

# Measuring Time Use in Development Settings

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## 1. INTRODUCTION

Time is increasingly recognized as a basic resource required for reducing poverty and improving well-being (Williams, Masuda, and Tallis 2015). Various survey-based methods for measuring time use currently exist, such as stylized questions, time diaries, and experience sampling. However, the lack of consistency across space and time in how these methods are used makes it difficult to compare results across countries, to capture changes in time use patterns over time, and to monitor progress in the unequal distribution of care work between men and women.

Why is it important to measure time use, if one is ultimately concerned with empowering women and reducing gender inequality? A 2010 United Nations (UN) report finds that in all regions of the world: (1) women spend at least twice as much time as men on unpaid (household) work and (2) women's total work burden is higher than men's, when both paid and household work are taken into account (UNDESA

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\* This paper is part of a larger project on methodological experimentation to improve the measurement of time use, women's agency, and ownership and control of assets: three key constructs in women's empowerment, known both for their centrality in the current policy debate on gender equality and for the challenges posed by their measurement. This research aims to achieve three goals: (1) shed light on the relative quality of the existing methods of measuring these constructs; (2) design and test new ideas to measure these constructs; and (3) generate evidence on which measurement method is most appropriate given the policy and research question at hand. (The companion review papers on the ownership, control, and use of assets and women's agency are also being submitted to the 2016 ABCDE by other researchers.)

2010). Such patterns demonstrate the global persistence, particularly in less developed countries, of a traditional gender division of labor, in which women often specialize in domestic responsibilities, such as the care of children and other family members (reproductive labor), and men specialize in activities that are more closely tied to income generation (productive labor). The unequal sharing of household work between the sexes imposes several costs on women's well-being and livelihoods. Notably, women who choose to enter the labor market must do so from a highly disadvantaged position—time spent on domestic work restricts women's access to paid employment and reduces their time available for education, leisure, self-care and social activities.

Devising effective policies for addressing gender inequalities in the time men and women spend on household work, however, is far more complex than simply increasing women's integration into formal employment (ADB, 69). Policies need to be designed to take into account the social context of women's roles and responsibilities within the household. Understanding the extent of men's and women's time burdens, and gender disparities in both productive and reproductive work relies on accurate measurement of time use in both spheres.

To advance our understanding of gendered time use patterns and trends in developing countries, this paper critically reviews methods used to measure time use. We begin by sketching the three main methods for measuring time, depending on the scope or breadth of activities involved in measurement. Then we discuss how these methods are applied to either a unidimensional measure of time, focusing on the absolute quantity of time allocation, or a multidimensional measure of time, including not just absolute quantity but also other aspects of quality, such as stress or work intensity. We discuss the costs and benefits of each method in terms of accuracy and feasibility, emphasizing that the method chosen must be dictated by the research question being asked. We then present a typology of time use studies and conclude with some suggested innovations in data collection.

## **2. OVERVIEW OF METHODS**

Survey methods used to collect time data fall into three general categories: methods that focus only on specific activities (*stylized questions*), methods that collect information about all the activities undertaken within a specific period (*time diaries*), and methods that collect information only on the current activity the respondent is engaged in, usually prompted randomly by an electronic device (*experience sampling*). We briefly describe the advantages and disadvantages of each method in turn.

Often included as part of a comprehensive household survey, *stylized questions* ask respondents to estimate the amount of time they devoted to a particular activity during a “typical” day, week, or other interval.<sup>4</sup> The cognitive burden this places on respondents is heavy. Essentially, respondents must aggregate each and every memory of an activity during the recall period to formulate their answer. With recall periods spanning anywhere from the past week to the past year, the potential for bias—that is, over- or under-estimation of the actual time devoted to an activity—is a very real risk, which increases with the infrequency of the activity and the length of the recall period. For activities that tend to follow a set schedule (e.g., salaried employment), the risk of recall bias may be considerably less. Because better-educated individuals may be more likely to engage in salaried work or regular employment, recall bias may be non-random and correlated with individual or household characteristics. Another drawback of stylized questions is that they tend to be activity-specific—separate questions asked for each activity—which limits the types of research questions they can be used to answer, a topic that is discussed in greater detail in the following section.

*Time diaries* are another common method for collecting time use data. Rather than focusing on a single activity, time diaries collect information about all of a respondent’s activities during a specific period of time, typically the previous 24 hours. Time diaries can be self-reported or completed with the assistance of an enumerator as part of a household survey interview. With self-reported time diaries, respondents are given a paper diary or electronic device (e.g., tablet, smartphone) and instructed to use it to keep a record of their activities for a complete 24-hour day, typically in 15 or 30 minute increments.

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<sup>4</sup> The questions are “stylized” in the sense that they refer to a hypothetical construct (a “typical” day) rather than a specific day (yesterday).

Survey-based time diaries, on the other hand, are based on respondents' recollection of a particular 24-hour period (again, usually the previous day). Typically, respondents are asked to describe the sequence and duration of their activities, beginning at the time they woke up in the morning and ending when they went to sleep for the night. Survey-based, 24-hour recall time diaries are, at present, the most common method used for collecting time use data, and have been implemented in at least 57 developing countries around the world (Fisher et al. 2013). Their popularity likely owes to the cost-effectiveness of implementing this type of time use survey coupled with the perception that the use of a 24-hour recall period minimizes the risk of recall bias.

The third and final method considered in our review is broadly defined as *experience sampling*, which has the potential to eliminate recall bias altogether.<sup>5</sup> It includes methods like the Experience Sampling Method (ESM) (Hektner et al. 2007), which asks respondents to record specific details about the activities they are currently engaged in at random moments throughout their day, usually prompted by a preprogrammed device (a stopwatch or some electronic device such as a pager, timer, or smartphone), as well as several adaptations of the ESM. In particular, we are interested in methods which use experience sampling techniques to collect information not only on the amount of time they spend on different activities but also on respondents' emotional or physical state throughout the day, which reflects other dimensions of quality. The prime advantage of these methods relative to the others considered in our review has to do with recall bias or, perhaps more accurately, the lack of recall bias. Assuming full compliance on the part of respondents and the absence of incentives to misrepresent what one is actually doing (e.g., if engaged in illicit or illegal activities), experience sampling can yield near instantaneous data on respondents' activities. To date, interest in these methods has mostly (and understandably) been limited to psychologists; nonetheless, there are several promising avenues for methodological innovation

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<sup>5</sup> We call this method "experience sampling," although it belongs to a family of methods that is much broader. Also called "event sampling methodology," this method was initially developed by Larson and Csikszentmihalyi (1983). Antecedents of this method include random spot observation. The crucial difference is that in random spot observation, external observers collect the data, whereas in experience sampling, the respondent responds about his or her conditions at a particular point in time.

based on the ESM that may be worth considering for economists interested in time use issues, which we discuss in greater detail below.

### 3. ASSESSING TIME USE METHODS

What method should be used to collect time use data in developing countries? The answer depends on the research question of interest, the method's ability to minimize bias in respondents' estimates of their time use (e.g., recall bias, seasonality) and feasibility for use in a developing country setting (e.g., implementation costs, cognitive requirements). In general, research questions that can be answered by time use studies fall into two broad categories: questions that require information on the absolute quantity of time spent on particular activities, and questions that require information not only on quantity but also on the quality of time spent on these activities. Going beyond the method's ability to answer the research question, we employ three additional broad criteria to assess different time use methods: accuracy, feasibility, and multidimensionality.

The first set of research questions addressed by time use studies concerns absolute time constraints. For example, which activities take up the most time in a person's day? How much time is saved by using a new water collection system? Does women's participation in particular agricultural activities result in less time available for adequate care and feeding of young children? Investigating these questions requires data on the amount of time people spend on particular activities of interest.

The second set of questions considers how to evaluate differences in the quality of time people spend on different activities throughout the day. Some tasks may bring pleasure or happiness, whereas other tasks may be more unpleasant or physically taxing, involving higher energy expenditures, or some element of danger or risk. Livelihood activities may be more stressful or demanding when conducted simultaneously with childcare than when the activity is done by itself. Identifying whether individuals are time poor requires an understanding of work intensity that combines information on a full accounting of time spent in a given period as well as the drudgery and physical or mental effort associated with various tasks. These questions require a greater understanding of how people experience each moment of the day.

Research questions on how labor burdens are shared within the household requires that time use be measured for multiple individuals within the household. To be able to make useful comparisons, we need to know about the quantity and quality of time spent by women and men, boys and girls. To discern how time use patterns have changed, on the other hand, requires panel data, ideally on the same households. Except possibly in the context of impact evaluations that collect baseline and endline data on the same individuals, such data are rare, so studies on changes in time use over time often involve comparisons of cross-sections over time, see, for example, Aguiar and Hurst (2007), which analyzes trends in the allocation of time in the United States between 1965 and 2003.

### 3.1. Unidimensional measurement of time

A fundamental aspect of time use research is to establish patterns of individual time allocation on particular activities of interest. There are two general approaches to collecting information on the quantity of time spent on various activities: those that require only a partial accounting of activities for a given period, and those that require a full accounting of activities for a given period.

*Stylized questions.* If the research question is limited to a very specific set of activities, then we are only interested in a partial accounting of a person's time allocation and the most appropriate approach is a set of stylized questions on time use. In a stylized survey, respondents are asked to estimate the amounts of time they devote to the activity of interest during a "typical" day, week, month, or year. For example, in the impact evaluation of the CARE-Bangladesh Strengthening the Dairy Value Chain Project (SDVCP), which aims to improve the participation of smallholder farmers in the dairy value chain in northwest Bangladesh, Quisumbing et al. (2013) attempted to understand the time costs and tradeoffs associated with participation in SDVCP. To answer this question, they asked respondents to identify for each of 18 livestock-related activities and 5 household activities (Figure 1):

- Who is primarily responsible for doing it? [MEMBER ID]
- Who does it in the absence of the responsible person? [MEMBER ID]
- In the past 30 days, who usually does it? [MEMBER ID]
- In an **average week** in the past 30 days, how many hours total has this person spent on the activity?

Note that the list of activities is not exhaustive. Instead, it focuses only on the specific areas of interest in which the project hypothesized that tradeoffs exist: livestock activities and household activities. Another example is the second pilot survey for the Women's Empowerment in Agriculture Index (WEAI) in Bangladesh and Uganda, which asks about time spent in market and non-market work activities (Figure 2):

- In the last 7 days, how much time in hours did you spend on [ACTIVITY]?
- Did you spend a usual amount of time on [ACTIVITY] in the last 7 days?
- Since the last week was not usual, within the last 6 months how much time do you usually spend on [ACTIVITY] per week?

The time data in the WEAI is used to assess whether a person has an excessive workload, defined as working over 10.5 hours in a given day, using a cutoff based on Bardasi and Wodon (2006). Note that in both the SDVCP and WEAI examples, the questions purposefully ask the respondent about an “average,” “usual,” or “typical” week, as a way to minimize seasonality bias. In the WEAI, both “actual” and “typical” time spent were collected to enable comparisons between the two estimates.

Because stylized questions only ask about relevant activities, the method is typically less costly to implement than full accounting methods. Stylized questions are well-suited to capture activities that take place regularly or where the time spent is set externally by institutions (e.g., labor market work) (Juster et al. 2003). They may also be an effective way to analyze variation in time allocation across multiple seasons or over long periods of time, though to our knowledge this has yet to be empirically tested.. On the other hand, stylized questions require respondents to aggregate memories about several discrete events into a single estimate, which may place a significant strain on their cognitive abilities. . Indeed, some studies have found evidence of biases, such as over-reporting on regular activities and under-reporting on infrequent activities (Juster et al. 2003). For instance, in the second WEAI pilots, which collected time use data using both stylized questions and a full accounting, 24-recall time module, the range of values for stylized questions was much higher compared to the 24-hour recall responses, suggesting higher

measurement error (see Table 1). In particular, our Uganda partner reported that respondents found the 7-day recall challenging and relied on the enumerators for help in extrapolating a weekly total based on whatever the respondent could remember. Reported time based on a “typical” week were much higher than reports based on the “actual” time spent in the last 7 days, which also suggests higher measurement error associated with the extra step of estimating what would be considered as “typical”. Despite asking about fewer activities in the stylized questions, the additional probing and extrapolation actually required more time to implement it and ultimately did not save a significant amount of survey time compared with the full accounting, 24-hour recall approach. Apart from the recall bias, stylized questions are also likely to increase the risk of social desirability bias around activities influenced by deep-seated social norms.

One approach to eliminate recall bias is to use more objective ways of measuring time instead of in-person interviews, such as electronic, motion-activated sensors. For example, Chaudhri et al. (2012) wanted to understand the impact of providing convenient water supply on the water carriers’ pattern of time-use in rural Ethiopia. To collect the time use data, they attached a motion-activated electronic sensor to the water collection vessel, which monitored the time spent collecting water based on movement during a single day. This approach has a number of advantages: it requires only passive participation of respondents, it eliminates sources of recall bias, and it is relatively inexpensive (the estimated price per sensor was less than \$20). However, the exact method used by Chaudhri et al. (2012) is only appropriate for measuring movement-based activities, and without some way to track the identity of the person actually collecting water (e.g., assigning each person within a household a unique sensor and preventing the exchange of sensors) it is unclear to what extent it is possible to discern whether an activity is performed by the same individual or by different individuals—that is, the method cannot tell who it is within the household that is collected the water, only that somebody in the household did so. Thus, while this approach has significant data collection potential, it is still quite limited by technological and programming constraints.



*Time diaries.* Research questions that require information on broad categories of activities such as market and non-market work, or questions around the intrahousehold division of labor, are typically collected using a 24-recall time diary. The time diary provides consistency in the time data by forcing a full accounting of time, and uses a 24-hour recall to minimize recall bias. However, using 24-hour recall increases seasonality bias, unless surveys are repeated multiple times in a year. Even within seasons, one cannot assume that the previous day was “typical,” and so additional questions are usually recommended in order to distinguish between patterns of time allocation that are out of the ordinary (e.g., holidays, festivals, etc.). A prime example of this approach is the WEAI time use module (see Figure 3), which is based on the Lesotho Household Budget Survey (Lawson 2007). In the WEAI, time use data is collected for both the primary and secondary activities in 15 minute intervals across 18 activities. Table 2 provides an example: the average time spent by men and women on several different categories, based on WEAI surveys in Bangladesh, Cambodia, Ghana, Mozambique, and Nepal. Several patterns are apparent in the WEAI data. In all of the countries but Bangladesh, women’s overall work burden (reproductive and productive workload) is greater than men’s. This is primarily because in all of the countries women spend more time in domestic work, cooking, and caregiving than men—women spend between 3.2 (Cambodia) and 5 (Bangladesh) more hours per day on reproductive work than men. Men, on the other hand, spend more time on agricultural and nonagricultural work than women, though women still spend at least 3 hours in agricultural work in all countries except Bangladesh (due to an issue with the categorization of “farming” activities explained below).

The primary disadvantage of the WEAI time use instrument is that the grid-like design may be considered too complicated, especially in developing countries where the education level of interviewers and respondents tend to be low. Further, as presented in Figure 3, it does not translate easily to computer-assisted interviewing.<sup>6</sup> However, a simpler version, capable of collecting the same information, is

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<sup>6</sup> Enumerators tasked with implementing the instrument using tablets found that the best practice was to first collect the time diary using the paper survey and then transfer the data to the tablets later in the evening.

currently being piloted (see Figure 4), which may improve the ease of implementation. Another potential problem is that each activity must be precisely and clearly defined to ensure that activities are not misclassified. For example, during the collection of the WEAI in Bangladesh, both respondents and enumerators tended to consider agricultural work (“farming”) to only include activities performed away from the homestead. As a result, all the activities done by women in the homestead, whether or not they were related to agriculture, were classified under domestic chores, which severely limits the types of research questions the time data can be used to answer. Subsequent WEAI surveys in Bangladesh now disaggregate domestic activities further to specifically capture various chores as well as various agricultural tasks done within the homestead.

*Pictorial methods.* For researchers working among largely illiterate populations who may not conceptualize time according to a 24-hour clock, pictorial methods of collecting time use data may be most appropriate. One promising approach, proposed by Masuda et al. (2014), involved presenting the respondent with a series of illustrations or photographs depicting different activities and a set number of pieces of macaroni, or another similar marker (e.g., beans, buttons, etc.), each representative of a particular amount of time. The respondent was then asked to distribute the macaroni among the pictures in proportion to the amount of time he or she spent on each activity during the previous day. Once finished, the enumerator reported back to the respondent the amount of time distributed to each activity (by converting macaroni pieces into minutes). This allowed the respondents a chance to reflect on the accuracy of the distribution as a whole and to make any necessary corrections.

The main advantage of this approach is that the use of visual stimuli may ease the cognitive burden for respondents. Providing respondents with a visual representation of their time allocation may help them to conceptualize the amount of time spent on each activities in a much different way than would be possible if the interview were conducted verbally. In particular, innumerate respondents may benefit from the visual representation of their time (Masuda et al. 2014). The main drawbacks of the approach are that it yields the proportion of time spent on each activity (relative to the times the

respondent reports waking up and going to bed during the previous day), rather than the actual amount, nor does it provide information about the sequential order of activities or other contextual factors, although, as the authors point out, such data could be collected in a qualitative interview following the pictorial exercise.

### **3.2. Multidimensional measurement of time**

Most discussions of time use focus on the absolute quantity of time devoted to various activities. However, some researchers argue that the quality of time is more important. Floro and Pichetpongsa (2010) contend, for example, that it is not only the type of activity a person performs or the amount of time he or she devotes to an activity that contribute to his or her well-being, but also the manner in which each individual task is performed. Figuring out how to measure the quality of a person's time is, however, a difficult proposition. One approach is to draw inferences about a person's physical or emotional state based on the activities he or she engages in, though this requires strong assumptions on the part of researchers. For example, Floro (1995) and Floro and Pichetpongsa (2010) draw conclusions about the deleterious effects of overlapping work activities on women's well-being, based on assumptions about the physical and emotional demands of combining work activities. Similarly, in calculating the workload component of the WEAI, which is based on the total amount of time a person spends working, a similar assumption is made: time spent on secondary work activities is given half the weight of primary work activities, regardless of the type or sequence of activities being combined. As Krueger et al. (2009) point out, assumptions such as these can be problematic, given the idiosyncrasies involved in how people experience their time. For example, not all leisure activities are equally enjoyable to everyone, and not all non-leisure activities are equally arduous (Krueger et al. 2009). The preferred approach to measuring quality of time avoids such assumptions and relies instead on respondents' own evaluations of their physical or emotional state—usually collected via contemporaneous or retrospective self-reports.

*Experience sampling.* Traditionally, experience sampling only collects information on the subjective experience of respondents at random moments throughout their day. Recently, however,

several adaptations have been tested that open up many different research questions, which are largely infeasible to address using traditional time diary-based approaches. For example, are people spending their time in more or less pleasurable ways than they were a generation ago (Krueger et al. 2009)? Kahneman et al. (2004) propose an innovative method for collecting data on both quantity and quality of time called the Day Reconstruction Method (DRM), which combines elements of experience sampling with stylized questions and a traditional 24-hour, recall-based time diary. The DRM proceeds as follows. As a first step, respondents are asked to write a narrative description of the previous day, in which they describe each episode of activity. The sole purpose of this exercise is to stimulate respondents' memories of the previous day prior to actual data collection—i.e., before asking them to answer any specific questions about the day. Following the narrative exercise, respondents are asked a series of follow-up questions about each episode (e.g., what they were doing, how long they were doing it for, where they were, who they interacted with, and how they felt). The key innovation of the DRM is in the way it reduces the risk of recall bias. Asking respondents to immediately recall a specific moment from the previous day without any sort of preface may be difficult. By prompting respondents to spend a few minutes reflecting on the previous day prior to asking them to think about specific moments, the DRM reduces the cognitive burden imposed on respondents.

Relative to the traditional ESM, the DRM has a number of advantages. First, it is less intrusive, as it does not require contemporaneous monitoring on the part of respondents. Second, it provides an assessment of respondents' emotional experience as well as a full account of the amount of time they spent on different activities during the previous day, rather than a random sampling of moments.

The main drawback of the DRM has to do with the level of competency (e.g., literacy, numeracy, familiarity with 24-hour clock) required on the part of the respondent, which is likely too steep to be feasible in most developing countries. As alluded to above, however, an abbreviated version of the DRM exists, which may be more appropriate for developing country use, though it comes with its own set of drawbacks. The abbreviated version of the DRM was designed by researchers at the World Health Organization (WHO) to be implemented as part of a traditional, household survey interview and has been

tested and successfully validated for several different countries (Miret et al. 2012; Ayuso-Mateos et al. 2013). While these studies demonstrate the potential of the DRM for adaption to a developing country context, the particular version tested by the WHO lacks several of the innovations that make the DRM such an innovative tool for measuring time use. First, it does not collect a full account of the person's time use during the previous day. Instead, only a portion of the previous day is covered in the questionnaire (e.g., morning, afternoon, evening). Second, respondents are not required to provide a narrative account of the previous day, prior to answering specific questions about their activities. Thus, the abbreviated version of the DRM is just as susceptible to recall bias as any 24-hour recall-based method.

Recent fieldwork, conducted by one of the authors in 2014 in rural Bangladesh, provides an additional example of how the DRM might be adapted for a developing country context. Information on five aspect of respondents' experienced well-being was elicited immediately following the WEAI time diary portion of the survey via the following series of questions adapted from the DRM (Seymour 2015):

- How happy did you feel?
- How sad did you feel?
- How tired did you feel?
- Did you feel (physical) pain?
- How stressed did you feel?

Responses were given on a scale of 1 to 10, where 1 corresponded to not experiencing the feeling at all and 10 to experiencing the feeling all of the time. Following Kahneman and Krueger (2006), responses to these questions can be aggregated to minimize the influence of idiosyncrasies in how respondents interpret the response categories and to ensure comparability across people. More specifically, the resulting indicator, the so-called U-Index, measures the proportion of time a person spends in an unpleasant state, where each episode is defined as pleasant (happiness) or unpleasant (sadness, tiredness, pain, or stress) according to the most intense emotion experienced during the

episode.<sup>7</sup> Table 3 shows the average time spent on several different categories of activities during the past 24 hours, as well as the average U-Index values for each set of activities. Several patterns are revealed. First, the U-Index suggests that sampled women are generally less happy than men. This is true of time spent on both market work—women report experiencing unpleasantness 50 percent of the time, compared to only 28 percent for men—and non-market (household) work—women report experiencing unpleasantness 36 percent of the time, compared to only 20 percent for men. Looking closer at how women experience the different activities comprising household work, the negative feelings women associate with household work appear to be largely driven by domestic activities (cooking; shopping/going to the market; cleaning the home; weaving, sewing, and textile care; and other domestic work) and the collection of water firewood. These activities elicit feelings of unpleasantness in women much more often than other household work activities, such as care work and homestead production. With respect to non-work activities, both men and women tend to (unsurprisingly) experience leisure activities as predominantly pleasant, however men and women differ somewhat in how they regard social and religious activities—women report more pleasant experiences than men (though given the small sample sizes the difference is not statistically significant).

Another promising approach to measuring quality of time, which contains elements of experience sampling, stylized questions, and time diaries, is the use of self-administered surveys on mobile devices to collect data on how respondents spend their time as well as other relevant contextual details. One recent study provides an example. Lai et al. (2010) describe the results of a small marketing study in the United States in which respondents were given a specially-equipped smartphone to carry with them for 10 days and use to complete a self-administered survey. Each day respondents were prompted on an hourly basis to complete a short 2–4 minute survey that included questions about their current activity (e.g.,

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<sup>7</sup> Formally, the U-Index for person  $i$  is defined as:  $U_i = \frac{\sum_j M_{ij} h_{ij}}{\sum_j h_{ij}}$ , where  $M_{ij}$  is an indicator that equals 1 if episode  $j$  of duration  $h_{ij}$  for person  $i$  is unpleasant and 0 otherwise.

duration, location, people interacted with, current mood, etc.) as well as a picture of their surroundings taken with the smartphone's camera.

Although exactly replicating the Lai et al. (2010) study on a larger scale in a developing country would likely be too costly to be feasible, the study does illustrate a number of features associated with the use of self-administered surveys on mobile devices that might be adaptable for use in a developing country context. First, assuming respondents complete the surveys when prompted, the risk of recall bias is significantly reduced or even eliminated. Second, a single device could potentially be used to collect data over multiple days (limited only by the device's battery life), which could increase the accuracy of the data by reducing the risk of outliers. Third, although some degree of literacy, numeracy, and familiarity with a 24-hour clock on the part of respondents would likely always be required, these concerns could be mitigated by a well-designed, pictorial user interface. Lastly, it is worth noting that the costs of obtaining the mobile devices themselves could be potentially offset in a number of ways. For example, respondents could complete the surveys using their own personal mobile devices—perhaps in exchange for mobile credit—or survey questions could be posed to respondents via text message.

*Measuring energy expenditure or work effort.* Aside from the psychological aspects of time use, there is growing interest in monitoring the energy expenditure or work effort associated with various activities. Drawing from efforts to measure physical activity, the key concepts revolve around frequency, duration, and intensity (FAO/WHO/UNU 2004). Development practitioners could be concerned, for example, with whether an intervention “did no harm” in terms of increasing energy expenditure of women. This question can be broken down into three components: (1) whether the intervention increased the duration, intensity, and frequency of engagement in intervention activities; (2) if yes, whether it led to any adverse changes in BMI (e.g., decreasing weights may indicate that energy intakes do not compensate for greater activity levels); and (3) whether the intervention caused any other undesirable effects on time,

such as reduction in time for child care, relaxation, or leisure.<sup>8</sup> These questions are especially relevant in developing country settings where lack of publicly provided infrastructure, limited access to mechanical or animal power, or access to labor-saving devices is associated with higher work burdens and increased drudgery. This approach is also quite different from the developed country literature, where the emphasis is on increasing activity levels to prevent overweight and obesity, rather than to save labor and reduce drudgery. It must also be noted that while energy expended may be the same across different activities, the psychological implications of different types of activities can be quite different: a marathon runner expends energy performing an activity that increases her well-being, but a poor woman who has to fetch water every day for long distances almost certainly does not derive the same degree of psychological satisfaction as the marathon runner, even if she also expends a lot of energy performing her task.

Although the technology exists to measure energy expenditure and physical activity, it is only recently that advances have been made that reduce costs of monitoring energy expenditure in a field setting. The gold standard for measuring energy expenditure, in which the individual drinks doubly labelled water (DLW) with heavy isotopes, and decreases in their concentration are measured in the person's urine, is costly and therefore infeasible to collect in large enough samples in a field setting, although studies have been conducted among smaller samples in developing countries.<sup>9</sup> Moreover, to get a picture of energy expenditure over an extended period of time—a period that could potentially affect weight or BMI—one should be able to measure intensity of the activity (whether moderate or vigorous), duration (minutes or hours), and frequency (number of days per week). One low-cost method of obtaining this information is through activity diaries. Exercise or activity diaries face similar issues as time diaries (for recording the quantity of time); once the amount of time spent on a specific activity is determined (which is, of course, subject to recall bias), the activity has to be matched to a list of activities in various

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<sup>8</sup> This draws from notes prepared by Gina Kennedy on measuring energy expenditure and physical activity, see <http://www.a4nh.cgiar.org/files/2015/01/Energy-Expenditure-and-Physical-Activity-Reference-Notes1.pdf>.

<sup>9</sup> A recent example of this approach in a developing country context is the study by Pontzer et al. (2012) in Northern Tanzania where they measured the total daily energy expenditure of 30 Hadza adults over an 11-day period.



categories (e.g., occupational, home, leisure/recreation, travel or commuting), each with its own energy expenditure conversion factors.<sup>10</sup> Because respondents are unlikely to recall whether such activities were consistently performed at peak intensity or involved rest periods, estimates of energy expenditures using these methods are likely to be fraught with error. Other methods for monitoring energy expenditure include heart rate monitoring, pedometers or activity monitors, and exercise diaries. Costs of wearable activity monitors have decreased, making them feasible to use in a field setting.

#### **4. Concluding remarks and next steps**

In reviewing methods for measuring time use, we have identified two main approaches: (1) one that focuses on a unidimensional measure, the quantity of time; and (2) one that recognizes that time use is a multidimensional concept that encompasses psychological and physical aspects of well-being, the quality of time. The survey methods that we consider fall into three broad categories: methods that focus only on specific activities (*stylized questions*), methods that collect information about all the activities undertaken within a specific period (*time diaries*), and methods that collect information only on the current activity the respondent is engaged in (*experience sampling*). We have assessed each method according to a set of three criteria: (1) ability to minimize bias in respondents' estimates of their time use; (2) the ability to capture dimensions of time use other than quantity; and (3) feasibility for use in a development setting. Table 4 provides a simplified, overview of our thoughts on each method. Over the course of our review, no one method stands out as universally superior to the others. Each has its strengths and weaknesses. Methods that account solely for the quantity of time still have to address problems of recall bias, particularly in low-literacy populations, as well as the possibility of obtaining an inaccurate picture of time use patterns owing to seasonality. Methods that recognize the multiple aspects of time use have greater potential for measuring well-being. In developing country settings in particular, the energy intensity of activities, the increased work intensity owing to multi-tasking of productive and

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<sup>10</sup> There are several questionnaires, mainly from the US and Europe that include links to physical activity questionnaires, see, for example <http://appliedresearch.cancer.gov/resource/collection.html>.

domestic activities, the different statuses and vulnerability associated with types of work, all combine to make the measurement of time a more nuanced effort than accounting for quantity alone. Addressing these issues in a cost-effective manner is essential if time use is to be captured in large-scale surveys that go beyond laboratory or small experimental studies.

To advance the field of measuring time, we propose to rigorously compare a number of different innovations. One option is to randomly assign different approaches to data collection on time use to household samples drawn from a range of sub-Saharan African countries, taking advantage of surveys that will go into the field in the near future. Some of these survey treatments will mimic the most common ways that are currently used to collect time use data. Other treatments will be designed by us and informed by careful preliminary qualitative work with the local communities. In particular, we may experiment with creative illustrated survey materials, different interviewer-administered survey techniques, different methods to measure multi-tasking, including the measurement of active vs. passive time use via remote monitoring of physical activity, and alternative methods to translate local perceptions of time into a standard 24-hour timetable. The accuracy of each survey treatment and its feasibility will be rigorously compared against the scenario obtained under the standard approach of time use diaries.

We also propose to go beyond the traditional approach of time use diaries to capture other dimensions of time use. Lessons from psychological approaches, in particular, are useful in discerning whether activities contribute to a person's greater sense of well-being. Approaches from the biomedical sciences can get at energy expenditure, which is important in determining the nutrition and health status of poor populations. As biomedical sensors become cheaper to use in field settings, such efforts may be useful in informing the development of technologies that reduce drudgery, particularly for women in their domestic roles. Careful documentation and comparison of these approaches will help to advance the multidimensional measurement of time, in order to identify what time constraints—whether actual or multidimensional—contribute most to gender inequality, and what policies and interventions can be implemented to relieve those constraints.

**Table 1.** Average time spent working in the past 24 hours, by method, country and sex of respondent (in minutes)

	Bangladesh			Uganda		
	Men	Women	Both	Men	Women	Both
<b>Pilot 1.1</b>						
<i>N</i>	179	221	400	136	140	276
24hr primary & secondary	564	528	540	486	600	546
24hr primary only	558	528	540	486	600	546
<b>Pilot 2.0</b>						
<i>N</i>	175	225	400	144	189	333
7dr actual	480	522	504	522	780	660
7dr typical	588	660	600	660	840	780
<i>N</i>	175	225	400	142	149	291
24hr primary only	510	534	522	378	546	462

**Sources:** Authors' calculations using WEAI Pilot II data from Bangladesh (IFPRI & DATA, 2015) and Uganda (IFPRI & ARU, 2015).

**Note:** In the WEAI, work time includes all market and nonmarket activities, including domestic chores and care (Alkire et al. 2013). Total work time is defined as time spent in primary activities plus one-half of time spent in secondary activities (if collected).

**Table 2.** Average time men and women spent in the past 24 hours by activity (in minutes)

Activity	Bangladesh			Cambodia			Ghana			Mozambique			Nepal		
	Men	Women	T-test	Men	Women	T-test	Men	Women	T-test	Men	Women	T-test	Men	Women	T-test
Total work (reproductive and productive)	566.4	521.5	***	420.6	535.0	***	504.1	580.4	***	352.0	455.8	***	490.5	652.8	***
Reproductive work	162.6	484.4	***	64.6	259.3	***	18.6	283.1	***	28.1	238.3	***	106.4	381.0	***
Domestic work <sup>a</sup>	119.0	273.0	***	41.5	76.8	***	6.5	114.2	***	17.5	95.4	***	53.9	246.3	***
Cooking	1.9	157.5	***	5.9	86.0	***	5.1	126.0	***	3.0	103.0	***	n/a	n/a	
Caregiving	10.7	55.7	***	11.4	80.1	***	2.3	35.0	***	4.1	32.6	***	52.6	134.8	***
Productive work	403.7	37.1	***	356.0	275.7	***	485.4	297.3	***	323.9	217.6	***	384.1	271.7	***
Agriculture	98.7	5.5	***	283.8	195.5	***	383.8	213.4	***	242.3	205.4	***	269.5	251.7	***
Non-agriculture <sup>b</sup>	305.1	31.7	***	72.3	80.2		105.3	87.7	***	81.6	12.16	***	114.6	20.0	***

**Sources:** Table 3.2 from Komatsu, Malapit, and Theis (2015, p. 10). Authors' calculations using data from Bangladesh Integrated Household Survey (2011) for Bangladesh; Feed the Future surveys for Cambodia (2012), Ghana (2012), and Mozambique (2012–2013); and baseline survey of Suaahara project for Nepal (2012).

**Notes:** \*\*\* 1 percent significant, \*\* 5 percent significant, \* 10 percent significant. a For Nepal, domestic work includes cooking and shopping. For Bangladesh, domestic work includes off-farm agricultural activities. b For Bangladesh, nonagricultural work includes livestock raising. n/a indicates that the data were not available.

**Table 3.** Average time spent in the past 24 hours and unpleasantness of activity, by sex of respondent

Activity	Minutes spend on activity			U-Index		
	Women	Men	T-test	Women	Men	T-test
Total work <sup>abcde</sup>	583.2	589.8		0.39	0.27	*
Labor market work <sup>a</sup>	84.0	424.8	***	0.50	0.28	**
Household work <sup>bcd</sup>	499.2	190.8	***	0.36	0.20	***
Water and firewood collection <sup>b</sup>	28.8	0.6	***	0.30	0.00	
Homestead production <sup>c</sup>	86.4	57.6	**	0.19	0.06	***
Care work <sup>d</sup>	51.0	20.4	***	0.18	0.22	
Domestic activities <sup>e</sup>	333.0	112.2	***	0.36	0.15	***
Personal care <sup>f</sup>	694.2	690.6		-	-	
Leisure <sup>g</sup>	147.6	131.4		0.17	0.13	
Status activities <sup>h</sup>	76.2	43.8	***	0.14	0.23	
All activities combined	1,440	1,440		0.34	0.26	
<i>N</i>	91	71		91	71	

**Source:** Tables 3 and 5 from (Seymour and Floro, 2016). Authors' calculations based on primary data collected in Bangladesh in 2014.

**Notes:** *a* Includes work as employed; own business work; farming; construction; fishing; and other work; *b* Includes collecting water and collecting firewood; *c* Includes vegetable gardening and animal husbandry; *d* Includes caring for children and caring for the sick/elderly; *e* Includes cooking; shopping/going to the market; cleaning the home; weaving, sewing, and textile care; and other domestic work; *f* Includes sleeping; eating and drinking; and personal care; *g* Includes traveling (for leisure purposes); watching TV; listening to radio; reading; sitting with family; and other leisure; and *h* Includes social activities and religious activities

*T*-tests are performed comparing the means of each category of activity between men and women. *P*-values < 0.10, 0.05, and 0.01 refer to \*, \*\*, and \*\*\*, respectively.

**Table 4.** Summary of advantages (+) and disadvantages (-) of different time use methods

Method	Accuracy	Multidimensionality	Feasibility
	Ability to minimize bias in time use estimates	Ability to capture dimensions other than quantity	Ability to implement in a development setting
Stylized questions	-	-	+
Time diaries			
Non-pictorial	+	-*	+
Pictorial	+	-	+
Day Reconstruction Method	+	+	-
Experience sampling	+	+	-

Notes: \*Varies depending on the time use instrument. Inclusion of additional questions may decrease feasibility.

**Figure 1:** Stylized time use questions from the Impact Evaluation of the Strengthening the Dairy Value Chain Project (SDVCP) in Bangladesh

**Z6. Participation of household members in livestock activities and household activities**

Livestock activity	Code	Who is primarily responsible to do it Member ID	Who does it in absence of the responsible person Member ID	In the past 30 days, who has usually done it? Member ID	In an average week in the past 30 days, how many hours total has this person spent on the activity?
Cleaning/draining of animal shed	1				
Taking care of Cows/animals					
Washing of animals	3				
Collecting/carrying fodder from field	4				
Taking animals to the field for grazing	5				
Purchasing feed	6				
Preparing feed and feeding the animals	7				
Taking the animals to hospital/somewhere else for treatment	8				
Taking the animals for vaccination and/or deworming	17				
Calling doctor for treatment of animals	9				
Taking the animals to hospital/somewhere for artificial insemination	10				
Calling doctor for artificial insemination of animals	11				
Milking animals	18				
Cleaning of milking area	12				
Cleaning and drying of utensils before and after milking	13				
Carrying the milk for selling	14				
Collecting the money after selling milk	15				
Grazing animals in the field	16				

Last four rows for purchase livestock and poultry are deleted as these are already asked in other modules.

Household activities	Code	Who is primarily responsible to do it Member ID	Who does it in absence of the responsible person Member ID	In the past 30 days, who has usually done it? Member ID	In an average week in the past 30 days, how many hours total has this person spent on the activity?
Feeding young children	1				
Looking after young children	2				
Cooking	3				
Washing clothes	4				

**Source:** Impact Evaluation of the Strengthening the Dairy Value Chain Project (SDVCP) in Bangladesh, Endline Survey Questionnaire collected by International Food Policy Research Institute (IFPRI), Data Analysis and Technical Assistance Limited (DATA) and CARE – Bangladesh.

**Figure 2:** Stylized time use questions from the WEAI Pilot II in Bangladesh and Uganda

**TIME CHECK:** [ ] [ ] : [ ] [ ] **CIRCLE ONE: AM/PM** **MODULE G5: TIME ALLOCATION**

G5.01: Now I'd like to ask you some questions regarding how you've spent your time over the last week and whether or not this was typical. ENUMERATOR NOTE: THERE ARE 168 HOURS/WEEK.		In the last 7 days, how much time in hours did you spend on [ACTIVITY]?	Did you spend a usual amount of time on [ACTIVITY] in the last 7 days?	Since the last week was not usual, within the last 6 months how much time do you usually spend on [ACTIVITY] per week?
		HOURS	CIRCLE ONE	HOURS
A	Farming	<input type="text"/> <input type="text"/> <input type="text"/>	Yes.....1→ NEXT ACTIVITY No.....2 N/A.....98	<input type="text"/> <input type="text"/> <input type="text"/>
B	Fetching water	<input type="text"/> <input type="text"/> <input type="text"/>	Yes.....1→ NEXT ACTIVITY No.....2 N/A.....98	<input type="text"/> <input type="text"/> <input type="text"/>
C	Cooking	<input type="text"/> <input type="text"/> <input type="text"/>	Yes.....1→ NEXT ACTIVITY No.....2 N/A.....98	<input type="text"/> <input type="text"/> <input type="text"/>
D	Care for children/adults/elderly	<input type="text"/> <input type="text"/> <input type="text"/>	Yes.....1→ NEXT ACTIVITY No.....2 N/A.....98	<input type="text"/> <input type="text"/> <input type="text"/>
E	Work as employed (inc. casual and salaried labor)	<input type="text"/> <input type="text"/> <input type="text"/>	Yes.....1→ NEXT ACTIVITY No.....2 N/A.....98	<input type="text"/> <input type="text"/> <input type="text"/>
F	Own business work	<input type="text"/> <input type="text"/> <input type="text"/>	Yes.....1→ NEXT ACTIVITY No.....2 N/A.....98	<input type="text"/> <input type="text"/> <input type="text"/>
G	Livestock/fishing	<input type="text"/> <input type="text"/> <input type="text"/>	Yes.....1→ NEXT ACTIVITY No.....2 N/A.....98	<input type="text"/> <input type="text"/> <input type="text"/>
H	Market/getting service (including health services)	<input type="text"/> <input type="text"/> <input type="text"/>	Yes.....1→ NEXT ACTIVITY No.....2 N/A.....98	<input type="text"/> <input type="text"/> <input type="text"/>
I	Weaving/sewing/textile care	<input type="text"/> <input type="text"/> <input type="text"/>	Yes.....1→ NEXT ACTIVITY No.....2 N/A.....98	<input type="text"/> <input type="text"/> <input type="text"/>
J	Other domestic work	<input type="text"/> <input type="text"/> <input type="text"/>	Yes.....1→ NEXT ACTIVITY No.....2 N/A.....98	<input type="text"/> <input type="text"/> <input type="text"/>
K	Fetching wood	<input type="text"/> <input type="text"/> <input type="text"/>	Yes.....1→ NEXT ACTIVITY No.....2 N/A.....98	<input type="text"/> <input type="text"/> <input type="text"/>
L	Travelling and commuting	<input type="text"/> <input type="text"/> <input type="text"/>	Yes.....1→ NEXT ACTIVITY No.....2 N/A.....98	<input type="text"/> <input type="text"/> <input type="text"/>

**Source:** Women's Empowerment in Agriculture Index Pilot II, individual questionnaire version 2.0, collected by International Food Policy Research Institute (IFPRI), Data Analysis and Technical Assistance Limited (DATA), and Associates Research Uganda (ARU).





**Figure 4:** Proposed 24-hour recall time diary for the FTF Haiti Mid-Term Survey

EA                       HH

Activity Type	NIGHT		MORNING		DAY								
	4 (am)	5 (am)	6 (am)	7 (am)	8 (am)	9 (am)	10 (am)	11 (am)	12 (noon)	13	14	15	
Primary													
Secondary													

  

Activity Type	DAY		EVENING		NIGHT							
	16	17	18	19	20	21	22	23	24	1 (am)	2 (am)	3 (am)
Primary												
Secondary												

**Activity Log:** Each cell above represents 15 minutes of time for the woman within a 24-hour period, from 4am yesterday until 3:59am this morning. Use the activity codes listed below to fill in the chart.

**Primary Activity:** Ensure that every 15 minute time period (i.e., every cell) for the two primary activity rows have been accounted for.

**Secondary Activity:** Only those 15 minute periods when the woman was engaged in a second activity will there be an entry.

Activity Codes:	
<b>A</b> Sleeping and resting	<b>K</b> Domestic work (including fetching wood and water)
<b>B</b> Eating and drinking	<b>L</b> Care for children/adults/elderly
<b>C</b> Personal care	<b>M</b> Travel and commuting
<b>D</b> School (including homework)	<b>N</b> Watching TV/listening to radio/reading
<b>E</b> Work as employed	<b>O</b> Exercising
<b>F</b> Own business work	<b>P</b> Social activities and hobbies
<b>G</b> Farming/livestock/fishing	<b>Q</b> Religious activities
<b>H</b> Shopping/getting service (including health service)	<b>R</b> No activity code found (primary activity only)
<b>I</b> Weaving, sewing, textile care	<b>X</b> Other (specify)
<b>J</b> Cooking	

**Source:** Personal correspondence from Sherrell Goggin, part of the Westat team conducting the Feed the Future Haiti Mid-Term Survey.

## References

- ADB. 2013. *Gender Equality and Food Security: Women's Empowerment as a Tool against Hunger*. Manila, Philippines: Asian Development Bank.
- Aguiar, Mark, and Erik Hurst. 2007. "Measuring Trends in Leisure: The Allocation of Time over Five Decades." *The Quarterly Journal of Economics* 122 (3): 969–1006. doi:10.1162/qjec.122.3.969.
- Alkire, Sabina, Ruth Meinzen-Dick, Amber Peterman, Agnes R. Quisumbing, Greg Seymour, and Ana Vaz. 2013. "The Women's Empowerment in Agriculture Index." *World Development* 52: 71–91.
- Ayuso-Mateos, José Luis, Marta Miret, Francisco Félix Caballero, Beatriz Olaya, Josep Maria Haro, Paul Kowal, and Somnath Chatterji. 2013. "Multi-Country Evaluation of Affective Experience: Validation of an Abbreviated Version of the Day Reconstruction Method in Seven Countries." *PLoS ONE* 8 (4). doi:10.1371/journal.pone.0061534.
- Bardasi, Elena, and Quentin Wodon. 2006. "Measuring Time Poverty and Analyzing Its Determinants: Concepts and Application to Guinea." In *Gender, Time Use, and Poverty in Sub-Saharan Africa*, edited by Mark C Blackden and Quentin Wodon, 75–95. Washington, DC: The World Bank.
- Chaudhri, Rohit, Rita Sodt, Kristian Lieberg, John Chilton, Gaetano Borriello, Yuta J. Masuda, and Joseph Cook. 2012. "Sensors and Smartphones: Tracking Water Collection in Rural Ethiopia." *IEEE Pervasive Computing* 11 (3): 15–24. doi:10.1109/MPRV.2012.21.
- Floro, Maria S., and Anant Pichetpongsa. 2010. "Gender, Work Intensity, and Well-Being of Thai Home-Based Workers." *Feminist Economics* 16 (3): 5–44.
- Hektner, J.M., J.A. Schmidt, and M. Csikszentmihalyi. 2007. *Experience Sampling Method: Measuring the Quality of Everyday Life*. Thousand Oaks, CA: SAGE Publications.
- International Food Policy Research Institute (IFPRI), and Associates Research-Uganda (ARU). 2015. "Women's Empowerment in Agriculture (WEAI) Pilot II for Uganda." Harvard Dataverse.
- International Food Policy Research Institute (IFPRI), and Data Analysis and Technical Assistance Ltd. (DATA). 2015. "Women's Empowerment in Agriculture Index (WEAI) Pilot II for Bangladesh." Harvard Dataverse.

- Juster, F. Thomas, Hiromi Ono, and Frank P. Stafford. 2003. "An Assessment of Alternative Measures of Time Use." *Sociological Methodology* 33: 19–54.
- Kahneman, Daniel, and Alan B. Krueger. 2006. "Developments in the Measurement of Subjective Well-Being." *The Journal of Economic Perspectives* 20 (1): 3–24.
- Kahneman, Daniel, Alan B. Krueger, David A. Schkade, Norbert Schwarz, and Arthur A. Stone. 2004. "A Survey Method for Characterizing Daily Life Experience: The Day Reconstruction Method." *Science* 306 (5702): 1776–80. doi:10.1126/science.1103572.
- Komatsu, Hitomi, Hazel Jean L. Malapit, and Sophie Theis. 2015. "How Does Women's Time in Reproductive Work and Agriculture Affect Maternal and Child Nutrition?" IFPRI Discussion Paper 1486. International Food Policy Research Institute, Washington, DC.
- Krueger, Alan B., Daniel Kahneman, David Schkade, Norbert Schwarz, and Arthur A. Stone. 2009. "National Time Accounting: The Currency of Life." In *Measuring the Subjective Well-Being of Nations: National Accounts of Time Use and Well-Being*, edited by Alan B. Krueger, 9–86. Chicago, IL: University of Chicago Press.
- Lai, Jennie W., Lorello Vanno, Michael W. Link, Jennie Pearson, Hala Makowska, Karen Benezra, and Mark Green. 2010. "Life360: Usability of Mobile Devices for Time Use Surveys." *Survey Practice* 3 (1): 1–6.
- Larson, Reed, and Mihaly Csikszentmihalyi. 1983. "The Experience Sampling Method." *New Directions for Methodology of Social and Behavioral Science* 15: 14–56.
- Lawson, David. 2007. "A Gendered Analysis of 'Time Poverty'—The Importance of Infrastructure." GPRG Working Paper Series 078. <http://economics.ouls.ox.ac.uk/12984/>.
- Masuda, Yuta J., Lea Fortmann, Mary Kay Gugerty, Marla Smith-Nilson, and Joseph Cook. 2014. "Pictorial Approaches for Measuring Time Use in Rural Ethiopia." *Social Indicators Research* 115 (1): 467–82. doi:10.1007/s11205-012-9995-x.
- Miret, Marta, Francisco Félix Caballero, Arvind Mathur, Nirmala Naidoo, Paul Kowal, José Luis Ayuso-Mateos, and Somnath Chatterji. 2012. "Validation of a Measure of Subjective Well-Being: An

- Abbreviated Version of the Day Reconstruction Method.” *PloS One* 7 (8): e43887.  
doi:10.1371/journal.pone.0043887.
- Pontzer, Herman, David A. Raichlen, Brian M. Wood, Audax Z P Mabulla, Susan B. Racette, and Frank W. Marlowe. 2012. “Hunter-Gatherer Energetics and Human Obesity.” *PLoS ONE* 7 (7): 1–8.  
doi:10.1371/journal.pone.0040503.
- Quisumbing, Agnes R., Shalini Roy, Jemimah Njuki, Kakuly Tanvin, and Elizabeth Waithanji. 2013. “Can Dairy Value-Chain Projects Change Gender Norms in Rural Bangladesh? Impacts on Assets, Gender Norms, and Time Use.” IFPRI Discussion Paper 1311. International Food Policy Research Institute, Washington, DC.
- Seymour, Greg. 2015. “Three Essays on Empowerment: Issues of Subjective Well-Being, Identity, and Agricultural Productivity in Rural Bangladesh.” PhD. dissertation. American University.
- Seymour, Greg, and Maria S. Floro. 2016. “Women’s Time Use and Subjective Well-Being: How Social Norms Affect Women’s Preferences for Time in Rural Bangladesh.” Unpublished manuscript.
- UNDESA. 2010. “The World’s Women 2010: Trends and Statistics.” United Nations Department of Economic and Social Affairs, New York, NY. doi:ST/ESA/STAT/SER.K/19.
- Williams, Jason R., Yuta J. Masuda, and Heather Tallis. 2015. “A Measure Whose Time Has Come: Formalizing Time Poverty.” *Social Indicators Research*. Springer Netherlands. doi:10.1007/s11205-015-1029-z.