

**Timeline Data Collection and Analysis:
Time Diary and Event History Calendar Methods**

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Chapter 2

Measuring Well-Being: Using Calendar and Time Diary Methods in Life Course
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Introduction

Often we are interested in measuring time devoted to different activities over some reference period – such as weeks worked for pay in a year or hours per day spent in housework or childcare. And, besides the elapsed time in a certain domain, we may also want some characterization of the activity, such as attributes of a spell of time or information on the timing of external events or transitions from one activity or state to another. The purpose of such measures is to construct variables which capture the level of designated time allocations and responses for the purpose of understanding behavior in the context of a model. In turn, the model portrays the choices of individuals with respect to a type of behavior, ranging from work, leisure, health states, and investment (Juster and Stafford, 1991) to episodes of violence or periods in various affective states. In such analyses a goal can be to understand factors shaping well-being.

To illustrate, how do certain types of time use (e.g. childcare, eldercare from the perspective of a provider or recipient) connect to contact with other persons over the day or how does time in compound activities (multitasking) affect mental health and stress (Michelson, 2005, p. 126, p.142)? Another purpose is to provide descriptive aggregates for assessing time trends or to create a system of social accounts, such as for satellite non-market Gross Domestic Product accounts (M. Hill, 1985; National Academy of Sciences, 2005; Harvey, 2006). Or, as a blend between accounting and hypothesis testing, has time in personal contact with others throughout the day changed across the decades as a result of the growth of new media forms?

In this chapter an overview of some of the similarities and differences between time diaries and event history calendars is developed. These two approaches share a common

theme which is the collection of timeline data – for diaries the timeline is a 24 hour day and for EHC's the timeline can commonly range from months to years or even over long sections of the life course. For these different applications, how successful have they been in terms of data quality and resulting research? Answers to the question of whether the project was a research success or are the data of high quality are always equivocal, and in these chapters only some of the answers are given. The strength of the volume is the provision of the methods as applied to a given study and some indication of how these methods supported research findings.

The chapters in this volume demonstrate that EHC's and time diaries and their variants are becoming applied to both large, national infrastructural data bases as well as more focused, investigator-initiated research projects. In conjunction with application to more diverse samples, different variants of the instruments have emerged and are likely to continue emerging. To illustrate, the American Time Use Survey (ATUS) (Chapter 7) provides a national sample and a particular model for data collection. Investigators working with diaries for special populations can compare their descriptive results with ATUS. This will provide a benchmark for situations where there sample or methods give rise to how generalizable their study findings may be.

As an example of a more focused study, the Child Development Supplement (CDS) of the Panel Study of Income Dynamics (PSID) has collected time diary data on children 0-12 as of 1997, 6-18 as of 2002/03 and age 11-18 in 2007/08. Since ATUS has diaries on individuals in the age range of 15 and older, some comparisons of those in the common age, 15-18, can be made between CDS and ATUS. In a similar fashion, market work hours as measured in the work hours via EHC in the PSID can be compared to

market hours as reported in the Current Population Survey (CPS). For innovative designs such as the Consumption Activities Mailout Survey (CAMS) (Hurd and Rohwedder, Chapter 12), measures of the time estimates can be compared with ATUS.

From these smaller investigator-initiated projects there will be feedbacks to improvements in the larger infrastructural collections. This will in turn benefit such goals as providing satellite GDP accounts. Two examples come to mind. Intangible investments in human capital have been shown a key to economic growth, and much of the input to human capital is time of the individual, caregivers in the family, and those providing out-of-home instruction. A focused study of time use and cognitive gains could support the construction of satellite GDP accounts.

I. Themes in Common

This chapter identifies similarities in both the data collection methods from diaries and calendars in the use of the resulting data for research. Moreover, both methods have a long prior history. The well-known landmark EHC study by Freedman, et. al. (1988) was preceded by other earlier efforts (Belli and Caligaro, Chapter 3). For diaries the systematic use of the method appears to date back to the Soviet academician, S.G. Strumilin in 1924 (Juster and Stafford, 1991). The next major period of activity was in the mid 1960's led by the Hungarian sociologist, Alexander Szalai (1965), who organized diary projects in the U.S., USSR, Hungary, Federal Republic of Germany, East Germany, France, Peru and several other countries. Since the 1960's many countries have had regular national data collections based on time diaries. The United States has had a number of smaller scale diary collections, and starting in January of 2003 the U.S. Bureau of Labor Statistics began an ongoing, national diary project based on a sample of

the participants in the Current Population Survey. For a full discussion of the national U.S. diary data from 1965 to the present, see Harvey (2006).

The collection of such timeline data from diaries of calendars can be highlighted by reference to the experiences using both methods in the Panel Study of Income Dynamics and the other studies in this volume. The similarities are a matter of the extent to which diary and calendar methods share their basic collection characteristics and application. For each method the types of data collection range from large infrastructural data collections such as the American Time Use Survey (ATUS) (Phipps and Vernon, Chapter 7) and the Panel Study of Income Dynamics (PSID) to investigator initiated analysis or methods projects such as the diary based Daily Reconstruction Method (DRM) studies and the calendar based Intimate Partner Violence Study (IPVS) (Yoshihama, Chapter 8), the study of health risk behavior (Martyn, Chapter 5) or the study of violent individuals (Roberts and Mulvey, Chapter 11).

Most uses of diary data are based on a summation of time across the activity records to provide a measure of the share of time allocated to different activities. An example of this is the creation of population estimates of time use for the purpose of social accounts (Harvey, 2006). Across a wide range of users, the analysis of the time diary data is based on temporal sequencing. A recent study examined time in shopping, at work, and in leisure over days of the week and time periods within days. The goal of the study was in part to examine the effect of changes in shopping hours laws in the Netherlands (Jacobsen and Kooreman, 2005). Another example of timing analysis is the extent to which time use over the day is varied or routine across different levels of income (Hamermesh, 2005).

Consider time diary data for children age 6 - 18 in the NICHD funded Child Development Supplement (CDS) of the PSID. National time diary data were collected for children age 0-12 as of 1997 and then again when they were re-interviewed five to six years later, 2002-03, when they were approximately age 6-18. The re-interview rate for the second set of two diaries was 88%. The CDS data were collected partly in person but largely over the phone by an interviewer who recorded the diary information on paper – with post-field coding and processing.

A timeline portrayal of the diary data from CDS II are presented in Figure 1. The diurnal pattern of personal care in getting ready for school is shown to be similar for boys and girls, with a pronounced weekday peak at about 7:30 A.M. and again around mid evening. For weekends personal care time is mid morning to noon and then again in mid evening. These patterns are similar for boys and girls. In contrast to personal care, time in sports and work differs by gender. Girls spend more time working in the labor market and this is concentrated in the late afternoon during weekdays and mid day to afternoon on weekends. From such timeline portrayals boys are shown to have somewhat more time in sports than girls at young ages. This difference is most evident at mid-day on weekends with almost 45 percent of young boys in active leisure or sports at the midday peak. This differential is much wider at older ages (12.0 – 17.9), where the time in such activities drops sharply for girls. For computer time outside of school and jobs both boys and girls have similar total weekly hours and coincident diurnal patterns on weekdays and week end days.

There are some obvious gaps in time diary methods at present. Most respondent-based diaries give only a superficial measure of elapsed time at school and at market work.

Time on task has long been seen as a critical measure of learning input in schools. Individual diaries can be replaced with teacher diaries. The CDS attempted this in 1997. This was a national sample so it was primarily a single teacher for each pre high school child. A school based sample may improve this since there should be better opportunities to train the teachers in the methods to be used. School-based studies of the sort by Rowan Camburn and Correnti (Chapter 10) may be combined with an in-home component to capture a more accurate and comprehensive learning time measure. To highlight this issue, Figure 2 shows a tempogram of daily educational activity of African-American and other children by school day versus the weekend. The superimposed figure shows a virtual coincidence of time in school and other educationally related activities during weekdays for African and other students – for both age groups, 6-12 and 12-18. For weekends the story differs. Among the older children (12-18), from noon (.5) on, there is a noticeably wider gap in educational activities between African-American and other children. Here we can see the need for both in-school and out of school diaries to capture educational exposure. Moreover, the fine-grained activity within the school day can only be captured by a teacher log or other school-based diary methods.

One possible approach to within school activity in a diary is to have a topics module after the diary is completed. For those reporting segments of time at school in the diary records, there could be a series of questions that would ask about share of time in different subject matters. If such a post-dairy approach were successful in educational settings it may apply to time at market work. Here too, diary respondents usually report quite long blocks of undifferentiated time ‘at work’. There have been some small scale observational studies of the workplace (Stafford, 1987 – from data in the Effectiveness in

Work Roles pilot study). Just as CAMS appears to have had success in getting respondents to have a temporal frame of reference as a prelude to attempting reports of time, so might a time diary with reported episodes provide a more specific framing than a generic question series on activities at work. A further advantage of time diaries is that they can capture the spells of work (or study) for those with no fixed work (or school) location for the growing many who devote time to market work while at home or away from their normal place of work.

Besides the tempograms in Figures 1 and 2, the diary data could be used to study transitions during the day just as an EHC data file can be used to study transitions across states. In 2003 the PSID initiated national data collection of a two-year EHC of labor market activity and residential domains. This computer assisted telephone interviewing (CATI) EHC application was based on methodology work funded by the National Science Foundation and the National Institute on Aging. The EHC CATI software is a tabular graphical user interface for the interviewer and is a separate software component which merges into and from a more comprehensive BLAISE application, which collects information on other content areas. Based on the validity and design studies summarized in this volume the actual EHC section as used in the 2005 PSID Instrument can be set out in Chapter 3. In 2007 PSID implemented a health history calendar to capture early life health conditions of the adult respondents.

Both EHC and TD provide vastly more information than stylized questions or what have been called question list or q-list approaches. Here with EHC or TD we have more of a chronology pieced together by the respondent with the aid of CATI or other collection tools. With high power desktop tools (SAS, Oracle) users are free to innovate

with more complex variable constructions and data alignments that are targeted to their specific research purposes. For example, the timing of (re) employment and vehicle purchases may differ for those in poverty and more affluent consumers.

To see the nature of the micro data produced from the 2003 and 2005 EHC application in the PSID, here we present data on transitions on a third of the month basis, starting at the beginning of January (January:1, January:2,...December:3). This one-third of a month data is from our initial methods work in which respondents were found to be able to answer “beginning”, “middle” and “end” of the month. Here we consider four states: employed (including multiple job holding and not ‘other’), E; other (paid sick leave, vacation and on strike), V; unemployed, U; and out of the labor force, O. This produces 12 possible transitions. We are looking at such transitions over the period January:1, 2001 to December:3, 2002. As shown in Calegario (2006?), there are far smaller within time window seams across the years with EHC data. Here we are looking one calendar year back within the 2-year window transitions on a third of a month basis. First, how many transitions do we see and in which months and thirds of a month do they occur?

For calendar year 2002, restricting the individuals to be age 30-60 and using the reports with complete data (about 90 percent of the cases), the overwhelming number of transitions are from working for pay, E to V and returning, V to E. Moreover, most of the short periodicity transitions are concentrated around the last third of May (Memorial Day), the first third of July (July 4) and the last third of December. Strikes (very rare) two calendar years prior. The pattern of transitions as a timeline is presented in Figure 2.

Event history calendars are proving to be an extremely flexible data collection tool. In a sense the 24-hour time diary is a type of event history calendar. This becomes more

evident with timeline portrayals of a *24 hour day* with respect to certain activities as in Figure 1 for educational activity participation and then turning to Figure 3, which is a *24 month* interview window in the EHC of the PSID. In Figure 3 are the percent *not* transitioning to a different labor market state, where the states are: at work for pay, on vacation from work, on strike, unemployed, on sick leave from an employer, and out of the labor force. The 24 month time window is broken into fixed grids, a practice similar to that in time use studies which have broken each hour into four fixed grids of 15 minute each.

Here in the EHC one-thirds of a month are used. This is from lab work (Belli, Shay and Stafford, 2001), which strongly suggested that the beginning, middle and end of the month could be more easily recalled than weeks. Weeks have the troublesome feature of often crossing over into the next month or carrying over from the prior month. In Figure 3 we can see, not surprisingly, but comfortingly, the share of non-transitions on a third of a month basis is lowest in July (after the 4th of July), November and late December. This reflects the obvious fact these are common vacation times near major holidays, and that the EHC captures the major, known patterns in a fashion we would expect. How well an EHC so designed might be in capturing joint transitions onto and off welfare, schooling, and employment or non-market care-giving of household members remains to be seen.

EHC's have the property of more fully capturing coincident activities of interest. Unlike time diaries, where there have been on-going issues of how to treat secondary and even tertiary activities, with EHC's it is normally the case that several domains of activity or states prevail at a given time – and – that within each domain there can be multiple activity forms. So a person can be a student and work at the same time (which one might

judge as the primary of secondary is possible with some modification of the EHC), and one could hold two jobs simultaneously to support the on-going school enrollment. Note that such an EHC is providing far richer information than simple questions as “Did you work last year (month). Did you go to school last year (month)? Are you in school now? Are you working now?” Depending on the purpose such short questions may be better, but EHC (or Time Diary) provides a great deal more information in a clearer layout even if one is interested in overall schooling activity of different population groups.

EHC’s have been applied to a very wide and growing range of time windows, ranging from large segments of a person’s entire life to shorter periods. For example, there have been EHC applications to obtain health conditions and events of an individual’s youth (Belli, 2003; Smith, 2006). Educational histories seem particularly well-suited to EHC’s. Again one may be content with much less information; such as what is the highest grade the respondent has attained as of the date of the interview. But in an EHC design it is possible to capture the timing of specific spells of education or within a spell there are changes in the subject matter studied. Then there are distinct events such as graduation or dropping out, temporarily or otherwise. The time points of these can be marked. Health histories illustrate another area of application. For illnesses with a distinct onset and treatment period the EHC seems well-suited. However some conditions such as arthritis may come on gradually so there is not a distinct event which marks the onset. Health history calendars may be refined to capture the distinction between onset and diagnosis or may be better if designed to capture both for some health conditions.

Time Diary and EHC Measures: A Comparison

One phrase that has been used to describe the diary is that the responses are ideally non-directed. There is no question about work or childcare or housework – ideally just an objective chronology of the events on the randomly sampled day. The idea is that respondents can think of distinct time or activity segments in different activities over a recall period of a few days. They give a verbal description of the activity sequences and the hard work – just as in occupation coding – is the post-field transformation of what are sometimes vague answers into one of many codes by the research and processing team. When the respondent is asked to process as with a domain specific diary, which asks for all the spells of a given type over a 24-hour day, the result is generally a strong upward bias, as illustrated in studies on media use (Roberts, 2000).

The diary system is also driven by location. Often changing activities involves a change in location within the residence or travel to a different location. A parallel in EHC is the common conjunction between changes in residence and changes in employment. These location changes provide a cognitive anchor or landmark which promotes better recall for both diaries and calendars. Validity studies have often found TD to provide unbiased measures compared to the estimates from an identical population using Experience Sampling Method¹ (ESM) or random paging of time samples (Robinson, 1985).

Time diary studies have shown the importance of secondary activities within each diary segment. A parallel for EHC's could be thought of as applying to people who have a lot going on in their lives in the domains under question. For example, people may hold multiple jobs at a given time or may have multiple partners or members of their family in

¹ For a study of youth based on ESM see (Schneider and Stevenson, 1999).

residence. Do such coincident conditions induce stress in a manner parallel to multitasking as recorded in time diaries?

Collection and Use of the Data

The use of the resulting timeline data from a time diary or an EHC ranges from creating simple individually aggregated summaries to what can be termed customized, 'complex constructions'. The use of EHC methods appears to allow the construction of summary measures which are similar to the aggregates from respondent based methods – in terms of the basic allocation of the 52 weeks of the year into employment, weeks out of the labor force, on vacation,....

In a similar fashion the time diary records from the individual 24-hour diary (or *diaries* if more than one per person as with CDS), can be processed in a great variety of ways, starting with the most basic aggregates of an individual's time to complex timelines. The activity records are the fundamental data element collected in diaries. Each represents a non-overlapping segment or spell of time in a given (primary) activity, and the location of an activity is both a descriptor and often the basis for delineating a new spell. Descriptors of the spell, such as secondary² activity or who else was present are often key to the study of social interactions, such as child care. An interesting descriptor used in the Australian time diaries is a 'for whom' indicator³ (Harvey, 2006).

The activity records are first used to create files of hours and minutes per day in specific time use codes for each respondent. These basic aggregations of the records into a file with daily time into activity codes are a basic 'processed' or flat file per person day which is helpful to many analyses, especially for descriptive purposes and often

² Or consider a second secondary (tertiary) activity.

³ Includes the code 'myself'.

explaining a particular time use as a dependent variable⁴. For diaries the codes are often fine grained – as many as 300 to 400 categories and are possibly beyond the level of detail as reported by the respondent. These need to be aggregated to some higher level for any meaningful analysis. Even with aggregation to 20 code categories or so, while some respondents will have multiple episodes of an activity per day, many respondents may not have participated in a given activity on the diary day or days even in common activities such as housework – only sleep and rest (almost!) invariably shows up as an activity at the individual level. This issue of reliability or what Alwin and McCammon (Chapter 16) would refer to as sampling variability of time in different days, has been discussed in numerous writings (Juster, Ono and Stafford, 2003; Kalton, 1985).

One descriptive tool is creation of similarity indices for the aggregated time use categories for population subgroups, parallel to the application of occupational dissimilarity comparisons between males and females. These dissimilarities indices can capture the extent to which time use patterns differ across the specified groups (Stewart and Frazis, 2005).

Besides supporting creation of overall time use measures the other value of the micro diary activity record data is the creation of what may be called ‘complex constructions’ – that is, compound use of the activities *and* descriptors of the activity (where, who else was present, were you doing anything else at the same time, and - rather specific to CDS - what program were you watching (if viewing a video screen was reported),...) to create such special measures. There have been measures of media content exposure to learning (Vandewater, 2004) or interactive development time with parents on weekdays versus

⁴ For example, the diary data from CDS show greater TV time for children with mothers who work longer market hours at low wages; TV appears to play the role of a low-cost babysitter.

weekend days, based on the presence and involvement columns in the CDS diaries. Diaries of adults are commonly used to measure childcare through the use of who was present indicators. In families where there are multiple children being cared for or caregivers other than the sampled adult, an incomplete picture of the childcare received by the child is a likely result. Regardless of the respondent, child care measures require a set of judgments about what activity types constitute child care and whether the direct involvement of and which other persons should be included in a specific definition.

Using these ‘with whom’ and ‘involvement’ descriptors and a set of activities regarded as developmentally valuable, it can be shown that young children living with both biological parents get more than twice as much direct interactive developmental time (Stafford and Yeung, 2005 – if to be used we need to check if we can reprint this from the Hamermesh volume or some shorter version of it.). (See Table 1.) The value of the diary is in the ability to obtain a sample of elapsed time under a particular definition of ‘development time’. Direct questioning about how involved the parents are might provide a possible ranking measure, but could not support a cardinal measure of the sort used in Table 1.

Both event history calendar data can also be designed to capture descriptors associated with a given spell or episode. For example one can characterize a spell of employment as full time or part time or by the rate of compensation or extent of on-the-job learning. While complex constructions have been created and analyzed for CDS time diaries, use of the EHC data in PSID is of very recent vintage. To date they have been used to construct summary measures of annual market work weeks, unemployment, and time out of the labor force. Methodology work indicates that the EHC can provide more

valid measures of a two year employment window than traditional question list recall of labor market activity from two years back (Belli, Shay and Stafford, 2001).

Just as with diary descriptors of time, EHC data could be used to create more complex constructions such as number of weeks during the last two years during which the respondent worked more than one job, or had a second job at a lower wage rate. These constructions would support descriptive characterizations of multiple job holdings. A deeper use of the EHC files is to study transitions across domains. In conjunction with measures of financial holdings and expenditures in the PSID such job holding constructions could also support the investigation of the use of second job activity as a way of meeting cash flow needs. As noted a number of financial variables in the PSID have monthly activity indicators or 'month strings'. For example, there are month strings on the receipt of transfer payments or purchase/lease initiation of autos. These joint timeline data on residence and employment (from EHC) and vehicle acquisition and transfer payment receipt (from month strings) could be used to support analysis of the timing of exit from welfare and securing transportation for employment.

A difference between diaries and EHC's in the PSID and in other applications is the commonly far greater omnibus character of diaries compared to the selected domains common in EHC designs (Yoshihama, Chapter 8; Martyn, Chapter 5; and Roberts and Mulvey, Chapter 11). The EHC is usually designed to target specific types of activities, since unlike time diaries it is not, in concept, a real time measure. In an EHC when a person reports working over some spell or spousal abuse over some time period, the activity is not occurring 24/7, and is in conjunction with other life domains. With time diaries there is, by definition, only a single primary activity at a point in time. On the

other hand diary activity records invariably include additional descriptors including with whom (CDS), affect (Schwarz, Kahneman and Xu, Chapter 9) and may target activities such as child care or non-market work (Phipps and Vernon, Chapter 7), and as noted above it is these descriptors which give rise to complex constructions – but constructions in a domain chosen in the research design.

With diaries while there is often an omnibus character to the primary time uses, there is much more direction behind the choice of activity descriptors⁵. Further, in the application of teacher logs (Rowan, Camburn and Correnti, Chapter 10), the teachers themselves are asked to code the class time. While this may give rise to some bias in reporting their teaching, responses to an annual survey on 24 items from an annual survey show far higher frequencies of teaching do the same items recorded in the teacher logs. The teacher logs are a variant of diaries. They ask the teacher to focus on a specific teaching episode and record, from a set of items, those which occurred during the lesson. In principle, these data could be used to study the timing of teaching methods over a school day. Studying school days themselves is important. In a general purpose diary both time at work and time at school get reported as largely an undifferentiated block of time.

Timeline analysis of diary data is also possible but is less common among economic studies. For example, time diary data have been used to study the daily patterns of time in one's residence as a way of evaluating the potential for energy saving on heating and cooling and possible peak load pricing responsiveness (D. Hill, 1985). A number of timeline portrayals of diary data are reviewed by William Michelson (2005). These are presented as tempograms of percentage of percentages of workers engaged in main paid

⁵ In CDS the goal of understanding the extent and impact of media exposure motivated the media content gathered in Column. D.

work across a 24 hour day (Michelson, p.116-119) and can also be used to characterize the daily patterns of social contact of children during school days. Other newly emerging tools can be applied to the analysis of diary files as timeline data. One approach which has been used with success is a software to portray sequencing (Clarke). Possibly tempograms and sequencing software will become applied to EHC data.

Conclusion: Calendar and Diary Data Compared to What?

Commonly we hope to phrase a question or question sequence and rely on the respondent to construct a summary measure of elapsed time for us. The summary measure is often readily used by the research community with few concerns – but then some limitations of the summary measure come to light. Or we would like to characterize the elapsed time in some way such as, say, productive, enjoyable, or representing an investment in children. Further still we may be interested in the sequencing of episodes that add up to the total elapsed time. To illustrate, of the weeks of unemployment during a calendar year, was this one spell of several shorter spells, and what was the timing?

In direct respondent reports of elapsed time over a year or a ‘typical week’ or ‘typical day’ or recent weeks, there can be a bias in their processing to come up with an average, particularly when the time category is not well delineated as with emerging employment patterns with less structure as to time and place – as a contrast to market work on a regular schedule at a given location or a daily housework routine. For example, particularly when the work is variable with respect to effort, location and content, respondents may exaggerate socially desirable time as a part of the construction process or rely on stereotypic or stylized answers such as eight hours of work, sleep or two hours of housework a day. So, for example, time allocated to the care of own children – which

has an inherent ambiguity as to what is time in child care itself or possibly including time 'on call' as part of childcare as a secondary time use (as a reported activity descriptor) - and a large social desirability element - is found to be reported at levels way beyond amounts as measured in a validation study with paging devices (Hofferth, 2000). Further, this time exaggeration is greater for more educated parents - evidently because care for children is seen as important and who would say, "I barely notice my children- most of *my* time is spent channel surfing!". "and, by the way, what do you *really mean* by care of my child??" On the other hand the use of carefully designed non-diary sequences asking for recall over recent months and weeks have been implemented with notable success (Hurd and Rohwedder, Chapter 12).

Some time constructions of interest to researchers are simply too demanding for respondents to provide from direct questions. A classic distinction in economics is between time in employment and unemployment versus time out of the labor force - for extended periods, perhaps because of illness or injury. The respondent may only know that work was missed for 6 months because of an injury. The respondent may think of this as 'unemployment' but researchers would consider most of the 6 months to be time 'out of the labor force' - because of injury - not unemployment: not 26 weeks of illness - since shorter periods of time away from work on accident or sick leave (but paid) is another matter. And the respondent over a calendar year may have several segments of time out of the labor force but which add up to 6 months - yet those the segments may be too much to process into an estimate of 6 months in an interview situation.

Many times a q-list sequence or more detailed sequences can be used to get 'good answers'. An interesting illustration is years and spells of smoking behavior collected in

the Panel Study of Income Dynamics (PSID). In 1986 respondents were asked for their current smoking behavior and smoking history – do they currently smoke and how many cigarettes do they currently smoke per day? When did they start and, if they have quit (dozens of times, it's easy), when was that. Again in 1999 – thirteen years later and in 2001 – fifteen years later – they were asked similar questions on current smoking behavior and their smoking history. Here we can use their prior (at the time reports – which we assume to be accurate) and compare with their recall over a 13 year interval. In comparing the reports from the two waves it was found that about 10 percent gave inconsistent answers (Grafova and Stafford, 2006). Why might this happen? Possibly a lot of attention is given – both by the smoker and also by friends to attempts to quit and by the onset of or cessation of a distinct and visible habit. The transition creates its own landmark – “I haven't smoked a cigarette since New Year's Day of 1994” or “I quit on my birthday in 1997,”... Quitters often refer to the duration of their success and those who smoke often keep a mental note of how long they have been smoking. So there are natural mental landmarks that appear to make this smoking recall quite accurate. It is an open question of whether, let us suppose, a Smoking History Calendar (SHC) would provide data as good or better, but a calendar may be possible while a panel over prior years is not possible or is more expensive. If so, an advantage of the SHC is that long panel observations would not be necessary. A key aspect of long span EHC's is that they may be a substitute for an expensive panel project.

Another example of what seems effective for some diary based measures is the use of an extensive set of questions about a particular time use but calibrated over a shorter horizon for regularly occurring events and over a longer period for less frequently

occurring activities. The Consumption and Activities Mailout Survey (CAMS) in the Health and Retirement Study (HRS) is an example of a non diary based time use study which appears to do quite well. At the other side of the diary type spectrum is the Daily Inventory of Stressful Events (DISE). There respondents were asked to report the presence of a set of stressful events over the prior 24 hours on eight contiguous days (Wethington and Almeida, Chapter 6). The goal of the project was to record the incidence of stressful events in daily life and extent of stress in each episode, not the elapsed time of the stressful event. Given the panel nature of the approach the time path of stressors and well-being can be assessed. Here we ignore the potential risk of respondent burden and refusals.

References

- Belli, Robert F., William P. Shay and Frank P. Stafford. 2001. "Event History Calendar and Question List Survey Interviewing Methods: A Direct Comparison." *Public Opinion Quarterly* 65: 45-74.
- Bianchi, Suzanne M., Melissa A. Milkie, Liana C. Sayer and John P. Robinson. 2000. "Is Anyone Doing Housework? Trends in the Gender Division of Household Labor," *Social Forces* 79: 191-228.
- Bittman, Michael and Judy Wacjman. 2000. "The Rush Hour: The Character of Leisure Time and Gender Equity," *Social Forces* 79:165-89.
- Carlstein, Tommy. 1978, "A Time-Geographic Approach to Time Allocation and Socio-ecological Systems" Pp. 100-11 in *Public Policy in Temporal Perspective*, edited by William M. Michelson. The Hague: Mouton.
- Csikszentmihalyi, Mihalyi and Isabella S. Csikszentmihalyi. 1988. *Optimal Experience: Psychological Studies in Flow of Consciousness*. Cambridge. Cambridge University Press.
- Csikszentmihalyi, Mihalyi and Reed Larson. 1992. "Validity and Reliability of the Experience Sampling Method." Pp. 43-57 in *The Experience of Psychopathology: Investigating Mental Disorders in Their Natural Settings*, edited by Martin W. de Vries. Cambridge: Cambridge University Press.
- de Vries, Marten W. 1992. "The Experience of Psychopathology in Natural Settings: Introduction and Illustration of Variables." Pp. 3-16 in *The Experience of*

Psychopathology: Investigating Mental Disorders in Their Natural Settings edited by Martin W. de Vries. Cambridge: Cambridge University Press.

Frazis, Haley and Jay Stewart, "What Do Male Nonworkers Do? Evidence from the American Time Use Survey," working paper, U.S. Department of Labor, Bureau of Labor Statistics, November 2005.

Gershuny, Jonathan. 2000. *Changing Times: Work and Leisure in Postindustrial Society*, Oxford. Oxford University Press.

Hallberg, Daniel, and N. Anders Klevmarcken. 2003. "Time for Children: A Study of Parents' Time Allocation." *Journal of Population Economics* 16:205-26.

Hamermesh, Daniel. 2002. "Routine." Working paper, Department of Economics, University of Texas.

Hill, Martha. 1985. "Investments of Time in Houses and Durables." Pp. 205-43 in *Time Goods and Well-Being*, edited by F. Thomas Juster and Frank P. Stafford. Ann Arbor: Institute for Social Research.

Hofferth, Sandra. 1999. "Family Reading to Young Children: Social Desirability and Cultural Biases in Reporting." Paper presented at the National Research Council Workshop on Measurement and Research on Time Use, Committee on National Statistics, Washington, D.C.

Hofferth, Sandra and Jack Sandberg. 2001. "How American Children Spend Their Time." *Journal of Marriage and the Family* 63: 295-308.

- Juster, F. Thomas. 1985. "The Validity and Quality of Time Use Estimates Obtained from Recall Diaries." Pp. 63-91 in *Time Goods and Well-Being*, edited by F. Thomas Juster and Frank P. Stafford. Ann Arbor: Institute for Social Research.
- Juster, F. Thomas and Stafford, Frank. 1991. "The Allocation of Time: Empirical Findings, Behavioral Models, and Problems of Measurement." *Journal of Economic Literature* 29: 471- 522.
- Kalton, Graham. 1985. "Sample Design Issues in Time Dairy Studies." Pp. 93-112 in *Time Goods and Well-Being*, edited by F. Thomas Juster and Frank P. Stafford. Ann Arbor: Institute for Social Research.
- Killingsworth, Mark R. and James J. Heckman. 1986. "Female Labor Supply: A Survey." Pp. 103-204 in *Handbook of Labor Economics: Volume I*, edited by Orley C. Ashenfelter and Richard Layard. Amsterdam. North-Holland Publishers.
- National Academy of Sciences. 2000. *Time-Use Measurement and Research*. Washington, D.C.: National Academy Press.
- National Academy of Sciences. 2005. Satellite Accounts need reference.
- Putnam, Robert D. 2001. *Bowling Alone: The Collapse and Revival of American Community*. New York. Simon and Shuster.
- Roberts, Donald F 2000. "Media and Youth: Access, Exposure, and Privatization," *Journal of Adolescent Health*, Vol. 27, p. 8-14.
- Robinson, John P. 1985. "The Validity and Reliability of Diaries Versus Alternative Time Use Measures." Pp. 33-62 in *Time Goods and Well-Being*, edited by F. Thomas Juster and Frank P. Stafford. Ann Arbor: Institute for Social Research.

Robinson John P. and Ann Bostrom. 1994. "The Overestimated Workweek? What Time Diary Measures Suggest." *Monthly Labor Review* 117: 11-23.

Schneider, Barbara L. and David Stevenson. *The Ambitious Generation*. New Haven, CT: Yale University Press, 1999.

Stafford, Frank P., "Organizational Theory and the Nature of Jobs," Journal of Institutional and Theoretical Economics, December, 1987.

Stafford, Frank P. and Greg J. Duncan, 1985 "The Use of Time and Technology in the United States." Pp. 245-88 in *Time Goods and Well-Being*, edited by F. Thomas Juster and Frank P. Stafford. Ann Arbor: Institute for Social Research.

Stafford, Frank P. and Sundström, Marianne. 1996. "Time Out for Child Care: Signalling and Earnings Rebound Effects for Men and Women." *Labour* 10: 609-29.

Szalai, Alexander. 1972. "Design Specifications for the Surveys." Pp. 31-41 in *The Use of Time*, edited by Alexander Szlai. The Hague: Mouton.

Timmer, Susan G., Jacquelynne Eccles and Kerth Obrien. 1985. "How Children Use Time." Pp. 353-82 in *Time Goods and Well-Being*, edited by F. Thomas Juster and Frank P. Stafford. Ann Arbor: Institute for Social Research.

Yeung, W. Jean, Jack Sandberg, Pamela Davis-Kean and Sandra L. Hofferth. 2001. "Children's Time-use with Fathers in Intact Families." *Journal of Marriage and the Family*.

Table 1: Time Children Spend Directly Interacting with Biological or Adoptive

Parents, by Family Type

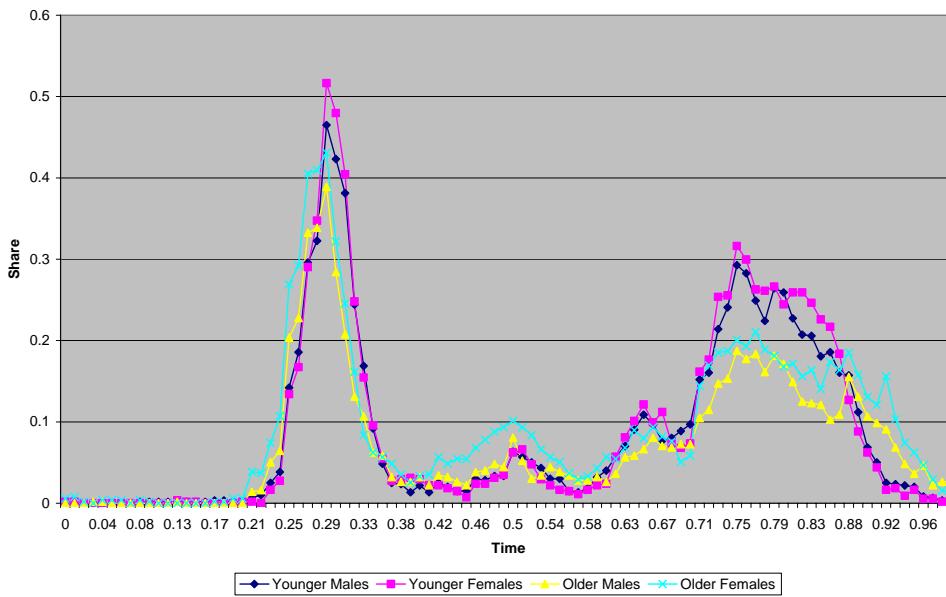
Deleted: **Parents,**
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A Weekday	A Weekend Day
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	Intact Families	Single-mom fam.	Single-dad fam.	Other	Intact families	Single-mom fam.	Single-dad fam.	Other
Total Time	2:15	1:01	1:07	0:54	4:42	1:57	1:30	1:40
With both parents	0:51	0:03	0:02	0:07	2:46	0:13	0:07	0:22
With mom only	1:01	0:56	0:03	0:45	1:13	1:36	0:00	1:12
With dad only	0:23	0:02	1:02	0:02	0:43	0:08	1:23	0:06

Deleted: Total Time¶ [1]

Personal Care, Weekday, by Sex



Education and Training, Week-end, by Race

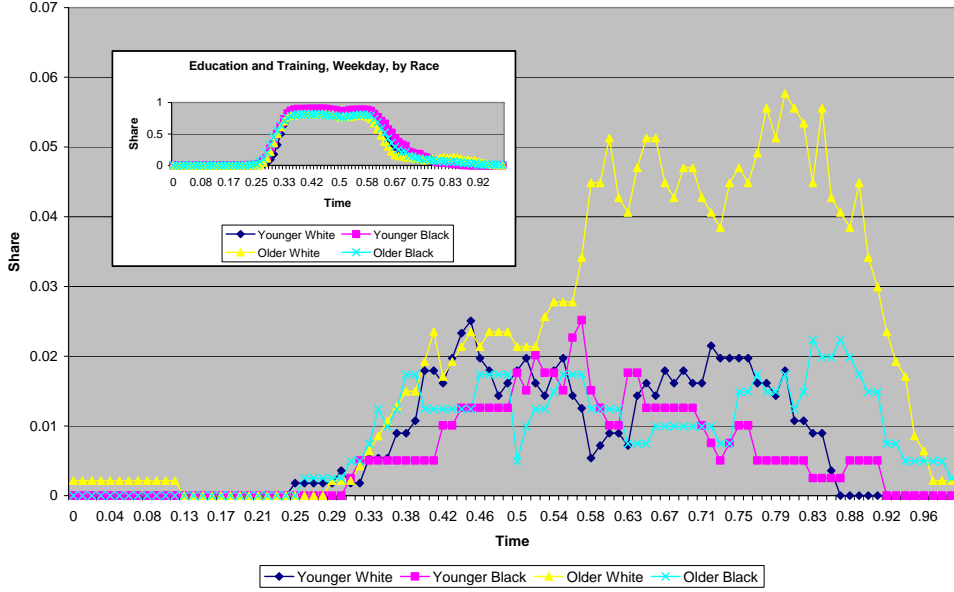


Figure 2

Fraction of Sample Not Transitioning

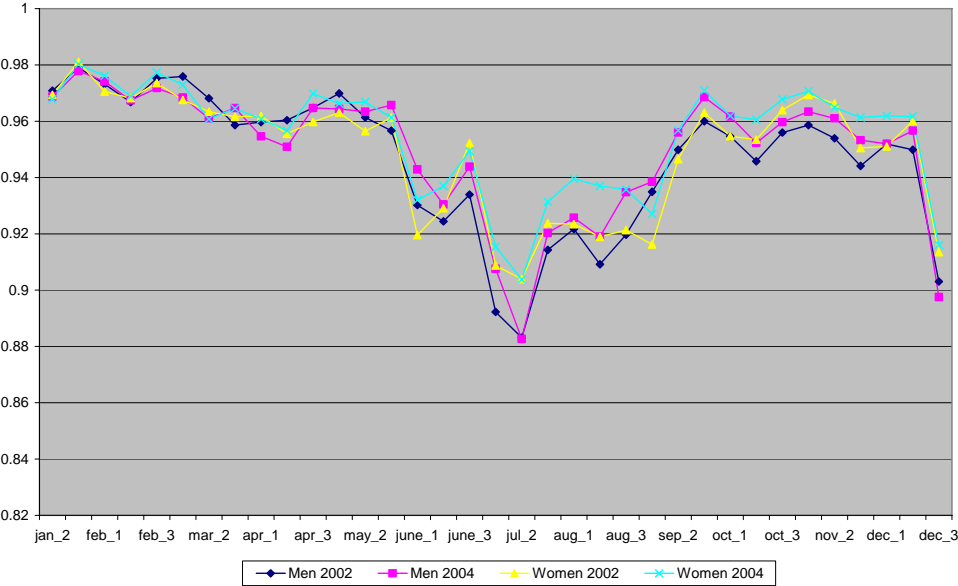


Figure 3

Total Time	2:05	1:01	1:07	0:54	4:42	1:57	1:30	1:40
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