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Guidelines for Harmonizing Time-Use Surveys

Prepared by the Task Force on Time-Use Surveys

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Acronyms

AHTUS	American Heritage Time Use Study
ATUS	American Time Use Survey
ATUS-X	American Time Use Survey Data Extract Builder
CAPI	computer-assisted personal interviewing
CATI	computer-assisted telephone interviewing
CHAD	Consolidated Human Activity Database
CPS	Current Population Survey
DEFF	design effect
DRM	day reconstruction method
ESP	experience sampling method
GDP	gross domestic product
HETUS	Harmonised European Time Use Surveys
IATUR	International Association for Time Use Research
ICATUS	International Classification of Activities for Time-Use Statistics
ICLS	International Conference of Labour Statisticians
ILO	International Labour Organization
INSEE	Institut national de la statistique et des études économiques (French National Institute of Statistics and Economic Studies)
MTUS	Multinational Time Use Study
NSO	national statistical office
OECD	Organisation for Economic Co-operation and Development
PSID	Panel Study of Income Dynamics
SEARS	Survey of Employment Arrangements, Retirement and Superannuation
SNA	System of National Accounts
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational Scientific and Cultural Organization
WHO	World Health Organization

1 Introduction

1. In most developed countries, time-use surveys are an integral part of social statistics, and the number of countries that collect time-use data is rising.¹ Since 1990, 69 countries worldwide have conducted a time-use survey. Policymakers increasingly recognize the value of time-use data, primarily for understanding the relationship between growth in market output measured through national accounts and the total output produced within a country, including household production. Time-use surveys have proven very useful in measuring essential dimensions of gender equality. In recent years, time-use surveys have been seen as an important contributor to the measurement of well-being. Overall, time-use data allow policymakers and researchers to address a great number of issues that are of relevance to their work.

2. The international scope of time-use surveys has raised the need for the exchange of good practices and for coordination in defining the concepts, methodology and ways of aggregating the results. This is necessary to obtain reliable time-use statistics that can answer the pertinent policy questions and be comparable across countries. The present Guidelines aim to respond to these needs. They are designed to help the relevant national authorities carry out time-use surveys and to improve their international comparability. The Guidelines build on several international harmonization initiatives described below.

1.1 International harmonization initiatives

1.1.1 Multinational Time Use Study

3. Sandor (Alexander) Szalai led the UNESCO-sponsored Multinational Comparative Time-Budget Research Project, the first cross-national time-use project to harmonize data collection methods (Szalai 1972). This project set out the scheme for data collection that is still used in almost every time-use survey. In the 1980s, researchers harmonized the datasets collected in the early 1960s into a dataset with a common series of background variables and total time spent per day in 69 activities. This formed the Multinational Time Use Study² now hosted at the Centre for Time Use Research at Oxford University. The Study has since grown to encompass more than 60 datasets from 25 countries and incorporates recent data from the Harmonised European Time Use Surveys (see below) and the American and Canadian time-use surveys.

1.1.2 Harmonised European Time Use Surveys

4. In 1996 and 1997, Eurostat launched a number of pilot studies that resulted in the guidelines for Harmonised European Time Use Surveys (HETUS). These included recommendations on the sample design, diary days, survey forms, activity coding lists, interviewers, data coding and estimators. The Eurostat HETUS guidelines, most recently revised in 2008, propose a set of recommendations covering all steps and aspects, from the design of the surveys to the processing of results and a recommended activity classification (Eurostat 2009). Their focus is on the production of output-harmonized data.

¹ The Centre for Time Use Research maintains a database of metadata about time use surveys at <http://www.timeuse.org/information/studies>.

² <http://www.timeuse.org/mtus>

5. Most, but not all, national statistical offices (NSOs) around Europe that have carried out time-use surveys since the late 1990s have taken these guidelines into account. The result is a database with comparable or almost comparable data representing 15 European countries (Belgium, Bulgaria, Estonia, Finland, France, Germany, Italy, Latvia, Lithuania, Norway, Poland, Slovenia, Spain, Sweden, United Kingdom). With financial support from the European Commission, Statistics Sweden and Statistics Finland developed a web application for HETUS, an online tool³ for the production of user-defined tables from the data of those 15 countries.

1.1.3 United Nations guide and classification

6. In 2005, the United Nations Statistics Division published a *Guide to Producing Statistics on Time Use: Measuring Paid and Unpaid Work* (United Nations 2005a) to present an overview of the different approaches that have been adopted in the design of time-use surveys and in the dissemination of time-use data. The main approach of the Guide is to advise countries on how to undertake a time-use survey and to harmonize the method for wide international use. It does not contain prescriptive guidelines, discussing instead the lessons learned from the surveys already conducted and presenting the advantages and disadvantages of the different options.

7. The Guide includes the trial International Classification of Activities for Time-Use Statistics (ICATUS) first introduced in 1997. A United Nations expert group met in 2012 to discuss potential revisions to this classification. A working group is carrying out the updates of the classification for presentation and adoption as an international standard classification.

1.1.4 In-depth review by the Bureau of the Conference of European Statisticians

8. In November 2010, the Bureau of the Conference of European Statisticians conducted an in-depth review of time-use surveys based on a paper by the German Federal Statistical Office, as well as written comments and suggestions from 22 countries and organizations.⁴ The review highlighted the need to improve the comparability of time-use surveys across countries and the usefulness of developing further practical guidelines for their implementation. It was noted that due to the budget restrictions for many national statistical offices (NSOs), a legal framework and financial means to carry out time-use surveys had become an increasing concern for many countries. Examples of good practices, particularly in the use of a light time-use diary and in the use of time-use data for policymaking, could help national agencies to advocate for this complex and resource-demanding survey. Practical guidelines could provide NSOs with the opportunity to learn from these practices.

9. The in-depth review concluded with the establishment of the UNECE Task Force on Time-Use Surveys, which worked through 2011 and 2012 on developing the present Guidelines.

³ <https://www.h2.scb.se/tus/tus>

⁴ Azerbaijan, Belarus, Bulgaria, Brazil, Canada, Czech Republic, Finland, France, Hungary, Japan, Latvia, New Zealand, Norway, Portugal, Romania, Slovenia, Spain, Sweden, Turkey, United States Bureau of Labor Statistics, Eurostat, Organisation for Economic Co-operation and Development.

1.2 Purpose of the Guidelines

10. The objectives of these Guidelines are to (a) help statisticians and policymakers understand the importance of time-use surveys, (b) provide guidance in the design and implementation of time-use surveys, and (c) improve the international comparability of their results. They focus on areas where the statistical community has expressed a particular need for further guidance, which includes policy relevance of time-use surveys, availability and comparability of key statistical measures of time use, periodicity of time-use surveys, the use of light and full-scale time-use diaries, and activity classification. Drawing on the experiences of countries conducting time-use surveys, the Guidelines include recommendations of preferred or best practice where these are available.

11. The Guidelines are based on the experience of UNECE member countries and other developed countries participating in the work of the Conference of European Statisticians.

12. The present Guidelines are meant to complement the United Nations *Guide to Producing Statistics on Time Use: Measuring Paid and Unpaid Work* (United Nations 2005a) and the *Harmonised European Time Use Surveys: 2008 guidelines* (Eurostat 2009), and therefore do not attempt to cover the issues that are thoroughly addressed in those publications.

1.3 Outline of the Guidelines

13. Chapters 2 to 5 deal with these topics of primary interest. Chapter 2 addresses the fundamental question of why it is necessary to conduct time-use surveys. It identifies three key areas where information from time-use surveys is necessary for informed policymaking, and for which other data sources are not adequate. The three key uses for time-use surveys are unpaid work and non-market production, monitoring well-being, and gender equality. The need to inform policy in these areas provides the core rationale for conducting time-use surveys and defines priorities for survey content. The chapter describes the use of time-use surveys in addressing these policy areas, including concrete examples from several countries. The chapter also refers to a range of other uses of time-use data of relevance to policymakers but which are of a lower priority, either because there are alternative information sources available or because the policy impact of the information is smaller at this time.

14. The present Guidelines aim to harmonize time-use surveys on the level of aggregate outputs. For this purpose, chapter 3 defines the statistical measures that should be produced from each time-use survey. These measures have been selected to inform and monitor the key policy areas outlined in chapter 2 – unpaid work and non-market production, monitoring well-being, and gender equality. A list of input requirements and populations are included under each of the recommended outputs, as well as the definition of the population to whom the measure is relevant, such as being a parent of a dependent child or persons who provide informal care to others.

15. The perceived need for more frequently updated information on time use and budget constraints has motivated a search for alternatives to conducting full time-use surveys every ten years. Chapter 4 summarizes the yet scarce experience with the use of light time-use diaries and argues that while they are suitable for studying general trends in time use, they cannot replace the full-scale diary survey with its rich content. The chapter also provides arguments for the use of diaries as opposed to surveys based only on stylized questions. Further, this chapter considers the different intervals for conducting the surveys and addresses activities that last longer than the observation period of time diary surveys. It also summarizes

the experience with longitudinal time-use surveys and the purposes for which they can be useful.

16. Currently there is no single approved international standard classification of activities for time-use surveys, which limits international comparability and impacts on the ability to achieve standardization in the collection and output of activity data. However, there are many common elements used across different frameworks that can be utilized to form a minimum set of classification categories for international comparability and reporting purposes. Chapter 5 proposes a minimum set of classification categories to allow for the comparison of activities across countries and to facilitate key policy and output requirements. The proposed classification is sufficient for the production of the recommended outputs described in chapter 3.

17. Further chapters of the present Guidelines cover the different stages of survey taking: sampling, questionnaire design and testing, data collection, processing and dissemination. Regarding these topics, the Guidelines focus on issues not covered in the United Nations *Guide to Producing Statistics on Time Use* (see section 1.1.3) or where updating is necessary in the light of recent experience. The Guidelines focus on issues that are specific to time-use surveys at the cost of guidance on household surveys in general, because a great deal of methodological guidance is available for the latter (e.g. United Nations 2005b and 2008). The guidance provided here draws on experiences from countries with developed statistical systems. Where relevant, the Guidelines provide a recommendation of preferred or best practice. The methods and requirements recommended in this paper will help countries populate the key outputs, which in turn allow reporting on the main policy areas. While the Guidelines may recommend one method as best practice (such as use of a 24-hour self-complete diary), it also discusses alternative methods or options that may be more cost effective.

18. Wherever relevant, the Guidelines include explicit recommendations at the end of each chapter. On some topics, the Guidelines do not make any clear-cut recommendations due to insufficient evidence. Such areas include the use of light time-use diaries, the measurement of well-being and its subjective measurement (affect), and the use of new technologies like mobile devices. Survey design and methodology are continuously evolving, looking to reduce respondent burden and gain accuracy. At the same time, policy needs also evolve. An overview of the areas envisaged for further harmonization efforts is provided in chapter 11.

2 Policy Relevance

2.1 Introduction

19. Time can be viewed as the ultimate constraint on human activity. Unlike other resources, it is shared equally by everyone. Each of us has 24 hours per day. Time-use surveys measure the numerous and diverse ways in which people use these hours

20. Time may be spent in the labour market where its value is measured in monetary terms, but it is also the resource that enables consumption and the undertaking of domestic and volunteer work. Because production can move between the labour market and the domestic sector, an understanding of time use is necessary to understand trends in either area. Time is also the basic resource for leisure activities and an important aspect of well-being. Only a time-use survey provides an integrated picture of how the various paid, volunteer, domestic and leisure activities come together in people's lives (Fleming and Spellerberg 1999).

21. Five methods are commonly used to measure people's use of time: direct observation; databases of time-stamped information; stylized questions; experience sampling; and time-use diaries. These Guidelines concentrate on the time diary method, which produces data that are more accurate and offer greater depth of detail for policy applications than the alternatives.

22. Direct observation produces the most detailed data over the widest range of activities. Though useful in qualitative contexts where a researcher can build a relationship of trust with participants, this method requires considerable labour resources. Costs, post-coding and concerns such methods may raise with some participants make this approach unsuitable for national sample surveys.

23. Databases of time-stamped information, for example official records of periods of stay in institutions such as hospitals or prisons, use of facilities, such as public sports facilities or libraries, and time-stamped social media entries, from Twitter feeds or Facebook timelines, offer a range of time-use information. Nevertheless, these resources reflect the activities of highly selective samples and do not cover the comprehensive activity ranges needed to address the range of policy applications outlined in this chapter.

24. A number of surveys include stylized questions that ask people to estimate the total time people spend undertaking various activities (how long did you watch television/clean the house/take to drive to work yesterday?). As also discussed in sections 3.1 and 4.1, this method entails significant inaccuracy (that varies by activity type), and cannot capture other dimensions of time use necessary to measure some of the policy dimensions outlined in this chapter.

25. The experience sampling method collects detailed information regarding the participants' activities in response to a prompt from a beeper, instant message, text or phone app prompt (mentioned further in section 8.1.5). While this method works well in contained populations, such as school students, implementation difficulties mean this method is not readily useful across a national sample. Also, the absence of total time spent over a day and the lack of activity sequences make this method unsuitable for some of the policy areas outlined in this chapter.

26. The preferred method for studying an individual's time allocation is through a time-use diary. The time diary method records the detailed account of the activities undertaken by an individual, usually over a period of 24 hours. The respondent reports successively all activities either in predetermined fixed time intervals or by indicating the beginning and ending time of each activity. An advantage of the time diary method is to allow respondents to

report activities that they have performed simultaneously, along with the context of these activities. This offers a wealth of analytical opportunities and policy-relevant information that would not be available otherwise. The policy issues described further in this chapter require collection of data on the total time spent in activities over whole days as opposed to participation at any moment in time. They also require data on the context surrounding the activities undertaken, for example, whom people are with, where they are and how they fit into chains of events over the day.

27. Time diary surveys have a long history. Studies based on time-use data first developed in the early 1900s in social surveys reporting on the living conditions of working class families (Szalai 1972). Until the late 1960s, mainly academic researchers used time-use information. Since the 1970s, however, policymakers have increasingly recognized the value of time-use information. Such data is essential to understanding the relationship between growth in market output measured through national accounts, and the total output produced within a country, including household production. It is also essential to providing an evidence base on policy concerning unpaid domestic work and gender equality. In recent years, time-use data has made important contributions to the measurement of quality of life, an area of high policy importance (Stiglitz et al. 2009). Beyond this, time diary surveys can provide information relevant to understanding social and leisure time, health, and transport policy. It is also used as a tool to study print media, radio and television audiences.

28. The exceptionally broad range of applications makes time diary surveys a particularly good value for money. In an environment where issues of fiscal impact and respondent burden limit what activities national statistical offices (NSOs) can undertake, it is important to be clear about the key purposes for which time diary surveys are necessary. This is essential in order to make decisions regarding trade-offs about what information is most important for time-use surveys to collect, what information NSOs should produce from time-use surveys, and how frequently time-use surveys should be undertaken, as well as for decisions about the relative priority of time-use surveys compared to other statistical activities.

29. The present Guidelines identify three key areas where information from time diary surveys is necessary for informed policymaking, and for which other data sources are not adequate: unpaid work and non-market production, monitoring well-being, and gender equality. These provide the core rationale for conducting time diary surveys and define the priorities for survey content. This chapter also presents a number of other uses for time data that, while relevant to policymakers, are not as high a priority because there are other data sources available for these topics or because the policy need is smaller. These are described in section 2.5.

30. A 24-hour time diary approach can adequately address the policy issues identified below, but must not rely on “stylized” questions or other approaches alone. Sections 3.1 and 4.1 address the differences between these approaches.

2.2 Unpaid work and non-market production

31. The System of National Accounts (SNA) excludes production of services by households for their own use (with the exception of the services of owner occupied dwellings) because they are difficult to observe and value, and have little relevance for short-run economic management (see 2008 SNA para. 6.30). The SNA production measures include production of goods by households for their own consumption. Such production may be very important in countries with a large informal economy. Surveys of households, especially time-use surveys, may assist in the periodic measurement of both goods and services produced by households

for their own use to provide information for policy purposes, and to assist in compiling production of goods estimates.

32. Time-use information that is potentially useful for policy purposes includes: volunteer activities and care, in which people engage for others; the increased participation of women in the labour market resulting in increased market production of some products; and services that were previously produced or offered by households. The current lack of this information might lead to a policy conclusion that an increase in services, such as childcare or long-term care for the chronically ill, increases the quantity of goods and services produced in a country, when in fact they simply move production from the household to the market sector. Without data on work in the unpaid sector, an accurate assessment of the impact and long-term costs and benefits of that policy change cannot be made. Currently, time-use surveys are the preferred source of information for the production of estimates of the value of own-account household production of services and volunteer services. Other methods, calling for general recall of frequency of occurrence of specific activities can be used, but these are not recommended where time-use data is available and current.

33. Placing monetary values on the non-market sector is not straightforward since the work is unpaid and most of the time, unpaid care produces intangible services. Broadly, there are two distinct approaches to estimation: (1) by placing a value on the unpaid work registered in the time diaries (“input valuation”), and (2) by estimating the market-equivalent value of the episodes of intangible service consumption recorded in the diaries (“output valuation”). In turn, the first of these has two alternatives: (1a) the “opportunity cost” approach and (1b) the “replacement wage” approach. The first is based on the observation that, while doing this unpaid work, the household members are prevented from engaging in paid work, so their unpaid work is to be valued (at the lowest) by their own marginal (or in the case of the un- or non-employed, expected) wage. The replacement wage approach values the unpaid work time either by the wage rates earned by specialist workers (cooks, cleaners, drivers and so on) or by generalists (termed “housekeepers”) who might otherwise have been paid for this work.

34. There is no general agreement as to the choice between methods 1a and 1b. On one hand, 1a does reflect the fact that households of higher paid workers are likely to have better domestic equipment than those of lower paid workers, with the consequence that domestic productivity in the former is on average higher than in the latter. However, preferring 1a over 1b does have paradoxical consequences: for example, the value of a meal home-cooked by a brain surgeon would be (it is to be assumed, incorrectly) valued on the basis of 1a at many times the value of a meal home-cooked by a professional chef.

35. Method 2, output valuation, can, however, provide some basis for resolving this problem. Each recorded episode of consumption of unpaid household services may be valued by the cost of an equivalent purchased service. In this case, the consumption may be differentially valued by the economic level of the household. For example, a meal lasting more than 30 minutes eaten by a member of a low-income household might be valued at the average price of a meal eaten at a fast-food outlet, whereas a meal eaten by a member of a rich household might be valued at the price of a meal at a cordon bleu restaurant. A fundamental principle of national accounting (somewhat simplified here) is that the value of national production is identical to that of national consumption. By extension, the value placed on the home-cooked meal (minus the costs of ingredients and some allowance for domestic capital equipment) must be identical to the value added by the labour input to the home cooking. In this case at least, using the output valuation method, the 1b cook (or housekeeper) valuation of the labour would come closer to the required national accounting identity than would the 1a opportunity cost approach. The experimental national accounts extensions constructed by the United Kingdom Office for National Statistics (Holloway et al. 2002) provide, inter alia, an example of this comparison of input and output calculations.

36. The output approach has the additional advantage of drawing attention to the value of that part of domestic output/production that relies mostly on domestic capital, and only minimally on unpaid labour. A household's provision of sleep-related services appears only as the value of bed-making time in the input-based approach. By contrast, the (output) sleep episodes revealed by the diaries might be valued, in a poor household, at the cost of beds in a one-star hotel, and in a rich household, at prices at a five-star hotel. Conventional gross domestic product (GDP) measures already include an allowance for general services provided by housing and other domestic capital. To avoid double counting, these allowances should be subtracted from the calculated total value of extra-economic consumption in complete national accounts.

37. Better knowledge of other unpaid production activities (and the corresponding unpurchased consumption activities) can help answer many important policy questions. For example, how do public policies, such as on tax, family leave and welfare, change the mix of market, housework and leisure time? How would national income accounts change if the value of citizens' unpaid productive activities were included? To what extent are GDP growth rates biased because they exclude the home productivity losses that typically occur when someone enters the labour market? Time-use surveys provide the data required to answer such questions. For example, analysis of the French time-use survey suggests that, valued at minimum wage and measured with the narrowest definition, unpaid domestic work is worth 17.5 per cent of GDP, a figure equivalent to the value-added of the entire French manufacturing industry. Measured with an intermediate definition, its value reaches 27 per cent of GDP, half the added value of market services.

38. Some countries have started to value these activities through an input-based "Household Satellite Account", which provides important information on the economy and society. *Australia* undertook unpaid work satellite accounts, which resulted in the publication of experimental estimates (Soupourmas and Ironmonger 2002). *Finland* also undertook household unpaid production and use of market services for national accounts (Varjonen and Aalto 2006). *New Zealand* is currently building a household satellite account to provide statistics on the contribution of households and informal volunteering to the economy following their 2009/2010 time-use survey. The country also measured the contribution of unpaid work to the economy after the 1999 time-use survey (Callister and Dixon 2001; Statistics New Zealand 2001). *France* has also published a methodological document about unpaid domestic work using the 1998 French time-use survey (Roy 2011). Similarly, *Canada* has undertaken work with its 1986, 1992 and 1998 time-use surveys highlighting that these data are a critical ingredient to estimates for the measurement and economic value of household unpaid work, which are excluded from the measurement of GDP (Jackson and Chandler 1995; Hamdad 2003). In the *United States*, such satellite account estimates have been recommended by the National Research Council Panel (Abraham and Mackie 2005) and compiled from several time-use surveys, including the 2009 American Time Use Survey (Landefeld, Fraumeni and Vojtech 2009). Output-based extended accounts (Holloway et al. 2002 for the *UK*, Soupourmas and Ironmonger 2009 for *Australia*) are rather rarer.

39. Hirway (2010) demonstrates that measuring household production is particularly significant in the context of developing countries, where an even greater share of total national output takes place in the household sector. The quantity and efficiency of household production, and the time constraints on people (mostly women) who devote long hours to domestic production, matter for the tracking of the level of economic development, the potential to upskill the workforce, and the economic power of women relative to men. For this reason, the United Nations Economic Commission for Africa is currently developing guidelines for time-use studies in developing countries.

2.3 Well-being

40. In their report on the measurement of economic performance and social progress, the Stiglitz commission argued for a shift of emphasis from measuring economic production to measuring people's well-being (Stiglitz et al. 2009). The commission referred to the consensus that quality of life depends on people's health and education, their everyday activities, their participation in the political process, the social and natural environment in which they live, and the factors shaping their personal and economic security. It identified time-use surveys as a key way to inform on well-being and progress, recognizing that indicators in this area remain deficient.

41. When an assessment of well-being relies solely on quantifiable measures like real income or earnings, it assumes that higher salaries equate to a better quality of life. However, high-salary jobs often imply long working hours and less leisure time, and measures that ignore home production and leisure may be misleading. Time-use data allows for the consideration of an essentially broader set of resources in these measurements (Stewart and Stewart 1999; German Federal Statistical Office 2010). Time diary accounts are exhaustive. A well-designed and implemented time diary study covers the whole spectrum of human activity in a representative fashion. Ultimately, this exhaustiveness is the basis for the contribution that diary studies make to the measurement of well-being. Time-use data is crucial to understanding how time spent in different activities contributes to well-being, and how changes in time-use impact on overall well-being. In particular, time-use data provides the most accurate and quantifiable way of assessing the value of leisure time and social connections, as well as the impact of work life balance on overall well-being. Time-use data also provides a potential framework for the development of more comprehensive "well-being accounts" based on measures of subjective well-being.

2.3.1 Social and leisure time

42. A great deal is known about the effects of policy changes on labour market behaviour, but relatively little about how government policies affect the way people spend their non-working time. For example, do people engage in more non-market production or do they consume more leisure? (Stewart and Stewart 1999). Time-use surveys provide information on the allocation of time to household production of substitutes for market output as well as on the allocation of time to leisure activities. This information is typically missing in other household survey datasets, but is required to show how well-being depends on consumption and leisure (Apps 2002).

43. The concept of a balanced life must also account for unpaid activities necessary to maintain quality of life, such as childcare, repairs around the home, paying bills and buying supplies and goods for the household. In themselves, these activities may not be conducive to relaxation, quality time with family and friends or intellectual challenge. For this, the leisure time of a family member has to be distinguished from the time spent on household maintenance, management and care activities for other family members. Time-use data provide the key starting point for the measurement of the value of leisure. For example, leisure is 64 per cent more pleasurable than domestic tasks in the *French* time-use survey (Ricroch 2011).

44. Time-use surveys also reveal that: levels of subjective well-being correlate negatively with some activities, such as commuting, and positively with time spent with others (Kahneman and Krueger 2006); infrequent communication between spouses is an important predictor of possible family dissolution (Hill 1988); and the social capital of volunteering and

social networking contribute to happy and successful life careers (Zuzanek 2009; Ravanera, Raiulton and Turcotte 2003).

2.3.2 Work-life balance

45. Policymakers and academics have a long-standing interest in collecting statistics on contracted hours of paid employment and hours of work, reflecting the concern that long hours of work can have damaging social consequences (Lourie 1996). Social surveys, such as labour force surveys, measure usual work hours. Some surveys also collect usual commuting times to measure the full constraints of paid work. While they matter for quality of life, these measures are insufficient in understanding several key policy-relevant issues. They do not indicate when during the day and the week paid work is undertaken and therefore lack evidence of atypical or antisocial hours. They do not indicate the duration of work spells and so lack evidence of work stress. They do not indicate whether spouses or other household members are simultaneously working or taking leisure (Gershuny 2011). Yet the time spent together with a partner and children that is measured by a time-use survey is of key concern in understanding work-life balance. Social surveys do not show the context of the whole day, whether the respondent sacrificed sleep, leisure, self-care or social time to make space for long commitments to paid work (Fisher and Layte 2004). Likewise, the daily and weekly work rhythms measured by a time-use survey have an important impact on well-being.

46. Time-use diaries are known to provide a more accurate estimate of the total number of hours than direct questions on this metric encountered in general social surveys (Robinson and Bostrom 1994). Furthermore, time at the work place is not the same as time on the job,⁵ as people may attend to matters not related to work while at work (Robinson and Godbey 1997). Time-use surveys also provide an insight into less well understood productive activities such as subsistence work, casual work and work in the informal sector (Merz 2009). Time diaries map the entire spectrum of issues relevant to measuring balance of needs in life and for the development of work-life balance policies (Fisher and Layte 2004).

47. A major advantage of a time-use survey is that it establishes where work was undertaken and when several activities were carried out simultaneously. For example, it can be shown that a significant share of white-collar workers who work late into the evening are at home when undertaking such work. Over 40 per cent of the time they spent working in the late evenings was recorded as being simultaneous paid work and childcare (Callister and Singley 2004). In contrast, a worker in the hospitality industry may be required to work Friday nights and weekends, outside of their home, at times when formal childcare is generally not available. In this example, the hospitality worker may work relatively few hours of paid work and have a less satisfactory work-life balance than an office-based professional working longer hours (Callister 2004).

48. In *Japan*, time-use data have been used to monitor the implementation of the “Charter for Work-life Balance” and the “Action Policy for Promoting Work-life Balance” adopted in 2007. *Finland*’s national programme to increase the attraction of work life has used time-use surveys to ensure that the working week of older people is shortened and systems are put in place to make paid working time more flexible. *Canada* has also identified the ability of time-use surveys to measure time crunch. Despite a small decrease in 2010, almost one in five Canadians between 20 and 64 years of age feel high levels of time pressure. The

⁵ Time diary surveys typically ask people simply to record "paid work" without asking them to specify details of the work, such as whether they were in a meeting, repairing equipment, giving a presentation, and the like. The research referenced in this paragraph makes use of the context information (secondary activities that are not paid work, location, who else is present, for whom, and flag if the activity involved use of the Internet). Supplements to diaries, including GPS trackers or accelerometers, are discussed in section 8.3.

consequences of time pressure can lead to less contact with one's family and friends, worse health, higher levels of stress and depression, and lower life satisfaction (Canadian Index of Wellbeing and University of Waterloo 2012). *India's* time-use survey has measured absence of leisure when low status people, particularly women, undertake such physically demanding activities that their downtime is limited to exhaustion recovery rather than personal enhancement or social regeneration (Hirway 2010).

2.4 Gender equality

49. Gender analysis of public policies is increasingly recognized as an essential component of policy advice. Strategic objective H2 of the Beijing Platform for Action demands that gender perspectives be integrated into legislation, public policies, programmes and projects. The objective requires that governments “seek to ensure that, before policy decisions are taken, an analysis of their impact on women and men, respectively, is carried out.”

50. Convention 156 of the International Labour Organization encourages member countries to develop policies to ensure that workers with family responsibilities are not discriminated against, and to reduce conflict between family life and employment. In *New Zealand*, the response was a project to promote “family friendly” workplaces. For projects of this kind, time-use data provide empirical evidence of unequal sharing within households and the barriers to participation in employment presented by caring responsibilities (Fleming and Spellerberg 1999).

51. Because of the unequal distribution of paid and unpaid work between men and women, data on time spent in household and caring work are an essential component of gender analysis. As women make key contributions to unpaid work that both maintains the household and generates household income, understanding women's full range of activities is an essential element of modelling movement towards or away from gender equality. Time-use data can therefore be used increasingly as a tool for policy analysis on gender, and this has been the driving motivation for recent time-use surveys, among others, in emerging economies such as Brazil and South Africa (Antonopoulos and Hirway 2010).

52. Despite substantial change over the last half century, women still do much more unpaid work and less paid work than men. Men have increased the time they spend doing housework and childcare, but by a small amount. For example, in 2000, men in *Finland* performed an average of 12 more minutes per day of domestic work than they had performed in 1987 (Niemi and Pääkkönen 2002). Between 1961 and 1995, men in the *United Kingdom* increased their average time performing household cleaning and childcare by 17 minutes a day (Gershuny 2000). In *Canada*, the average length of time men spent doing household work and childcare increased by 13 minutes from 1998 to 2010 (Statistics Canada 2011). In *France*, between 1986 and 2011, men only increased their average time in unpaid work by 13 minutes, whereas women decreased their average time by 48 minutes. The difference was still 87 minutes per day in 2011 (Ricroch 2012).

53. When women's and men's participation in paid employment differs, the partners' respective rates of accumulation of human capital will differ. If, furthermore, a couple splits, the outcome is often that the man departs with enhanced human capital while the woman's human capital diminishes. In the absence of appropriate compensation, this outcome is potentially inequitable. To design policies that address these issues, evidence of the joint distributions of paid and unpaid work within households is required (Gershuny 2011). Time-use surveys provide such evidence.

54. For example, a time-use survey can show how occupational segregation and, ultimately, pay disparities between women and men could be influenced by something as simple as the daily starting time of jobs. *Australia* saw large differences between the proportion of men and women who were working in the early morning. Men were more than twice as likely to be working between 4 am and 6 am and about twice as likely in the 6 am to 8 am period. The later start for mothers reflects higher rates of part-time work among this group as well as childcare constraints in the early morning. While policymakers consider day care, after-school care and even weekend care in terms of supporting working parents, they have given little attention to early morning care (Callister 2004).

55. While time-use surveys have been used to research gender equality, they have also been used to inform policy in some countries. *Japan* has “The Basic Plan for Gender Equality”, which was established by the government under “The Basic Law for a Gender-equal Society”. This basic plan stipulates that the time spent on “childcare” and “caring or nursing” should be measured by gender through the Japanese Survey on Time Use and Leisure Activities. The results are being used to monitor the goal of increasing the time that men with children under six years of age spend on housework and childcare from 60 minutes in 2006 to 150 minutes in 2020. Research in *Romania* has looked into the gender differences in time use in life cycle stages. In *Hungary*, the Women and Men Gender Equality Council is collecting information on all aspects of gender equality, including reconciliation of work and family life and sharing of work and housework between men and women. In *France*, time-use surveys, in conjunction with other data sources, are used by INSEE, the National Institute of Statistics and Economic Studies, to publish a report entitled *Women and men – an overview of gender parity* (Femmes et hommes – Regards sur la Parité) every four years.

56. *Norway* has used time-use surveys in research for several government offices since the 1970s. Particular interest has included men’s and women’s time spent on paid work in various age groups and life cycle stages. The Ministries of Finance, Labour, Children, Equality and Social Inclusion, Culture, and Health and Care have funded research and investigations based on time-use surveys.

2.5 Other uses of time-use data

2.5.1 Health

57. Time-use surveys provide a picture of time inputs into health-related activities alongside their demographic and economic characteristics. Through this, a much better understanding of investments in health is assured (Hamermesh, Frazis and Stewart 2005). The valuation of unpaid health care services is another important issue related to health policy and health insurance. Unpaid services in the household influence the length of stay at hospitals. The World Health Organization (WHO) defines the expenditure for non-market production as the value established at the cost of resources used to produce the good or service in question (WHO 2003; Lorenz and Amjad 2010).

58. Time-use surveys allow us to understand engagement in behaviours that have a direct influence on health over the long term, such as exercise, eating and sleeping. Time-use surveys also cast light on relationships between time use, well-being and health. It has traditionally been assumed that long hours of work have direct negative effects on health (Harrington 2001). Time-use data show that this negative impact may be indirect and operate with a considerable delay, since the self-assessed health of people who work more than average was higher than of employees working shorter hours (Zuzanek 2009).

59. Time-use data contribute to shaping obesity policy (Davis and You 2011; Hamrick 2006). The *United States* Department of Agriculture added an Eating and Health Module to the 2006-2008 American Time Use Survey to examine the effectiveness of some poverty reduction policies on the health of poor communities, and to facilitate wider inclusion of health implications in policy analysis (Reifschneider et al. 2011). Time-use data feature in the analysis of physically active transport (Tudor-Locke et al. 2007; Peters 2010), and health researchers have developed a compendium to the American Time Use Survey that maps the typical energy expenditure people make when participating in various activities (Tudor-Locke et al. 2009). The United States National Institute of Health is developing a similar compendium to the Multinational Time Use Study. Time-use data helped confirm in *France* the link between the rhythm of eating and obesity: people who have less than three meals per day are more often obese than others of same characteristics and behaviours, as they eat between meals more often (De Saint Pol 2012).

60. A recent study in the *United Kingdom* concluded that medical and educational professions undertake relatively little exercise (Gershuny 2011). In *Canada*, the need for data to inform sport policy continues to be a priority, and their time-use survey is the only national survey that provides information on sport participation for all Canadians aged 15 and older.

61. In *Australia*, a study on new mothers' time use provided policymakers with a way to improve the use of the country's human capital. It draws attention to the potential policy contradiction between increasing women's labour force participation and protecting and forming the human capital of their young children, as the first year of life is the most critical for the future health and learning trajectories. In conclusion, the authors argue for increased paid maternity leave and more family-friendly employment policies (Smith, Craig and Ellwood 2009).

2.5.2 Work

62. Another important use of time-use surveys is the capacity to identify forms of work that go beyond what is currently measured in labour statistics. Time-use surveys can help measure casual, sporadic or temporary employment work that is becoming more frequent, as well as volunteer work and own-use production work that comprises both unpaid production of goods and unpaid provision of services. The information based on short time segments is of great importance in understanding the impact of different forms of work and kinds of jobs on people's lives.

63. Experts on work and labour force statistics have prominently acknowledged the usefulness of time-use surveys in understanding the less formal aspects of volunteer work, such as community work or helping neighbours (ILO 2011). Information from time-use surveys can be very useful in conjunction with labour force surveys, as one can then relate time in other forms of work, including non-employment work activities, to labour force status.

2.5.3 Transport

64. Time-use data have long been used to model demand for transportation facilities, the mechanisms driving consumer choices of transportation mode, and more recently the environmental impact of transportation behaviours (Arentze and Timmermans 2007; Banerjee, Ye and Pendyala 2007; Chikaraishi et al. 2012). Additionally, time-use surveys reveal gender disparities in access to transportation. Research in *Canada* (Michelson 2009) and *South Africa* (Potgieter et al. 2006) shows that men tend to control the use of the most advanced transportation options owned by households, while women make do with the less

expensive and convenient options, and that the limitations in women's transportation access in turn restricts their options in other elements of daily activity scheduling.

65. Time-use surveys provide a lot of information on the household production of transport services, specifically the number, duration and timing of trips in motor vehicles. The distance travelled in kilometres can then be estimated based on the duration of a trip multiplied by the average speed obtained via travel surveys.

66. In *Australia*, there are also annual official surveys of samples of both domestic and commercial vehicles to determine, for public transport policy purposes, the annual average number of vehicle kilometres travelled by vehicle type. These surveys provide estimates of household transport vehicle kilometres.

67. In *Australia*, time-use surveys have been used in combination with journey-to-work data from the Census of Population and Housing to understand transport demand and the needs of people using transport networks and surveys (Soupourmas and Ironmonger 2009). They revealed that travel does not involve a large use of total time. They also revealed that travel time is a growing component of total time use by women, while it is a diminishing proportion of time use by men.

68. In *Canada*, time-use data have been used to explore commuting patterns, time spent travelling to work, and their relationship to selected subjective measures of quality of life, including stress levels and satisfaction with work-life balance (Turcotte 2011).

2.5.4 Culture and sport

69. Examples of using time-use data in *Finland* include the planning and timing of television programmes and cultural policy evaluation. *Canada's* Department of Canadian Heritage and Sport Canada have used time-use surveys for sport-related policies and to evaluate sports participation programmes. The non-governmental organization Active Healthy Kids Canada, which is committed to engaging all children and youth in physical activity, has used data from the time-use survey in its *2009 Report Card on Physical Activity for Children and Youth* (Active Healthy Kids Canada 2009). *Canada* has also used time-use data to describe Canadians' demand for cultural goods and services and their involvement in cultural activities (Allen 2013). In addition, time-use data have been used to explore social contacts, shopping and consumption behaviours, as well as sleep patterns (Statistics Canada 2011).

70. Research using the American Time Use Survey finds that women and men undertake similar levels of exercise, but men are more likely to participate in team sports and competitive sports, and the competitive sport gives men social capital advantages that women do not enjoy (Deaner et al. 2012).

2.5.5 Environment and climate

71. Time-use surveys play an increasingly important role in environmental and climate research. The *United States* Environmental Protection Agency has funded both national and regional level time-use studies, collected in the Consolidated Human Activity Database (CHAD), to examine the impact of exposure to traffic fumes, passive smoke, chemicals used in the home and industrial pollution. Similarly, time-use surveys feature in the analysis of exposure to poisoning from the use of biofuels in cooking (Shimada et al. 2012). As the impacts of anthropogenic climate change are better understood, time-use studies now feature in research to measure peak flows for energy demand (Aerts et. al 2012; Torriti 2012; Widén et al. 2012) and the impact of energy consumption reduction policies on individual behaviours. Research using time-use data in the *United States* has also revealed that

expansion of the total volume of state-level environmental policies and regulations contributes to general reductions in energy consumption across the population (Fisher, Shahbazian and Sepahvand 2012).

2.5.6 Time poverty

72. Similar to income or material poverty, which deprives people of the resources necessary to afford decent living conditions, time poverty also acts as a hindrance to life satisfaction. The research community is acutely interested in time poverty for its policy implications. For instance, sleeping five hours instead of the recommended eight constitutes time deprivation suffered by those who are frequently subjected to it, and might negatively impact their general health status and life satisfaction. Time poverty can be understood as the deficit of enough time for rest and leisure after taking into account the time spent in paid work and nonmarket activities. Studies of time constraints and poverty include the comparative analysis of time use among Germans at risk of poverty and not at risk of poverty (Holz 2004). More recently, Bonke, Deding and Lausten (2009) analysed the simultaneous determination of economic satisfaction and leisure satisfaction for women and for men, and Zacharias, Antonopoulos and Masterson (2012) undertook the development of a new approach to poverty that takes into account time deprivation as well as income. These time-poverty studies have relied heavily on time-use surveys, which are particularly suited to measuring this particular form of deprivation.

2.5.7 Policies targeting specific population groups

73. Time-use surveys also are used in policies that target specific population groups. For example, *Finland* has used time-use surveys for policymaking or policy evaluation concerning rural areas, including employment projects for rural work, and on early retirement (Huovinen and Piekkola 2002a and 2002b). *Hungary's* Ministry of National Resources has used time-use surveys, in conjunction with other data sources, to create a complete picture of how the elderly use their time. The Ministry's interest has included understanding active or passive time and free time activities. The complete picture of how the elderly use their time was further utilized in a comprehensive "National Strategy on Ageing" in 2009. Other investigations include whether actual activities of the elderly strengthen or weaken their social relationships and how they are connected to persons in and outside their households.

74. Children are also the focus of time-use policy in the *United States* (Hofferth and Sandberg 2001), *UK* (Hagell 2012), and *Australia*. Interest in children's time use is the key motivation for adding the Child Development and Transition to Adulthood supplements to the Panel Study of Income Dynamics (*United States*), and for including time-use diaries in *Australia's Growing Up in Australia: Longitudinal Study of Australian Children*.

75. Additionally, researchers have used time use studies to examine how single fathers manage childcare responsibilities in the *United States* (Hook and Chalasani 2008), how drivers adjust travel behaviour when petrol prices change (Sen 2012), how couples where one partner or both has a disability and people looking after adults with long-term disabilities manage daily schedules to accommodate care (Bittman et al. 2005; Freedman et al. 2012). Time-use surveys also play a central role in the analysis of improving the basic living conditions of women in the communities with the least resources in developing countries (Antonopoulos and Hirway 2010).

76. More generally, time-use surveys can also be used to assess inequalities between different population groups. In this respect *New Zealand's Time Use Survey 2009/10*, not

only examined gender differences in society as a whole, but also broke down the statistics so as to compare Maori and non-Maori women and men (Statistics New Zealand 2011).

77. Further possible applications of time-use surveys include studies on culture, civic, physical as well as religious or spiritual activities.

2.6 Conclusions

78. Time-use surveys collect information on all human activities and can therefore inform a broad range of policies. The three key areas of unpaid work and non-market production, monitoring well-being, and gender equality are identified as those where information from time-use surveys is necessary for informed policymaking, and for which other data sources are not adequate. This provides the core rationale for conducting time-use surveys regularly. In particular, time-use surveys are well placed to respond to the recent shift of emphasis towards measuring well-being in the context of measuring social progress.

3 Recommended Outputs

3.1 Introduction

79. This chapter outlines the recommended outputs available from time-use surveys that have been selected to inform and monitor the key policy areas outlined in chapter 2. This is not an exhaustive list of outputs from time-use surveys; rather it covers the minimum measures needed to report on the key policy areas. For some measures, time-use surveys are the only source of relevant and accurate information, while for others, time-use outputs produce more relevant measures or allow the measures to be analysed according to how time is spent.

80. While there are a number of methods of collecting time-use information, only the time diary method captures the range of information needed to produce the outputs recommended in this chapter. As such, most of the following recommended outputs assume the use of a 24-hour diary collection method. For some countries, adapting their time-use survey to produce all of these measures would require an increase in costs and a respondent burden compared to previous collection efforts. Countries should assess their survey objectives against their key policy areas and the recommended measures for reporting purposes. For some activities, such as volunteering, additional outputs are recommended that do not require diary collection.

81. It is not recommended to use stylized questions to measure time spent on a daily basis in activities. Stylized questions asking people, for example, how much time they spent preparing food, helping children with their homework, doing laundry and other activities cannot provide the same accuracy of information collected by a time diary, and also cannot collect the range of additional detail that diaries collect. Nevertheless, questions asking people to report the longer term frequency of participation in activities they may not do every day (how many times did you participate in sports in the last month, how often do you perform volunteer activities over a year, or how many times do you go to the cinema or a live performance each year) usefully complement diary data to model average activity times over a longer period (see section 4.4). Similarly, stylized questions can well measure the overall prevalence of volunteering and the time crunch.

82. Many of the recommended outputs from time-use surveys require the collection of contextual information about the activity. This may include information about who was with the respondent during the activity (with whom), why the respondent undertook the activity (for whom), the location of the activity (potentially including both inside/outside and the home, workplace) or the mode of transport during the activity. As outlined in section 7.2, the collection of secondary activities is also important to enabling more comprehensive measures of how people are using their time and therefore becomes an additional input variable to several recommended outputs described in this chapter.

83. The “for whom” contextual variable permits the creation of estimates of time spent on a range of unpaid work such as volunteer work, disability and childcare. Although these estimates can be produced by directly coding unpaid work activities to volunteer work, childcare, etc. (as is done using HETUS), the focus is on the purpose of the activity, and the nature (or why) of the activity is lost. The “with whom” or “for whom” contextual variable is also important for the production of estimates of passive childcare, activities with family members, and more broadly time spent alone or with others. Further coding information is provided in section 9.1.1.

84. In this chapter, a list of input requirements and the definition of the relevant population are included under each recommended output. Some data items from time-use surveys are

best examined by restricting the population to those who have performed the activity or have a certain characteristic, such as being a parent of a dependent child or persons who provided informal care to others. This is particularly useful when looking at time spent on activities undertaken only by a subset of the population. Where the population is best restricted to those who performed the activity, the population has been marked as participants followed by a brief description of the participants.

85. Even when an average time figure relates to the whole population (such as average time spent volunteering on any given day), some reports are most usefully presented in three parts: the average time spent per person per day across the population, the average time spent in the activity by those people who performed the activity on their diary day, and the percentage of the population who performed the activity.

3.2 Unpaid work and non-market production

86. Work may be paid (in cash or in kind) or unpaid. The majority of employment jobs are paid, although contributing family workers (included within employment and market production) are paid indirectly. Other forms of work, such as own-use production⁶ work and volunteer work are not paid. Statistics on time spent doing the unpaid work in the household and volunteering sectors allow for the calculation of the value of the goods and services produced there. The concepts of employment (paid workers plus unpaid family workers) and other forms of work and working time used here are based on International Labour Organization (ILO) definitions (International Conference of Labour Statisticians (ICLS) 1982, 2008; ILO 2011, 2013).

87. The trial International Classification of Activities for Time-Use Statistics (ICATUS) proposes to define unpaid work as work “beyond the System of National Accounts (SNA) production boundary”, that is, as activities 06-08 of the Classification (United Nations 2005a: 185). The outputs defined in this chapter allow for this distinction. The use and further analysis of these outputs may benefit from awareness of the International Conference of Labour Statisticians (2008) “Resolution concerning the measurement of working time”,⁷ which clearly sets out the need to measure working time both within and beyond the System of National Accounts production boundary. The resolution also recognizes that time-use surveys are an important source of statistics on the topic and are a useful source to adjust and improve the measurement of economic activity through labour force surveys.

3.2.1 Household production

Output 1: Household production as a percentage of gross domestic product (GDP).

Input requirements

Total hours spent in unpaid work

Minimum 24-hour diary

⁶ ILO (2013) defines own-use production work as any activity to produce goods or provide services for own final use where “any activity” refers to work for at least one hour and “for own final use” is interpreted as the destination of output for consumption or use by the producer, by household members or by family members living in other households. Own-use production of goods is included in the System of National Accounts production boundary, whereas the own-use production of services is not.

⁷ Available at http://www.ilo.org/global/statistics-and-databases/standards-and-guidelines/resolutions-adopted-by-international-conferences-of-labour-statisticians/WCMS_112455/lang--en/index.htm

Population (denominator)

All persons

88. There are several methods for extending gross domestic product to include economic activity beyond the System of National Accounts (SNA) production boundary, within the SNA General Production Boundary. The *shadow wage* approach replaces this unpaid work with the marginal wage rate; the *market wage for equivalent tasks* values this unpaid work as the cost to pay a professional to do it; and the *consumption* approach values events by the market price of an equivalent event (Gershuny 2011).

3.2.2 Time spent on unpaid work outside of employment

3.2.2.1 All unpaid work

Output 1: All persons, by sex, average time spent in unpaid work as primary or secondary activity

Output 2: Proportion of all persons, by sex, reporting any time spent in unpaid work as primary or secondary activity

Input requirements

Collection of secondary activity

Minimum 24-hour diary

Population (denominator)

All persons

3.2.2.2 Food preparation and clean-up

89. Food preparation time and clean up matter in the calculation of national accounts as these activities can easily be outsourced. Tracking the degree to which people rely on unpaid household production or market sources for these activities captures both cultural changes and economic performance in meeting basic needs. These two outputs are also highly comparable across cultures.

Output 1: All persons, and separately for women and men, average time spent in food preparation and clean-up at home as primary or secondary activity

Output 2: Proportion of all persons, and separately for women and men, who participated in the activity

Input requirements

Collection of secondary activity

Minimum 24-hour diary

Population (denominator)

All persons

Output: All persons, number of episodes of eating a meal at home (as a main activity or a secondary activity)

Collection of secondary activity, collection of location

Minimum 24-hour diary

Population (denominator)

All persons

3.2.3 Unpaid care, childcare and provision of assistance to household members

90. Market substitutes for physical and medical childcare differ in price and availability from market substitutes for interactive care. Parents report enjoying interactive care, and children may feel less happy with market substitutes for such care. Research finds that fathers are more willing to take up the more enjoyable elements rather than the more routine elements of childcare (Raley et al. 2012), and some researchers argue that some types of childcare are more like leisure than like care (Agiar and Hurst 2007).⁸ For these reasons, it is important to report both all childcare and time in the more enjoyable dimensions of childcare.

91. The identification of persons with a disability in the household component of the survey assists in accurately coding care for persons with disabilities.

Output 1: Average time spent providing childcare as primary or secondary activity, for all persons who provided childcare, and separately for all women and all men who provided childcare.

Output 2: Average time spent playing with children, doing sports with children or reading to children as primary or secondary activity, for all persons who provided childcare, and separately for all women and all men who provided childcare – this care time is a subset of all childcare time.

Output 3: Average time spent providing care to adults as primary or secondary activity, for all persons who provided care to adults, and separately for all women and all men who provided care to adults.

Input requirements

Primary activity collects childcare

Primary activity collects care to adults

Secondary activity collects childcare

Secondary activity collects care to adults

“For whom” and “with whom” contextual variables

Disability identification in the household questionnaire for all members of the household

Population (denominator)

Participants - persons who provided childcare

Participants - persons who provided informal care to others

3.2.4 Time spent volunteering

92. Volunteer work by definition is unpaid work (see ILO 2011 for details). While interview-based questions are more effective at capturing the prevalence of undertaking all types of volunteer work in the population over a year, they are less accurate in capturing time spent on episodes of volunteering. Time-use surveys not only collect the average duration of volunteering activities, they also allow analysts to examine the way people structure volunteering activities into their day, and thus estimate the capacity for people to undertake

⁸ Research in some countries with low levels of absolute poverty, a large proportion of women working in the paid labour market and high levels of education among women have a curious trend of increasing childcare time while fertility declines (Bianchi 2010, Raley, Bianchi and Wang 2012). This trend partly reflects the fact that older children no longer tend to look after younger siblings, but it also reflects rising time spent in interactive investment in children (Bianchi 2010).

further activity (Fisher 2010). This capacity of time-use diaries to accurately collect volunteer work has been underlined by the International Labour Organization (2011), which identifies two major categories of volunteer work: direct volunteering, (i.e. volunteer activities engaged in directly for other households) and organization-based volunteering (i.e. volunteering done for or through non-profit institutions or other types of organizations). Time diary information is usefully supplemented by questions on longer term participation in volunteer activities (see section 4.4.1).

Output 1: Average time spent volunteering for organizations by people who volunteered (organization-based volunteer work).

Input requirements

Classification of activities as "volunteering"

"For whom" contextual variables includes "for organization"

Population (denominator)

Participants - persons who volunteered for an organization

Output 2: Average time spent providing direct volunteering/assistance to others by people who provided informal assistance to other households.

Input requirements

Classification of activities as direct volunteering

Classification of activities as assistance to others outside the household

"For whom" contextual variable is used to separate activities done for persons outside the household/family and the community (direct volunteering/assistance)

Population (denominator)

Participants - persons who spent time providing direct volunteering/assistances to others (direct volunteer work)

93. Informal or direct volunteering is broadly assisting other households on an informal basis (such as collecting shopping for a neighbour) or activities that benefit the wider community (Fisher 2010). To collect data on direct volunteering, a survey must be able to distinguish for whom the activity was done. Time-use surveys should specifically request that respondents mention the beneficiary and mechanism of the volunteering. This activity can be coded either in the primary and secondary activity classifications or marked using a "for whom" column. For consistency with the ILO definitions, the reference period for recording these activities should be four weeks. Other reference periods may need to be used to ensure comparability with earlier surveys.

Output 3: Proportion of persons who provided unpaid volunteer work to an organization in the last four weeks.

Output 4: Proportion of persons who provided unpaid assistance or help to other households (direct volunteering) in the last four weeks.

Input requirements

Question collecting volunteer unpaid work undertaken for an organization in the last four weeks

Question collecting direct volunteering to (unpaid assistance or help to other) households in the last four weeks

Population (denominator)

All persons

94. Standard interview questions covering a longer reference period, for example four weeks, are considered better at capturing the prevalence of volunteer work than using the participants from the diary. While questions of this kind are subject to recall issues, they do

overcome the problem of persons who volunteer regularly not doing so on their diary day(s). Collection on an interviewer-based questionnaire is preferred to a self-complete question on the diary to avoid non-response issues. Collection in this way also allows for consultation between the results of the questionnaire and the diary for consistency and to capture people who did not report volunteer work on the questionnaire but performed this activity in their diary day.

3.3 Well-being

3.3.1 Social and leisure time

95. Leisure time is the amount of time left over out of 24 hours once time for sleep, paid work, unpaid work and personal care have been deducted. Even then, as noted below, the encroachment of paid work and duties on “down-time” makes isolating pure leisure time difficult.

96. Time-use surveys allow for the estimation of three types of leisure time:

- a) Active: where the primary activity is a leisure activity but where the secondary activity could be childcare, paid work, personal care, etc.
- b) Pure: where the primary activity is a leisure activity and where the secondary activity is also leisure (not paid work, home production or personal care related) or there is no secondary activity.
- c) Passive: where the primary activity is an activity not considered to be leisure, but where there is a secondary activity that is (e.g. cleaning while listening to music).

97. The collection of secondary activities is necessary for this distinction.

98. The data items presented below are necessary for calculating the valuation of leisure time and putting it in context.

3.3.1.1 Time spent alone or with others

Output 1: All persons, average time spent alone

Output 2: All persons, total time spent alone by primary activity group

Input requirement

"With whom" contextual variable needs to include "self"

Population (denominator)

All persons

Output 3: All persons, average time spent with others by relationship to others (e.g. family, children, friends) and by primary activity group

Input requirement

"With whom" contextual variable

Locational data

Population (denominator)

All persons

99. People do need time alone. However, evidence suggests that some activities such as leisure time are more enjoyable when spent with others than when spent alone. There are also empirical studies showing a link between isolation and mental illness (Fisher, Gimenez Nadal,

Sevilla Sanz 2009). Time-use surveys allow time to be analysed by the presence or absence of other people.

3.3.1.2 *Active leisure time*

Output 1: All persons, proportion of people engaged in active leisure by time of the day

Output 2: All persons, average time spent on active leisure

Input requirement

Collection of primary and secondary activities

Population (denominator)

All persons

100. As well as data on the amount of leisure time in which people are engaged, the timing of that leisure activity is useful in addressing policy needs, including timing for public television broadcasting.

3.3.1.3 *Pure leisure time*

Output 1: Proportion of persons who engaged in pure leisure by time of the day

Output 2: All persons, average time spent on pure leisure

Input requirement

Collection of primary and secondary activities

Population (denominator)

All persons

3.3.1.4 *Passive leisure time*

Output 1: All persons, proportion of people with secondary passive leisure activities by primary activity group

Input requirement

Collection of primary and secondary activities

Population (denominator)

All persons

Output 2: All persons, average time spent in secondary leisure activities

Input requirement

Collection of secondary activities

Population (denominator)

All persons

Output 3: Average time spent where the secondary activity is leisure, by primary activity group for persons who had a secondary leisure activity

Input requirement

Collection of secondary activities

Population (denominator)

Participants - persons who had a secondary leisure activity.

3.3.1.5 *Timing of leisure activities*

Output: All persons, times of day with highest proportion of persons participating in leisure activities

Input requirements

Leisure activities by hour of the day

Population (denominator)

All persons

101. The availability and quantity of leisure time does not necessarily equate to an improved work-life balance, particularly if that leisure time is available during a period in the day where one is unable to capitalize on the financial benefits of work or the richness of relationships, for example the shops are closed or all other family members are at work/asleep (Fisher and Layte 2004).

3.3.2 **Time spent sleeping**

Output 1: All persons, average time spent sleeping

Input requirements

Greater than 24-hour diary to collect hours slept the night before the first diary day, or question on diary asking what time went to bed the night before day 1

Population (denominator)

All persons

102. Amount of sleep and its relation to health outcomes is a well-recognized field of study. Time-use diaries provide the only nationally representative estimates of average hours of sleep that are objectively measured. In addition, 24-hour time diaries allow for the examination of relationships between sleep and other behaviours, such as activities prior to going to bed. Sleep and work are the two longest activities the average person does in each day. Time diaries allow for the examination of how sleep and work impact on other activities, such as unpaid work and leisure.

3.3.3 **Work-life balance**

3.3.3.1 *Employment*⁹

Output 1: Proportion of persons who did employment work (in exchange for remuneration as pay or profit) by hour of the day.

Inputs requirements

24-hour diary includes adequate sampling on weekends

Population (denominator)

Persons engaged in employment work on their diary day(s)

103. Interview-based questions about work patterns, as found in labour force questionnaires, do not inform *when* people are working and thus there is the potential for a mismatch between work, family and leisure time.

Output 2: Proportion of persons who did employment work, who undertook secondary activities simultaneously.

⁹ The concept of “employment” is understood as defined by ILO (2013).

Input requirements

Collection of secondary activities

Population (denominator)

Persons engaged in employment work on their diary day(s)

3.3.3.2 *Non-standard employment working time*

Output 1: Proportion of persons who did employment work outside of “normal schedules” (e.g. before 8 a.m. or after 6 p.m.).

Output 2: Proportion of persons who did employment work on weekends

Output 3: Proportion of persons who did employment work performing non-continuous work.

The non-continuous work could be, for example, working in one job or one four-hour shift that starts in the early hours of the morning, and then working in a second job or working during a second four-hour shift that starts in the late afternoon. This pattern of employment reflects long blocks of other activities in between employment spells, not merely normal breaks for rest or meals during a more typical employment arrangement.

Input requirements

Duration of work collected in maximum 15-minute intervals

Categorization of "normal schedules" (e.g. 8 a.m. to 6 p.m.) to establish work done outside these hours

Population (denominator)

Persons engaged in employment work on their diary day(s).

Labour force data does not provide in-depth information about people working outside "normal schedules", on weekends or irregularly throughout a 24-hour day.

3.3.3.3 *Time crunch*

104. While time stress or time "crunch" can be measured in any household survey through stylized questions, only a time diary provides the data to assess time stress with time-use behaviours. Time-use surveys can provide a measure of the extent to which employment, unpaid work and leisure time overlap.

Output 1: Proportion of all persons who feel stressed most or all of the time

Input requirements

Question collecting perception of time pressure, such as "how often do you feel pressed for time"

Population (denominator)

All persons

Output 2: All persons, average proportion of time when more than one activity undertaken concurrently

Output 3: All persons, ratio of all work time (employment + unpaid) to leisure time including primary and secondary activities.

Input requirements

Collection of primary and secondary activities

Population (denominator)

All persons

105. Time spent in employment or other forms of work alone cannot be used adequately as a measure of work-life balance. It does not necessarily equate that the more time spent working, the lower the quality of non-work time (Callister 2004). Time-use data allows policymakers and analysts to see the relationships between employment, unpaid forms of work, personal care and leisure time that cannot be taken from a traditional labour-related household survey and the extent that the different activities may be undertaken concurrently.

3.3.3.4 Breaks from employment work: job time/non-job time

106. Working time spent in employment does not equal the exact hours spent on work activities or performing productive work. There are many intrusions into working time, like short morning and afternoon tea and coffee breaks, and pauses for prayer. The measurement of working time concepts such as hours actually worked includes these short pauses, but excludes longer breaks (i.e. meals). Other breaks are less formal, such as talking socially with colleagues or phone calls. Breaks from work are generally important for healthy work practices. Time-use surveys are the only source of information about the detailed breakdowns of the “working day”.

Output 1: Average time spent on all types of breaks from employment work (by type of break (e.g. lunch; morning/afternoon tea) for persons who did employment work

Output 2: Average continuous working time between breaks taken, for persons who did employment work

Input requirement

Diary events recorded during working time

“For whom” data.

Diary requires at least 15-minute intervals

Population (denominator)

Persons engaged in employment work on their diary day(s).

107. Though the specifics may vary, sound human resource management principles recommend that people take short breaks from work. Time-use surveys can be used to identify how long a lunch break is, or whether lunch is eaten while working.

Output 3: Average time spent on non-productive activities in employment by type of pause/break/activity for persons who did employment work

Input requirements

Collection of primary and secondary activities

Locational data

Population (denominator)

Persons engaged in employment work on their diary day(s).

3.3.3.5 Intrusion of employment work into other activities

108. One definition of work-life balance is the degree to which people with paid job(s) can keep their work and other activities associated with employment confined to their place in the daily cycle (Fisher and Layte 2004). Increases in flexible work places and working time arrangements (e.g. working from home), and mobile technology have blurred the lines between the start and finish of the working day/night. The following outputs allow policymakers to measure both the impacts of employment policy with the potential impacts on work-life balance.

Output 1: Average time spent undertaking employment work at home or during travel for persons who did employment work

Input requirements

Location data collected for each event in the time diary

Ability to exclude those people whose usual place of work is the home, such as questions on usual place of work and those whose work involves travelling as part of work. Questions on nature and participation in working time arrangements should be included.

Population (denominator)

Persons engaged in employment work on their diary day(s)

Work done at home can be used as a measure of the availability of specific flexible working time arrangements; in their absence it can show the extent to which employment intrudes in other activities.

3.3.3.6 *Weekend employment work*

109. Weekend employment work, whether part of a working time arrangement, as normal hours of work or overtime hours, interrupts the time available for leisure and social activities and parents' ability to spend time with their children. Alternatively, some people may use weekends to enable the scheduling of employment work around care arrangements, study or other commitments.

Output 1: Proportion of all persons who undertook employment work on weekend days

Input requirements

Adequate sample allocated to weekend days

Population (denominator)

All persons

Output 2: All persons, average time spent undertaking employment work on weekend days

Output 3: Average time spent on employment work on weekend days, for persons who undertook employment during the weekend.

Input requirements

Adequate sample allocated to weekend days

Population (denominator)

All persons

Persons who did employment work on weekends

3.3.3.7 *Time spent with family*

Output 1: All persons, average time spent on activities with family members

Output 2: All persons, average time spent on activities with family members without employment-related activities

Output 3: Average time spent on activities with family members, for persons who did employment work

Output 4: Average time spent on activities with family members without work-related activities, for persons who did employment work.

Input requirements

"With whom" contextual information collected for each activity

Location data
Collection of primary and secondary activities
Population (denominator)
All persons
Participants - persons who did employment work on their diary day(s)

3.3.4 Travel time

3.3.4.1 All travel

110. Although surprisingly under-researched, several studies have revealed the link between commuting times and negative health outcomes such as sleep disturbance, stress, exhaustion, low self-assessed health, and sickness absence (Hansen et al. 2011). Commuting time during which productive activity for the job is performed (e.g. working while on the train) is included within *hours actually worked* (ILO 2008).

Output 1: All persons, average time spent travelling, by purpose of travel

Output 2: All persons, average time spent travelling, by mode of transport

Output 3: Proportion of persons who travelled, by time of day

Input requirements

Travel time recorded and coded separately

Coding strategy to include rules for imputing missing travel episodes (see UN 2005a: 119)

Mode of transport

Population (denominator)

All persons

111. Total time spent travelling is also a key benchmark variable for the production of time-use accounts. Splitting by mode of transport allows for the analysis of travel patterns. Understanding peak travel times during the day also allows for better transport network planning.

3.3.4.2 Physically active transport

Output 1: All persons, and separately for males and females by age group, average time spent walking, riding a bicycle, or travelling by other physically active means as primary or secondary activity

Input requirements

Collection of secondary activity, mode of transport (note, for this purpose, it matters to group physically active modes of transport, including horseback riding, skiing, skating, rowing and the like, together, and not mixing such modes with vehicle-based modes of transport).

Minimum 24-hour diary

Population (denominator)

All persons

3.3.5 Affect and subjective well-being

112. Over the past decade there has been an increasing interest in subjective measures of well-being from both researchers and policy-makers. In particular, recommendation 1 of the *Report by the Commission on the Measurement of Economic Performance and Social Progress* (Stiglitz et al. 2009) suggests that aspects of subjective well-being – life evaluation, positive and negative emotions – should be collected as part of official statistics. The report recommends that positive and negative emotions (affect) need to be collected in real time and separately as "the presence of positive affect does not imply the absence of negative affect" (Stiglitz et al. 2009: 146).

113. Time-use surveys are one of the primary means of collecting information on subjective well-being. In particular, time-use surveys are uniquely suited to providing information on the affective component of subjective well-being – which captures people's moods and feelings at a particular point in time.¹⁰ Such measures are important both because they capture information that can be used to understand how different aspects of peoples' lives affect their well-being, and because subjective experiences are an important part of well-being in their own right.

114. There is a long tradition of collecting information on subjective outcomes in time-use surveys, dating back to the 1920s. In general, most of the subjective questions in time-use surveys have been broad questions relating to happiness and satisfaction on the day, happiness and life satisfaction in general, perceptions of time pressure, and which one or two activities the participant enjoyed the most and the least. These sorts of questions remain widespread and appear with many current surveys, including the 2000 and 2010 surveys in South Africa as well as other recent African surveys, most HETUS surveys (both rounds) and the Australian and Canadian surveys. However, there has traditionally been little standardization in measures collected or how questions are worded across surveys. This matters because different questions enable different sorts of analysis and capture different concepts.

115. The following proposed outputs focus on information on subjective well-being collected as part of time-use diaries, either via an implementation of the Day Reconstruction Method (as used in the United States) or by a simpler question on pleasure (as used in the French time-use survey and a number of early studies collected by academic researchers (Michelson 2009; Robinson and Godbey 1999)). This reflects the fact that questions on which activity was preferred, while providing useful information for some purposes, do not provide suitable data to monitor the average level of well-being (i.e. they give an ordinal ranking of activities but not a cardinal measure of well-being). In addition, there is evidence that the two diary-based methods produce broadly comparable results (OECD 2013). The OECD *Guidelines on the Measurement of Subjective Well-being* (OECD 2013) recommend collecting subjective well-being data in time-use surveys via either the day reconstruction method (DRM) or French models. Appendix II details the proposed OECD questions.

116. Information on the mean level and distribution of affective states across different activities and population groups provides an important complement to other measures of subjective well-being from general household surveys that provide information on the evaluative aspects of subjective well-being. Policymakers who use subjective well-being information may be interested not just in how people evaluate their life but in the amount of

¹⁰ Subjective well-being is typically regarded as having two distinct components: life evaluations and affect. Eudaimonia - a contented state of being happy, healthy and prosperous - is sometimes identified as a third component. Life evaluations include measures such as life satisfaction and involve a cognitive judgement on the part of the respondent as to how their life is going overall. Measures of affect, however, focus on people's feelings, moods and emotions at a particular point in time. Positive affect comprises emotions such as happiness, contentment and enjoyment. Negative affect includes fear, anger, sadness and worry.

time people spend in different affective states. In particular, it has been argued by some (Kahneman and Krueger 2006) that there is legitimate policy interest in reducing the proportion of time spent in states of strong negative affect. This implies that it is important to measure the average level of affect in society and the distribution of levels of affect across different population groups. The activities most closely associated with different affective states are also important, as it is this information that provides an insight into the factors driving the high-level trends.

117. There are thus three key types of output from time-use surveys on affect and subjective well-being:

- a) The mean level of subjective well-being for the population as a whole;
- b) The distribution of mean levels of subjective well-being across people;
- c) The distribution of levels of subjective well-being across activities.

118. The collection of measures of affect (positive or negative emotions) from time-use surveys is still in its early stages. It is therefore recommended that experimentation about subjective measures of well-being be encouraged and the following proposed outputs be taken as an indicative guide of the main likely areas of interest rather than as definitive technical guidelines. In particular, there may be value in further experimentation with respect to the most appropriate scale to use to collect data and how to report this as a one-dimensional index.

Output 1: all persons, mean proportion of time spent in an unpleasant state.

Input requirement

Can be calculated using either the DRM, in which case input requirements are negative affect and positive affect by diary entry and duration of each activity, or via a simpler enjoyment scale in which case input requirements are the enjoyment by diary entry and duration of each activity.

Population (denominator)

All persons

Output 2: all persons, mean proportion of time spent in an unpleasant state by sex, age group, ethnicity, labour force status, highest qualification attained, and household income quintile.

Input requirement

Can be calculated using either the DRM, in which case input requirements are negative affect and positive affect by diary entry and duration of each activity, or via a simpler enjoyment scale in which case input requirements are the enjoyment by diary entry and duration of each activity. Demographic data on age, sex, ethnicity, labour force status, qualifications attained and household income are required.

Population (denominator)

All persons.

Output 3: all persons, mean net affect by primary activity group.

Input requirement

Net affect can be calculated from DRM data as the mean score of positive affective states (happy, content) minus the mean score of negative affect states (angry, sad, pain, worry). For surveys measuring enjoyment on a single scale, net affect is the mean scale score for an activity. A normalization will be necessary if different scales are used.

Population (denominator)

All persons

Output 4: all persons, mean net affect by presence of others

Input requirement

Net affect can be calculated from DRM data as the mean score of positive affective states (happy, contented) minus the mean score of negative affect states (angry, sad, pain, worry) by “with whom”. For surveys measuring enjoyment on a single scale, net affect is the mean scale score by “with whom”. A normalization will be necessary if different scales are used.

The “with whom” contextual variable is required.

Population (denominator)

All persons

3.3.6 Physical activity and sedentary behaviours

119. Healthier lifestyles whereby people engage in more physical activity and less sedentary time are associated not only with better overall health outcomes, but also with higher levels of self-confidence and well-being (Domelen et al. 2011; Tudor-Locke et al. 2009; van der Ploeg et al. 2007). While the level of physical activity (or inactivity) is best measured complimenting a diary with an accelerometer (see section 8.3), some basic measures of activities requiring high levels of exertion and those that are predominantly sedentary reflect both potential for risks of health problems, including obesity, and general well-being.

120. These indicators should be collected with output 3.3.4.2 (physically active transport). If a country chooses to report these physical and sedentary activity variables but not to report the transport outputs, the physically active transport outputs should be included with these two outputs.

3.3.6.1 Sport and exercise

Output 1: All persons, and separately for women and men by age group, average time spent in sport or exercise as primary or secondary activity

Output 2: All persons, and separately for women and men by age group, proportion of persons who participated in sport or exercise on any given day.

Input requirements

Collection of secondary activity

Minimum 24-hour diary

Population (denominator)

All persons

3.3.6.2 Screen time

Output: All persons, and separately for women and men by age group, average time spent watching television or other visual electronic media, playing computer games, otherwise using a computer as primary or secondary activity - where the activity does not take place with sport or exercise or a physically active mode of transport at the same time

Input requirements

Collection of secondary activity, a yes/no flag column in the diary marking whether the respondent used the Internet or a computer during the activity.

Minimum 24-hour diary

Population (denominator)

All persons

3.4 Gender equality

3.4.1 Employment and other forms of work (unpaid) by sex

121. Women's contribution to the unpaid production of household service work remains universally higher in general than men's. Thus the absence of valuation of such own-use production work (ILO 2013) in gross domestic product understates women's contribution to economies and economic growth (Gershuny 2011; Hirway 2010). Many of the outputs in sections 3.2 and 3.3 above, must be examined by sex to explore gender differences in the division of labour in households, society and the economy as a whole, of paid versus unpaid forms of work, and of caring or volunteer work activities. The pursuit of gender equality highlights the value of time-use data for multiple policy purposes as outlined in chapter 2, and expanded in relation to unpaid forms of work and non-market production (section 2.2) and gender equality (section 2.4).

Output 1: All persons, average time spent in unpaid forms of work, by sex

Output 2: All persons, average time spent in total work (employment and unpaid forms of work) by sex and by form of work

Output 3: Proportion of persons who did employment work by sex

Output 4: Proportion of persons who did total work (employment and unpaid work) by sex

Output 5: Proportion of persons engaged in employment work by time of the day and by sex

Output 6: All persons, average time spent on own-use production of goods and services by sex

Input requirements

24-hour diary with adequate sampling on weekends

"For whom" contextual variable

Sex and forms of work

Population (denominator)

All persons

Output 7: Average time spent on caring activities, by sex, for persons who provided childcare or adult care in their own household

Output 8: Average time spent on organization-based volunteering, by sex, for persons who did volunteer work for an organization

Output 9: Average time spent on direct volunteering, by sex, for persons who provided unpaid assistance/help to other households

Input requirements

24-hour diary with adequate sampling on weekends

"For whom" contextual variable

Sex

Population (denominator)

All persons who engaged in provided caring activities (childcare and adult care), and volunteer work (through organizations and to other households).

Output 10: Average time spent caring for own children as a primary or secondary activity, by sex for persons who provided childcare

Input requirements

Sex

Collection of primary and secondary activity

"For whom" contextual variable

"With whom" contextual variable - for the accurate coding of passive childcare

Population (denominator)

Participants - persons who provided childcare

Output 11: Average time spent providing care to persons with a disability as a primary or secondary activity by sex for persons who provided care to a person with a disability

Input requirements

Sex

Collection of primary and secondary activity

"For whom" contextual variable

"With whom" contextual variable - for the accurate coding of passive childcare

Question(s) collecting information on persons with a disability in the household.

Population (denominator)

Participants - persons who provided care to person with a disability

Input requirements

Sex

Collection of primary and secondary activity

"For whom" contextual variable

"With whom" contextual variable - for the accurate coding of passive childcare

Population (denominator)

Participants - persons who provided informal assistance to others

Some work/life balance policies (e.g. Japan's Action Policy for Promoting Work-life Balance) specifically identify the need to increase men's involvement in providing childcare and assistance to others.

Output 13: Proportion of total childcare time that is routine, physical, medical or supervisory (as a primary or secondary activity) that is performed by women/men

Input requirements

Collection of secondary activity; activity classification to identify the different childcare forms

Minimum 24-hour diary

Population (denominator)

All persons

3.4.2 Joint distribution of work in couples

122. Just like income, time is a resource that is shared between members of the household and between couples. Time-use surveys show how couples distribute employment work and

unpaid work between them. In the past, the bulk of employment work within couples was done by men, while women did the bulk of unpaid work. A key policy and research question is the extent to which this pattern has changed over time and if so how.

123. The four outputs described in this section can only be produced if the survey captures diary information from all household members.

Output 1: Proportion of couples where women contributed more than half of employment work, for couples where at least one person was undertaking paid employment.

Population (denominator)

Couples where at least one person engaged in employment work on diary day(s)

Input requirements

Collection of diaries from all adults in the household.

Both members of a couple responded

Primary activities only

Family weights

Family coding

Output 2: Proportion of couples where men contributed more than half of unpaid work

Population (denominator)

Couples

Input requirements

Both members of a couple responded

Primary activities only

Family weights

Family coding

Output 3: Proportion of couples where men contributed more than half of total work (employment and unpaid)

Population (denominator)

Couples with or without children where at least one person engaged in employment work and/or unpaid work on the diary day(s)

Input requirements

Collection of diaries from all adults in the household.

Both members of a couple responded

Primary activities only

Family weights

Family coding

3.5 Other uses of time-use data

124. Time-use data has many other uses, ranging from examining time spent on healthy and unhealthy behaviours to the detailed analysis of people's use of private and public transport. These can be analysed in the context of other time-use behaviours.

125. *Health behaviours.* Time-use surveys provide estimates of exercise duration and meal preparation that can be examined against demographic and characteristic data to explore possible health correlations with hours spent in work, occupation and industry.

126. *Transport.* Time-use surveys provide estimates of average time spent traveling, including to and from work. Transport chains, such as driving to the station to catch the train to the city to work or dropping off children at school, are important for transport policymakers to optimize public transport time tables and road development.

127. *Cultural and sporting participation/attendance.* Time-use surveys also provide data on time spent attending and participating in cultural and sporting events.

128. *Key population groups.* Time-use surveys provide valuable information about the living circumstances of key demographic groups of interest and aid in developing policies for these groups. Achieving this requires the collection of key demographic data on the questionnaire that should accompany the time diary. Key groups of interest include:

- Older persons
- Persons with a disability or a long-term health condition
- Carers of persons with a disability or long-term health condition
- Unemployed
- People living in low-income or economic resources households
- People living in public housing
- Children and young people
- Migrants and refugees.

3.6 Conclusions

129. Producing the recommended outputs outlined in this section has implications on the collection design for time-use surveys, which are addressed further in these Guidelines:

- The collection of additional personal characteristics, such as disability status and relationship status (see section 4)
- The collection of diaries from all persons in the household to create household-level outputs (see sections 6.1 and 9.2)
- Time intervals that are brief enough to capture activities of shorter durations (see section 7.1)
- The collection of secondary activities (see section 7.2)
- The need for contextual variables such as "with whom", "for whom" and location
- The collection of measures of subjective well-being (see section 7.3).

130. The proposed outputs in this chapter are recommended as a suite that NSOs can use as a starting point and adapt to their particular purposes.

4 Survey Scale and Time Frames Covered

4.1 Diary versus other methods

131. It is recommended to collect time-use statistics via a 24-hour time diary. As an alternative to time diaries, official surveys have tried to collect time-use data through stylized questions, for example: *on average how many hours a week do you spend doing unpaid domestic work for the household*. Stylized questions ask respondents to recall the amount of time they allocate, or have allocated, to a certain activity over a specified period, such as a day, week or year (United Nations 2005a: 15).

132. The diary method is more diversified and reliable than interviewing with stylized questions. Stylized questions can be used to ask about time used for main activities only, but not about parallel activities, being with someone else or the timing of activities, which can be done with the diary method. Studying time use by using stylized questions also has measurement problems. It has been observed that stylized measures of time use overestimate the time used for gainful and domestic work (Bonke 2005; Robinson and Bostrom 1994; Niemi 1993). Overestimations have also been noted in time used for volunteer work (Robinson 1985). Stylized questions can be useful in providing contextual information about an individual's activities over a longer term, and this can be combined with diary data to improve the picture of behaviour (see section 4.4 for more discussion).

4.2 Full-scale and light diaries

4.2.1 Definitions

133. In a full-time diary “the respondents report what activity they were doing when they began the day, what activity came next and what time this activity began and ended, and so on through the 24 hours of the day” (United Nations 2005a: 15). Full-time diaries collect a wider range of context information and greater precision of activity data, and are usually coded afterwards, but the interviewer can also code them in connection with a computer-assisted interview, as done in Brazil and Canada.

134. The United Nations Guide defines a time-use survey as light if it uses pre-defined activity categories from which the respondents select the activities they were doing. The “respondents report the time at which each activity occurs based on an exhaustive list. In other words, the 24 hours of the day are accounted for in terms of the identified activity categories” (United Nations 2005a: 15). The main reason for collecting a light survey is to capture a minimum level of time-use information in the least amount of time with as little respondent burden as possible.

4.2.2 Diaries describing “yesterday” or “tomorrow”

135. Relative to the initial interview, the diary can describe either "yesterday" or "tomorrow". In the first type of diary, the interviewer forms a picture of the respondent's yesterday starting from the early morning of the previous day through the early morning of the interview day. Yesterday interviews begin with what the respondent was doing at the beginning of the observation period, what they did next, what they did after this, and so on.

With the diary describing "tomorrow", the interviewer leaves the diary with the respondent to be filled in, and the respondent records his or her activities during the day into a ready-made frame at the accuracy of, say, five, ten or fifteen minutes. Diaries left with participants for completion on the day can also allow people to record the starting time of each activity in chronological order.

136. The diary describing "yesterday" is suitable for a telephone survey. This diary type has been used in time-use surveys in, for instance, the United States and Canada. Besides the main activities, the American Time Use Survey (ATUS) also asks respondents whether a child under age 13 was in their care. Supplements in some years have asked about secondary eating and drinking (2006-08), emotions during episodes (2010, 2012-13), and secondary elder care (2011). Telephone interviews often only cover time use during one day (Gershuny 1995).

137. Eurostat's guidelines recommend the diary type describing "tomorrow" (Eurostat 2009). It offers better possibilities to study parallel activities and information about context. Different types of data collection are further explored in chapter 8, where these Guidelines also recommend the use of a "tomorrow" diary. While both diary types produce reasonably similar estimates about time use (Gershuny 1995; Robinson and Godbey 1999), it is expected that NSOs will choose an approach consistent with other survey design choices, such as the mode of data collection, the time frame of activities to be collected, and the diary and questionnaire content.

4.2.3 Practices with the light diary

138. In the light diary, time is recorded into pre-coded time-use categories by ticking or drawing a line. The light diary is usually constructed so that the left-hand side of its page contains a column listing various activities. The top of the diary page gives times of the day in running sequence starting from, say, 4 in the morning and continuing for the next 24 hours. The accuracy at which activities should be recorded may be 10 or 15 minutes.

139. The light diary has been used in national time-use surveys in many countries, for example, in the United Kingdom in 1995 and 2005 (Lader, Short and Gershuny 2006), in Ireland in 2005 (McGinnity et al. 2005), and in Denmark (Körmendi 1990) and Sweden in 2000 and 2010/2011. In Finland, the light diary was tested in parallel with the full-scale survey during one month in 2010.

140. Statistics Korea conducted pilot surveys with pre-coded light diaries in 1997 and 1998. In Japan, the NHK Broadcasting Culture Research Institute changed from post-coded to pre-coded diaries in 1995 (Nakano 2012). The Statistics Bureau has used the light diary since 1976, but adopted a supplementary post-coded own-words diary in 2001 (Mikami 2012).

141. Information about context (such as simultaneous activities, location, persons present) has been asked about in a variety of ways in the light diary. In the 2005 UK survey, secondary activities were asked about in addition to main activities but not locations or being together with someone. In the 2010-2011 Swedish survey, only main activities were asked about but no context information. In the Finnish test survey, information about being together with someone was asked in addition to main activities.

142. Light diaries collected in the United Kingdom have produced statistics comparable with some elements of the HETUS approach, but not with others (including travel (Gatenby 2003), and volunteering (Fisher 2010)). Some of these inconsistencies might be corrected with more explicit instructions (for instance prompting respondents to record informal volunteering (Fisher 2010)). Nevertheless, the light format collects fewer episodes, a more limited range of activities, and less overall detail (Gershuny 2005).

143. In the Finnish pilot survey, the results of the full-scale and light surveys deviate most in the time used for domestic work. The light diary uses fixed ten-minute intervals for data collection. It produces 30-minutes less time for domestic work per day than the full-scale diary (Pääkkönen and Väisänen 2012). Domestic activities are of particular interest for satellite accounts and seem to be the core aspect on which reliable data are sought.

144. The Irish light diary survey produced high-item non-response in location data. Based on these experiences, researchers suggest that the location dimension should be attached to certain important activities such as employment and eating (McGinnity et al. 2005).

4.2.4 Advantages and disadvantages of the light diary

145. The advantage of the light diary is that it reduces the response burden. The respondents do not have to write their activities into the diary in their own words. They only have to select activity categories from the given list for different time frames. The light diary also lowers the cost of the survey because the expensive and laborious coding stage is not needed. The light diary is also well suited as a web application, which further reduces data entry costs.

146. The drawback of the light diary is its fewer time-use categories. The paper questionnaire has put limitations on the number of activity categories. The number of codes has varied but, as a rule, about 30 to 35 time-use categories have been used in the light diaries. The lower the number of activity categories, the higher the risk of the respondents understanding the time-use categories in different ways (United Nations 2005a). An Internet-based questionnaire might offer the possibility to provide a higher number of activities for the respondents to select from than a paper diary.

4.3 Periodicity

147. The collection of regular time-use data is necessary in order to obtain data from the key policy areas of unpaid work and non-market production, well-being and gender equality. In addition to the recommended outputs (chapter 3), regular time-use follow-up data are needed from areas such as obesity and sedentary life style, transport and energy use, and environmental modelling.

148. Time-use data are usually collected once every ten years. This is because it is expensive to collect and code full-scale time-use data and the basic features of people's time-use habits change slowly.

149. The measurement of household satellite accounts and well-being require more frequent data collection to detect policy effects. Some countries, including Canada, Japan and Korea (where both the national broadcasters and official statistical offices collect separate time-use surveys), and the Netherlands (through a private research institution with the involvement of the Central Bureau of Statistics since 2005) collect time-use data at intervals of five or six years. In Canada, the time-use survey is part of a programme of social surveys conducted at five-year intervals.

150. Analysis of time trends in Canada finds that gender gaps in time devoted to paid work and unpaid work by women and men have decreased (mainly as a result of women doing more paid work and less housework, though men have marginally increased domestic production) (Marshall 2011). Gershuny (2011) has observed similar trends in over 20 other countries using the Multinational Time Use Study collection of surveys over six decades.

151. The American Time Use Survey (ATUS), launched in the United States in 2003, is the only survey to collect diaries continuously, with interviews occurring nearly every day since the survey's inception. This very large-scale (in number of diaries and time period covered) opens opportunities to study trends in time spent in market work and leisure (Aguilar and Hurst 2007; Krueger 2007; McFarlane and Tedds 2008), time-use trends in families (Bianchi 2010), and food-related time use (Zick and Stevens 2010). Even longer term trends have been analysed using the American Heritage Time Use Study harmonized archive of USA-based time-use surveys collected from 1965 through the ATUS (Fisher et al. 2007; Fisher et al. 2011).

152. If a full-scale time-use survey is performed only once every ten years, light surveys with pre-coded diaries could be conducted between the full-scale surveys every three to five years to meet the need for more timely information. The results could, for instance, be used for calculations of the household satellite accounts or complete accounts for diverse policy purposes. When analysing time-use trends by means of the full-time and light diary, the comparability of the results should be tested carefully. If a country conducts full-scale surveys every five years, there is no need for a light survey.

4.4 Time use over weeks, months and years

153. Time diaries sample patterns of behaviour on random days, thereby revealing the range of activities that take place across a society on any given day. Researchers and analysts have used diary data widely to measure total national production, compare the distribution of tasks and leisure among women and men, and assess the elements in chains of events.

154. A significant number of users also seek to measure the proportion of the population that participates in activities over thresholds longer than the one-day, two-day or one-week observation period of time diary surveys (asking questions such as what proportion of the population participates in sports each month, or how many people perform volunteer work in a month or a year). For activities that all people do most days and in which nearly all people engage on any given day, such as eating, personal care or sleeping, time diaries readily address the question of participation. The less frequently people tend to perform an activity, the less chance there is of a respondent engaging in the activity on the same day they complete their diary.

155. Other researchers aspire to model intra-personal change and intra-personal differences in daily behaviours with diaries. As people do not perform all activities in which they regularly engage every day, understanding intra-personal variation requires a longer observation period for the same people. This section explores options for measuring time use over a scale longer than typically covered in time diary surveys

4.4.1 Longer term participation questions

156. Limited literature comparing participants in some less frequent activities in national time-use surveys with participants in these same activities measured by other means finds that time-use surveys produce similar profiles of participants as other sources. For instance, Fisher, Patulny and Bittman (2004) found similar profiles of volunteers in the Australian national time-use surveys, World Value Surveys, and Voluntary Work Surveys. Whether this finding holds across most activities is not known.

157. Including longer term participation questions on the individual questionnaire that accompanies diaries offers one strategy for measuring longer term time use and intra-personal variation. Longer term participation questions typically have a structure such as:

- In the last year, how often did you go to the cinema?
- How regularly do you play sports or exercise?

followed by an ordinal scale, such as

- Several times a week
- Once a week
- 1-3 days a month
- Once every few months
- 1-3 times a year
- Less often or never

158. While it is well established that, as more time elapses between the moment a person engages in an activity and the survey question about the activity, the less reliable a participant's account may be, such questions do clearly identify those people who never undertake a specified activity (or who at least are unwilling to report participation). Even if the replies are less precise than replies typically gathered by a diary, such questions nonetheless give insight into longer term participation, which makes such questions independently valuable in their own right as a part of a daily activity diary survey.

159. Gershuny (2012) demonstrates further potential of using such questions in conjunction with time diaries, provided that the survey draws a large sample and that the longer term participation questions and the time-use survey cover the same period (if the diaries are collected over a whole year, the estimate questions ask about frequency of participation over the last year; but if the diary survey collects diaries only for one month, the estimate questions ask about participation over the last month).

160. This process starts by examining the distribution of instances of participation in diaries by people who report each category of longer term participation across days of the week and months of the year. It is possible, for instance, that people who report engaging in volunteer work once a month might volunteer on all days of the week and across all months, while people who report attending live sport once a month might be more likely to attend matches on a Saturday and not to watch sport in July.

161. When the number of days over which a time-diary survey collected data is known, it is possible to work out the approximate number of days during the survey period on which people who select each answer are likely to have performed the activity (accounting for clustering of activities in certain months and days if relevant) based on the ordinal scale in such longer term participation questions. It is then possible to calculate the probability of people giving each answer having been sampled to complete a diary on a day when they performed that activity. As the number of people who select each answer is known, it is possible to calculate the number of people giving this answer on the ordinal scale who are expected to perform the activity in their diary. Gershuny (2012) demonstrates that it is possible to take the proportion of people who report a specified level of participation on the long-term participation question who are expected to have reported this activity in their diaries, and the proportion of this group of participants who actually report the activity in their diaries, to estimate the level of error in the long-term participation question. With this combination of information, it is possible to examine how people with this level of participation sequence the activity of interest into their day, and how long they perform the activity when they undertake that activity. It is also possible to analyse how people who perform the specified activity behave on days when they do not engage in the activity of interest (particularly useful in the case of exercise and sports).

162. Gershuny (2012) argues that by asking a large number of long-term participation questions, it may be possible to build up a profile of constraints that enable researchers to work out the constraints on the range of routines in which a particular person may engage, which may in turn inform the question of intra-personal variability. The 2009-2010 French time-use survey offers an example of a range of long-term time-use questions that might be used for this purpose, such as: Over the past 4 weeks, did you do any of the following activities (for leisure or competition, but outside school or professional activity)? How many times in the past four weeks? These questions cover a range of sports, exercise and physical activities; as well as a range of cultural participation activities. The survey also asked about frequency of driving, watching television, performing artistic activities and volunteer activities. Even where the survey team does not use these questions for such estimations of longer term time use, these questions nevertheless offer a variety of independently valuable uses for research and policy analysis.

163. People do not perform exactly the same routines every day, and activities do vary across the days of the week. Activities on Fridays differ from other weekdays, and activities on weekends tend to differ more considerably from weekdays. Diary surveys that capture two or three diaries from participants will capture a wider range of the activities that person regularly undertakes, improving the quality of estimations using this procedure

4.4.2 Longitudinal surveys

164. Longitudinal surveys offer one of the most reliable methods of measuring intra-personal factors associated with changes in personal and household circumstances. A small number of time-use surveys collected repeated diaries from the same participants over time. In a limited number of cases, a highly selective group of participants kept diaries for a substantial period that would allow analysis of intra-personal variation driving changing behaviours. Very small numbers of people participating in the Project SIGMA survey collecting diaries of sexual behaviour from men who have sex with men continued to keep diaries and send these diaries to the survey coordinator for over a decade after the study ended (Coxon 1996), and some participants in the Mass Observation project in the UK from the 1937 to the 1950s, and revived from 1981, continued to keep diaries for prolonged periods (Shaw 1994). While these long-term longitudinal diary samples contain rich information, they do not provide a basis for official national statistics.

165. Some surveys have gathered diaries from the same participants over multiple collection waves. Canadian city-scale longitudinal random time diary samples date back to the 1960s (Michelson 1971; Kinsley and O'Donnell 1983). A limited number of national (or most of nation) sample diary surveys exist. The earliest of these was the University of Michigan American's Use of Time survey, which collected one 24-hour diary from a sample of residents of the 48 contiguous US states in the autumn of 1975, then collected three further one-day diaries in the winter, spring and summer of 1976. The survey team re-contacted just over one-third of the original sample for a fifth wave in 1981 (Juster and Stafford 1985). The three most recent Danish national time-use studies collected by Statistics Denmark included longitudinal elements. The 1987 and 2001 surveys sampled people aged 16-74, and the 2008-09 survey sampled the population aged 18-74. The 1987 survey collected a single diary day, and the two more recent surveys, which are part of the HETUS project, collected diaries on a weekday and a weekend day. The two more recent Danish surveys re-contacted some participants in the previous survey who remained in the sampled age range (Bonke and Fallesen 2010). Little work considers the longitudinal elements of these surveys.

166. The 1998-2001 Home-On-Line survey collected by British Telecom in conjunction with the Institute for Social and Economic Research followed a sample of households that had a

home computer in 1998 and a sample that did not own a computer, and collected three sets of one-week diaries from all household members aged 11-74, with each diary week a year after the previous. Limited work with the longitudinal component of this survey found that households with computers enjoyed more social time, and household that first acquired a computer during the survey period had the highest out of home social time (Gershuny 2003). While the longitudinal component of this survey proved useful in examining the topic that the study was designed to measure - how home computing and Internet access affected household behaviour - such research demonstrates that the limited days collected by these surveys constitutes a sufficient observation window to identify the factors that drive change in intra-personal time-use patterns.

167. Longitudinal time-use surveys entail significant additional costs and resource commitments. As with any longitudinal survey, time-use surveys seeking to collect future diaries from the same sample need to keep in contact with participants to ensure contact details remain up-to-date and to reduce the prospects of participants dropping out. Staff need to continue to work on the survey in between collection points to ensure continuity and security of the data. These and other practical considerations may make this option impractical in many contexts.

168. Some longitudinal surveys have included time-use supplements. The USA Panel Study of Income Dynamics has included three child development and transition to adulthood supplements (1997, 2002-03, 2007-08). In the first of these supplements, parents of young children assisted their children in completing one weekday and one weekend daytime diary. The second sampled children aged 5-18, and the third children aged 10-19 (Stafford and Yeung 2004). The 1998-2002 Longitudinal Study of Child Development in Québec (in Canada) included time diaries (completed by caregivers) of young children, and collected longitudinal time diary data for the children (Dubois and Girard 2003). The most extensive longitudinal series of diaries collected as a part of a longitudinal survey are part of the *Growing Up in Australia: Longitudinal Study of Australian Children* collected by the Australian Bureau of Statistics, which initially collected children's time diaries completed by parents, and which now uses innovative means, including giving children instruments resembling games and pens that include a clock, to collect diaries directly from the children (Baxter 2010). The Panel Study of Income Dynamics (PSID) contains an additional 2009 Disability and Use of Time study that follows older couples where at least one partner was aged 60 or older, and like the Longitudinal Study of Child Development, the 2009 Disability and Use of Time study collected one weekday and one weekend day diary (Freedman et al. 2012). The American Time Use Survey collects diaries from a subsample of the people who have completed the eighth and final wave of the Current Population Survey.

169. Attaching time diaries to longitudinal surveys enables the use of detail not otherwise available on one-time surveys in the analysis of behaviour, for instance tracking changes in the parenting patterns on children's time use, or comparing the behaviour patterns of people with precarious employment histories with those with stable employment histories.

4.4.3 Linking diary surveys with qualitative surveys

170. Conducting in-depth life history interviews offers an alternative way to unpack the elements of intra-personal change in daily behaviours. While such methods are not practical as an alternative to a national time diary survey, large-scale diary data can identify groups of interest for special investigation by qualitative methods and topics to include in interviews. These interviews in turn may inform the design of future time-use surveys.

4.5 Conclusions and recommendations

4.5.1 Diary versus other methods

171. It is recommended to collect time-use data through a diary method describing “tomorrow”. While it is acknowledged that some countries will wish to use other diary methods to reduce costs, this needs to be assessed against the risk of reduced data quality. Though questions about the frequency of participation in activities during a month or year usefully supplement diary accounts (see section 4.4.1), stylized questions about time use do not provide a satisfactory alternative to diaries.

4.5.2 Light and full-scale diaries

172. A full-scale time diary survey is the primary recommended method of collecting time-use data.

173. A light time-use survey cannot provide answers to all the policy questions that a full-scale survey can. A light survey can be sufficient for some policy questions, and its design should be guided by these questions. Such purposes include household satellite accounts, use of information and communication technologies, study or education (Gershuny 2005).

174. The light diary is suitable for studying general trends in time use, but it cannot replace the full-scale diary survey with its rich content. The light diary can also serve to verify the continued relevance of data from a full-scale time-use survey that are several years old (Gatenby 2003) or predict the need to bring forward the next full-scale survey (Gershuny 2011).

175. It is recommended that light surveys be further studied before they can be recommended as general practice. If the need for information is rapid or there is a lack of sufficient resources to carry out a full-scale time-use survey, a light diary survey is still better than no time-use survey at all.

176. In case any country should undertake a light survey, the following should be taken into consideration:

- a) It is recommended that the light paper diaries contain the required number of pre-coded main activities, which take into account the needs of the household satellite account or other purposes for which the survey data are to be used. However, the activity list should cover all activities in order to avoid the effect of social desirability. A harmonized, basic classification of activities is necessary for international comparability.
- b) Using a web questionnaire could also be tested as an additional mode of data collection. A light web diary allows the use of more time-use categories than a light paper diary. Different modes of collection could, however, produce outputs that are not directly comparable. Wherever multi-mode data collection is adopted, the instruments need to be comparable and prevent the introduction of a modal bias.
- c) It is recommended that, in addition to main activities, the light diary allow the recording of at least one parallel activity. The respondents themselves should indicate which of the parallel activities they regard as the primary one.
- d) According to Finnish experiences from the pilot survey, a high-quality light diary survey cannot be conducted only as a postal inquiry. Assistance from interviewers is needed to reach a satisfactory response rate and to guarantee the quality of the filled in diaries.

- e) Post-stratification and generalized regression estimators can help to reduce the non-response bias in the light and full-scale diary surveys. The weights are benchmarked to respond to the population values by using a method based on calibration estimators.

4.5.3 Periodicity

177. It is recommended that full-scale time-use surveys be conducted at least every ten years.

4.5.4 Time use over weeks, months and years

178. A full-scale time-use survey has to be carried out in a manner that covers an entire year or at least covers all seasons, as well as captures the range of activities that happen on weekdays (or work/school days) as well as on weekend days (or non-work or school days). Covering weekend days adequately requires an oversampling of these days.

179. If activities that people are likely to perform less frequently have policy relevance in a country collecting a time-use survey, the survey team should consider including long-term time-use questions about the frequency of performing those activities in the individual questionnaire, and draw a sample that collects all days of the week over the whole year to obtain a sample of days across the year.

5 Activity Classification

5.1 Introduction

180. The classification of activities forms an integral component of any time-use survey, enabling the measurement of the time spent on different economic and non-economic activities within households.

181. Currently there is no single approved international standard classification of activities that countries can use as a basis for the collection and dissemination of activity information in national time-use surveys. The lack of a single approved international standard has meant that there are numerous conceptual and structural frameworks used across the international community in the production of time-use statistics on activities. The use of these different (but often similar) frameworks limits international comparability, and affects the ability to achieve standardization in the collection and output of activity data.

182. However, despite the variety of activity classifications in use internationally, many common elements used across those varying frameworks can be utilized to form a minimum set of classification categories for international comparability and reporting purposes. In the absence of an agreed international standard classification, the common elements identified from the review of international practice are discussed below. These guidelines also propose a minimum set of activities that can be used as a basis for creating an activity classification to allow comparison of activities across countries and facilitate key policy and output requirements. The minimum set prescribed in this chapter is not presented as a definitive or comprehensive classification to be used for the measurement of time-use activities. It is simply a recommendation of activities that should be covered by any classification structure. National agencies should further breakdown categories or create detailed definition texts when building their classification from the minimum set.

183. Examples of the varying frameworks discussed in these guidelines and upon which a proposal for a minimum set is based include the:

- American Time Use Study (ATUS) classification
- Australian Time Use Activity Classification
- Harmonised European Time Use Survey (HETUS)
- International Classification of Activities for Time Use Statistics (ICATUS) (trial version)

184. Some countries have adapted or modified versions of the above classifications as the basis for their approach, while others have created lists of the main activities undertaken within households, and yet others have used other conceptual frameworks (e.g. activity types proposed by Dagfinn Aas, or the System of National Accounts (SNA)).

185. The development of any activity classification for time-use statistics must recognize the need for a sound conceptual base, and adhere to best practice principles and guidelines in its development. The classification must also facilitate the requirement that the time components total 24 hours in the time diary.

5.2 Definition of a statistical classification

186. Hoffman and Chamie (1999) define a statistical classification as “a classification having a set of discrete categories, which may be assigned to a specific variable registered in a statistical survey or in an administrative file, and used in the production and presentation of statistics.”

187. Classifications are generally developed to support policymaking and to facilitate the collection and organization of statistics. This is relevant to time-use statistics. An activity classification categorizes different activities into groups, thus providing a picture of how people lead their lives, and identifying how much time is spent on economic and non-activities.

5.3 Principles of statistical classifications

188. Classifications used in the measurement of time-use statistics need to follow a set of established principles, prescribed rules and guidelines that ensure that information is classified consistently.¹¹

189. To achieve this, the following principles are applied:

- Clearly state the objectives and statistical priorities to be served;
- Clearly identify the organization responsible for the preparation and maintenance of a classification and state its responsibilities;
- Publicize a timetable for the work and allow substantive experts, who are users of the classification for statistics or for administrative purposes, to contribute to the process at appropriate moments;
- Prepare a well-defined classification structure;
- Provide descriptive definitions or exhaustive listings of the contents of the defined categories;
- Provide instructions on the effective use of classifications for data collection, coding and analysis;
- Prepare guidance and training materials as a necessary part of the development process for a new or revised classification.

190. These principles provide the broad framework for developing a classification, and for assisting in its implementation. However, some essential components of a classification are required to ensure that the classification meets user needs, and that it is able to facilitate the production of fit for purpose statistics.

191. A major consideration that needs to be recognized is that a single classification may not necessarily be able to encapsulate all the requirements for the collection or output of data. Hence, guideline documentation that identifies coding rules or operational decisions as well as good and robust category definitions that incorporate inclusion and/or exclusion text may be useful.

¹¹ Based on *Best Practice Guidelines for International Statistical Classifications*, UN Expert Group on International Statistical Classifications, 2013.

5.3.1 Essential components of a statistical classification

192. A statistical classification must:

- Have a consistent conceptual basis;
- Have a flat or hierarchic structure;
- Contain categories that are mutually exclusive and exhaustive;
- Have definitions that are clear and unambiguous, and which define the content of each category;
- Be up-to-date and relevant;
- Be robust enough to last for a period of time;
- Meet the needs of a diverse range of users;
- Provide comparability over time and between collections;
- Provide guidelines for coding and output of data collected using it.

193. Guidelines on the components to consider when developing an activity classification are detailed below.

5.3.1.1 *Conceptual basis*

194. It is important that any activity classification be based upon sound and agreed concepts and principles. The explanatory notes for everything included in the classification should reflect the conceptual basis for the classification.

195. The conceptual basis should be well defined and documented to enable users to understand what the classification is about and should be used for categorizing, interpreting and structuring the classification. It may be based on principles or concepts developed through international collaboration and the production of an agreed international standard, and/or through stakeholder consultation or agreement between national statistical offices.

5.3.1.2 *Classification structures*

196. Activity classifications are either structured as flat classifications (a simple listing of categories) or as a hierarchic classification (with a logical hierarchy of categories ranging from detailed to broad levels).

5.3.1.3 *Definitional descriptions/ explanatory notes*

197. Definitional descriptions provide supporting information about the activity being classified. Often they are statements that clearly define the activity, or they may assist users in determining the boundaries of the activity.

198. Explanatory notes may explain the content by giving examples of inclusions and exclusions, or they may provide rules or guidelines for how to code an activity to a specific classification category.

5.3.1.4 *Descriptors*

199. Descriptors used in an activity classification should be unique and meaningful to illustrate with certainty the exact content of the activity. Each descriptor should be meaningful on its own, that is to say, no further information should be needed to see that this activity has content that is different from all others.

5.3.1.5 *Mutual exclusivity and exhaustiveness*

200. The categories in an activity classification need to be mutually exclusive and exhaustive (i.e. each activity should only be classified in one category); and it should be possible to classify all units in a category in the classification. While this is a fundamental requirement for any classification, in relation to a time-use diary, this principle may have some flexibility in the way a concept is captured with regards to secondary activities and/or domain used.

5.3.1.6 *Residual categories*

201. Residual categories are designed to capture survey responses that do not fit into the classification categories. Often these categories are not formally part of the classification structure and exist for operational reasons, in particular, to ensure all survey responses can be coded.

5.3.1.7 *Statistical balance*

202. An activity classification should not have categories at the same level in its hierarchy that are too disparate in their population size. Statistical balance allows a classification to be used effectively for the cross-tabulation of aggregate data. Forcing classification categories to conform to size limitations can mean that the categories will not be meaningful or useful.

5.3.1.8 *Statistical feasibility*

203. The statistical feasibility of an activity classification means that it is possible to effectively, accurately and consistently distinguish between the categories in the classification on the basis of the information available, for example as responses to questions that can be reasonably asked in a time-use survey.

5.3.1.9 *Time-series comparability*

204. In developing and using a statistical classification, consideration must be given to ensuring comparability over time between current and previous versions of the classification.

5.4 Conceptual approaches to activity classifications

205. The following section discusses some of the current conceptual approaches used internationally in the development of activity classifications.

5.4.1 Trial International Classification of Activities for Time-Use Statistics (ICATUS)

206. The International Classification of Activities for Time-Use Statistics (ICATUS) is a conceptual framework for the classification of activities developed by the United Nations Statistics Division using three typologies, based around the System of National Accounts (SNA) production boundaries, to identify and group the various major divisions. A United Nations expert group met in 2012 to discuss potential revisions to this classification.

207. SNA takes into account the boundaries between economic and non-economic activities and productive and non-productive activities. An advantage of taking this approach is that it facilitates the assessment of national labour inputs into the production of all goods and

services, enables compilation of household satellite accounts, and allows examination of trends within the broad uses of time.¹²

5.4.2 Harmonised European Time Use Survey (HETUS)

208. The activity coding list utilized within the Harmonised European Time Use survey (HETUS) is based upon work done by Szalai in 1972, and on country modifications in Europe, Canada and Australia (Eurostat 2009). The original listing was prepared in 1993.

209. Over time, the listing has been adapted and modified. The latest listing, developed in 2008, aimed to keep the existing categories and main structure of the previous classification, with some simplifications or amendments. This resulted in a three-level hierarchic classification.¹³

5.4.3 American Time Use Survey (ATUS)

210. The American Time Use Survey (ATUS) is a federal survey that provides information on how Americans spend their time. It is conducted under the auspices of the United States Bureau of Labor Statistics and the United States Census Bureau. The survey has collected data since 2003. It uses a three-level classification system with seventeen broad categories.¹⁴

5.4.4 Australian Time Use Survey

211. The activities measured in the Australian Time Use Survey are classified according to dimensions of time at the broadest level (see discussion below on the dimension of time framework). This approach is the same as that used in New Zealand. The Australian Time Use Survey was first run in 1992 with subsequent surveys occurring in 1997 and 2006.¹⁵

5.4.5 Dimensions of time framework

212. In the dimensions of time framework, all activities can be classified within four types of time: necessary time; contracted time; committed time; and free time (Aas 1978). Their order reflects the priority with which the time in a day could be allocated. It should be noted that while the dimensions are appropriate groups, Goodin, Rice, Parpo and Eriksson (2008) argue that people need to perform a certain level of activities measured in these dimensions and that the activity itself may shift across the time dimension.

- a) Necessary time: This includes activities that serve basic physiological needs such as sleeping, eating, personal care, health and hygiene.
- b) Contracted time: This includes the time a person allocates toward an agreement to work or study, such as paid work or regular education.
- c) Committed time: This includes activities to which a person has committed to maintain a home and family, such as housework, childcare or shopping for others.

¹² For further discussion, refer to the System of National Accounts 2008 at <http://unstats.un.org/unsd/nationalaccount/sna2008.asp>.

¹³ For further discussion refer to Eurostat (2009) at http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/publication?p_product_code=KS-RA-08-014.

¹⁴ For further discussion, refer to ATUS at <http://stats.bls.gov/tus>.

¹⁵ For further discussion refer to the Australian Time Use Survey at <http://www.abs.gov.au/ausstats/abs@.nsf/mf/4153.0>.

- d) Free time: This is basically the time left in the day after the previous three types have been used. Free time activities can include leisure activities as well as unstructured activities.

213. These four domains differ from the enjoyment of activities - people might enjoy or dislike activities in any of these domains.

5.5 Adapting a classification to country situations

214. Activity classifications are developed for use in planning and implementing data collection on time use, and for facilitating the processing and analysis of the resulting data.

215. Ideally, there should be an international standard classification that can be adopted, or adapted, for national use. However, this is not currently the case for classifying activities, and the lack of an international standard is a hindrance to enabling international reporting of data and comparability in conceptual approaches.

216. Consequently, the present Guidelines endeavour to provide a proposal for countries that enables the adoption of a common set of activities to support international reporting and comparability. Countries should be encouraged to adopt the same general principles and definitions in their activity classification where possible as long as no agreed international standard exists.

217. A common approach to the conceptual framework will assist countries that either have infrastructural difficulties in developing classifications or have not conducted a national time-use survey before.

218. It is important to also note that an activity classification may be supplemented or used in conjunction with other classifications or modes describing contextual variables such as secondary activity, location (inside or outside and specified locations), mode of transport, who else is present, and for whom, which are required for the compilation of certain recommended outputs. Additionally, it should be noted that some concepts can be collected in multiple ways.

5.6 Analysis and comparison of international approaches to activity classifications

219. In the absence of an approved international standard classification, countries have developed various frameworks for collecting and disseminating data about time-use activities. This has resulted in the creation of a variety of differing flat (one level) or hierarchic (multi-level) classifications, with differing conceptual frameworks used in many instances.

220. In analysing the differing classifications that exist internationally, there are common threads in terms of the categories that are generally appearing across activity classifications. These are discussed in the comparative analysis section below.

221. Whether these common threads sufficiently encapsulate the basis for either a hierarchic or flat activity classification is dependent on the end purpose of the data. If the focus is on producing statistics that represent activities that contribute to assessing all labour inputs, or that identify own-use production of goods and services for private use within households, then these categories may not be sufficiently detailed. An alternative or supplementary approach

could be to ask additional questions in labour force surveys in an effort to elicit data on labour inputs and on productive and non-productive activities.

222. Using a classification built upon dimensions of time may be a more useful approach, but again, do the common threads identified above support such a framework and provide sufficient information and detail for in-depth research? For developing countries, the use of the current SNA economic framework has already caused issues, because while, for example, the collection of water and firewood for household use is currently included within the SNA production boundary and hence considered an “economic activity” in principle, countries vary a great deal in regard to whether they include or not such activities in their measure of employment. Recognition of these particular activities (and many others) as productive work is specifically maintained in the 19th International Conference of Labour Statisticians (ICLS) work statistics resolution and classified as unpaid work for households within a concept of *own-use production work*, to produce goods and to supply services for own final use.

223. In some respects, a simple flat classification based around common activities would be relatively straightforward for countries to adopt and implement. However, the nature of the actual survey in terms of diary design, questions to be answered and the need to prompt for a response are factors that influence the level of detail required in an activity classification.

224. An overarching issue with any activity classification is the treatment of secondary or simultaneous activities. Can the classification, when adhering to best practice principles of mutual exclusivity, ensure that there is sufficient detail and definition to allow clear distinctions to be made?

225. As part of the analysis work, a consolidated listing of 24 international activity classifications was created. This listing includes classifications used within Australia, Canada, Europe, New Zealand and the United States, among others, and provides global coverage. Of all the classifications analysed, nine are hierarchic classifications and fifteen are flat (one level) classifications (see Appendix I: List of Activity Classifications Used in the Analysis). Additionally, reference was made to the policy issues (chapter 2) and the recommended outputs (chapter 3) to ensure they were included in the analysis, particularly with concern to the identification of activities that support well-being or gender equality.

226. The starting point for the comparison work was HETUS, as this is the primary framework used in European Time Use Surveys, and within which a large amount of harmonization of activities has already been incorporated. The other classifications were compared against HETUS to ensure comparability of activities was achievable. Suggestions around HETUS are documented in Appendix I: List of Activity Classifications Used in the Analysis.

227. All classifications in the analysis were compared for like groupings that could form broad aggregations. As a result of the international analysis, 15 activities were identified as the most occurring broad categories that provide consistency and compatibility between the classifications analysed.

5.7 Recommendation

228. The following table outlines a minimum list of the broad level categories that would enable aggregation into a dimension of time structure, aggregation into an SNA approach, the development of key policy initiatives and the recommended outputs in chapter 3. It is not the intention of the analysis exercise to produce a statistical classification with detailed structures or definitional text. The list presents only the broad categories that any national or international activity classification should endeavour to include.

Table Minimum list of activity categories

Broad level category	Definition	Dimension of time category	Output area
Sleeping	Covers all activities related to sleep and resting	Necessary	Well-being Gender equality
Personal care	Covers all activities related to personal care, including grooming, medical care, personal hygiene	Necessary	Well-being Gender equality
Childcare	Covers all activities related to childcare, including for those with disabilities, but excluding educational activities	Committed	Unpaid work and non-market production Gender equality
Caring for adults and people with disability	Covers all activities related to caring of people, including for those with disabilities, but excluding personal care and childcare	Committed	Unpaid work and non-market production Gender equality
Housework	Covers all activities related to household administration, including shopping, but excluding meal preparation	Committed	Unpaid work and non-market production Gender equality
Meal preparation	Covers all activities related to meal preparation in the household and eating and clean-up	Committed	Unpaid work and non-market production Gender equality
Volunteering - organization-based (may be formal or informal organizations)	Covers all activities related to volunteer work that are unpaid and non-compulsory, performed for or through organizations	Committed	Unpaid work, market and non-market production Gender equality
Direct volunteering - for other households or other people generally	Covers all activities related to volunteer work that are unpaid and non-compulsory, produced for others outside the volunteer's own household	Committed	Unpaid work, non-market production Gender equality
Employment	Covers all activities related to employment for remuneration (pay or profits)	Contracted	Work-life balance Gender equality
Education	Covers all activities related to learning and study (excluding professional training for the job)	Contracted	Unpaid work and non-market production Gender equality
Travel	Covers all activities related to travel for any purpose using any mode of transport	Committed/Free	Work-life balance Gender equality
Sports participation	Covers all activities related to active participation in sports, including administration	Free	Well-being Work-life balance Gender equality
Culture and leisure participation	Covers all activities related to culture and leisure participation, including visiting museums, attending theatre, watching TV or listening to radio, socializing with others; also includes active and passive leisure activity	Free	Well-being Work-life balance Gender equality
Crafts and hobbies	Covers all activities related to handicrafts and hobbies	Free	Well-being Gender equality
Reading	Covers all activities related to reading including books, newspapers and magazines in hardcopy or electronic format.	Free	Well-being Gender equality

229. This minimum list of broad activities covers requirements for the recommended outputs from time-use surveys (chapter 3). In all, approximately 80 per cent of all activity categories identified in the 24 international classifications that were analysed are covered by this minimum list. For example, 86 per cent of HETUS and 91 per cent of ICATUS activity categories can be aggregated into this broad minimum list, as can 88 per cent of the Australian classification and 78 per cent of the American one.

230. The broad categories listed can be broken down into more detail or to a second level if required by national agencies when creating a classification from the minimum set to more formally identify activities such as volunteering, shopping or socializing: splitting childcare into (a) interactive childcare (playing with children, reading to children, sports with children, socializing with children) and (b) physical, supervisory, accompanying and medical childcare matters, for the measurement of household service work and gender equality. Similarly, splitting the cultural and leisure category into activities in and outside home is a highly useful additional breakdown for some of the policy areas and outputs recommended in the present Guidelines. However, this level of detail goes beyond what is needed for the creation of the minimum list of activities.

6 Sampling

231. Chapter VI of the United Nations *Guide to Producing Statistics on Time Use* (United Nations 2005a: 73-88) as well as Chapter 2.1 of the 2008 HETUS guidelines (Eurostat 2009: 7-9) include comprehensive coverage of sampling for time-use surveys. Specifically, these chapters discuss sample design; units of analysis and target population; analytical and operational considerations in sampling, such as person versus household levels of analysis, sample size and multi-stage designs; technical considerations; and sampling in multi-purpose surveys. For in-depth understanding of these topics, please refer to the above documents.

6.1 Issues related to the diary

232. The reference period should cover one year. The survey days/dates should be representative, and cover a full 12-month period (i.e. 365 consecutive days), inclusive of all religious or other public holidays, such as Easter, Midsummer, Christmas and New Year. Public holidays should be included in the reference period only once. For instance, if the reference period starts in spring then it should take into account such moving holidays as Easter in order to make sure that it is included only at the start or at the end of the period. This ensures the effective coverage of seasonal activities across time.

233. Diary days should be allocated according to the purpose of the current survey, and the allocation has to be taken into account in the calculation of weights. The days should be assigned to the respondents by a random process. Several countries have used uniform allocation of diaries to the weeks and then followed a weekday and weekend day schema. To control for variation at the day level, adequate sampling should be done for each day of the week. Some countries, such as Australia, oversample on the weekends due to a perceived wider variety of activities being undertaken on weekends compared to weekdays. Some days of the week may have a lower sample response. Calibration should also be done at the day level to ensure the correct ratio of weekday to weekends is maintained (i.e. 5:2).

234. Diary surveys typically cover periods of one day, two to four days, or one week. Diary surveys covering two to four days tend to follow one of three patterns: consecutive days, 1-2 week days and 1-2 weekend days in the same week, or two to four days over different seasons. Each approach has benefits and drawbacks. The choice should be determined by the objectives of the survey.

235. The one-day diary, used in the American Time Use Survey and some elements of the Harmonised European Time Use Surveys, including the Spanish 2009-2010 survey, may offer a simpler design. They can work more easily with computer-assisted telephone interviewing (CATI)-only surveys and potentially offer lower overall survey costs (though the cost per diary is lower when a survey collects more than one diary per person). This design avoids within-person clustering of time-use patterns (though as people do not do the same range of activities every day, these differences can be minimal and vary by survey design). The ATUS oversamples weekend days, and the Spanish survey oversampled Fridays, Saturdays and Sundays to capture the wider range of activities that happen on weekends. Surveys administered over the phone often use the one-day design, though this periodicity works with any data collection mode.

236. The Harmonised European Time Use Surveys design recommends collecting diaries on one weekday (Monday-Friday) and one weekend day (Saturday or Sunday). Most participating HETUS surveys followed this model. Behaviour patterns differ more markedly

between weekend (or typically non-work/school) days, between Fridays (or the typical end of work/school week) and other week (typical work/school) days, and between the weekend and week days. This design captures a greater range of individual routine variation, which in turn augments the effectiveness of the use of time diary data to estimate longer term time use in conjunction with longer term participation questions (as outlined in section 4.4.1). While not all people complete both diaries, most do, typified by the experience in Finland, where 97 per cent of the respondents kept a diary on both days.

237. The Australian national time-use surveys are among those that collect consecutive days. When activities taking place overnight are of policy interest (sleep patterns, night work, care activities and care need overnight), this design captures a complete and uncensored observation of night-time activity patterns. This design also allows researchers to see how people behave on the day after an intensive day (for those persons reporting an intensive day on the first diary day). Some diary combinations in this design include Sunday-Monday, Thursday-Friday, and Friday-Saturday, and this design permits some analysis of variation in activity across the days of the week, though to a lesser extent than available in the HETUS weekend and weekday design.

238. The 2001-02 German HETUS survey used a hybrid model, collecting three diary days per respondent, at least one of which was a weekday and at least one of which was a weekend day. More than 85 per cent of respondents in this survey completed diaries on at least two consecutive days, and more than 20 per cent completed three consecutive diaries. Nearly all people who agreed to complete the diaries returned all three diaries.

239. The 1975-76 University of Michigan American's Use of Time in Economic and Social Accounts survey collected four diaries from four seasons, oversampling weekdays in two waves, and oversampling weekend days in the other two waves; 87 per cent of respondents returned four diaries. Some surveys, including the 1975-2005 series collected by the Sociaal en Cultureel Planbureau in the Netherlands and British Broadcasting Corporation audience research surveys, collect diaries for one full week. As people have weekly as well as weekend cycles, this model captures the complete weekly cycle, which is of particular significance in researching healthy lifestyles, especially sleeping patterns, exercise and sedentary behaviours. Nevertheless, the more diaries the survey collects, the higher the respondent burden, and the greater the potential impact on response rates. While there is an observable drop in response rates from the first to subsequent diaries in these multi-diary surveys, this drop is not large in many cases, and can be addressed at least partially through weighting.

240. Design-effect calculations can assist in measuring the dependency between two or more diary days completed by the respondent. Design effects (DEFF) measure the efficiency of the sampling design. DEFF is the ratio of variance based on the actual sample design to the variance based on a simple random sample design. When the same person has two or more survey days, the analysis must take into consideration the intra-class correlation between the days.

241. These Guidelines recommend the collection of time-use data from all persons in the household for the analysis of intra-household time use (within the age limitations for household surveys in each country, e.g. persons aged over 15). Where more than one person per household completes a diary, surveys that collect diaries on two or more days capture details of household dynamics missed by one-day surveys. Household members may specialize in tasks on all or most days, or may share around patterns. Surveys collecting two or more diaries allow assessment of the degree to which households share tasks. As the full range of domestic work is not undertaken in all households every day, multi-day surveys give a clearer indication of which households have more specialized or more shared distribution of tasks. Multi-diary multi-household member surveys contribute more information to the gender equality research than surveys collecting only one diary.

242. To reduce non-response due to not reaching the persons for the initial interview, it would be good to have the possibility to postpone the diary keeping according to certain rules. In the second wave of the HETUS it is possible to postpone the diary days by seven days, 14 days or a maximum of 21 days, to the same day of the week.

6.2 Recommendations

243. The diary days should be assigned to the respondents by a random process.

244. The number of diaries each respondent completes depends on the policy interests that motivate the survey, budget and the constraints of survey administration (where the diary is an element of a wider survey).

245. Where surveys collect two or more diary-day accounts per person to capture intra-personal and intra-household activity patterns, the analysis must take the intra-class correlation between the days into consideration.

246. When a statistical office collects a survey in part to observe total household production of goods and services or to study how households distribute tasks among members, the survey design would benefit from considering the collection of diaries from all household members able to complete their own diaries.

7 Questionnaire Design and Testing

7.1 Time intervals

247. Time-use data can be collected in fixed or open intervals of time. An open interval approach collects start and finish times from the respondent, whereas a fixed interval approach divides the day into equal non-overlapping segments of time. Most national time-use surveys use a fixed interval approach (of 5-, 10-, 15- or 30-minute intervals), regardless of whether they are collecting data using a self-completed diary or personal interview.

248. Examples of the open interval diaries include the American Time Use Survey¹⁶ and the women's time-use survey in Morocco in 1997-1998.¹⁷ Five-minute interval diaries include those in Australia and the 1992/1992 German Time Budget Survey. The majority of HETUS surveys use the ten-minute interval option (Eurostat 2009). South Africa's 2000 and 2010 surveys and Pakistan's 2007 survey¹⁸ offer examples of diaries using a 30-minute interval that can be broken into 15- or 10-minute subintervals. Canada uses a different mixed interval approach: fixed intervals for primary activities and any duration for secondary activities (i.e. open interval).

249. The use of technologies that capture precise time information, such as GPS tracking devices or apps, may better suit the open interval design. Testing has suggested that open interval diaries yield greater variation in data quality and are more cumbersome to process than fixed interval diaries; however, fixed interval diaries are less precise in duration of activities (United Nations 2005a: 55). A disadvantage of fixed interval diaries is the impact on reporting activities that last less than the minimum duration specified on the form, such as posting comments on social networking sites or taking medication. As a result, these activities may be under-reported or be reported imprecisely as secondary activities. Nevertheless, fixed interval diaries can capture the approximate timing of these short activities by offering a tick-box column where a simple mark notes that the short activity took place during this interval.

250. A large number of activities in open-interval surveys are reported in multiples of 5 and 10 minutes. While the evidence is not conclusive, longer intervals (15 or 30 minutes) may capture less detail of the variety of unpaid work and care activities taking place, as well as the variety of secondary activities taking place during leisure activities. Shorter interval reports (5 or 10 minutes) potentially capture more variation in the presence of others.

251. The key considerations in determining the most appropriate interval length for fixed diaries are:

- Accuracy – smaller intervals may increase reporting of activities of a short duration; however, this will increase the volume of processing;
- Response burden – the pre-testing and dress rehearsal phase of diary surveys should test whether presentation of intervals and instructions regarding completing the diary contribute to or can be adjusted to minimize response burden;
- Output level – if outputs are required for more aggregated (or higher) activity categories then larger intervals may suffice; however, the quality of microdata will decrease, limiting the broader usefulness of the outputs.

¹⁶ <http://stats.bls.gov/tus>

¹⁷ <http://unstats.un.org/unsd/demographic/sconcerns/tuse/country/Morocco/INMar98.pdf>

¹⁸ http://www.prsm.gov.pk/tus_moredetails.html

252. Further information on the advantages and disadvantages of each approach can be found in chapter IV of the United Nations Guide (United Nations 2005a: 54-56). For further information regarding intervals of time using light diaries, see section 4.1.

7.2 Simultaneous activities

253. The collection of simultaneous activities allows for the capture of a more comprehensive measure of how people are using their time and provides a better understanding of those engaged in multiple activities. In order to optimize the value of data, the objectives of collecting simultaneous activities need to be carefully defined. The first goal is to decide what needs to be measured and how the data will be analysed. For instance if the focus is on childcare activities, the definition of childcare or all time caring for children needs to be defined. (What constitutes caring? Is it caring for a child when the parent is doing the dishes and children are watching TV in the other room? Etc.).

254. The questions “What else were you doing?” and “How long did you spend on this activity?” are recommended to be used to capture the simultaneous activities, along with the possibility of collecting a secondary activity and the time allocated to it. Some surveys have collected more than one secondary activity, but these additional activities have rarely been analysed.

255. The minimum duration of primary and secondary activities should be determined as part of the survey methodology (see section 7.1). As a general rule so far, the practice has been that respondents should be allowed to decide which activity is primary or secondary. Research concerning methods of assigning primary and secondary activities shows that, with respect to certain types of activity, for example related to caring for children, the household or meals, men and women may classify the two categories differently based on traditional gender roles associated with unpaid household service work. Furthermore, individual national statistical offices may make the decision to prioritize certain activities as primary, such as sleep or driving a motor vehicle. Such differences or decisions need to be reflected and made part of the coding strategy (see chapter 9).

256. Information on secondary activities may be difficult to obtain for certain kinds of primary activities. Depending on country practices, a decision needs to be made on whether participants should report secondary activities during certain types of activities such as personal activities (personal care, religious observance, etc.).

257. The ability to collect data on simultaneous activities depends on the survey method and the design of the survey instrument. The collection of simultaneous activities may be eased when conducted with the help of an interviewer in order to reduce respondent burden and minimize the time for the collection of the diary. For instance, probing can help provide precise responses, facilitate the recall of missed activities and contextual information, or bring out unreported simultaneous activities. The use of fixed time intervals (as opposed to nominated start and stopping time) may also facilitate the recording of simultaneous activities.

258. The coding of both primary and secondary activities should align with the precise information provided by the respondent. In countries using computer-assisted applications with pre-existing activity categories, if there is any doubt, the interviewer should confirm with the respondent that the code assigned to their reported activity is correct.

259. If using different modes of data collection within one survey, the number of simultaneous activities that may be collected must be the same for each mode.

260. The collection of simultaneous activities has editing implications. Editing procedures need to be carefully planned. Consistency checks and other validation procedures are required to ensure data coherence. For instance, certain types of secondary activities need to be compared to travel information to correct inconsistencies (for instance, watching TV while riding a bicycle) or certain types of simultaneous activities need to be compared to the “with whom” information to verify validity (for instance, presence of children for childcare simultaneous activity or presence of adults for adult care simultaneous activities). Editing procedures must ensure that no gender-based or other bias can be introduced through coders’ assumptions (e.g. regarding which of the reported activities is primary).

261. See section 9.1.1.3.1 on primary and secondary activity coding.

7.3 Subjective measures of well-being

262. Time-use surveys are one of the primary vehicles for collecting information on subjective well-being (see section 3.3.5). Measures of overall happiness and life satisfaction generally capture the evaluative component of subjective well-being. Such questions are a valuable addition to time-use surveys, but have much wider applicability. The OECD has published a set of *Guidelines on the Measurement of Subjective Well-being* (OECD 2013) that address how and where such questions should be collected. While measures of life satisfaction are useful to include in a time-use survey as part of the array of analytical variables, the most important output for measuring well-being is information on positive and negative emotions (affect).

263. A common approach to collecting information on respondent’s subjective attitude to different activities in time-use surveys has been to ask questions on the “most/least” preferred activity at the end of a questionnaire. While these questions may be useful for some specific purposes, they capture a different sort of information to questions on positive and negative emotions in that they focus only on the activities provoking the most extreme responses. They lack information on intensity of feeling, and they require a cognitive judgement by the respondent that may result in responses that are different from those collected by questions focusing more specifically on emotional state.

7.3.1 Measuring positive and negative emotions (affect)

264. Broadly speaking, there are two approaches to measuring positive and negative emotions (affect) in time-use surveys. Both of these make use of time-use diaries to link particular emotional states to specific activities, which allows for analysis that is not possible with more general survey questions.

265. The first approach is asking enjoyment questions as a field in the time-use diary. For the collection of positive and negative emotions, the respondent’s emotional state needs to be collected alongside the event to which they relate and at the same time as the recording of the event rather than in a separate questionnaire where the respondent is required to recall their feelings. This approach dates back to the early 1980s. In Canada, William Michelson and Andrew Harvey conducted a number of time-use studies in Toronto and Halifax, respectively. Their diaries included the fields: main activity; secondary activity; mode of transport; whom were you with; how much did you enjoy this activity; and how stressed did you feel during this activity. In 1985, John Robinson and a wider team in the United States collected a random-digit dialling national sample survey that included a field asking people how happy they were during each activity. Also in the mid-1980s, Jonathan Gershuny was involved with

a national quota sample survey conducted by Unilever in the United Kingdom that also included an enjoyment field in the diary.

266. In the 2010 French time-use survey, INSEE, the French national statistical office, added the intensity of emotional experience as a separate column in the time diary, asking the respondent to record "was that moment pleasant or unpleasant" on a scale from minus 3 (unpleasant) to plus 3 (pleasant).¹⁹ The scale was presented visually rather than allowing respondents to write down their own interpretation. Sequencing may also be important in analysing the positive or negative emotions attached to a particular event linked to an activity. Emotions attached to an event may influence the emotional response to following events or activities; or indeed following events may occur that change the emotional state caused or associated with the previous activity.

267. An alternative approach to asking respondents to report the overall positive/negative feelings about an activity on a single scale is to ask many questions on different emotional states about each activity. To manage issues of respondent burden, this is usually limited to a small number of randomly selected activities. For example, the United States Bureau of Labor Statistics asked respondents in the 2010 American Time Use Survey (United States Bureau of Labor Statistics 2013) to record their emotions in three randomly selected activities. Respondents were asked about the intensity of six emotions using a 0-6 scale: stressed, tired, happy, sad, interested, painful.

268. Information collected in this way is much richer with respect to each activity than a single scale, but at the cost of collecting information on only a sample of activities. In analysing data of this sort, an episode can be considered as unpleasant if the respondent reported stronger negative emotions than positive emotions. An "unpleasantness index" of an activity can then be obtained as the percentage of time spent doing that activity categorized as unpleasant. This allows the respondent to have different "feelings" for separate episodes of the same event.

7.3.2 Other subjective measures

269. In addition to measures of subjective well-being, other subjective questions may also be valuable within the context of a time-use survey. These include self-assessed health, time crunch, and frequency and main reasons for feeling pressed for time or rushed. Measures of time crunch are an important output for time-use surveys to allow comparison of time stress or crunch with time use (see section 3.3.3.3). Time-use surveys may also serve to implement questions regarding other less explored measures of subjective self-assessment, such as relating to discrimination (gender-based, racial, etc.).

7.4 Testing

270. In addition to standard testing procedures for surveys in general, such as qualitative testing²⁰, respondent and interviewer debriefing,²¹ and dress rehearsal or pilot study,²² time-

¹⁹ Testing by INSEE suggested that this scale better conveyed the idea of positive versus negative feelings when compared to a 1-5 scale.

²⁰ Qualitative testing: a series of in-depth interviews that provide insights into how respondents react to questionnaires. Qualitative testing helps assess the validity of questions and identify potential sources of response error. It also helps identify poor question wording or ordering, and problems caused by the respondent's inability or unwillingness to answer the questions.

²¹ Respondent debriefings are conducted to get a better understanding of the respondents' experiences in completing the survey questions. Respondent debriefings can identify problems such as sensitive questions,

use surveys in particular have specific features that require additional testing protocols. While testing approaches should be tailored to the mode of collection, they should generally focus on the time-use diary, given its special format and length. The diary portion of the questionnaire works by associating each activity with a numerical code. Where these questionnaires are administered by an interviewer via telephone or in person, it is imperative that the coding be designed in such a way as to enable the interviewer or coder to find the appropriate codes quickly and easily. Much emphasis should, therefore, be placed on ensuring that the coding is consistent and logical. In cases where a multi-mode approach is used to administer the survey, it is recommended that testing be done to ensure comparability of responses to individual questions across modes.

271. When new modes of data collection are introduced (for example changing from paper questionnaires to electronic surveys), it is important to identify — during the pilot test phase, if possible — variations in data quality and comparability that may have resulted from this change. This information will be useful to data users when performing analysis.

272. Where feasible, survey staff should consider testing the 24-hour diary using fictitious respondents with various characteristics, such as sex, age, marital status, income, education, presence of children, employment, hobbies, personal interest, social networks and health status. The more scenarios tested, the more likely that coding inconsistencies or difficulties will be recognized and corrected prior to the survey collection in the field. Testing will be more extensive for those time-use surveys that utilize a survey application with pre-existing activity codes, such as the light time-use surveys (see section 4.2).

273. It is also worth noting that some countries use both diaries and stylized questions to cover the same or similar concepts (e.g. unpaid work in Canada) (see section 4.1 for the comparison of diary and stylized questions). If the resulting data differences are of concern, countries should test both methods carefully and observe the results before the survey goes into the field.

7.5 Response burden

274. The collection of detailed activities in time-use surveys can contribute to high respondent burden. Conversely, collecting data at a too high a level may not allow for disaggregation of data to answer the main policy questions. Creating estimates of unpaid work for satellite accounts requires that some activities be reported in detail. For example, tending edible plants is within the production boundary, whereas tending non-edible plants is not. To instruct respondents to provide sufficient detail on their diary to allow for the splitting of these activities could be too burdensome and counterproductive to data quality. National statistical offices need to balance survey objectives (i.e. is an unpaid work satellite account a high priority for your country) with the level of detail that will need to be requested from respondents and associated respondent burden.

275. The most important technology-based methods to manage respondent burden involve the development of self-completed surveys via electronic questionnaires on home computers, handheld electronic devices such as palm pilots and smartphones, as well as downloadable diaries. Countries such as Japan and Brazil are already employing some of these technologies,

difficulties in recalling information, and questions that are unclear or difficult to answer. Debriefing sessions with interviewers take place after the pilot testing. Interviewers discuss their experiences in interviewing respondents and how the questionnaire performed. They can identify potential sources of response and non-response errors as well as areas where the questionnaire can be improved.

²² A dress rehearsal or pilot study replicates the final survey design on a small scale from beginning to end. It provides the opportunity to fine tune the questionnaire before its administration in the main survey.

and others are in the process of implementing them. Self-completed electronic questionnaires offer respondents flexibility and convenience and may contribute to shortening the length of the interview.

276. The following are some more specific examples countries may use to reduce response burden:

- a) Time use as a subsample of a larger survey increases individual household burden but decreases aggregate burden compared to running the two surveys separately.
- b) Estimates can be designed nationally rather than at the state/regional level to reduce the sample size required.
- c) Running the time-use component in every second iteration of the parent survey is an optional approach.

277. The burden of time-use surveys can only be reduced to a point beyond which the utility of the survey output may be compromised. The strategy can then shift to "selling the benefits" of participation by respondents in the survey.

278. If collecting via a person or telephone interview, adopt a conversational style interviewing technique for the collection of the time-use diary portion of the survey. This style of interviewing guides respondents through memory lapses, probes for information in a non-leading way for the level of detail required to code activities properly, and redirects respondents who provide unnecessary detail.

7.6 Recommendations

279. With respect to simultaneous activities (section 7.2), at least one simultaneous activity should be collected for each primary activity.

280. All time-use surveys should include an over-arching measure of life evaluation. While the simplest and least burdensome means of achieving this is a question on life satisfaction, a better measure is information on positive and negative emotions. There are two main approaches to measuring positive and negative emotions. The OECD covers both approaches in its *Guidelines on the Measurement of Subjective Well-being* (OECD 2013), and producers of time-use surveys are advised to base their decision on what will best meet user needs. A copy of the relevant section of the guidelines is presented in Appendix II: Questionnaire Module on Experienced Well-being.

281. With respect to testing for time-use surveys (section 7.4), approaches should be tailored to the mode of collection, but should generally focus on the time-use diary, given its special format and length.

8 Data Collection

8.1 Mode

282. There are several methods for the collection of time-use statistics. These include computer-assisted personal interviewing (CAPI), computer-assisted telephone interviewing (CATI), leave behind self-complete “tomorrow” diaries, and the experience sampling method (ESM). The advantages and disadvantages of each of these are covered in the United Nations *Guide to Producing Statistics on Time Use* (United Nations 2005a: 65-72).

283. The following section recommends the most appropriate methods for the collection of national time-use statistics to produce the best quality results, then discusses other collection methods where quality can be traded for a reduction in enumeration and processing costs.

8.1.1 Computer-assisted personal interviewing (CAPI) with a 24-hour self-complete diary

284. The best practice for the highest quality outputs is to undertake computer-assisted personal interviewing (CAPI) for the collection of demographic (personal and household information) and time-use specific data such as time stress, self-assessed health and life satisfaction, coupled with a self-complete “tomorrow” diary covering two days (2 x 24 hours). The collection should include sufficient sampling of weekends given the variability of activities undertaken on weekends compared to weekdays.

285. At the time of the interview, the interviewer will also instruct the respondent on completing the time-use diary accurately.

286. Personal interviews provide better response rates than telephone surveys, and the 24-hour “tomorrow” diary does not suffer from the same level of recall issues as collecting time use by interview (provided respondents fill it out at the time or shortly after activities). The diary also ensures that short-term activities are collected, such as personal care activities as they may not be adequately recalled in a “yesterday” diary method.

287. Care should be taken to minimize the potential for diminishing data quality when respondents complete more than one diary (the advantages and disadvantages of length of the survey observation period are set out in section 6.1).

288. To maximize the response rates for the diary information, the self-completed diaries should be collected by the interviewer wherever possible. This ensures that the diary is completed by the respondent and returned to the NSO. This also provides the opportunity for the interviewer to review the diary with the respondent and query any unusual activities, illegible handwriting, or inconsistencies with the interviewer-collected data as appropriate (for instance, the respondent claimed not to be in the labour force, but on the diary the person participated in paid work).

8.1.2 Computer-assisted personal interviewing (CAPI) only

289. Some countries collect time-use content wholly by personal interview. The time-use component requires the respondent to recall their activities for a specified day, usually the previous day (the “yesterday” diary method). This introduces recall issues, and so to be successful, the reference day should be no more than two days before the interview.

290. Recall interviews tend to overestimate some activities (such as shopping) and underestimate others (United Nations 2005a: 65) compared to the 24-hour diary method. Recall interviews also tend to omit smaller tasks or tasks perceived to be less significant or memorable by the respondent.

291. It is worth noting that in many countries, large numbers of people carry mobile devices with time-stamped information. While no one has yet tested the willingness of respondents to look at tweets, e-mails, texts, instant messages and other time-stamped records sent on their diary day, looking at this information could jog people's memory and will give some precisely timed hooks around which the rest of the day can be reconstructed.

8.1.3 Computer-assisted telephone interviewing (CATI) only

292. Countries such as Canada and the United States of America conduct their time-use surveys via telephone through computer-assisted telephone interviewing (CATI), which reduces the overall cost of data collection. Like CAPI, respondents are asked to recall their activities over a 24-hour period, usually for the previous day. This produces the same recall issues highlighted above when conducting CAPI.

293. CATI methods also require a complete frame of telephone numbers in order to be representative of the population. The rapid growth in communication technologies (mobile phones, call screening) presents challenges in reaching respondents and obtaining representative data since historically, households were reached only on landlines through random-digit dialling. If statistical offices are undertaking CATI interviews and do not have full person registers (with associated telephone numbers) from which to select their respondents, they should aim to include mobile telephone numbers in their survey frames to ensure the representativeness of their sample.

294. The Nordic countries sometime collect surveys over the phone, and they have a national register sample frame. The American Time Use Survey uses the Current Population Survey as the sample frame. This survey includes households that have only mobile phones and households with no phone at all. People who live in households with no phone at all or only mobile phones on limited use contracts are given vouchers for credit on their phone or to call from a public telephone so that they do not incur costs from a call.

295. CATI and CAPI are good options for areas that have lower literacy, where the presence of an interviewer will aid in the collection of higher quality data.

296. With CATI, it can be difficult to collect data on all persons in the household, which impedes the calculation of household-level time-use estimates (see sections 6.1 and 9.2 for more information).

297. The benefits of time-use recall using CATI or CAPI are:

- The interviewer can immediately validate data
- The automatic coding of responses into the data processing system reduces overall processing time.

298. The quality of data collected via 24-hour "tomorrow" diaries outweighs the validation and coding efficiencies associated with interview only methods. This should be considered in addition to the overall costs when deciding on the method in which to collect time-use information. With new technologies being explored for use in diary collection (web reporting, smartphones), cost reductions and quality checks may be possible in the future for the self-complete 24-hour diary method.

8.1.4 Types of diary

8.1.4.1 Fixed and open interval diaries

299. Open interval diaries ask respondents to record the start and finish times of activity episodes, whereas fixed interval diaries mark time intervals (five or ten minutes) on the page or screen display. Open interval diaries create larger variation in the quality of data and are more difficult to code and process compared to the more common fixed interval diary. A fixed interval diary is recommended over an open interval diary. See section 7.1 for the discussion on different fixed intervals.

8.1.4.2 Light diaries

300. Light diaries are a variation of fixed interval diaries and are designed to require minimal response time. As a trade-off, these diaries collect less detailed information. Light diaries may have longer fixed intervals, tend to provide fewer and more limited context variables (for instance asking people to tick a box to indicate if the activity took place at home, at the workplace or elsewhere), and ask respondents to report their activities from a short, pre-coded list of activities. For more information on the benefits and challenges of light surveys, refer to section 4.2.

8.1.4.3 Stylized activity questions

301. Some surveys ask stylized questions that require respondents to estimate the amount of time they usually spend on a particular activity within a specified period of time (a typical work day, last week, last month, or over a year). Though these specialized questions compliment diary-based estimates by capturing the details of longer term participation in activities, stylized estimates alone do not collect suitable data for national estimates of time use. Rather, a 24-hour diary approach is the most appropriate and recommended approach for collecting national time-use data (see section 4.1 for more information).

8.1.5 Experience sampling method (ESM)

302. The experience sampling method (ESM) asks respondents carry around a pager or “beeper” to provide the survey team with a mobile phone number or Skype name, or download a phone app. Participants are requested to report what they were doing, where they were, who they were with, their emotion at the time, and other information regularly included in diaries when the beeper goes off or in response to a text, instant message or similar prompt.

303. This method minimizes the potential for recall bias, captures strong contextual information about human behaviours, and minimizes normative editing. ESM is not viable for national time-use surveys (see section 2.1), partly due to the administrative complexities of applying this method in equal fashion across populations (in some cases including expense of equipment). This method also only captures participation, not time spent in activities, and misses out on the chains of activities over the day, both of which are needed for many of the recommended outputs (see chapter 3). Nevertheless, ESM approaches may capture some detail that complements diary survey results for some policy research questions.

8.1.6 Multi-purpose surveys – time use as a subsample of a larger survey

304. The United Nations *Guide to Producing Statistics on Time Use* (United Nations 2005a: 61-65) outlines the advantages and disadvantages of conducting a stand-alone time-use survey or integrating a time-use component into other surveys. Although they are expensive to run, time-use surveys conducted independently can collect very detailed information on a wide variety of topics of interest. Collecting time use as part of another survey is more cost effective and can provide a richer dataset in which coincident measures can be analysed. An integrated survey requires greater consideration to ensure that the populations and topics are consistent, as it increases respondent burden, and complexity in the field, in processing and in weighting arrangements. The inclusion of a time-use component as part of a longitudinal survey provides opportunity for behavioural analyses over time. This is explored in more detail in section 4.4.2.

305. The United States collects their time-use survey as a ninth wave extension for a subsample of their longitudinal Current Population Survey (CPS). Individuals are randomly selected from completed CPS questionnaires and contacted by CATI. The survey is run continuously, with an estimated 2,200 samples collected per month. This design offers the advantages of a sample that is large enough in which to study time use separately in each state, and to study under-researched populations, such as single fathers. As this survey is linked to longitudinal household income and resource experiences, it also permits analysis of longer term financial circumstances on behaviour.

306. Belarus conducted its 2004 time-use survey (24-hour diary, persons aged 12 years and over) as a part of their annual household income and expenditure survey, which resulted in response rates of 98.5 per cent, well above response rates experienced in many other countries. A particular advantage of this pairing of content was the analysis of how low-income populations use their time and the cross-examination of behaviour patterns and economic resources.

307. Japan collected time-use information in its survey of time use and leisure activities. This collects time-use data two ways: in a questionnaire for about 5,000 households using a self-complete 24-hour time-use diary; and in a questionnaire for another 79,000 households about leisure activities, with time use collected via a time-use light approach - time allocation of two days based on pre-coded activity groups.

308. The Australian Bureau of Statistics plans to draw a subsample of its Survey of Employment Arrangements, Retirement and Superannuation (SEARS), to be known as the Work, Life and Family Survey, for its next time-use study. All respondents will answer the parent survey content and with about one-third of the sample filling in two self-completion diaries over two consecutive days. The pairing of these surveys will allow for cross analysis of work arrangements and retirement and how people and households use their time. It also reduces overlap of some material across surveys and the harmonizing of previously different methods of collecting data.

309. The subsample approach allows greater capacity to schedule other households for interview immediately prior to the allocated diary days, thus reducing interviewer travel time and managing workloads more efficiently than in previous stand-alone cycles.

310. Overall respondent burden is reduced across surveys when surveys are conducted together; however, there is a larger respondent burden for those who are selected for the time-use component.

8.2 Training of time-use survey staff

311. The HETUS guidelines provide an overview of best practices in training for time-use surveys. It is recognized that specialized training is required for those employed on a time-use survey. This is due to the methodological complexity of time-use surveys along with the diary and its extensive activity classification/coding system.

312. While the format and type of training should be tailored to suit the mode of collection, in all cases survey staff should be provided with in-depth training on the survey methodology, concepts and content. They should also be very familiar with the objectives of the survey, the previous and future planned uses of the data, and the value of the data collected through the diary. Their ability to communicate this information to respondents will help encourage respondent participation, whether the survey is conducted over the telephone or in person. Encouraging respondent participation has been increasingly important given the global trend in declining survey response rates in recent years. As with all surveys, collection observation and monitoring by senior personnel is highly useful.

313. Extensive training on coding activities in the diary is essential whether coding is done during collection by field staff or after collection by coding personnel (in the case of leave-behind diaries). Reference documentation, such as interviewer and coding manuals, are essential in helping interviewers and coders with quality and consistency in their coding. Periodic reviews of coding techniques and practices may help identify problems and lead to improved practices.

8.3 New methods and instruments

8.3.1 New collection technologies

8.3.1.1 *Web reporting*

314. Several countries are considering a web-based application for upcoming or future time-use surveys, including Canada, Hungary, Latvia, and New Zealand (United Nations Economic Commission for Europe 2010: 20-23). In 2011, the Japanese Time Use Survey provided a downloadable time-use diary as an alternative to the paper diary; however, this online version only achieved a small uptake of respondents. Testing of the web completion in the 2008-2009 Danish national time-use survey found that web-based surveys collected higher quality data than the diaries completed by other methods (principally CATI) (Bonke and Fallesen 2010).

315. Some important considerations for web-based collection include:

- A web application offers the advantage of enabling the participant to see the layout of the day while completing their account, which may potentially aid recall.
- Prompts can be used to aid self-coding and reduce errors.
- While web reporting is cheaper per person than direct interviewing or leave behind diaries, the web application is considered to be an expensive enterprise to develop, though this might be negated if a generic tool is created for use internationally and for other collections such as expenditure diaries.
- Web reporting does not remove the need for a paper-based (or telephone interviewing) instrument as some parts of the community do not have easy or regular access to the Internet, or may not be willing to provide this information electronically.

- For those countries collecting data from individuals, web-based collection may allow for more ease of collecting data from all members of the household. Multi-modal collection must be allowed within households to ensure response from all household members.
- Electronic collection can allow for the monitoring of data collection and assuring compliance with assigned diary days while addressing any respondent questions.
- Reporting on the computer may discourage regular reporting throughout the day, thus reducing the accuracy of the reporting of time. However, encouraging respondents to use web reporting on mobile devices such as smartphones and tablets could mitigate the limitation.
- Security of the information needs to be assured.

8.3.1.2 Mobile devices

316. Transport and health researchers have spearheaded much of the technological development in the collection of time-use statistics. Health researchers have made wide use of a range of devices, including skin connectivity measures (indicating the level of stress the wearer feels during the day) and sit/stand counters (counting the number of times people sit down or stand up during the day). The most commonly used device is the accelerometer, which enables researchers to monitor the degree of physical activity, both to measure general patterns of physical exertion (Domelen et al. 2011), and also to monitor the functionality during ageing (Tudor-Locke et al. 2009) as well as among people living with disabilities or poor health (van der Ploeg et al. 2007).

317. Smartphones offer the possibility to bridge these various techniques, as applications can equip most phones to act as accelerometers, GPS trackers and collect other information automatically while also serving as the platform through which participants might complete their diaries. Examples of such surveys are already in the field (for instance the London School of Economics Mappiness project, which uses a smartphone application to collect GPS, diary and emotion information – <http://www.mappiness.org.uk>). For the moment, the distribution of smartphones varies significantly across countries, and across regions within some countries, but this distribution will change over time. Also, the variety of platforms on which future devices will operate pose challenges for the design of survey apps. Nevertheless, developments in technology will open opportunities to collect types of information not presently available for official statistics or research. National statistical offices will need to consider the level of personal intrusion such advanced collection methods have and ensure this is compliant with their national privacy legislation.

318. The recent Brazilian pilot time-use survey made use of a handheld computer tool. Specialized software allowed for interviewers to assist in the coding of activities through search and lookup mechanisms, thus reducing post-enumeration coding.

8.3.2 Multi-modal collection (the inclusion of web-based reporting)

319. The collection of survey data through web-based reporting is expected to increase in the next few years, and it is expected that this will also occur for time-use survey data. However, it is unlikely that surveys will move to only web-based reporting, with a proportion of the population unable or unwilling to report online. The Statistics Denmark 2008-2009 Danish national time-use survey was one of the first major national time-use studies adopting mixed-mode diary and questionnaire collection (offering participants the option of web-based CAPI or CATI). Review of this survey found that just over half of participants opted to complete all instruments by the phone mode, while only 10 per cent opted for web-based completion of all

instruments – with the remainder mostly completing questionnaires online but diaries over the phone (Bonke and Fallesen 2010).

320. Each time-use data collection mode has advantages and disadvantages. For instance, there is a link between the degree of anonymity and the willingness of respondents to be honest on sensitive questions, which suggests leave-behind diaries would be more effective for collecting sensitive time-use data. In general, personal interviews are considered to produce more detailed and complete data than telephone interviews or self-complete diaries, though they are hampered by recall issues and require a complex and burdensome set of questions to approximate a diary format. Web-based reporting may be less prone to social desirability effects, but at the same time may be less engaging for respondents and thus cause reduced compliance, for example filling out the form once rather than throughout the day. Given that questions are read on screen, questions need to be shorter and less complex than those collected via personal interview.

321. The inclusion of web-based reporting (via computer or mobile devices) creates an additional level of complexity in assessing the impact of mode on data quality. This is because web-based reporting is unlikely to be the sole instrument in use (because not everyone will have access to the Internet or compliant device) and so NSOs must take into consideration the possible impacts of using multiple modes.

322. When analysing the modal effects, the difficulty of quantifying if and to what extent differences in results are due to the mode, the "type" of person who takes up the mode, or a genuine difference in the reporting of the information. Randomized control trials would be required to ensure the effects of each mode are known and accounted for. If modal effects are known, then techniques can be used to convert data to a single mode (i.e. converting web reported data to be like a paper diary data).

323. A substantial body of published time-use research compares surveys that collect diaries using different methods without finding major issues of policy concern arising from the mode of data collection. The literature finds more differences between diaries collected by light as opposed to more detailed means than between methods of collecting more detailed diary accounts (for instance Lader et al. 2006).

324. Overall, however, more extensive testing on the impacts of including multiple modes in a time-use context needs to be carried out to determine to what extent mode effects may impact on the data.

8.4 Monitoring of the data collection process

325. While much of the monitoring of the data collection in time-use surveys is the same as other household surveys, additional monitoring can be carried out on the time-use component of the survey. Monitoring of the data collection process should be adapted to the specific mode of collection.

8.4.1 Sample loss

326. Monitoring the extent of sample loss throughout the collection can identify the potential impacts on the desired response rate early, and techniques can be mitigated during enumeration. Forms of sample loss are:

- Dwellings that are out of scope of the survey;

- Dwellings that are under construction, demolished, or converted to non-private dwellings or non-dwellings;
- Private dwellings that are vacant;
- Private dwellings that contain out-of-scope residents (e.g. dwellings occupied by foreign diplomats and their dependants); or
- Private dwellings that contain only visitors.

8.4.2 Number of episodes

327. The number of episodes recorded in a diary on a single day can be used as a measure of the quality of diary responses, with higher numbers of episodes indicating more thorough completion. Monitoring of any concentration of diaries not completed sufficiently can be fed back to interviewers during enumeration in order to address any inadequate explanation to respondents.

8.4.3 Workloads

328. Due to smaller time-use survey samples, interviewers are likely to have smaller workloads, making it less financially viable to run the survey. This is more likely to occur in sparsely populated areas. Careful management is recommended to ensure the optimum workload allocation across the interviewer workforce. Given the requirement for interviewers to return to the household and collect the forms (see section 8.4.5), time-use surveys are best planned among other survey activities.

329. Monitoring response rates, diary returns, time and travel information by workload throughout enumeration allows early intervention into any potential interviewer effects or problems, as well as any areas that may be misrepresented in the final survey.

8.4.4 Diary returns

330. Monitoring of diary returns of different days of the week during enumeration through management information received will allow for real-time adjustment in the sample to ensure accurate representation of diary days in the survey sample.

8.4.5 Form tracking

331. Time-use surveys are unique among many household surveys as they are (normally) a paper-based form that is left with the respondent to fill out on their own time. As such, special practices are required to track the paper forms, particularly if forms are mailed back to the office.

332. Best practice is to have the diaries collected by interviewers and have them mail back the diaries to the NSO or collection centre rather than the respondent mailing it back themselves. While this is more costly to administer, it ensures time-use diaries are returned and the sample is not lost from the survey. This will reduce the need for resources spent on intensive follow up actions to obtain diaries.

333. Form tracking also allows the identification of households with lost or incomplete data due to diaries not being returned or lost.

8.4.6 Timing

334. Regular management information on survey timing (both average time and minimum and maximum times) throughout the collection of data allows for the monitoring of survey costs against the budget, leading to real-time adjustments if required.

8.4.7 Quality of data collection

335. There are a number of mechanisms for monitoring the quality of data collection. These include:

- The number of edits triggered in an electronic instrument;
- The number and type of interviewer comments about the diary;
- The number of refusals and “don't know” responses to specific questions in the personal interview questionnaire.

8.5 Response rate

336. A decline in response rates over the years has been a particular concern for time-use surveys. This is in part due to the fact that respondents are assigned to a specific reference day or days without being offered an alternative. In addition, time-use surveys are particularly burdensome for respondents who have to recall specific activities on a retrospective 24-hour diary. It is recognized, however, that in order to obtain good quality data on time-use patterns and to account for variations in activities throughout the day, on various days of the week and throughout the year, these methods are necessary.

337. Response rates, in addition to being an important quality measure, may also provide a symptomatic indicator of response burden. To achieve the desired precision for the survey estimates, the statistical sample size needs to be adjusted for the anticipated response rate. Once the decision has been made upon a certain expected response rate, the statistical agency should do everything possible to achieve at least this response rate. Failure to achieve the expected response rate could affect the precision of the survey results.

338. Achieving low non-response rates is one of the most difficult objectives in the implementation of time-use surveys. Since non-respondents effectively decrease the size of the sample, non-response increases the sampling variance. In order to deal appropriately with total non-response, simply increasing the sample size is inadequate. Potential bias could still result if the non-respondents differ from the respondents with respect to the characteristics of interest in the survey.

339. Every effort should be made to avoid non-response since it impacts the survey quality results. Typically, little or nothing is known about the non-responding cases, and as such, the results may be biased to the extent that the non-responders differ from those who provided responses.

340. The non-response may simply be adjusted by the introduction of a weight calibration technique based on the assumption that non-respondents have similar characteristics to those of respondents. However, this may not be the case. The alternative method would consist of conducting special studies to evaluate bias caused by total non-response through follow-up interviews done with survey non-respondents (i.e. try to obtain responses from a subset of non-respondents). Since their objective is to measure bias due to non-sampling error, these

studies are complex and potentially costly. The study results could be used to plan non-response follow-up procedures for subsequent surveys.

341. The quality of the survey frame may help in obtaining better respondent contact rates. Across the whole sample, high refusal rates indicate public resistance that could make it difficult to achieve the desired data quality in the time and budget allowed. A higher than expected number of “out-of-scopes” could indicate frame problems. Good contact information helps increase the response rate for the survey, improve the quality of the estimates, and reduce interviewer tracing time.

342. Data collection mode may also affect the response rate. Self-enumeration surveys often have the lowest response rates and can take the most time to conduct. Personal interviews usually yield the highest response rates but can also be the most expensive. Telephone interviews usually have medium response rates, are less expensive than personal interviews, and are the quickest method of collection. Other methods of data collection such as electronic data reporting could also be chosen. A combination of more flexible collection methods such as multi-mode options (including an Internet-based option) could be adopted in order to help improve response rates while maintaining the collection costs at a minimum. However, the potential of mode effects on the survey results is also a consideration (see section 8.1).

343. Cost-effective solutions, such as using a light diary (or pre-coding of activities) as opposed to a full diary (or after-coding of activities), or computer-assisted telephone interviewing as opposed to a face-to-face interview, may help stabilize or increase response rates, but may also place some limitations on the scope, coverage of the survey and the comparability of its results over time.

344. Quality assurance measures need to be implemented at each of the collection and processing steps. Measures such as recruitment of qualified interviewers, training of interviewers for specific survey concepts and procedures, observations of interviews to correct questionnaire design problems and instruction misinterpretations, procedures to ensure that data captures are minimized, and edit quality checks to verify processing logic are all important considerations to optimize the potential for the highest survey response rates (see section 9.1.1).

345. In order to encourage participation in time-use surveys, introductory letters should be mailed prior to data collection in order to sensitize the population to the existence of the survey and to motivate interest, thereby increasing the potential response rate and the accuracy of responses. The letter should outline the purpose of the survey, explaining how the results are used and assuring the respondent that the information is kept strictly confidential. It should also provide contact information should respondents require additional information about the survey or need support in completing the questionnaire.

346. For any statistical agency, the best public relations strategy is to establish and maintain a credible and professional reputation by ensuring that the data that it collects are reliable, widely available, used and appreciated, and that the confidentiality of respondents' answers is respected. For a statistical agency, protecting respondents' confidentiality is essential to maintaining the public's confidence and hence of obtaining good quality data and high response rates.

347. In addition, it is important that interviewers be provided with the tools to respond to questions and complaints. As part of their training, interviewers should be provided with solid arguments to encourage participation, and very clear messages to understand and relay to respondents regarding the direct benefits of the time-use survey results in their lives. This is a particular challenge for time-use surveys given their multi-purpose nature. Examples of highlights from previous survey results or information on how the data is used by

governments and researchers should be provided to the respondents to inform them about the importance of the survey.

348. Interviewers may also need to receive extensive training on refusal conversion techniques to help them convince reluctant respondents to participate in the survey. Follow-up letters sent to potential respondents could also be used to attempt to convert refusals. Interviewers could be provided with support documentation, such as commonly asked questions and their answers, so they are prepared to answer questions the respondents may raise during the course of the interview.

349. Field collection activities are also restricted by the methodology that forces interviewers to contact the survey respondents only on designated days, which restricts the interviewers' ability to set appointments as they would normally do. When the selected respondent is not available, interviewers do not have the option of making appointments on another day, thus resulting in no flexibility to accommodate the respondents. This could increase the refusal rate for the survey. A potential solution could involve relaxing the recall period rule beyond the 48-hour maximum. However, the longer the recall, the lower the quality of recall, creating a trade-off between quality and response rate or bias.

8.5.1 Control and monitoring

350. For many surveys, response rates in combination with other quality measures are among the indicators of the quality of data collection. Aside from information on response rates, operational data such as interviewer completion rates, follow-up rates, and information from production reports, and quality control or quality assurance operations should be produced and reviewed. By identifying and addressing problems early on, the target response rates and other quality measures have a better chance of being achieved.

351. Response rates at the household, individual and diary-day levels are basic indicators of the level of unit non-response and are computed from survey information. These rates should be reported for the total sample and for major survey domains. Response criteria should be defined to determine when a non-response occurs. To be classified as responding, the degree of item response or partial response (where a sufficiently accurate response is obtained for only some of the data items required for a respondent) must meet some threshold level below which the response would be rejected and considered unit non-response (where the sampled person or household is classified as not having responded at all).

352. Response rates, non-response rates, coverage rates and other survey quality indicators should be included in the survey documentation in order to provide information for users and, importantly, for those developing the next iteration of the survey.

8.6 Conclusions and recommendations

353. These guidelines recognize that the preferred method of data collection for national estimates of time-use activities is by self-completion of a 24-hour full recall diary (section 8.1).

354. Specialized training requirements for time-use surveys should focus on the relevance of the survey, its content and concepts, its methodological complexity, and the coding of the time-use diary (section 8.2).

355. With the reference day(s) and the diary being key components of time-use surveys, countries conducting these surveys should understand the unique challenges associated with

obtaining adequate response rates (and subsequent quality data). Statistical offices should consider a combination of aspects to achieve the best possible responses rates, including: the collection mode, the survey frame, the sample size, the design of the survey, the availability of well-trained survey staff who can promote the survey and carry out collection, and the efforts to reduce response burden.

9 Data Processing, Estimation

9.1 Coding

9.1.1 Coding and quality control

356. Coding and quality control of information in the personal questionnaire of a time-use survey, such as occupation, country of birth, education and industry, should follow the standard procedures for the corresponding classifications. The following recommendations are for coding and quality control for the diary-specific information for time-use surveys.

9.1.1.1 *Diary coding*

9.1.1.1.1 *Field versus interviewer coding*

357. Time-use activities can be coded a number of different ways:

- a) The respondent does the coding;
- b) The interview/field staff code the activities; or
- c) Office staff are specifically employed and trained to code the activities.

358. The United Nations *Guide to Producing Statistics on Time Use* (United Nations 2005a: 108-109) provides a detailed examination of the advantages and disadvantages of each approach. The Guide does not recommend that the respondent carry out the coding for self-complete diaries, although when using a light time-use diary, the respondent is effectively coding activities to the pre-determined list of activities. While this minimizes the cost of coding diaries for the NSO, the burden and the risk of inconsistent coding should be taken into consideration.

359. The United Nations Guide (2005a) indicates that interviewer coding is feasible where the interviews are conducted face-to-face, as the interviewer will often remember details about the respondent and their use of time to aid with coding. To be successful, interviewers must receive adequate training. However, given the geographic spread of interviewers, it is difficult to supervise and undertake quality control when the coding is decentralized. This may lead to reduced data quality and inconsistencies in coding. Decentralized coding by interviewers may also not be possible if information is coded using complex systems.

360. The preferred method is for a dedicated coding team to code time-use diaries in a centralized location within the NSO. This is to ensure consistent coding practices, high-quality, ongoing training of coders, and the ability to respond rapidly to changes in direction and the implementation of new coding practices.

361. Regardless of the type of coding selected, a coding manual and training should be established to ensure consistent, accurate coding.

9.1.1.1.2 *Coder training: experiential training methods*

362. Training of the coding team is pivotal for the smooth processing of input data from time-use diaries to ensure high-quality and consistent coding of episodes of time. Some Australian observations from evaluations of the coding phase suggest that experiential training is more effective than lecture-style seminars when inducting coders. Lengthy training packages prior to the start of the coding phase may be viable for those coders who begin at the start of processing; however, a repetition of these training courses midway through the phase

for new or replacement staff may not be feasible. Ongoing refresher training should be conducted throughout the coding phase to maintain the quality of the coding. During their initial training, coders should complete a time-use diary and code their own diary to give them a first-hand understanding of the diary and how the information is coded. Completing a time-use diary is also recommended for interviewers.

9.1.1.1.3 Coders utilizing questionnaire content

363. Efficiencies and improved coding quality of time-use diary information can be achieved by coders having access to key household information obtained from a personal questionnaire. This allows the coders to cross-reference the information and assist with accurate query resolution. Examples of this could be household type, age and sex of all members of the household, employment status, disability status, occupation, etc.

364. The recommended method to provide this information is for the information to appear in the diary processing system at the same time as the diary so coders can cross-reference information. Coders should be provided with specific instructions on the main issues to look out for when crosschecking the personal interview content with the diary information.

365. In countries where the questionnaire information may be edited and or imputed, such as for coding "don't know" and "other" comments to appropriate response categories, it may be efficient for coders to undertake this activity prior to coding the diary information so they are more familiar with the household and can utilize this information in coding the time use. During this process, the coders record any valuable information about the household that would aid them in performing the diary coding. Australia used this approach successfully: while it added to the processing time for each diary, it led to efficiencies for the coders, provided coders with additional information to assist in more effective coding, and allowed for a balance check between information collected in the personal interview and data contained in the diary.

9.1.1.1.4 Coding and new technology

366. Computer-assisted telephone and personal interviewing (CATI and CAPI) allow for the entering of information directly into an electronic format and thus reduce the cost of processing diaries. This is one of the main benefits of these collection methods, but data quality is reliant on the respondent's ability to recall their activities over the previous day (see section 8.1 for more information).

367. Collecting time-use data via smartphones or mobile devices gives the respondent the ability to report soon after the event as well as in an electronic format. This information can then be uploaded directly into the processing system and is ready to undergo the editing phase, including any coding of activities that could not be automatically coded.

368. The benefits of utilizing a web form to complete a time-use diary will depend on the behaviour of the respondent as well as the accessibility of the Internet throughout their day so that quality, detailed information can be collected. If the respondent has constant access to the Internet and can complete the diary periodically throughout the day online, the time-use data is likely to be of high quality. However, if the respondent only completes the diary online once or twice during the day, the accuracy of the data will diminish. While this is also a risk when using a paper diary, it is important that the diary be in a format that allows it to be carried with the respondent throughout the day in order to enable the collection of the highest quality data. Careful consideration is required for the use of web forms unless they can be accessed via mobile devices.

369. Other benefits of electronic collection via mobile devices include:

- a) The possibility of assisting the respondent in accurately self-coding activities to the activity classification;
- b) The possibility that the respondent may need to record less information in the diary through the use of auto-coding within the diary;
- c) The ability to prompt when contextual information (such as location) is left blank; and
- d) The potential to build in coding rules, reminders and edits into the collection tool.

370. The following concerns should be minimized when using assisted coding via electronic collection:

- a) Ensuring that the experience of completing (and coding) by respondents is straightforward and efficient to ensure that respondents complete their diary frequently and accurately;
- b) Ensuring that the activities are recorded in the way that the respondents would describe the activity;
- c) Ensuring that respondents can easily record episodes frequently and not recommending that they use an electronic tool if they do not have a mobile device or do not have relatively constant access to the Internet;
- d) Ensuring that the coding tool enables correct coding of activities; and
- e) Ensuring that sufficient information is collected from respondents, including information to address any ongoing queries to code their time use.

371. Utilizing mobile devices to access an online diary could be more easily applied to light time-use surveys, but the collection will suffer from the same limitations with light surveys collected via pen and paper (see chapters 4 and 8 for more information on light surveys).

9.1.1.2 Quality control

372. Ongoing quality control checks should be undertaken for coding of diary information throughout the coding phase.

373. Quality control for time-use surveys can be undertaken by:

- a) Automatic edits for inconsistent or incorrect coding;
- b) Randomized checking of coding;
- c) Systematic recoding of records, or simultaneous coding of records.

374. Systematic recoding of records or simultaneous coding of records is useful for training coding staff as well as for assessing levels of accuracy in coding staff. Usually the coding activity of a staff member is recoded by another staff member and the discrepancies are analysed by a coding supervisor.

375. Initially, a coder should have every diary they code subsequently recoded by another coder. To reduce costs, quality control can be gradually reduced over time where coding accuracy increases.

376. Wherever possible, the coding supervisor should have the functionality to perform minor edits to make the record as accurate as possible, while avoiding introducing errors into the coding. It is important that an audit trail of changes made be saved and can be referred to if necessary.

377. Quality control is the most time-consuming task of the coding phase. An effective recruitment strategy, induction or on-boarding activities, frequent and constructive feedback to coders, and setting realistic quality control targets will all ensure a good balance between detecting and eliminating error, and the cost of coding diaries.

378. Quality control can be best managed through a central, dedicated coding team.

9.1.1.2.1 Query resolution and management

379. Queries arising on how to code activities should be stored in a centralized computer repository. This allows for analysis of the types of queries and common resolutions. This information can indicate what type of refresher training should be provided to coders, what updates should be made to the coding list, as well as identification of potential errors. It also provides guidance on how to improve future surveys.

380. Queries about activity codes may lead to necessary adjustments to the activity classification where the classification no longer represents the types of activities undertaken by respondents, or the descriptions do not adequately capture the way in which they describe their activities.

381. Query management can become a large part of a coding workload, so it is important to provide coding staff with feedback on common resolutions to reduce queries through the coding phase.

9.1.1.3 Specific coding issues

9.1.1.3.1 Primary and secondary activity coding

382. The same level of coding activities should be applied to all activities (primary and secondary activities).

383. Ideally the processing system should allow for the most detailed amount of activity information to be recorded, but at minimum a primary and a secondary activity should be able to be assigned to each episode of time. In general, on a paper diary the "for whom" column refers only to the primary activity (due to limited space), so it is important that activities that are specifically done for others (caring, childcare, volunteering) be coded as primary activities.

9.1.1.3.2 Missing activities for primary and secondary activities

384. To maximize the response rates of the survey, it is necessary to undertake some imputing of diary activities to ensure a household remains in the final sample. The decision to keep a household should be based on the fact that most personal questionnaire and diary information has been collected for the household. This should be clearly outlined for interviewers and coders.

385. Where activities are missing in a diary, best practice is to use other information within the diary or diaries from other members of the household to impute the activities. Similarly, secondary activities may be determined from the nature of the primary activity.

386. Examples that can be easily imputed are:

- a) Where respondents report "going to bed" and "waking up" but do not mark the intervening time as sleep; or
- b) Where a change in location has been recorded but no travel event has taken place. In this instance, information such as a reverse journey may help provide more detail on the type and length of the journey.

387. When travel time is missing, the coding strategy should determine whether it is best to insert a generic travel time (e.g. 10 minutes to and from) or not. Another option is to estimate a time based on geographic knowledge, though this may introduce data error, so caution is advised.

388. Other considerations:

- a) There may be occasions where the use of "no activity" is appropriate;

- b) The code for "doing nothing" can only be used in the primary activity column;
- c) Checking that there is at least one episode of sleep, eating, drinking or personal care is a good data-quality check.

389. The coding manual should describe how coders should code the data in each scenario. It is important that repeat episodes of a coding issue be treated consistently.

9.1.1.3.3 Communication and technology

390. Given the interest in understanding how technology is used, and whether time use has changed as a result of new technology, collecting and disseminating information on communication and technology use should be done wherever possible. The type of communication (e.g. in person, mobile, e-mail) and technology (computer, Internet, smartphone) should be collected and coded for relevant activities. For many activities, communication and technology will not be applicable.

391. Communication codes should be used to describe the type of interaction undertaken with other people. Technology codes should be used when the respondent has indicated that they are using technology to perform other activities not relating to communication, for example, doing research on the computer or reading the newspaper online.

392. In many cases, the type of communication or technology will be self-evident from the description of the activity, for example "sent an e-mail" or "phoned my mother". In other cases, the type of communication or technology used may be difficult to determine. For instance, the respondent records "did research". This may or may not involve using a computer and/or the Internet. Providing a separate category on the diary for mode of communication or technology is the best approach to collect this information, rather than relying on respondents to include this information in the reporting of the primary or secondary activity.

393. Sweden successfully operationalized this in its 2010/2011 Time Use Survey as a box on the diary that was to be ticked whenever certain activities were specified as either primary or secondary. The time diary component of the next Australian Work, Life and Family Survey will provide a column where respondents can write the type of information or communication technology used. This will provide more detail on the types of technology used for particular activities.

9.1.1.3.4 "For whom" and "with whom"

394. Many countries collect "for whom" the activity was undertaken in a separate column in the diary. This column explains *why* an activity is done. This information can identify the time spent in volunteer work and caring activities and for whom they were undertaken. This is important for the production of recommended outputs on unpaid work.

395. "For whom" should be coded using a list of key recipients, such as self, work, family, child, other households, and organizations. Some countries, such as Australia, also attempt to classify whether the "for whom" related to children or someone who has a disability or need for assistance. This can be difficult to code without using additional information from the questionnaire about other members of the household.

396. When the "for whom" column is left blank, coders should try to impute a response based on the other information the respondent has provided.

397. Activity information may also provide evidence for the editing of the "for whom" data. For example, if someone records "drove kids to shops" in the activity column but in the "for whom" column reports "self", then this should be recoded to "family".

398. It is possible that the activity may have been done for more than one person or group and systems should therefore allow for more than one recipient of the activity.

399. Some activities such as sleeping, eating and personal hygiene should be coded with a “for whom” of “self”, even if the respondent has reported differently. The reason is that respondents cannot eat, sleep or go to the toilet for someone else.

400. The “with whom” column in a typical time-use diary allows for the development of recommended outputs on socializing and leisure time. In Sweden’s 2010/11 Time Use Survey the “with whom” box designated for spouse/partner was checked against the interview data to ensure that it was not marked if such a person did not exist within the household. Codes were also developed to indicate that the coder had imputed the presence of another person based on other diary information and diary data from other people in the household. It is important to be able to distinguish between raw and imputed data in output.

401. In Australia, the “with whom” responses are separated into people who normally reside in the household and people who do not.

9.1.1.3.5 Coding location (*Where were you?*)

402. A time-use survey should have two fields to classify “location” - one for physical location and one for spatial location. Physical location includes categories such as “home”, “workplace”, “public area” and “educational establishment”. Spatial location includes broader categories, such as “indoors”, “outdoors” and “in transit”.

403. The location codes describe the respondent's relationship to the location. For example, if the respondent reports studying at a library, then they would be coded as being in an “educational establishment” rather than in an “establishment for leisure, culture, sport activities”. However, the latter code would be used if the respondent reported going to a library and did not report that they were studying.

404. Sweden’s 2010/2011 Time Use Survey had automated controls that ensured every episode in the diary had a locational code attached.

9.1.1.3.6 Journey to and from work

405. Transport policymakers are particularly interested in the number and frequency of incidental and purposeful activities reported by respondents that form part of their “usual” journey to and from work. Coding rules should be established to assist coders in capturing this required information by “chaining” together episodes of activities that comprise a “journey to work” or “journey from work”. Some time-use data users have also expressed interest in charting the journey to education.

406. Examples of travel “chains” or circles are shown in section 3.2.4 of the *Harmonised European Time Use Surveys: 2008 guidelines* (Eurostat 2009).

407. Exceptions may be made for the following people:

- a) Those whose jobs are carried out at home; and
- b) Tradespeople and others who work at a succession of clients' homes. Their journey to work begins with the first journey from home to first work episode and the journey from work begins at the end of the last work episode of the day to the home location.

408. These exceptions also influence the locational data. A consistent approach should be undertaken in the treatment of location where workplace and home are the same. In the Canadian time-use survey “respondent’s home” is prioritized over workplace.

9.1.1.3.7 *Mode of transport*

409. Mode of transport coding for when the respondent is “in transit” improves travel and time-use understanding. Some of the potential categories could include “train”, “bicycle” and “taxi”. For modes of transport where it will be unclear if the respondent is the driver or passenger (such as car, van or truck), the driver and passenger should be coded separately.

Determining the driver

410. If the respondent reports being in a car with other people and it is not clear from the episode entry whether or not the respondent is driving, the other household diaries should be checked for more information. If there is no extra information available, then one option is to split the travel episode evenly, with half the time as a driver and half as a passenger.

Missing mode of transport

411. If the mode of transport is missing, the description in the activity that indicates transit, or another corroborating household diary, should be checked to see if it can be validly inferred.

9.1.2 Editing and checking

412. As outlined above, editing or imputation may be required to maximize the sample that can be used for the final estimates, and also to make the information more useful by providing consistent and accurate information and ensuring that all time is accounted for.

413. The decision to retain or drop a record rather than to edit or impute parts of the data provided depends on a number of conditional factors. A decision tree should be created that determines the retention of households. Questions that need to be considered include “Is at least one person schedule completed?”, and “Is at least one diary coded?” If the answer to any of these questions is no, then the decision may be made to drop the household. Further decisions may be threshold based, as in Canada’s time-use survey where 24-hour diaries containing more than four hours without recorded activities are designated as refusals and removed from the sample.

9.1.2.1 *Automated editing*

414. A number of automatic and/or manual edits should be carried out to identify any information that may require editing or imputation. General checks of diary data which need to be made are:

- a) The 12 a.m. to 12 a.m. time period is covered for each diary day;
- b) There are no missing time blocks;
- c) Diary days are consistent within a household; that is, diaries are filled in for the same days within a week, but not necessarily on the same dates;
- d) Activities should generally not be the same for the primary and secondary activities in one episode.

415. In the Canadian time-use survey, duplication in simultaneous activities was resolved by converting the secondary activity to “not asked”. There are some episodes that have simultaneous activities of the same type, for example:

- a) Communication related to recreation and leisure that can occur as a primary and secondary activity if, for example, the respondent is speaking on the phone as the primary activity and speaking to someone in person as the secondary activity.

- b) Playing/reading/talking with child could be used as a primary and secondary activity concurrently if the respondent reports reading to one child as the primary activity and talking to another child as the secondary activity.

416. When inconsistencies arise during the edit checks, other diary information, personal questionnaire, other household member's diaries and interviewer's comments should be used to carry out any further edits before considering whether to progress to imputation. This will include recoding diary and questionnaire information based on interviewer comments, respondent comments or "other specify" categories.

417. Canada uses a computer-assisted telephone interviewing (CATI) instrument that allows for an edit that keeps track of total time in a live environment. In the Canadian survey, activity capture ends when 1,440 minutes and a maximum of 70 episodes are collected.

9.1.3 Imputation

418. Imputing involves attributing missing information to a respondent based on the information already provided by the respondent or by others in the household or sample. While minor elements of imputation are completed during the coding phase, further imputation practices are applied to the output from the coding phase.

9.1.3.1 *Imputing versus adjusting weight*

419. The United Nations *Guide to Producing Statistics on Time Use* (United Nations 2005a: 122-124) outlines recommendations of when imputation should be used and when adjustments to the weights during estimation should be used. A summary of these recommendations is:

- a) Where items are missing from the personal interview – hot deck (where each missing value is replaced with an observed response from a "similar" unit) or donor imputation should be used
- b) If a respondent is coded as a full non-response, then a weight adjustment should be used.
- c) If a respondent completes most of the diary, but there are missing time slots (i.e. total time does not equate to 24 hours) then, time permitting, the diary should be investigated for missing elements (see above), or if this cannot be done or it does not resolve the missing information, a hot deck imputation based on relevant classes (age, sex, marital status, labour force) should be used.
- d) If the respondent completed the interview but not the diary, then apply a weight adjustment.

9.1.3.2 *Outliering*

420. Outliering is the process of finding and adjusting for extreme values in a data set. For example, one person may have recorded sleeping for 20 hours. If it cannot be determined that this information is incorrect and the record has considerable impact on the overall results for key population groups, then the record may be given a smaller weight and the other weights adjusted accordingly. There are various methods for examining outliers in a data set, and these guidelines do not attempt to address the advantages and disadvantages of each. There are, however, some special considerations for the identification and treatment of outliers in time-use diary data.

421. Highest and lowest observations of time spent on activities is a good method of finding illogical activity durations which may be caused by input error during coding, or, if using an

automated coded system, errors that were not picked up during checking. Another source of error is incorrect substitution of a.m./p.m. Use of a 24-hour clock in the processing system will minimize this type of error.

422. Another example of imputation techniques relevant for time-use diaries is the regression imputation undertaken by Finland in its 2010 Time Use Survey. Regression imputation was used to complete missing data in diaries that had been kept for at least half of a day. The imputation was only applied to the most important activity in which almost all people engage, such as the starting time of sleep. The duration of sleep at night was modelled and predicted for diaries that were partly completed. In the model, sleep at night was explained by sleep in the morning, day of the week, gender, age, day off from work or workday. The starting point of sleep was calculated backwards from the end of diary keeping.

9.2 Estimation and weighting

423. Weighting and estimation for time-use surveys is covered in chapter IX of the United Nations *Guide to Producing Statistics on Time Use* (United Nations 2005a: 128-140). A brief overview of different weighting is provided in the following sections.

9.2.1 Weighting time diary estimates

9.2.1.1 Person-day weights

424. The basic weighting of time-use data is done at the person-day level. Whether a respondent records one or two diary days, that person is then representative of similar persons on those days. For those with two diary days, the base file for each respondent would have two records, but they would not necessarily have the same weight.

9.2.1.2 Household-day level weights

425. The inclusion of a household-day level file with household-day level weights is a valuable addition to a time-use survey when all persons or adults in the household complete a diary. The purpose of examining time-use data at the household level is to look at the distribution of time in paid and unpaid work across the members of the household. Just like income or wealth, time is an asset that can be shared among people in the household, and there are economies of scale that exist in many time-related activities. For instance, the person level might examine time spent by a person on preparation of meals. These meals, however, are (except in the case of a one-person household) often prepared for the family or household, and while one member may undertake meal preparation, other members may contribute by undertaking other activities.

426. The production of household-day level estimates allows for additional levels of analysis. An analyst can, for example, apply similar concepts of equivalisation to time that are applied to income or wealth. This allows for the comparison of time spent on activities between different household compositions on an equivalent basis.

427. Calculation of household-day level estimates requires that all survey content be collected from all in-scope members of the household, including the two-day diary. Only households (days) which have complete diary information for all in-scope members of the household are used for the calculation of household diary-day weighting. This means that some people may not have a household level weight if they were included in the sample for person/day weight but where other members of the household were non-respondents. When

surveys only collect time-use diary data from a limited number of people in the household, household-day weights cannot be created.

9.2.1.3 Episode or activity weights

428. Countries may consider creating an episode file that contains detailed information regarding each time interval of an individual's day. Specifically, this file would contain information about a primary activity, how long this activity lasted, the other activities that were occurring at the same time as the original episode, and information regarding who else was present during the time period of the episode. There is more than one record for each individual, and the total minutes recorded in the episode file for each individual must add up to a 24-hour day (or 1,440 minutes). The weighting on the episode file reflects the number of time-use episodes an individual represents (it is not a person weight).

429. The episode file provides a wealth of analytical possibilities, such as to discover how much time people typically spend on activities such as leisure, childcare or paid work, or to explore multi-tasking, time spent alone or with others, and to look at time spent on unpaid work. In addition, it is possible to look at issues such as commuting times, place of work, and how individuals utilize technology such as computers and cell phones in their daily lives.

9.2.2 Non-time related weights

430. Where estimates that are not time-related are derived from the survey data file, a completely different set of weights is needed at both the person and household level. Examples of such estimates would be "the number of people studying at an educational institution" or "the number of households that have a television" (note the difference to estimates of "time spent undertaking educational activities" and "time spent watching television by households"). While the main objective of a time-use survey is not to produce estimates of this kind, users of the data may have an interest in this data. If the correct weights are not given to allow users to produce these types of estimates, the diary-day weights may be used incorrectly, which will result in misleading estimates. Therefore, person and household level weights for non-time-use data items should be produced in addition to person-day and household-day weights to maximize the use of the data.

9.2.2.1 Integrated weighting

431. Integrated weighting should be performed to ensure consistency between estimates produced at different levels, such as persons and households. Integrated weighting achieves consistency by ensuring that all members of a household have the same weight as that of the household or by deriving the household weight by calculating an average of the person weights within that household. While it appears that integrated weighting would have benefits when weighting the time-use survey, there are also several disadvantages and complications. Where a time-use survey is collected over a number of different periods, such as quarters, each quarter is weighted separately and only records from complete households can be used in integrated weighting (meaning that a significant number of people diary days could be lost). The number of household records in each quarter may not be sufficient to accurately perform integrated weighting at the desired level.

432. Given the loss of person diary records from incomplete households encountered with integrated weighting, household and person weighting should be performed separately. To achieve consistency between comparable person time-use estimates and household time-use estimates, household diary day weights should be calibrated to totals of key estimates derived from the person diary day weights, in particular for measures of unpaid work.

9.2.2.2 *Weighting time use as part of an integrated survey*

433. Where time-use data is collected as a subset of a larger survey, or integrated into another survey but containing a separate sampling methodology, weighting for time-use estimates should be treated separately. Consideration should be given as to whether to integrate the weights as part of the larger survey. Households or persons who are selected for the time-use subsample will have a combined set of weights, one for use in the production of estimates of the primary survey, and another for use in the production of time-use content.

9.3 **Assessing the quality of outputs**

434. Quality reporting must be done in compliance with generally approved quality indicators. The generally used quality components for statistics include: i) relevance, ii) accuracy and reliability, iii) timeliness and punctuality, iv) coherence and comparability, v) accessibility and clarity.

435. The most important aspects are accuracy and reliability. Systematic and random errors should be reported. Several indicators can be calculated from the sample or from the data of the respondents. Response rates should be calculated at household, individual and diary levels. Unobserved item non-response of diaries can be measured by calculating the number of episodes, the total time of simultaneous activities, and the total time of unknown activities.

436. In the United Nations *Guide to Producing Statistics on Time Use* (United Nations 2005a: 157-167), the following are presented as quality assurance procedures:

- a) Data quality evaluation methods: certification or validation methods and sources of error studies;
- b) Review of quality of time-use data (standard measures and indicators specific to time-use survey data);
- c) Consistency checks;
- d) Comparisons based on known patterns and previous findings;
- e) Comparability over time;
- f) Comparability with other data sources;
- g) Expert judgements.

437. As an example of comparison to other data sources, the annual gainful work estimate produced by time-use surveys can be compared to the estimate on annual working time produced by the Labour Force Survey. This requires data collection on every day of the year in the time-use survey. Trend data from time-use surveys and labour force surveys concerning working hours can also be compared with one another. However, the differences in the estimates of the number of working hours caused by different methods should be considered in the comparison (e.g. Robinson and Bostrom 1994; Niemi 1993).

438. The estimates of the number of working days (number of survey days on which employed subjects have performed gainful work) can be compared with the estimate of the number of working days in the Labour Force Survey. However, while in some instances it would be useful to compare the results of time-use surveys with other surveys within a country, it may not always be useful to do so.

9.4 Recommendations

439. Quality reporting should be done in compliance with generally approved quality indicators. In addition, indicators specific to time-use survey data should be used. Response rates should be calculated at household, individual and diary levels. Unobserved item non-response of diaries can be measured by calculating the number of episodes, the total time of simultaneous activities, and the total time of unknown activities (section 9.3).

10 Dissemination

10.1 Introduction

440. Time-use data are used broadly by many different groups, including, but not limited to, policymakers, researchers, non-profit organizations and journalists. The dissemination of time-use data should consider the varied needs of these groups and how dissemination products can meet their needs. The needs will range from single numbers obtained from published data to complex analysis and modelling. As a result, a suite of products should be considered for any time-use survey. A dissemination strategy should be developed that outlines the potential users of the data, and what products will meet the main requirements. The dissemination strategy should consider the following four areas:

- a) Standard tables;
- b) Microdata;
- c) Secondary analysis using time-use surveys;
- d) Data visualization.

10.2 Standard tables

441. Many of the recommended outputs can be covered by simple output tables. Other recommended outputs are more analytically intensive. The dissemination strategy, including standard tables, should seek to cover as many of the recommended outputs as possible.

442. Chapter 10 of the *United Nations Guide to Producing Statistics on Time Use* (United Nations 2005a) covers the standard types of output for release from time-use surveys. They include:

- a) Average time the survey population spent on a specific activity;
- b) Average time spent on a specific activity by those who participated in the activity;
- c) Average duration of an episode of an activity;
- d) Average number of episodes of a specified activity reported by the survey population;
- e) Average number of episodes of a specified activity reported by participants who undertook the activity;
- f) Participation rate or proportion of persons in the survey population who participated in a specified activity.

443. These tables use the following different populations:

- a) All persons/households;
- b) Only those persons/households that participated in the specified activities.

10.2.1 Units of time

444. Time is usually presented in tables as average hours and minutes per day (hh:mm). However, other units can be presented, including for specific days (weekday/weekend) or per week. Per week can be particularly useful for presenting infrequent activities. Presentation of weekday or weekend can be useful for activities that vary dramatically between different days of the week. In some instances, annual figures can be useful for a variety of uses, for instance,

a campaign to get people to exercise by using more physically active transport might find a figure like "on average, we spend 20 days a year sitting in traffic". The Centre for Time Use Research offers a time calculator that does this.²³ Data can also be presented by time of day. For example, the proportion of the population participating in paid employment by the time of day. This might show, for instance that only a small proportion of people work at 6 a.m. and it increases dramatically between standard working hours (9 a.m. to 5 p.m.) and then tapers off in the evening, such as for those who work in the evening or night shift. These types of tables are often called "daily rhythm" tables or charts.

10.2.2 Time series

445. It is important to present changes over time in the average time spent on activities and in the participation in activities over time. These tables can also show changes in the distribution of time across the average day. For the interest of certain users, time series tables should also be presented by weekdays/weekends. Such splits will show any changes in time use over a week and reveal important changes, such as whether the average time spent in paid work on weekends has increased.

10.2.3 Cross-classification and cross-tabulation

10.2.3.1 Activity classification

446. The main output from any time-use survey is the activity classification that can be presented at different levels dependent on the sample size or demand from users. Usually activities would be presented in the rows of any two-dimensional table output (i.e. spreadsheet) to allow for the long activities classification to be presented in one view.

447. The activities list should be cross-classified by primary and secondary activities. Sample tables in Annex 14 of the United Nations *Guide to Producing Statistics on Time Use* (United Nations 2005a) recommends cross-classifying activities with personal and household characteristics. Activity detail may need to be collapsed to allow detailed cross-tabulation by some demographic variables.

448. Demographic and characteristic data should be kept to the columns of a table so that the activity classes can be as expansive as possible.

449. For more information about activities classifications, see chapter 5.

10.2.3.2 Demographic variables

450. Tables on average time spent per day should be cross-classified (columns) by age and by sex to the lowest reasonable level of detail. It is important to present generally accepted life stages as separate categories (i.e. 0-14, 15-24, 25-44, 45-64, 65-74, 75+). Age groupings that are too wide may mask different time-use patterns of different life cycle groups.

451. Any time series differences in time use should be considered, whether it is a shift in time use or the difference is the result of the changing demographic characteristics of the population (such as fewer families with children, ageing population or more people living alone).

²³ <http://www.timeuse.org/information/calculator>

452. Geographic regions such as urban/rural and states or provinces should also be considered for cross tabulation. The number and detail of these will depend on what geographic level the survey sample was designed to support.

453. Urban/rural is an important geographic breakdown for time use, particularly for some recommended outputs such as travel time. Persons living in major cities may have different travel patterns (average time spent and modes of transport) than persons living in regional centres or rural areas where some modes (such as trains, trams, ferries) may not be available, or where they may live closer to where they work.

10.2.3.3 Other person and household characteristics

454. Other key characteristics that should be used to cross-classify time-use activities include: labour force status, educational attainment, educational participation, income (particularly equivalised household income), wealth (particularly equivalised household wealth), household or family composition, and disability status.

455. These categories usually contain only a small number of categories; for instance labour force status is often subclassified into employed full-time, employed part-time, unemployed, not in the labour force (retired), not in the labour force (not-retired). This makes them appropriate for cross-tabulation with the activity classification.

10.2.3.4 Time-use contextual variables

456. Time-use contextual variables that were collected in the diary along with the activity and the time spent can be presented as a cross-tabulation to activities and demographic variables. The contextual variables include whom they were with at the time of the activity, whom the activity was carried out for, the location of the activity, if transport was used and what mode it was, and whether technology such as computers, Internet, etc. was used to carry out the activity.

457. These contextual variables will show, for example, average time spent with partners, family, own children, friends, work colleagues, for different population groups and variables such as different age groups, geography, labour force status, or the type of activity. Some activities, however, by their nature will not have a “with whom”, and others will always have a “for whom” as “self” such as sleeping (see section 9.1 for more details on coding rules for contextual variables).

10.2.3.5 Types of time use

458. The Australian and the New Zealand time-use surveys present their activity classifications aggregated to the main purpose of the time:

- a) Necessary time - personal care and maintenance activities;
- b) Contracted time - work, primary production, learning;
- c) Committed time - unpaid domestic work, care giving within and outside the household;
- d) Free time - socializing, attending events.

459. This four-way split can be created using most of the major activity classification sets, including the minimum activity list included in this publication (chapter 5), and allows for a simple examination of the different types of time at a level even higher than the major divisions level (United Nations 2005a: 193).

10.2.3.6 Employment and unpaid work

460. Both participation in and average time spent in employment and unpaid work activities by sex are important outputs from time-use surveys. They allow for the examination of the differences in paid and unpaid time between men and women, as well as the division of these activities within households. Further disaggregation by age and by household composition are also recommended in order to identify any differences in the distribution of activities for different types of households and for different age groups. A useful output is to cross-tabulate the employment composition of households (i.e. double income, single income, whether both are employed full-time) to see how the division of unpaid work varies by the paid working arrangements of households. This can only be created if household level weights are created for the survey.

10.2.3.7 Travel time

461. Average time spent travelling is an important output for transport economists and urban traffic planning, in particular for analysing travel to work or education. In a table of primary activities, each activity classification can have an "associated travel" attached to it. This allows for average hours associated with each major group of activity, such as personal care, work-related activities, education, etc.

10.3 Reporting on simultaneous activities

462. Reporting on simultaneous activities is useful in understanding all of the activities being undertaken by respondents, particularly with the increasing use of technology. It is particularly useful for understanding the extent of childcare that occurs, as time-use data shows that this is frequently undertaken simultaneously with other activities.

463. The ability to report on simultaneous activities is entirely dependent on whether secondary activity data is collected, the quality of secondary data collection, and the thoroughness of coding and editing (see section 9.1 on coding of primary and secondary activities). While many countries have collected secondary or even tertiary activities, the volume of outputs of secondary activity data is low.

464. There are three methods to present secondary activity information: aggregated with primary activities; cross-classification of primary activity; and cross-tabulated by primary activity.

10.3.1 Aggregated with primary activities

465. Time spent on primary activities is combined with time spent on secondary activities to show the total time spent on any activity (examples are tables 5, 6.1 and 6.2 in New Zealand's 2009/10 Time Use Survey (Bascand 2011)). Care needs to be taken to ensure that primary and secondary activities that fall into the same coding level are not counted twice. This is dependent on the level of the classification at which the activities are being disseminated.

10.3.2 Cross-classification of primary activity

466. Primary activities are disaggregated by time spent in primary activities with no reported secondary activity, separate from time spent in primary activities performed with secondary

activities. At the simplest level, all secondary activities can be aggregated together into one category, though more clear meaning can be conveyed by grouping secondary activities into a small subset of commonly reported areas of secondary activity: secondary care, secondary social time, secondary media and computing use, and all other secondary activities. This presentation allows for characteristic variables to be included in the columns, and the data can be easily understood by users. An example of this table is table A8 in the United Nations *Guide to Producing Statistics on Time Use* (United Nations 2005a: 267).

10.3.3 Cross-tabulated by primary activities

467. Where the secondary activities data supports the detailed disaggregation of secondary activities, primary activities can be cross-tabulated by the secondary activities (in the columns). This identifies which activities are generally performed simultaneously. The first column of this type of table should include "no secondary activity", as not all activities can be carried out simultaneously with other activities.

468. The output of secondary activity information should be presented in published tables as well as available via microdata or specialized data requests. The Harmonised European Time Use Survey allows for the output of secondary activity information through its table-builder application.

10.4 Microdata

469. Policymakers and researchers use microdata from time-use surveys heavily. A microdata output strategy is recommended for all time-use surveys as part of the dissemination strategy. It is also important that the microdata output strategy include ongoing management of the microdata files to ensure an appropriate degree of privacy and security. This could include responsibilities for maintaining registers of users of the microdata files, agreements on plans for further data integration and data linkage, data security arrangements, and retention and destruction plans.

470. There are a number of different ways to disseminate microdata, including: public-use microdata files; remote access; and online tabulation.

10.4.1 Public-use microdata files

471. Confidential unit record level files can be disseminated either for free, by agreement, or for a fee. These files have all identifiable information (names, addresses, etc.) removed, and the data have been formatted in a manner that ensures that no individual or household is likely to be identified. The process of making them confidential may involve perturbation of information, removing records or suppressing information which would be likely to lead to the identification of an individual or household.

472. Outputs from a time-use survey differ in many ways from other collections in the types of data collected and available for analysis, as well as in the way the data is structured. Most collection outputs will have different *levels* of data. In a simple example, this might include a data file containing information about the household where each record represents one *household*, and a separate file containing information about individuals where each line of data represents a *person*. For time-use surveys there is typically an *episode* level where each record on the file represents an episode of time, and/or an *activity* level where each record represents an activity undertaken by an individual. Some countries also have a *day* level that

contains information about the particular day that was sampled. An example of how time-use data can be structured is the microdata output from the American Time Use Survey (ATUS). The ATUS microdata files are split over a number of levels that are linked by the use of identifiers on each file.²⁴ The end use of the information determines how the data is structured, but it is best practice to ensure that time-use data is available at the lowest level of observation: the *episode* or *activity* level.

10.4.2 Remote access

473. Authorized users provide statistical script (code) in a supported statistical language (e.g. SAS, SPSS, Stata, open-source freeware, namely R) that is sent remotely to the national statistical office. The NSO runs the script and provides the output, made confidential, to the user. The key differences between this and the microdata file is that the researcher does not have access to the unit record file and the confidentiality is applied to the output file rather than the input file. Remote access can allow the researcher to analyse more detailed data and for the results to be released back to the researcher in a manner approved by the NSO.

10.4.3 Online tabulation

474. New technologies allow users to create their own tables using a web-based application, such as the Harmonised European Time Use Survey web application. The application (currently maintained by Statistics Sweden) allows for the calculation of user defined statistical tables with a specific focus on comparability across participating European countries. A similar user-defined table builder is available on the Statistics Finland website. Future developments in online tabulation will see the expansion of the variables and complexity available. The NSO assesses the confidentiality of the tabulated data before release to the researcher. For example, extremely disaggregated table requests may lead to a high degree of suppression or may not be approved for execution and release.

10.4.3.1 DotStat

475. The DotStat initiative is a web service functionality allowing high-end users to pipe data directly into their information technology systems. DotStat technology is currently in use by the Organisation for Economic Co-operation and Development, the International Monetary Fund, and Statistics New Zealand, among others. Whether or not time-use data would be fit for this type of dissemination channel needs to be further investigated.

10.4.3.2 Time series

476. The American Time Use Survey provides microdata files that combine several years of data. This initiative does require a strategy for effectively dealing with changes in methodology, weighting and data quality issues.

10.4.3.3 Integrated time-use surveys

477. Where time-use surveys are conducted as a subsample of other social surveys (such as in the United States of America and Belarus) the richness of the time-use microdata is enhanced by the inclusion of a greater depth in characteristic information. The microdata strategy for these surveys may differ from stand-alone time-use surveys as they will need to

²⁴ See <http://www.bls.gov/tus/howto.htm/#basicfiles>.

take into consideration a larger amount of detail in the confidentiality process, and the inclusion of different weighting for the surveys.

478. The data can either be provided on a single dataset, or have separate datasets for the time-use survey and the full survey.

10.4.3.4 International microdata collaboration

479. The Multinational Time Use Study (MTUS) and the Harmonised European Time Use Study (HETUS) are both examples of microdata collaboration between countries.

480. The MTUS²⁵ is a dataset containing aggregate and episode data from 60 surveys from 25 participating countries. The data is prepared, harmonized and combined together on a consistent basis to allow cross-country analysis.

481. The American Time Use Survey Data Extract Builder (ATUS-X)²⁶ facilitates access to the ATUS and Current Population Survey (CPS) by assisting researchers in making customized data files with desired variables and sample elements.

482. The MTUS and ATUS-X are in the process of developing collaborative links to make some elements of the MTUS data more readily useful to a wider range of users, and to share expertise to improve the online documentation resources for the surveys included in the database.

483. HETUS is a tool that allows users to produce tables comparing time-use data from participating European countries. The cross-country comparison is possible as countries collect data on a common set of standards.

10.4.3.5 Microdata issues specific to time-use surveys

484. Consideration is required as to whether there is a need to make diary data on a microdata file confidential. These include episodes, duration and activities or other information collected, such as time stress. While the combinations may potentially be unique in comparison to any other diary, this may not be considered enough evidence in itself to identify respondents. Analysis should be carried out for any potentially unique combination of activities for each individual survey to determine the need for confidentiality. NSOs should decide on the rules for release of microdata from time-use surveys consistent with their internal confidentiality policy and national privacy requirements.

10.5 Secondary analysis using time-use surveys

485. While time-use data is extremely informative, the data is perceived to be very complex. This perception largely reflects the fact that current statistical, economic and policy analysis and other social science training rarely include training on the use of diary data. While high-end users such as researchers and economists will be able to draw their own conclusions from the microdata, to maximize the use and impact of time-use data by all users, a strong analytical programme is needed to complement the release of two-way tables and microdata.

486. National statistical offices should develop secondary analysis as a part of their time-use dissemination strategy, to be presented alongside standard tables or to be presented separately. NSOs can either publish analysis independently or in compendium analytical publications.

²⁵ <http://www.timeuse.org/mtus>

²⁶ <http://www.atusdata.org/index.shtml>

NSOs can undertake these, or commissioned researchers can undertake the analysis. Brief analysis should also be included in releases provided to journalists and the media.

487. Chapters 2 and 3 of this guide outline the policy relevance and recommended outputs of time-use statistics, and the analytical priorities should be geared towards illuminating and expanding on those issues.

10.5.1 Time use and the System of National Accounts

488. Time-use data will also feed into national accounts by providing estimates of unpaid work, household production for sale or barter on the market, and household production for own final use. A fuller explanation of the relationship between time-use outputs and the System of National Accounts can be found in chapter XIII of the United Nations *Guide to Producing Time Use Statistics* (United Nations 2005a: 179-200).

489. Time-use data is also used for the production of not-for-profit institution satellite accounts.

490. NSOs should consider satellite accounts as part of their time-use data dissemination strategy.

10.6 Data visualization

491. In recent years there has been demand from users for visual illustrations of data, particularly for an extensive community of users who do not have high levels of statistical literacy.

492. Data visualization is the turning of statistics into images, charts and graphics to enhance the story-telling capability of the data. It is a way of presenting complex statistics to less sophisticated users. The most basic forms are graphs, charts and diagrams, but also extend to more engaging and interactive tools such as the Google Public Data Explorer, where large datasets can be presented in graphic and mapping tools.

493. Given the complexity and richness of time-use data, data visualization is an ideal way to present time-use data and engage the public with the data. Visualization of time-use data can easily present differences between men and women, different life cycle groups, or the change in the distribution of activities over the course of a day.

494. Data presentation can be taken beyond simple visualization by developing a presentation that interacts with the user and provides a narration to tell the story of data. One example using census data is *Spotlight*²⁷ by the Australian Bureau of Statistics. Developed to promote the 2011 Australian Census of Population and Housing, it is an animated illustration of an individual's contribution to the Australian population. Containing voice-over narration, a user is asked to input some demographics about themselves to see what proportion of the population has characteristics similar to them. Hans Rosling's *The Joy of Stats* television series is another example of other innovative ways to present and describe data.

495. Data visualization can range from a simple HTML programme illustrating the increase in population over time, to those mentioned above. The extent of data visualization that will be undertaken by the NSO should be planned for and designed in the dissemination strategy. More complex visualizations, such as data mapping and animated diagrams/graphs, may benefit from system development that would be easier to implement earlier rather than once

²⁷ <http://spotlight.abs.gov.au/>

the data is ready for dissemination. Visualization software may require data to be in a particular format.

10.7 Conclusions

496. Time-use data are of interest to different kind of users, including policymakers, researchers and journalists. The need for statistics or microdata differs between different users. As time-use data is rich and complex, it is important to have a dissemination strategy.

497. Recommended outputs should be presented in simple standard output tables showing how much time is spent on various activities on a general day of the week. The United Nations *Guide to Producing Statistics on Time Use* (United Nations 2005a) recommends several types of standard output tables, for example, the average time the survey population spent on a specific activity, the proportion of persons in the survey population who participated in a specified activity, and the average time spent on a specific activity by those who participated in the activity.

498. These tables should be cross-classified by at least gender and age, but many other types of background information could be used, including other demographic variables, household income and employment status, for example. It is important to present generally accepted life stages as separate categories. On the other hand, age groupings that are too wide might hide important information about time-use patterns.

499. Standard output tables should be presented by weekdays/weekends.

500. It is also important to present changes over time in the average time spent on activities and in the participation in activities.

501. Time should usually be presented in tables as average hours and minutes per day (hh:mm).

502. If secondary activity data is collected, reporting on simultaneous activities is useful for understanding the extent to which people perform certain activities concurrently with others such as childcare, for example. Reporting on simultaneous activities enables a better account of activities ranked as secondary or tertiary and which would be underrepresented otherwise. There are three ways of reporting on simultaneous activities: aggregated with primary activities, cross-classification of primary activity, and cross-tabulated by primary activities.

503. Many users' needs are not fulfilled by standard output tables, and the user often needs to access the microdata. Therefore, a microdata output strategy is recommended for all time-use surveys as part of the dissemination strategy. In the end, NSOs must decide if releasing microdata is consistent with their internal confidentiality policy and national privacy requirements.

504. The dissemination strategy should include a visualization strategy. Data visualization is a way of presenting complex statistics to less sophisticated users. The most basic forms are graphs, charts and diagrams.

11 Issues Requiring Further Work

11.1 Introduction

505. These Guidelines focus on areas where the statistical community has expressed a particular need for further guidance in the harmonization of time-use surveys. They include recommendations wherever these are warranted by current knowledge and experience. Yet, current knowledge on several key issues is not sufficient for the formulation of clear-cut recommendations that go far enough for international harmonization. Further work is required on these issues. The most important of them are briefly summarized below.

11.2 Light surveys

506. A light time-use survey²⁸ uses pre-defined activity categories from which the respondents select the activities they were doing. The advantage of the light diary is that it reduces the response burden, does not require coding of the collected data, and is applicable on the web. The main drawback is the lower number of time-use categories, which does not allow it to provide answers to all the policy questions that a full-scale survey can. If a full-scale time-use survey is performed only once every ten years, light surveys with pre-coded diaries could be conducted between the full-scale surveys every three to five years to meet the need for more timely information.

507. Light time-use surveys require further research before recommending whether and in which circumstances they could replace full-scale surveys. Countries could consider running them between full-scale surveys as a method of updating estimates or projecting the need to conduct the full-scale survey again. As more countries run light versions of a time-use survey, further evaluation can be undertaken to inform knowledge of best practices. In particular, light surveys running in parallel with full-scale surveys are required in order to understand the data comparability issues better.

508. In the calibration of the weights of the light diary data, the shared variables of the full-scale diary and the light diary can be utilized in addition to external data. However, the development of calibration methods still requires more research. In order to collect data for such comparison, light and full-scale surveys should cover the same period at least once.

11.3 Subjective well-being

509. The *Report by the Commission on the Measurement of Economic Performance and Social Progress* (Stiglitz et al. 2009) suggests that information on subjective well-being – including measures of life evaluation, positive and negative emotions – should be collected as part of official statistics. Such measures are important both because they capture information that can be used to understand how different aspects of peoples' lives affect their well-being, and because subjective experiences are an important part of well-being in their own right.²⁹

²⁸ See sections 4.2 and 4.3 for more information on light and full-scale diaries and survey periodicity.

²⁹ See sections 3.3.5 and 7.3 for more information.

510. Time-use surveys are one of the primary vehicles for collecting this information. In particular, time-use surveys are uniquely suited to providing information on the affective component of subjective well-being that captures people's moods and feelings at a particular point in time.

511. The collection of measures of affect (positive or negative emotions) from time-use surveys is still in its early stages. Further research and testing is required, in particular to identify the most appropriate scale for data collection and the means of reporting this as a one-dimensional index. As additional countries repeat techniques similar to the 2010 French time-use survey, further evidence on the quality of this data can be examined. More research is also required on how subjective well-being data in general, and affect questions in particular, can be used to inform policy outcomes.

11.4 Use of modern technologies

512. The collection of survey data through web-based reporting is expected to increase in the next few years, and it is expected that this will also occur for time-use survey data. However, it is unlikely that surveys will move to only web-based reporting, with a proportion of the population unable or unwilling to report online. The inclusion of web-based reporting thus leads to multi-modal data collection where assessing the impact of mode is complex.³⁰

513. More extensive testing on the impacts of including multiple modes in a time-use context needs to be carried out to understand to what extent mode effects may influence the data. Randomized control trials would be required to ensure the effects of each mode are known and accounted for. If modal effects are known, then techniques can be used to convert data to a single mode. This same testing process can also check for differences between multi-modal collection and older time-use surveys to retain backwards comparability with previous surveys to facilitate tracking of trends in time use.

514. Technological advancements hold the potential to collect new types of information, such as geo-spatial data from GPS trackers, and levels of physical activity from accelerometers, and energy consumption from smart meters. Smartphones offer the possibility to bridge these various techniques, as applications can equip most phones to act as accelerometers and GPS trackers, and collect other information automatically while also serving as the platform through which participants might complete their diaries. Developments in technology will open opportunities to collect further types of information not presently available for official statistics or research.

515. The use of these technologies has not been included in the recommendations, because their use within the context of a national statistical office needs further consultation, recognizing the increased level of intrusion into the lives of citizens above what is already imposed through the diary collection. The level of acceptance for these techniques may differ between countries, and so internationally comparable outputs from such techniques will require significant development and negotiation.

³⁰ See section 8.3 for more information.

11.5 Activity classification

516. Activity classification³¹ forms an integral component of any time-use survey, enabling the measurement of the time spent on different productive and non-productive activities within households. Currently, there is no single approved international standard classification of activities that countries can use as a basis for the collection and dissemination of activity information in national time-use surveys. Based on the common elements in different international frameworks, the present guidelines propose a minimum set of classification categories to allow comparison of activities across countries and facilitate key policy and output requirements.

517. Nonetheless, a single approved international standard is desirable for international comparability and standardization in the collection and output of activity data. Trialling of an international activity classification is underway, and a United Nations expert group met in 2012 to discuss potential revisions to this classification. Further work will be required to assess its use in comparable international reporting. Additionally, within the context of conducting full-scale and light surveys, an international classification would need to factor in its usefulness as a framework for light surveys as well.

³¹ See chapter 5 for more information.

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Appendix I: List of Activity Classifications Used in the Analysis

518. This lists the countries and/or studies from which the activity classification analysis was undertaken.

American Time Use Survey (ATUS)
Australia
Austria
Benin
Canada
Denmark
Dominican Republic
France
Germany
Harmonised European Time Use Study (HETUS)
Hungary
India
International Classification of Activities for Time-Use Surveys (ICATUS)
Israel
Italy
Japan
Morocco
Multinational Time Use Study (MTUS)
New Zealand
Netherlands
Oman
Palestine
South Africa
Spain

Appendix II:

Questionnaire Module on Experienced Well-being

Objective

519. This question module³² focuses on questions that could be included in a time-use survey. It outlines approaches to collecting information on the positive and negative emotional states that people experienced while undertaking specific activities.

Description

520. The experienced well-being module has two components. The first component, comprising questions F1 to F7, is an implementation of the day reconstruction method (DRM) adapted for large-scale time-use surveys. These questions should be used together in the manner described below, and in conjunction with a time-use diary. The questions are repeated for three randomly selected time-use diary episodes.

Box 1. Day reconstruction method questions

1. *I now want to ask you some questions about how you felt yesterday*
2. *The computer has selected three time intervals from your diary that I will ask you about.*
3. [For each episode:]
4. *Between [start time of episode] and [end time of episode] yesterday, you said you were doing [activity]. The next set of questions asks you how you felt during this particular time.*
5. *The following questions ask how you feel about yourself and your life, on a scale from 0 to 10. Zero means you did not experience the emotion “at all” at that time while 10 means you experienced the emotion “a lot” at that time.*
6. F1. Overall, how happy did you feel during this time? [0-10]
7. F2. Overall, how contented did you feel during this time? [0-10]
8. F3. Overall, how angry did you feel during this time? [0-10]
9. F4. Overall, how sad did you feel during this time? [0-10]
10. F5. Overall, how much pain did you feel during this time? [0-10]
11. F6. Overall, how tired did you feel during this time? [0-10]
12. F7. Were you interacting with anyone during this time, including over the phone? [yes/no]

If yes, with whom were you interacting? [include people on the telephone/online chat, etc.]

Note: [Activity] refers to the respondent’s primary activity for the episode being discussed.

521. The second part of the module consists of a single question (F8), which is also intended to be used as part of a time-use diary. Question F8 should generally not be used in conjunction with the DRM, as it is a substitute and should be completed by the respondent for all time-use diary activities.

³² Published in the OECD *Guidelines on Measuring Subjective Well-being*, 2013.

Origin

522. The version of the DRM used here is taken from the American Time Use Survey 2011. Question F8 was taken from the 2011 French time-use survey. Questions remain unaltered.

Time

523. It takes 5 to 10 minutes to complete the three activities for the DRM. Question F8 adds an extra 5 minutes to the time it takes respondents to complete their time-use diary, but has no effect on interview time.

Box 2. Experienced well-being question

13. Question F8 below should be included in the time-use diary filled out by respondents. See below for an example.

14. F8. Was this moment pleasant or unpleasant? [from -3: very unpleasant to +3: very pleasant]

	Qu'avez-vous fait durant les 3 heures qui ont précédé la visite de l'enquêteur ?	Faisiez-vous autre chose en même temps ?	Était-ce un moment agréable ou désagréable ? (de -3 : très désagréable à +3 : très agréable)
.... h 00			-3 -2 -1 0 +1 +2 +3
10			-3 -2 -1 0 +1 +2 +3
20			-3 -2 -1 0 +1 +2 +3
30			-3 -2 -1 0 +1 +2 +3
40			-3 -2 -1 0 +1 +2 +3
50			-3 -2 -1 0 +1 +2 +3
.... h 00			-3 -2 -1 0 +1 +2 +3

Comments

524. The DRM (questions F1 to F7) should be administered in an interview following the completion of a time-use diary. Because recall is important, the interview should take place as soon as possible after the diary has been completed – preferably the day after the day covered by the diary. Question F7 relates to whom the respondent was with at the time of the activity, and is conceptually distinct from the affect questions (F1 to F6). If the time-use survey already collects “with whom” information, question F7 can be omitted.

525. When implementing the question module, three episodes are selected from the time-use diary, omitting episodes when the respondent was sleeping or otherwise unconscious. The procedure to select the episodes should ensure that, over the sample as a whole, there are an adequate number of responses for each major time-use activity. The classification of activities can be drawn from the standard time-use classifications underpinning the survey. The questions are administered to the respondent with respect to each of the three episodes.

526. Question F8 is included in the time-use diary that the respondent completes rather than being administered in a follow-on interview.

Output

527. Information from the DRM questions described here (F1 to F7) can be presented both as the results of answers to single questions, or as a composite measure of affect balance by activity classification. The answers to individual questions provide information on particular emotional states. The composite measures capture aspects of the respondent's affect balance – positive mood, negative mood, and which of the two is the stronger. In all cases, the answers should be presented with respect to a particular activity.

528. Information on responses to individual questions can be presented as the mean value of responses, excluding missing values for a particular activity. This will give a value in the 0 to 6 range.

529. A composite measure of positive affect can be calculated as the average score for question F1 (happy) and question F2 (calm), excluding missing values. This will give a value in the 0 to 10 range.

530. A composite measure of negative affect can be calculated as the average score for question F3 (angry), F4 (sad), F5 (pain) and F6 (worry), excluding missing values. This will give a value in the 0 to 10 range.

531. A composite measure of affect balance can be calculated as the difference of positive affect less negative affect for each respondent divided by 6 averaged over all respondents. This will give a value ranging from –10 to 10. Affect balance can be reported as the mean score (–10 to 10), but can also usefully be presented as the proportion of the population with net negative affect (an affect balance less than 0) sometimes described as a U-index (Kahneman and Krueger, 2006).

532. In cleaning and preparing affect data, it is important to screen for response sets. These are evident when the respondent scores at the top or bottom of the scale for all six affect measures. This may indicate a response set due to either a lack of understanding on the part of the respondent or an unwillingness to respond meaningfully. In either case, the lack of variation will distort subsequent analysis. Hence, such responses (where the respondent reports the same score for all six affect questions) should be coded as missing data.

533. Information from the “pleasant/unpleasant” approach (question F8) is conceptually similar to affect balance calculated from DRM data, as discussed in the previous paragraphs. Responses to question F7 can be presented as the mean score for different activity types or the mean score for different demographic groups (e.g. gender, age groups, labour force status).

Guidelines for interviewers

534. These questions relate to how the respondent felt during a specific episode identified from a time-use diary. It is important that the respondent answer with respect to how they felt during the period of time covered by that episode rather than providing information on how they felt during the day as a whole or what the dominant emotion was during the day.

535. For question F5, pain includes both physical and mental pain.

536. For question F7, interacting means communicating or responding to someone in some way. This could include active participation in a conversation, listening to a conference call, or playing a game like tennis or chess.