Panel Data Research Center, Keio University

PDRC Discussion Paper Series

Measuring time poverty and its relation with well-being

Kayoko Ishii, Isamu Yamamoto, Kunio Urakawa

2 November, 2026

DP2026-003
https://www.pdrc.keio.ac.jp/en/publications/dp/10485/



Panel Data Research Center, Keio University
2-15-45 Mita, Minato-ku, Tokyo 108-8345, Japan
info@pdrc.keio.ac.jp
2 November, 2026

Measuring time poverty and its relation with well-being

Kayoko Ishii, Isamu Yamamoto, Kunio Urakawa

PDRC Keio DP2026-003
2 November, 2026
JEL Classification: J22; I31; I32
Keywords: Time poverty; Subjective poverty line; Poverty measurement; Well-being

Abstract

Using original 2024 survey data from Japan, complemented with official time-use statistics, this study develops and evaluates alternative measures of time poverty. For housework, a subjective minimum necessary housework (SMH) threshold is estimated from survey responses under a zero-outsourcing assumption, following methods for subjective income poverty lines. For leisure, a relative cutoff tied to the population average is used to avoid socially implausible low thresholds. Four models are examined: a Relative Time Poverty (RTP) model, an Absolute Time Poverty (ATP) model, an SMH model, and an SMH with Relative Leisure (SMH-RL) model. After computing time-poverty status, probit models describe who is classified as time poor under each specification. Construct validity is assessed by relating time-poverty status to multiple well-being indicators (leisure satisfaction, life satisfaction, weekday–weekend sleep gap, diet quality), and relative validity is tested using cross-model classification contrasts. Results show large variation in incidence across models and indicate that ATP likely overclassifies time poverty, while RTP tends to flag low leisure even when driven by longer sleep, personal care, or housework. The SMH-RL specification aligns most consistently with poorer well-being. The study offers a practicable approach to defining time poverty that better reflects physiological and social needs and informs policy design.

Kayoko Ishii
Faculty of Economics, Keio University
2-15-45, Mita, Minato-ku, Tokyo, Japan
ishiikayoko@keio.jp

Isamu Yamamoto
Faculty of Business and Commerce, Keio University
2-15-45, Mita, Minato-ku, Tokyo, Japan
yamamoto@fbc.keio.ac.jp

Kunio Urakawa
Faculty of Economics, Kyushu University
744 Motooka, Nishi-ku, Fukuoka, JAPAN
urakawa.kunio.020@m.kyushu-u.ac.jp

Acknowledgement: We are grateful to Akiko Oishi (Chiba University) for her valuable comments and suggestions at the Japanese Economic Association Annual Meeting. Any remaining errors are our own. This work was supported by the Japan Society for the Promotion of Science [grant numbers 22H04911].

Measuring time poverty and its relation with well-being

Kayoko Ishii
Keio University

Isamu Yamamoto
Keio University

Kunio Urakawa
Kyushu University

Abstract

Using original 2024 survey data from Japan, complemented with official time-use statistics, this study develops and evaluates alternative measures of time poverty. For housework, a subjective minimum necessary housework (SMH) threshold is estimated from survey responses under a zero-outsourcing assumption, following methods for subjective income poverty lines. For leisure, a relative cutoff tied to the population average is used to avoid socially implausible low thresholds. Four models are examined: a Relative Time Poverty (RTP) model, an Absolute Time Poverty (ATP) model, an SMH model, and an SMH with Relative Leisure (SMH-RL) model. After computing time-poverty status, probit models describe who is classified as time poor under each specification. Construct validity is assessed by relating time-poverty status to multiple well-being indicators (leisure satisfaction, life satisfaction, weekday–weekend sleep gap, diet quality), and relative validity is tested using cross-model classification contrasts. Results show large variation in incidence across models and indicate that ATP likely overclassifies time poverty, while RTP tends to flag low leisure even when driven by longer sleep, personal care, or housework. The SMH-RL specification aligns most consistently with poorer well-being. The study offers a practicable approach to defining time poverty that better reflects physiological and social needs and informs policy design.

Keywords: Time poverty; Subjective poverty line; Poverty measurement; Construct validity; Well-being; Japan

Classification codes: J22, I31, I32

Acknowledgments:

We are grateful to Akiko Oishi (Chiba University) for her valuable comments and suggestions at the Japanese Economic Association Annual Meeting. Any remaining errors are our own. This work was supported by the Japan Society for the Promotion of Science [grant numbers 22H04911].

1. Introduction

Time poverty has emerged as a central dimension of well-being in contemporary societies. Beyond shortages of income, individuals increasingly face constraints on their ability to allocate sufficient time to essential activities such as rest, household production, care, and leisure. Rising labor-market participation, demographic change, and persistent gender inequalities in unpaid work have intensified concerns that time constraints may undermine health, family life, and overall life satisfaction. As a result, time poverty has become an important topic in labor economics, social policy, and well-being research.

Despite growing interest, there remains considerable debate over how time poverty should be defined and measured. Existing studies have proposed a variety of definitions, yet these approaches have seldom been evaluated side by side empirically within a unified dataset, leaving their empirical and conceptual differences largely unexplored (Williams et al., 2016). As a result, estimates of time poverty are often highly sensitive to the choice of thresholds and operational definitions, leading to substantial variation in both incidence and classification across studies (Burchardt, 2008; Kalenkoski et al., 2011; Williams et al., 2016). Moreover, relatively few studies have systematically examined how alternative measures differ in whom they identify as time poor or in how well these classifications align with indicators of well-being (Williams et al., 2016; Zacharias, 2011).

Existing studies largely rely on two broad approaches that mirror the income poverty literature: absolute and relative definitions of time poverty.[1] Absolute approaches define time poverty with reference to externally specified minimum requirements for daily life, including housework, basic personal care, and leisure (e.g., Vickery, 1977; Douthitt, 2000; Harvey and Mukhopadhyay, 2014). Relative approaches, by contrast, conceptualize time poverty as a deprivation of leisure or discretionary time relative to others in society and classify individuals as time poor when their leisure falls below a distribution-based threshold (e.g., Bittman, 2002; Burchardt, 2008; Kalenkoski et al., 2011).

While both approaches have provided valuable insights, each suffers from important limitations. Absolute measures critically depend on how minimum time requirements are set, yet these benchmarks are often weakly grounded empirically. A common practice is to define minimum housework time using the average housework time in households with non-employed

[1] While there is a body of work on qualitative perspectives of time deficits, we do not pursue those debates here and instead focus on quantitative measurement. Studies examining the qualitative dimensions of time deficits include Reisch (2001), which underscores the importance of autonomy and long, uninterrupted blocks of time; Etkin et al. (2015), which shows that conflicting goals reduce the perceived quality of leisure; and Hamermesh and Lee (2007), which focuses on the subjective feeling of time pressure.

homemakers under a zero-outsourcing assumption, a benchmark that is likely to exceed what is strictly necessary in contemporary societies where norms, technologies, and labor-market participation have changed. Similarly, minimum leisure requirements are typically fixed exogenously at very low levels, raising concerns about social and physiological plausibility. As a result, absolute measures may systematically overclassify time poverty, particularly among households with young children and dual earners.

Relative measures, in contrast, adapt automatically to observed time-use patterns and social norms, but they face a different problem. By defining time poverty in terms of low residual leisure, they may classify individuals as time poor even when reduced leisure may reflect heterogeneous needs or preferences, such as longer sleep, extended personal care, or greater housework, rather than excessive work demands. In such cases, relative measures risk conflating genuine time deprivation with time allocations that reflect individual preferences rather than binding time constraints, thereby weakening their conceptual validity as indicators of constrained well-being.

This study addresses these challenges by proposing and evaluating an alternative approach to measuring time poverty that combines insights from both traditions. Specifically, we introduce a subjective minimum threshold for housework, estimated using methods developed for subjective income poverty lines, and combine it with a relative benchmark for leisure to avoid socially implausible minimums. This hybrid approach is designed to reflect both physiological necessities and socially embedded norms, while remaining empirically grounded in individuals' own perceptions of minimum time needs.

For housework, we apply the logic of the Subjective Poverty Line (SPL) framework (Kapteyn et al., 1988; Bishop et al., 2015). Using survey questions that elicit respondents' assessments of the minimum necessary time for housework under a zero-outsourcing assumption, we estimate a Subjective Minimum necessary Housework (SMH) threshold. This replaces externally imposed housework benchmarks with a respondent-based standard that varies systematically with household composition. To our knowledge, this is the first study to apply subjective poverty-line methods to the measurement of time poverty.

For leisure, we do not elicit subjective minimums, as such questions tend to generate boundary responses near zero that are inconsistent with the role of leisure in well-being. Instead, we benchmark leisure relatively, using a fixed proportion of the population average, ensuring that minimum leisure requirements remain socially meaningful.

Using original survey data collected in Japan in 2024, complemented with official time-use statistics, we implement and compare four alternative time-poverty models: a conventional Relative Time Poverty (RTP) model; a conventional Absolute Time Poverty (ATP) model; an SMH model, which replaces the absolute housework requirement with the subjective minimum;

and an SMH with Relative Leisure (SMH-RL) model, which combines the subjective housework benchmark with a relative leisure threshold. After computing time-poverty status under each specification, we examine who is classified as time poor using probit models, and we evaluate construct validity by relating time-poverty status to multiple indicators of well-being, including leisure satisfaction, life satisfaction, weekday–weekend sleep gaps, and diet quality. We further assess relative validity by exploiting cross-model classification contrasts, rather than relying solely on simple correlations.

This study makes three main contributions. First, it provides a systematic comparative assessment of alternative time-poverty measures, demonstrating how incidence, correlates, and policy-relevant classifications vary sharply across models. Second, it introduces a novel subjective approach to defining minimum necessary housework time, extending the SPL methodology to the domain of time poverty. Third, by linking alternative time-poverty measures to multiple dimensions of well-being, it assesses which definitions are most consistently associated with adverse well-being outcomes. The results show that conventional absolute measures tend to overclassify time poverty, while purely relative measures often capture low leisure irrespective of its source. In contrast, the SMH-RL specification shows the most consistent associations with poorer well-being outcomes, suggesting that the SMH-RL specification may provide a useful alternative for measuring time poverty.

The remainder of the paper is organized as follows. Section 2 reviews the related literature and presents the analytical framework, Section 3 describes the theoretical framework and Section 4 explains the data. Section 5 reports the empirical results and validity assessments, and Section 6 concludes.

2. Literature Review

(1) Previous Research on Time Poverty

The measurement of time poverty can be systematically reviewed in close analogy to the income poverty literature. In income poverty literature, absolute approaches based on minimum living standards and relative approaches based on social position have long been distinguished. Similarly, time poverty research has developed several corresponding measurement frameworks, although no single unified indicator has yet been established.

Understanding these frameworks requires revisiting the original motivation behind the concept of time poverty. The idea can be traced back to Vickery (1977), who critically examined the official U.S. income poverty line based on the U.S. Department of Agriculture's (USDA)

Economy Food Plan. She argued that this poverty line focused exclusively on minimum monetary income and failed to account for the time required for household production, such as cooking, housework, childcare, and personal care. Because lower-cost subsistence standards implicitly assume greater household labor capacity, excluding time resources leads to an incomplete assessment of living standards. Vickery thus showed that maintaining a minimum standard of living requires both income and sufficient time, and that long working hours undertaken to secure income may crowd out essential household time and lower effective living standards.

Building on this critique, Vickery's (1977) seminal work on measuring time poverty aimed to develop a method for incorporating the two-dimensional constraints of income and time into the construction of income poverty thresholds. Rather than treating time poverty as a separate metric, she adopted an absolute approach that mirrors income poverty measurement by externally defining necessary personal time (T_N) and minimum household maintenance time (T_1), and by constructing a household-type–specific "absolute time poverty line" equal to their sum.

Specifically, Vickery defined total allocatable time (T_A) as the remainder of a fixed weekly endowment of 168 hours after subtracting T_N and T_1. T_N includes sleep, meals, personal hygiene, and related activities required to maintain physical functioning. She set T_N at 81.4 hours per week, based on the contemporaneous U.S. adult average of 10.2 hours per day devoted to these core activities, augmented by arbitrarily defined minimum allowance of leisure time amounting to 10 hours per week (one hour per day plus three additional hours on weekends).

Minimum household maintenance time (T_1) was designed to capture the time required to sustain household production under minimum-income conditions, when domestic labor cannot be substituted through market purchases. For most components—food-related activities, care of clothing, family care, and household management—Vickery relied on average time allocations observed in households with a non-employed homemaker, differentiated by household composition. In contrast, for house care activities, she applied the average time of employed women, arguing that these activities are more strongly influenced by preferences than by strict necessity.

Formally, T_A is defined as

$$T_A = 168 - T_N - T_1, \tag{1}$$

and an individual is classified as time poor if the remaining T_A is insufficient to cover actual paid work time (T_w), that is, if

$$168 - T_w < T_N + T_1. \tag{2}$$

Vickery's two-dimensional perspective was not widely adopted until it was empirically updated by Douthitt (2000) using U.S. data and later operationalized further by Harvey and

Mukhopadhyay (2014) using Canadian time-use data. These studies largely follow Vickery's original framework; however, they also differ in several important respects, particularly in how the underlying time thresholds are constructed and operationalized.[2] Similar applications of Vickery's absolute, two-dimensional framework can be found in studies using developing-country household surveys, such as Bardasi and Wodon (2010) for Guinea, and in East Asia, where Ishii and Urakawa (2014) apply the framework to Japanese data. More broadly, the Levy Institute's LIMTIP project has extended Vickery's core logic to a cross-national setting by implementing related time-adjusted income poverty measures in several countries.

In contrast, much of the relative time poverty literature conceptualizes time poverty as a deprivation of leisure arising from disproportionate demands on paid and unpaid work, and treats it as a stand-alone dimension of disadvantage rather than as an extension of income poverty. These approaches typically define leisure residually, as the time remaining after contracted (paid work), committed (unpaid domestic work), and necessary (physiological) time have been allocated, and then impose distribution-based thresholds on this residual.

Within this tradition, studies such as Bittman (2002) and Burchardt (2008) identify time poverty using relative cutoffs (e.g., a fixed proportion of median leisure or free time), while Kalenkoski et al. (2011) construct thresholds at 50/60/70% of median discretionary time. Related distribution-based approaches also include the discretionary time framework by Goodin et al. (2005, 2008), which defines "strictly necessary" personal care and household labor time as the mean minus one standard deviation and derives necessary paid work time from an income-poverty benchmark. Other studies adopt a different relative formulation by defining time poverty in terms of excessive working hours compared to the median, as in Bardasi and Wodon (2006). As Spinney and Millward (2010) emphasize, these measures are not intended to represent subsistence-level time requirements analogous to an income poverty line, but rather to capture relative time disadvantage within a given society.

(2) Previous Research on Subjective Income Poverty

In the measurement of income poverty, alongside absolute and relative approaches, a third strand relies on subjective assessments of minimum needs. Subjective poverty measures are motivated by the idea that objective poverty lines may fail to reflect individual's perceived adequacy of resources, which is shaped by social norms, expectations, and lived experiences.

[2] With respect to T_N, later studies use different data sources and leisure allowances, resulting in modest differences in thresholds while preserving the same conceptual structure. With respect to T_1, later studies also differ in the reference groups and empirical sources used to set the benchmark for necessary household production. For example, Harvey and Mukhopadhyay base T_1 on average maintenance time observed in households with a resident homemaker for all components of T_1.

A central example is the Subjective Poverty Line (SPL) developed in the Leyden tradition (e.g., Goedhart et al., 1977; Kapteyn et al., 1988). Based on survey questions such as the Minimum Income Question (MIQ)—which asks respondents what income is minimally required to make ends meet—these approaches estimate a poverty line at the point where reported minimum income equals actual income. Related methods, including the Leyden Poverty Line and the Centre for Social Policy poverty line, differ in implementation but share the principle of grounding poverty thresholds in respondents' own evaluations.

A substantial literature shows that subjective income poverty is systematically associated with demographic characteristics, health, employment prospects, and expectations, and often diverges from objective poverty classifications (e.g., Ravallion & Lokshin, 2002; Bishop et al., 2015). Subjective measures are therefore commonly viewed as a complement to, rather than a replacement for, objective income poverty lines.

By contrast, subjective approaches have rarely been applied to the measurement of time poverty. Existing studies rely almost exclusively on externally defined thresholds and seldom elicit individuals' own assessments of minimum time needs analogous to subjective income poverty lines. While a related literature examines subjective aspects of time use, such as perceived time pressure or time stress (e.g., Hamermesh and Lee, 2007), this work focuses on experienced time scarcity rather than on constructing normative thresholds that classify individuals as time poor. Consequently, it does not yield a subjective time poverty line comparable to those used in income poverty research.

3. Theoretical Framework

This section presents the conceptual framework underlying alternative measures of time poverty and introduces the measurement approaches evaluated in this study. We first clarify the distinction between absolute and relative concepts of time poverty and discuss their respective limitations. We then introduce a subjective benchmark for minimum necessary housework time, drawing on the Subjective Poverty Line (SPL) methodology developed in the income poverty literature. Finally, we define the four time-poverty models compared in the empirical analysis.

(1) Conceptual Framework of Time Poverty

Although time poverty has long lacked a unified measurement framework, two main approaches have commonly been used to measure time deficits. These approaches follow the same distinction as in the income poverty literature between an absolute approach, grounded in minimum

requirements, and a relative approach, based on comparative deprivation.

The absolute approach measures time poverty with reference to an absolute threshold defined by the minimum necessary hours required for household production, basic personal care, and leisure. These thresholds typically vary by household composition and embody assumptions about the minimum time needed to sustain basic standards of home maintenance, personal care, and physical and mental health. Individuals are classified as time poor when available time is insufficient to satisfy these minimum requirements.

The relative approach, by contrast, does not define time poverty by imposing minimum requirements for each necessary activities such as hygiene, sleep, or housework. Instead, it first identifies a target category of time use and then defines critically low levels based on the observed distribution of that time. Studies adopting this approach have focused primarily on time under individual discretion, using terms such as leisure time, free time, or discretionary time (Bittman, 2002; Burchardt, 2008; Kalenkoski et al., 2011).

While both approaches have shaped the study of time poverty, they also face limitations. Absolute definitions offer clear thresholds, but a central concern is that the minimum requirements are not always empirically grounded. A common practice, following Vickery (1977), is to define minimum housework time based on the average housework time in households with non-employed homemakers, assuming no outsourcing of household production. However, this benchmark likely exceeds the minimum time actually required. Likewise, leisure-time thresholds are typically fixed arbitrarily and lack strong empirical justification.

Relative definitions, on the other hand, adapt to observed time-use patterns and changes in social norms, technology, and lifestyles evolve. However, they also risk misclassification because assessment depends on the amount of residual free time. Even when basic needs are met, individuals may allocate substantial time to housework or personal care due to preferences rather than needs, compressing free time without necessarily indicating binding time constraints. As a result, relative measures may overstate time poverty by conflating genuine time deprivation with preference-driven time allocations.

(2) Subjective Minimum Necessary Housework (SMH)

In income poverty measurement, beyond absolute and relative thresholds, researchers have developed a subjective standard for income, the Subjective Poverty Line (SPL) (Kapteyn et al., 1988; Bishop et al., 2015). The SPL is estimated from answers to the Minimum Income Question (MINQ), which asks, "*What is the minimum net monthly income your household would need to make ends meet?*" Reported minimum income is then regressed on actual household income and demographic controls, using a specification in which the fitted function increases with actual

income. The subjective poverty line is identified at the income level where the fitted minimum equals actual income—the intersection of the MINQ curve with the 45-degree line. Intuitively, households below this point report a higher minimum than what they actually have, and those above it report a lower minimum; the crossing pinpoints the subjective threshold.

Following the SPL approach, we introduce a benchmark called the Subjective Minimum necessary Housework (SMH). This replaces the exogenously fixed minimum housework requirement in the absolute time-poverty framework with a respondent-based, subjective standard. Instead of MINQ, we elicit respondents' perceptions of the minimum necessary time for housework under the assumption of zero outsourcing, by asking a question such as: "If you were to perform all household chores by yourself, how much time would be the minimum necessary for housework?" Estimating the SMH provides a respondent-based benchmark for minimum necessary housework time.

By contrast, we do not apply the SPL approach to estimating minimum required leisure time, as eliciting minimum values tends to produce boundary responses near zero, implicitly suggesting that leisure is unnecessary, which is not the concept we aim to capture. Instead, leisure is benchmarked against observed societal time-use patterns and assessed relative to the average leisure time.

Formally, the reported minimum necessary time for housework (T_{min}) is regressed on actual housework time (T) and demographic characteristics (x) to identify the SMH, using the following specification:

$$T_{min} = f(T; x), \tag{3}$$

where the function $f(\cdot)$ is monotonically increasing in T, indicating that respondents spending more time on housework report a higher minimum necessary time for housework, and conversely, those spending less time report a lower minimum. Assuming there exists a true minimum necessary level of housework time T^*_{min}, defined by

$$T^*_{min} = f(T^*_{min}; x), \tag{4}$$

only respondent whose actual housework time equals T^*_{min} would answer the question correctly, otherwise, those with $T > T^*_{min}$ would tend to overstate the minimum, and those with $T < T^*_{min}$ would tend to understate it.

Practically, the specification for T_{min} is following equation,

$$(T_{min}) = \alpha_0 + \alpha_1(T) + \alpha_2 x_2 + \alpha_3 x_3 + \cdots + \alpha_n x_n + \varepsilon, \tag{5}$$

where x_n is a set of household structure indicator variables. The coefficient α_1 denotes elasticity of minimum necessary housework time; α_0 is the intercept. The coefficients α_2, …,

α_{n} are differences in minimum necessary housework time for households with structure x_j. Although prior work on subjective income poverty lines estimates models in logarithm, our analysis concerns time that is bounded 0-24, so we keep it in levels.

Under these conditions, the "true" minimum necessary housework time can be obtained by evaluating time at the intersection points, as given by the following equations.

$$T^*(x_2, \dots x_n) = \frac{\widehat{\alpha}_0 + \widehat{\alpha}_2 x_2 + \cdots + \widehat{\alpha}_n x_n}{1 - \widehat{\alpha}_1} \tag{6}$$

Because household composition shapes time demands, responses vary with family size. Two-adult households typically require more minimum housework time than one-adult households. Additional children also increase the minimum required housework time through fixed-care duties, with any economies of scale from shared routines only partly offsetting this.

(3) Alternative Time Poverty Models

The present study compares four alternative models of time poverty and evaluates their validity by examining whom they classify as time poor and how these classifications relate to well-being. The models include a conventional Relative Time Poverty (RTP) model, a conventional Absolute Time Poverty (ATP) model, and two adaptations of the absolute framework that incorporate subjective benchmarks for housework.

Table 1 summarizes the defining equations of the four models. Let W denotes paid working time including commuting, B basic personal care time, L leisure time, and H housework time. An asterisk (*) indicates the minimum necessary level of each component.

Relative Time Poverty (RTP)

The RTP model evaluates time poverty at the individual level. An individual is classified as time poor when required leisure time L^*, defined as a fixed proportion of average leisure, exceeds actual leisure L, which is the time remaining after deducting actual B, W, and H from 24-hour day. The necessary leisure is set relatively at 60% of the overall average leisure, 34.0 hours/week in our data. Because the RTP model is individual-based, classification relies solely on the respondent's own time allocations.

Absolute Time Poverty (ATP)

The ATP model evaluates time poverty at the household level. Households are classified as time poor when actual paid work time W exceeds the residual time available after meeting minimum benchmark requirements for housework H^*, basic personal care B^* and leisure L^*. We assume that housework is undertaken only by adults and therefore focus only on the sum of adults' time

use. Because it is difficult to observe the time use of each adult in multi-adult households, the analysis is therefore restricted to households with one adult or two adults (husband and wife).

Subjective Minimum Necessary Housework (SMH)

The SMH model modifies the absolute framework by replacing the exogenously fixed minimum housework requirement H^* with the Subjective Minimum Necessary Housework estimated in Section 3.2, while retaining absolute benchmarks for B^* and. L^*.

SMH with Relative Leisure (SMH-RL)

The SMH-RL model further modifies the SMH framework by benchmarking leisure time L^* relative to observed societal norms, while continuing to define minimum necessary housework time using the SMH. This hybrid specification combines a subjective housework benchmark with a relative leisure standard.

Benchmark Values

Across all models, the minimum necessary time for basic personal care B^* is fixed at the average observed among men and women aged 20–59. In the ATP model, minimum necessary housework time is set to the average housework time in households with non-employed homemakers, whereas in the SMH and SMH-RL models it is given by the estimated SMH. Minimum leisure time is fixed exogenously in the ATP and SMH models and defined relatively in the RTP and SMH-RL models.

4. Data

This study primarily relies on original survey data collected through an online survey panel, in addition to using official time-use statistics the 2021 *Basic Survey on Social Life* to set exogenous benchmarks for minimum necessary time. This ensures consistency with official statistics and allows comparability with previous studies.

The survey was conducted nationwide in Japan between March 6 and March 8, 2024, with the target population consisting of men and women aged 20 to 59. The sampling design was intended to approximate population representativeness by stratifying respondents according to gender, ten-year age cohorts, and five major regions (Hokkaido–Tohoku, Kanto, Chubu, Kinki, and Chugoku–Shikoku–Kyushu), following the framework of the 2020 Population Census, the most recent census available. At the initial stage, screening questions identified respondents belonging to household types of interest—couples with or without children under 18 and single-person households with or without children under 18. The survey was closed once the target of

5,000 valid responses had been reached, resulting in a final sample of 5,150.

The questionnaire was designed by the authors to collect detailed information on actual hours spent on housework, sleep, other basic personal care, work, and commuting, as well as on household structure, employment status, household income, and various aspects of well-being, for the respondents themselves and, in part, for their spouses. In particular, the survey elicited respondents' perceptions of the minimum necessary time required for housework by asking: *"If you were to perform all household chores by yourself, how much time would be the minimum necessary for housework?"* This question serves as the basis for estimating the SMH, the key variable in this study. For all time-use questions, respondents were asked to report separately for weekdays and weekends.

Although the survey collected basic information on time use, it did not directly ask about leisure time. Since previous studies have relied on official time-use surveys, which are based on much larger samples and provide more reliable averages, we use the *Basic Survey on Social Life* to establish the exogenous benchmarks for the minimum necessary time for daily life. This approach ensures consistency and comparability with earlier studies, rather than relying on our own survey responses.

The survey also elicited information on several well-being indicators, and these variables are used for assessing the validity of each time poverty model. We focus on four indicators of well-being: leisure satisfaction, life satisfaction, the discrepancy between weekday and weekend sleep duration[3], and dietary quality. The two satisfaction indicators take values ranging from 0 to 10, with higher values indicating greater satisfaction. Weekday and weekend sleep gap is calculated from the survey-reported difference between weekend and weekday sleep duration. A positive value indicates longer weekend sleep, typically reflecting shorter sleep on weekdays and catch-up sleep on weekends, and we interpret it as low well-being. This pattern is closely related to "social jetlag", the discrepancy between social and the biological time, documented by Wittmann et al. (2006) and linked to poorer sleep quality and lower psychological well-being. Dietary quality is measured based on respondents' time constraints over the past year. They were asked whether lack of time ever prevented them from preparing or obtaining nutritionally balanced meals. Responses were coded as 1 = often, 2 = sometimes, 3 = never, with higher values indicating better dietary quality.

Household types were classified into eight subcategories: (1) couples with children aged 6–17, (2) couples with one child under age 6, (3) couples with two or more children under age 6, (4) couple-only households, (5) single parents with children aged 6 or older, (6) single parents with children under age 6, (7) single-person female households, and (8) single-person male households. Housework is assumed to be undertaken by adults, and because collecting

[3] For actual sleeping hours, responses below three hours per day were excluded.

reliable information on the housework time of each adult becomes difficult in households with three or more adults, the analysis is restricted to one- and two-adult households (husband and wife). Some of these categories, especially those involving single parents with children, contained relatively few observations and were therefore aggregated in parts of the empirical analysis to ensure sufficient statistical power.

Table 2 presents the descriptive statistics of the variables used in the estimation by household types. After excluding observations with missing values and outliers[4] on the variables used in the analysis, the final sample consists of 3,318 households.[5] The first two columns report actual and perceived minimum weekly housework hours. Perceived values exceed actual time in couple households with children but are similar or lower in couple only or single-person households. This reflects that the benchmark in couple households with children incorporates tasks otherwise attributed to the spouse. Basic personal care includes times for sleep, eating, and other personal care.

To improve representativeness, we employ sampling weights for all tabulations except for the regression analyses. The sampling weights were created by an iterative proportional fitting or raking method to align the distributions of gender, age group, employment status, region, and household type in our sample with those of the Japanese population. Population data were obtained mainly from the *Labour Force Survey*, but for the distribution of household type we obtain from the *Basic Survey on Social Life*. Both are conducted by Ministry of Internal Affairs and Communications.

5. Results

(1) Minimum necessary time for daily life

In the concept of absolute time poverty, the key variable is the minimum necessary time for daily life, which is the sum of minimum necessary times for housework, basic personal care, and leisure, serving as the threshold for measuring time poverty. Most benchmarks are exogenously determined with reference to the average values reported in the *Basic Survey on Social Life*,

[4] For actual housework time, responses indicating 12 hours per day that is the maximum response option were treated as outliers and excluded from the analysis. Similarly, for minimum necessary housework time, responses of 0 or 12 hours per day were considered outliers and excluded. For actual sleeping hours, responses below 3 hours per day were excluded.

[5] For the estimation of subjective minimum necessary housework time, which uses only actual housework hours, reported minimum necessary housework hours, and household type, we employed 4,034 observations to maximize sample size.

whereas the subjective minimum necessary time for housework in the SMH models need to be estimated using the methodology applied to the SPL approach.

The minimum necessary time for housework in each model is presented in Table 3, along with the estimates of the subjective minimum necessary time. The regression coefficients indicate that respondents' own housework hours are strongly associated with the perceived minimum necessary housework time, and that household structure also plays a significant role. Based on these coefficients, the subjective minimum necessary hours of housework are calculated for each household type. These estimated values for the SMH models are presented alongside the exogenously set ATP benchmarks that are the average housework time of adults in households with a non-employed homemaker from the *Basic Survey on Social Life*. The comparison reveals that the SMH estimates are generally lower than those of the ATP model, although both exhibit the same ranking across household categories, with the highest requirements observed for couples with young children. The difference is particularly pronounced among households with children under 6, likely because non-employed homemakers may voluntarily spend a substantial amount of time on housework and child-rearing.

The minimum necessary time for basic personal care in the absolute concept models is derived with reference to the average values for individuals aged 20–59 reported in the *Basic Survey on Social Life*. The corresponding values are presented in Table 1, and the daily average is about 10.6 hours (including 7.7 hours of sleep) per person.

The minimum necessary time for leisure in the ATP and the SMH models is exogenously decided as one hour on weekdays and three hours on weekends, amounting to 11 hours per week per person, following Ishii and Urakawa (2014). On the other hand, the minimum necessary time for leisure in the SMH-RL model is derived with reference to the average values for individuals aged 20–59 reported in the *Basic Survey on Social Life*, with 60% of the survey average taken as the minimum necessary leisure time, yielding 22 hours per week per person. These values are presented in Table 1.

The RTP model is conceptually different from that of the other models, and time poverty is determined with reference to 60% of the overall average value of leisure time. Although the survey did not directly ask about leisure time, it is obtained as the residual of 24 hours after subtracting working hours, commuting, housework, and basic personal care, with 60% of the average of this measure used as the benchmark for comparison.

Figure 1 presents the total minimum necessary time for daily life, which is the time poverty threshold, in each model. Among three absolute concept models, the ATP model consistently produces the highest thresholds, particularly for couple households with children, because it incorporates the average housework time in households with non-employed homemakers. By contrast, the SMH model yields the lowest thresholds, as it largely follows the

ATP model but replaces the minimum necessary housework time with a subjective benchmark, which is substantially lower than that in the ATP model. The SMH-RL model lies between these two: it is largely based on the SMH approach, except that minimum necessary leisure time is set as 60 percent of the average, which is higher than the arbitrarily fixed value used in the ATP model. In particular, the SMH-RL model yields lower poverty thresholds than the ATP model for households with preschool children, but, curiously, the thresholds of the two models are almost identical for households without children.

In the RTP model, the threshold is calculated as the sum of 60% of the mean leisure time, the average actual basic personal care time, and the average actual housework time. Although the RTP model conceptually different from that of the other models, the pattern that required time is longer in households with young children is consistent with the other models.

(2) Time Poverty Rate

Table 4 presents the time poverty rates under four models. The time poverty rates are highly sensitive to the specification of the minimum necessary time for daily life, and the pattern varies systematically by household structure. Using the ATP model—which sets housework requirements based on the average time in households with non-employed homemakers—yields the highest prevalence overall. This pattern is especially pronounced in households facing intensive childcare demands, such as households with preschool children, and is even stronger for full-time dual-earner couples and full-time single parents. For example, the ATP model classifies 36.9% of couples with one preschool child, 41.7% of those with two or more, and 43.4% of single parents with preschool children as time poor. The prevalence is even higher when parents work full time, reaching 71.5% for dual-earner couples with one preschool child, 84.4% with two or more preschool children, and 69.7% for full-time single parents.[6]

By contrast, the SMH model—replacing minimum necessary housework time with a subjective minimum—drastically reduces time poverty rates across all groups. This is consistent with external benchmarks, such as the average housework time in households with non-employed homemakers are far more demanding than what respondents themselves consider minimally necessary.

The SMH-RL model, which follows the SMH model for housework but applies a relative benchmark for leisure (60% of the average), lies between these two. The corresponding

[6] The measurement approach of the ATP model is broadly consistent with that of Ishii and Urakawa (2014). However, the higher prevalence of time poverty observed in this study can be attributed to two main factors: the increase in housework hours among housework with non-employed homemakers and hours of basic personal care over the past decade, and the rise in labor force participation among women with children.

figures under the SMH-RL model are substantially lower—7.3% for couples with one preschool child, 5.9% with two or more preschool children, and12.4% for single parents with children—illustrating that the ATP model produces much higher estimates of time poverty. Even among full-time working parents, the time poverty rate remains considerably lower under the SMH-RL model, at 14.9% for dual-earner couples with one preschool child, 15.4% with two or more, and 26.9% for full-time single parents.

Turning to the RTP model, both the level and the pattern differ from the absolute models. As like the absolute concept models, time poverty rates in the RTP model are high among households with young children, but the rates are also notably high among households without children, with 10.6% for couple-only households, 9.3% for single men, and 16.3% for single women. Furthermore, unlike the other models where single-parent households show the highest prevalence, the RTP model records higher rates for two-parent households: 27.6% for couples with one preschool child and 30.6% for those with two or more, compared with 16.8% for single-parent households. This pattern persists among households with full-time working parents, where time poverty rates are higher overall but still greater for two-parent households than for single-parent households.

(3) Characteristics of Those Categorized as Time Poverty under Alternative models

To examine who is classified as time poor under each model, we estimate probit regressions with time poverty as the dependent variable and household characteristics and time allocated to paid work, basic personal care, and housework as regressors. Each activity (e.g., sleep, housework) is measured as its share of the household's total adult time, rather than in hours. For single-adult households, the share is computed from the individual's time; for two-adult households, it is computed from the sum across both adults. This specification makes coefficients comparable across household types. Each average marginal effect (AME) shows how the predicted probability of time poverty changes with an increase in the share of a given activity.

In each model of Table 5, the first two columns report group means of each covariate for the time-poor and not-time-poor groups, and the third column shows their differences. The fourth column reports AMEs from the probit regression; only statistically significant estimates are shown. The fifth column reports each variable's contribution, computed as the difference in group means multiplied by the AME. While the AME indicates how strongly each variable is associated with the probability of time poverty, it does not account for how much the variable actually differs between time-poor and non-time-poor households. The contribution incorporates both aspects. For example, even if housework has a larger AME than paid work, paid work may contribute more to the difference between the two groups if their actual paid work hours differ

substantially. Thus, the contribution helps identify which characteristics most strongly distinguish time-poor from non-time-poor households. Contributions are expressed in percentage points and provide an approximate measure of the extent to which differences in each variable account for the gap in predicted probabilities of time poverty between the two groups.

Across all models, the share of working hours is the dominant driver of the predicted probability gap between time-poor and non-poor households. Its large AME, together with a sizable between-group difference in mean shares, yields a large contribution. Specifically, in the ATP and the SMH-RL specifications the working-hours share alone accounts for over 20pp of the total predicted time poverty gap.

Household composition is also a significant driver in some models. The presence of a child under six shows a positive AME and a large mean difference between time-poor and non-poor households, yielding a contribution of about 6–7pp in the ATP model. Under the SMH and the SMH-RL models, the child variables are small and negligible.

By contrast, the RTP specification displays notable differences from the other models. In particular, larger shares of sleep, other basic personal care, and housework are associated with higher predicted probabilities of time poverty and make positive contributions to the predicted gap. This pattern is consistent with the concept of RTP model, under which greater allocation of time to those daily activities leaves less leisure time and thus raises the likelihood of being classified as time poor.

(4) Evaluating the Validity of Time Poverty Models

Table 6 reports the associations between time poverty, measured under alternative models, and multiple dimensions of subjective well-being, including leisure satisfaction, life satisfaction, weekday and weekend sleep gap, and diet quality based on the results of multiple regression models controlling for household income and household type dummies. The findings indicate that the strength and significance of these associations vary markedly depending on the specification of time poverty employed.

For the total sample, the ATP model shows statistically significant associations with leisure satisfaction and sleep gap, but the coefficients are relatively small, suggesting that under this model time poverty is only weakly related to subjective well-being. By contrast, both the SMH and SMH-RL models yield larger and highly significant negative coefficients for leisure satisfaction and life satisfaction. These stronger associations indicate that time poverty, when measured by subjective thresholds, is more consistently linked to lower well-being. Notably, the SMH-RL model also shows a positive and significant association with the sleep gap and a negative association with diet quality, underscoring that this measure captures individuals who

are genuinely constrained in balancing rest, nutrition, and discretionary time.

For households with children, including single parents, the contrast between models is even sharper. The RTP and ATP models show weak or insignificant associations with most well-being outcomes, with small coefficients and low R^2 values. In contrast, the SMH-RL model records strong and statistically significant negative associations with leisure satisfaction and life satisfaction, alongside relatively larger explanatory power compared to the other models. Moreover, it is the only model that simultaneously shows significant relationships with both the sleep gap and diet quality. These findings suggest that for households in the child-rearing stage—where time demands are particularly intensive—the SMH-RL model, which integrates subjective housework requirements with a relative leisure benchmark, is more effective in identifying those experiencing real time constraints that adversely affect multiple dimensions of well-being.

Table 7 evaluates the relative validity of three time-poverty models by using classification differences across models, rather than simple correlations. We construct indicators for being time poor under one model but not the other ("ATP-only," "RTP-only," "SMH-RL-only") and for being time poor under both models; we then regress these indicators on well-being outcomes. If the "one-model-only" indicator shows significant negative association with well-being, the model is interpreted as measuring time poverty more appropriately than the comparison model; conversely, if these indicators are not significant, the model is taken to be overclassifying time poverty.

In the comparison between the ATP model and SMH-RL model shown in Panel A of Table 7, individuals classified as time poor under both models show significant negative associations with well-being, confirming that those consistently identified as time poor experience meaningful disadvantages. However, when individuals are classified as time poor only under the ATP model, the associations with leisure satisfaction, life satisfaction, sleep outcomes, and diet quality are all insignificant except for the case of diet quality among households with young children, suggesting that the ATP benchmark does not necessarily translate directly into well-being losses and tends to overclassify time poverty.

In the comparison between the RTP and the SMH-RL models shown in Panel B of Table 7, those classified as time poor by both models have consistently worse outcomes on all well-being measures. For the RTP-only group, the evidence is much weaker: only leisure satisfaction differs significantly, while other outcomes are not statistically different. In contrast, the SMH-RL-only group shows robust negative associations with well-being across most outcomes, except life satisfaction and the sleep gap in the total sample.

6. Conclusion

This study measures time poverty using alternative specifications and evaluates their validity against multiple well-being outcomes. The models compared are the Relative Time Poverty (RTP) model, which classifies individuals as time poor when their leisure time falls below a relative threshold. By contrast, the Absolute Time Poverty (ATP) model classifies households as time poor when the time remaining after subtracting working hours is insufficient to meet fixed minimum requirements for housework, basic personal care, and leisure. In the ATP model, the minimum necessary time for housework is set to the average housework time of adults in households with a non-employed home-maker, and the minimum necessary leisure is set at 11 hours per adult per week. Within the absolute framework, we also consider two variants. The first is the Subjective Minimum Housework (SMH) model, which replaces the housework requirement with the SMH estimated following the SPL approach. The second is the SMH-RL model, which additionally evaluates minimum necessary leisure using a relative threshold such as 60% of the population mean.

Time-poverty rates differ markedly across the four models. Within the absolute concept models, incidence is highly sensitive to threshold specifications. The ATP model yields the highest rates, especially for households with preschooler and full-time dual-earner/single-parent families, whereas the SMH model sharply decreases rates and the SMH-RL model sits in between yet remains far below the ATP model. Because ATP model sets the minimum necessary housework time at the average for households with a non-employed homemaker, it is likely to overclassify time poverty. Relative and absolute concepts also produce different household-type patterns: under the RTP model, incidence is high even for childless households, and, unlike the absolute models, two-parent households exceed single-parent ones. An analysis of characteristics associated with time-poverty status helps explain these differences: the RTP model primarily captures individuals whose leisure time is relatively small, whereas ATP/SMH are more sensitive to household composition and childcare demands that raise the minimum required time. While long working hours are a primary driver of time poverty across all models, the RTP results further indicate that longer sleep, other basic personal-care time, and housework also compress leisure and thereby increase the likelihood of being classified as time poor. In other words, under RTP, individuals may be classified as time poor not only because of long working hours but also because more time is allocated to other activities that crowd out leisure.

To see how well each model measures time poverty, simple regressions were conducted to examine the correlations between time poverty under each model and several well-being indicators. The results show that the SMH-RL model has the strongest and most consistent associations, including lower leisure and life satisfaction, a larger weekday–weekend sleep gap,

and poorer diet quality. Additionally, the relative validity of the models was evaluated using regression analyses in which classification differences across models were used as explanatory variables predicting well-being outcomes. In the comparison between the ATP and SMH-RL models, those classified only in the ATP model show no significant associations with most well-being indicators, indicating that ATP benchmark does not necessarily translate directly into well-being losses and tends to overclassify time poverty.

Similarly, in the comparison between the RTP and SMH-RL models, those classified only in the RTP model are significant only for leisure satisfaction, whereas those classified only in the SMH-RL model exhibit robust negative associations on most outcomes.

Measuring poverty is inherently difficult, and time poverty is no exception. Our results show that the conventional relative approach, which focuses on the amount of leisure, can classify people as time poor even when low leisure simply reflects longer sleep, more personal care, or extra time devoted to housework. By contrast, within an absolute approach the key challenge is how to set the minimum necessary time. Our analysis shows that, for housework, conventional fixed benchmarks may no longer provide an appropriate benchmark for minimum necessary housework time. Asking respondents for a subjective minimum is therefore a practical alternative. For leisure, the results suggest using a relative value based on the population average rather than a socially unreasonable minimum. Whether the benchmark of 60 percent of the mean is appropriate should be tested with sensitivity checks in future research.

References

Bardasi, E. and Wodon, Q. (2006). "Measuring Time Poverty and Analyzing its Determinants: Concepts and Application to Guinea," *Economics Bulletin*, 10(12): 1-7.

Bardasi, E. and Wodon, Q. (2010). "Working long hours and having no choice: Time poverty in Guinea," *Feminist Economics*, 16(3): 45-78.

Bishop, J. A., Grodner, A., Liu, H., and Ahamdanech-Zarco, I. (2014). "Subjective poverty equivalence scales for Euro Zone countries," *Journal of Economic Inequality*, 12:265-278.

Bittman, M. (2022). "Social Participation and Family Welfare: The Money and Time Costs of Leisure in Australia," *Social Policy & Administration*, 36(4): 408-425.

Burchardt, T. (2008). "Time and income poverty," *CASE report* 57.

Douthitt, R. A. (2000). ""Time to Do the Chores?" Factoring Home-Production Needs into Measures of Poverty," *Journal of Family and Economics Issues*, 21(1): 7-22.

Etkin, J., Evangelidis, I., and Aaker, J. (2015). "Pressed for time? Goal conflict shapes how time is perceived, spent, and valued," *Journal of Marketing Research*, 52: 394–406.

Goedhart, T., Halberstadt, V., Kapteyn, A., and van Praag, B. (1977). "The poverty line: concept and measurement," *Journal of Human Resource*, 12: 503–520.

Goodin, R. E., Rice, J. M., Bittman, M., and Saunders, P. (2005). "The time-pressure illusion: Discretionary time vs. free time," *Social Indicators Research*, 73: 43–70.

Goodin, R. E., Rice, J. M., Parpo, A., and Eriksson, L. (2008). *Discretionary time: A new measure of freedom*, Cambridge: Cambridge University Press.

Hamermesh, D. S. and Lee, J. (2007). "Stressed out on four countries: Time crunch or yuppie kvetch?" *The Review of Economics and Studies*, 89(2):374-383.

Harvey, A. S., and Mukhopadhyay, A. K. (2014). "When twenty-four hours in not enough: Time poverty of working parents," *Social Indicators Research*, 82:57-77.

Ishii, K. and Urakawa, K. (2014) "Poverty Analysis Accounting for Time Use (in Japanese: Seikatsu jikan wo kouryo sita hinkon kenkyu)," *Mita Business Review*, 57(4):87-121.

Kalenkoski, C. M., Hamrich, K. S., and Andrews, M. (2011). "Time Poverty Thresholds and Rates for the US Population," *Social Indicators Research*, 104:129-155.

Kapteyn, A., van de Geer, S., and van de Stadt, H. (1985). "The Impact of Changes in Income and Family Composition on Subjective Measures of Well-Being," In *Horizontal Equity, Uncertainty, and Economic Well-being*, ed. M. David and T. Smeeding, 35-64. Chicago: University of Chicago Press.

Kapteyn, A., Kooreman, P., and Willemse, R. (1988). "Some methodological issues in the implementation of subjective poverty definitions," *Journal of Human Resources*, 23(2): 222-242.

Ravallion, M. and Lokshin, M. (2002) "Self-rated economic welfare in Russia," *European Economic*

Review, 46: 1453-1473.

Reisch, L.A. (2001). “Time and wealth: The role of time and temporalities for sustainable patterns of consumption,” *Time &Society*,10(2–3):367–385. http://tas.sagepub.com/content/10/2-3/367.short.

Spinney, J., and Millward, H. (2010). “Time and money: A new look at poverty and the barriers to physical activity in Canada,” *Social Indicators Research*, 99(2): 341–356.

Vickery, C (1977). “The time-poor: A new look at poverty,” *Journal of Human Resources*, 12(1): 27-48.

Williams, J. R., Masuda, Y. J., and Tallis, H. (2016). “A Measure Whose Time has Come,” *Social Indicators Research*, 128(1): 265-283.

Wittmann et al. (2006). “Social jetlag: Misalignment of biological and social time,” *Chronobiology International*, 23(1–2): 497–509.

Zacharias, A. (2011), “The Measurement of Time and Income Poverty,” *Levy Economics Institute of Bard College Working Paper*, 690.

Table 1. The specifications of the four alternative time-poverty models

	Relative Time Poverty model (RTP model)	**Absolute Time Poverty model (ATP model)**	**Subjective Minimum necessary Housework model (SMH model)**	**SMH with Relative Leisure model (SMH-RL model)**
Defining equation	W > 168h-B-H-L* (L* > 168h-B-H-W)	W > 168h-B*-H*-L*		
Basic Personal Care	Actual	Overall Average (74.0)	Overall Average (74.0)	Overall Average (74.0)
Housework	Actual	Average of households with a non-employed homemaker (20.8~80.7)	Subjective Minimum necessary Housework based on the subjective poverty line (9.7~32.8)	
Leisure	60% of mean residual (34.0)	Weekday: 1 hour/day Weekend: 3 hours/day (11.0)	Weekday: 1 hour/day Weekend: 3 hours/day (11.0)	60% of overall Average (22.0)
Work	Actual	Actual	Actual	Actual

(Note) W=paid work time including commuting time.

An asterisk (*) indicates the minimum necessary level of each component.

Table 2. Descriptive statistics

Panel. A

	(hours/week)	N	Housework		Basic personal care	Work	Commute
			Respondent's actual	Minimum necessary			
2 adults	with child 6-17	741	18.7	22.2	55.1	32.6	5.5
	with one child under 6	397	24.7	27.6	57.6	33.6	5.7
	with two + children under 6	154	27.0	28.7	56.2	35.7	5.1
	Couple only	861	16.3	17.4	58.2	30.0	5.1
1 adult	with child 0-18	63	25.0	24.4	56.7	31.6	4.4
	with child 6-17	48	21.3	21.4	55.3	33.6	4.7
	with child under 6	15	35.8	33.2	61.9	24.1	3.0
	male	660	12.5	11.7	55.0	35.4	5.5
	female	442	15.5	14.3	60.8	30.5	5.2
Total		3,318	18.5	20.2	56.9	32.5	5.4

Panel. B

		N	Leisure satisfaction (0-10)	Life satisfaction (0-10)	Sleep gap (hours)	Diet quality (1,2,3)	Household annual income (1000yen)
2 adults	with child 6-17	741	5.2	5.6	0.7	2.2	6,703
	with one child under 6	397	5.5	6.2	0.6	2.0	6,785
	with two + children under 6	154	5.1	6.1	0.5	2.1	6,579
	Couple only	861	6.0	6.1	0.7	2.3	6,660
1 adult	with child 0-17	63	4.5	5.0	0.8	1.9	3,193
	with child 6-17	48	4.7	5.0	0.7	1.8	3,087
	with child under 6	15	3.8	5.3	0.9	2.0	3,583
	male	660	5.3	5.1	0.8	2.1	3,740
	female	442	5.5	5.0	1.1	1.9	2,899
Total		3,318	5.5	5.7	0.7	2.1	5,830

(Note) Sleep gap is calculated as weekend minus weekday sleep duration (hours per day).

Table 3. Regression Results for SMH and Minimum Necessary Housework Time under the SMH and ATP Models

Dependent variable: Minimum necessary housework time (hours/week)		Regression result for estimating SMH			Minimum necessary housework time (hours/week)	
		Coeff.	t-value		SMH	ATP
Respondent's actual housework time		0.65	53.3	***		
2 adults	with child 6-17	5.37	9.9	***	28.1	51.7
	with one child under 6	7.02	11.1	***	32.8	77.4
	with two + children under 6	5.96	7.4	***	29.8	80.7
	Couple only	2.28	4.4	***	19.3	42.9
1 adult	with child 6-17	3.04	2.3	**	21.5	37.0
	with child under 6	5.85	2.8	***	29.5	69.0
	without child (male)	-1.12	-2.0	**	9.7	20.8
	without child (female)		ref.		12.9	20.8
constant		4.52	9.7	***		
$R^2 = 0.50$						

(Note) The minimum necessary housework time under the SMH model is calculated from the regression estimates in the left panel using Equation (6). The ATP values are the average housework time of households with a non-employed homemaker in the 2021 *Basic Survey on Social Life*.

**** p<0.01, ** p<0.05, * p<0.1.*

Table 4. Time poverty rate under each model

		RTP	ATP	SMH	SMH-RL	N
		Total (N= 3,318)				
2 adults	with child 6-17	10.8	4.7	1.1	3.8	741
	with one child under 6	27.6	36.9	0.9	7.3	397
	with two + children under 6	30.6	41.7	0.7	5.9	154
	Couple only	10.6	3.5	0.8	3.3	861
1 adult	with child under 17	16.8	43.4	4.7	12.4	63
	with child 6-17	13.0	35.0	6.0	13.9	48
	with child under 6	30.8	74.7	0.0	7.2	15
	male	9.3	7.1	2.3	7.1	660
	female	16.3	2.2	0.8	4.5	442
Total		14.9	12.0	1.2	5.0	3,318
		In which full-time dual-earner couples (N=623)				
2 adults	with child 6-17	8.6	10.3	2.5	8.8	179
	with one child under 6	33.3	71.5	1.9	14.9	141
	with two + children under 6	48.6	84.4	2.0	15.4	46
	Couple only	16.3	7.9	1.2	7.2	257
		In which single full-time earners (N=734)				
1 adult	with child under 17	21.8	69.7	10.2	26.9	24
	male	11.4	9.2	3.4	9.2	440
	female	20.9	3.4	1.3	6.5	270

(Note) Figures are time poverty rates in percent (%), except for N.

Table 5. Each characteristic's contribution and a decomposition of the predicted probability gap.

	RTP					**ATP**				
	Group means of covariates					*Group means of covariates*				
	Time poor [a]	Not time poor [b]	Difference [a-b]	AME on *p* (time poor) [c]	Contribution to gap [a-b]*[c]	Time poor [a]	Not time poor [b]	Difference [a-b]	AME on *p* (time poor) [c]	Contribution to gap [a-b]*[c]
Number of children under 6	0.36	0.17	0.182			0.74	0.14	0.60	0.111	6.6pp
Number of children 6-17	0.56	0.47	0.090			0.79	0.45	0.33	0.055	1.8pp
Number of adults	1.65	1.63	0.025	0.034	0.1pp	1.73	1.62	0.11	-0.04	-0.4pp
Share of working hour	0.26	0.18	0.076	1.7	13.pp	0.30	0.18	0.12	1.791	21.6pp
Share of weekday sleep hour	0.20	0.19	0.008	1.773	1.4pp	0.18	0.19	-0.01		
Share of other basic personal care	0.10	0.06	0.037	1.759	6.4pp	0.07	0.07	0.00		
Share of housework	0.15	0.09	0.068	1.712	11.6pp	0.11	0.09	0.02	0.155	0.3pp

	SMH					**SMH-RL**				
	Group means of covariates					*Group means of covariates*				
	Time poor [a]	Not time poor [b]	Difference [a-b]	AME on *p* (time poor) [c]	Contribution to gap [a-b]*[c]	Time poor [a]	Not time poor [b]	Difference [a-b]	AME on *p* (time poor) [c]	Contribution to gap [a-b]*[c]
Number of children under 6	0.15	0.20	-0.05			0.24	0.20	0.04	0.016	0.1pp
Number of children 6-17	0.48	0.49	-0.01	0.008	0.0pp	0.45	0.49	-0.04	0.018	-0.1pp
Number of adults	1.50	1.63	-0.13			1.51	1.64	-0.13	-0.02	0.3pp
Share of working hour	0.43	0.19	0.24	0.227	5.5pp	0.35	0.18	0.17	1.198	20.3pp
Share of weekday sleep hour	0.17	0.19	-0.02	-0.091	0.2pp	0.18	0.19	-0.01		
Share of other basic personal care	0.06	0.07	-0.01			0.07	0.07	0.00		
Share of housework	0.07	0.10	-0.02			0.09	0.10	-0.01		

(Note) [c] and [a－b]×[c] are omitted for characteristics whose AMEs are not statistically significant at the 10% level.

Table 6. Association of various time poverty models and well-being

	Total							
	Leisure Satisfaction		Life Satisfaction		Sleep Gap		Diet Quality	
	Coef.	R^2	Coef.	R^2	Coef.	R^2	Coef.	R^2
(1) RTP	-0.414***	0.032	-0.150	0.071	0.109*	0.029	-0.044	0.021
(2) ATP	-0.356**	0.030	-0.215	0.071	0.175**	0.030	-0.042	0.020
(3) SMH	-1.158***	0.032	-1.253***	0.074	0.206	0.028	-0.212*	0.021
(4) SMH-RL	-0.845***	0.035	-0.564***	0.073	0.278***	0.030	-0.184***	0.023
N	3,318							

	Households with children (incl. Single parent)							
	Leisure Satisfaction		Life Satisfaction		Sleep Gap		Diet Quality	
	Coef.	R^2	Coef.	R^2	Coef.	R^2	Coef.	R^2
(1) RTP	-0.468***	0.016	-0.290*	0.031	0.155**	0.014	-0.067	0.020
(2) ATP	-0.159	0.011	-0.109	0.029	0.238***	0.018	0.022	0.019
(3) SMH	-0.920	0.012	-0.986*	0.031	0.721***	0.017	-0.112	0.019
(4) SMH-RL	-0.845***	0.017	-0.881***	0.036	0.491***	0.022	-0.245***	0.024
N	1,355							

*** p<0.01, ** p<0.05, * p<0.1

(Note) Coefficients are estimated by OLS, controlling for household type dummies and log household income.

**** p<0.01, ** p<0.05, * p<0.1.*

Table 7. Assessment of validity of each time poverty model

Panel. A: Comparison between the ATP model and SMH-RL model

	Leisure satisfaction		Life satisfaction	
	Total	Household with children	Total	Household with children
Time Poor under ATP only	0.146	0.115	0.223	0.194
Time Poor under both models	-0.814***	-0.820***	-0.613***	-0.838***

	Sleep Gap		Diet Quality	
	Total	Household with children	Total	Household with children
Time Poor under ATP only	0.0722	0.122	0.101	0.121*
Time Poor under both models	0.269***	0.518***	-0.174***	-0.218**

Panel. B: Comparison between the RTP model and SMH-RL model

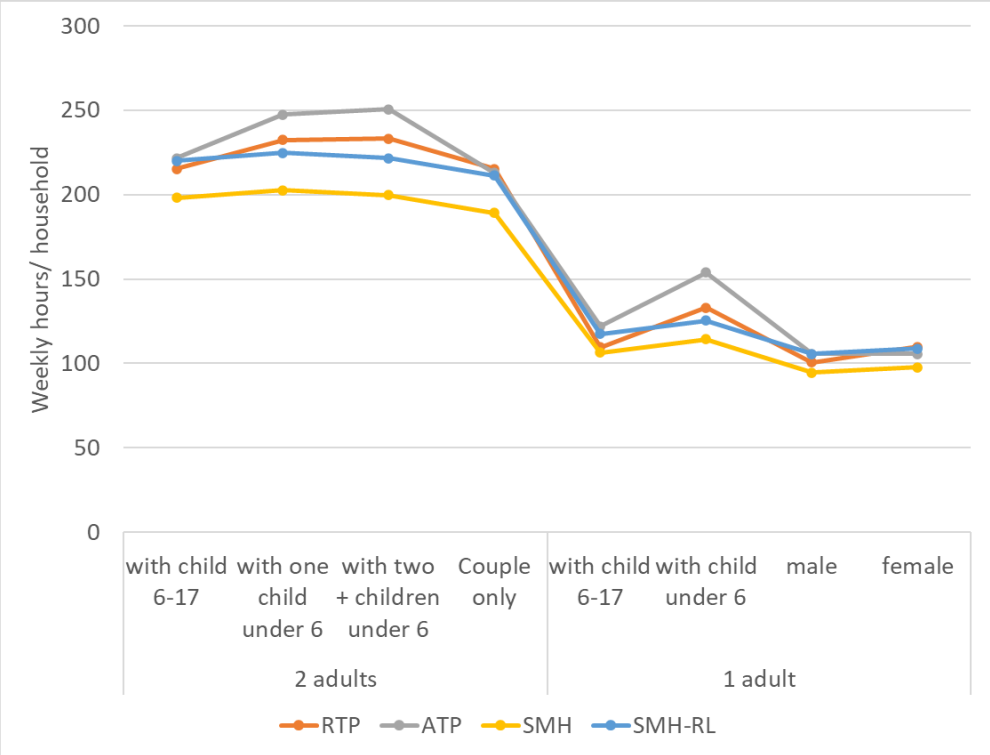
	Leisure satisfaction		Life satisfaction	
	Total	Households with children	Total	Households with children
Time Poor under RTP only	-0.320**	-0.409**	-0.0208	-0.169
Time Poor under SMH-RL only	-0.810***	-0.843**	-0.349	-0.690*
Time Poor under both models	-0.953***	-0.978**	-0.768***	-1.106***

	Sleep Gap		Diet Quality	
	Total	Household with children	Total	Household with children
Time Poor under RTP only	0.0602	0.0879	-0.0255	-0.0451
Time Poor under SMH-RL only	0.209	0.389**	-0.214**	-0.259**
Time Poor under both models	0.357***	0.610***	-0.162**	-0.246**

(Note) The reference group consists of respondents who are not time poor under either model. Coefficients are estimated by OLS, controlling for household type dummies and log household income.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Figure 1. Total minimum necessary time for daily life by model



(Note) Because the RTP model is defined at the individual level, the total minimum necessary time for two-adult households is calculated as twice the individual benchmark.