# HAPIT Results: Health Benefits of Stove Interventions in Rwanda

## Generated by HAPIT 2.1 on 2014-09-05

This document contains output from HAPIT, the Household Air Pollution Intervention Tool. Based on user's inputs of information in their own setting, HAPIT calculates the potential health benefits of stove interventions to reduce health impacts related to household air pollution (HAP) from use of solid cookfuels in traditional stoves.

This report focuses on Rwanda. It is tailored to the national average conditions (household size, background disease rates, GDP per capita, etc). Estimates derived from HAPIT are based on methods and databases developed during the Comparative Risk Assessment, a component of the IHME Global Burden of Disease project (GBD-2010). It includes exposure-response information for each of the major disease categories that have been accepted as being due to HAP as well as background health, demographic, energy, and economic conditions for an additional 13 countries. Throughout this report, an \* indicates that pre and post intervention PM exposures are default values estimated from the literature and not empirical, country-specific measurements, which are recommended in actual use.

For countries with large demographic, geographic, or economic heterogeneity, estimates generated by HAPIT must be used with caution. In these areas, sub-national scenarios and input data are strongly recommended.

#### Overview

This document is split into two sections. The first contains a text-based overview of HAPIT and output from the model. The second contains a number of relevant tables and graphs.

## Scenarios Modeled

Burden of disease estimates and health benefits estimated by HAPIT require definition of an 'ideal' counterfactual exposure, below which there is no risk to health. In the 2010 Burden of Disease, this value was set at 7.3  $\mu$ g/m3 for annual average PM2.5 exposure. In HAPIT, the default value is 10  $\mu$ g/m3, which is the official Air Quality Guideline of WHO. HAPIT offers a third choice as well – 35  $\mu$ g/m3, which is the Interim Target-1 in the WHO AQG document.

The creator of this report set the counterfactual to  $10 \ \mu\text{g/m3}$  and the pre-intervention PM2.5 exposure to  $450 \ \mu\text{g/m3}$ . HAPIT is designed to accept information derived from each user's own setting for cost, pre- and post- intervention exposures, etc. \* denotes scenarios using default exposure values from the literature.

Custom Scenarios

Scenario	Post PM2.5	Targeted Households	Frac Using	Useful Life	\$ per Intvn	\$/Year
Custom 1	40	25000	1	3	85	240.0
Custom 2	242	25000	1	3	25	2.5

## Default Scenarios

Scenario	Post Pl	M2.5	Targeted Households	Frac Using	Useful Life	\$ per Intvn	\$/Year
LPG*		63	25000	1	3	85	240.0
Chimney*		331	25000	1	3	10	2.5
Rocket*		236	25000	1	3	25	2.5
Advanced*		118	25000	1	3	75	7.5

## Deaths and DALYs avoided over 3-year evaluation period

HAPIT reports values for chronic diseases adjusted using the EPA 30 year Cessation lag. Deaths and DALYs in children (due mainly to acute lower respiratory infection, ALRI) are unadjusted and are assumed to accrue quickly after intervention deployment. Avoided deaths and DALYs are reported in Table 2. DALYs avoided by the interventions, summed across all disease categories, are presented in dark grey in Figure 1. Red indicates avoidable DALYs still remaining in the target population. Table 4 contains averted Deaths and DALYs by disease category for each scenario.

## WHO CHOICE Cost Effectiveness Analysis

Cost-effectiveness is determined by comparing the expected annual cost of the intervention per DALY to the GDP/Capita (PPP) in international dollars. The World Health Organization's CHOosing Interventions that are Cost-Effective (WHO CHOICE) effort advises that interventions costing less than the GDP/capita (PPP) are very cost-effective, those costing one to three times the GDP/capita (PPP) are cost-effective, and those costing more than three times the GDP/capita (PPP) are not cost-effective.

# Tables and Figures



## Avoided and Unavoided DALYs by Scenario

## Total Averted Deaths and DALYs

Scenario	Pre-Intervention	Post-Intervention	Total DALYs	Total Deaths
Custom 1	450	40	6951	95.60
Custom 2	450	242	693	9.63
$LPG^*$	450	63	4904	66.00
Chimney*	450	331	283	3.98
$\operatorname{Rocket}^*$	450	236	726	9.99
$\operatorname{Advanced}^*$	450	118	2342	31.55

## Children's Health: Averted Deaths and DALYs due to ALRI

Scenario	Pre-Intervention	Post-Intervention	ALRI DALYs $<5$	ALRI Deaths $<5$
Custom 1	450	40	6000	70.0
Custom 2	450	242	500	5.8
$LPG^*$	450	63	4200	49.0
$\operatorname{Chimney}^*$	450	331	190	2.2
$\operatorname{Rocket}^*$	450	236	530	6.1
$\operatorname{Advanced}^*$	450	118	1900	22.0

# Averted Deaths and DALYs due to Chronic Diseases in Adults

Scenario	Pre-Intervention	Post-Intervention	COPD DALYs	COPD Deaths	IHD DALYs	IHD Deaths
Custom 1	450	40	410	3.4	240	8.70
Custom 2	450	242	120	1.0	45	1.70
$LPG^*$	450	63	350	2.9	180	6.60
$\operatorname{Chimney}^*$	450	331	60	0.5	21	0.78
$\operatorname{Rocket}^*$	450	236	120	1.0	47	1.70
Advanced*	450	118	250	2.1	110	4.00

Scenario	Pre-Intervention	Post-Intervention	Lung Cancer DALYs	Lung Cancer Deaths	Stroke DALYs	Stroke Deaths
Custom 1	450	40	41.0	1.50	260.0	12.00
Custom 2	450	242	11.0	0.38	17.0	0.75
$LPG^*$	450	63	34.0	1.20	140.0	6.30
$\operatorname{Chimney}^*$	450	331	5.2	0.19	6.8	0.31
$\operatorname{Rocket}^*$	450	236	11.0	0.40	18.0	0.79
$\operatorname{Advanced}^*$	450	118	24.0	0.85	58.0	2.60

#### WHO CHOICE Cost-Effectiveness by Scenario



\*Strickly speaking, deaths cannot be avoided, but only postponed. Thus, the correct term is avoided premature deaths, but for conciseness, we use deaths here.

Visit HAPIT on the web for information on the methods used to generate the results outlined in this document. Click the "Documentation & Background" tab for detailed descriptions of data sources and methodologies.

HAPIT was created by Ajay Pillarisetti and Kirk R. Smith of the Household Energy, Climate, and Health Research Group at University of California, Berkeley with support from the Global Alliance for Clean Cookstoves.