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Quality considerations for Time-use Surveys *

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in collaboration with the *Expert Group on Innovative and Effective ways to collect Time-Use Statistics*[1]

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* This document has not been formally edited.

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Table of Acronyms

Acronym	Definition
ATUS	American Time-use Survey
CAPA	Computer Assisted Personal Agenda
CAPI	Computer Assisted Personal Interview
CATI	Computer Assisted Telephone Interview
CAWI	Computer Assisted Web Interview
DIPA	Data Protection Impact Assessment
EG	Expert Group on Innovative and Effective Ways to Collect Time-use Statistics
ESM	Experience Sampling Method
EU	European Union
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation, European Union
GPS	Global Positioning System
GSBPM	Generic Statistical Business Process Model
GSS	General Social Survey, Statistics Canada
HETUS	Harmonized European Time-use Surveys
ICATUS	International Classification of Activity for Time-use Statistics
ICLS	International Conference on Labour Statistics
ICR	Intelligent Character Recognition
ICT	Information and communication technology
ILO	International Labour Organization
IVR	Interactive Voice Response
LFS	Labour Force Survey
MHI	Minimum Harmonized Instrument
NSO	National Statistical Organization
NTTA	National Time Transfer Accounting
OMR	Optical Mark Recognition
PAPI	Paper and Pencil Interviewing
PC	Personal Computer
RCD	Responsive Collection Design
SAPA	Smart phone Assisted Personal Agenda
SDG	Sustainable Development Goals
SMS	Short Message Service
SNA	System of National Accounts
TUS	Time-use Survey
UNSD	United Nations Statistical Division
UNECE	United Nations Economic Commission for Europe
UNECLAC	United Nations Economic Commission for Latin America and the Caribbean
UN Women	United Nations Entity for Gender Equality and the Empowerment of Women

1. BACKGROUND

Member States at the 48th and 50th sessions of the UN Statistical Commission endorsed the International Classification of Activities for Time-Use Statistics (ICATUS 2016)[2] and supported the development of methodological guidelines on how to implement/operationalize the classification to produce internationally comparable time-use data, using the latest technologies, in support of SDG monitoring and with the overall objective of promoting this critical data collection across countries and over time.[3]. In response to this request, since 2018, the Statistics Division and *the Expert Group on Innovative and Effective Ways to Collect Time-Use Statistics* have been working towards the implementation of ICATUS 2016 and the development of guidance and recommendations that will contribute to the revision of the *Guide to Producing Statistics on Time-Use: Measuring Paid and Unpaid Work*[4] (hereafter referred to as the *Guide*).

This report presents key quality considerations for the production of time-use statistics and once finalized, it will be integrated in the revised *Guide*. This report should be read with the report of the *Expert Group* on *Minimum Harmonization Instrument for the Production of Time-Use Statistics.*[5]

The same underlying quality principles that apply to all household surveys are relevant to time-use surveys. There are existing models and frameworks such as the UN Statistical Quality Assurance Framework[6] and Generic Statistical Business Process Model (GSBPM)[7] that outline the principles, best practice and a common understanding for data collection and quality assurances for the compilation and production of national statistics.

This report will focus on critical design features with important quality considerations that are specific to time-use surveys.

This report gives guidance on data quality under the headings: survey management, the diary instrument frequently used by NSOs, survey content, data processing, data dissemination, and the activity classification system.

Some of the unique quality considerations that must be considered for time-use survey include:

- Temporal representation: timing of the survey over a twelve-month period to capture changing activity patterns associated with the changing seasons and observance of cultural practices. For example, indoor activities in winter months and outdoor activities in summer months; religious celebrations and holiday periods.

[2] https://unstats.un.org/unsd/demographic-social/time-use/icatus-2016/
[3] UN Statistical Commission-Final report 48th session-Decision 48/109 https://unstats.un.org/unsd/statcom/48th- session/documents/Report-on-the-48th-session-of-the-statistical-commission-E.pdf
[4] Available at https://unstats.un.org/unsd/publication/seriesf/seriesf_93e.pdf
[5] See the report *Minimum Harmonization Instrument for the Production of Time-Use Statistics,* prepared by the Expert Group and available online as a background document to the Secretary General's report on gender statistics at https://unstats.un.org/unsd/statcom/53rd-session/
[6] UNSD — Methodology
[7] Generic Statistical Business Process Model - Generic Statistical Business Process Model - UNECE Statswiki

- Appropriate representation of days of the week. Activities undertaken vary across the days of the week, particularly between workdays/non-workdays and weekdays/ weekend days.
- The mode of data collection for example, face to face interviewing, telephone interviewing or an online survey.
- The type of instrument that will be used.

2. SURVEY MANAGEMENT

Time-use surveys have been conducted as dedicated stand-alone surveys, as additions to or modules within other data collection programs, or by using samples from other surveys as the time-use survey sampling frame. Some national time-use measurement programs have evolved from one-off or special purpose projects into regular components of NSO programs. This may involve initiating a time-use survey as an addition to another survey or managing it independently.

Other major decisions for survey management are the mode of data collection and the scope in relation to the demography and geography of the surveyed population.

2.1 Dedicated versus incorporated time-use data collection

Dedicated stand-alone time-use survey

A dedicated stand-alone time-use survey (TUS), also known as a stand-alone survey or independent survey, is designed specifically for TUS data. The content, methodology and enumeration procedures are aligned to the collection and production of time-use statistics only. A dedicated stand-alone TUS provides optimal outcome for time-use statistics. They are generally expensive to undertake, however, and can have a lengthy development time.

Quality considerations

A dedicated stand-alone TUS is tailored to the time-use data requirements. The background questionnaire is designed to collect information required to support time-use analysis and properly classify activities. The sample design and frame are appropriately designed to ensure the correct representation of different cohorts of the population (for example, urban and rural areas; areas with higher proportions of older and younger populations). A dedicated stand-alone TUS should be designed to achieve an adequate representation of weekdays, weekends, holidays, and seasons. The sampling methodology and file weighting can also be tailored for optimising TUS.

Incorporated in another survey

The alternative to a stand-alone survey is to incorporate TUS in another survey. There are two main options:

1. Adding a TUS module or set of questions to an existing household survey such as the labour force survey, living standards measurement survey, household income and expenditure survey or general social survey;
2. A dedicated TUS where the sample is selected from an existing household survey. Respondents may be the same as or a subset of those in the host survey.

The benefits of these approaches are that costs are reduced as the survey infrastructure is already established and shared across surveys. There are additional advantages to be gained from the rich data included in the parent survey, offering greater analytical opportunities.

This would also be well suited to a situation where an organization is exploring the possibility of starting a time-use data collection program in support of economic or family policy development and is considering a pilot project. The development time may be reduced since the background information is already there, and the survey can be mobilized relatively quickly.

Quality considerations

Depending on the base survey vehicle, incorporating TUS in another survey may present limitations for TUS. Careful consideration is required to ensure the base survey is the best vehicle for TUS and aligns as closely as possible with TUS requirements. For example, there may be limited survey time available for TUS content. The scope and coverage of the base survey may not be ideal for TUS. The age of respondents included in the scope of the base survey may not align with TUS requirements. The number of people enumerated in the household may not be suitable (enumerating all adults, a randomly selected person, or any responsible adult). The geographic coverage may not be complete. It is important for TUS to include urban and rural settings to capture the different activities undertaken by people living in different areas. The enumeration profile of the base survey vehicle may have an impact on TUS requirements such as length of time in the field, follow-up, requirement for interviewers to return to the household to collect diaries, and the ability to achieve a representative distribution of days, seasons, and holidays.

2.2 Scope and coverage

Decisions about the survey coverage are made at the survey design phase. Things to consider when deciding coverage include:

- time of year coverage
- age limits
- the inclusion of children
- number of respondents per household

Time of year coverage

The activities people undertake can vary across the year. Therefore, it is important at the survey design stage to consider when the survey should be enumerated. Ideally, enumeration should be evenly spread across the year to capture these variations. For example, the activities undertaken in cold winter months are likely to be different to those in warmer

summer months, with more indoor activities in winter and outdoor activities in summer. Agricultural activities are also closely linked to the changing seasons.

Holiday periods and significant religious and cultural observance are associated with specific activities. The enumeration schedule should include a proportional representation of these events.

Quality considerations
Where possible the enumeration windows should reflect changing activities patterns across the year. This is not always possible depending on operational requirements such as interviewer availability, funding, and timing constraints.

An unbalanced representation of certain times of the year may result in over or under reporting of particular activities. For example, many people around the world take a summer vacation. If more of the sample is collected in summer than other seasons it is likely there will be more time spent on 'vacation' activities such as relaxing or swimming than non-vacation activities such as work and education.

It is important that the enumeration dates and any such quality considerations are included in the published survey documentation so data users can understand the potential limitations of the data.

Age limits
The time-use survey age limit will depend on the survey data requirements, survey organisation guidelines, and applicable legislation. Annex 2 provides details of the age limit for individual countries.

Quality considerations
Inferences can only be made in relation to the surveyed population.

Children
Some countries include children in their time-use surveys to better understand how children's time allocation affects key outcomes related to their well-being, including early childhood development, health, educational achievement, and gender equality. These surveys are usually completed by the parents, or primary caregiver (often women), on behalf of the child. In Mexico the survey is applied face to face to children aged 12 to 17 in the presence of the parents. Sometimes the parent helps to answer. Because some of the activities of analytic interest for children's time-use may differ from adult's (e.g. time spent playing), care must be taken to ensure that countries use an activity classification system that produces meaningful statistics on children's time-use, adding additional categories of activities if warranted.

Quality considerations
Where the parent, or primary caregiver, is completing the survey for the child there is an assumption that the respondent can answer on behalf of the child or will ask the child the questions and complete the survey.

For children who spend time away from the parent it may be difficult for the parent to accurately report all the child's activities. This may be more of a concern for older adolescents, who generally exhibit more autonomy than younger children.

If the parent asks the child, their activities for the day the child may chose not to report accurately if they know they were involved in an activity their parents did not approve or conversely may over-estimate the time spent on 'parental approved' activities.

Including children's diaries is likely to result in an extra burden for parents, who must complete diaries for their children and themselves. In these cases, it may be more appropriate to record the time-use data of one randomly selected child if there is more than one child within the household. This approach does not allow for intrahousehold analysis of children's time-use (e.g. differences in time allocation among male and female siblings) but would still allow for analysis of time-use patterns across households.

Number of respondents per household

Time-use surveys are varied in the number of people in the household that must complete the time-use survey. Some countries choose one person, others select every adult or everyone (including children). Some select one adult and one child. See Annex 2 for number of respondents per household details for individual countries.

Quality considerations

The benefit of choosing one person in the household is the overall household level burden is low. Care must be taken however to choose the selected person randomly to ensure demographic representation across the sample. This design is also more expensive to administer since more dwellings must be selected to achieve the target sample.

Choosing one person also means intra-household analysis cannot be undertaken. The division of labour within the household cannot be examined but analysis of gender gap in the division of labour is possible across households. Choosing two adults, spouses, or partners, would allow intra-household analysis.

Choosing everyone in the household, whether all adults or all persons will enable more intra household analysis. The household level burden however will be increased. This also increases the complexity of field or data collection operations. At the data entry and editing phase household members' diaries can be crossed checked if information is missing.

Alternatively, in households with more than two adults, selecting two respondents in the household may still support some of intra-household analysis but reduce the collective household burden.

3. THE DIARY

Time-use diaries are used to collect the sequence of activities a respondent undertakes in the reference period. The diary imposes a unique structure on time-use datasets in that it collects data on individual activity episodes as they are reported. Hence an episode-based dataset is created in addition to the respondent-based dataset generated by the collection of background data and diary metadata. It is the episode file structure that permits collection of secondary activity data and contextual details, such as location. The alternative to a diary instrument is the use of stylized time-use questions. This approach to time-use surveys is described in the Expert Group's report on the Minimum Harmonized Instrument, available online on the UN Statistical Commission portal, as a background document.[8]

Designing the diary requires, among others, decisions about time intervals, the reference or reporting period and the type of instrument.

3.1 Time interval

The time interval relates to the units of time in which respondents report their activities. Time information can be collected in an **open interval diary** or a **fixed interval diary**.

Open interval diaries

Open interval diaries require the recording of the start and finish time of the activity. Respondents report the activity they were doing from when the diary time starts, and progress from one activity to the next through the entire diary period.

Quality considerations

While this approach appears to be theoretically most accurate, as the respondent can report the exact time an activity commenced and ended, it can add extra burden for respondents to report the exact timing. The level of precision required from respondents is also not clear with this method and it may result in greater variability in how respondents report their activities. Some may choose to report to the minute, others may round to 5, 10 15 or 30 minutes. For interviewer administered diaries, the interviewer can instruct respondents on the level of precision required. For self-completion diaries, instructions or examples can help clarify the level of precision required.

Data entry and processing can be more complex for entering and managing open interval diaries.

Fixed interval diaries

Fixed interval diaries mark intervals of time on the diary for recording activities. These are usually 5, 10, or 15-minute intervals.

Quality considerations

Fixed interval diaries are designed to be less burdensome to complete, since they do not require the recording of the actual time. The time interval also gives an indication of the

[8] https://unstats.un.org/unsd/statcom/53rd-session/

level of detail expected, with a shorter interval suggesting that more detailed activities should be reported. In the paper diary version, the time interval is generally printed in the margin. Activities are entered next to the time the activity commenced and arrows are used to indicate the duration of that activity. Electronic versions of the diary also follow the time interval conventions.

While the 5-minute interval may be considered most accurate, because of the finer level of granularity, it also adds extra burden given the amount of detail requested. On the other hand, larger reporting intervals may add to the cognitive burden since respondents must decide which activities to report if more than one activity is undertaken in that time slot. This could result in under- or over-reporting of time spent on some activities, for example personal care or snack breaks. A larger time interval may result in respondents reporting more than one activity in the same time period because the period is longer. For self-completion diaries, this necessitates a decision at the data entry stage about which activity to include in the entered data. Decisions may also need to be made about which activity will be recorded as secondary. These data entry decisions could potentially introduce error and importantly undermine comparability. For interviewer completed diaries, the interviewer can prompt for further information about the sequence of activities and/or if they occurred simultaneously. For example, in South Africa, the TUS uses a 30-minute slot with up to three activities and respondents are asked if they were continuous or simultaneous.[9] Clear instructions are required at the data collection and data entry stages to ensure interviewers, respondents and data entry staff understand the requirements.

3.2 Reference period

The reference period is the time frame for which survey respondents are asked to report activities and there are a number of components to this:

- Length of time: The length for which information will be sought. This period may be 24 hours, two consecutive days, a weekday and weekend day, a full week, or some other combination of days.
- Type of day: The survey managers must decide beforehand whether all days must be sampled or whether only the workday and rest day cycle should be measured. Rest days are Saturdays and Sundays in Europe and the Americas but include Friday in the Middle East.
- Methodology: This refers to which day the respondent is expected to report about. This will impact the survey methodology. Options are:
  - Yesterday (past 24 hours) – actual day, retrospective
  - Tomorrow – actual day, prospective
  - Typical day
  - Actual week (retrospective or prospective)
  - Typical week

The longer length of time may be preferred as it collects more data and can measure differences in time-use for each person between the selected days. However, this must be

[9] www.statssa.gov.za/publications/Report-02-02-00/Report-02-02-002010.pdf

balanced against the respondent burden and the risk of recall error. Time-use diaries are relatively burdensome compared with other types of household surveys, and increased burden tends to discourage response or encourage the respondent to take 'shortcuts' in reporting. Reducing the length of the reference period substantially reduces the respondent burden of the survey. A reference period of a week is an option offered in the section on stylized questions in the Minimum Harmonized Instrument report, available online on the UN Statistical Commission portal, as a background document.[10]

Most TUS prefer a mixture of work and rest days in their sample to support analysis across the week, particularly the different activities that might be undertake during work days compared to rest days. This is particularly important if the measurement objectives include quantifying unpaid care and domestic work time (which may be concentrated at weekends but occurs throughout the week).

See Annex 2 for country examples.

The survey enumerations model will impact the methodology choices.

Yesterday

Respondents are asked about all the activities they undertook yesterday, starting from a particular time and continuing for 24 hours. These surveys are usually interviewer administered with the interviewer progressively working through the 24-hour period with the respondent. For self-administered yesterday diaries the respondent will work through the activities undertaken yesterday. Yesterday diaries are also relevant for the stylised format (see below).

Quality considerations

This approach places the least burden on selected persons, both because the reference period is only one day and the activities respondents undertook yesterday should be relatively fresh in their minds.

The mode of data collection is a factor determining whether this is the best approach. The yesterday approach is best for interviewer-administered diaries because the interviewer can prompt the respondent and methodically work though the reference period from one activity to the next. The interviewer can also prompt for typical activities that might have been missed, such as travel or eating, and probe for other details such as whether others were present.

The field phase of the yesterday methodology needs to be managed carefully to ensure there is an appropriate representation of days across the week. This may require interviewers working on days that are generally treated as non-work days such as Saturday and Sunday.

Tomorrow

This methodology is used for self-enumerated diaries. Once the base questionnaire is completed, the diary is provided to the respondent for them to complete for tomorrow or some near future date (usually a few days away). Alternatively, the diary could be posted to the respondent with instructions on how to complete it. For online diaries, these will 'open'

[10] https://unstats.un.org/unsd/statcom/53rd-session/

tomorrow or on the diary date. The diary dates are kept close to the date the base survey is completed to minimise the risk of respondents forgetting to commence the diary.

Quality considerations

It may be considered that these diaries are more accurate, since respondents are expected to complete them throughout the day. However, this may not be the case and there is some evidence that respondents tend to complete tomorrow diaries in one or two sessions per day, rather than continuously throughout the day.

Survey organisations have little control over when the respondents complete the diary, particularly for paper diaries. There is more scope with an online diary to regularly prompt respondents to complete it during the day. This needs to be managed carefully to avoid respondent annoyance and consequent survey abandonment.

As is the case for the yesterday methodology, the field phase of the tomorrow methodology needs to be managed carefully to ensure there is a good representation of days across the week. It is important that respondents are contacted ahead of their allocated diary day to make sure they have their dairy and are ready to start completing on their allocated day.

Typical day

In some stylized question or light diary surveys' respondents are asked how much time they spend on a given list of activities on a typical day. The 'typical day' approach may be sufficient if the survey objectives are broad for example, comparing time allocation to paid work and to unpaid housework.

Quality considerations

The respondent burden is potentially reduced since respondents are only asked about time spent on a given list of activities. These surveys may also be quicker to administer and process as the extra contextual information such as location, for whom, with whom etc., are generally not collected. Time spent on activities may be over- or under-reported, as respondents are providing an estimate. Time spent on socially desirable activities are more likely to be over-estimated and time spent on socially undesirable activities under-estimated.[11]

These survey instruments provide an overall indication of the quantity of time spent on specific activities and are therefore not suitable if detailed activity level analysis is required.

Actual week - retrospective

Similar to the yesterday methodology, the respondent reports activities for last week. This will provide information about all their activities across the week and will allow for more detailed analysis at the individual level.

[11] https://www.timeuse.org/sites/ctur/files/public/ctur_report/4486/timeusesurveysandwellbein_tcm77-232153.pdf

Quality considerations

Respondent burden associated with completing a diary for a week is a consideration. There is a risk that recall, and quality will drop off the further away the reported day is from the diary completion day. There is also the risk of under reporting less common activities and over reporting common activities.

Actual week - prospective

Similar to the tomorrow methodology, the respondent reports activities for a given week. This will provide information about all their activities across the week and will allow for more detailed analysis at the individual level. The prospective diary week reference period may be considered more accurate than the retrospective diary period since the respondent does not have to remember what they did up to a week ago. They complete the diary for the current week as it progresses.

Quality considerations

Respondent burden associated with completing a diary for a week is a consideration. There is a risk that quality will drop off as the week progresses. Respondents' fatigue may result in failure to complete the diary or return the diary.

Typical week

Similar to the typical day, respondents report the amount of time spent on various activities in a typical week. For example: work, exercise, education, housework, entertainment etc.

Quality considerations

The respondent burden may be much less than the 'actual week' methodology since respondents are only asked about time spent on a given list of activities and these are likely to be more common activities. Social disability bias may impact on the data quality.

Distribution of survey days

This methodology selects, for example, one week/work day and one weekend/rest day for each respondent. This is beneficial in understanding the time-use across different days for a given respondent.

Quality considerations

The benefit of this approach is that respondent burden may be much less than the 'week' approaches since respondents are only asked about two days. This methodology will allow for comparative analysis of the different activities undertaken on work and rest days.

3.3 Diary day

Convenience day

There are different approaches that can be used in selecting the reference day or date for which the time-use activities will be reported. If the survey is in the field for an extended time and the survey manager is confident that a good distribution of days can be achieved in that

time then the reference can be aligned to when the background questionnaire is completed. For example, if the background questionnaire is completed on Monday, the yesterday diary can commence for Sunday, the preceding day. If the tomorrow methodology is being used the respondent is instructed to complete for tomorrow - Tuesday.

Quality considerations
Survey managers must be confident that a suitable distribution of days will be achieved and that there are no biases associated with different days. For example, in households where the occupants are at work Monday to Friday, interviewers may only be able to make contact on the weekend and if the yesterday methodology is used there will be a higher representation of Fridays and Saturdays amongst the employed group.

Designated day
Another approach is for selected dwellings to be allocated a particular day of the week. Regardless of when contact is made with the respondents, they will be asked to complete the diary for the next occurrence of the allocated day.

Quality considerations
The methodology gives more certainty that the right distribution of days will be achieved.

Some countries, for example Australia, allocate diary dates to the selected addresses. In this case, the dwelling must be approached, and the background questionnaire completed, a few days ahead of the allocated diary commencement date so respondents are prepared and ready to commence their diary on their designated day. This approach relies on contact being made ahead of the diary commencement date. If not, the dwelling is treated as non-contact. Close field management is required to ensure non-contact is minimised. The expected degree of non-contact should also be considered at the sample design stage, so the sample size is adjusted accordingly.

Quality considerations
Non-contact may be higher with this approach if contact cannot be made with respondents ahead of their allocated diary commencement date. This methodology does not provide as much flexibility as those reported above.

Substitute or postponement day
Unavailability of respondents on designated days poses the problem of whether to substitute days. Survey managers will need to consider their approach to respondents who wish to alter their allocated diary dates or for whom contact could not be made ahead of the allocated day. If the respondent feels that the designated day is unsuitable, they may simply not respond. However, allowing them to complete the diary for a different day risk introducing bias, as the types of days they prefer to record may be more or less busy. On the other hand, by not allowing them to complete the diary on a preferred day, they will be treated as non-responding. Likewise, if the respondent forgets to complete the diary on the designated day, allowing them to complete the diary on another day reduces the incidence of non-response.

To maintain representation of days in the sample and avoid bias, it is advisable to select the same day the following week (that is, postponement). If this is not an option, empirically similar days may be substituted. These may be weekdays for weekdays or weekends for weekends.

Quality considerations
Allowing a substitute day may reduce survey non-response.

Selection of the substitute day should not be left to the discretion of either the interviewer or the respondent, as this might affect the sampling design and introduce bias. If respondents are allowed to select their day they may choose a 'less busy' day to reduce the burden of completing the diary. Or, they may choose a day where they were engaged in more socially desirable activities.

If the initial diary day cannot be achieved, it is preferred that postponement is used rather than substitution.

See Annex 3 for country examples.

3.4 Type of instrument

Most time-use surveys use diaries for respondents to record the activities and related information about how they are using their time. There are several diary types that are used.

Full diary
Respondents record the activity they are undertaking, either in free text or using a predefined activity list.

In a free text diary, the respondent writes the activity they are undertaking (such as sleep, preparing food, eating, watching television, reading, travel to work, working etc.) verbatim. An example page can help the respondent understand the terms and level of detail expected.

The information is then coded to the most appropriate activity from the activity classification.

Quality considerations
The benefit of recording activities in free text is that respondents can use their preferred terminology, and do not need to make the effort to find a matching category from a list. There is a greater opportunity to collect a broader range of activities and to identify new and emerging activities which could be added to the activity classification for output.

Free text paper diaries create extra work for diary coders to interpret the respondent's handwriting. Poor handwriting may result in miscoding or the inability to code. Respondents may not provide the level of detail sought or they may give an inadequate description of their activities.

Survey managers should consider the effect on quality of where in the survey process their coding takes place. If the diary is interviewer-administered (as with a recall diary), interviewers can be trained to code activities consistently, with special

attention given to any known difficult activities to code. However, they will be performing coding quickly while conducting an interview, which may lead to error. If the diary uses free text entry of activities and the coding is performed by data entry staff after collection, again, the data entry staff should be trained in detail to achieve consistent coding decisions. Data entry staff can take time to query difficult decisions with a supervisor. However, at this point the respondent is no longer available for clarification. The *Guide* offers direction on coding practice.

Diaries that are self-enumerated by respondents using a predefined activity list place the task of activity coding on the respondent. The activity list should be prepared to ensure activities are well understood and mutually exclusive. This can be achieved by carefully designing the activity categories to be widely understood, designing a highly usable diary interface, and striking the balance between categories that are too broad or too narrow. These measures should reduce cognitive load and encourage completion.

Light Diaries

In a light diary, less information is collected across one or more of the different data domains. For example, the list of activities is generally reduced to under 50 and provided as a pre-determined list for the respondent to select from. The *Minimum Harmonized Instrument* report[12] offers such an activity list, composed of 25 activities. Likewise, the contextual information (such as secondary activity, location, who with) either is not collected or the level of detail collected is reduced.

The respondent chooses from the list the activity that most closely aligns to the activity they are undertaking. The list should be comprehensive enough to cover the most common activities and drawn from a recognised activity classification such as ICATUS.

Predefined activity lists are commonly used for electronic data collection.

Quality considerations

Light diaries are generally cheaper and quicker to administer and process. Respondent burden is reduced since there is a reduced amount of information collected.

Because the amount of information collected in light diaries is reduced, these diaries cannot support the level of analysis that can be undertaken with full diaries. Respondents may experience frustration if the activity list is too restrictive and this may result in activities recorded incorrectly.

The benefit of a predefined activity diary is that the data is coded as it is collected. There is less risk of variability in the terms used to describe an activity, as respondents or interviewers select from the predetermined list. The reliance on data entry staff and processing time are reduced. If an 'other (please specify)' category is available, respondents can report activities that are not on the list although in practice, they may try to find a category that is 'near enough' rather than specifying an additional activity. If the

[12] See the report *Minimum Harmonization Instrument for the Production of Time-Use Statistics,* prepared by the Expert Group and available online as a background document to the Secretary General's report on gender statistics at https://unstats.un.org/unsd/statcom/53rd-session/

list is designed well in the electronic form, an activity previously selected can appear as the top match in future searches to save respondent effort.

Paper Diary

For self-enumeration surveys (full diary or light diary), the paper diary has long been the method for collecting time-use activities. For full diaries, the diary is generally set up in a grid format with columns and rows. The columns include the details and instructions for what information is to be collected (e.g. main activity, location, who with, who for, secondary activity). The rows are for the time of day. Commencing at a particular time, usually when people are asleep, 12am or 4am and continuing for the diary period, usually 24 or 48 hours. As discussed above the time interval may be open interval or fixed interval. If using a fixed interval the time intervals are printed in the margins. A down arrow is used to indicate when the activity is finished. This is repeated for all the columns as the timing for the other contextual information may not be the same as the main activity. For example, the secondary activity may not have lasted as long as the main activity or the 'who with' information changed if someone has left.

The open interval diary is also designed as a grid but in the row, the respondents record the start and finish time for the activity. Each activity occupies one row.

The paper light diary will include a list of activities the respondent is expected to report about. These are usually listed vertically with the time across the top of the page.

The intention for self-completion paper diaries is for respondents to take them with them for the day and complete them 'on the go'.

Interviewer completed paper diaries likewise have the same layout as the self-completion diary but rather than being completed on the go by the respondent, they are completed as recall diaries with interviewers asking for the start and end time of each activity and associated contextual information.

Quality considerations

The grid design of the paper diary provides a visual representation of what is required. The expectation is that respondents will complete the diary 'on the go' and therefore it is an accurate representation of all activities undertaken in the reference day, the commencement and end time of activities and the timing for all the contextual information. While this is the expectation of survey managers, respondents can complete the diary only a few times during the day; or even once a day. Additionally, the level of completion can vary. In particular, the more information requested the greater the respondent burden and more likely there will be missing information. This is less a problem for interviewer completed paper diaries as they can prompt the respondent for information. The presence of an interviewer does not stop a respondent from withholding all their information to either complete the interview sooner or avoid mentioning socially undesirable activities.

Self-completion paper diaries are not suitable for areas with low levels of literacy or where the concept of time is less meaningful, especially if there is limited use of clocks.

Surveys using paper diaries can be expensive to administer and take longer to process. As well as the cost of printing, distributing, and collecting the diaries; they require a team of data entry staff to code the information. There is a risk of introduced error and subjectivity since data entry staff need to interpret handwriting as well as make other editorial decisions.

It is important that data editing staff receive thorough training and instructions to apply the rules consistently. The amount of time taken to enter data will increase with the amount of editing and imputation expected. For example, cross referencing with the diaries of other household members to complete any gaps in diaries or look for consistency. Modern survey practices have moved away from excessive editing and imputation with a preference to keep this to a minimum.

Digital diary and collection

The modernisation of the statistical system has seen the move to electronic survey data collection. There is also increasingly an expectation by the public that they should be able to undertake their administrative and civil responsibilities online and national statistical agencies are moving their data collection to online platforms.

For statistical agencies, moving surveys online has been implemented to varying degrees. There are three main approaches:

- Computer Assisted Personal Interviewing (CAPI) involves interviewers conducting a face to face interview and entering responses into a computer. For TUS, after the background questionnaire is complete interviewers may either record the diary information directly in the computer as a recall diary or leave behind paper diaries which can be collected, or mailed back, once the diary days have passed.

- Computer Assisted Telephone Interviewing (CATI) involves interviewers conducting a telephone interview and entering responses into a computer. The interviewer will call the respondent to complete the questionnaire and diary.

- Computer Assisted Web Interviewing (CAWI) this involves the respondent completing all the survey requirements online with no interviewer involvement.

See the Expert Group's report on 'Modernisation of the production of time-use statistics' for a detailed discussion on the digitisation of TUS. The report is available online on the UN Statistical Commission portal, as a background document.[13]

Quality considerations

CAPI surveys are considered the most expensive to administer since the interviewer must travel to the home and interview the respondent. This may require a smaller sample to manage the survey within the budget and could impact data accuracy because of the smaller sample size. They are also likely to have a longer enumeration period to accommodate the travel and interview time. For both CAPI and CATI,

[13] https://unstats.un.org/unsd/statcom/53rd-session/

interviewers are well trained in conducting surveys, resulting in high quality data. Interviewers can prompt respondents and help clarify and explain what is required. One of the drawbacks of CAPI is respondents may over report socially desirable behaviour and under report undesirable behaviour because of the presence of an interviewer.

CATI surveys are similar to CAPI, however, the interviewer calls the respondent on the telephone to complete the survey and diary. The over and under reporting of socially desirable and undesirable activities may be less problematic in this scenario since the interviewer and respondent are not face to face.

CATI relies on respondents having access to a telephone. Depending on how the telephone numbers are sourced, if the population coverage is incomplete, the quality and population representativeness of the data may be impacted.

CAWI may be considered the cheapest and quickest option to implement since interviewer costs are completely removed. With online diaries there is no requirement for paper diary printing, collection, or data entry costs. Respondents can complete the survey component at a time that suits them.

Online collection reduces the risk of data loss through misplaced or unreturned forms. However, online collection carries the risk of data loss if the technology is not stable, there is a power outage or errors occur.

Built-in prompts, error messages, sequencing and auto-correction can be coded into the instrument to improve the flow, accuracy, and completeness of data.

CAWI relies on access to equipment and the internet. Similar to telephone access for CATI, coverage errors are amplified for CAWI in many countries and for low income and low digital literacy populations.

For CAPI and CATI the interviewer is interacting with the instrument. Interviewers are well trained on how to use their equipment and programs and therefore will not require the level of instrument design and on screen instructions that are required for CAWI where the respondent is working through the instrument.

Online diaries can offer convenience and result in higher quality data if they have been optimised for handheld devices since they can be completed on the go. If completing the diary is made more convenient and easier for respondents, they may be more willing to fill in more days and at a more detailed level of completion, resulting in higher quality. While there is an expectation that respondents will complete the diary on the go, this may not be the case and the expected quality improvements may not be realised.

Depending on the sophistication of the instrument other data may also be collected to improve quality such as the exact location if the GPS is used. If the location has changed, the respondent can be prompted to enter the new details. However, care must be exercised to make sure respondents are not feeling overburdened or that their privacy is being negatively impacted which may result in non-response.

The quality of online collection is improved as there is no requirement to interpret handwriting. If coding rules are built into the instrument, the activity can be chosen exactly as worded in the classification.

Modern technologies can also support the monitoring of the field progress, providing information, for example, on how many surveys are completed, the number of times the diary was accessed, etc. Additionally, the automatic transmission of data means data can be processed and published sooner.

The way respondents interact with an online diary is very different to an interviewer-based diary or self-completion grid-based paper diary and this needs to be taken into consideration in the design phase. Similarly, if the intention is to enable completion via handheld devices such as mobile telephones, the way respondents interact on a mobile telephone is different to larger desk top computer devices.

Hardware and software limitations can impact the design of the survey. Significant testing across the most common operating systems, devices and platforms is required to ensure the survey displays and performs as designed. If respondents experience performance issues and/or difficulties, they may not complete the survey.

There are still population groups that cannot or prefer not to participate online. This may be due to preference, computer literacy skills or lack of internet facilities. Alternatives such as CAPI, CATI and/or paper diaries should also be available or this group will be excluded which introduces non-response bias. If the TUS is conducted as a multi-modal survey, for example the Australian TUS, all modes must be thoroughly tested to ensure they perform as expected and, where multi-mode is used, the resulting data is consistent across the different modes. Some compromises may be required in the design, volume, and quality of data collected to accommodate participation of all population groups. The report on Modernisation of time-use data production, available online on the UN Statistical Commission portal, as a background document,[14] further discusses the benefits and challenges of collection via online diary.

Stylized questionnaire

Instead of diaries, some countries have used a time-use questionnaire to obtain data on the time allocated to specific activities. In most cases, the respondent is asked how much time they spent on a specific activity yesterday, last week, or on a typical day or typical week. Additional information on the use of stylized questionnaires is included in the *Minimum Harmonized Instrument* background report, available online on the UN Statistical Commission portal.[15]

Quality considerations

The benefit of stylised questions is the survey can target specific activities. For example, if a key data requirement is to improve the reporting on unpaid work or care,

[14] https://unstats.un.org/unsd/statcom/53rd-session/
[15] https://unstats.un.org/unsd/statcom/53rd-session/

the stylised question approach can specifically ask about these activities. They are quicker to administer – reducing respondent burden – since only a given number of activities are targeted. They can also be used to measure the incidence of less common activities such as how much time was spent on vacations or in hospital in the last 12 months. Compared to diaries processing is also more streamlined since there is less diary coding involved and fewer activities to enter.

Stylised questions can result in under or over reporting of activities, particularly for activities that are considered socially desirable or undesirable. Respondents may also have difficulty recalling how much time was spent on an activity especially if the reference period is long past the collection date. The reference period used in most TUS stylized questionnaires is yesterday of last week.

If the 'typical day' or 'typical week' approach is used, respondents may have difficulty conceptualising the typical or average reference period.

See Annex 1 for country examples on collection modes.

4. SURVEY CONTENT

Time-use data seek to capture human behaviour in terms of what is done (activity) and when, during a given time period. The key focus of each time period is "what were you doing?" The answer to this question is generally considered to be the primary activity, although some answers may describe activities that are carried out simultaneously as secondary activities.

To contextualise this basic information on the activities carried out during the reference period (day, week), information is generally collected on the location or means of transport and on the people present. Other important contextual dimensions concern the purposes of the activities carried out, the use of ICT and their enjoyment.

In addition, surveys using diaries automatically generate timing data for all activities permitting analysis of daily rhythms, the duration and timing of episodes, and transitions from one activity to another. Lastly, surveys will collect data on the background characteristics of respondents and their households.

4.1 Primary and secondary activity

The level of detail that the survey can achieve depends mainly on the type of time-use data collection and the survey instruments used.

Primary activity

The primary activity, (also referred to as main activity), as defined in the *Guide to Producing Statistics on Time-Use* (UN, 2005), is the one considered most intense in terms of focus or energy by the respondent. In other words, it is the activity that the respondent determines is the main

activity, within a given time unit.[16] The choice of the primary activity is therefore left to the respondent but it is recommended to include guidance and examples that clarify the criteria with which to choose it.

Quality considerations

Activities may be recorded in as much detail as a full-time diary allows by recording verbatim or selecting from a detailed list of possibly hundreds of activities. Alternatively, in a light diary or in stylised questions a shorter activity list possibly having fewer than 50 activities may be supplied. Too much detail may make the resulting database unmanageable or lead to increased costs in terms of coding, processing and analysing the data. The usual first step for a data user is to combine detailed activities into more generalized classes. Insufficient detail, on the other hand, limits the usefulness of the survey. Depending on the level of detail decided on, an appropriate activity list or classification will need to be used for coding purposes.

Secondary activity

The secondary activity is carried out at the same time as the primary activity and is considered by the respondents not as intense as a primary activity, in terms of focus or energy required or may be taken for granted as a background responsibility. Although it adds to the respondent's burden, the collection of secondary activities enhances the accuracy of the data. The collection of secondary activities allows the identification of specific types of activities that otherwise may not appear or would typically be underestimated if only primary activities are covered. Childcare - especially passive care - is a classic example of an activity performed simultaneously with others such as domestic work that respondents tend to report as secondary activity. Respondents tend to report as primary activities those that require most of their attention. Activities that would typically be reported as secondary activities or simultaneous are childcare or some leisure activities, such as listening to the radio, watching television, or talking to someone.

Quality considerations

Secondary activity can be collected in light diaries as well as full diaries, but it comes with extra respondent burden and cost so the trade-offs need to be considered at the survey development stage.

For stylized questions, this information is nearly impossible to collect. In particular, the use of stylized questions can make it difficult for respondents to distinguish between main and secondary activities. In order to try to have comparable data, it is recommended specifying in the questions if it is intended to collect information on specific activities of interest that are often carried out as secondary activities.

The secondary activity is important for addressing some of the key data requirements from TUS, specifically child and family care. It is important therefore that respondents are aware that this information is required and that instructions and examples in the diary

[16] Also defined in the *Guide to Producing Statistics on Time-Use* (UN, 2005) has the one whose value added exceeds that of any other activity carried out within the same time unit.

highlight the interest in all activities not just those demanding the respondent's main attention.

Survey managers may decide that some activities should always be treated as primary regardless of whether they are listed as primary or secondary in the diary. Similarly, if a number of activities are included in the primary activity time slot, for example, cooking, talking to family and listening to radio, decisions may have to be made on which should be moved to the secondary and which activity will be excluded.

4.2 Contextual information

Any episode of an activity occurs in time and space and under a set of circumstances that constitute its context. To understand the significance of any activity, it is important to understand the context in which the activity took place. Contextual information refers to features of the environment in which a specific activity episode takes place (location, with whom, for whom), additional defining characteristics of the activity (paid/unpaid), or subjective aspects (enjoyment, stress and wellbeing).

Location

Location is an important objective contextual variable. There have been various specifications of location ranging from generic variants (for example, home, office or designated physical work location, other places, and mode of travel) to more elaborate ones. The HETUS guidelines provide for 17 types of place and means of transport, while in the Italian TUS these types rise to 36. Typically, the location of the activity is recorded by asking respondents where each activity took place, allowing for a free text entry. The level of detail provided by the respondent is usually guided by the information included in the example information or the pick list available for interviewer in an interviewer administered survey.

The move to online diaries offers other opportunities such as the use of smartphone geolocation to record location more accurately, rather than reliance on respondents to report their location.

Quality considerations

The possibility of automatically collecting information on the movements and places frequented by the respondent from a smartphone could decrease the statistical burden, improve the quality of the data collected and expand data use. This relies on the respondent having their smartphone with them at all times. Otherwise, location information will be incomplete for the entire diary period. The level of detail provided through the geolocation may be well beyond the information required for many time-use surveys. For example, it may be sufficient to know the respondent went to the shops rather than where the shops are located. The inclusion of geolocation may add extra time and complexity to data processing but expands the data uses, especially for analysis of service use and urban travel.

Privacy laws may prohibit the survey organisation from collecting geolocation data from respondents or may require approval processes for gaining permission to implement. Also,

respondents may feel concerned that the survey is 'tracking' their movements and therefore may refuse to complete the survey. Enabling geolocation could be optional for the online diary.

If TUS is collected via mixed mode, for example CAWI, CAPI and CATI, only respondents participating in the CAWI mode can enable geolocation. This data will need to be processed and merged with the location information collected through the other modes, potentially adding complexity to the data processing phase.

With whom

Social interactions are a part of people's lives; hence, most studies include social contact as a source of contextual information. The people present while an activity takes place is an objective contextual variable often included in TUS. It can be used as a proxy for passive childcare or to understand the amount of time people spend alone and with others.

"With whom", can be recorded in as much detail as a full-time diary allows - by recording verbatim or selecting from a detailed list of person(s) present - or may be delimited by the pre-listed type of person(s) present. For example, HETUS guidelines provide for 6 types of people present. The Italian TUS uses 8 types. The level of detail required would be determined at the planning stage.

It is important to understand how this information will be used as this will help determine how the data will be collected. If the intent is to use it as a proxy for childcare then it would be best to include a detailed list for respondents to select from. This can be further split by the age group of the children in recognition that younger children generally require more parental attention than older children.

Quality considerations

Respondents might use multiple interpretations of the "with whom" question if no direction or definitions are provided. They can focus on people with whom they were interacting, with whom they had an intentional relationship or who were in the same physical location (for example, in the same area or in the same house). This suggests that the question "Who was with you" comprises two separate questions: "Who was present, but not participating?" and "Who was participating?" Thus, it is important to clarify the meaning of the question being asked. Making this a two-part question while providing more accurate information adds extra burden to the respondent.

Using a pick list for 'with whom' can cause confusion as the categories used are not necessarily mutually exclusive. For example, 'partner', and 'other household members' are all correct description of a person's husband or wife.

For whom

This context variable is particularly useful when TUS uses an activity classification system linked to the definitions of SNA, such as ICATUS, while it is rarely used in other contexts. In HETUS it is omitted. This context variable, in fact, is useful to classify activities that correspond to the boundaries used by economic analysts—for example, the "general production boundary" that separates non-market work from other non-market activities or the "SNA production boundary" that separates SNA work and non-SNA work.

Quality considerations

To be compliant with the latest international standards (ICLS 2013) definition of work[17] to which the ICATUS 2016 is harmonized and to correctly classify time spent in paid and unpaid work, this variable should identify at least the following four categories to indicate for whom the primary activity was performed:

- For paid job or own or family business
- For use by own household member(s)
- For use by family members residing elsewhere
- For use by others

This variable can be used to help code other data items of interest such as volunteering. For example, in the Australian TUS if an activity such as baking a cake has a "for whom" of 'school fete', it is coded to Voluntary Work in the Australian activity classification.[18] Whereas, baking a cake with a "for whom" of 'family' is coded to food preparation. However, this is reliant on respondents completing the information accurately. The variables of interest may be over or under reported depending on how well respondents understand the intent and how to complete the information. Instructions and examples should be included to show respondents how to record this information.

Subjective context variables

Adding subjective dimensions to the typical objective ones for each episode of activity may help to tap into the emotional and psychological side of behavior. Such dimensions are often less essential to survey objectives of a general-purpose national time-use data collection but may be important in specific applications, especially quality-of-life issues. For example, two aspects that are often studied include how stressed people are when performing an activity and how much people enjoy what they are doing. For example, Italy and France collect a pleasantness variable using a full paper diary. Finland has done the same using both paper and web-based diaries. In the United States, the American Time-use Survey (ATUS) has periodically collected a module on well-being in an electronic diary (CATI).

Quality considerations

These variables can be complex to interpret and difficult for respondents to complete. Is the level of enjoyment associated with: the activity, the time of day, who you are with, your location, or all of these? Respondents should be informed as to whether data will be presented as the level of enjoyment associated with individual episodes or as an overall daily rating. The ATUS well-being module data are typically presented as comparisons, e.g., "people report higher levels of stress when doing activity x compared with activity y." These data are published as a research data set only.

Activity-determined context variables

Other context variable can be added to study specific aspects related to particular activities.

[17] https://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/normativeinstrument/wcms_230304.pdf

[18] https://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/863BE05F5DF81C08CA2573F500148972?opendocument

***Paid/unpaid activity*.** Growing interest in determining the extent to which people allocate time to paid and unpaid work activities has been motivated by the use of time-use data for valuing and integrating unpaid work in national accounts. The paid/unpaid distinction also informs policy on advancement of more gender-equitable divisions of labour.

ICT use. Another variable of emerging interest is the use of technology in performing various activities. The data can be used to assess the impact of new technologies on people's lives. These impacts are realized, for example, in work activities carried out through teleworking and in the use of smartphones and other devices to access the Internet. The increase in the use of the internet in almost all activities (shopping, work, entertainment) has prompted Europe to include this variable among those recommended in the full diary proposed in the latest HETUS guidelines.

Quality considerations
Time-use surveys generate a lot of interest from policy makers and researchers. What is not always clearly understood are the limitations of TUS data.

In the case of paid/unpaid work, some take a view that it is any activity that can be purchased, for example gardening. You can choose to do that yourself or pay a gardener. What if someone participates in gardening or cooking as a hobby or for relaxation? Is this still unpaid work? This is information that is not collected in TUS. Many people enjoy their work, but this does not negate the fact that it is still a type of production and accounted for in GDP.[19]

The measurement of ICT use can be similarly complex. How can TUS be used to inform this data need? Within a smartphone session of 15 minutes, it is not unreasonable for people to check their work emails, respond to a message from a friend, play a game, read a news items, do some online browsing, and stream a television show. How would survey managers expect or instruct respondents to record this information in their diary? Is 'on my smartphone' sufficient?

Survey managers must manage users' expectations and make the data limitations explicit in their documentation.

4.3 Temporal location

Temporal location is the time of the day activity episodes are undertaken. Temporal location of an activity is useful in understanding the time constraints within which time allocation decisions are made. Sequence alignment studies examine the clock-time, episode length and transition patterns of activities over the course of full days or significant periods, such as mealtimes. This permits the identification and classification of behaviour patterns based on a unified description of activities and their contexts. Temporal location of episodes also permits the illustration of peaks and troughs of activities throughout the day, hour by hour.

Quality considerations
This information requires data on the beginning and ending times of activities and a

[19] See International Classification of Activities for Time-use Statistics, for additional information and definition of unpaid work, available at https://unstats.un.org/unsd/gender/timeuse/23012019%20ICATUS.pdf

chronological reporting of activities and contexts, thus precluding the use of stylized questions.

4.4 Background information

Time-use Surveys include background questions to understand respondents' living conditions (personal, material and social resources) and, if possible, some questions to understand respondents' values, attitudes and personal feelings. In a stand-alone survey background information is usually collected through household and individual questionnaires (and from registers, if possible). When TUS modules are incorporated in another survey, it will be possible to obtain basic information such as sex, age, employment status, and education from the questionnaires of the survey platform used. Labour force, household income and expenditure and general social surveys are often used. The Expert Group report on the minimum harmonized instrument, available online on the UN Statistical Commission portal as a background report,[20] emphasizes that separate questions are needed to gather household versus individual respondent data.

The *Minimum Harmonized Instrument* report gives detailed advice on the background variables needed to describe respondents and their households.

5. PROCESSING

5.1 Response rate

Survey manager will design the survey in line with their expected response rate. This is generally based on response rates achieved for previous time-use surveys or other similar surveys. Survey managers should also consider changes in the enumeration model that might affect the response rate, such as moving to online collection, changing from CAPI to CATI, surveying in a different area with a different demographic profile, completeness of the survey frame and time since the last survey.

Response rates are calculated as the total number of completed interviews divided by the total number of eligible units. Depending on the survey design, the following are different response rates that can be reported for TUS:

- Sample response rate: completed sample / (approached sample minus sample loss[21])
- Person response rate: number of persons completed the survey/persons eligible for the survey
- Diary response rate: number of acceptable returned diaries / placed diaries

[20] https://unstats.un.org/unsd/statcom/53rd-session/

[21] Sample loss refers to that part of the sample that cannot be enumerated. For example, in a telephone list-based sample it would be the telephone numbers on the list that are no longer in use and therefore it would be impossible to elicit a response from that number.

- Diary days: number of days that met the acceptable thresholds / total eligible diary days.

If children are included in the survey a separate child level response rate can also be calculated with the denominator representing the eligible number of placed child diaries and the numerator, the actual number of diaries from children included in the data file.

Quality considerations
Higher response rates are often considered an indication of higher quality, however, before making that assumption it is important to consider the following:

- Is the responding sample representative of the target population?
- How has the sample been selected?
- What is the quality of the frame?
- How is the response rate calculated? For example, with quota samples interviewers might keep calling telephone numbers until they reach their survey quota. These surveys might report a 100 per cent response rate because everyone contacted completed the survey, however, the numbers that did not answer or were not valid were not included in the calculation.

See Annex 2 for country examples.

Form tracking
For time-use surveys, particularly those using paper, it is important forms are tracked from the time of dispatch from the survey office, all the way through to the completion of data entry. Each form should include a unique identifying number or barcode and tracking systems set up to log the location of the diary whenever it is expected to change hands.

Quality considerations
Loss of survey material will impact the survey response rate and time-use information will be lost. There is also a risk of breaching confidentiality if the information is viewed by people other than employees of the survey organisation.

5.2 Diary acceptance thresholds

For time-use surveys, it is necessary to define a 'completed interview'—that is, how much of the diary or questionnaire needs to be completed for it to be used for analysis. This may be expressed in hours of completed activities, or as the number of activities entered. Where the reference period is more than one day, consideration should be given to the treatment of diaries containing only one complete day.

Quality considerations
A balance needs to be achieved between setting the acceptance threshold too high – and not having enough diaries to complete the analysis, or too low – and impacting data quality.

See Annex 2 for country examples of thresholds.

5.3 Diary coding and editing

When collecting time-use data in the respondent's own wording (verbatim), activities can be after-coded (activities are coded after the collection of data by coders or experts into a list of activities or classification of activities) or on-the-fly coded (activities are coded at the time of the interview by the interviewers into a list of activities or classification of activities or self coded by the respondents for online diaries.).

The coding phase, when it is needed, is the most delicate and important one due to the multiple dimensions referred to in the description of the activities in the diaries. To correctly assign a code it is very important to accurately interpret the context in which the activities take place, their sequences, their purposes, the place and time of the day, week or season in which they took place. For this reason, coding is also one of the most expensive and time-consuming activities in time-use surveys. Data processing experts must collaborate with subject matter analysts in formulating the coding rules and constructing the coding indexes and inserting them into the processing procedures and system. High data quality presupposes a uniform way of coding and interpreting the coding list to ensure identical work habits. Coding rules are especially needed when processing the information on time-use activities in diaries in order to deal with:

- multiple primary activities. Descriptions of activities reported by respondents may actually be not a single activity but several activities, especially when giving free text answers. Examples of such activities are travelling, socializing or entertainment that involves going to a venue, visiting or receiving visitors for more than a few hours.
- omitted activities. Examples of such activities are constant background activities such as passive childcare, travel, eating and sleeping. Sometimes, no activities are reported for intervals of time.
- simultaneous activities. When simultaneous activities are recorded, it may be necessary to choose which one to prioritise as the primary activity.

The coding of diaries may be performed either in the field by interviewers or at a central site by coders; the optimal choice will depend on type of collecting method and on having appropriate coding tools and procedures. On-the-fly coding is often used for diaries collected in CATI mode, while after coding is generally used for paper diaries.

The development of a coding index for activities and for contextual information that have been included in the time-use diary is one such tool. Provisions for developing the index would have to be built into the survey timetable.

> *Quality considerations*
> Training for coders needs to be arranged before the actual coding starts and possibly followed by periodic coding meetings regarding modifications to the coding list, additional rules and examples, or problems that have arisen. For specific problems, it is best if the coders can ask the supervisor and receive immediate answers.

Decisions made about coding will influence international comparability. To improve comparability, the coding solutions should follow similar rules, and categories should be interpreted in the same way. See *Quality control* below for further information.

5.4 After coding

After coding occurs when information previously collected in the respondent's own wording is later coded by experienced coders who choose codes from a coding index. This is the usual coding process for paper diaries and sometimes for other modes. It is possible to record the verbatim information provided in the diaries and then use an automatic or semi-automatic coding tool to select the relevant code from the coding index, or to record the coder's decision only. The first option is more expensive but allows the use of text during the editing phase as in the Italian Time-use Survey.[22]

Quality considerations
In order to ensure identical work habits, the coding should preferably be arranged centrally. If central coding is not possible consistent training and supervising of the coding staff should be applied. Providing a system where more complex coding cases could be shared by email or a central helpdesk can also support consistent application of coding rules. This type of coding process is constrained by the description provided by the respondents, which may be lacking enough detail to allow for a correct assignment of the code.

5.5 On-the-fly coding

On-the-fly coding is when information that is collected through the time-use diary in the respondent's own wording is coded contextually by interviewers, who choose the code from an activity list, or use an activity classification provided by a tool. This is one of the methods used for electronic diaries collected in CATI.

Quality considerations
This type of coding process allows interviewers to test their understanding of the meaning of the activity by asking the respondent directly.

5.6 Quality control

Attention to the quality of activity coding is essential for time-use studies.
Quality controls should be envisaged at every stage of the production process:

- before coding - checking that the information provided in the diary is sufficient;
- during the manual data entry or coding process - to evaluate the work of the data entry staff and possibly provide further training;

[22] http://www3.istat.it/dati/catalogo/20080612_01/arg0835time_use_in_daily_life.pdf (pp. 271-295).

- if digitized coding is used - evaluating the accuracy of the coding and adjusting the coding thresholds and/or treatment of non-coded records to achieve desired quality standard.
- after the coding - with an appropriate editing plan to correct coding errors and resolve unresolved inconsistencies and/or gaps in the coding phase.

Quality control before coding

At this stage, the purpose of quality control is to assess the quality of the information provided by the respondents. Decisions need to be made by the survey manager about the survey quality thresholds and what actions will be taken.

Generally, the basic indicators used are the number of episodes described in the diary and the share of non-described time over 24 hours (diaries with too many missing hours).

In case of coding on-the-fly it is possible to ask for more detail directly from the respondent. In the case of post coded diaries a minimum threshold must be chosen to accept or reject the diary.

At the data entry phase for paper diaries

If paper diaries are used, these need to be data entered into the processing system. Decisions need to be made about whether these are checked and edited before data entry or after the data has been entered 'verbatim' into the system. For interviewer completed diaries, the expectation is that there will be fewer corrections required since interviewers are trained to collect the information required and to prompt respondents for information and details they may have forgotten such as: the main purpose of the activity, missing activities (e.g. eating and travel time), or missing or illogical contextual responses.

Paper diaries completed by respondents are likely to be more variable in quality.

Some of the basic inconsistences that might be corrected are:

- Essential activity codes omitted in the diary (i.e. sleeping, eating, personal care);
- Redundant information (same code in the main activity and in the secondary activity);
- Inadequate level of detail;
- Episodes with missing answers in the activity, location, or other contextual variables included in the diary.

More complex quality checks concern the inconsistency between main and secondary activities, between activities and place, and between activities and people involved.

The amount of editing must be balanced in accordance with the available time and staffing resources. The work of data entry staff should be checked to ensure they apply the coding rules as expected.

Annex 2 includes examples of the minimum thresholds applied by different countries.

For electronic diaries (CAPI or CAWI)
Similar to above, electronic diaries should be checked for the quality parameter set out for the survey. For electronic diaries, these can be embedded in the collection instrument with error messages triggered if incorrect or missing information has been detected. When specifying the edits, care should be taken not to overburden respondents with too many error messages which may result in them abandoning the survey.

Once the electronic diaries have been submitted, automated data checks can be run to ensure the data meets the quality thresholds such as minimum number of hours, activities etc.

5.7 Imputation

For time-use surveys imputation is the process used to resolve the problem of missing invalid information and inconsistent responses identified during editing. Imputation is then used to handle remaining edit failures at the processing stage, since it is desirable to produce a complete and consistent file containing imputed data. The general principles for imputing missing or invalid survey data are outlined in the *Guide to Producing Time-use Statistics*.

Quality considerations
In general, standard imputation specifications and quality indicators for evaluating missing, invalid and inconsistent time-use data need to be specified. Issues of quality addressed in relation to imputation are:

- Which variable should be imputed in the time-use survey, for example background information, diary information etc.?
- Is there enough information to use for imputing the missing information?

Choosing an appropriate imputation methodology is important, as some methods of imputation do not preserve the relationships between variables or can distort underlying distributions. For example, if location has changed and travel time was not included, to impute travel will require decisions about how much travel to impute and which activity either side of the location change will have a decrease in time. The *Guide* advises that all imputations be flagged.

The imputation procedures may be automated or computerized, manual or a combination of both. Implementing automated imputation methods can improve accessibility and reduce processing costs. Regardless, imputation will add extra time to the data processing stage.

6. DISSEMINATION

In disseminating time-use data, statistical offices need to know the audience and their issues of concern to ensure the data disseminated is relevant. The data should be presented clearly and in such a way that they can be understood, available and accessible to all users.

Appropriate confidentiality and privacy provisions of official data collection must be applied to any data releases.

Detailed metadata including information about collection methodology, response rates, quality statement etc. should also be readily available. This provides information to help users understand how the information was collected and the level of confidence they can have in the representativeness of the data.

Where possible, time-use data should be made available to users in a number of formats microdata, macro data and metadata.

Time-use data should be made available on the date that was promised and in a timely manner – as closely as possible to the collection date.

> Q*uality considerations*
> Time-use data is complex and difficult to use. It is important that sufficient information is provided to ensure the correct usage. This includes survey documentation describing its methodology.

7. ACTIVITY CLASSIFICATION SYSTEM

Frameworks

The main purpose of an activity classification system is in providing a set of activity categories that can be utilized in producing meaningful statistics on time-use. These have to be meaningful in relation to the broad range of objectives of national time-use studies as well as cross-national and cross-temporal comparative studies on time-use.

An activity classification system categorizes different activities into groups to provide a picture of how people spend their time, and identify how much time is spent on different activities to support policymaking, and facilitate the collection and organization of statistics. It defines the framework for assigning activities to numeric activity codes and provides a basis for defining analytical categories of activities. It is usually hierarchical in nature with each successive tier made of more detailed codes.

The proposed ICATUS 2016 is designed to be consistent with existing standard classifications in labour and economic statistics; the underlying objective is the integration of time-use statistics with official social and economic statistics. ICATUS 2016 is intended to serve as a standard activity classification for time-use statistics applicable to both developing and developed countries.

Other activity classification systems actually in use are widespread in developed countries, where time-use studies have been conducted for many years. Their frameworks are more related to quality-of-life analyses rather than to standard economic classifications, such as HETUS in Europe. A comparison of the ICATUS and the Eurostat classification system (HETUS) is proposed to facilitate cross national comparisons. Please see the *Minimum*

Harmonized Instrument background report, available online on the UN Statistical Commission portal for a correspondence table.[23]

Quality considerations

It is important that countries starting to conduct time-use surveys use an international classification system, such as ICATUS or HETUS. National adaptations may be minimized by adding details to the proposed standard codes, by using a 4th digit/level to the above international 3 digit/level classifications.

8. CONCLUSION

As mentioned in the introduction and evidenced through the discussion above, time-use surveys are complex and require a significant investment of time and resources. Countries undertaking these surveys will do so within their household survey framework and based on the data outcomes they are trying to achieve. The UN Expert Group on Time-use was keen to provide guidance to countries embarking on time-use surveys with what is considered the minimum set of requirements. These are summarized in the box below. The Annexes also includes country examples for a number of the quality dimensions discussed above.

Minimum set of requirements for a time-use survey:

- Use the minimum activity list to collect primary activities, either in diary or stylized questions format, or a list that can be aggregated to correspond to the minimum list.
- A target population is defined and the sample is representative of the target
- Select at least one person in household using probability sampling
- Allocated reference days are representative of the days of the week
- Where possible the survey is conducted across a 12 month period.
- Instrument covers at least one 24-hour period
- Instrument includes at least 12 hours of activities, excluding activity not specified
- Diary instrument includes at least 3 activity episodes, excluding activity not specified
- When using diaries, contextual information includes location, with whom, for whom and use of ICT.
- When using diaries, if possible, collect secondary activity, as outlined in section 6.4
- Activity checks must be performed to make sure no essential activities have been omitted, for example “eating”
- When using a stylized questionnaire, interviewer checks or automated calculation must ensure the total number of hours reported does not go over 24 daily hours or 168 weekly hours.

[23] https://unstats.un.org/unsd/statcom/53rd-session/

Annex 1: Instruments and modes used by countries

	Type of instrument and mode	Duration of interview (if applies)
Australia	2020-21: eDiary and left-behind full paper diary	30 minutes for the background questionnaire. Completed online or interviewer administered (CAWI, CAPI and CATI)
Belgium	2013-2014: full diary, self-completed	
Canada	2015-2016: Full time diary in CATI; also used an electronic questionnaire	CATI interview: 25-35 minutes
China	2018: Left-behind paper diary with predefined list of activities; In Shanghai, electronic app was used.	
Finland	2020-2021: full paper and web diary, self-completed	CATI
Italy	2013-2014: Left-behind paper full diary, self-completed	
Japan	2016: light and full diary, self-completed, paper and online instrument	
Mexico	2019: stylized question using CAPI with in interviewer	CAPI interview, 35-40 minutes
Mongolia	2015: full-diary, self-completed	
Morocco	2011-2012: full-diary with interviewer	
New Zealand	2009-2010: full-diary self-completed	
South Africa	2010: full-diary with interviewer	
Thailand	2014-2015: Full time diary in CAPI with interviewer	
UK	2014-2015: full-diary, self-completed	
USA	2003 to present: Full time diary in CATI	15-20 min

Annex 2: Scope, thresholds and response rates by country

	Complete diary/questionnaire	Response rate
Australia	All persons in the household aged 15 years and over. Household level questionnaire and two-day diary for everyone in the household aged 15 years and over. Household questionnaire must be completed for diaries to be included Diary: if a 24-hour period had a minimum of 14 hours of information the diary was accepted. If only one day was completed of the two days, diaries was accepted If only some in scope people in the household completed the diaries – diaries were included	Calculate three response rates: household, individual and diary. Household response rate: = (number of fully + partially responding households)/(number of households approached – sample loss – non responding households).
Belgium	The sample of BTUS13 was drawn from the Belgian 2013 Labour Force Survey (LFS13) The study or target population for the time-use survey, as for LFS13, is the residing Belgian population living in private households. This population is restricted to households where at least one member is between 15 and 76 years old, to form the sampling frame for LFS13.	Households who fully completed TUS (2 days + 2 questionnaires) / sampled households from LFS Response rate: 20.1%
Canada	Questions + diary Start with diary. If it is not answered, then questionnaire is not asked. Questionnaire must be answered at least up to education (towards the end). Diary requires at least 3 activities in a 24-hour period	Response rate (calculated as USA) (the number of completed interviews)/[(the number of completed interviews)+(the number of refusals)+(the number of noncontacts)+(the number of "other" cases)+(the number of cases of unknown eligibility)]
China	2018: at least 3 activities connected by a continuous line to be considered complete	Do not consider the calculation of the response rate, because the households are chosen from the household spending survey and are willing to answer

Finland	All persons in the household No concrete criteria, but if the person had filled in the diary for most of the day, it was accepted, and the missing activities were given the activity code 999. Imputation: if the diary has no sleep in the morning, time before the first activity is coded as sleeping	Calculate three response rates: household, individual and diary. Household rate 2009: 59%. 2021: 47% Individual rate 2009: 53% Diary rate: 2009: 39%
Italy	The sample unit is the household (without substitution) and all individuals aged 3 years and over have to fill in the diary. Massive consistency checks are carried out on the diaries, and especially the necessary activities (sleeping, eating) and travels, if missing are imputated. All diaries with less than 7 episodes or with too many hours not described (threshold: 7 hours and more) are checked and eventually discarded.	To calculate the response rate, the standard definition used by Eurostat (Unweighted) is used: https://ec.europa.eu/eurostat/documents/3859598/6651706/KS-GQ-15-003-EN-N.pdf pag. 51 - Table 1 - Unweighted Response rate= the ratio of the number of household interviews completed (and accepted in the data base), to the number of eligible households at the contacted addresses. The sample unit is the household and therefore the response rate is calculated for the households as follows: theoretical sample: 27,144 units non eligible units: 771 units respondents: 19,093 units Household response rate in 2013-2014 edition is: 72.4% Instead the diary response rates are calculated on the total of the individuals of the respondent households who should have filled in the diary, considering first the IT target population for the diary (people aged 3 years and over) and then EU population target (people aged 10 years and over). Diary non response rate among individuals aged 3 years and over (IT population target): 5.8% Diary non response rate among individuals

		aged 10 years and over (HETUS population target): 5.6%
Japan	Paper questionnaires were reviewed by prefectural offices or NSO, and eventually the following were removed as "no-response": - No background information (sex, age, labour status etc.) was provided - Questionnaires with only name and sex - One or both designated days were not reported - Less than 3 activities were reported. However, if both "sleep" and "meal time" were reported, it was not removed - More than 6 consecutive hours were not reported Those standards are applied both for questionnaires, A and B. Regarding the online survey, the system automatically checks blank fields which are mandatory, thus all submitted "e-questionnaires" met the standard of "responded".	Response rate at household level in 2016: 75%
Mexico	The questionnaire is divided into 6 sections. The questionnaire is considered complete when all the sections are answered/completed.	Response rate in 2019: 89.6%
Mongolia	All question sin questionnaire must be answered to be accepted. Diary: one complete day is accepted	Response rate in 2019: >90%
Morocco	To check the completeness of the diaries, check the activities: e.g. if the person forgot travel time.	Response rate household in 2012: 97% Complete diary 94% man 95% woman and children
South Africa	Two people 10 years or older	Response rate individual in 2010: 87.5%
Thailand	No criteria for a complete diary	Response rate in 2015: >90% Denominator: Number of total households

USA	One person per household, age 15 years or older, is interviewed about their time use on one day. Diaries that have more than 3 hours coded as “don’t know” or “can’t remember” are removed. Diaries with fewer than 5 activities are also removed. In the American Time-use Survey (ATUS), interviews are counted as “completed” if they finish the diary section of the interview.	ATUS response rate in 2019 = 42% (the number of completed interviews)/[(the number of completed interviews)+(the number of refusals)+(the number of noncontacts)+(the number of “other” cases)+(the number of cases of unknown eligibility)] “Not eligible cases” are excluded from the ATUS response rate calculation. They include cases where the home was vacant or not used as a regular residence, the selected respondent was underage, the selected respondent was not a household member, the selected respondent was in the armed forces, etc.

Annex 3. Substitute days by countries

Country	Substitute day
Australia	2006: No substitution during the first 3 quarters. Because of low response rate, during Q4 postponement was allowed once: same two days in the following week. 2020-21: Substitution was used only for areas where enumeration was impacted by COVID lock downs and only same days following week.
Belgium	2 days in a week are assigned and can be postponed to the following week up to the end of the same month.
Canada	allows postponement of diary day for up to eight weeks
China	2 days in a week are assigned and can be postponed to the following week up to the end of the same month
Finland	Postpone dates by 1, 2 or a maximum of 3 weeks. Day has to be the same day of the week as assigned. 37% of the days were postponed.
Italy	Postponement rule allows household postponing a maximum of 3 weeks (5 weeks in July or August) and the day has to be the same day of the week as assigned. In 2013-2014 edition 26.1% of diarist changed diary day, 1.8% of diarist changed diary day without respect the postponement rule (changing the day of the week as assigned)
Mexico	Questions ask about the past week, and therefore postponement is not relevant
Mongolia	No postponement or substitution of diary days
Morocco	Postponement to the following week is allowed. If the person is still not available, he/she is replaced with another person from the same household.
Thailand	Allow postponement of diary days
USA	Substitution is not allowed. If a person is assigned a Monday and is not available on Monday, a call will be made the following Monday for up to 8 weeks.