Measuring how people spend their time: a time-use survey design

Methodological decisions concerning the mode, follow-up probes, coding schemes, and simultaneous activities all have far-reaching implications

Linda L. Stinson

Time-use studies typically have a single focus: to study the frequency and duration of human activities. For example, time-use surveys may ask respondents to report everything they did during a 24-hour period along with some indication of the starting and stopping times of those actions. This chronological reporting procedure avoids many pitfalls that other survey estimation procedures encounter and is less subject to distortion due to "social desirability bias." But there are many methodological considerations to take into account when designing a time-use survey. Decisions concerning reporting procedures and mode of data collection may influence data quality. Likewise, the choice of follow-up probes and the treatment of simultaneous activities can determine the amount of information available for accurate and reliable coding of activities.

This article describes the methodological decisions that the BLS time-use working group faced when designing a possible time-use survey.[1] It also presents the methodological choices that the group made and provides the rationale for those selections.

While time-use research (that is, the actual enumeration of the activities people perform) may have originated within the social sciences and the time management domain of the business world, international governments have also been quick to recognize the value of this information. A number of their policy-related issues can be addressed with time-use data. Consequently, the question is not so much *"why?"* time-use data should be collected, but rather, *"how?"* it can be collected well.

Linda L. Stinson is a research psychologist in the Office of Survey Methods Research, Bureau of Labor Statistics.

Methodological considerations

A single focus upon "a day in the life of a respondent" is simple enough in principle. However, as with any other survey design, there are a number of different approaches that may be followed when collecting time-use data, each with its accompanying ramifications on data appearance and quality.

Moreover, time-use research may be rather unique in the world of social science analysis in that it has a long history of international cooperation and is often animated by researchers who want to make cross-national comparisons.[2] Consequently, certain standards and procedures for time-use data collection have been established and are generally recognized within the field as successful practices.[3] However, within this normative framework, there still remain several methodological options to be considered and challenges to be confronted.

Mode

Since time-use research began during the era of face-to-face interviews and continues to be popular in localities where telephone data collection is non-normative, it is not surprising to discover the widespread popularity of the paper diary. A "time clock" diagram is an example of one early attempt to use a paper and pencil format to collect time-budget information in the United States. (See exhibit 1.) The U.S. Department of

Exhibit 1. The time clock format used to collect time-budget information

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

DAILY TIME RECORD
OF HOMEMAKER

Name .....

Address .....

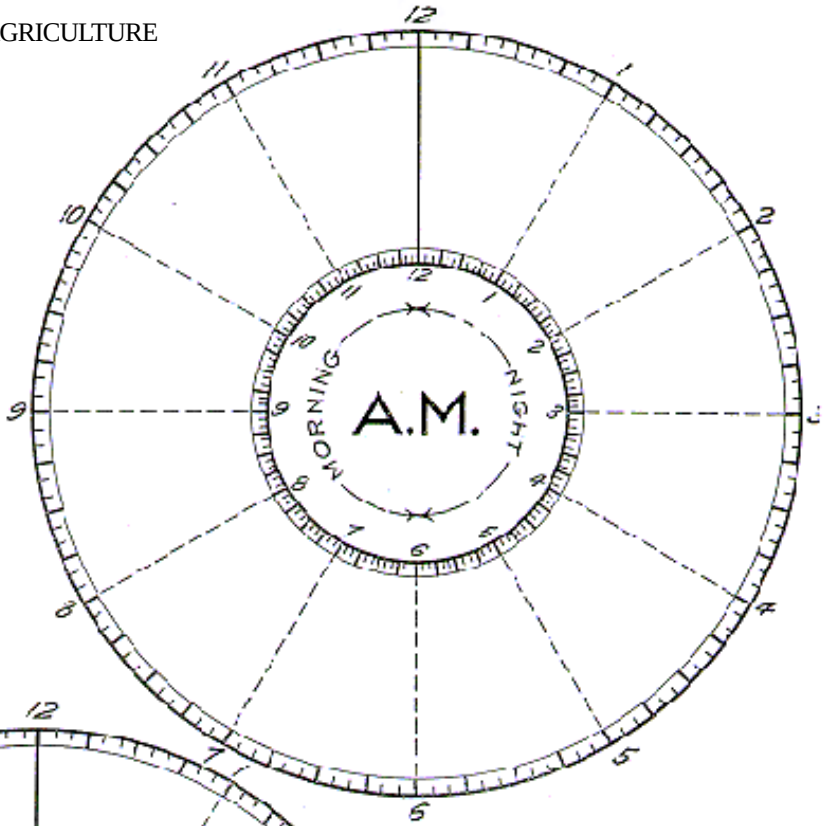
.....

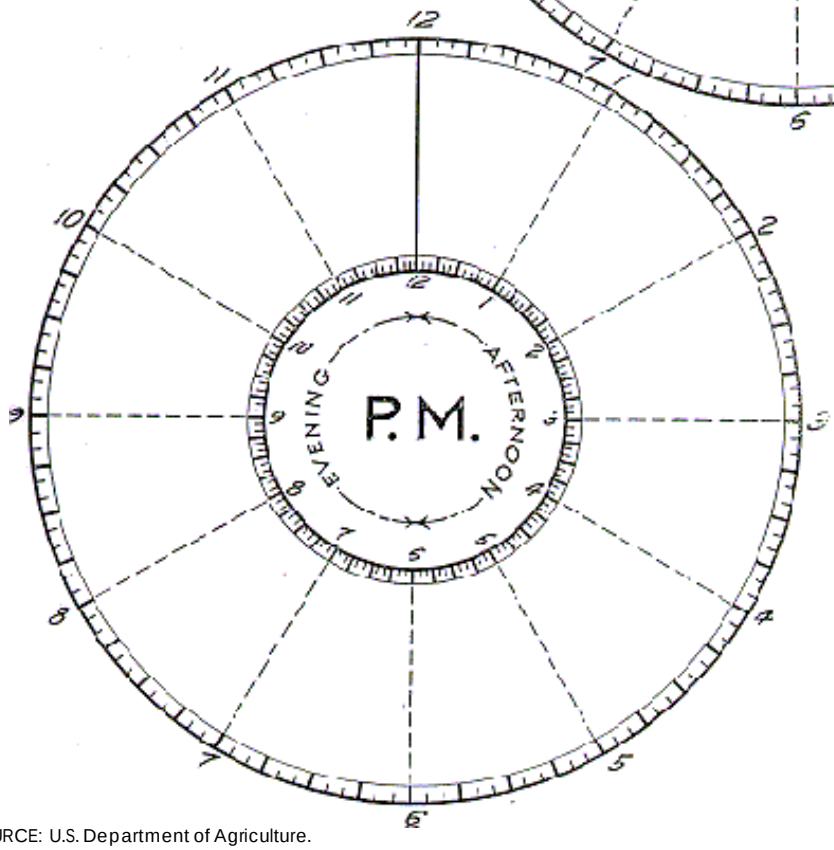
Day of week .....

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.





NUMBER OF PERSONS

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

NOTES

SOURCE: U.S. Department of Agriculture.

Agriculture used this method in the 1920s and 1930s to create a daily time record for homemakers.[4] Participants were instructed to draw lines on the clock diagram to mark the beginning and ending times of their activities and to describe the activity inside the intervening spaces. Time diaries have continued to evolve through the years, and presently, we find examples such as the time diary prepared by the Australian Bureau of Statistics. It consists of five questions at the top of the page and 5-minute time slots down the first column. (See exhibit 2.)

Although the look of the time collection instrument has evolved, in all cases, the heart of the time diary is preserved: a verbatim description of the day's activities is collected along with an assignment of the approximate starting and stopping times for each activity, recorded either in free format or in fixed 5- to10-minute intervals.

In both Canada and the United States, the drive for cheaper, faster, and easier data collection has generally resulted in a great push for surveys to be telephone-administered and, ultimately, to become computerized. In line with this trend, both the "1985 American's Use of Time Project"[5] and the Canadian General Social Survey[6] have demonstrated that in North America, information about the use of time can be successfully collected over the telephone. Because our proposed sampling frame included a ready-made list of telephone numbers,[7] our working group followed the North American precedent and opted for a computerized, telephone format.

The option to collect time-budget information by telephone does have certain implications. One implication is that, when information is collected by telephone from centralized calling centers, there are new opportunities to monitor interviews and improve the quality of the entire data collection process. In any survey situation, the capacity to increase the precision, efficiency, and accuracy of data collection is extremely valuable. It may be even more valuable for time-use interviews because they are built upon the collection of verbatim accounts of activities elicited from respondents by interviewers using skills that may best be referred to as "flexible interviewing."[8] A second implication is that telephone data collection almost certainly precludes the possibility of collecting diaries from an entire household due to the difficulties inherent in trying to make contact with all household members on a designated day.[9] While some statisticians argue that the design effects produced by collecting clusters of activities within households are detrimental to survey standard errors and should be avoided, other social scientists argue that the social dynamism produced by the intertwining of household members' activities demands that households be studied *in toto*.[10] At any rate, it seems most likely that any study design requiring data collection from an entire household would not find a method of telephone collection optimal.

Follow-up probes

Throughout the years, it has become increasingly clear that accurate coding and the complete analysis of activities requires more than a simple verbatim record of their content. Other elements are deemed essential for providing the context necessary for interpreting these verbatim accounts. This additional information generally includes: the locations where activities occurred, the identities of other persons who were present or participating, and other activities that might have been performed simultaneously.[11]

The classic example typifying the importance of such additional information is found in the activity "eating." Based upon contextual circumstances, the classification of the activity "eating" can range from: *personal care* when the activity is performed alone or with household members exclusively, *work time* when eating on the job or during work-related functions, or *socializing* when food is consumed in a social situation or location with nonhousehold members.[12] While it may be possible to glean some contextual information from preceding activities (for example, eating in a restaurant is preceded by travel to the restaurant), nevertheless, this information may not always be sufficient (for example, eating alone in a restaurant, versus joining friends at a restaurant to socialize).

In many paper diaries, additional information about time spent with others (immediate family members, relatives, coworkers, schoolmates, and acquaintances) is recorded by checking an appropriate column. Some studies suggest, however, that when respondents are instructed to complete their own time diaries, the information about the presence of other people is not always recorded correctly. Finland's nationwide time-use study, conducted by the Central Statistical Office of Finland in 1979, found that only a third of the respondents correctly filled in the column identifying time spent "in the company of others." In many cases, respondents only reported the time actively involved with others in mutual activities and failed to identify time spent passively in the company of others. Many others made vague or careless entries rendering the data unclear.[13] However, telephone data collection provides interviewers with the opportunity to probe for complete and accurate answers.

Following the example of Statistics Canada's telephone administered time-use interview, the working group concluded that after each activity reported, interviewers should ask either, *"Where were you*?" or *"Were you still… ?"* For each activity, there would be only one answer collected and it would be recorded in one of the following categories:

Place:

1. at respondent's home
2. at workplace
3. at someone else's home
4. at other place (includes park, neighborhood)

Or in transit:

5. in car (driver)

Exhibit 2. An example of a time diary used by the Austrailian Bureau of Statistics

Day 1 6 a.m. 9 a.m.

	1 **What was your main activity?** (Please record all activities, even if they only lasted a few minutes)	2 **Who did you do this for?** (e.g. self, family, work, friend, a charity, the community)	3 **What else were you doing at the same time?** (e.g. childminding, watching television, listening to the radio)	4 **Where were you?** (e.g. at work, home, on a bus, driving a car)	5 **Who was with you at home, or with you away from home?** (e.g. no-one, family, friends)
6:00					
.05	Sleep	Self	Passive child care	Home	Family
.10	↓	↓	↓	↓	↓
.15	↓	↓	↓	↓	↓
.20	Toilet	↓	↓	↓	↓
.25	Had shower	↓	↓	↓	↓
.30	↓	↓	↓	↓	↓
.35	Got dressed	↓	↓	↓	↓
.40	Put on a load of washing	Family	↓	↓	↓
.45	Made breakfast		Talked to family	↓	↓
.50	↓	↓	↓	↓	↓
.55	Ate breakfast	Self	Read newspaper	↓	↓
7:00	↓	↓	↓	↓	↓
.05	↓	↓	↓	↓	↓
.10	Hung washing on line	Family	Nothing	↓	↓
.15	↓	↓	↓	↓	↓
.20	Dressed children	Children	Talked to children	↓	↓
.25	↓	↓	↓	↓	↓
.30	Brushed hair, teeth, etc.	Self	Nothing	↓	↓
.35	↓	↓	↓	↓	↓
.40	↓	↓	↓	↓	↓
.45	Packed children s bags	Children	Said goodbye to partner		
.50	Drove children to my	↓	Talked to children	Driving car	2 children
.55	mother s house	↓	↓	↓	↓
8:00	↓	↓	↓	↓	↓
.05	↓	↓	↓	↓	↓
.10	Greeted my mother	Self	Organising children	Mother s	Children &
.15	Said goodbye to children	↓	Nothing	↓	mother
.20	Drove to work	↓	Listening to radio	Car	No-one
.25	↓	↓	↓	↓	↓
.30	↓	↓	↓	↓	↓
.35	Parked car & walked to work	↓	Nothing	Street	↓
.40	Working	Work	↓	Work	Workmates
.45	↓	↓	↓	↓	↓
.50	↓	↓	↓	↓	↓
.55	↓	↓	↓	↓	↓
9:00	↓	↓	↓	↓	↓

SOURCE: Australian Bureau of Statistics, Time Use Survey Australia User s Guide, 1992, ABS Catalogue No. 4150.0 (Canberra, Commonwealth Government Printer).

6. in car (passenger)
7. walking
8. in bus or subway (includes street cars, commuter trains or other public transit)
9. on bicycle
10. other (for example, airplane, train, motorcycle)

Also following the Statistics Canada model, for each activity, the interviewer would then ask either, *"Who was with you?"* or *"Were you still…?"* to get a complete list of other persons present. Interviewers would use the following list to record all that apply:

1. Alone
2. Spouse/partner
3. Child(ren) of the household under 15 years
4. Parent(s) or parent(s) in-law in the household
5. Other member(s) of the household (including children ages 15 or older)
6. Child(ren) of the respondent less than 15 years old outside the household
7. Child(ren) of the respondent, 15 or older outside the household
8. Parent(s) or parent(s) in-law outside the household
9. Other family member(s) outside the household
10. Friend(s)
11. Other persons(s)

Taken together, these additional probes for "locations" and "other persons present" should provide enough information for accurately identifying and coding social situations and any ambiguous events. Beyond even that, however, these responses provide an opportunity for further probing, should a specific interest ever arise. For example, if there were interest in having a supplemental "child-care module" attached to the time-use interview, response number 3 (that is, children under 15 in the household) to the *"Who was with you?"* question could be programmed to trigger additional child-care questions attached either to the specific activity where the flag was evoked or at the end of the completed 24-hour activity report as a separate battery of questions. Likewise, the location "workplace" could be used to trigger additional "work schedule" questions or an "in-transit" response could be used to signal additional questions on "commuting patterns." The possibilities are almost limitless and confirm the importance of this additional contextual information.

Finally, the BLS working group concluded that a final contextual probe should be added at the end of the interview to identify all the activities for which respondents were paid.[14] The exact wording of the question will, no doubt, need to be tested to assure us that it also helps respondents identify "self-employed activities." But despite the need for additional clarification of the wording, the fundamental necessity for some type of "paid work" question was abundantly clear during our 1997 time-use pilot test. Without it, we were not able, in all cases, to separate "market" from "nonmarket" work, a coding distinction that will, most likely, always be of paramount interest to BLS.

Coding schemes

Throughout the world, most of the currently used activity classification systems have evolved from the original structure developed by Alexander Szalai for the Multinational Time-Use Project of the 1960s. These activity codes are typically arranged into mutually exclusive behavior groups that cover all aspects of human activity. These primary divisions of behavior generally include:

- Personal care activities
- Employment related activities;
- Education activities
- Domestic activities
- Child care activities
- Purchasing goods and services
- Voluntary work and care activities
- Social and community activities
- Recreation and leisure
- Travel time

Not only do the current classification systems attempt to reflect meaningful distinctions between specific activities for the purposes of tabulation, but they also try to prioritize those distinctions in such a way that they provide a solid conceptual basis for the analytic endeavor.

One such temporal typology, developed by Dagfinn Ås and based on the ideas of V.D. Patrushev, identifies all time as either[15]:

- Necessary time–serving basic physiological needs
- Contracted time–related to gainful employment and school attendance
- Committed time–to which one is obligated, but for which a substitute service could be purchased
- Free time–which remains when the other three types have been accounted

Within these levels of "time commitment," all the primary divisions of activities are clustered and interpreted. Perhaps due to the cohesion of this system, time-use studies from all over the world have been analyzing and reporting their results, using this structural framework. Such a typology should

also assist coders in distinguishing between activities that may have multiple layers of meaning and which may not be readily identifiable in their classification.

Internationally, there are several existing coding schemes that are very appealing. Because they have evolved from a common source, they share many similarities. By selecting an existing classification system, we would benefit from their previous tests and code revisions, thereby saving time and money. International coding consistency is also necessary for cross-national comparisons. The following classification systems were especially appealing to the working group.

Eurostat classification system. Iiris Niemi of Statistics Finland developed the first version of the Eurostat coding list in 1993 and it was adopted for the Eurostat Harmonized European Time-Use Survey."[16] Since that time, several workshops and expert panels have discussed the Eurostat coding system, and refinements were made in 1995. Further refinements and adaptations have been made in close collaboration with coding experts in England, Finland, and Sweden. Beyond the effort invested in continuous improvement, the Eurostat system offers the advantage of direct international comparability. To date, eighteen countries[17] have participated in the "Harmonized Time-Use Project" and share the common coding scheme at the one- and two-digit levels, while maintaining the opportunity for country-specific adaptations at the third-digit level.

Australian classification system. This system has the advantage of having been tested and critiqued since 1992, resulting in a number of revisions in 1997. The overall structure is very similar to the Eurostat system and provides international comparability, while attempting to adjust the uneven distribution of time within the major categories by redefining some of the primary categories. Some of the most interesting revisions include:

- Combining "domestic activities," "child or adult care," and "purchasing" together into a single domain of "household and family care," reflecting the common thread of "time committed to the household"
- Separating "free time activities" into the four clearly distinguishable subcategories: social life and entertainment, sports participation, hobbies and games, and mass media
- Disentangling the category of "voluntary work" so that "committed activities" and "free time activities" are more easily distinguished, thereby allowing "unpaid work activities" to be more accurately identified

United Nations international trial classification system. In the autumn of 1997, the United Nations Statistical Division convened an expert panel of time-use researchers to design a "trial classification system" that would provide an international coding scheme for analyzing and understanding the use of time in all different societies. The proposed classification system differs from other existing systems mainly in three ways:

- The basic framework for distinguishing the economic nature of activities is the System of National Accounts
- All nonmarket production has been brought together into a single one-digit category and then further specified at the two- and three-digit levels.
- "Paid work" activities, which are normally undefined at the two- and three-digit level, have been given more detailed breakdown.[18]

While aiming for international comparability, the main feature of the UN system is clearly its economic conceptualization. This classification is useful because it could be helpful in assessing national labor inputs into production of goods and services, compiling household satellite accounts, and analyzing time use within the framework of the System of National Accounts. This system was designed to be especially useful for developing countries that may lack labor force or expenditure surveys and may need to use a single national survey to address many different research and policy issues. It seems less likely to be adopted by other countries that already have years of experience with their own time-use coding schemes, as well as fully developed national statistical survey programs to address specific research needs.

Assessment

While other national classification systems are similar to these three systems (because they all share a common origin), the Australian, Eurostat, and United Nations systems stand out. The Australian system is impressive because it seems to have developed the most—from a simple structure to be used for the tabulation of activities, into an analytically cohesive and theoretically strong "explanation" of time use. The Eurostat system benefits from the breath and scope of its application throughout the unified Europe. The United Nations system is appealing because of the economic foundation on which it rests.

After considering each of these coding schemes, our working group recommended a slightly modified version of the Australian system because it provides international coding comparability, while redefining some of the primary categories to be more logically consistent with the four-fold typology of time. Our design shows minimal changes at the level of first-digit codes, such as expanding "child care" to include "care of all household dependents, including children, the elderly, and the disabled." At the two-digit level, there would be a few

codes added to provide additional classification for the expanded one-digit categories. Finally, at the three-digit level, useful codes from other international systems would be added to provide additional clarifications.

Simultaneous activities

One of the most difficult problems all time-use researchers must confront is how to record, with accuracy and completeness the pulsing dynamism of human activity. As Alexander Szalai pointed out, there are practical limits to how well this can be done. While there are many "parallel and criss-crossing threads of activity," we are generally constrained by the linear flow of time itself to view activities as predominantly sequential in nature, rather than as pulsating energetic moments extending backwards from and forwards into their surrounding activities.[19] As he wrote:

> …for whatever level of accuracy one may reach, still more minute observations could possibly prove that some activities which seemed to be carried out simultaneously were in effect alternating with one another, or that some activities which seemed to be performed consecutively were factually overlapping to some extent. Nevertheless, any time-budget study which does not grapple in some way with the problem of recording secondary or parallel activities is essentially unable to give a balanced account of the great variety of activities which fill up everyday life.[20]

Typically, time-use studies provide respondents with an opportunity to report at least one "simultaneous" or "secondary" activity in parallel with each sequential activity mentioned. Such studies find that respondents spend as much as 3 to 4 hours per day, doing more than one activity at a time.[21] Child-care activities, in particular, seem especially subject to simultaneity. However, as mentioned earlier in the discussion of follow-up probes, when respondents are left to record their own activities in paper diaries, the collection of simultaneous activities often suffers.[22]

The1997 time-use pilot test found that most reports of simultaneous activities were coded either as social or personal care activities or were classified as "nonmarket work." On average, our respondents reported nearly 2 hours of either social or personal activities and an additional hour of nonmarket work occurring simultaneously with other activities per day. Consequently, we recognize the importance of providing a forum whereby respondents are able to report activities that might have been performed in tandem with other actions. This information would be obtained by asking respondents, *"Were you doing anything else during that time?,"* after recording the starting and stopping times, the location, and other persons present for each recorded activity.[23] Standardizing the collection of simultaneous activity through scripted questions administered by interviewers would avoid some of the measurement difficulties encountered by the self-administered paper diaries. It also would avoid undue respondent burden by not asking respondents to provide a subjective assessment of how they think their parallel activities should be apportioned for analytic purposes. □

Notes

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A Bureau of Labor Statistics working group was established to examine the feasibility of conducting a survey on how Americans spend their time. Members of the group include: Diane Herz, Michael Horrigan, Mary Joyce, Ed Robison, Jay Stewart, and Linda Stinson. This article contains material from the report prepared by the working group, along with additional material researched by the author and presented in a paper at the 1999 Joint Statistical Meetings in Baltimore, Maryland.

[1] In any survey design process, there are always a series of methodological decisions to be made. As the BLS working group advanced into the design process, it made specific methodological decisions along the way. These decisions were made as part of the design process only.

[2] Alexander Szalai, ed., *The Use of Time: Daily Activities of Urban and Suburban Populations in Twelve Countries* (The Hague, Mouton, 1972).

[3] Andrew Harvey, "Guidelines for Time Use Data Collection," *Social Indicators Research, vol.* 30, 1993, pp. 197–228.

[4] Early time diary records are available from the Department of Agriculture, National Agricultural Library, Beltsville, MD.

[5] The 1985 American's Use of Time Project was headed by John Robinson and conducted by the Survey Research Center at the University of Maryland. They also used telephone data collection for their 1995 time-use survey sponsored by the Environmental Protection Agency. See John Robinson and Geoffrey Godbey, *Time for Life. The Surprising Ways Americans Use Their Time* (University Park, PA, The Pennsylvania State University Press, 1997). Also, see John P. Robinson and Ann Bostrom, "The overestimated workweek? What the time diary measures suggest," *Monthly Labor Review*, 1994 August, pp. 11–23.

[6] Judith Frederick, *As Time Goes By. Time Use by Canadian,* Catalogue 89–44E (Ottawa, Ontario, Statistics Canada, 1995).

[7] Our proposed sampling frame is the list of month-in-sample eight participants in the Current Population Survey.

[8] Michael Schober and Frederick Conrad, "Conversational Interviewing," *Public Opinion Quarterly,* vol. 61, 1997, pp. 576–602.

[9] A "designated day" is statistically selected and assigned so that the activities recorded in time-use studies will be representative. This is necessary in order that activities, such as those performed outside the home, are not overestimated.

[10] Jose Geurts, and Jos De Ree, "Influence of Research Design on Time Use Estimates," *Social Indicators Research,* vol. 30, 1993, pp. 245–84.

[11] The final report issued by the Expert Group convened by the

United Nations Statistical Division to discuss a "Trial International Classification for Time-Use Activities" cited "for whom," "with whom," and "location" as the important context variables that should be collected in time-use studies (United Nations Secretariat, 1997).

[12] Angie Becher, "Identifying Non-Market Work: A Look at Coding Issues." Paper presented at the Time Use, Non-Market Work, and Family Well-being Conference, co-sponsored by the Bureau of Labor Statistics and the MacArthur Network on the Family and the Economy, Washington, DC, Nov. 20–21, 1997.

[13] Iiris Niemi, *The 1979 Time Use Study Method*, no. 91 (Helsinki, Central Statistical Office of Finland, 1983).

[14] During the 1997 BLS pilot test, we tested the following "paid work" question: "Of all the activities that you did yesterday, did you get paid for any of them?" The note to interviewers instructed them to include only work that was paid to respondents in the form of money (for example cash and checks) and to exclude bartering or exchange services.

[15] Dagfinn Ås, "Studies of Time-Use: Problems and Prospects," *Acta Sociologica*, vol. 2, 1978, pp. 125–141; Dagfinn Ås, "Designs for Large Scale Time-Use Studies of the 24-Hour Day," *It's About Time*, International Research Group on Time Budgets and Social Activities, 1982; and Iiris Niemi, Salme Kiiski, and Mirja Liikkanen *Use of Time in Finland 1979* (Helsinki, Central Statistical Office of Finland, 1986).

[16] Niemi, *The 1979 Time-Use Method*.

[17] These countries participating in the 1996–97 pilot test include Finland, Sweden, Luxembourg, Ireland, Italy, Spain, Portugal, Greece, United Kingdom, Albania, Bulgaria, Hungary, Poland, Slovenia, Lithuania, Estonia, Latvia and the Former Yugoslav Republic of Macedonia. France and Germany also have expressed interest in joining the "Harmonized Project" and are negotiating possibilities for financing their participation. Likewise, Austria, Denmark, and the Netherlands are engaged in ongoing discussions, but have not yet reached decisions about future participation.

[18] United Nations Secretariat, Statistical Division, *Expert Group Meeting on Trial International classification for Time-Use Activities*, Report of the meeting held in New York, Oct. 13–16, 1997.

[19] Szalai, *The Use of Time*, 1972.

[20] *Ibid.* p. 3.

[21] International Research and Training Institute for the Advancement of Women, *Measurement and Valuation of Unpaid Contribution, Accounting Through Time and Output* (Santo Domingo, Dominican Republic, United Nations INSTRAW, 1995).

[22] In the minutes of the November, 1998 meeting of the Eurostat Task Force on their "Time Use Survey" pilot tests, the recommendation was made that secondary activities should not be included in satellite accounts because of the lack of data quality and the variability in reporting simultaneous housework activities between countries. Our survey hopes to avoid this pitfall by standardizing the collection of simultaneous activity through scripted questions administered by interviewers.

[23] The dilemma that follows upon the collection of secondary activities is the problem of constraining everything to total into a 24-hour day for analytic purposes. One approach would be to ask respondents to somehow apportion "weights" to any activities performed simultaneously so the overlapping time can be re-distributed. Due to the magnitude of the respondent burden and issues of measurement error, we have decided not to follow this approach. Instead, we are investigating *post hoc* analytic procedures that would take advantage of aggregate information to create utility functions that would supply the necessary weights.