Measuring Time Use
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Purpose

This brief summarizes the evidence base for various types of commonly-used time use measurements, and lists categories of time use as identified by major organizations and reports, and identifies studies finding significant impacts of interventions designed to reduce specific time constraints.

Approaches to Measuring Time Use

In developed countries, time use surveys are often used to complement national statistics and provide additional information on informal work or activities. In Sub-Saharan Africa and Southeast Asia, however, total productive activity is not necessarily captured in national statistics (Blackden & Wodon, 2006). There are a number of different issues that must be considered when measuring time in these countries – illiteracy, watch ownership, the concept of time, sociocultural conditions, and seasonal activities all affect how time use can be measured (Harvey & Taylor 2000). To account for these activities, special measurement tools and survey instruments are often used to measure time in developing countries that are not typically used in the developing world. *Table 1* displays key methods for measuring time use, as well as their advantages, disadvantages, and examples of instruments that use these methods.

Table 1. Methods for Measuring Time Use

Method	Definition	Advantages	Disadvantages	Examples
Direct Observation	A researcher observes what individuals do at certain times and records the activities performed. In certain instances, "spot observations" are done at random intervals throughout the day (Senegal 1993) to improve accuracy and decrease bias.	The individual being observed does not have to be literate or have a "western concept of time," and is particularly useful when activities are in short intervals or performed simultaneously (Blackden & Wodon, 2006).	Observations tend to have high costs and require a higher quantity of researchers because they are so researcher intensive (Harvey & Taylor, 2000). Individuals also "tend to change their behavior" once they know they are being observed (Blackden & Wodon, 2006; Guerrero, n.d.).	Kenya 1985, Kenya 1990, Nigeria 1992 (Blackden & Wodon, 2006) Senegal 1983 (Harvey & Taylor, 2000)
Stylized Questions	Typically part of a questionnaire or survey, this method includes general questions on time spent on certain activities.	Reliable in measuring frequencies of activities. Often less costly than diary data (Budlender, 2007).	Total time in one day can exceed 24 hours (omits simultaneous activities) and can suffer from subjective calculating of time use (Guerrero, n.d.). Stylized questions may also be confusing (Harvey & Taylor, 2000, Esquivel, 2009).	Modules added onto current measures (LSMS – Living Standards Measurement Surveys) Tanzania National Panel Survey (National Bureau of Statistics, 2012)

Interviewer-Administered Activity Log	A list or matrix of daily activities from which a person is asked how much time is spent doing each activity on a certain day. An expanded version of the matrix – a Time Activity Matrix – includes an activities list and time periods, allowing the respondent to mark the activities done during each time period.	Reliable in measuring frequencies of activities. Often less costly than diary data. Due to the pre-determined list, data is more consistent (Harvey & Taylor, 2000).	List may omit certain daily activities, and stylization may create confusing questions (Budlender 2002).	Modules added onto current measures (LSMS) Ghana Time Use Survey (Ghana Statistical Service, 2009) 2002 Mexico Time-Use Survey (Instituto Nacional De Las Mujires, 2002)
Left Behind Activity Log	A person is asked to note on a blank survey form each time she engages in an activity and the time spent on this activity. The log is structured by activity rather than by time of day.	Less costly than diary data (Harvey & Taylor 2000).	Person must be literate to complete the log. Lack of motivation or attention could lead to missed time accounting (Blackden & Wodon, 2006). List may omit certain daily activities Budlender 2002).	Modules added onto current measures (LSMS) Ethiopia Time Use Survey (Central Statistical Agency, 2014)
Interviewer-Administered Time Diary	The interviewer asks the respondent to describe each activity from the beginning to the end of a given day. The time diary may or may not include a list of activities to choose from.	Interviewer can ask for a full account of time, can allow for simultaneous activities, does not require respondent literacy, and can minimize recall bias (Blackden & Wodon, 2006).	Concept is complicated and requires high quality interviewers, which can be costly. Bias can be introduced by the presence of an interviewer (Guerrero, n.d.)	Benin Time Use Survey (INSAE/PNUD, 1998) South Africa – Time Use Survey 2000 (Statistics South Africa, 2000)
Left Behind Time Diary	The interviewer leaves behind a time diary to retrieve at a later date. The respondent fills out the diary according to what activities they were doing at different times of the day.	Events can be recorded as they happen, decreasing recall bias. Costs are also lower than interviewer-administered methods (Budlender, 2007; Kes & Swaminathan, 2006).	Person must be literate, or else the diary must contain pictures which can omit important activities. Delayed recordings can decrease accuracy, and quality of records may decrease if the recording takes too long (Esquivel, 2009; Guerrero, n.d.).	Malawi Second Integrated Household Survey (National Statistics Office, 2005) Continuous Multi-Purpose Household Survey (Statistics Mauritius, 2003) Time Use in Nigeria: A Pilot Study (Federal Statistics Office, 1998)

Source: Adapted from Budlender, 2007; Harvey & Taylor, 2000; Kes & Swaminathan, 2006; and Blackden & Wodon, 2006

Challenges in Time Use Measurement

The literature on time use measurement describes a wide variety of issues that must be considered when developing a time use instrument. Cost is often a consideration, as methods that require personal or more frequent enumerator involvement are more costly than methods that place the burden for reporting time use on respondents (Harvey & Taylor, 2000; Kes & Swaminathan, 2006; Budlender, 2007). Instruments that involve a household survey must consider how they will approach the issue of measuring time use for different household members. Many will collect information for just one respondent for household, or may ask a respondent to fill out a time log for one or more other household members (Winkler, 2002). Certain modes of

time use data collection require respondents to be literate or must represent activities with pictures, which can lead to sampling of data quality issues (Esquivel, 2009). Masuda et al (2015) find that pictorial diaries may help minimize recall bias in illiterate populations.

Timing of data collection can also introduce measurement bias, as surveys that depend on recall may introduce errors depending on the immediacy of the time period in question, the granularity of activities being asked about, and the salience and regularity of the activities (de Weerdt, 2015). People have more difficulties recalling the distant past than the near past (Stone & Shiffman, 2002). Most time-use survey methodologists argue that recall is sufficiently poor after just two or three days that responses are unbearably inaccurate (Kalton, 1985; Harvey & Taylor, 2000). Some events may not even be processed and stored into memories, especially repetitive or mundane everyday tasks; old events may be overridden by more recent events; or an individual may have simply forgotten (Beckett et al., 2001). In these cases, respondents are more likely to give an answer that reflects his or her "average" (Chenu and Lesnard, 2006; Juster, 1985b). Individuals often believe events that are easily recalled happen more often than they actually do (Tversky and Kahneman 1973; cited in Beckett et al 2001). This may systematically result in overestimates of memorable events if respondents are asked to recall over sufficiently long periods. The more salient an activity or event, the better the recall of said activity/event (Beckett et al., 2001). People also tend to use events throughout the day to measure time to such an extent that a day full of rather salient events may result in very accurate recall (Juster, 1985b).

An issue related to time use measurement is how seasonality of labor in developing countries relates to time allocation (Beegle, 2005; Esquivel et al., 2008; Juster and Stafford, 1991; Kes and Swaminathan, 2006). In countries with clearly delineated wet and dry seasons, time allocation can vary drastically from one season to the next. Households may devote most of their hours to agriculture during planting and harvesting season and increase leisure during the dry season (Skoufias, 1996). Child labor, which is much more common in developing countries than in developed countries (Vuri, 2010), is likely different during the school year and during other parts of the year (Masuda et al., 2014), and it likely varies during the wet and dry seasons, as well.

Most instruments use a "day in the life" approach, taking a respondent's time use in a single recent day as generally representative of their daily time use. This approach is less costly than collecting multiple time logs over a period of time, but may have ramifications for data quality (Stinson, 1998). Repeated sampling versus survey methods may lead to more reliable measures of of short-term, irregular, and sporadic activities (De Weerdt, 2015; Sonnenberg et al, 2012). De Weerdt (2015) finds that individuals are pretty consistent at reporting/estimating the average number of labor hours per working day, but vary in terms of recalling the average number of working days per week, and that individuals who were surveyed at the end of an agricultural seasons reported significantly more time spent on labor than individuals who were repeatedly surveyed in person or by phone during the course of the agricultural season. Collection of time use data using mobile phones may help overcome the costs of repeated data collection, and also help address potential sources of measurement error (de Weerdt, 2015; Sonnenberg et al, 2012).

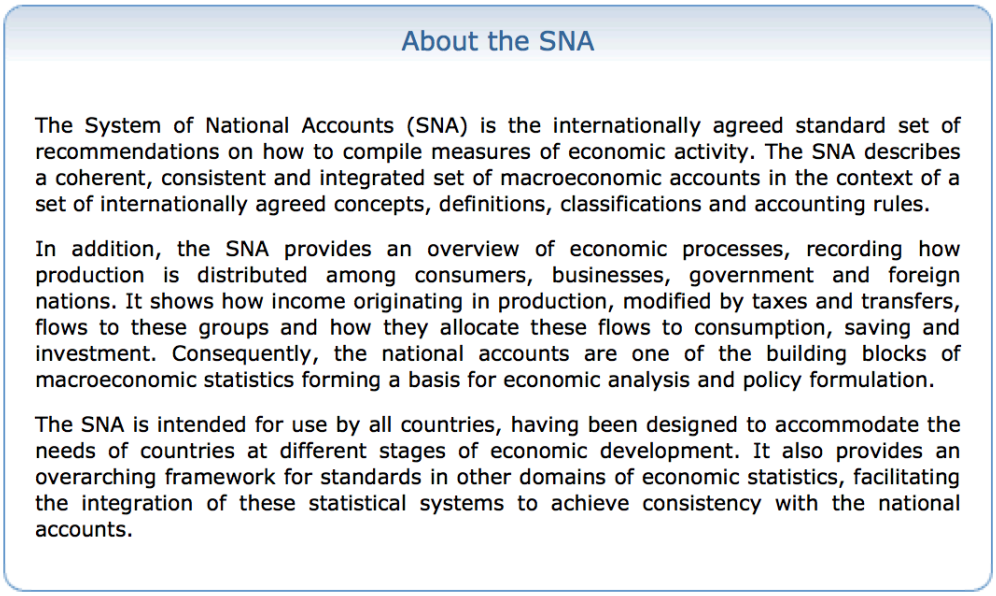
Stinson (1998) points out that accurate analysis of time use may require additional information beyond the amount of time spent on different activities, such as "the locations where activities occurred, the identities of other persons who were present or participating, and other activities that might have been performed simultaneously" (p. 14). The authors argues that this additional information can help identify differences in whether certain activities should be considered as work or social time, for example, and provide greater context for understanding time use. The issue of simultaneous activities is of particular concern for researchers, as activities that can be conducted at the same time as other time uses may not pose as much of a time constraint as activities that cannot. Studies that allow respondents to report at least one "simultaneous"

or “secondary” activity find that “respondents spend as much as 3 to 4 hours per day, doing more than one activity at a time” (*ibid.*, p. 18).

Categories of Time Use

A primary decision in collecting time use data is what categories of time use to collect information and report on. Time use instruments generally include multiple mutually exclusive activity codes intended to cover all potential uses of time (Stinson, 1998). A majority of time use instruments and time use studies appear to use the United Nations’ System of National Accounts (SNA) as a base, upon which additional, non-SNA categories may be added.

Figure 1. Description of the System of National Accounts (SNA)



Source: United Nations Statistics Division, 2008

Blackden & Wodon (2006) note that while some unpaid work is included in the SNA (defined as “contributing” labor), there is still a considerable amount of unpaid, non-market work in the household economy that is not in the SNA, and that is, economically speaking, invisible. To include non-SNA activities that are both productive and non-productive (though could be regarded as investment activities), researchers may categorize time use activities into SNA, non-SNA, and non-productive activities. A good example of this categorization is in Valodia & Devey (2005) – in the South African time use survey conducted in 2000, activities recorded in the time diaries were classified into ten broad categories:

SNA Production

1. Work in establishments includes waged work, domestic employment, and seeking work.
2. Primary production not for establishments includes subsistence farming and collection of water and fuel.
3. Other productive activity not for establishments includes home-based production, informal street trading, and informal provision of services such as hair dressing.

Non-SNA Production

4. Household maintenance such as homework

5. Care for persons in the household, including looking after children, and sick and aged members of the household
6. Community service

Non-Productive Activity
7. Learning activities
8. Social and cultural activities
9. Mass media activities including watching television and listening to the radio.
10. Personal care including sleeping, eating and drinking, washing and dressing, and receiving medical and personal care.

Charmes, in his "Review of Empirical Evidence on Time Use in Africa from UN-Sponsored Surveys," (2006) notes that surveys in five African countries also grouped time use activities into SNA and non-SNA activities (*Table 2*)

Table 2. To What Extent Do the Notions of Market/Non-Market Work, Paid/Unpaid Work and SNA/Non-SNA Work Overlap?

	Market work		**Non-market work**	
	Paid work	**Unpaid work (contributing)**	**Unpaid work (contributing)**	**Unpaid work**
SNA work	**1**	**2** (family workers)	**3** (family workers)	
Non-SNA work				**4** (domestic and care work)

Source: Charmes, 2006.
Notes from the author: (1) Production of goods and services for the market by remunerated labor and remunerated self-employed. (2) Production of goods and services for the market by contributing family workers (belonging to economic units producing for the market. (3) Production of goods and services for own consumption or own capital formation of the household, by contributing family workers (belonging to economic units not producing for the market. (4) Production of domestic and care services in the extended SNA.

After identifying the overlap between these categories, Charmes analyzes the classification of activities across the chosen Sub-Saharan African countries and divides activities into SNA Non-Market Activities and non-SNA Activities (See Appendix A for details). This allows him to then compare daily time use across South Africa, Benin, Madagascar, and Mauritius by specific activities (*Table 3*).

Table 3. Comparison of Daily Time Use For Women and Men in Four Sub-Saharan African Countries (in % of a 24-hour day)

	South Africa 2000			Benin 1998			Madagascar 2001			Mauritius (2003)		
Activities	Women	Men	Both Sexes	Women	Men	Both Sexes	Women	Men	Both Sexes	Women	Men	Both Sexes
SNA activities	7.8%	12.8%	10.1%	16.4%	16.3%	16.2%	11.7%	19.3%	15.4%	8.4%	21.4%	14.9%
Domestic and care activities	14.6%	5.7%	10.4%	13.6%	4.2%	9.0%	15.1%	3.7%	9.7%	18.6%	5.3%	12.8%
Work	22.4%	18.5%	20.5%	30.0%	20.5%	25.2%	26.8%	22.9%	25.1%	28.5%	26.7%	27.6%
School, studying	6.4%	7.4%	6.7%	4.5%	7.6%	6.2%	6.4%	7.6%	7.0%	4.7%	4.9%	4.8%
Social activities	8.8%	9.4%	9.1%	5.9%	8.0%	7.2%	2.3%	2.7%	2.3%	7.6%	10.7%	9.1%
Leisure	8.5%	10.4%	9.4%	3.8%	6.9%	5.2%	9.0%	10.6%	9.7%	7.8%	7.3%	7.6%
Commuting	4.1%	5.7%	5.1%	2.1%	3.5%	3.1%	2.7%	4.0%	3.3%	0.0%	0.0%	0.0%
Sleeping, eating, resting, personal care	49.8%	48.7%	49.2%	53.7%	53.5%	53.1%	52.8%	52.2%	52.5%	51.4%	50.4%	50.9%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Charmes, 2006. Table elaborated on basis of the results of national time use surveys.

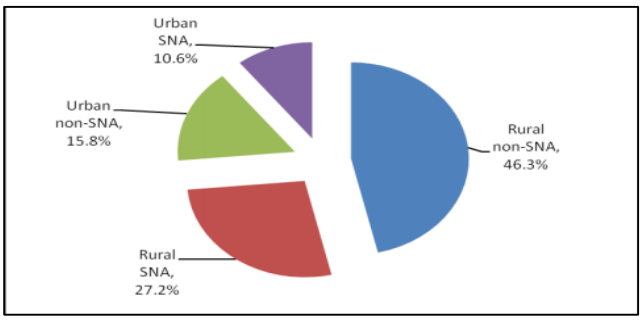
While other studies are not always specific enough as to define SNA and non-SNA activities, the United Nation's SNA is often referenced when categorizing time use activities in developing countries. For instance, Blackden & Canagarajah (2003) and Fontana & Natali (2008) only differentiate activities by those that are SNA and Non-SNA (*Table 4 and Figure 2)*.

Table 4. Kenya: Comparison by Gender of Work Hours in SNA and non-SNA activities; shares of SNA/non-SNA activities in total work.

	Female		Male		Total
	hr/d	(%)	hr/d	(%)	in %
SNA	5.7	42	6.3	76	56
Non-SNA	6.6	58	2.0	24	44
Total	11.3	100	8.3	100	100

Source: Blackden & Canagarajah, 2003.

Figure 2. Rural and urban shares in total time inputs to SNA and non-SNA activities.



Source: Fontana & Natali (2008)

The Time Use Survey conducted in seven states within India (Kerala, Meghalaya, Hayana, Madhya, Pradesh, Orissa and Gujarat) from 1998-1999 defined SNA activites and non-SNA activities. The activities were grouped into the following categories based on the UN's System of National Accounts (Gupta, n.d.):

1. **SNA (Productive and Economic) Activities**
   - I. Primary production activities
   - II. Secondary activities
   - III. Trade, business and services
2. **Extended SNA Activities**
   - IV. Household maintenance, management and shopping for own households
   - V. Care for children, the sick, elderly and disabled for own household
   - VI. Community services and help to other households
3. **Non-SNA Activities**
   - VII. Learning
   - VIII. Social and cultural activities, mass media etc.
   - IX. Personal care and self-maintenance

Budlender (2007) notes that due to unclear definitions in the 1999 Korean Time Use Survey, "activities falling within the SNA production boundary were classified under major group 2, "employment," which included four subdivisions: employment for establishments; second jobs; self-employed work (agriculture, forestry and fishing); and unpaid work." The codes for unpaid family work are presented in Figure 3.

Figure 3. Codes for family care.

51	preschool childcare
511	physical care of preschool children
512	reading or playing
519	preschool childcare not elsewhere classified
52	school childcare
521	physical care of school children (e.g., preparing children for school)
522	teaching the child (e.g., helping with homework, guiding and playing)
523	visiting school (e.g., attending parent-teacher meetings)
529	school childcare not elsewhere classified
53	spouse care
530	spouse care (e.g., massaging, mental or physical help)
54	parents care
540	parents care (e.g., physical care, washing, accompanying parents to doctor)
55	family care not elsewhere classified
550	family care not elsewhere classified (e.g., relatives care)

Source: Budlender (2007) and the Korean Time Use Survey 1999

Impacts of Easing Time Use Constraints

Many studies theorize that providing people with technology to increase their time efficiency will provide them with time savings and help them escape poverty, but few provide concrete evidence (World Bank, 2012; Blackden & Wodon, 2006). Studies that have provided evidence to support or contradict this theory include research on programs that have provided water supply sources or new cooking technology to households (cite1; cite2; cite3). For example, Blackden & Wodon (2006) argue that because significant time is used daily to fetch water and gather firewood (*Table 7*5), providing technology that decreases this time will allow people – and rural women in particular – to spend the time saved on other activities. The authors theorize (but do not test) that this shift would allow women and households to improve their standard of living.

Table 5. Time Spent on Fetching Water and Collecting Firewood by Women and Men Engaged in the Activity

		Benin (1998)			South Africa (2000)			Madagascar (2001)		
		Women	Men	Women/ Men	Women	Men	Women/ Men	Women	Men	Women/ Men
Fetching water	Urban	47	40	118%				56	54	104%
	Rural	1h 38	1h 15	131%				62	56	111%
	Urban and rural	1h 2	1h 2	100%	1h 2	46	135%	1h 2	55	113%
Collecting firewood	Urban	1h 5	1h 11	92%				1h 6	1h 13	90%
	Rural	1h 50	1h 30	122%				1h 14	1h 31	81%
	Urban and rural	1h 14	1h 23	89%	2h 17	2h 14	102%	1h 12	1h 26	84%

Source: Blackden & Wodon, 2006

As noted in the 2012 World Development Report (World Bank 2012), results from studies of technology and time use are often mixed: a number of studies have found that increased productivity in the home has minimal effects on time use (Greenwood et al., 2005; Jones et al., 2003), and often dependent on the type and quality of technology program implemented (Ilahi & Grimard, 2000; Costa et al., 2009, Koolwal & van de Walle, 2010; Lokshin & Yemtsov, 2005). Tables 6 and 7 summarize the evidence for time constraints and uses of time savings for rural and urban individuals in Sub-Saharan Africa and South Asia.

Table 6. Time Constraints for Women by Location

Time Constraints	Sub-Saharan Africa		South Asia	
	Rural	Urban	Rural	Urban
Fetching Water	Ivens, 2008 UNDP, 2006 World Bank, 2005 Blackden & Bhanu, 1999	UNDP, 2006	Shrestha, 2002 UNDP, 2006 Well, 2005	UNDP, 2006
Collecting Firewood	WLPGA, 2014 Blackden & Bhanu, 1999 Udry et al., 1995 Saito et al., 1994 Tibaijuka, 1994 Blackden & Wodon, 2006 Fracci et al., 2004	Bates, 2007	WLPGA, 2014 UNDP, 2011 Barnes & Sen, 2003 Practical Action, 2014	Practical Action, 2014
Other			Khandker, Bakht, and Koolwal, 2006	

Table 7. Uses for Time Savings

Uses of time saved	Sub-Saharan Africa		Southeast Asia		Impacts
	Rural	Urban	Rural	Urban	
Education	UNDP, 2006 World Bank 2005 Blackden & Bhanu, 1999 Blackden & Wodon, 2006 Fracci et al., 2004	UNDP, 2006	Well, 2005 Practical Action, 2014 WLPGA, 2014	Practical Action, 2014	Increased education
Income Generating Activities	Ivens, 2008 WLPGA, 2014 Blackden & Wodon, 2006 Fracci et al., 2004	Bates, 2007	Shrestha, 2002 UNDP, 2006 Well, 2005 UNDP, 2011 Barnes & Sen, 2003 Practical Action, 2014 Khandker, Bakht, and Koolwal, 2006	UNDP, 2006 Practical Action, 2014	Increased income, income-generating skills
Household		Bates, 2007	Shrestha, 2002 Barnes & Sen, 2003		Increased childcare, cleaning, cooking
Social & Community			Practical Action, 2014 UNDP, 2011	Practical Action, 2014	
Leisure, Sleeping		Bates, 2007	WLPGA, 2014		

As fetching water and collecting firewood are two of the main time constraints for women discussed in the literature, we present summaries of the evidence describing the impacts of programs designed to address these constraints.

Water Supply Programs

- Shrestha (2002) reviews the Rural Water Supply and Sanitation Project (RWSSP) in Nepal, which decreased time spent in water fetching from 3-4 hours per day per household to less than half an hour per day. The

author notes that the time saved is spent mostly in "intensive childcare, income/economic activities and improved hygiene and sanitation activities by women." He estimates that 30% of the time saved is devoted to economic activities (farming, industry, etc.), 16% is devoted to productive activities in the household (childcare, cleaning, cooking), with the remaining saved time spent in non-economic activities like leisure, sleeping, and socializing. The saved time spent on economic activities averages an additional NRs 300-500 per month, which is typically spent on "clothing, children's school, and family savings and investments."

- A case study on the SNV/PROTOS water supply program in Benin argues that women's workload did not decrease with the program, and that extra time gained from the increased water supply led to extra time working in their husbands' fields (Ivens, 2008).
- The 2006 Human Development Report notes that time burden of collecting and carrying water is one explanation for the very large gender gaps in school attendance (UNDP, 2006). In Tanzania, school attendance levels are 12% higher for girls in homes 15 minutes or less from a water source than in homes an hour or more away, while "attendance rates for boys are far less sensitive to distance to water sources," (Gómez-Lobo & Contreras, 2003) displaying the choices that girls must make in households facing time poverty.
- Research in India by the Self Employed Women's Association (SEWA) finds that women engaged in a successful microenterprise project reduced the time spent on microenterprise work during the summer months when the time to collect water increased by two hours a day. SEWA calculated that reducing water collection to one hour a day increase earnings by $100 a year depending on the enterprise (UNDP, 2006).
- In Uttranchel, India, the Swajal Project installed a water supply system that increased women's' time savings, allowing women to develop skills to make and sell handcrafts (Well, 2005). Well also notes that "school attendance by girls has risen since the introduction of water points in four communities in Arappalipatti and Panjappatti in Tamil Nadu, India."
- In Morocco, the Rural Water Supply and Sanitation Project aimed to improve school attendance by reducing the burden of girls who typically fetched water. In the six provinces where the water supply project is based, researchers found that girls' school attendance increased by 20% in four years, attributed in part to the fact that girls spent less time fetching water. They also found that time spent fetching water by women and young girls decreased by 50 to 90% (World Bank, 2005).
- Blackden & Bhanu (1999) demonstrate the relationship between living close to piped water and school attendance rates in several Sub-Saharan African countries (*Table 8*).

Table 8. Factors affecting school attendance of children of age 6 to 11 year in selected countries

	Gender		Education level of household head				Other characteristics		
	If female household head	If girl	Some primary education	Complete Primary education	Some secon-dary	Complete Secondary or higher	If rural	If piped water	If poor
Burkina Faso	8	-14	12	22	30	33	-29	7	-13
Djibouti		-13	13	6	11	13		9	-10
Ethiopia	5	-11	7	9	16	24	-51	8	-7
Gambia		-12	8*	24*	6*				-4*
Ghana	12	-8	19	15	50	32	-4	6	-5
Guinea		-20	11	24	25	29	-22	16	-15
Côte d'Ivoire		-17	29	31	30	36	-14	13	-9
Kenya	9	-3	28	30	31	36		2	-6
Madagascar	8		20	34	41	50	-13	13	-16
Niger	5	-11	25	21	34	39	-26	6	-7
Mauritania	-3*	-4				22	-15	10	-8
South Africa	3	3	2	9	3			4	-5
Senegal	3	-11	-13*				-29	16	-11
Tanzania	3*	3		12	10	7		7	-5
Uganda	6	-5	10	14	24	22	-5	6	-12

*Statistically significant at the 10 percent level. Not marked parameters are significant at the 5 percent level.
Source: Blackben & Bhanu (1999), adapted from Ye (1998)

Modern Fuel and Energy Studies

- Electricity in rural South Africa has increased women's labor force participation by 9% and has increased leisure time for women in Bangladesh (WLPGA, 2014).

- A number of studies have considered the impacts of liquefied petroleum gas (LPG) on housework in developing countries. In Kenya, women adopting LPG reported using time saved on small enterprise or farming (Bates, 2007). In India, a study finds that women's participation in wage work increased noticeably as a result of an LPG adoption program: of the 53 women who bought LPG stoves, 77% were engaged in income activities "such as weaving and working with oil production units, farms and orchards," (UNDP, 2011).

- An ESMAP study in India finds that in households with access to LPG or electricity, women spent less time collecting fuel, fetching water and cooking, and more time reading and watching TV (Barnes & Sen, 2003). Multiple studies note that time 'saved' is used for "household chores, agricultural activities, and child care, watching TV, listening to the radio, leisure time, reading," (Barnes & Sen, 2003; Practical Action, 2014; UNDP, 2011). Women sometimes use this time for attending community meetings and for engaging in income generating activities (Practical Action, 2014; UNDP, 2011).

- In South Asia, a recent Practical Action (2014) study finds that saved time in cooking and fuel collection due to access to LPG is contributing to increased women's involvement in social and family activities, including "giving more time to their children; giving more time to agricultural activities; attending community meetings and meeting friends and relatives, and watching TV while doing knitting," (Practical Action, 2014). The study also found that the mothers who use improved cook stoves are able to give more time to their children to prepare them for school (*Table 9*). Because women have more time savings, a separate study also showed that a higher percent of children from LPG households are enrolled in school compared to non-LPG users (WLPGA, 2014).

Table 9. Use of saved time due to switching to modern fuels in three Indian states (% of women respondents)

Activities	Karnataka	Himachal Pradesh	Odisha	Total
Give more time to children's care	30.4	27.9	45.2	34.7
Give more time to agricultural activities	34.8	15.6	16.9	20.0
Able to attend community meetings	15.9	0.0	25.0	12.4
Meet other friends and relatives	17.4	4.1	10.5	9.1
More time to household chores	0.0	42.2	2.4	19.1
Have a rest	1.4	10.2	0.0	4.7

Source: Practical Action, 2014

- In Tanzania, studies find that reducing time burdens of women could potentially "increase household cash incomes for smallholder coffee and banana growers by 10 percent, labor productivity by 15 percent, and capital productivity by 44 percent" (Blackden & Bhanu, 1999; Udry et al., 1995; Saito et al., 1994; Tibaijuka, 1994).
- In a 2003 study on the impact of energy on women's lives in rural India, Barnes & Sen find that access to LPG for cooking enabled women with lower levels of education to save time spent cooking and "devote it to other activities such as paid work."
- A program initiated by the UN Industrial Development Organization and the International Fund for Agricultural Development supplied 400 diesel-powered multifunctional platforms and reached 8,000 women across Mali (Blackden and Wodon, 2006; Fracci et al. in Modi, 2004). In a study of 12 villages that were recipients of the platforms researchers find that the time and labor saved by women was shifted to income-generating activities, increasing women's income by $0.47 on average every day. Further, they report that the ratio of young girls to young boys in school increased as girls were less needed for housework, and that time savings were correlated with improved women's health and increased prenatal care.
- In a 2011 case study examining the effects of an energy program (Jagriti) in Himachal Pradesh, Indi, the UNDP found that "women's wage work and women's empowerment have increased" (*Table 10*).

Table 10. Indicators of women's empowerment through energy-efficient devices

Indicator	Status change due to introduction of energy-efficient devices	
	Before	After
Social		
Number of women opening accounts with banks	Negligible	109 joint bank accounts (women and their spouses)
Support of household members in women's tasks	Negligible	More supportive
Mobility	Low	Increased considerably
General awareness levels	Low	Increased participation in trainings, fairs and visits to banks and government offices
Economic		
Market for local produce	Negligible	Value addition and increased market opportunities for local products
Savings	Negligible	Increased individual savings 109 joint accounts among WSCGs
Loans	Sourced from money-lenders	Sourced from intra-group loans
Political		
Women's participation in *gram sabhas*	Negligible	60-70 percent participation of women
Articulation of women's needs and issues in village meetings	Negligible	Common needs and demands placed before elected representatives. Increased say in allocation of resources
Community		
Platform for women's participation	Passive participation	Enhanced confidence in proposing ideas and asking questions
Identity as a group	Nil	WSCGs have strong visibility; men are forthcoming and supportive of women
Individual		
Self-esteem and confidence	Very low	Increased considerably due to increased mobility and fortnightly group meetings
Work burden	High	Reduced work burden due to usage of LPG stoves, cookers and *hamams*
Networking	Negligible	Increased interaction with women members of other *panchayats* and government staff

Source: UNDP, 2011

Other Time Savings

Finally, while the previous studies focused on providing water sources and more efficient fuel to increase time savings, the World Bank (2012) notes that investments in other aspects of infrastructure can have greater effects and should not be discounted in importance:

> "Investments in transportation can increase women's access to economic opportunities by reducing travel time and increasing mobility (Duchène, 2011; Peters, 2001). Given their multiple responsibilities, women often choose jobs on the basis of distance and ease of travel, choices that tie them to local work options. These limitations are particularly severe for poor women, who often reside in more marginal neighborhoods where most available jobs are informal and low in productivity. Investments in transport can thus have large payoffs. In rural Peru, 77 percent of surveyed women reported that the availability of rehabilitated roads and tracks enabled them to travel farther, 67 percent reported that they could travel more safely, and 43 percent reported that they could obtain more income (World

Bank, 2005). In Bangladesh, better rural roads led to a 49 percent increase in male labor supply and a 51 percent increase in female labor supply (Khandker, Bakht, and Koolwal, 2006)."

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Appendix A. Classifications of Time Use Activities (Charmes, 2006)

Table A.1. Classifications of SNA Non-Market Activities Used in South Africa, Benin and Madagascar

SNA Non-Market Activities	
South Africa	**Benin, Madagascar**
Crop farming	Agriculture,
	Gardening
Tending animals, fish farming	Animal husbandry
	Small cattle
	Cattle
	Poultry
Hunting, gathering	Hunting
	Fishing
	Gathering
	Forestry
Digging, stone cutting and carving	
	Crushing
Food processing and preservation	Processing agricultural products for food
	Drying food products
	Other processing for self-consumption
Preparing/selling food & beverages	
Making/selling textiles/craft	Spinning
	Weaving
	Embroidering
	Basket making
	Mat making
Building and extension of dwelling	

Table A.2. Classifications of Non-SNA Activities Used in South Africa, Benin, Madagascar, and Ghana

Non-SNA Activities (Domestic, care)		
South Africa	**Benin, Madagascar**	**Ghana**
Preparing food and drinks	Preparing meals	Cooking
	Washing up	
Cleaning and upkeep of dwelling		Sweeping
Care of textiles	Washing, Ironing	
Shopping	Shopping	
Accessing government services	Accessing government services	
Household management		
Home improvements		
Pet care		
Household maintenance	Household maintenance Other Maintenance	Garbage disposal
Fitting, Maintaining tools and machinery	Repairing house or apparels	
Physical care of children (spontaneous)	Caring for children	Childcare
Physical care of children (prompted)		
Teaching of household children (spontaneous)	Teaching of household children	
Teaching of household children (prompted)		
Accompanying children (spontaneous)	Accompanying children	
Accompanying children (prompted)		
Physical care of non-child household members	Caring for adults, handicapped, elderly	
Accompanying adults		
Supervising those needing care (spontaneous)		
Supervising those needing care (prompted)		
Care of household members n.e.c		
Non-SNA Activities (volunteer)		
Community organised construction		
Community organised work	Preparing food for ceremonies	
	Other Manufacturing for ceremonies	

Non-SNA Activities (Domestic, care)		
South Africa	**Benin, Madagascar**	**Ghana**
Organizational volunteering		
Participation in meetings	Participation in meetings (associations)	
	Participation in meetings (religious)	
Involvement in civic responsibilities		
Caring for non-household children (spontaneous)		
Caring for non-household children (prompted)		
Caring for non-household adults (spontaneous)		
Caring for non-household adults (prompted)		
Other informal help to other households		
Community services n.e.c		