

# Introduction to time diary data

---

Pierre Walthéry

UK Data Service

June 2026

# Plan of the course

---

- Day 1
  - Origins of time use research
  - Structure and design of time diary data
  - Introduction to the Multinational Time Use Study
  - Computing simple time use estimates
- Day 2
  - Further examples
  - Data quality and weighting
  - Research example
  - Working with work schedules
  - Computing tempograms



Source: DALL-E

# 1. Origins of time use research

---

# What is time?

---

Time as implicit knowledge (Adam 1996)

- *Contextual time or timescapes*
  - Natural time (ie seasons, planetary cycles)
  - Has a direction, which is irreversible (ie birth, ageing and death)
  - Plural experiences (between people, other beings, etc...)
- *Delimited time*
  - can be *measured* and *divided* (by clock and calendars);
  - universal and invariable rhythms (ie days, months are the same everywhere);
  - that is a limited and commodified resource: valuing speed

# Growing interest for measured time

---

- Early 20th Century:
  - Surveys of peasant households in pre-1917 Russia
  - Time use of working class women in London 1909-13 by the Fabians
  - Time budget of Soviet workers and peasants in 1923–1924;
  - USDA large-scale time-diary studies of American households:
    - 1924-28 Farm and small towns households
    - 1930-31 College educated women
- In the UK (1930s onwards):
  - Mass Observation
  - BBC [listener surveys](#) (1937-)

# More recently

---

- Alexander Szalai's *The Use of Time* (1972)
  - Pioneering survey of urban households in 12 countries
  - First systematic recording of '*who does what, where, with whom*' over 24h
- Large scale nationally representative surveys
  - American Time Use Study; Indian Time Use Survey, UK, etc..
- Harmonisation efforts:
  - Multinational Time Use Study (MTUS)
  - Harmonised European Time Use Surveys (HETUS) from 1998;
  - International Classification of Activities for Time Use Statistics (ICATUS-2005)

# In the UK

---

- 2000; 2014/15 UK Time Use Survey
- 2020-25 [Online Time Use Study](#)
- Time diaries in existing large scale studies:
  - [Millennium Cohort Study Sweeps 6 & 14](#)
  - [Understanding Society Innovation Panel Wave 7](#)

Also:

- [CTUR 6 Wave Sequence across the COVID-19 Pandemic, 2016-2021](#)
- [CTUR UK Time Use Survey, March 2023](#)

# What drives this interest for time use?

---

- Push to monitoring (household) productivity
- Finer understanding of labour force behaviour
- Social (central) planning
- Better understanding of consumer behaviour
- Investigate social issues ie poverty, gender inequality
- More broadly part of the trend towards continued rationalisation of societies (Weber)



Ernst Gottmann, public domain via Wikimedia Commons

# What is recorded in time diaries ?

---

- *Main* activity ie ‘eating dinner’
- *Secondary* activity ie ‘watching Instagram’
- Location of the activity (ie at home, at work, etc)
- Who was also present
- Any unique combination of the above is an *episode*
- Recent features:
  - Whether a device (ie phone...) was used
  - Immediate wellbeing: enjoyment
- Activities recoded using a harmonised nomenclature

# A paper time diary example

DAY 1

Use an arrow or quote marks to record that an activity lasted longer than 10 minutes

Were you alone or with somebody you know?  
Mark all relevant boxes

Time 7am–10am Morning (am)	What are you doing? Please write down your main activity	If you did something else at the same time, what else did you do?	Did you use a smartphone, tablet, or computer?	Where were you? Location, or mode of transport	Were you alone or with somebody you know? Mark all relevant boxes							How much did you enjoy this time? 1=not at all 7=very much
					Alone	Spouse/partner	Mother	Father	Child aged 0–7	Other person	Others you know	
7.00–7.10	Woke up the children			At home								5
7.10–7.20	Had breakfast	Checked emails	✓	↓								6
7.20–7.30	" "	Talked with my family										5
7.30–7.40	Cleaned the table	listened to the radio										4
7.40–7.50	↓	↓			✓							↓
7.50–8.00	Helped the children dressing	Talked with my children		↓								↓
8.00–8.10	" "			↓								↓
8.10–8.20	went to the day care centre			On foot								1

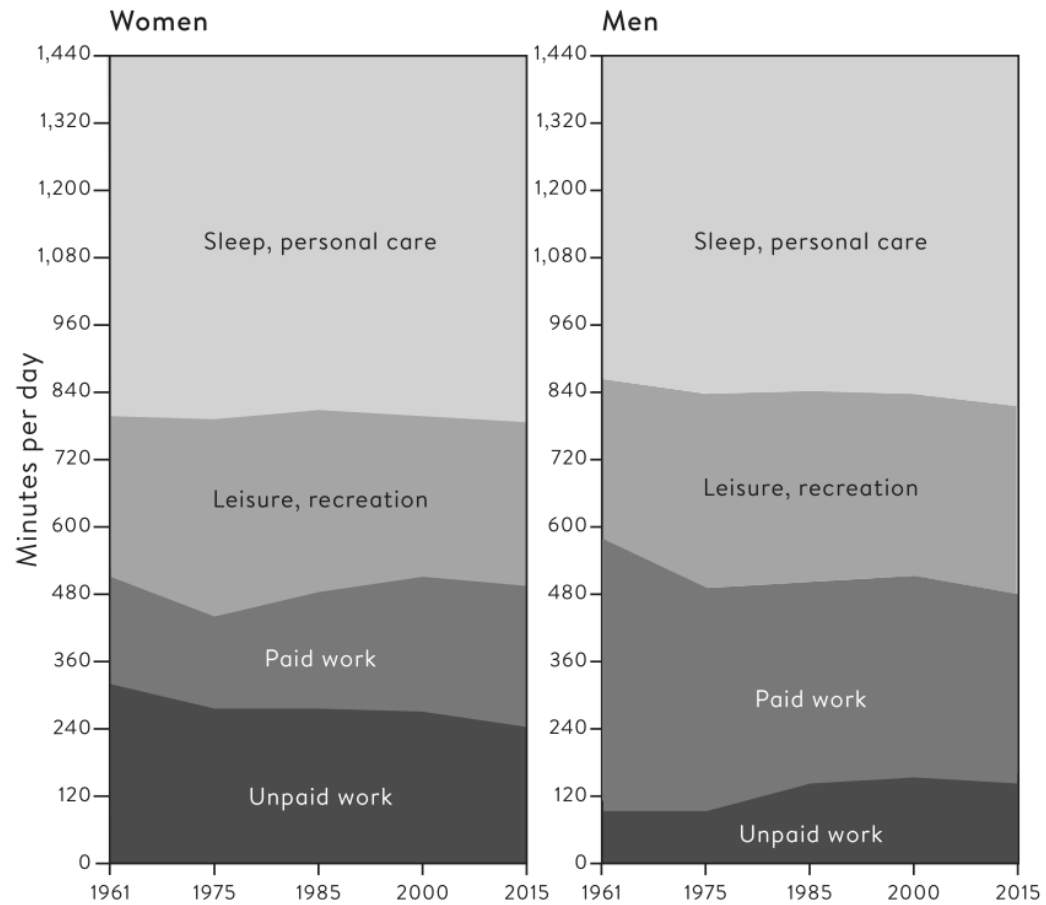
From Gershuny et al 2020

# Common estimates from time diaries

---

- The time spent on activities ie their duration
- Their scheduling and sequencing through the day
- The probability of activities to be taking place or not
- The importance (in terms of duration, probability of occurrence) of some activities relative to other ones
- Change over time in the above

# Durations of activities



From Gershuny et al 2020

# Duration of activities?

---

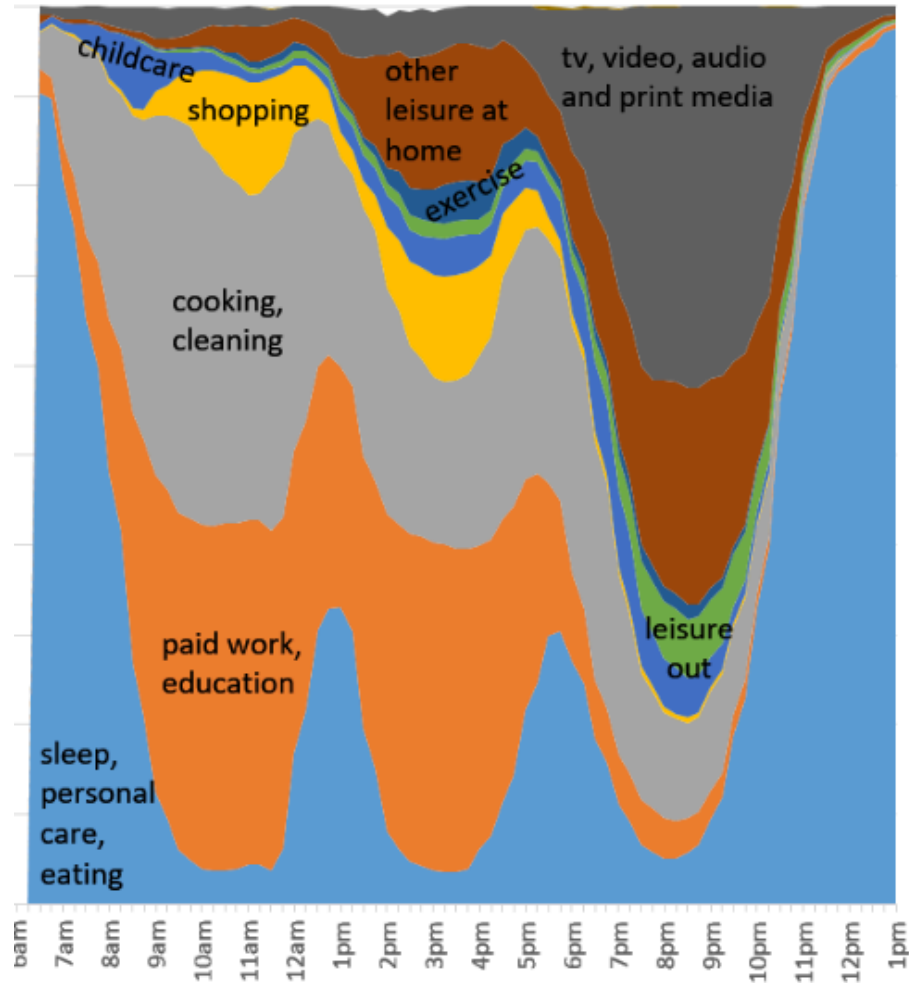
- For simplicity, activities were grouped in 4 categories
- For each time point, we have the average amount of time spent on each activity
- Activities all add up to 24h ie 1,440 minutes.
- We can compare time use between groups
- Three main lessons
- Overall impression of stability over time
  - Little change in sleep and leisure duration
  - Opposite trends in paid and unpaid work
  - Marked gender differences

# Scheduling of activities

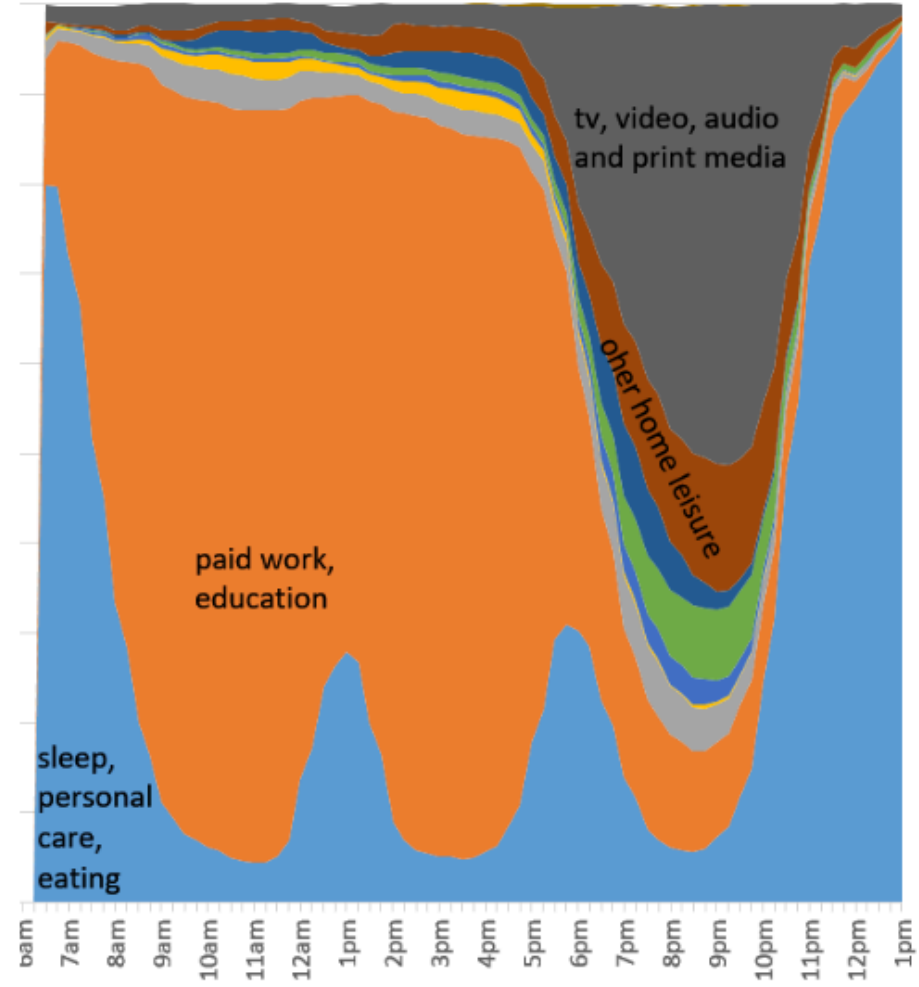
---

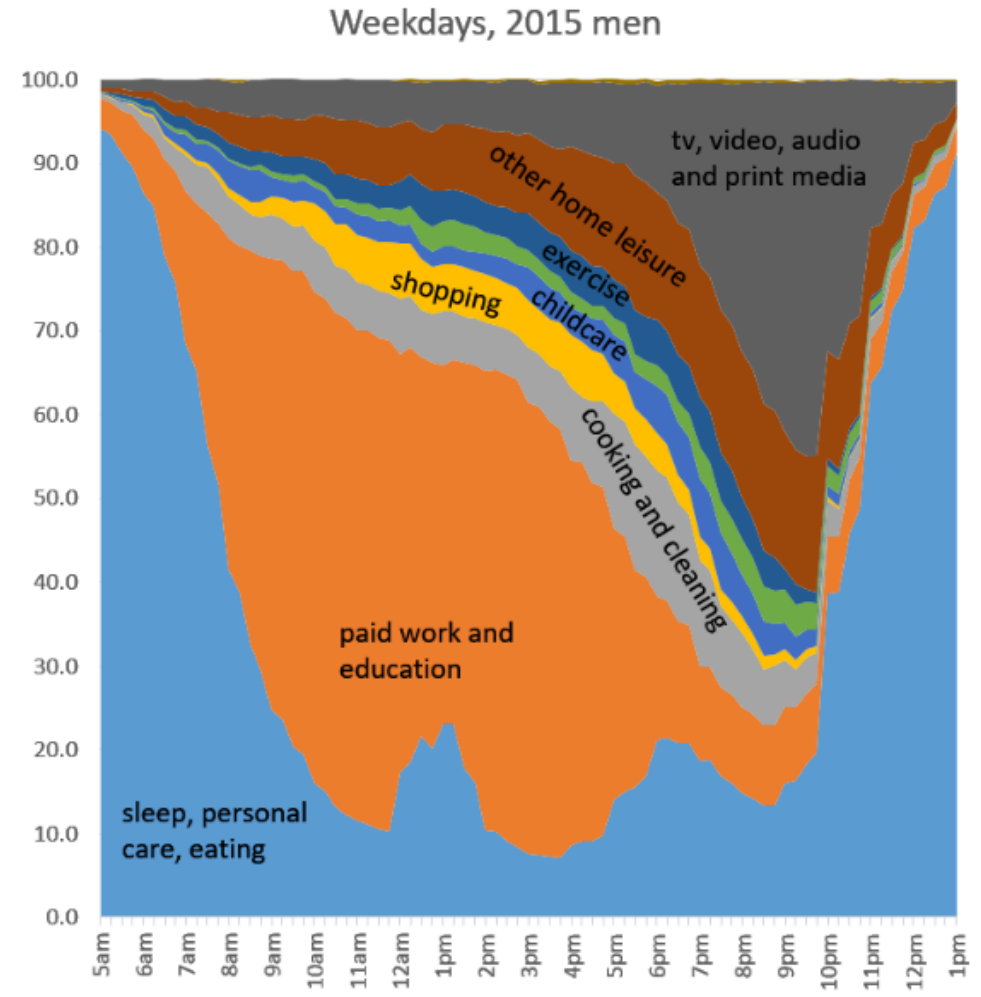
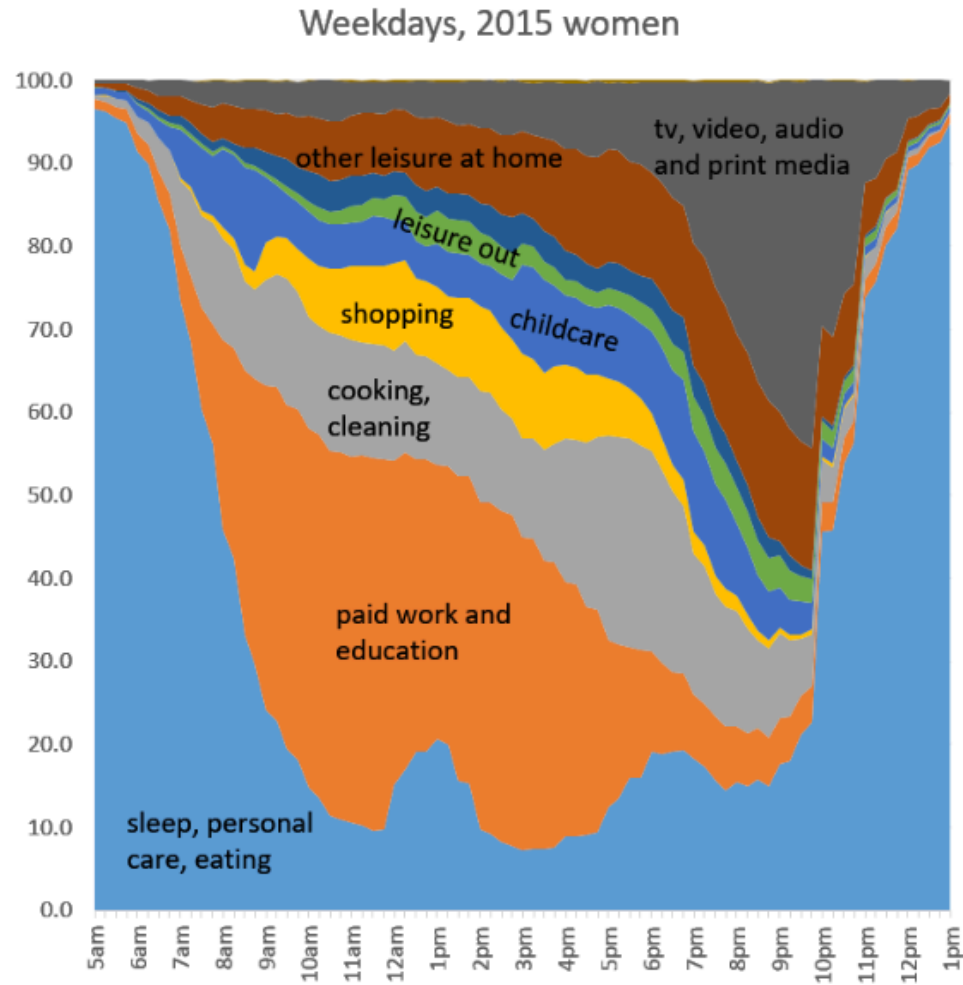
- The following plots show by time of the day, the percentages of people engaged across 8 types of activities
- We can follow the daily rhythms of people
  - Paid work leisure, meal times
  - Partial blurring of originally heavily gendered use of time
  - Changes in leisure behaviour
  - Spread of eating time: erosion of the traditional meal

Weekdays, 1961 women



Weekdays, 1961 men





(Source: Gershuny et al 2020)

# Summary

---

- Over the course of the 20th century, rise of interest for the way men, women and households spend their time
- There is now large amount of comparative data enabling time use research
- Time diaries record primary, secondary activities and their context
- Stability *and* change in daily behaviour over the last 50 years; gender contrasts

# 2. Overview of time diary data

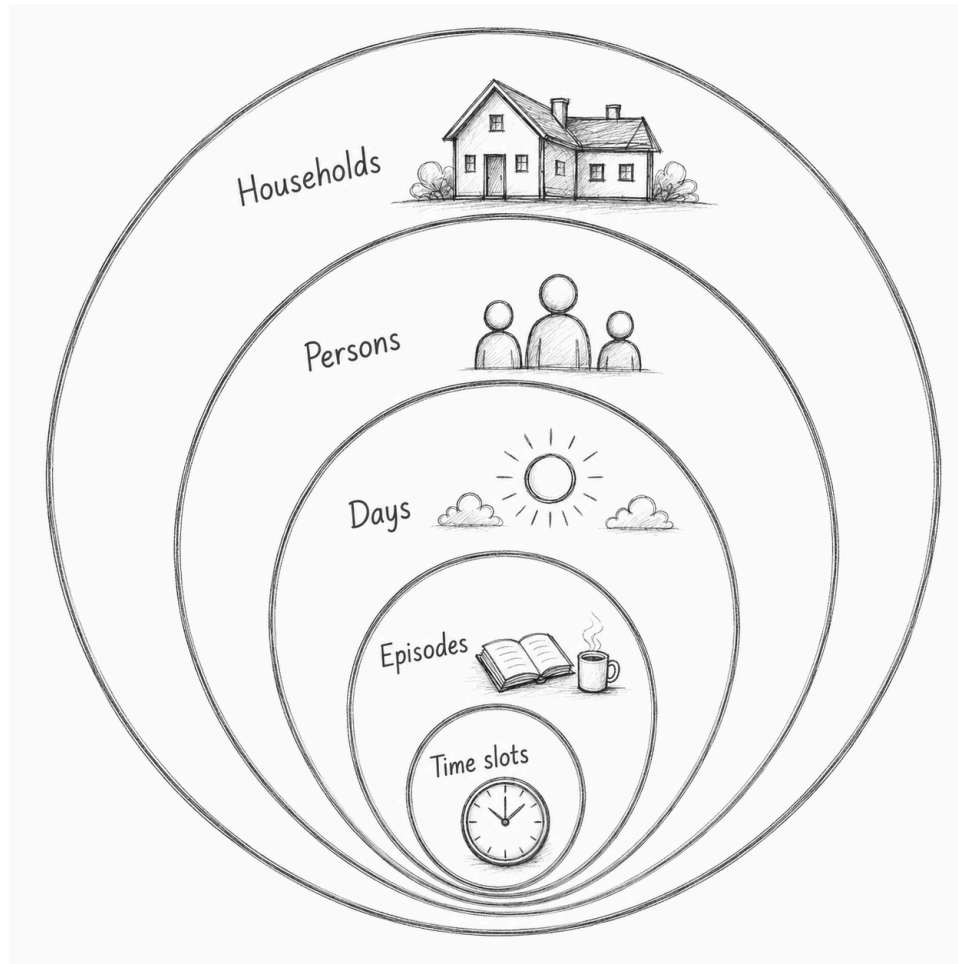
---

# Some basic vocabulary

---

- **Activity** Action recorded by respondents in the time diary ie what the respondent was doing during an episode
  - Example: I am teaching time diary analysis
  - Multitasking: Primary vs secondary
- **Episode** Any unique combination of primary, secondary activity, copresence and location
  - Episode 1. I watch TV whilst eating crisps alone at home;
  - Episode 2. I watch TV whilst eating crisps with my son at home
  - Episode 3. I play video games whilst eating crisps with my son at home
- **Time slot** Minimum duration of an episode (ie resolution of the time diary). Usually 10 or 15 mins

# Data structure of time use surveys



Source: Dall-E

# Data structure and files

---

## 1. Individual files ie person-level data

- Socio-demographic characteristics ie age, education...

## 2. Day-level files (aka 'aggregate' files)

- Each line in the dataset records a day
- Often, 2 or more lines per respondent
- Aggregate variables (ie time spent on activities)
- Also sometimes include day level variables: *Is this a rushed day?*
- May also include time diary data in wide format

# Episode data

---

- Each line in the dataset records an *episode*
- On average 15 episodes per day per person
- Episodes are embedded within days within persons
- One of the most common time diary format
- Intuitive, but requires more storage space and computing power than wide format
- Requires episode number, duration, start and end time

Ep nr	Person nr	Day nr	Duration	Activity	Start	End
1	1	1	360	Sleep	10	370
2	1	1	20	Shower	370	390
3	1	1	30	Breakfast	390	420

# Slot-level data

---

- Each line records a 10 minute time slot of the diary
- 144 observations (ie lines) per day per respondent
- Requires a slot ID variables

Slot nr	Person nr	Day nr	Activity
1	1	1	Sleep
...	...	...	...
42	1	1	Shower
43	1	1	Shower
44	1	1	Breakfast
...	...	...	...
144	1	1	Sleep

- In many time use surveys, days begin at 4 AM and end at 3.59 AM

# Data structure in wide format

- Episode and time slots datasets are also available in wide format.
- Example of a time slots dataset in the wide format:

Day	Pers.	Activity	TS 1	...	Act.	TS 42	...	Act.	TS 144
1	1	Sleep		...	Sleep		...	Watch TV	
2	1	Sleep		...	Commute		...	Sleep	
1	2	Sleep		...	Shower		...	Sleep	

- Lines=days, variables records activity, location, copresence for one time slot
- Lots of variable, less intuitive but also less resource-intensive than the long format
- During this course, we will be working with episode files in the long format

# Recap: variables in time diary dataset

---

- Primary and secondary activities
- If episode files: duration
- Incremental time in minutes / clock time
- Copresence, ie ‘with who were you?’
- Location
- Day of the week, month, calendar date
- Diary number (ie whether this diary was the first one collected)
- Less common variables
  - Whether feels rushed on the day
  - Whether day is a typical day
  - Enjoyment
  - Device use

# Nomenclatures of activities

---

- Until recently activities were written down literally in time diaries (ie *I walked the dog around the block*) and needed to be recoded
- Indispensable to standardise activities
- National and international norms and guidelines for coding activities
- Three main international nomenclatures: MTUS, HETUS, ICATUS (UN-based)
- National nomenclatures: US (ie ATUS), Japanese, Korean, Indian Time Use surveys have their own

# Harmonised European Time-use survey nomenclature

---

## *Annex IV / 1.1 Main and secondary activities*

<b>0</b>	<b>PERSONAL CARE</b>
<b>01</b>	<b>SLEEPING</b>
<b>011</b>	<b>Sleeping</b>
<b>012</b>	<b>Sick in bed</b>
<b>02</b>	<b>EATING</b>
<b>021</b>	<b>Eating</b>
<b>03</b>	<b>OTHER PERSONAL CARE</b>
<b>031</b>	<b>Washing and dressing</b>
<b>032</b>	<b>Personal care services</b>
<b>039</b>	<b>Other or unspecified personal care</b>

# Indian Time Use Survey nomenclature

- 1. ECONOMIC ACTIVITIES IN THE PRIMARY SECTOR (AGRICULTURE, HUNTING, FORESTRY AND FISHING, MINING AND QUARRYING)
  - CROP AND ANIMAL PRODUCTION, HUNTING AND RELATED SERVICE ACTIVITIES (NIC'08 DIV-01)
    - CULTIVATION OF CROPS IN THE FIELD OTHER THAN PLANTATION, HORTICULTURE AND FLORICULTURE

## Abridged Classification

### Land preparation and planting in the field

- 100. Ploughing/tilling, preparing land for cultivation
- 101. Sowing, planting and transplanting, in the field
- 109. Land preparation and planting activities in the field n.e.c.

### Raising crops/cultivation in the field

- 110. Applying fertilizer, manure etc in the field
- 111. Applying pesticides/insecticides/rodenticides etc. in the field
- 112. Watering of plants/irrigation operations in the field
- 113. Weeding, cutting of undergrowths/shrubs etc. in the field
- 114. Grass cutting, tree/plant pruning in the field
- 115. Plant propagation activities
- 119. Crop raising/cultivation activities n.e.c.

### Harvesting and reaping in the field

- 120. Harvesting and related works
- 121. Threshing and winnowing of crops and related works, including collection of stalks and stems

# American Time Use Survey nomenclature

---

## 01 Personal Care

**Category definition:** This category captures time the respondent spends sleeping, grooming, providing self-care, and doing sexual activities. Respondents are not asked WHO they were with or WHERE they were for sleeping (0101xx), grooming (0102xx), and personal (sexual) activities (0104), as such information is sensitive for these activities. (Modified for clarity: Apr2006)

1. Exercising for medical conditions: If it is clear from the verbatim that physical therapy exercising is done specifically for medical reasons, code as health-related self care (010301). If the purpose is not clear, code as Sports, Exercise, and Recreation/Participating in Sports, Exercise, or Recreation/specific sport] (1301xx). For example, code weightlifting exercises as weightlifting. (Updated: Feb2004)
2. Insomnia: Code as Sleeplessness (010102). **Exception**: If the respondent mentions thinking or worrying, code as Socializing, Relaxing, and Leisure/Relaxing and Leisure/Relaxing, thinking (120301).
3. Kissing hello or goodbye: Code as Socializing, Relaxing, and Leisure/Socializing and Communicating/Socializing and communicating with others (120101), not as Personal Care/Personal Activities.
4. Meditating: Code as Personal Care/Health-related Self Care/Health-related self care (010301). **Exception**: If verbatim specifically mentions Meditating for religious purposes, code as Religious and Spiritual Activities/Religious and Spiritual Practices/Participation in religious practices (140102).

# Workflow: producing time use estimates from time diaries

---

- One can:
  - ... work directly with aggregate variables in day-level datasets ('Aggregate files' in MTUS jargon)
  - ... compute one's own, which usually entails four steps:
    1. Recoding original time use activities in the episode dataset
    2. Sum the total time spent on these activities within day & person
    3. Merge the data with person-level variables of interest
    4. Produce the estimate of interest (ie, mean, median, etc)

# References

---

Adam, B. (1995). *Timewatch: The Social Analysis of Time*. Polity Press.

Baster, N. (1958). Some Early Family Budget Studies of Russian Workers. *American Slavic and East European Review*

Gershuny, J., & Sullivan, O. (2020). *What We Really Do All Day: Insights from the Centre for Time Use Research*. Penguin UK.

Pember Reeves, M. (1913). *Round About a Pound a Week*. Fabian Society

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

# Resources

---

- [UK Time Use Survey at UKDS](#)
- [UK Time Use Survey at the Office for National Statistics](#)
- [American Time Use Survey](#)
- [Indian Time Use Survey](#)
- [Harmonised European Time Use Surveys \(HETUS\)](#)
- [International Classification of Activities for Time-Use Statistics 2016 - ICATUS](#)
- [Multinational Time Use Study](#)