

### Fuelwood Collection and Cooking

Table D.1 shows that the time spent collecting wood each day varies quite considerably. But the average time is more than 2.5 hours, and it can be eight times that. The largest share of the burden is carried by women.

If electrification means that less firewood is collected, then there are time savings to the households. However, the main use for firewood is for cooking, and, as table D.2 shows, in most countries less than 1 percent of the rural population (and usually not a much larger share of those with electricity) uses it for cooking. Therefore, these benefits will not be realized in the short to medium term.

East Asian countries may be something of an exception, because rice cookers are a common purchase in electrified households: in Lao People's Democratic Republic just over a quarter (27 percent) of electrified households have a rice cooker, so electrified households do use significantly less fuelwood in these countries.

### Ownership of Electric Goods

Figure D.1 uses DHS data for 53 countries, several with data from more than one survey, giving a sample of up to 113 observations. The graphs plot the percentage of people in rural areas owning the specified good against the RE rate. The 45° line and fitted line are also shown.

**Table D.1: Time Spent Collecting Wood (hours/day)**

Country	Boys	Girls	Men	Women	Total
Benin	n.a.	n.a.	0.47	1.60	2.07
Benin	n.a.	n.a.	0.50	2.90	3.40
Ghana (rural) <sup>a</sup>	n.a.	n.a.	3.23	4.60	7.83
Guinea (rural)	2.50	1.50	1.60	2.40	8.00
Madagascar	n.a.	n.a.	1.35	0.82	2.17
South Africa	n.a.	n.a.	0.35	0.70	1.05
Indonesia	n.a.	n.a.	0.21	0.09	0.30
Burkina Faso	n.a.	n.a.	0.03	0.10	0.13
India	n.a.	n.a.	0.65	0.65	1.30
Nepal	n.a.	n.a.	0.83	2.37	3.20
Himachal Pradesh <sup>b</sup>	n.a.	n.a.	n.a.	n.a.	1.30
Tamil Nadu <sup>c</sup>	n.a.	n.a.	n.a.	n.a.	0.65
Rajasthan <sup>c</sup>	n.a.	n.a.	n.a.	n.a.	1.64

Sources: Bardasi and Wodon 2006; Charmes 2006; Dutta 2005; GSS 2000; Nathan and Kelkar 1997; Laxmi and others 2003; Parikh 2005; Parikh and Laxmi 2000; Blackden and Wodon 2006.

Note: n.a. = not available.

a. Average for forest and savannah.

b. Average across Regions. Gender division of labor varies by Region. Daily average over a month.

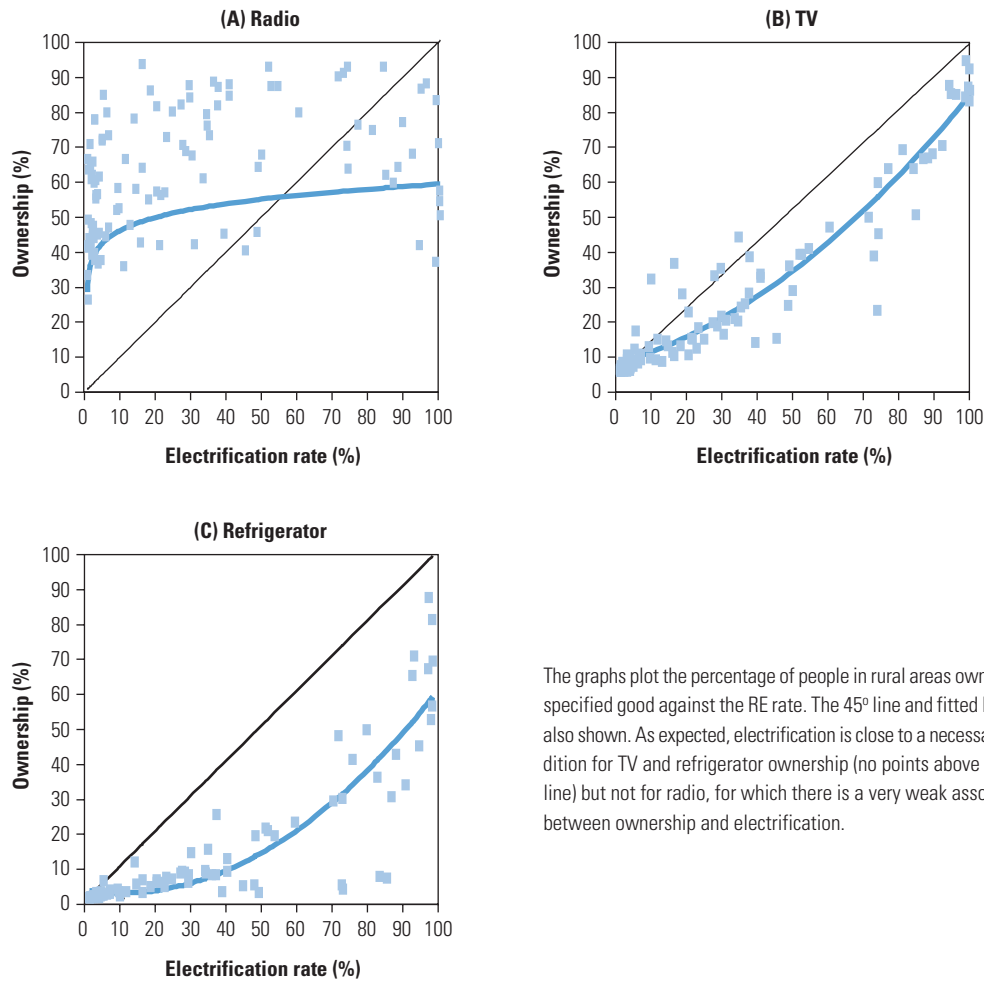
c. Average across Regions. Daily average over a month.

**Table D.2: Use of Electricity for Cooking**

Country	Year	Percent of rural population		Percent of total population		Percent of those with electricity using electricity for cooking	
		Electricity	Use electricity for cooking	Electricity	Use electricity for cooking	Rural	Total
Armenia	2000	98.6	20.4	98.9	37.4	20.7	37.8
Bangladesh	2004	30.4	0.0	40.6	0.1	0.0	0.2
Bolivia	1998	29.0	0.0	71.2	0.9	0.0	1.3
Bolivia	2003	35.7	0.0	72.3	0.5	0.0	0.7
Burkina Faso	2003	0.8	0.0	11.4	0.0	0.0	0.0
Cambodia	2000	9.0	0.1	16.6	0.1	1.1	0.6
Colombia	2000	83.8	5.0	95.2	13.8	6.0	14.5
Colombia	2005	89.2	4.1	96.8	7.2	4.6	7.4
Dominican Republic	2002	80.6	0.1	92.3	0.1	0.1	0.1
Egypt, Arab Rep. of	2000	95.9	0.3	97.7	0.4	0.3	0.4
Eritrea	2002	3.0	0.0	32.2	0.6	0.0	1.9
Ethiopia	2000	0.4	0.0	12.7	0.1	0.0	0.8
Ghana	2003	24.1	0.1	48.3	0.3	0.4	0.6
Haiti	2000	5.2	0.0	33.7	0	0.0	0.0
India	1998	48.1	0.2	60.1	0.4	0.4	0.7
Indonesia	2002	84.5	0.2	90.7	0.4	0.2	0.4
Jordan	2002	98.7	0.0	99.5	0.1	0.0	0.1
Kenya	2003	4.6	0.1	16	0.3	2.2	1.9
Madagascar	2003	10.8	0.1	20.3	0.3	0.9	1.5
Malawi	2000	1.0	0.2	4.8	2.1	20.0	43.8
Mali	2001	2.2	0.0	10.8	0	0.0	0.0
Morocco	2003	51.3	..	78.2	7.8	..	10.0
Mozambique	2003	1.1	0.2	8.1	0.8	18.2	9.9
Namibia	2000	13.2	5.5	36.5	26.4	41.7	72.3
Nepal	2001	17.4	0.0	24.6	0.1	0.0	0.4
Nicaragua	2001	40.1	0.1	72.6	0.9	0.2	1.2
Nigeria	2003	33.8	0.1	52.2	0.3	0.3	0.6
Peru	2000	28.9	0.0	69.3	1.1	0.0	1.6
Rwanda	2000	0.9	0.0	6.2	0.2	0.0	3.2
Tanzania	2004	1.6	0.0	11.4	0.3	0.0	2.6
Turkmenistan	2000	99.6	0.4	99.6	0.5	0.4	0.5
Uganda	2000	2.4	0.1	8.6	0.8	4.2	9.3
Zambia	2001	2.9	1.9	17.4	14.1	65.5	81.0
Zimbabwe	1999	8.3	1.9	38.4	27.4	22.9	71.4

Source: DHS data: ORC Macro, 2006. MEASURE DHS STATcompiler. <http://www.measuredhs.com>, October 28, 2006.

Note: .. = excluded because of discrepancy between published data and IEG calculations.

**Figure D.1: Electrification and Consumer Goods Ownership in Rural Areas**

The graphs plot the percentage of people in rural areas owning the specified good against the RE rate. The 45° line and fitted line are also shown. As expected, electrification is close to a necessary condition for TV and refrigerator ownership (no points above the 45° line) but not for radio, for which there is a very weak association between ownership and electrification.

Source: DHS data (MEASURE DHS STATcompiler, <http://www.measuredhs.com>, March 8 2007).

As expected, electrification is close to a necessary condition for TV and refrigerator ownership (no points above the 45° line). But it is not a sufficient condition, because many data points lie below the 45° line. This is especially so for refrigerator ownership, which only rises above low levels for countries with very high electrification rates—reflecting, of course, the income effect. The two relatively poor countries (Indonesia and Vietnam) with high electrification rates have low fridge ownership.

In contrast, TV ownership rises quite quickly with electrification; the data support the argument that the majority of electrified households ac-

quire a TV in most countries (again Indonesia and Vietnam are outliers, but not as extreme as in the case of fridge ownership). By contrast, there is a very weak association between radio ownership and electrification. Many observations lie above the 45° line, because radio ownership is not dependent on a grid connection.

Because the surveys are relatively close together, many variables can be controlled for by modeling the changes in the variables between survey rounds (changes in other determinants will generally be small compared with the intracountry variation). The results from regressing the change in ownership of

**Table D.3: Change in Electric Goods Ownership as a Function of Change in Electrification Rate**

	Radio	TV	Refrigerator
Intercept	-0.03 (-0.56)	3.42* (2.66)	3.01* (4.24)
Coefficient	6.15* (1.24)	0.47** (2.48)	0.93* (4.99)
R2	0.00	0.18	0.47
N	59	59	59

Note: Ordinary least squares with robust standard errors. Figures in parentheses are t-statistics.

\*Significant at 1 percent.

\*\*Significant at 5 percent.

each of the three changes in electrification are shown in table D.3. Consistent with the above analysis, there is a significant impact on TV and refrigerator ownership but not for radio.

TV watching is unsurprisingly associated with TV ownership. Table D.4 reports DHS data (women's survey) for nine countries, showing this association, which is summarized in figure D.2. On average, 60 percent of women in households with TV watch almost every day, whereas less than 10 percent of women in households without TV watch that frequently. These data thus support the argument that “communal viewing,” while not unknown, is not the norm.

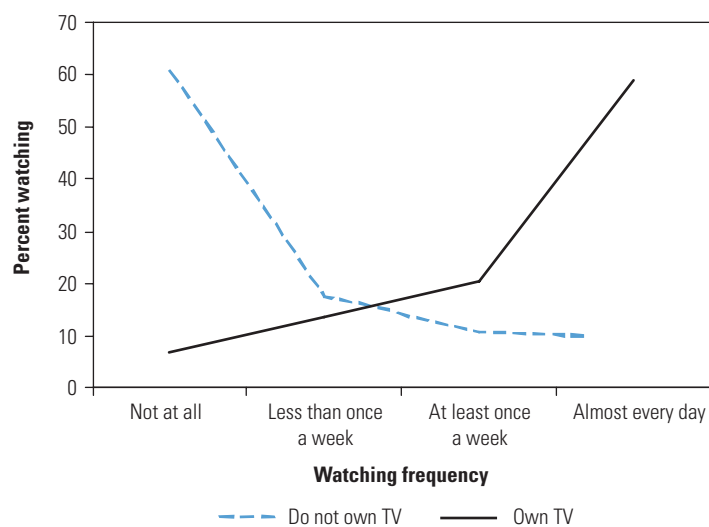
### Health Facilities

RE is argued to facilitate the cold chain and so improve health status. Analysis of health facility data from six countries shows that the cold chain is significantly more present in electrified rural facilities than in those without electricity (see table D.5)—this difference is significant in all six

**Table D.4: TV Watching by TV Ownership (Women)**

Country	Television ownership	Frequency of watching				Number
		Not at all	Less than once a week	At least once a week	Almost every day	
Bangladesh	Do not own TV	64.2	10.6	19.9	5.2	6,193
	Own TV	9.7	5.7	19.0	65.4	1,343
Ghana	Do not own TV	70.4	15.4	10.1	4.0	2,985
	Own TV	13.7	14.9	24.3	47.1	329
Indonesia	Do not own TV	30.3	32.1	18.4	18.8	9,279
	Own TV	2.0	7.4	6.4	83.8	7,886
Morocco	Do not own TV	49.3	6.5	11.5	32.7	4,715
	Own TV	5.4	3.5	9.9	81.2	3,085
Nepal	Do not own TV	90.4	0.0	9.6	0.0	6,943
	Own TV	12.4	0.0	87.6	0.0	629
Nicaragua	Do not own TV	84.6	3.2	4.2	7.9	4,111
	Own TV	5.1	2.0	9.1	83.7	1,662
Peru	Do not own TV	50.2	43.9	1.3	4.5	9,751
	Own TV	3.3	33.1	1.8	61.7	5,735
Philippines	Do not own TV	52.3	31.3	9.5	6.4	7,843
	Own TV	3.9	47.9	7.8	40.0	5,601
Senegal	Do not own TV	58.0	18.2	13.9	9.8	6,071
	Own TV	5.6	9.3	17.4	67.7	2,218
Unweighted average	Do not own TV	61.1	17.9	11.0	9.9	
	Own TV	6.8	13.8	20.4	59.0	

Source: IEG analysis of DHS data.

**Figure D.2: TV Watching Is Far Greater in TV-Owning Households**

Source: IEG analysis of DHS data.

**Table D.5: Electrification of Rural Health Clinics and the Cold Chain by Country**

	Ghana (2003)		Egypt (2002)		Kenya (2004)	
	Electricity	No electricity	Electricity	No electricity	Electricity	No electricity
Electricity	72.8	27.2	98.6	1.4	77.5	22.5
Refrigerator	64.2	40.7***	51.3	0.0***	71.9	67.3
Ice	2.6	6.2*	0.6	0.0	0.6	0.0
No storage	21.9	37.2**	11.6	0.0***	3.3	7.1***
Immunization	88.7	84.1	63.4	0.0***	75.7	74.5
				<b>Electrified (%)</b>	<b>Not electrified (%)</b>	
Bangladesh (2000)						
Cold chain equipment available and operational				55.9	10.0***	
Nicaragua (2001)						
Electric refrigerator				65.5	10.2***	
Solar refrigerator				15.2	20.7*	
Any refrigerator				80.7	31.0***	
Cold box				29.2	14.1*	
Termo				92.6	65.9***	
Rwanda (2001)						
Refrigerator				80.8	96.6***	
Immunization				80.8	98.8***	

Source: DHS data except Nicaragua, from Measure Evaluation Health Facility Survey.

\*Significant difference at 10 percent.

\*\*Significant difference at 5 percent.

\*\*\*Significant difference at 1 percent.

**Table D.6: Average Number of Hours Rural Clinics Are Open**

	Electricity	No electricity
Bangladesh	7.1	6.1 <sup>a</sup>
Kenya	15.1	11.0 <sup>a</sup>

Source: DHS facility surveys.

a. Significant difference at 1 percent.

countries. However, the difference in the proportion of clinics providing immunization services does *not* vary according to electrification status—meaning that clinics are used for immunization days and so forth. The impact of RE on immunization rates is thus not likely to be strong, but it can help build the immunization into routine service delivery at the clinic level and thus reduce the cost of delivering immunization services. Data are not available to explore this issue further.

It is also argued that electrification allows longer opening hours for community facilities. Data for health facilities were only available for two countries, but in both cases electrified clinics had significantly longer opening hours (table D.6).

Finally, access to electricity may improve the water supply (see table D.7). Data from health facilities

from three countries show a significant difference in source of water. The electrified facilities were more likely to have access to piped water (index = 1 for piped water; two-thirds for protected well/borehole; one-third for unprotected well) compared with the nonelectrified facilities. Availability of water within 500 meters of the facility was significantly higher for electrified facilities in two of the four countries. However, availability of water year 'round was better for electrified facilities only in one of four countries. Causality is not established here, as both electricity and better water supply may reflect some third factor.

### Access to Water

Water supply frequently needs pumping, which can be done using either diesel or electric pumps. Figure D.3 shows a positive association between rural access to water and RE in cross-country data. It might be thought that this is a spurious correlation, explained by income per capita, which is an explanatory factor for both these variables. However, electrification remains a significant determinant of water supply once income is allowed for (table D.8). The relationship between water supply and electrification deserves further study but is not pursued in this report.

**Table D.7: Electrification of Rural Health Centers and Water Availability**

Country and year	Water available on site		Water available all year round		Source of water index	
	Electricity	No electricity	Electricity	No electricity	Electricity	No electricity
Ghana 2003	77.4	47.5 <sup>a</sup>	37.7	24.6 <sup>a</sup>		
Bangladesh 2000					0.54	0.38 <sup>a</sup>
Egypt 2002	96.3	33.3 <sup>a</sup>	4.2	0.0	0.97	0.44 <sup>a</sup>
Kenya 2004	64.3	69.4	71.1	68.4	0.86	0.58 <sup>a</sup>
Rwanda 2001	16.4	13.8	58.6	52.1		

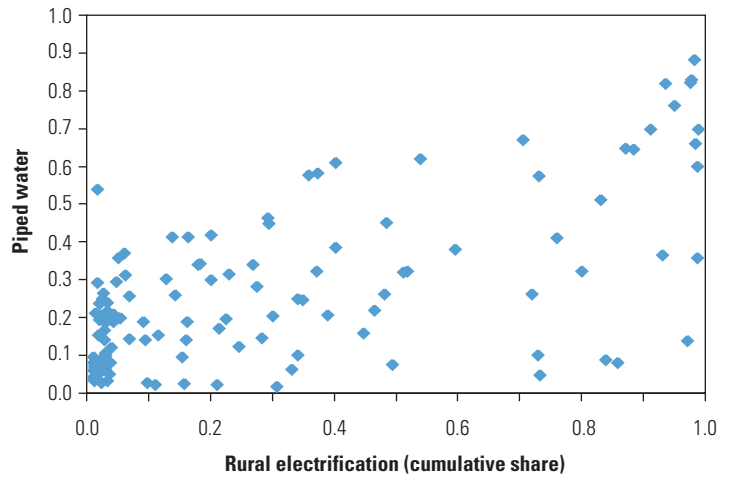
Source: DHS facility surveys.

a. Significant difference at 1 percent.

**Table D.8: Regression of Rural Water Supply Using Cross-Country Data**

	<b>Coefficient</b>	<b>t-stat</b>
Electrification rate	0.192	2.04 <sup>a</sup>
Floor material	-0.026	-0.34
Nonelectric assets	-0.025	-0.10
GDP per capita	0.000	2.60 <sup>a</sup>

*Note:* GDP = gross domestic product.  
 a. Significant difference at 5 percent.

**Figure D.3: Rural Electrification and Access to Piped Water**

*Source:* DHS data.