
The Invisible Hand that Rocks the Cradle: On the Limits of Time Use Surveys

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ABSTRACT

Almost every intervention in the field of international agricultural development — from microcredit finance to fertilizer subsidies to trade policy — has come to recognize gender, and relationships within households, as important. Yet most interventions continue to treat the household as a ‘black box’, with changes within the household measured by the effects on income, anthropometry, health, or other secondary metrics within bargaining models. In this context, there has been increasing interest in time use studies as a way to peer inside this black box. This article offers a review of methods and identifies some of the difficulties facing time use studies in capturing intra-household dynamics, and presents the results of a two-season simultaneous activity time use study in Malawi which aimed to address these difficulties. The results suggest significant limitations to time use surveys. The kinds of reproductive labour that often interest researchers may be invisible to the women responding to time use surveys, with the result that care work is dramatically under-reported. The authors discuss the implications of the divergence between researchers’ concerns and the women’s reports of their lives for time use surveys, and for feminist development research methods more broadly.

AN OVERVIEW OF TIME USE STUDIES AND THEIR CURRENT POPULARITY

Recent concern with intrahousehold behaviour has been prompted by a resurgence in interest in the links between agricultural interventions and nutritional outcomes. If women grow cash crops, for example, does infant

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malnutrition fall and, if so, through what pathway(s) and why (Engberg et al., 1988; Girard et al., 2012)? In the absence of sound empirical knowledge about changes in patterns of labour and reproductive labour within the home (Federici, 2004), it is impossible to propose causal linkages on which to base models of household behaviour (Doss, 2013; Johnston et al., 2015). Time use surveys (TUS) have increasingly been offered as a means to assess the division of labour within households and to show how productive and reproductive labour mesh together. Such surveys are part of a longer history in which researchers attempt to render visible and enumerate the behaviour of families in poor and rural conditions.

Although there is some record of late 19th century Russian work around peasant time use, the quests to measure and to find statistically significant patterns in arrangements of household work are largely 20th century phenomena (UN Task Force on Time Use Surveys, 2013). Statistical studies of time use first emerge in the private sector, specifically in Frederick Taylor's quantification of work in industrial settings through time and motion studies (Taylor and Towne, 1911). Early efforts to bring this analysis to bear on women's work in the home include those by British Fabian researchers with interests similar to our own, studying 'the effect on mother and child of sufficient nourishment before and after birth', in which 'mothers' diaries' were collected to chart women's domestic duties within working class households in London (Pember Reeves, 1914). The transfer of these ideas to the household emerge at scale in rural sociology, specifically with United States Department of Agriculture (USDA) surveys of homemakers' 'time budgets' (see Figure 1) in the 1920s and 1930s. Part of state extension efforts, motivated by the Progressive era's drive for efficiency, these time use surveys were intended to identify ways to help women modernize home economies (Stinson, 1999).

More recently, time use surveys have been used for a range of purposes, from capturing the scope of the care economy (Budlender, 2006, 2010), to mainstreaming unpaid work (Charmes, 2017; Esquivel, 2017; Hirway, 2017b), to efforts to understand the mechanisms through which 'women's empowerment' might be manifest within the household (Alkire et al., 2013). Empowered women might, for instance, be in a position to demand and engage in a smaller burden of unpaid care work in the home, or perhaps enjoy more leisure, compared to men or to their pre-empowerment situation. Time use research can help parse households' divisions of paid and unpaid work (Beneria et al., 2016), but TUS analysis is not straightforward. Recent literature reviews point to the potential but also to the limits of TUS as a tool to track gender relations, patterns of reproductive labour within the home, and the consequences of interventions upon those relations (Folbre et al., 2005; Hirway, 2017a; Johnston et al., 2015; Mullan and Craig, 2009).

In order for TUS data to accurately reflect the complex of activities that characterize communities engaged in subsistence agriculture, and for these data to be a sound basis for tracking women's empowerment, five

Figure 1. USDA Bureau of Home Economics Daily Time Record, 1925
 [Colour figure can be viewed at wileyonlinelibrary.com]

UNITED STATES DEPARTMENT OF AGRICULTURE
 BUREAU OF HOME ECONOMICS
 WASHINGTON, D. C.

**DAILY TIME RECORD
 OF HOMEMAKER**

Name _____
 Address _____
 Day of week _____
 Date _____, 192

Each small space between the hours on the "clock" represents five minutes. Begin this day's record by drawing a line on "A. M. clock" from outer to inner circles at time of arising. At end of time given to the next activity draw another line, and in space between lines describe this activity. Continue in this way changing to "P. M. clock" at noon and accounting for all of the 24 hours of the day.
 Read separate "Instructions" carefully before beginning record.

1.9 507133
 H752D

Reserve

A. M.

P. M.

NUMBER OF PERSONS

Lodging	At meals (include--fringes put up)		
	Breakfast	Dinner	Lunch or supper
Family			
Guests			
Boarders and roomers			
Household help			
Farm help			
TOTAL			

NOTES

PREPARED BY
 ILENA M. BAILEY
 WASHINGTON, D.C.

(OVER)

Source: USDA National Agricultural Library

methodological concerns have particular resonance. TUS researchers face challenges primarily related to decisions about how specific a period of time to ask about, how much detail to ask, when to ask, who to talk to, and how to treat those activities. In this article, we address the treatment of five challenges: (1) the granularity of activities; (2) simultaneity; (3) seasonality; (4) the shifting of activities to individuals outside of the TUS sampling frame;

and (5) the richness of coding of responses. These are discussed below, in the context of current practice and the existing literature; then, in the second part of the article, we utilize two seasons of TUS data from Malawi to examine some of these challenges more closely.

We argue that TUS cannot do much of the analytical work that policy makers are currently asking of it, particularly in rural areas of the global South. The limitations of TUS are gendered because, on its own, a TUS will likely fail to make women's work — especially women's care work — more visible. Specifically, we argue that invisibility of care practices to women and communities engaging in such work in northern Malawi produces gender-biased TUS data, which contribute to the continuing under-reporting of care work. Our data, utilizing both TUS studies and follow-up interviews and observation, indicate that the ability to report simultaneous care and other activities may itself be a product of socialization, rather than a pre-existing unrecorded datum against which gender parity in the home might be benchmarked. If that is the case, there are some limitations to time use surveys in gender and development that cannot be bridged by training or protocol improvement.

The Five Challenges

Granularity

The first challenge is granularity, or the question of the period of time over which to record activities. As Circella et al. (2012) note, the choice of granularity of time use matters. Time slots can range from an hour to ten minutes. The shorter the time slot, the more burdensome the survey becomes. When capturing the prior day's activities, the precision of a ten-minute slot may be artificial. Yet the granularity of time use also matters for understanding cognitive effort. There is an intuitive difference in the cognitive load of 'stirring pot, looking after baby, preparing ingredients, talking with neighbour' when these activities happen over the duration of ten minutes rather than an hour.

Simultaneous Activities

The next, related, challenge lies in capturing and analysing simultaneous activities, and the issue of how many activities to record. Not asking about multitasking could result in a failure to capture activities, such as childcare, that are squeezed in around other work (Esquivel et al., 2008; Kenyon, 2010; UN Task Force on Time Use Surveys, 2013). Childcare, in which caregivers often engage while also farming, cooking, eating etc., presents a particular and substantial measurement challenge. Surveys that exclude simultaneous

activities will under-report caregivers' duties for any given time and can under-report total work. For example, eating while watching a child or while encouraging a child to eat might be coded as 'eating' but eating without a young child is usually a more leisurely activity. Johnston et al., in their review of TUS, find that 'consideration for simultaneous activities . . . emerges as an area for improvement of time use data' (2015: 18). Surveys keen to capture 'productive' or 'farm' labour may not explicitly recognize or ask about the simultaneity of activities, resulting in some respondents' activities appearing more focused and singular than they are (see, for example, questionnaires in FAO, 2016). Similarly, the Women's Empowerment in Agriculture Index (WEAI) allows for the coding of two simultaneous activities (Alkire et al., 2013), a primary and secondary activity. If people are engaged in more than two (for instance, shelling beans while chatting, and keeping an eye on baby), that refinement is not captured, which can lead to an under-reporting of childcare activities.

There is no consensus on how to treat simultaneous activities analytically. Two or more activities can happen at the same time, but consider the difference between simultaneously walking and eating a banana, versus simultaneously cooking and tending a child. The former require very little in terms of active attention, whereas the latter are two very demanding activities. In the WEAI, the secondary activity is recorded as lasting half the length of time of the primary activity — making it possible for people to work more than 24 hours a day (Alkire et al., 2013). Other authors have developed criteria to code this *quality of simultaneity* (Ironmonger, 2003; Kenyon, 2010). Kenyon's (2010) focus groups returned six different types of multitasking, which include differentiations such as 'active' multitasking that involves doing multiple activities at once, and 'on-call' multitasking that includes being limited in the set of activities one can do because the need to do another activity may arise. For example, it is more laborious to engage in active multitasking of watching children while also cooking, relative to on-call multitasking of cooking while a child is sleeping. Nonetheless, on-call multitasking does limit one's activities. The caretaker cannot do anything that requires her to leave the house, even if she is able to do a subset of activities while her children sleep. An alternative approach to understanding childcare is to identify whether a simultaneous activity, such as childcare, requires passive or active work. This is a less fine-grained distinction than Kenyon's, and considers active childcare to be more onerous and requiring more attention compared to passive childcare.

Seasonality

The third challenge relates to seasonality: when is the best time for TUS? The UN Task Force on Time Use Surveys (2013) argues that best practices for time use data collection include fielding the survey over the course of the

year or during representative time periods. We are aware of very few TUS of agrarian households that have collected data from the same households repeatedly across seasons, due in part to the expense of collecting TUS (see Esquivel et al., 2008). Yet this oversight can run the risk of masking how the types and hours of work vary substantially for members within agrarian households over the course of a week, and a year. Sunday work schedules differ from weekday ones. Paid day labour is often available only at certain times of year, such as during harvesting or weeding times. Further, the burden of unpaid labour shifts over the course of the year (Blackden and Wodon, 2006). Collecting water can be more difficult and time consuming during the dry season, for example. Lastly, there are short periods in the year, between harvest and planting, where leisure time for some household members may increase substantially in some agrarian communities.

The Sampling Frame

The fourth challenge concerns household work carried out by individuals outside of the sampling frame, and can be summed up by the question: whom to ask? Households often include more than one adult male and one adult female respondent. The UN Task Force on Time Use Surveys (2013) recommends interviewing all adult persons (aged 18 and above) residing in the home, to understand the division of labour. Yet it might be that elders or other community members living outside the home take responsibility for care work. Fieldwork suggests this is likely, as is another alternative — that children in rural areas regularly engage in agricultural and household work. Capturing children's roles in agricultural production, housework and care work is particularly important in understanding the time effects of an intervention. After an intervention that may require more time, the primary head and spouse may not increase the amount of time on unpaid or paid work but instead transfer those requirements onto grandparents, older children, or community members living outside the home. Neighbours and friends often help out with tasks, and particularly with child care. With these individuals absent from data, questions about the actual impact of an intervention on household labour cannot be fully resolved (Johnston et al., 2015).

We know of no surveys to date that have successfully addressed this problem, in part because administering surveys to children as young as 6 years old in order to reliably capture data, as well as finding relevant community carers outside the home, adds a considerable practical and ethical burden. Beyond this, there may be analytical difficulties. For example, if the intervention lasts beyond one or two seasons, it is challenging to disentangle the effect of an intervention on children from their families' changing expectations about the duties that children should assume as they get older. In other words, in the context of evaluating interventions, when we observe increases in children's work over the course of years, is this because (1) the

intervention displaced labour onto children or (2) children are now older and their parents expect them to do more? This is an important avenue for future research aiming to establish the effects of an intervention on labour allocations within households.

Richer Coding

Finally, the fifth challenge concerns richer coding of housework and agricultural activities, or in other words, how to understand the responses. An important debate in the TUS literature is the value of using standardized codes versus context-specific codes (Esquivel et al., 2008). The UN Statistics Division's latest International Classification of Activities for Time Use Statistics (ICATUS 2016), for example, aims to standardize codes to allow for cross-national assessments of differences in unpaid and paid work (UN Statistical Division, 2017). The ICATUS minimum list of codes includes a broad level category of paid work, which 'covers all activities related to employment for remuneration' (ibid.: 127). There are also broad level categories for childcare, caring of adults and disabled individuals, housework and meal preparation. When context-specific codes are collected, during analysis, these codes can be aggregated up to the broad category. In theory, this allows for both cross-national comparisons and attention to local issues. Underlying the ICATUS categorization, however, is the assumption that time spent can be easily partitioned into paid activities and all other activities. This is a dubious assertion even in the urban global North — each of this article's authors have attended to sick children while writing this article — and it is even harder to partition activities in the rural global South. ICATUS's treatment of own production misses rich and varied categories for housework and agricultural work undertaken by agrarian households. As Beneria et al. (2016) point out, subsistence activities often blur between paid and unpaid. Trying to isolate what activities are 'paid' may not make sense for households both selling and consuming what they produce.

Note that this problem cannot be resolved through improved training of enumerators; the household respondents themselves may not know at the time the survey is administered the extent to which activities such as shucking corn will be paid or unpaid. If the split between own-consumption and sale to market is resolved weeks later, even asking community members themselves to code this activity cannot yield good data. This is not to argue against the value of good enumerator training or the involvement of community members in coding — we have embraced both in our own work. This is to point to a deeper problem that cannot be resolved through practical interventions such as these.

Some TUS rely on pre-formatted choices, which mask some of the richness of activities, limiting the usefulness of time use information. Two examples from WEAI demonstrate that pre-formatted choices lack the necessary detail

to enable understanding of specific tasks. The WEAI Survey's original intent is to measure discrepancies between kinds of male and female labour (Alkire et al., 2013). It includes a 'domestic work' category which covers activities like cleaning, washing clothes, collecting water, boiling water for baths (and cooking) and making fires. This category is distinct from cooking, care of children/adults and elderly, and weaving. It is particularly useful to understand how much time women spend collecting water when weighing the prospective benefits of water pumps, for example, but the WEAI's pre-formatted codes are too aggregated and lack sufficient resolution to provide an answer (Esquivel et al., 2008; Grassi et al., 2015).

Relatedly, in WEAI, childcare is not listed separately but is part of general care practices, which include care of elders and adults. In practice, the individuals caring for adults tend to be actively caring. For example, a sick adult may need times of very active care (e.g., feeding or bathing) but when the adult is resting, the caretaker may not be expected to remain in the house and would not consider the time the sick adult is resting as a form of care. This differs from childcare, where a person's freedom of movement is restricted even during passive childcare (e.g., naps), although bathing a child may be easier than bathing a sick adult.

ANALYSIS OF A PRE-HARVEST AND HARVEST TIME USE SURVEY

In the second part of this article, we first discuss how the five challenges identified above shaped our data collection and coding strategy for a pre-harvest (rainy season) and harvest (post-rainy season) time use survey from Malawi. We then use empirical examples to examine how sensitive our results are to three of these methodological issues: richness of coding, simultaneity and seasonality. We show that methodological choices made by researchers influence TUS findings. We then consider TUS limitations and discuss future directions for research.

Time Use Data Collection and Coding

Two time use surveys were conducted in Mzimba District, northern Malawi, as part of a larger participatory agriculture and nutrition project that included labour-intensive agroecological approaches (Kangmennaang et al., 2017). We developed this survey to track the impacts of interventions designed to encourage men to spend more time engaged in cooking and other reproductive labour (Patel et al., 2014), as a pathway to measuring women's empowerment.

During our data collection and coding, we aimed to follow best practices as related to each of the five challenges, viz.: (1) the shifting of activities to individuals outside of the TUS sampling frame; (2) the granularity of activities; (3) simultaneity; (4) seasonality; and (5) the richness of coding.

Sampling Frame

Participating households were randomly selected from intervention and control households that fit the following three selection criteria: at least 18 years old, married, and with a child under the age of 2 in the home. In each round, when possible, both the husband and wife were interviewed. In season one, 84 couples (168 people) were surveyed, along with four additional women and three additional men, for a total of 175 people. In the second season, 67 couples were surveyed along with six additional men and six additional women, for a total of 146 people. The survey team consisted of seven experienced enumerators and two supervisors (who are co-authors). We did not measure the time use of family members other than the primary head and spouse. This is a limitation of this research, and the shifting of activities to individuals outside of the TUS sampling frame remains an important consideration, particularly when the objective of the research is to assess the labour impacts of, and any reallocation of labour following, an intervention.

Granularity

We used a diary recall approach, dividing 24 hours into fixed 30-minute time slots. Respondents reported their prior day's activities, which were later coded. Although it is preferable to ask a person to *record* all the activities they do (rather than *ex post* interviews), because of low literacy levels in the rural areas, a face-to-face interview was conducted. The surveys were pre-tested to assess the response burden as well as the ability to capture secondary and simultaneous activities (e.g., childcare combined with other work). While methods for collecting time use information vary, there is strong evidence that diary recall is an effective method given low literacy levels. Although it is both expensive and time consuming, the diary recall method has a comparatively low risk of respondent error and fatigue, and can capture simultaneous activities and richer descriptions of activities (Esquivel et al., 2008; Harvey, 1993; Juster, 1986; Juster et al., 2003; Stinson, 1999; UN Task Force on Time Use Surveys, 2013).

Enumerators completed the diary by asking respondents to describe how they had spent the previous day, including all activities in which they had engaged. To avoid overburdening respondents, we investigated time use at a granularity of 30 minutes, which necessarily introduces some approximation. Respondents indicated starting times for each new activity and the duration. Because of limited use of watches/clocks in rural areas in Malawi, the actual start times are approximate, though school schedules, church bells and widespread use of radio support a granularity of 30 minutes.

Simultaneity

Respondents were encouraged to enumerate both simultaneous and sequential activities that occurred within the same block of time. Each household has a child under 2 years of age living there. Critically, given concerns in the literature about the under-reporting of care, enumerators were trained to explicitly probe where the young child was during each activity, and who was looking after the child.

When coding, we separated out sequential activities that occurred within the same block. We then allocated the time evenly across activities. For example, in one 30-minute block, a respondent reported ‘washed face and swept’; we allocated 15 minutes to washing face (under the broad category of personal care) and 15 minutes to sweeping (under the broad category of housework). Simultaneous activities that occurred within the same 30-minute block were treated as follows. We first identified the activity requiring the most energy or attention as ‘primary’ activity. Secondary and tertiary activities were those which were more passive or relaxing. For example, someone who is gardening with a baby on her back is engaging in active farm work, while also engaging in passive childcare. In other cases, such as feeding a baby while chatting with the neighbours, childcare is the active, primary activity.

Seasonality

Data for season one were collected in February 2014 to capture activities during the rainy season. During this period, many agricultural tasks were carried out around the primary rain-fed crops. For some households, it was also a time of chronic food shortages. Data for season two, the dry season, were collected in June 2014 and capture harvest activities. This time period is often associated with more off-farm work opportunities and improved food availability. Individuals were not surveyed on Mondays, since Sunday (the day prior) is the day of the week least commonly devoted to farming, household tasks and food preparation. By limiting the recall period to the day prior, we hoped to avoid what Masuda et al. (2014) refer to as ‘major’ recall bias due to the duration of recall being too long.

Richness of Coding

Time use responses were coded by the research team. We used the standardized recommended minimum list of broad activity categories from the UN Task Force on Time Use Surveys (2013) as a starting point for our activity codes. These codes are designed for urban lifestyles in the global North and masked some of the issues of greatest interest. We therefore expanded

some codes, while aggregating others. Fine-grained sub-codes within each code were developed based on three authors' extensive time at the research site: see the Appendix, Table A.1 for code descriptions. Broad, aggregated category codes are listed in bold and include sleeping, personal care, resting, eating, childcare, health seeking and adult care work, housework and meal preparation, paid work, own-farm work, community work, leisure, microcredit meetings and others.

Open-ended questions carry the risk that coding is more open to the coder's interpretation. For this reason, two people carried out coding and compared codes to assess inter-coder variation. The survey data were entered into STATA and checked for consistency, errors, outliers and other data problems. When a discrepancy among coding approaches occurred, the team — which involved community members — discussed and agreed upon a standard interpretation. Two authors returned to the field during this time to discuss activities with local community members. Undertaking an open-ended diary approach, where respondents describe activities, allowed us to code both broad level categories such as 'domestic work' and 'care' and the finer-grained activities within them. Nonetheless, limitations remain. Leisure and work may shift during other times of the year. In the absence of more frequent surveying, such shifts cannot be confirmed through time use tools.

FINDINGS

Using an open-ended recall diary approach means that respondents vary in the amount of detail and disaggregation in the activities they report. In Table 1, we present mean minutes spent on each activity category by period and gender. Some respondents gave upwards of 40 activities per day, while one individual recalled only two activities (being sick and sleeping). On average, respondents recalled 15 activities. In Table 2, we present Student t-tests that show whether the mean minutes spent significantly differ across genders within a time period or across time periods within a gender (e.g., do women report spending more time on a certain activity during pre-harvest compared to harvest).¹ We report differences in means for activities with at least 30 respondents in each category (Agresti and Min, 2002).² Some key findings are presented below.

- All forms of work: The reported amount of time spent engaged in *all* forms of work, which includes childcare activities, housework,

1. We present Student t-tests of difference of means using unequal variances. Results are robust to t-tests of differences of means using equal variances and are available upon request.

2. To apply t-tests to categories with fewer than 30 respondents requires the data should be approximately normally distributed. The categories with fewer responses show some skew and therefore we do not apply t-tests to them.

Table 1. Average Minutes Spent on Each Activity (number of responses in parentheses; time split across simultaneous activities)

	Period 1		Period 2	
	Women n = 88	Men n = 87	Women n = 73	Men n = 73
Sleeping	601 (87)	557 (84)	561 (72)	594 (71)
Resting	75 (15)	65 (34)	84 (10)	92 (14)
Eating	52 (84)	58 (84)	54 (67)	57 (67)
Personal care	29 (57)	33 (70)	34 (27)	33 (36)
Seeking healthcare and adult care	54 (21)	266 (5)	181 (11)	544 (7)
Childcare	48 (47)	48 (10)	51 (15)	57 (5)
Housework	132 (85)	128 (18)	168 (59)	147 (24)
Paid work		277 (5)	504 (7)	392 (10)
Own-farm work	325 (73)	428 (75)	287 (47)	396 (52)
Community work	264 (17)	281 (19)	371 (8)	260 (9)
Leisure	39.5 (20)	57.75 (30)	71 (20)	144 (21)
Microcredit meeting	108 (6)	85 (3)	239 (10)	115 (3)
Other	37.5 (4)	326 (7)	153 (6)	413 (6)
All forms of work	490 (87)	499 (86)	453 (72)	498 (69)
Average number of broad categories reported	6.21	5.48	5.22	4.72
Standard deviation of broad activities	1.32	1.36	1.19	0.97
Average number of activities reported each day	18.31	14.42	12.84	12.21
Standard deviation of raw activities	6.54	5.99	6.53	4.86

Notes:

‘Housework’ includes housework, water collection, fuel collection, foraging and meal preparation.

‘Paid work’ includes salaried and unsalaried work on other people’s farms or off-farm, or doing other off-farm paid activities.

‘Own-farm work’ includes farming activities, post-harvest processing activities, repairs and animal husbandry.

‘Community work’ includes volunteering, cultural activities, religious practice, attending funerals or weddings.

‘Leisure’ includes chatting, sports and leisure.

‘Other’ includes travel, and activities undertaken while travelling (e.g., marketing; visiting friends).

‘All forms of work’ includes childcare, housework, paid work, own-farm work and community work.

non-farm work and own-farm work, seeking financing through village credit schemes, and community work, does not statistically differ either by gender or between harvests (Table 2). Men and women spend, on average, between 450 and 500 minutes per day doing all these different types of work (Table 1).

Table 2. Student *t*-tests of Difference in Mean Minutes (*t*-values in parentheses; time split across simultaneous activities)

	Comparing women's and men's time in period 1	Comparing women's and men's time in period 2	Comparing women's time between period 1 and period 2	Comparing men's time between period 1 and period 2
Sleeping	44** (2.09)	-33* (1.82)	40** (2.27)	-37* (1.71)
Eating	-6.04 (1.22)	-2.91 (0.71)	-2.47 (0.59)	1.02 (0.20)
Personal care	-3.91 (1.29)	0.56 (0.19)		-0.39 (0.13)
Housework			-35.18* (1.70)	
Own-farm work	-104*** (3.23)	-108.85*** (2.95)	38.15 (1.12)	33 (0.94)
All forms of work	-9.13 (0.30)	-45.14 (1.18)	36.94 (1.24)	0.92 (0.03)
Average number of broad categories reported	0.74*** (8.48)	0.51*** (6.10)	0.99*** (11.34)	0.77*** (8.64)
Standard deviation of broad activities				
Average number of activities reported each day	3.88***	0.63***	5.47***	2.23***
Standard deviation of activities	(15.50)	(2.93)	(25.59)	(8.84)

Notes:

***, ** and * indicate statistical significance at the 1, 5, and 10 per cent levels respectively.

See Table A.1 for a description of sub-categories included in each category.

T-tests are computed only for averages with 30 or more respondents.

- Own-farm and all forms of work: In Table 1, men and women report engaging more in own-farm work during period 1, pre-harvest rainy season, compared to period 2, harvest season. Our results in Table 2 indicate that, on average, in the pre-harvest rainy season women and men report spending about the same amount of time engaging in all forms of work, while in the harvest season, women, on average, report engaging in about 55 minutes less work than men. These results are at odds with claims (e.g., Grassi et al., 2015) that report dramatic differences between men and women in time spent doing work.
- Gendered activities: We see few other statistically significant differences between men's and women's broadly coded activities in Table 2. One reason why we see few significant differences in Table 2 is the gendered nature of many activities. Because some activities are dominated by one gender, we cannot compute a *t*-value due to small sample sizes of one gender engaging in that activity. For example, housework is reportedly done by 85 women and only 18 men (precluding a *t*-test) in the pre-harvest, rainy season. Those men who report doing housework

Table 3. Probability of Participation (z-values in parentheses; time split across simultaneous activities)

	Comparing women's and men's time in period 1	Comparing women's and men's time in period 2	Comparing women's time between period 1 and period 2	Comparing men's time between period 1 and period 2
Resting	-0.22 (1.52)			0.18 -1.24
Personal care	-0.16* (1.99)	-0.12 (0.98)	0.27** (2.4)	0.31*** (3.31)
Childcare			0.33** (2.23)	
Housework		0.48*** (4.30)		-0.12 '(0.87)
Own-farm work		-0.07 (-0.73)	0.19** (2.31)	
Community work	-0.03 (0.19)			
Leisure	-0.12 (0.89)	-0.01 (0.10)	-0.05 (0.34)	0.06 (0.67)

Notes:

***, ** and * indicate statistical significance at the 1, 5, and 10 per cent levels respectively.

See Table A.1 for a description of sub-categories included in each category.

Z-tests are computed only when there are at least 15 participants and non-participants in each category or when adding two successes and two failures meets this minimum (see Agresti and Min, 2002).

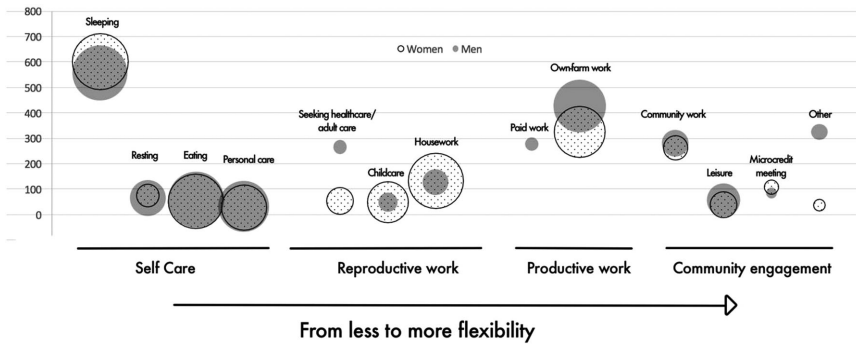
are contributing a substantial amount of time, averaging more than two hours (Table 1). Similarly, due to the small sample size of those doing off-farm work (only five men in the rainy season and 10 in the harvest season), we cannot assess whether these values statistically differ across time periods.

- Reproductive work: In order to address this issue, we calculated the differences in probability of participating in an activity (Table 3).³ The probability that women are more likely to carry out housework than men is statistically significant in the harvest season.⁴ In contrast to women, men, on average, are statistically more likely to report doing housework in the harvest season than in the pre-harvest rainy season, indicating that some tasks are seasonal. While there were no significant differences in the *amount* of time women and men do childcare, the *proportion* differs: women are three to four times more likely to report childcare. Surprisingly, however, the number of women who do not report doing

3. We compute whether there is a statistically significant difference in the likelihood of participating in an activity when there is a minimum of 15 participants and 15 non-participants. When an activity does not have either enough participants or non-participants, we use the 'add two successes and two failures' approach to adjust participation counts prior to computing statistical significance (see Agresti and Min, 2002).

4. The high sample size of women carrying out housework in the rainy season (85 out of 88 women) precludes our ability to compare two proportions statistically.

Figure 2. Average Minutes Spent on Each Activity in Pre-harvest Season (arranged from least to most flexible and weighted by number of people reporting participating)



any childcare is 47 in the pre-harvest rainy season and 15 in the harvest season. In households that have children under 2 years of age, this is an unexpected result. Despite training enumerators specifically to prompt for this information, the survey yielded surprisingly few data in this regard.

- Community work: Lastly, relatively few men or women report engaging in community activities, even when accounting for religious observation and attending funerals. Almost two thirds of our sample do not report engaging in any activities that could be considered leisure or socializing with their communities. That both men and women report such low levels of ‘free time’ in the pre-harvest season raises important questions about the feasibility of pre-harvest-related interventions. Those that require greater time commitments or are designed to shift the burden of work from women to men, without the introduction of other sorts of labour-saving devices, may be limited in their success.

Richness of Coding

One of the benefits of using an open-ended diary is that it provides a high initial resolution for activities and leaves open our ability to organize them into broader categories or alternative coding schemes. As an alternative to ICATUS’s focus on paid and unpaid work, we present gendered differences in the flexibility of time use during the pre-harvest period, shown in Figure 2. We offer in our analysis an ordering of activities that runs from least to most ‘flexible’ — a placeholder idea developed through discussions with community members about the degree of agency and freedom household members

had to perform the activity. By clustering the data around the concept of flexibility, and in trying to set a baseline for existing household gendered divisions of labour, we aimed to foreground the idea of agency in women's empowerment (Kabeer, 1999). We create four categories: self care, including activities such as sleep and rest; reproductive work, including activities such as childcare; productive work, including activities such as farming; and community engagement, including activities such as volunteering. Understanding that there are times when personal care is sometimes sacrificed for care of others, and when care of others takes a back seat to the needs of agriculture, this ordering is far from satisfactory. Given that our sample includes only households with small children, there is less control over the timing or scheduling of reproductive activities than productive activities. We offer it, though, as a way to examine the data not based on assumptions of paid or unpaid work, but in terms of increasing or decreasing degrees of an activity being flexibly scheduled (or even, on any given day, being optional) — a proxy for empowerment as freedom.

In Figure 2, the x-axis indicates the category, ordered from least to most flexible. The y-axis indicates the average number of minutes spent on each activity during pre-harvest. The circle sizes indicate the sample size of men and women, with larger circles indicating more people reported doing an activity. For example, about the same number of men and women reported eating. In contrast, very few men reported housework, although the average time spent on housework by men was similar to the amount spent by women. We find that, consistent with Tables 1 and 2, leisure and community work are not being enjoyed by either women or men in our sampled Malawian rural communities. Much of their time is taken up with basic personal care, reproductive and productive work, although, as we show below, there are variations in some activities by gender.

We can also examine more disaggregated codes. By separately coding 'seeking health care and adult care' and childcare, we find that a small number of men were spending a considerable amount of time taking children to the hospital or clinic. While health-seeking and adult care was more commonly done by women, when men did engage in these activities, they spent more time on these activities. In the pre-harvest rainy period, the mean amount of time that five men report spending on seeking healthcare and caring for adults is 268 minutes — four times the amount of time spent by 21 women. Thus, in this sample, it appears that men get involved in care seeking when something requires a large time investment, such as travelling to far-off clinics, but are less likely to engage in day-to-day care practices of other adults in the household. This contribution is significant in the face of time constraints for families. In contrast, other TUS, such as the WEAI approach, combine adult care with childcare, thereby potentially masking these gendered differences by category of care.

Simultaneous Activities

We find simultaneous activities are likely under-reported. In total, 321 respondents reported engaging in 4,057 activities (including sequential activities). About 2 per cent ($n = 92$) of the total number of activities listed ($n = 4,057$) include simultaneous activities. Childcare is the primary simultaneous activity reported (78 per cent; $n = 72$) and comprises 74 per cent ($n = 68$) of simultaneous activities reported by women.

As discussed above, simultaneous activities can be treated in several ways. We explore two. First, we can compute and present results for time evenly split amongst simultaneous activities. This has the benefit of maintaining a 24-hour day for each person while acknowledging that some people engage in multiple tasks. Second, we can assign the entire duration of the simultaneous activities to primary, or most active, activity.⁵ Comparing the two approaches, we find that the choice of approach does not make a substantive difference in our findings because the reported number of simultaneous activities is low.⁶

The small number of simultaneous activities reported, paired with three co-authors' decades of experience observing the work patterns of women and men in these communities, indicates a severe under-reporting of passive and active childcare in our dataset. The under-reporting of childcare is perhaps especially noticeable for mothers of young children, for whom caring for children is an implicitly understood activity that regulates their days. For example, in our TUS, we find a male respondent describing how, at 6 p.m., he 'watched television with his children. Then [he] had supper with the family and continued chatting with [his] wife and children'. While it is clear that watching television occurred prior to eating supper, do we consider eating supper, chatting, and watching children different activities? The first activity is presumably eating. Is the second chatting or watching his children? Can we assume he (and not his wife, or with his wife) is watching the children? His wife, in contrast, reports 'ate supper'. She was participating in the same dinner, but did not consider 'with children' worth mentioning.

This pattern occurs regularly in our data. In all of these households, children are present. Activities that indicate the active and non-simultaneous care of children mention children, such as bathing, while other activities that likely include children, at least passively, do not. For example, a woman

5. When coding childcare occurring simultaneously with other activities, we aimed to clarify whether the childcare is 'active' or 'passive'. Passive childcare, for example, is remaining in the house, completing other tasks, while a child is resting or sleeping. The caretaker cannot leave the house (for very long) but her full attention may not be on childcare. Thus, passive childcare restricts the mobility of the caretaker, but requires only minimal attention. On the other hand, active childcare is the diapering, feeding, playing with, and otherwise tending children. For any given period, caring for a child may include both active and passive components, and thus, our coding is coarse.

6. Results available upon request.

residing in a house with a young child, school-aged children, and a grown son reports that at 6 a.m., she ‘made a fire and warmed water for school children to bathe’. She refers to her school-aged children again, mentioning chatting with them at 3 p.m. Yet, at 7.30 p.m., she reports that she ‘ate dinner’ and then ‘went to sleep’ at 8 p.m. While it is likely that the children also ate dinner and went to sleep at home, who fed the children and who put them to bed is not recorded; nor is who cared for the younger child.

What do we make of this likely under-reporting of childcare? There are two possibilities. First, people outside the household, or children or elders not surveyed within the home may be taking care of children. Second, children are so much part of people’s daily lives that unless prompted, respondents may not remember all the activities associated with their care and, even then, the extent of their care seems difficult to capture with this method. This makes childcare easy to overlook. Women may assume that it is understood that many of their daily activities involve children. Blackden and Wodon identify similar issues, arguing ‘women often do not consider domestic and personal care activities as work, and hence, do not report it’ (2006: 25). Jeffery et al., in a study in rural Uttar Pradesh, India, find ‘childcare is rarely performed for long periods, because women’s other duties often dominate’ (1989: 171). The same authors find that women did not mention childcare as one of their duties unless specifically asked.

During an in-depth interview in 2017 with one of the co-authors, a respondent described a long list of different agricultural activities that she carried out, including making compost, carrying it to the field and applying it. These activities took several weeks of intensive labour. When asked where her infant child was during these different activities, the woman gazed at the interviewer with a bewildered expression, and then said ‘With me of course. I carry her on my back. There is no nursery school or place where I can leave her, so she is always with me. When she needs to be fed, I nurse her, and then put her back on my back. If she falls asleep, I put her down to rest and then keep working’ (field notes, 6 January 2017).

The response of the mother about where the child was speaks to the invisible and ongoing work of childcare that may not be ‘counted’ by women in time use surveys. Despite the prompt about the care of young children in the TUS, during the rainy season, women only reported an average of 49 minutes of childcare during the day — and 40 women do not mention any childcare as a primary activity at all, despite having a child under the age of 2 in the home. There may also be younger children or others involved in childcare, and given the routine, frequent passing of baby or young child to others, this involvement may go unmentioned, but given high rates of breastfeeding and observations of frequent childcare interactions in rural areas for children under 2, these results are surprising.

In another field visit carried out by another co-author, a woman was observed cooking a meal while looking after an infant (see Case below). The minute, mundane, frequent childcare events described here may ‘fall

Table 4. Average Number of Minutes Spent on Sub-categories of Childcare, by Primary and Secondary Activity (number of responses in parentheses)

	Primary activity	Secondary activity
Childcare	33	74
	(74)	(35)
Breastfeeding	25	31
	(15)	(5)
Young feeding	24	30
	(12)	(4)
Cleaning / diaper changing / bathing	31	30
	(41)	(2)
Passive childcare	30	84
	(1)	(15)
Interactive childcare	93	109
	(5)	(9)

through the cracks' of a time use survey, impossible to capture through recall.

Case: Falling through the Cracks of Time Use Surveys

One co-author observed a female respondent cooking a meal while looking after her baby. While the baby is on her back, she goes to pick some sweet potato leaves from her home garden. Her baby cries, so she takes him off her back and briefly breastfeeds. She then puts the baby back on her back, collects firewood from the side of the house and lights a fire. The baby stirs and fusses some more, so she pats him gently while going to get water from a bucket in the house. She pours the water into a pot, then puts the pot on the fire. She then sits and breastfeeds the baby for a few minutes. She then stands, puts her baby on her back, and goes to collect a knife and the sweet potato leaves. She sits down, and cuts the leaves into the pot. The baby cries and the woman again breastfeeds the baby, sitting for about five minutes. The baby falls asleep, and after a few minutes, the woman places the baby on a cloth on the ground, and then collects a spoon and begins to stir the food cooking on the stove. The baby cries out, so she goes and soothes him briefly, then returns to the cooking pot. In a total of 10 to 15 minutes, she has fed her baby five times, and carried out passive child care (carrying him on her back, having him doze nearby) while building a fire, cutting up vegetables and cooking a dish. When asked what she has been doing, she responded 'cooking vegetables'.

Table 4 presents data on the average number of minutes spent on several different categories of childcare.⁷ For respondents who reported childcare as

7. The total number of responses is higher in Table 4 than the total number of people reporting engaging in childcare in Table 2 because Table 4 counts responses by type of childcare activity, and some individuals reported doing multiple forms of childcare.

a primary activity, the average amount of time spent on childcare activities is 33 minutes. The main activity reported is bathing and cleaning children. This sort of activity is difficult to combine with other activities, whereas it is possible to combine other childcare activities with non-childcare activities, for example eating a meal while also feeding young children. We apply the code 'interactive childcare' when respondents describe more than an enumeration of specific care activities, including words and phrases such as 'playing', 'looking after', and 'caring' for babies and children. Interactive childcare is not commonly reported in our study as a primary activity. Because it occurs for a longer duration, it almost certainly includes activities related to feeding and diapering. The relatively high number of people reporting engaging in interactive childcare as a secondary activity reflects that some people combine leisure, such as listening to the radio or resting, with chatting and playing with their children.

Seasonality

Neither men nor women appear to spend statistically significantly more time engaging in own-farm activities in one period relative to another (see Table 2). When we split own-farm activities into sub-categories, we do see variation by season. Table 5 shows the average minutes spent on different types of own-farm agricultural work by season and gender. Contrary to common conceptions of agriculture being tidily split into 'women's work' and 'men's work' (Boserup, 1970; Grassi et al., 2015), our results indicate that women and men engage in most activities, although men are more likely to carry out some activities, such as post-harvest processing work. On average, men report sleeping more in the harvest season, while women sleep less. There are also more men and women reporting personal care activities in the rainy season compared to the harvest season (Table 5). This difference may in part be due to people bathing more often during the hotter season, when more physical labour is being done.

DISCUSSION AND CONCLUSION

By following best practices around sampling across seasons, we find some data that both conflict with, and can explain, existing TUS-based claims that men have abundant leisure (e.g., Grassi et al., 2015). In our data, women and men report working nearly the same total number of minutes during pre-harvest (490 vs 499), while women report working about 45 minutes less than men during harvest (453 vs 498). Gendered discrepancies in leisure observed elsewhere may have as much to do with the time of year of the survey as the inequality of gendered relations. In other words, the comparatively high

Table 5. Average Minutes Spent on Own-farm Work by Season and Gender (number of responses in parentheses)

	Period 1		Period 2	
	Women	Men	Women	Men
Weeding	228 (10)	270 (7)		
Banding or ridging or tilling	290 (16)	270 (19)		
Sewing or tying tobacco	88 (6)	204 (8)		
Harvesting	98 (10)	194 (10)	257 (28)	314 (24)
Post-harvest work	105 (2)	150 (11)	195 (6)	325 (12)
Planting or sowing	173 (2)	129 (7)		
Milling	161 (8)		240 (3)	158 (2)
Applying manure, fertilizer or compost to soil	176 (4)	221 (4)		
General or unspecified agricultural work	242 (48)	327 (47)	235 (13)	301 (21)
Repairs and construction	570 (2)	191 (9)	495 (2)	370 (6)
Livestock or animal husbandry	30 (1)	129 (8)	360 (1)	150 (2)

number of leisure hours enjoyed by men may be most plausible for periods, such as the post-harvest season, when agricultural demands are lower.

This is not to say that gendered labour patterns do not exist. Based on extensive field observations, we know that they do. Rather, we are sceptical about specific numerical claims made about women's and men's time use in rural Africa because such claims are based on data that themselves include invisible gender biases. The example of a man who reports watching television, caring for his child and then eating, while his wife merely reports eating is, we suspect, indicative of broader trends in which childcare work is considered so mundane that it is invisible to the women reporting it. Ethnographic evidence and interviews, collected at the same field site, give credence to this interpretation.

In other words, childcare is invisible to those who are carrying it out. Our survey specifically prompted respondents to offer information about simultaneity of childcare with other activities, and nonetheless it was under-reported. The question remains whether this particular survey, developed following current best practices in time use survey methodology, might be improved or whether the enterprise of time use surveying itself is flawed.

In contrast to studies aiming to understand paid or productive work (e.g., Alkire et al., 2013; FAO, 2016), we suspect that TUS are unlikely to be adequate for capturing activities such as childcare, because of the level of

detail and simultaneous nature of the care. This is not the kind of analytical problem that can be surmounted through technology. Suggestions for making cellphones available and randomly sampling women and men throughout the day with the question ‘what are you doing right now?’ will likely yield fewer activities rather than more. For future TUS studies in the global South, explicitly asking about work related to children in order to get a complete picture of caretakers’ activities is necessary, but may not be sufficient. In future iterations of the survey, we aim to explore whether the question ‘was (were) your child(ren) with you at the time?’ for each time period recalled yields significantly more care work. By asking such questions, we are asking respondents to see activities that they usually overlook. Even with such prompting, though, time use surveys face further challenges, particularly in capturing the density of women’s multiple activities carried out in parallel, shifting from one task to another, over a short period of time.

Nonetheless, understanding the entirety of women’s and men’s time use remains critically important. One risk of development projects that require more work by women is the reduction of time available for women to engage in other activities, such as the care of children, rest or leisure. Evaluations of agricultural interventions that examine only agricultural labour will miss changes in time spent on care activities. Without this information, we will not know whether the interventions, in the words of Eyben and Napier-Moore, result in ‘women working for development, rather than development working for women’ (2009: 294). Researchers should continue to explore alternatives that are less burdensome for respondents and that serve to address the meaningful questions related to women’s and men’s real work on a daily basis.

Our concern with the limits of time use surveys can be illustrated with a thought experiment. Imagine a 24-hour body camera worn by a statistically significant sample of men and women. Set aside ethical concerns about surveillance or invasions of privacy, and ignore the cost of administering the protocol and coding these data. Questions about seasonality and the answers to whether a particular agricultural activity was paid or unpaid might be overcome by administering the cameras over a range of months, tracing back the extent to which — for example — corn shucking ended up providing food for sale or for home consumption. Imagine, in other words, that all activities, productive and reproductive labour, sexual activity, domestic violence, child labour and abuse are panoptically visible. Such surveillance would answer questions that researchers have not dared ask, even at a cost of dignity to those surveilled. And still the data from a fully visible life would fall short in cases where care work was carried out by extended family, community members, or other children. Imagine, then, that everyone in a village is monitored, all the time. An approach such as this might answer the questions that researchers and policy makers are asking of time use data. Yet, turning an entire village into a glass-walled laboratory would still deny informants

the opportunity to see what it is researchers are asking: the prevalence of care work in daily life. Though their hands rocking the cradle might be recorded by researchers, the importance of domestic labour would remain invisible to those carrying it out. Such a researcher's panopticon is the *reductio ad absurdum* that good time use survey analysis demands.

How, then, might we imagine doing this work differently? The American Time Use Survey Questionnaire (US Bureau of Labor Statistics, 2017: 29–32) offers the possibility of understanding some elements of care work not as activities but as responsibilities, by asking about children under the age of 13 in the care of the respondent. We wonder whether the boundary between activity and responsibility can be sustained under a TUS protocol. For example, if a child is chronically ill and needs several trips to the hospital in a year, plus therapy, medication, schooling, feeding, bathing, playing, educating, her care is both a series of responsibilities and a series of activities.

The boundaries between these categories are ones that lay themselves open to anthropological work and we wonder whether the use of community-driven ethnographic methods, combined with participatory methods such as photovoice, might not be preferable as a way both to remind policy makers of the epistemic limits of data about households, and to better capture these shifts in household dynamics and their nuances (Chung et al., under review).

We began our study hoping that TUS would provide a benchmark through which we might objectively be able to capture the extent to which women's and men's household work was (or was not) trending towards equality after engaging in gender equality training work. Our experience points to the uncomfortable conclusion that the ability to report simultaneous care and other activities may itself be a product of that training, rather than a pre-existing unrecorded datum against which gender parity in the home might be benchmarked. In other words, in order for simultaneity, especially around childcare, to be adequately addressed, not only does the survey team need appropriate training, but so do respondents. This can undermine the usefulness of TUS as a tool for capturing changes in time use due to gender-sensitive programming. If that is the case, there are limitations to time use surveys in gender and development that cannot be bridged by training, protocol improvement, or anything short of total surveillance.

Our interest in time use surveys was that they might be able to shed light into the black box of the household. Our attempts to execute such a survey suggest that there are problems in theory with such an attempt. But we ought not to be discouraged. Instead, we ought to focus on the goals of the research. Feminist awareness raising can help women and men to see care work as work. Not only is this approach a far more empowering alternative than for researchers to peer into the lives of others, but it also may be a necessary step to accurately capture care work in time use surveys by undoing latent biases about what is considered 'work'. Such awareness raising is a necessary precondition for time use surveys but is not sufficient to arrive at an

understanding of whether particular uses of time can be understood as more or less empowering. Future time use studies would benefit from qualitative and ethnographic supplements, as well as engagements with respondents, not only to assure a path to better responses to surveys about time use, but also to support transformations in the burdens of work.

APPENDIX

Table A.1. Aggregated Broad Categories (in bold) and Sub-categories

Category
Sleeping
Personal care
Resting
Eating
Childcare
Childcare – breastfeeding
Childcare – young feeding
Childcare – cleaning / diaper changing / bathing
Childcare – passive childcare
Childcare – interactive childcare
Health seeking and adult care work
Caring for spouse
Caring for the sick (self or others)
Health-care seeking behaviour
Caring for adults and people with disability
Housework and meal preparation
Housework
Fuel collection
Water collection
Foraging
Meal preparation and serving
Marketing/shopping
Picking from the garden
Paid work
Salaried work – farm work on other people’s farm
Salaried work – non-farm work
Non-salaried farm work on other people’s farm
Non-salaried farm work on own farm
Non-salaried non-farm work
Own-farm work
Own-farm agricultural work – weeding
Own-farm agricultural work – banding or ridging or tilling
Own-farm agricultural work – sewing or tying
Own-farm agricultural work – harvesting
Own-farm agricultural work – post-harvest
Own-farm agricultural work – planting or sowing
Own-farm agricultural work – milling
Own-farm agricultural work – applying something to soil (manure, fertilizer, compost)
Own-farm agricultural work – general/unspecified
Repairs and construction
Livestock or animal husbandry

(Continued)

Table A.1. Continued

Community work

Volunteering – formal
 Volunteering – informal
 Education
 Education – Malawi Farmer to Farmer Agroecology project
 Cultural participation – funeral
 Cultural participation – other (prayer, regular church attendance, etc.)

Leisure

Leisure
 Crafts and hobbies
 Chatting
 Reading
 Sports participation

Microcredit meeting**Other**

Travel
 Unknown

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