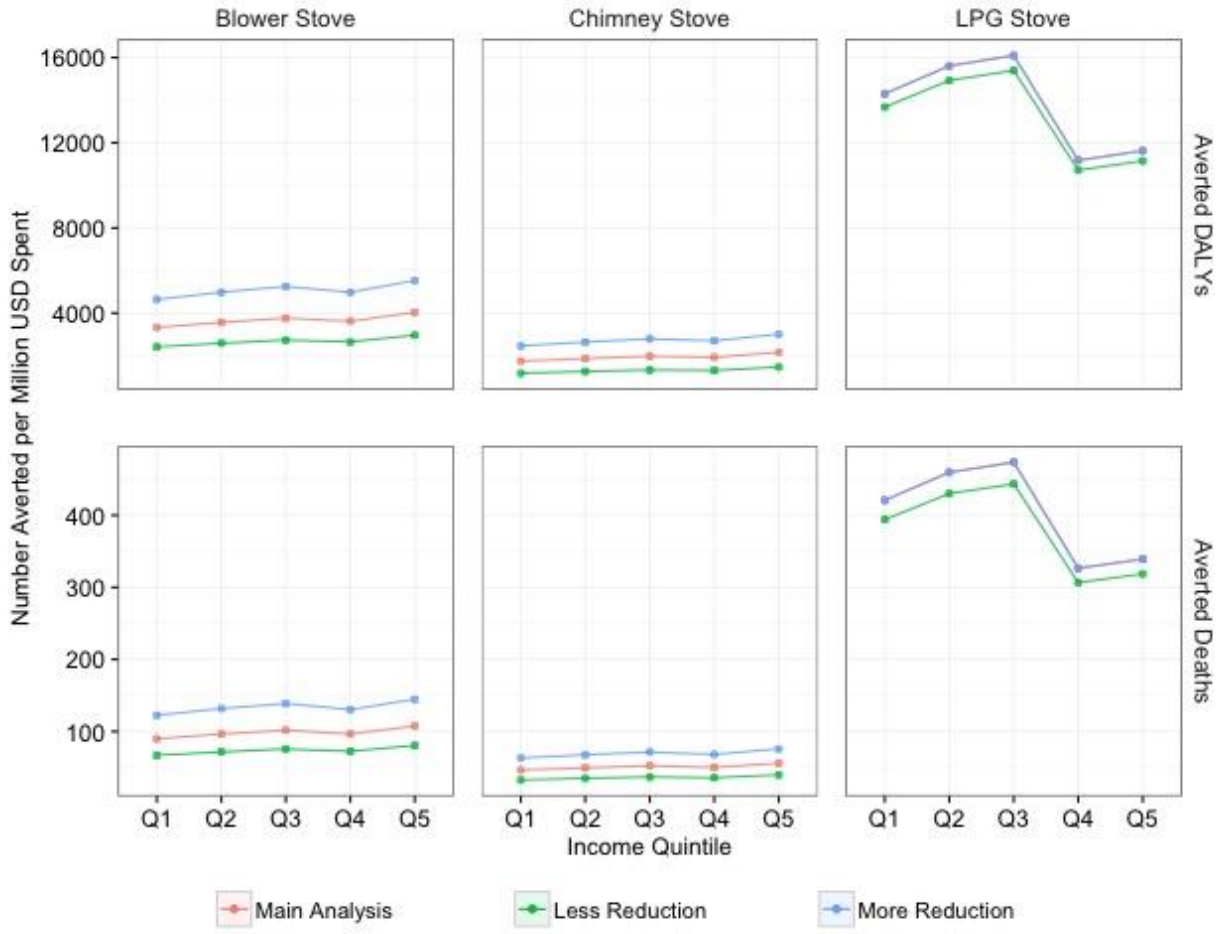
In the main text, we scale post-intervention exposures by an expected percentage reduction attributable to an intervention. To evaluate the sensitivity of our findings to this linear scalar, we introduced variability in the exposure reductions (±10% of the main paper value for chimney and blower stoves; ±2% for LPG stoves) and modeled subsequent impacts on averted deaths attributable to an intervention (Figure 12A.1). Averted DALYs follow a similar pattern (not shown). Figure 12A.2 shows the range of averted DALYs and deaths per million dollars of public expenditure. We found that trends were robust to the small changes in exposure we introduced; larger decreases in exposure resulted in more pronounced changes in health than an equivalent increase in exposure. This is likely to be related to the non-linear relationship between exposure and health described by the supra-linear integrated exposure response curves.

Figure 12A.1 Averted Deaths for Three Classes of Interventions in Haryana, India, under Various Exposure Reduction Scenarios, by Income Quintile



Note: Shaded areas account for uncertainty in background disease conditions and indicate the minimum and maximum avoidable burden for each intervention.

Figure 12A.2 Averted Deaths (A) and DALYs (B) per Million Dollars Spent By Income Quintile For Three Classes of Interventions In Haryana, India Over 5-Year Intervention Lifetime and Three Exposure Scenarios



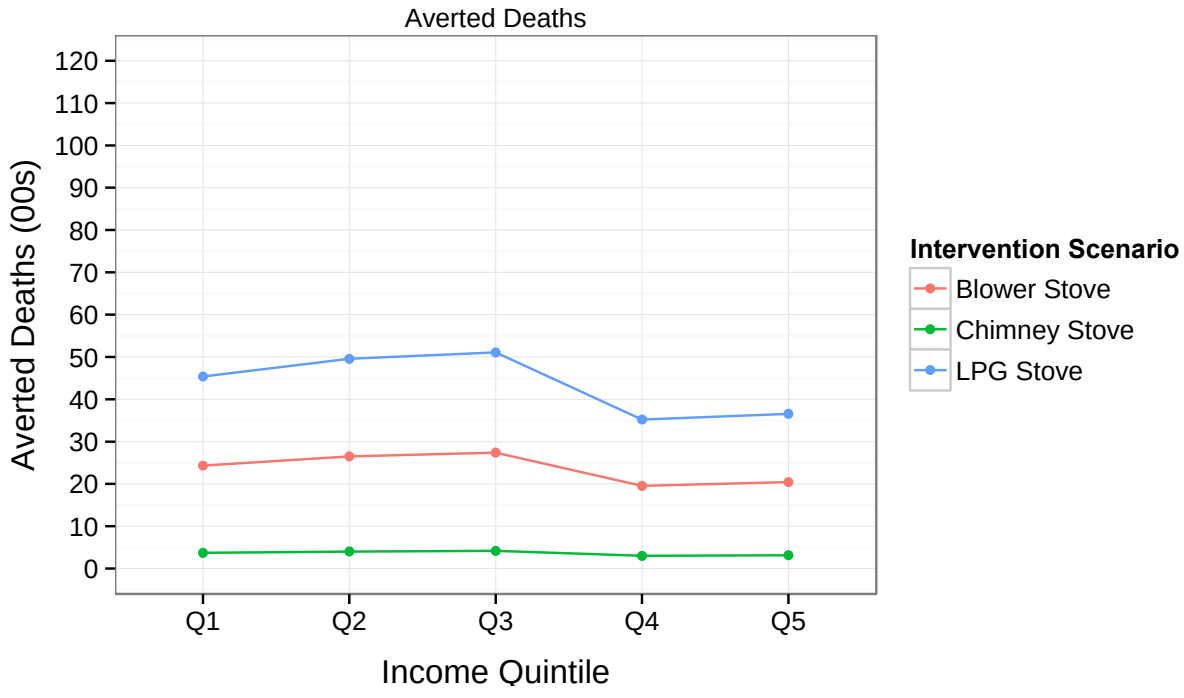
Note: For LPG Scenario 3, gas subsidies given up by income quintiles 4 and 5 result in no expense to the government for intervention in this quintiles; the subsidy is retargeted evenly to income quintiles 1, 2, and 3.

Sensitivity to Adoption/Uptake Parameters

In the main text, we assume that all households in Haryana fully adopt interventions. Experience in Haryana[8] and elsewhere reveals this usually not to be the case, at least initially. As the main analysis shows a marked higher benefit from LPG, Figures __A3 and __A4 show findings for a scenario with a lower but still high adoption of the chimney stove (90%), a moderate adoption of the blower stove (65%), and low adoption of LPG stoves (50%) for comparison. Due to the way HAPIT is structured, averted deaths and DALYs scale linearly with adoption rates. Across all interventions, as the adoption percentage decreases and the number of averted deaths and DALYs decrease, the interventions cost linearly increase from both a private and public perspective. Evaluation of uniform changes in adoption across the three interventions evaluated is not shown.

Figure 12A.3 Averted deaths (A) and DALYs (B) by income quintile for three classes of interventions in Haryana, India with reduced usage levels as compared to the main analysis. Shaded areas account for uncertainty in background disease conditions and indicate the minimum and maximum avoidable burden.

(A)



(B)

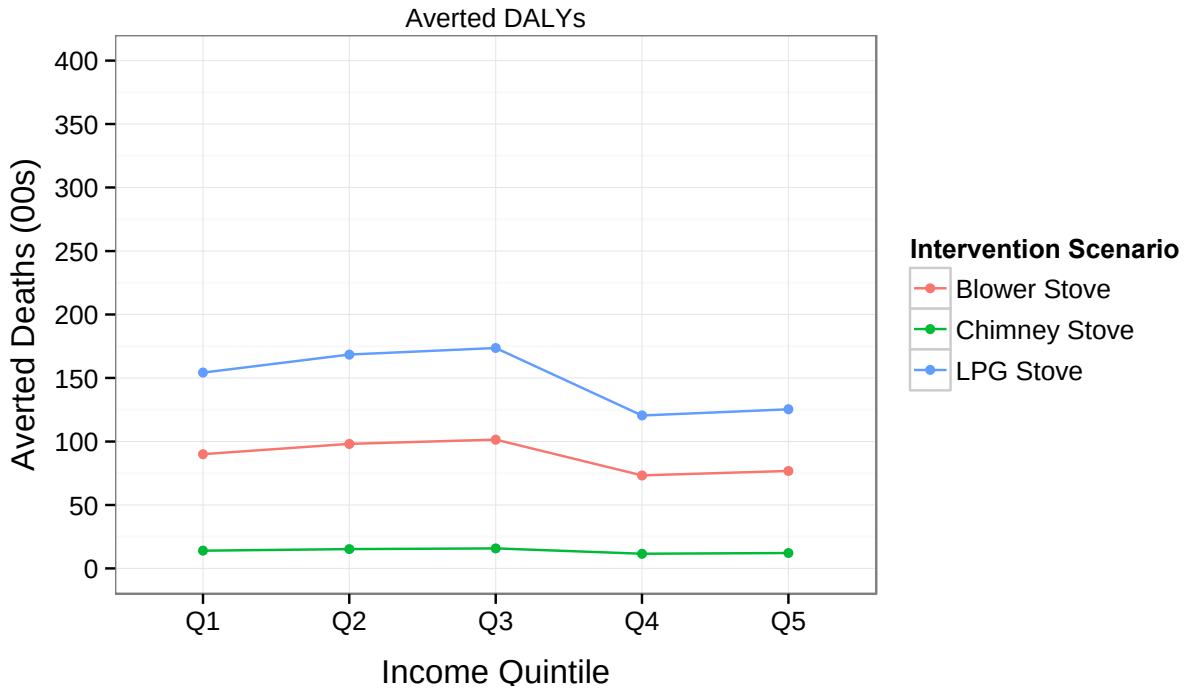
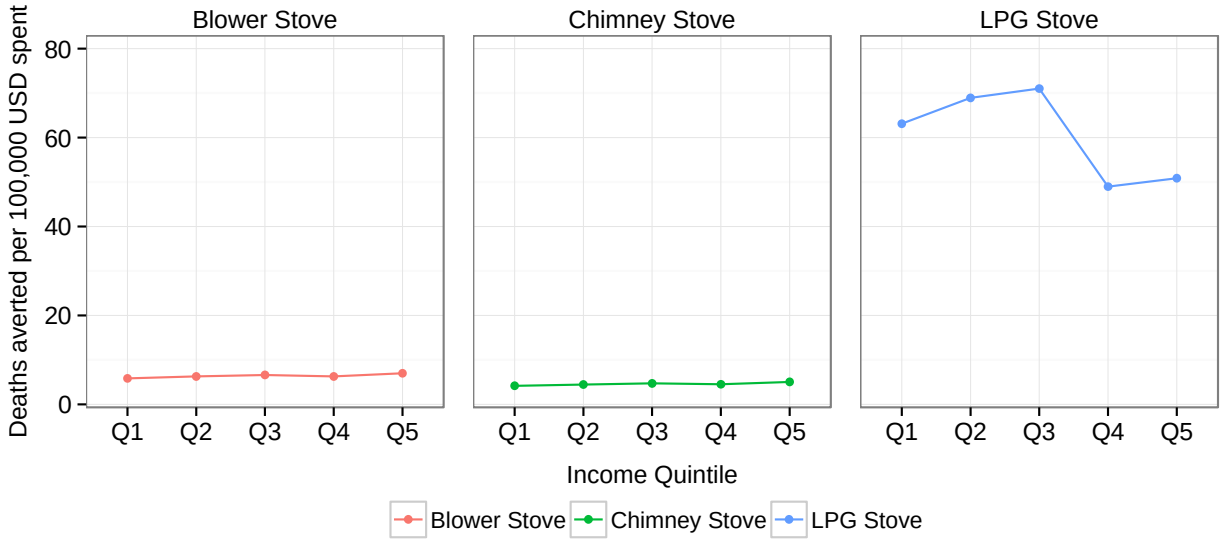
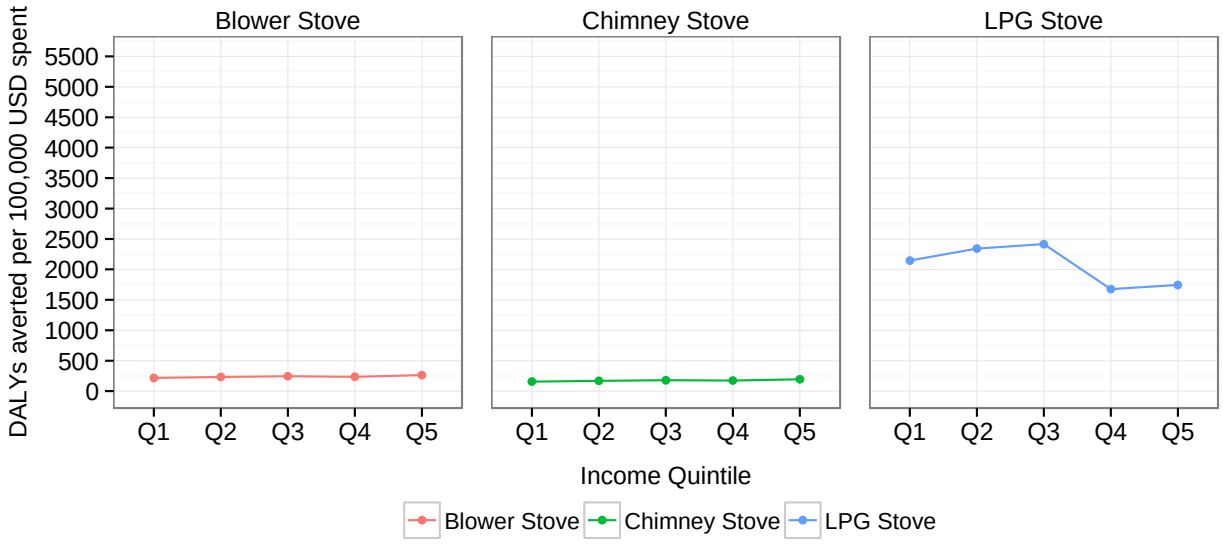


Figure 12A.4 Deaths and DALYs Averted per 100,000 USD Spent for Reduced-Adoption Scenarios

(A)

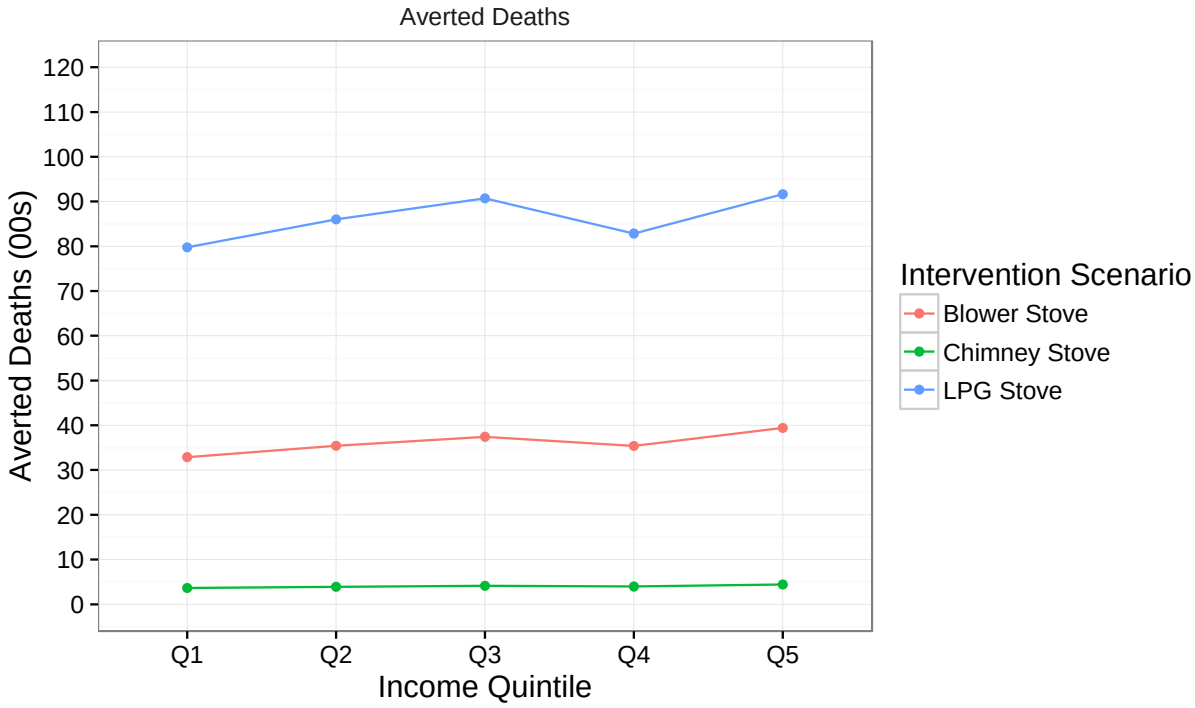


(B)



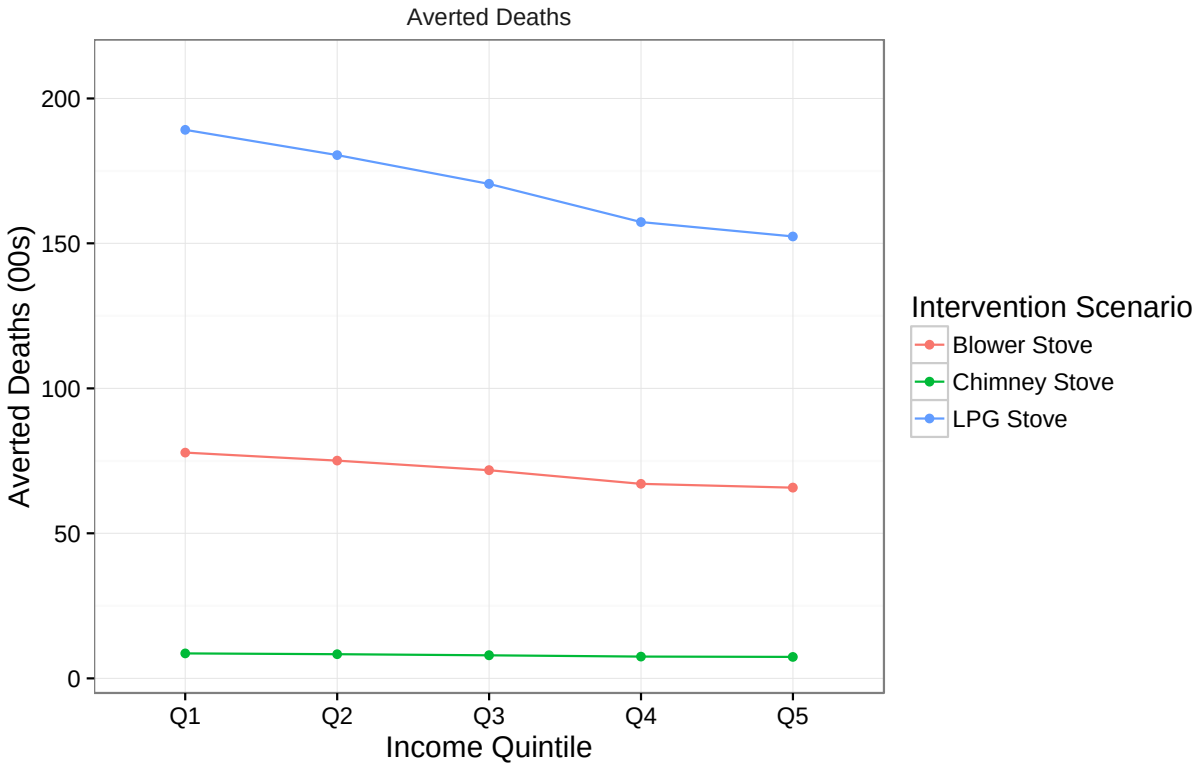
Sensitivity of findings to the distribution of background disease rates and solid fuel use. Given the lack of per-quintile disease information in Haryana, we chose to apportion the burden by the fraction of the total Haryana solid fuel using population in a specific quintile. We explored two other ways to distribute disease – first, weighted strictly by population in each quintile and second, through a linear decrease in solid fuel using percentages as wealth increases, starting at 90% for Q1 and decreasing to 60% in Q5. Under the first scenario, our findings indicate increasing benefits as wealth increases, due to the increasing number of people per household in Haryana as wealth increases (Figure 12A.5). Under the second scenario – in which we impose a linear decreasing solid fuel use trend upon quintiles and distribute background disease rates accordingly – trends favoring the poorly quintiles are clear and very pronounced (Figure 12A.6).

Figure 12A.5 Deaths Averted by Income Quintile.



Note: In this figure, the distribution of background disease information is weighted solely by population in the quintile, which in Haryana in 2004-05 increases as wealth increases, according to IHDS.

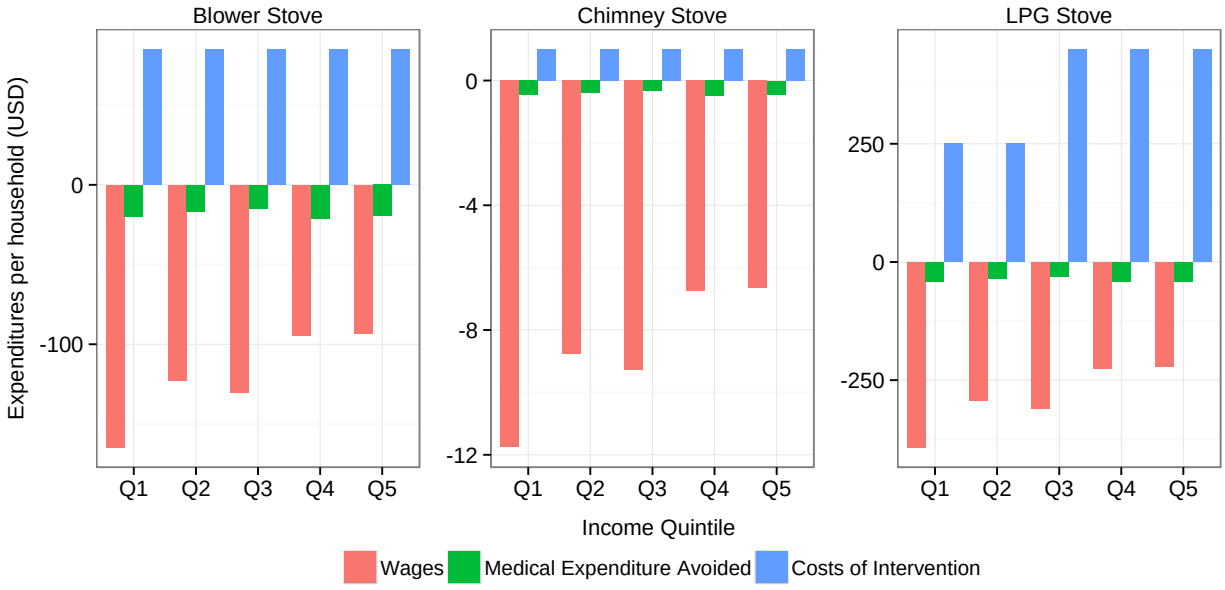
Figure 12A.6 Deaths Averted by Income Quintile



Note: In this figure, the distribution of background disease information scales with an imposed linear decrease in solid fuel as wealth increases.

The choice of method for distributing background disease rate has clear and pronounced impacts on the findings of this ECEA. Optimally, reliable background disease information for adults and children under five would be gathered for each income quintile.

Figure 12A.7 Costs and Savings per Household



Note: For the blower stove and LPG stove, we assume a 5 year intervention lifetime. For the chimney stove, a one-year intervention lifetime is assumed. Positive values indicate an expenditure; negative values indicate a saving to the household. For all interventions, the wage gains outweigh the medical expenditures significantly.