EXPLORING NEW GROUND FOR USING THE MULTINATIONAL TIME USE STUDY

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ABSTRACT

This paper explores recent changes in the Multinational Time Use Study, which has harmonised time diary data from twenty-four countries collected from the 1960s through the 1990s. The paper addresses the processes of harmonising variables across countries, considering the development of common activity, background, and context categories, the placement of activities in time, the future incorporation of sequence data, the reconciling of effects of variations in study design, and file access and distribution issues. The paper then explores new potential uses of the MTUS, concentrating on three of the many emerging applications: integrating time diary data with other records; tracking the changing behaviour of older people; and evaluating the effects of health interventions for chronic illnesses.

NON-TECHNICAL SUMMARY

This paper discusses efforts to create a harmonised file of information about the ways in which people have spent their time in twenty-four countries in various studies conducted since the 1960s. The Multinational Time Use Study draws on information collected when people were asked to keep a time diary, that is, to record what they were doing during the day and when they started and stopped each activity. Completing a time diary is a tedious process, and people who can be persuaded to keep a diary often only will provide a small amount of additional information. Studies collected in different countries and/or at different points in time gathered a wide variation of extra information. This paper discusses efforts to find common ground between the studies to permit direct comparison of the findings. The paper then explores three of the many potential future applications of the MTUS: integrating time diary data with other records; tracking the changing behaviour of older people; and evaluating the effects of health interventions for chronic illnesses.

EXPLORING NEW GROUND FOR USING THE MULTINATIONAL TIME USE STUDY[1]

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From the early years of the Twentieth Century, time diary research has become an increasingly common method for examining behaviour and social change. Time diary data can illuminate how households distribute paid and unpaid work tasks among members; how patterns of leisure and paid work activities change over the years; how individuals and communities fit the care of young children, frail elderly people, the severely disabled, or pets into the routines of daily life; the proportion of time people spend performing physically demanding tasks; the amount of time people are exposed to hazards; or when and how people use technology - to name but a few of the applications of this method. By the year 2000, more than 400 time diary studies had been conducted in 82 countries (more detail appears in Table 1).

The groundwork for significant comparative time use research has been laid. Indeed, five initiatives have sought to harmonise time diary studies to permit cross-national comparison. The first multinational time budget study was co-ordinated by Alexander Szalai (1972) in the 1960s. Twelve countries in Europe, North American and South America conducted studies following a harmonised methodology in 1965 and 1966, with additional countries adopting the Szalai methodology in later studies. The International Association of Time Use Research (IATUR http://www.stmarys.ca/partners/IATUR), founded at the 1970 meeting of the International Sociological Association, maintains a web site of time use research and hosts annual conferences to facilitate co-operation among time diary researchers. The United Nations Statistical Division (http://www.un.org/depts/unsd/timeuse/inter.htm) has developed harmonised time use activity coding scheme, and the International Labor Organization has initiated a call for the consideration of an alternative strategy for such classifications (international, regional or national) (Hoffmann and Greenwood 1999). EUROSTAT and members of the time diary teams of the national

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statistical agencies in many EU countries have developed a European Harmonised Time Diary Project to standardise the data collection and coding process across Europe (Eurostat 1997; Rydenstam and Wadeskog 1998; Österberg 1998).

Table 1. Countries Which Have Conducted Time Diary Studies By Number Of Studies

Number	Countries			
20+ studies	*France* *United States*	*Great Britain*	*Japan*	*Russia / USSR*
6-19 studies	*Australia* *Canada* India Republic of Korea	*Belgium* *Denmark* *Italy* Spain	Brazil *Germany(E/W/United)* *Netherlands* Sweden	*Bulgaria* *Hungary* *Poland*
1-5 studies	Albania Botswana China Dominican Republic Gambia Indonesia Laos Macedonia Mongolia Nicaragua Pakistan Philippines Saudi Arabia *Switzerland* Uganda	Austria Burkina Faso Cote D'Ivoire Ecuador Greece Ireland Latvia Malaysia Morocco Nigeria Palestine Portugal Slovak Republic Tanzania Vietnam	Bangladesh Chad Cuba Estonia Guatemala Israel Lithuania Mali Nepal *Norway* Papua New Guinea Romania Slovenia Thailand Yugoslavia	Benin Chile Czechoslovakia *Finland* Honduras Kenya Luxembourg Mexico New Zealand Oman Peru Rwanda South Africa Turkey Zimbabwe

Countries in *italics* have time use studies in three or more decades.

Many time diary studies, however, have not followed the initiatives to standardise data collection. Additionally, the recommendations made by IATUR and Eurostat have changed over time (Österberg 1998, Harvey, 1988, Harvey, 1999). This is not to say that direct comparison of divergent time use data sets is impossible, however. The Multinational Time Use Study (MTUS, http://www.iser.essex.ac.uk/mtus), initiated in the 1980s[2] by Jonathan Gershuny (then at the University of Bath), has created a time use database covering studies conducted between 1961 and 1998. Three teams in the UK, Canada, and Australia now work on the MTUS. The creation

[2] The European Foundation for the Improvement of Living and Working Conditions funded the initial phase of the MTUS.

of this database, however, has involved a complex process of reconciling the not inconsiderable variation between the studies. The new common data file, “WORLD5.5”, contains 50 national sample surveys from 24 countries in all (detailed later in Table 5), with surveys at multiple time points from 12 countries. It will represent nearly one-fourth of the developed world surveys of this type. This paper addresses the processes by which these data sets have been harmonised, the strategies used to address implications of variations between survey designs, and the emerging uses of the data.

1 METHODOLOGICAL ISSUES IN HARMONISING TIME DIARY DATA

The World 5.5 data set of the MTUS provides aggregated totals of minutes spent performing each of 40 activities over the 1440 minutes of a single day, along with basic demographic details, weights to balance the samples in proportion to country size, population characteristics, and number of diaries completed in each study and weights to correct for imbalances in the production of diaries across the different days of the week. The data set thus permits comparison of how people spent their days across time as well as across country. Creating such a data set, however, requires a number of methodological decisions. Due to the financial restrictions of the original project, the early versions of the MTUS achieved a minimum set of comparative standards. The subsequent discussion both highlights the choices which were made, and shortcomings of these choices which will be addressed in future versions of the MTUS.

1.1 Defining Activities

Two issues arise in the process of defining activities. The first matter is deciding which categories of activities to use. Two general strategies have been adopted to capture information about what people do during the day. One approach involves asking diarists to describe their activities in their own words. The other approach involves presenting diarists with a pre-coded list of activities and asking them to nominate the category of activity which they were doing at any particular point in time. The first approach requires translating the natural language into

categories for recording in data files. When a project harmonising time use studies conducted in different languages is undertaken, it is much easier to harmonise categories rather than to harmonise free text. The MTUS project has proceeded from the activity categories developed in the Szalai survey (which have greatly influenced subsequent research).

Table 2. The Minimal (20/22 Category) Classification In The World 5.5 File

PAIDETC	Paid work & education	DTRAVEL	Domestic-related travel
EDUC*	All education	OTRAVEL	Other non-work travel
HWORK	Routine housework	WALKING	Walking
KIDCARE	Child care	ASPORTS	Active sporting activity
SHOPPING	Shopping (all sorts)	SPECTAT	Spectator at leisure event
ODDJOBS	Non-routine domestic work	PUBCLUBS	At pubs, clubs
COOKING	Food preparation, cooking	HOBBIES	Other at-home leisure
EATING	Meals and snacks	READING	Reading books, papers, etc.
EATOUT	Eating out	CHATSETC	Talking, relaxing
PERSCARE	Personal care activities	VISITS	Visiting or entertaining friends
MEDICAL**	Personal medical care	TVRAD	TV, radio, electronic media

* *EDUC also included in PAIDETC*

** *For general analysis, MEDICAL is best combined with PERSCARE (since some studies do not distinguish these).*

Though most category harmonisation has been straight-forward, three problems have emerged. In a limited number of cases (a study in the UK in 1995, and studies in Denmark in 1964 and 1987), diaries have included a very limited pre-coded activity list. While one can collapse more detailed activity classifications into more general categories, one cannot break down categories which start at the general level.[3] The World 5.5 file thus includes two activity lists: a minimal list containing 20/22 activities which covers all studies, and a 40-category activity list which leaves out the studies with the limited category classifications (see Tables 2 and 3). For the three studies with the limited pre-coded activities, the out-of-home leisure activities are not fully distinguished, leaving the validity of the pubs and clubs category in some doubt. Similarly, though many the surveys record mode of travel, most do not record the purpose of travel episodes. Thus, in many cases the purpose of a journey was estimated from the activity

[3] At least, one cannot fully disaggregate. When contextual information, such as who else is present, what else people are doing at the same time, where activities take place, and so forth, is included in the data file, it can be possible to make informed estimations that allow partial disaggregation.

or activities which followed the conclusion of the journey. If work follows from within a half hour of the end of a journey, the journey is assumed to relate to travel to work (coded in work and education in the 20/22 category scheme). When out-of-home leisure activities occur within a half hour of the conclusion of a travel episode, the travel purpose is recorded as related to leisure. In other circumstances, the journey is defined as domestic-related travel.

Table 3. The 40 Category Classification In The World 5.5 File

AV1	Paid work not at home	AV21	Walks
AV2	Paid work at home	AV22	Religious activities
AV3	Second job	AV23	Civic duties
AV4	School/classes	AV24	At the cinema, theatre
AV5	Travel to/from work	AV25	At dances, parties
AV6	Cooking, washing up	AV26	At a social club
AV7	Housework	AV27	At a pub/bar
AV8	Odd jobs	AV28	At a restaurant
AV9	Gardening, care of pets	AV29	Visiting friends
AV10	Shopping	AV30	Listening to radio
AV11	Child care	AV31	Television, video
AV12	Domestic travel	AV32	Listening to tapes etc.
AV13	Dressing/toilet	AV33	Study
AV14	Personal services	AV34	Reading books
AV15	Meals, snacks	AV35	Reading papers, magazines
AV16	Sleep	AV36	Relaxing
AV17	Leisure travel	AV37	Conversation
AV18	Excursions	AV38	Entertaining friends
AV19	Active sport	AV39	Knitting, sewing etc.
AV20	Passive sport	AV40	Other hobbies and pastimes

Most uses of the MTUS data have compared time spent on unpaid work versus paid work, and the problematic areas have generally receded into the vacuum of other activities in which the researchers have had no interest. This is not to minimise the importance of these problems, but rather to highlight areas for which the MTUS data set as it presently exists is less useful as a research tool. Though some further detail can be added to the existing data set, the older studies do not facilitate a more detailed coding of activities. Activity categories, however, are the subject of considerable debate within the time diary research community, with particular calls to open up the black box of work by collecting more detail about what people do while they earn their livings (Mata-Greenwood, 2000; *Report*, 1999). Data sets collected from the late 1990s onward

will permit more sophisticated categories to be included in harmonised files, but comparability with older studies will remain constrained by the existing categorisations schemes.

A second dimension of activity definition revolves around whether and how to consider secondary activities. People often do more than one thing at the same time, though a single activity tends to command more of a person's attention than others at any given moment (Gershuny 2000). Some time diary studies ask people to list all activities in which they engage over a particular period (of 10 minutes to half an hour) without distinguishing the main activity, [4] while others ask people to nominate only their main activity at any given point.[5] Most recent time diary studies have asked people to nominate both their main and their secondary activities. Diaries that do not distinguish main from secondary activities can give an indication of the relative proportion of the day which people devote to a particular activity (like listening to the radio) and of the times of day when different groups perform this activity, but such studies do not facilitate analysis of the whole day. If the time spent doing each activity recorded in the diary is summed, people appear to be doing things for more than 24 hours in the day, which they cannot do. In consequence, studies of this nature have not been included in the MTUS.

As some studies do not include secondary activities, and for practical reasons (budget, staff and research time constraints), the MTUS versions thus far have included only primary activities (Table 5 indicates which studies recorded secondary activities and which did not). Secondary activity data, however, reveals significant information about the patterning of peoples' days. Some activities provide qualitatively different experiences for people depending on whether they are done in isolation or in conjunction with something else. Stretching out on the sofa and closing your eyes to listen to a new CD and listening to the same CD while commuting to work are not the same activity, though both would be recorded as the same activity if only the main activity is collected in the diary. Indeed, some activities, such a looking after children, are often secondary activities. Parents regularly clean the house, cook, work in the garden, talk on the phone or even perform paid work activities while keeping an eye on the children. Missing out

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[4] A number of studies sponsored by the BBC in the UK, and the media group NHK in Japan have followed this approach. The organisers of these studies maintain that people are more likely to record the full extent of their television viewing if they do not have to distinguish main activities.

[5] A study of men with spinal cord injuries in Canada in 1997, the Canadian national study in 1998, the last national East German time diary study in 1990, and a number of "etude des

secondary activities results in the under-reporting of such activities.[6] Equally significantly, excluding secondary activity information can produce misleading research results. In Australia, for example, women and men enjoy comparable minutes in the average day doing leisure activities; however, men enjoy considerably more pure leisure time (only doing one leisure activity or simultaneously doing multiple leisure activities, like drinking beer while playing a card game and socialising with friends), while women's leisure is more likely to be fitted around paid and unpaid work (such as reading while riding the bus to work or while watching the children) (Bittman and Wajcman, 1999). For this reason, future versions of the MTUS will include secondary activities coded in the same manner as main activities are presently coded in the data set, but with qualifications. Studies which do not include secondary activities could not be analysed in conjunction with studies which do collect such information. In the case of the studies in Finland in 1979 and 1987, secondary activity information is coded with a much more restricted frame than main activities, and could not be translated into either the 20/22 activity or 40 activity code list. Further testing of the data will be needed to determine whether the early Finish secondary activity data can be included (as people tend to perform a more restricted range of activities alongside their main activity), or whether these studies will need to be treated as studies without secondary activity data.

1.2 Activities In Time

Four issues of timing emerge in the process of harmonising the data files. The first problem relates to the timing of the administration of the diary instrument. Some surveys collect data over a calendar day (midnight to midnight – including the Australian national studies), while others collect data over a 24 hour period which spans calendar days – typically, this means starting at 04:00 and ending at 03:59 on the following day (such as most recent Canadian and European studies). The rational for starting a diary at 04:00 is that a majority of the population sleeps at this hour, permitting the tracking of time use from a point where most people are doing the same

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emplois du temps" studies conducted by the Institut National de la Statistique et des Estudes Economiques in France from the 1970s through 1980s provide some examples.

thing (Harvey et. al., 2000). A related second problem is that four older studies, the BBC studies in the UK in 1961 and 1974/75, the Denmark study in 1964, and the Canadian 1981 study, did not collect data for the full 24 hour period, and started diaries between the hours of 04:00 and 06:00, and ended diaries between 24:00 and 02:00 on the following day. The designers of these studies assumed that most people were asleep in the hours in which data was not collected. Some of the older studies in the World 5.5 file carry this assumption, and the original analysts added in sleep time to bring these diaries up to a level of 1440 minutes (24 hours). In practice, this decision has not proved too problematic. Comparison of sleeping habits between the studies with the added hours of sleep and studies which actually collected a full 24 hours of data indicates that total sleeping time has remained roughly consistent across the last century, and that most people were sleeping during the hours in question in other studies conducted in the same countries (Gershuny, 2000). The growing prevalence of surfing the internet and other activities which people might perform at any time of day make such a practice dubious in the current context, however, and recent time diary studies will only be included in the future if they cover a full 24 hour period. In the past, the MTUS has avoided problems resulting from differential diary starting times by producing only an aggregated file recording the total time spent in each of the 20/22 and 40 activity codes over a 24 hour period. In the future, when the sequencing of activities is included, we will test the implications of wrapping the less common 00:00 – 24:00 diaries, so that the activities which occur at the very beginning of the diary (00:00-03:59) get moved to the end of the diary record, following 24:00.

The third problem relates to the way time is recorded in diaries. Some studies (including the Szalai 1965 studies and the recent Canadian studies) ask respondents to nominate starting and ending times of activities. The alternative approach involves presenting respondents with a grid of time slots of a set length (varying between ½ hour slots for the BBC studies in the UK in 1961 and 1974/75) to five minutes slots (Australia 1992 and 1997, France 1975, and Germany 1992). With the time slot approach, respondents are asked to identify their main (and in many cases secondary) activity from 04:05-04:10, then from 04:10-04:15, and so forth. Diarists record fewer activities in diaries with longer fixed time slots longer (Gershuny, 2000), and for this reason more recent time diary studies tend to use ten or five minute slots, or respondent nominated starting

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[6] For this reason, the European Harmonised Time Diary and IATUR guidelines recommend that both main and secondary activity data be collected.

and ending times (Harvey, 1999). Nevertheless, open-time units and small time slot studies produce comparable numbers of reported activities (Harvey, 1988, 1999). In practice, diarists in the open-time period studies tend not to report activities last for 2 ½ minutes or 24 ¼ minutes, but rather round up or down to the nearest 5 minute to ¼ hour period. MTUS users are warned of the potential problems of comparability with the oldest studies that used the half hour time slots. Otherwise, the current version of the data file avoids comparability problems by presenting the aggregated time spent in each of the general categories of activity for the full day.

When the sequencing of activities is added to a future version of the data file, the varying methods of recording time will raise complications. Most of these, however, are easily resolved. All diaries with fixed time slots have used slots which are divisible by 5, with the smallest slots covering five minutes. The harmonisation process would require recording the five minute studies as they are, and breaking down the larger fixed units into five minute intervals, recording the primary activity reported once in a 15 minute interval three times in three consecutive five minute intervals. A five minute interval structure is also relatively easy to impose on the respondent nominated starting and stopping time diaries, though rules for handling the odd cases where people reported activities ending in a time period not divisible by five would need to be developed.

Table 4. Main Activities In One Diary Collected In The 1998 Canadian Study

	Coding from the Canadian Study	MTUS Code
04:00 - 09:00	Night sleep/essential sleep	AV16 Sleep
09:00 - 09:15	Washing and dressing	AV13 Dressing/toilet
09:15 - 09:30	Meal preparation	AV6 Cooking/washing up
09:30 - 10:00	Exterior maintenance and repair	AV8 Odd jobs
10:00 - 11:00	Grocery shopping	AV10 Shopping
11:00 - 11:30	Meals at home	AV15 Meals/snacks
11:30 - 13:30	Travel (active sports)	AV17 Leisure travel
13:30 - 15:00	Travel (active sports)	AV17 Leisure travel
15:00 - 17:30	Travel (active sports)	AV17 Leisure travel
17:30 - 19:00	Travel (other active leisure)	AV17 Leisure travel
19:00 - 19:30	Domestic travel	AV12 Domestic travel
19:30 - 20:30	Indoor cleaning	AV7 Housework
20:30 - 23:00	Watching T.V.	AV31 TV/radio
23:00 - 04:00	Night sleep/essential sleep	AV16 Sleep

A fourth timing issue arises in relation to future plans to incorporate the sequencing of activities. The activities would be harmonised into the existing codes then presented in temporal sequence. Problems can arise, however, when a diarist's record leaves ambiguity about transitions between one activity and the next. Table 4 gives an example of such a diary.

This individual perceived doing 14 principal activities over the course of the diary day, but found the Canadian codes for activities lacked sufficient detail to mark the transitions between the different leisure/sports/travel activities (though this person likely left out some activities, as it is unlikely that this person engaged in 7 ½ hours of active sports with no rest breaks followed by no bathing activities). From the perspective of the researcher, however, the distinction between the phases of an iron man competition (running a marathon, swimming a ¼ marathon, and cycling four marathons) or between cooking bread followed by cooking pastries may not be relevant. The validity and reliability of time diary research relies on the systematising of activity coding at an aggregated level, and for research purposes, active sports are active sports and cooking is cooking. The question of how many activities different people perceive they do on different days would be ascertained by a different research design. The Table 4 case, however, highlights a lingering problem. In the original Canadian codes, this person completed 12 activities, whereas in the MTUS harmonised codes, this person completed only 11 distinct activities. Achieving harmonised coding of activities requires reducing to a low (if not the lowest) common denominator. As with the categorisation of activities, the harmonisation of sequenced data would require the collapse of the respondent's perceptions of activity change into a minimal format, which in this case would be 11 activities.

Including sequence data in a future version of the data file will also require an adjustment of the way data from the week-long studies from the Netherlands and the UK are included. Rather than combining the week-long data into a pseudo "typical" day, the data file will either randomly select a day of the week for each respondent or treat the diary for each day as though it were completed by a separate respondent.

1.3 Context Variables

People do not perform actions in a vacuum. What people do, how long they do things and the way in which they do things can be influenced by both the environment in which they are located

and the behaviour (or even presence) of other people (Harvey and Spinney 2000). Knowing information about the context in which activities take place can enrich the interpretation of time diary research results (Harvey and Spinney, 2000). Many time diary studies collect at least some basic contextual information, including location of the activity, who else is present, for whom an activity is performed, and whether a respondent was paid or received comparable compensation for performing the activity. Location and who else is present variables are most common, and these two variables are in the process of being incorporated into the study. As with the activity categories, however, the detail on the context variables spans a range from minimal (at home/not at home in the UK 1961 study) to detailed 30 or 40 category schemes. Where possible, the MTUS will include a location distinction between at home, at work, at school, at other peoples' homes, and elsewhere. In addition, when it is possible, the MTUS will mark whether diarists are alone, around children, around adults who are friends or family, around children and adult friends or family members, or around other adults. Knowing if children are present while people perform an activity can help identify instances of passive child care which people may not choose to record in a diary. Table 5 indicates which studies in the MTUS have location and who else is present context variables.

1.4 Background Variables

As more background information is known about the diarists, the potential sophistication of the analysis which can be performed increases. However, researchers seeking to maximise response rates will not wish to antagonise potential diarists by adding too substantial a questionnaire to their already onerous task. In addition, collecting minimal background detail also helps assure respondents' anonymity, as it is far more difficult to identify people by patterns of behaviours than by their personal characteristics. The background detail collected in each survey varies considerably, depending on each survey's primary analytic aims and available funding. Fortunately, some basic demographic variables are almost always recorded (Gershuny, 2000). Few worthwhile surveys fail to include basic distinctions by sex, age, civic status (whether or not the diarist lives in a couple), employment status (full-time, part-time or not employed), educational achievement (has not completed secondary education, secondary education, a

Table 5. Context Variables & Secondary Activities In Studies Included In The MTUS

Country	Year of Field Work	Secondary Activities	Location	Who Else Is Present
Australia*	1974	Yes	Yes	Yes
Australia	1987	Yes	Yes	Yes
Australia	1992	Yes	Yes	Yes
Australia	1997	Yes	Yes	Yes
Austria	1992	Yes	Yes	Yes
Bulgaria+	1965	Yes	Yes	Yes
Bulgaria	1988	Yes	Yes	Yes
Canada*	1971	Yes	Yes	Yes
Canada	1981	Yes	Yes	Yes
Canada	1986	Yes	Yes	Yes
Canada	1992	Yes	Yes	Yes
Canada	1998	No	Yes	Yes
Denmark	1964	TV/Radio	Yes	No
Denmark	1987	TV/Radio	Yes	No
Finland	1979	Yes	Yes	Yes
Finland	1987	Yes	Yes	Yes
France+	1965	Yes	Yes	Yes
France	1974/75	Yes	Yes	Yes
Germany	1991/92	Yes	Yes	Yes
Hungary+	1965	Yes	Yes	Yes
Hungary	1976/77	Yes	Yes	Yes
Hungary	1986/87	Yes	Yes	Yes
Israel	1991/92	No	Yes	Yes
Italy	1979/80	Yes	Yes	Yes
Italy	1989	Yes	Yes	No
The Netherlands	1975	No	Yes	No
Netherlands	1980	No	Yes	No
Netherlands	1985	No	Yes	No
Netherlands	1990	No	Yes	No
Netherlands	1995	No	Yes	No
Norway	1971/72	Yes	Yes	No
Norway	1980/81	Yes	Yes	Yes
Norway	1990/91	Yes	Yes	Yes
Sweden	1990/91	Yes	Yes	Yes
UK	1961	Yes	Yes	No
UK	1974/75	Yes	Yes	No
UK	1983/84	Yes	Yes	Yes
UK	1987	Yes	Yes	Yes
UK	1995	No	No	No
USA+	1965	Yes	Yes	Yes
USA	1975/76	Yes	Yes	Yes
USA	1985	No	No	No
Other Szalai**	1965	Yes	Yes	Yes

+ Part of the original Szalai harmonised study.

* Followed the Szalai methodology at a later year.

** Belgium, Czechoslovakia, E. Germany, Peru, Poland, USSR, W. Germany, & Yugoslavia.

Table 6. Background Variables Not Available In The MTUS

Country	Year	Family Status	Civic Status	Household Type	Usual Work Hours	Been Unemployed	Income Bracket
Australia	74					missing	
Australia	87				missing		
Austria	92	partial[+]					missing
Bulgaria	88					missing	
Canada	71						missing
Canada	86				missing		
Denmark	64			missing			
Denmark	87			missing		missing	
Finland	79						missing
Finland	87						missing
France	66						missing
Hungary	65						missing
Hungary	76/7			missing	missing	[*]	missing
Hungary	86/7				missing	[*]	missing
Italy	79/80		missing	missing	missing		missing
Italy	89				missing		missing
Netherlands	75					missing	missing
Netherlands	80					missing	missing
Norway	71/2					missing	
Norway	80/1					missing	
Norway	90/1					missing	
UK	61		missing	missing		missing	missing
UK	74/5						missing
UK	83/4						missing
W Germany	65					missing	missing
Other Szalai	65						missing

[*] Hungary had no official unemployment at the time of these studies, and hence no variation on this variable.

[+]Austria collected diaries from people aged 10+, but the ages of younger children in the household are not recorded.

qualification higher than the secondary level), indicators of household composition (person under age 40 not living with children, person aged 40+ not living with children, living with at least one child aged <5, living with at least one child and all children aged 5+), and income strata (poorest 25%, middle 50%, richest 25%), as well as the date on which the diary was completed. Nevertheless, 29 of the 48 studies do not have one or more of five of these basic background variables (detailed in Table 6).

The education and income variables are the most difficult to co-ordinate for comparative analysis. Educational systems vary widely between countries, and can even change from survey

to survey in the same country. Currencies and purchasing power between countries can be equally hard to compare. Variations in variable specification and modes of data collection further compound the cross-national comparability of these variables. Some surveys assess the amount of cultural capital acquired by their respondents through completed years in school, others record the highest achieved qualification, and others collect the type of school the respondent last attended. Income variables sometimes record the individual's personal income, sometimes reflect the total income of the household to which he or she belongs, and sometimes only refer to earned income. In any event, almost all surveys then group the income figure, more or less broadly. The possibilities for confusion are considerable. However, the most important classificatory criteria are a respondent's level of income relative to others in that society, and educational attainment relative to completion of secondary schooling. In consequence, the education variable in the recent versions of the MTUS file follows the format of the UNESCO/OECD's most basic ISCED ranking of education standards in different countries (http://www.oecd.org//els/stats/edu_db/def_uoe2.htm) (Gershuny 2000). Future versions of the MTUS data file will also include variables indicating whether the diarist lives in an urban or a rural area, whether the diarist has a disability, and the general industry in which the respondent works.

1.5 Establishing Access To The Data Set

The accessibility of comparative data sets varies widely. At one extreme, any academic user can relatively easily gain access to the income equivalence files which compare changes in household and individual levels of income gained year on year by respondents to the long-running national household panel surveys in the United States (PSID) and Germany (SOEP), and more recently, Great Britain (BHPS). A researcher can gain access to the data files for the cost of transporting the data sets. At the other extreme, the harmonised format of the European Community Household Panel Study User's Database (ECHP-UDB), distributed by Eurostat, is available to academic users at a cost of 2,000 Euro per wave or 8,000 Euro for the first six waves. Data users have to register their intended uses with Eurostat, and send any prospective papers or publications to Eurostat for pre-approval before the paper may be presented or document

published if the paper or publication uses a data which has been released or re-released in improved format by Eurostat within the last six months.

The Multinational Time Use Study has aimed to make the harmonised time use data as freely available as possible. Users need to register for access, and sign an undertaking not to compromise the interests of the diarists or to attempt to identify any respondents, and to appropriately cite the original sources of the data sets as well as the MTUS project in publications. Once the undertaking is signed, most of the data is available for the cost of delivery.

Time diary studies entail high costs to conduct, and many are funded, at least in part, by national governments or the United Nations (though some large corporations have more recently sponsored time diary studies). The agencies which fund time diary research do not always have a tradition of sharing data freely, and many also must operate within legal constraints. In consequence, some additional restrictions have been instituted in order to maximise access potential. Prospective researchers need to produce research proposals for using the data and apply for separate permission to use the recent data from Australia and Canada and for all data from Finland and Sweden. Statistics Finland and Statistics Sweden grant access for limited periods, and researchers must sign an undertaking to either destroy the data set or re-apply for permission to continue to use the data as the period of permitted use comes to a close. The German 1992 is available for distribution only in the World 5.5 format. The main access limitation is that the harmonised file is currently only available in English, though future versions will likely include translations into other languages. These restrictions aside, the MTUS has accumulated data from a large number of countries into a format which allows the testing of a number of hypotheses for minimal hassle and cost. In this respect, the MTUS is one of the most widely accessible comparative data sets available to academic users.

1.6 Variations In The Scope Of The Studies

All the studies included in the MTUS strove to collect data for all days of the week. The scope of the studies vary in three respects, however. First, while many countries asked diarists to keep diaries for only one day, other studies, including Hungary (1976/77; 1986/87), the USA (1975/76), Sweden (1991), and Israel (1991/92), asked respondents to keep diaries for two or

more days.[7] In the cases of the Hungarian, USA, and Swedish studies (and minimal instances of multiple detailed diaries from Israeli respondents), each diary was treated as though it had been completed by a different respondent, and weighting procedures were used to correct for any subsequent demographic imbalances created by this decision. The five studies from the Netherlands and four of studies conducted in the UK covered a full week per respondent. For these nine studies, the data for the full week is summed and divided by seven, creating aggregates for a typical day. Potential "design effect" consequences of these decision have been ignored.

Second, the timing of the recording of activities varies. In some studies, respondents are warned that they have been randomly selected to participate in a time diary study, then are interviewed about the activities in which they engaged on the previous day. The other approach involves persuading people to participate in the study, then leaving a diary with them for completion during a future, designated diary day. While the diaries kept on the same day as the recorded activities take place have tended to pick up more activities, response rates to this design can be lower and diary entries more inaccurate (Robinson and Godbey 1997, Kalfs 1993). Further, people who experienced difficulty writing (particularly disabled and elderly people) were more likely to complete the what I did yesterday diaries rather than to record activities as they were performed (Robinson and Godbey 1997, Kalfs 1993). The benefits and disadvantages of the two forms of data collection can counter-balance each other (Harvey, 1999; 1988), and such differences are merely noted in the documentation produced by the MTUS team.

Third, the age ranges of the samples in the original studies vary considerably. The early through present versions of the MTUS data set restricted the file to a minimal age range of adults in their "working-years" (aged 20 to 60) as many studies conducted in the 1960s and the 1970s restricted their samples to this age range. More recent time diary studies tend to draw samples

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[7] The Hungarian 1976/77, Hungarian 86/87 and USA 1975/76 studies asked people to complete four time diaries, one diary in each season (though the number of people who responded dropped from season to season in the US study). The Israeli 1991/92 study primarily collected two diaries from people. The first diary was a what did you do yesterday diary completed with the assistance of the interviewer to make the diary-keeping process clear to the diarist. The main diary used in analysis by the Israeli researchers was then left behind with the respondent for completion on a later appointed date. A small number of people in the Israeli study completed two or three diaries at later dates, though the multiple diarists tended to complete an additional diary if they could not record much detail in one of the previous diaries on account of being "out of scope" – which mainly meant performing military service. The Swedish study only asked respondents to complete two diaries.

that include adolescents and impose no maximum age restrictions. Indeed, some Italian surveys including diaries from all household members aged 3 and above. Though the current World 5.5 data set retains the restricted age range (as it allows for the widest comparability across the studies), future re-releases will provide the full age range from each study in the data file - with a qualification advising users to restrict analysis of activities of the young and the old to studies for which the data are available.

1.7 Weighting To Produce Comparable National Samples

A four stage weighting process has been developed to facilitate different forms of cross-national comparison. Ideally, a representative time use survey would allow all days of the year to have an equal probability of selection for each respondent. In practice, people tend either not to be contactable or to be unwilling to complete diaries on religious or public holidays, special occasions, or while they are travelling. Consequently, surveys tend either to seek to adequately represent each season of the year, or to represent simply a single season (though in the case of Finland, efforts have been made to represent each day of the year). There is no general attempt to deal with this problem of seasonal representativeness within the weighting system adopted here.[8]

Previous research has shown that the most important categorical factors relevant to explanations of variation in time use patterns, other than nationality and date, are sex, age, and employment status (Gershuny, 2000). In some cases, particularly in the recent studies, the data-collecting agencies have developed weights to correct for imbalances in the representation of people in each sex/age/employment status group. When such weights are available, they are incorporated at this first level of weighting.[9] When such original sample weights are not

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[8] A 1983/4 (winter season) study in the UK and the 1987 (summer season) UK study have been combined to produce the synthetic "1985" two-season study, and the 1974/5 (summer/winter) two-wave survey has been regarded as a single survey. By combining cases across seasons, we have produced data sets which approximate two-season samples for the UK.

[9] Some more recent national studies, including those conducted by Statistics Canada and Statistics Sweden, have adopted complex systems of weighting which account for many more factors than included in the first level weighting of the MTUS in its present form. In future versions of the MTUS, these more complex weights will be included in the data file, with explanations for users about the suitability of the different weighting options for different

available, national estimates for these demographic distributions published by the ILO are used to produce an *ex post* first level demographic weight.

Internal evidence shows substantial and systematic differences between the activities performed on different days of the week, and we have *a priori* reasons to expect systematic biases in daily responses (such as difficulties interviewing employed women on Saturdays when they are occupied with domestic chores). The second stage of weighting corrects for the over-representation or under-representation of each day of the week for each of the sex/age/employment status categories.[10] This second level of weighting is completed by combining the socio-demographic adjustment with the day of the week adjustment.

The third level of weighting adjusts for the considerable variation in survey sizes. To facilitate cross-national analyses, this level of weighting produces a constant 2000 cases per survey, thus preventing large surveys from overwhelming smaller surveys. This level of weighting serves the needs of researchers who are either comparing studies from the same country across different years of from different countries across similar time periods.

The fourth level of weighting produces the equivalent of 2000 cases per country, even though the number of surveys per country varies between one and five, so that countries with large numbers of surveys are not over-represented when the World 5.5 file is analysed as a whole (analysis which is most meaningful when applied to a subset of countries which conducted similar numbers of studies in similar time periods). The choice of producing the equivalent 2000 cases per survey or per country is not a totally arbitrary – this figure represents the size of the smallest surveys in the comparative data set. Nonetheless, 2000 is considerably below the median sample size. Estimates of the statistical significance in analyses of the World 5.5 file using the variables SEDWT3 and SEDWT4 are consequently extremely conservative (Table 6 displays the MTUS weighting variables). The general guidance for these is that SEDWT2 should be used where the analyst looks at individual surveys, SEDWT3 where the focus is on cross-time change

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investigations of the data. In most cases, the original weights of these more recent studies will prove preferable to the more crude estimations to which the MTUS team has had to resort with the older and unweighted studies.

[10] Cases in the Netherlands and UK surveys, which used whole-week diaries, are represented in the MTUS by figures for an "average day of the week", which did not need to be adjusted in this way.

in the same country or cross-national differences over a similar time period, and SEDWT4 for analysis is of the World 5.5 file as a whole.

TABLE 6. Weighting Variables In The MTUS

FIRST STAGE WEIGHTING	
SEXEMPWT	sex, age, employment from survey or ILO data
SECOND STAGE WEIGHTING	
DAYWT	Weight to adjust sexempwt to give equal days/week
SEDWT2	sexempwt * daywt
THIRD STAGE WEIGHTING	
SURVWT	Weight to get 2000 cases per survey (after sedwt2)
SEDWT3	sexempwt * daywt * survwt
FOURTH STAGE WEIGHTING	
COUNWT	Weight to get 2000 cases per country (after sedwt3)
SEDWT4	sedwt3 * counwt

1.8 Comparing Surveys Collected Using Disparate Methodologies

To construct one large comparative data set, we had to account for both the differences in sample sizes as well as the variations in response rates.[11] The generally accepted methodology for weighting cross-sectional surveys relies on accurate and detailed information about the nature of the original sample, and of the rates and types of response at each sample point. On the basis of adequate "*ex ante*" information it would be possible to compensate systematically wherever we find that sample points have relatively low response rates. However, in the MTUS we are

[11] Some time diary studies have produced notoriously low response rates, but reasonable response rate can be achieved. Six studies in the MTUS have response rates in excess of 95%, and 10 further studies have response rates higher than 85%. The Netherlands 1990 study has the worst showing in this regard – 49% of the original sample completed diaries, though as this study included a very detailed pre-coded activity list and asked respondents to complete diaries for a full week, respondent burden was particularly high in this case. 16 other studies have response rates between 50% and 69%, while the remainder have response rates between 70% and 85%.

undertaking a process of historical reconstruction of surveys that were in some cases collected more than four decades ago. In some cases, the sample information has not survived, or is unintelligible without the participation of those originally responsible for the sampling. In a few cases, the required information was never available (Gershuny 2000).

Bearing in mind all the methodological variations described above, comparison obviously presents problems. Our primary concerns are change over time and the differences between countries. How can we be certain that our findings show real differences at any point in time and real changes across time when there are such substantial methodological variations in the surveys? Ultimately, we cannot provide conclusive proof of the validity of our results, but their technical reliability can be tested, at least in part (Gershuny 2000). We suggest three approaches.

First, investigations by ourselves and others have looked at the impact of various diary design choices. Experiments comparing a range of methodologies (Robinson and Godbey, 1987; Kalfs 1993) have demonstrated the time diary's technical robustness, at least when time use is analysed in broad aggregate measures. So we feel cautiously confident in rejecting instrument design as a significant factor affecting aggregate time use.

Second, sampling differences can be minimised by reweighting. The high non-response rates and the relatively small samples often used in time use surveys as a consequence of budgetary constraints can lead to unacceptably biased samples, with various population subgroups under- or over-represented. Intra-survey analysis has been used to test which variables are associated with, and hence can be used to explain, variations in time use patterns. Where there is no association, sampling differences can simply be ignored. When associations are found, the sample can be weighted on an a priori basis to simulate the appropriate national population with respect to the relevant factors.

This approach is limited to items actually included in the data set. If a survey has failed to collect the necessary data, no adjustment can be made for that factor: an unsatisfactory situation. However, there are no serious omissions in the surveys in the MTUS. There are some minor irritants, for example the failure of the UK 1961 and 1974/75 surveys to determine marital status. More seriously, estimates of education and income vary from the highly detailed to the non-existent. Fortunately, analysis shows neither has much effect on time use patterns once other, more significant factors have been taken into account (Gershuny 2000).

The absence of systematic patterns in comparative analysis would not necessarily confirm or refute the validity of the exercise. However, if such patterns did emerge regularly, showing shared trends over time and between countries, or if models of the effects of sociological variables work consistently across countries, and we cannot produce a priori arguments which suggest that these similarities and continuities are artefacts of differences in the way the data were collected, then we can conclude that genuine underlying processes have been recorded in spite of the methodological differences among the surveys (Gershuny 2000). Nevertheless, we do concede that there is no way of measuring for the extent of lifestyle and temporary illness bias in non-response after the completion of a study. The MTUS approach should be seen as representing an effort to achieve a best available alternative rather than as a perfect solution.

This third line of argument is admittedly circular: in effect we justify our methods from our conclusions, and our conclusions from our methods. But, from a certain perspective, the results themselves *must* provide the strongest defence of our work. Much of science - and particularly all science operating at the edge of what is currently known - proceeds in just this manner. We use complex machines to detect elementary particles which cannot be observed except in these machines, and we identify the particles on the basis that they are detected in regular and continuous ways which conform to clearly articulated models of their occurrence; but because of their complexity, in the last analysis, we only have confidence that the machines are operating correctly because they reliably detect the particles in the circumstances that are predicted by the models.

Direct evaluation of the research instruments themselves does not necessarily provide the final assessment of the quality of the data. The important features are the patterns of evidence - the regularities and continuities of time use, and the theories of national differences and inter-temporal change - and we can construct these out of the data. The justification for comparison of disparate data sets is that comparison produces the often very clear and consistent, cross-sectional and longitudinal patterns of behaviour and change (Gershuny, 2000).

2 FUTURE USES OF THE MTUS

For the past two decades, the MTUS data base has primarily been used to examine sociological changes in household arrangements for the performance of housework and the care of children.

Considerable further uses of the data remain largely untapped. This section now briefly outlines three of these opportunities. These three avenues represent only a small fraction of the potential future applications of the MTUS data. The researchers working on this project will investigate many of these possibilities in addition to working on the areas now discussed in greater detail.

As data which has a clear attachment to dates and times, time diary data permits integration with other records which have not yet received the general attention of the social science community. A longitudinal time diary study being conducted by the Institute for Social and Economic Research at the University of Essex in the UK for British Telecom has linked the phone call records of the households participating in the study with the time diary data to permit examination of the behaviour which precedes and follows phone use, and well as to check the extent to which people report phoning behaviour in their diaries. Such commercially sensitive data is unlikely to find its way into the MTUS, but other forms of commonly available records collected in most countries could be linked to time diary data. Weather records and pollution indexes, if joined with time diary records, would offer the opportunity to examine how populations respond to climate change or variations in pollution levels, as examples.

As the full age ranges of the original studies are restored to the MTUS formats of these studies, the MTUS can be used to compare changing behaviours of older people (Gauthier and Smeeding 1999). This research area has gained increasing significance with the ageing of populations in developed and some developing countries. A number of stereotypes have developed in popular discourse about ageing, from the spread of fears of frail elderly people draining families and governmental welfare agencies of resources, to the spread of expectations of a rejuvenated older age in which elderly people lead active lives cruising, travelling, and even working, and in which surgical and pharmaceutical advances accompany improved understanding of diet and exercise to facilitate partial reversals of the ageing process. Time diary studies provide national-level evidence of the extent to which different groups of older people are physically and/or economically active. Time diaries also reveal how older people integrate bodily management (from taking pills, to self medicating, the waiting for assistance) into daily routines (Ujimoto 1998). Likewise, time diaries provide an overview of the behaviour of the people who care for older people who need assistance.[12]

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[12] Time diaries provide useful information about people at the youngest end of the age spectrum as well. Studies in three countries presently included in the MTUS, Denmark, Italy, and the

A related new use for the MTUS involves applying similar measures to examine the lives of younger disabled people and their carers. Already, some small-scale time diary studies have examined the strategies by which disabled people accomplish the tasks of daily living (Pentland and McColl 1999). In particular, time diaries offer the potential to measure actual sociability (as opposed to the psychometric measures of how attached to other people disabled people report feeling). Actual sociability matters to the extent that people can only rely on social networks when they actually interact with other people and take actions that reinforce their social networks, and not simply when they report feeling appreciated and supported (Fisher 1999, 2000). Time diaries permit the measurement of productive time (time doing paid and unpaid work), physically active time, and possibilities for leisure (in contrast to time spent doing personal care, medical care, and other necessary functions or time waiting for services). Thus, time diaries not only allow assessment of certain dimensions of quality of life, they also permit a level of evaluating the effectiveness of large scale public health campaigns (Fisher 1999, 2000). Researchers could use the MTUS, for example, to compare productive time, physically active time, and proportions of time spent in various leisure activities before and after national anti-smoking campaigns introduced in Canada, Great Britain and the United States.

3 CONCLUDING REMARKS

The 24 hour day is a widely understood and shared resource. Time use thus offers greater latitude for cross-national comparative analysis than the study of many other aspects of the human condition. The main lesson of the MTUS project is that a vast range of quality comparative time use research is both feasible and achievable.

The process of maintaining the MTUS has produced another side benefit of preserving data sets. The project has acquired some older data sets which had faded, disused, into archives (including a 1933 Mass Observation diary study in the UK which may be incorporated in future versions of the data set). A computing failure in Statistics Sweden resulted in the loss of the 1991 data files. Though, sadly, some data, including data from a sub-sample of single mothers

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United States, collected diaries from children. The possibility of creating a separate MTUS file for children will be explored.

collected in that study, was lost, portions of the main files which had been acquired by the MTUS project were returned to Statistics Sweden.

In many respects, the Multinational Time Use Study is unique. It offers data from a wide range of countries and years. More significantly, this study has exceptional staying power. Changing patterns of behaviour will not become "dated". In so long as the study is maintained, it will retain relevance for a variety of academic, governmental and non-governmental users. The study does not depend on a specific person or source of funding. The study has survived past droughts in funding to expand again as new sources of funds were secured. A general good will and co-operative spirit has characterised the time use research community since the 1960s, and this spirit will permit the continued expansion of new ideas for the use of the MTUS for many years to come.

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