A measure whose time has come: Formalizing time poverty

Abstract:

Poverty remains a primary public policy issue, and a large literature has discussed the limitations of an income poverty measure. Using income as an indicator of poverty is a helpful simplification designed to capture ability to meet consumption needs. We argue that time is a basic economic resource allocated to create well-being along with income. Time is a scarce resource that individuals and households must allocate to produce goods, obtain services, and pursue rest and relaxation. Time poverty has been proposed as a complement to income poverty, yet it remains a relatively unknown measure in both policy and research spheres. The many ways time poverty is conceptualized and measured across studies has limited its adoption. To help familiarize readers with time poverty, we apply basic tenets of income poverty measurement to time. We conduct a survey of the theoretical and empirical literature discussing similarities, differences, and the pros and cons of different approaches to time poverty. In particular, inconsistent definition and categorization of *necessary* and *discretionary* time has been a barrier to the transparent application of time poverty in the literature, and we outline guidance on defining *necessary* and *discretionary* time for future studies. Finally, we outline future research directions for time poverty.

Keywords: time poverty, time use, poverty, time deficit, time stress

1. Poverty as resource deprivation

Poverty is a frequent subject of social critics and social scientists alike, and "improving the well-being of deprived people is a nearly universal goal among policymakers in all nations" (Haveman 2009, p. 388). A century ago, *poverty* merely signified the need for or actual receipt of charity (Bremner 1992). In time the conceptualization broadened to signify insecurity and inadequate living conditions. At its most general, poverty means a lack of resources perceived as being necessary to maintain "a minimally decent life" (Blank 2008, p. 234). Poverty is "typically measured by an indicator of *command over resources*, typically annual income" (Haveman 2009, p. 388, italics in original), a simplification that made the concept of poverty more tractable. Income captures all ability to obtain needed resources to promote safety, health, development, leisure, self-actualization, and so on. Thus, without a modifier, *poverty* usually refers to a relative lack of income.

As with any simplification, it is easy to find fault with the basic concept of income poverty. First, quite simply, "money...does not buy everything" (Harvey and Mukhopadhyay 2006, p. 57). The assumption "that all else equal, more money should lead to greater happiness...has contributed to a tremendous emphasis on market income" as an indicator of well-being (Folbre 2009, p. 78) that many schools of thought are now reconsidering. Second, even in the context of sufficient income, access may be an issue. This may mean physical access and the consideration of space, as in economic geography (e.g., Strazdins et al. 2011), market access, discrimination, or other considerations of external constraints on using income to purchase needed goods.

Finally, there is the concept of time. Like income, time is the basic currency that allows people to pursue activities that increase their well-being, so much so that Krueger and colleagues (Krueger et al. 2009) called time the "currency of life". Time is inherently embedded in the mechanisms connecting low economic status and health and other outcomes, such as parental investments in the health and cognitive development of children, engaging in physical activity, and obtaining education and training. Furthermore, in addition to access, one must have the time to pursue and consume goods.

In this paper, we argue that time should be considered as a scarce resource to complement income. Exploring the time dimension of poverty has the potential to provide a deeper understanding of poverty, yet little work has examined *time poverty* since it was first introduced

by Vickery (1977). We examine the theoretical and recent empirical literature on time poverty, comparing and contrasting measurement of income and time poverty. Despite its potential, time poverty has lacked a unifying method or framework, resulting in a variety of measures built with relatively arbitrary operationalization choices making comparisons between studies difficult. We address this weakness by grounding time poverty measurement in common and accepted practices for calculating income poverty. Our goal is to provide structure to how time poverty is calculated to broaden its use, and to encourage future analyses to be more consistent and transparent in how time poverty is operationalized. We discuss common challenges analysts encounter when defining time poverty and bringing the concept into decision contexts, and propose a broad framework for categorizing activities into necessary and discretionary time. Finally, we outline and highlight areas for future research.

2. Operationalizing poverty: A brief primer

Defining poverty remains an area of much debate, as "'poverty' is an inherently vague concept, and developing a poverty measure requires a number of relatively arbitrary assumptions" (Blank 2008, p. 243). Identifying who is poor involves a headcount of those categorized as having critically low levels of resources. This is based on a three-legged stool of measurement that considers:

1. *What resources count?* For income poverty, the analyst must decide whether to include various forms of cash and near-cash income, count income before or after taxes, subtract basic expenses, and so on. More expansive definitions consider the market value of unpaid household production (child care, etc.).
2. *Whose resources count?* Analysts often assume all income accruing to the entire family or household is pooled.
3. *What should the threshold be?* "Critically low" implies collected resources at or below some level thought to indicate sufficiency. This cut-off or "poverty line" may vary by location, household composition, and so on.

There are inherent trade-offs when making decisions on each of these points, which produce multiple competing poverty measures. We briefly remind readers of these decision points with regard to income poverty before turning this same lens on time poverty.

In the U.S., the primary government poverty classification, first established in 1964, measures pre-tax money income for related or married household members. It does not consider household production of goods and services that otherwise would be purchased in the market, among other sources of consumption.[1] The threshold is an external standard based upon research showing that families spent one-third of their income on food in 1955 (Blank 2008; Haveman 2009). The U.S. Department of Agriculture (USDA) had developed an Economy Food Plan to reflect "the amount needed for 'temporary or emergency use when funds are low'" (Blank 2008, p. 235). The threshold took the estimated cost of this subsistence-level food plan and multiplied it by three to reflect an estimate of a subsistence-level budget. Equivalence scales create thresholds for different family sizes and the presence of elder family members, and these thresholds are adjusted for inflation using only the Consumer Price Index. This constancy and reference to some assumed basic level of subsistence means the U.S. measure is an absolute measure of income poverty.

Critiques of the U.S. poverty measure usually refer to a National Research Council/National Academy of Sciences report (Citro and Michael 1995) that laid out a number of potential improvements addressing each leg of the measurement stool. Various alternative poverty measures have grown out of this body of criticism (see, for example, Meyer and Wallace 2009 and Plotnick 2012). Most of these variations maintain the same threshold and vary whose and which resources count. (One exception is the Census Bureau's Supplemental Poverty Measure, which expands the income sources to include non-cash benefits and uses thresholds derived from data on expenditures on basic needs.)

In contrast, other income poverty measures take a different approach to setting the threshold. In developing countries, a basic absolute threshold of the equivalent of $1 or $2 a day is often employed. In Europe and Canada, the concept of *relative poverty* is used, where the threshold is derived from the observed distribution of income (usually at the household level) to count the poor as those at or below some proportion (e.g., 50% or 60%) of the relevant median income. By basing categorization on median income, poverty is judged against a moving

[1] It also ignores capital gains and "in-kind transfers such as food stamps and housing subsidies, child care subsidies, or the Earned Income Tax Credit (EITC), all of which increase the economic well-being of the family; nor does the money income concept account for work expenses or taxes paid, which reduce well-being" (Meyer and Wallace 2009, p. 37). Further, by officially defining families as consisting of related or married household members, it is insensitive to the current reality of varied household structures, most importantly the increasing prevalence of unmarried partners.

standard of living, such that being below the threshold is declared as being critically distant from this typical level of consumption.

> A relative poverty line roughly represents, in Adam Smith's words (Smith 1937), the cost of "those things which the established rules of decency have rendered necessary to the lowest rank of people (p. 822)."… The premise of a relative measure is that, whatever the level of absolute poverty, relative poverty better indicates the socially relevant level of economic need in an affluent society. Surveys suggest that the socially perceived relative poverty line in the U.S. has been 45 to 50 percent of median income (Plotnick 2012 p. 4).

Once an absolute or relative poverty measure is chosen, a simple headcount of the number of poor persons or families provides a basic measure of deprivation and need as well as an indicator of those at risk for poor outcomes. Some analyses move on to more complex measures. One may examine the *depth of poverty* or *poverty gap* (i.e. how far below the poverty line), or the *severity of poverty* (which squares individual poverty gaps to give more weight to those "more" poor; Foster et al. 1984). Others focus on the *chronicity of poverty*, attending to spell length, turnover, or differential rates of entering and leaving poverty (e.g., Bane and Ellwood 1986; Sandoval et al. 2009). Most attention, however, remains on the basic measurement of the proportion of the population currently adjudged to be in need because they are at or below the income poverty threshold of choice.

The basic headcount of income poverty retains its hegemony because population-level data are readily available or relatively easy to collect. Although there have been discussions and some movement towards multidimensional poverty measures, they have been slow to catch on because the varied dimensions proposed can be less straightforward to measure and data are not consistently and readily available. Furthermore, it will become increasingly difficult to account for the expanding skills, tastes, and connections from which people derive well-being in an ever-changing world. Thus, given the idiosyncrasies of what we pursue to make us happy, "going upstream" or simplifying poverty measurements to the basic units utilized to pursue well-being may better capture the ability to engage in that pursuit. To most economists, the basic unit is money, the assumptions being that actors have time (and as time is constant, all have the same

time) and access to markets. The latter assumption is weakened by considerations of discrimination and market failure, topics for other essays. People's time endowments are constant, and time represents a scarce basic resource that is allocated to pursue well-being. We focus on the need to incorporate time back into the discussion of poverty.

3. Time as a basic unit for creating well-being

Over the past decade, time use and time scarcity have captured the attention of researchers, policymakers, and the general public (Lam 2014), because, like income, it is intuitive and a basic resource required for escaping poverty and creating well-being. Interest in time use arises from several angles. Regardless of the term—time stress, time scarcity, time pressure, time constraints, or leisure inequality—these scholars study subjective or objective time deficits and the resulting effects on economic, psychological, social, and physical well-being. Many authors assume that some level of leisure time is an implicit requirement for well-being, creating a deficit for those with excessive time allocated to paid and unpaid work. *The Atlantic* article cited above (Lam 2014) highlighted the work of Hamermesh (2014), who has noted the increase in working hours in the U.S. and the UK, often without a commensurate increase in pay or enjoyment of life. The time costs of food production and incentives to consume prepared or fast food have become important in scholarship on obesity and attendant health risks (e.g., Bertrand and Schanzenbach 2009; Cutler et al. 2003; Hamermesh 2010), as have the time we allot to physical exercise and active transportation (e.g., Brownson et al. 2005; Meltzer and Jena 2010) and to sleep (e.g., Knutson and van Cauter 2008).

Many of these approaches stem from Becker's (1965) discussion of how households combine market goods and time to produce utility. How we allocate our time has a direct consequence for individual and household well-being, as time allocated to one activity carries opportunity costs of not engaging in other activities. These activities may include necessary tasks for basic health and functioning individually (e.g., sleep and hygiene) and within the family (e.g., cleaning and care of a child or elderly member), market activity, education, or health-maintenance activities. Time deficits arise when completing one set of required or desired activities (e.g., income production) precludes engaging in another set of desired activities (e.g., child care).

Most discussions of time use or poverty focus on the *quantity* of time allotted to various activities, but Reisch (2001) argues the *quality* of time is more important. Specifically, the quality of time depends upon 1) the availability of large blocks of time, 2) having autonomy over time allocation, and 3) having time that aligns with the time rhythms of others. Similarly, Etkin et al. (*forthcoming*) describe how conflicting goals for a particular hour decreases our enjoyment of that hour and make it feel shorter. Concerns about "taking work home" and the pressure to constantly check in with the office even when on vacation reflect recognition that how Americans sometimes spend their nominal "free" time may not be beneficial to their physical and mental well-being. While a focus on quality draws attention to the importance of the subjective aspects of time use, most researchers focus on the minutes allocated to different types of activities due to simplicity and lack of data on the quality of time. For example, Burchardt (2008, p. 19) writes, "The distinction between free and committed time does not rest on the extent to which it is enjoyable—that is an entirely different form of assessment—but rather on the degree of discretion the individual has in the here and now about whether to engage in it."

Much of the related literature has sought to highlight the value of time spent in household production (Folbre 2009). Any discussion of child rearing practices and related socioemotional, health, and educational outcomes inherently involves the time parents spend (or do not spend) with their children identifying and moderating emotions, modeling health behaviors, or reading and helping with homework. The time poverty and time use literature has also frequently highlighted the plight of working parents, particularly single parents, who must juggle work, food preparation, child care, and household maintenance (Bittman 2002; Douthitt 2000; Harvey and Mukhopadhyay 2007; Strazdins et al. 2011; Vickery 1977). At the same time, time poverty may negatively affect individual well-being by preventing an individual from participating in social activities, thus further marginalizing their position in society. For instance, a mother who is overworked and underpaid may be unable to volunteer her time to parent-teacher associations or other community action institutions. More recently, research has suggested poverty, both in income and time, may result in poor decisions that exacerbate and extenuate one's state of deprivation (Mani et al. 2013; Mullainathan and Shafir 2013). Unlike an abundance of income, excessive amounts of free time, as due to disability or unemployment, may not be useful for creating well-being.

Time allocation involves decisions based on monetary constraints, social pressures and norms, personal preferences, and other available resources such as our social networks. Some activities, such as childcare or cleaning, can be done by hired labor. Because of this, wealthier individuals (i.e. those with more monetary resources) are more likely to have time to allocate to activities they prefer, holding working hours constant. Poorer individuals, in comparison, may lack time saving devices (e.g., appliances, Internet access) and services (e.g., childcare, housecleaning). As a result, individuals with limited resources may lack the time necessary to escape income poverty (e.g., they may not be able to work enough hours at their current wage rate), or they may only do so at the expense of their individual and household well-being (e.g., neglecting childcare or sleep). Individuals and households that are both income and time poor thus face unique challenges. Otherwise identical families headed by a single parent with incomes just below the poverty line will enjoy quite different levels of well-being if one requires 80 hours of paid labor a week while the other needs only 40.

Finally, the importance of time as a scarce resource is embedded in the official US poverty measure itself, a notion largely forgotten in subsequent discussion of poverty measurement. The USDA publishes several food plans at varying levels of total cost, of which the Economy Food Plan—the basis for the government's original poverty threshold—is the cheapest. In general, the lower the cost of the food plan, the more it relies on at-home preparation of food, thrifty shopping, and skilled cooking and management to maximize meals and minimize food waste. These acts take time. For example, recent analysis of the time costs involved in the slightly more expensive Thrifty Food Plan found that following the food plan would require an average of 16 hours per week in food preparation alone (plus shopping, clean-up, etc.), far more than the average household allots (Rose 2003, as cited in Caprio et al. 2008). Vickery (1977) is regarded as the first to note what were essentially the forgotten time costs inherent in the U.S. poverty measure. Her analysis attempted to add these time costs back in, adjusting poverty definitions to “move” those whose income might be just above the usual threshold into the poverty category to reflect their lack of time to actually produce the meals assumed to represent basic subsistence.

As finite resources that must be allocated among different choices, there are parallels to how time and income are discussed and measured in economic and other social science literatures. These parallels and the terms used to describe them are summarized in Table 1, which

we discuss further in the next section. Some focus on how the level of the resource is experienced subjectively, such as perceived stress. Objectively, one may speak of the level of the resource itself, or discretize the overall distribution to focus on groups at similar levels. Most concern, of course, is with groups at the lower end of the distribution, and particularly those judged to have critically low levels of the resource.

Table 1: Conceptualizations of income and time

	Income	**Time**
Subjective measurement	Self-report relative rank (often overall socioeconomic status), subjective relative poverty, or reported financial stress (money pressure, trouble paying bills, etc.)	Time pressure/stress
Continuous measurement	Income, ideally aggregated across households/families; may focus on discretionary income versus gross income	Time in average day/week spent in various activity categories; usually focused on discretionary or leisure time, sometimes emphasizing committed and/or necessary time
Low levels	Low income, often defined as some multiple of the usual (absolute) poverty level (e.g., 185% of poverty) or as the lower end of the distribution in the observed sample (e.g., lowest quintile, below median)	Time scarcity, often defined as relatively low levels of discretionary time or relatively high levels of necessary and committed time
Poverty (critically low levels)	Income poverty is when income ≤ some threshold. The threshold is either defined in absolute terms (e.g., $2/day, the U.S. poverty threshold) or in relative terms (e.g., 50% of median income for families of similar composition)	Time poverty is when a defined set of time ≤ some threshold. The threshold is either defined in absolute terms (e.g., some assumed minimum amount of time for necessary activities) or in relative terms (e.g., 60% of median discretionary time)

4. Measuring time poverty

Vickery's (1977) work is the oft-cited progenitor of time poverty. Her analysis focused on incorporating time into the economic model of the household, bringing attention to equity issues arising from differential adult hours available to households, and defining "more accurately the resources and choices available to various types of households" (p. 35). Outside of

time use studies (and accompanying refinement of survey measurement) and some discussion of time costs and time pressures, researchers did not adopt or expand upon Vickery's time poverty concept until Douthitt (2000; as cited in Kalenkoski et al. 2011) updated her adjusted poverty rates using the 1985 American Time Use Survey.

Measuring and estimating time poverty can be technically challenging, although no more challenging than measuring income. Objectively measuring time use and time deficits requires careful accounting of how individuals allocate blocks of time to specific activities. To name just a few challenges, researchers face trade-offs with implications for respondent recall (bias and measurement error), selecting the appropriate method that balances the grain or scale of measurement versus respondent fatigue (e.g., retrospective versus time sampling methods, and the required number of time blocks), and whether to ask for primary versus secondary tasks (e.g., Masuda et al. 2014).

When measuring time poverty, researchers first face a conceptual question about the extent to which time is considered independently of income, and then a familiar set of measurement decisions. The *who* leg of the measurement stool is relatively straightforward: Most consider individuals of working age, perhaps excluding those in school. Some aggregate across all adults in a household, which may mask important differences in allocation of tasks. More substantial differences occur via choices about the other two legs of the measurement stool, which determine how various activities are classified to produce the aggregated focal time considered, and the development of an absolute versus relative threshold.

Vickery's (1977) analysis developed a two-dimensional conceptualization of income poverty adjusted for time in the U.S. context. Douthitt (2000) updated Vickery's model using data from the American Time Use Survey. Bardasi and Wodon (2010; in Guinea) and Harvey and Mukhopadhyay (2007; in Canada) are among those who have followed this approach (see Zacharias (2011) for a review of the time-adjusted income poverty approach using a common analytical framework). The similar approaches of Freely Disposable Time (FDT; Hobbes et al. 2011) and Discretionary Time (DT; Goodin et al. 2008; Goodin et al. 2005) are somewhat simpler, converting necessary monetary expenditures to time via a household income rate so that all needs can be expressed in terms of hours.

In contrast, Kalenkoski and colleagues (Kalenkoski and Hamrick 2012; Kalenkoski et al. 2011) have argued for considering time as an important resource and time poverty as an

important risk factor independently of income poverty. Similarly, Bittman (2002) finds "that income plays an *insignificant* role in the distribution of leisure time" (p. 415; italics in original) and examines the distribution of risk of time poverty in and of itself. Spinney and Millward (2010) conclude that, considered independently, "time poverty may be more important than income poverty as a barrier to regular physical activity" (p. 352). Even those who consider time poverty separately generally include income or income poverty as a covariate in modeling the effects of time poverty (Spinney and Millward 2010 being an exception).

The aggregation of time use activity categories into the sum of time of interest is especially important, as it requires development of consensus and reliable activity classification systems. Scholars have arguably focused least on this ingredient. All considerations of time poverty are based upon the delineation of time into some collected categorization of focal time, although even when a similar classification scheme is used there is still substantial variation in how activities are classified. Some rely on the basic economic division between work and leisure. Some use Gershuny's (2011) "triangle of daily activities", consisting of paid work, unpaid work, and leisure. Others cite "the four kinds of time" of Ås (1978, p. 133), which divides activities into necessary, contracted, committed, and leisure time. Necessary time includes those activities thought to be required to satisfy basic physiological needs, such as eating, sleeping, health, and hygiene, although many have discussed eating as being a leisure time activity, at least in developed countries (e.g., Hamermesh 2010; Jastran et al. 2009). Contracted time includes activities that create income, while committed time refers to "activities that must be performed given previous life choices" (Kalenkoski et al. 2011, p. 133) such as getting married, owning a home, or having children. These activities are often referred to as unpaid work or household production. Leisure time is what is left after the other blocks of time are subtracted from 24 hours for the day or 168 hours for the week.

While categories developed by Ås (1978) and Gershuny (2011) address the questions raised in the well-being literature about the classical economic division between work and leisure (Folbre 2009), in the end all measures of time poverty aggregate time blocks into what is considered necessary (e.g., paid work plus unpaid work, or necessary time plus contracted time plus committed time) and what is discretionary (i.e., residual) time. Note again that we are not considering the quality of a particular minute, but rather the primary purpose of the activity engaged in for that minute. Some nominally focus on necessary or committed time and highlight

those in excess of some threshold, while others focus on discretionary time, highlighting those with critically low levels. These approaches are essentially equivalent since discretionary time is 24 hours (or 168 hours) minus necessary time, however defined.

Once activities are divided into necessary and discretionary time, the resulting time sum of interest is judged against some threshold. That threshold may allow for identification of those with a deficit of discretionary time or an excess of time allocated to necessary activities. Scholars may focus on minutes spent in nominally "necessary" activities beyond what is "strictly necessary" (Goodin et al. 2005, p. 44), or may allow individuals to allocate time to activities deemed necessary as they see fit and thus assume all the time in "necessary" activities was considered necessary. Where the threshold is set determines whether more or fewer individuals or households are deemed time poor, and whether rates of time poverty are higher in some groups than others.

How the threshold is described depends upon how the focal time is developed and described. For example, Harvey and Mukhopadhyay (2007) make three adjustments to Vickery (1977), where both focus on comparing *allocatable time* (T_A) to what is actually allocated to paid work (T_W). If the externally constructed *allocatable time* is less than the time actually spent in paid work, the individual is adjudged to be time poor. *Allocatable time* is that estimated to be available for either paid work or leisure. In other words, the concern is whether leisure time is negative, where:

$$T_L = T_A - T_W.$$

Allocatable time is constructed from subtracting two external standards from the 168 hours available in a week: One standard (T_N) represents the (constant) time an individual is thought to require to "maintain his or her mental and physical well-being" (Vickery 1977, p. 32), while the other (T_1 in the notation of both Vickery and Harvey and Mukhopadhyay 2007) is the amount of time deemed necessary for the individual to contribute to upholding a household, which varies by household composition to reflect needs and economies of scale:

$$T_A = 168 - T_N - T_1.$$

Putting these time blocks together, an individual is judged to be time poor ($T_L < 0$) if:

$$168 - T_W < T_N + T_1.$$

Vickery (1977) and Harvey and Mukhopadhyay (2007) differ slightly in their derivation of the standards of necessary personal time (T_N for sleeping, dressing, eating, personal hygiene, etc.) and necessary minimal household maintenance (T_1). Based on an early (1966) time use survey from Michigan, Vickery estimated the average time allotted to the core necessary tasks of 10.2 hours per day, or 71.4 hours per week, to which she added an arbitrary amount of 10 hours per week of "necessary" leisure time (T_N = 81.4). Harvey and Mukhopadhyay based their necessary time standard on a 1998 Canadian time use survey which found an average of 10.5 hours per day for the allotted activities, to which they added an arbitrary 2 hours per day of necessary leisure time for a total of T_N = 87.5 hours per week. The minimal household maintenance time standards for each were similarly derived from survey data on time allocated to housekeeping, food preparation and clean-up, household shopping, childcare, and other household maintenance activities. Harvey and Mukhopadhyay used the averages (by household composition group) among those households with at least one adult reporting "homemaker" as their main occupation, while Vickery argued for using averages of what full-time employed women allocated to home maintenance. The resulting time standards for a single parent with 2 or 3 children, for example, were T_1 = 61 hours per week for Vickery and T_1 = 57.3 hours for Harvey and Mukhopadhyay.

The resulting $T_N + T_1$ values represent an absolute time poverty threshold, varying by household composition in a similar way to how the U.S. income poverty threshold varies by household. Absolute time poverty thresholds incorporate assumptions about minimum levels needed to maintain basic standards of mental health, hygiene, and home maintenance, assumptions that appear to be less grounded in prior research than the U.S. income poverty threshold. In Douthitt's (2000) update of Vickery (1977), for example, the time constraint is assumed[2] to be "24 hours less 11.5 hours for sleep and personal care" (p. 10; i.e. T_N = 11.5 hours per day or 80.5 per week) and 2 hours per day is described as "subsistence amounts of time

[2] Douthitt (2000) ascribes this assertion to Vickery, but note that Vickery's time constraint, itself based on the inclusion of "necessary leisure", was 81.4 hours per week.

[for]...household production (i.e., cooking, cleaning, laundry, child care, etc.)" or the minimum T_1 (p. 11). Once minimum thresholds for sleep, personal care, and household maintenance are established, the same standard could theoretically be applied in subsequent research, much as the original threshold has lived on for income poverty since 1964 (without, of course, the need to update the threshold for inflation). In practice, this does not appear to happen—even Douthitt, while largely faithful to Vickery, updates values of T_1 from a broader and more detailed survey of time use.

A contrasting approach parallels relative income poverty measures. Rather than making a set of assumptions about hours needed to maintain subsistence-level hygiene, sleep, household maintenance, and so on, relative time poverty measures first define the set of time of interest, and then define critically low levels based upon the observed distribution of that set of focal time. Bittman (2002), for example, focuses on leisure time, and defines time poverty as those in his sample at or below 50% of median leisure time, while Spinney and Millward (2010) focus on necessary time (contracted and committed time, as described above), defining time poverty as those at 150% or more of median necessary time in the 2005 Canada General Social Survey time use dataset. Bardasi and Wodon (2010) use a relative time poverty definition in Guinea, while Burchardt (2008) applies a 60% of median free time definition to UK Time Use Survey 2000 data. In the DT approach (Goodin 2008; Goodin et al. 2005), "strictly necessary" time for personal care and household labor are defined as the population mean time spent in the relevant activities minus one standard deviation, while necessary paid labor time is defined as the relevant income poverty threshold (which in their original application, in Australia, is a relative threshold) divided by an adjusted wage rate.

Kalenkoski and colleagues (Kalenkoski et al. 2011; Kalenkoski and Hamrick 2013) are perhaps the leading practitioners of relative time poverty measurement. Using American Time Use Survey data from 2003-2006, they create time poverty thresholds for a variety of definitions, using 50%, 60%, and 70% of median discretionary time (after subtracting necessary and committed activities from 24 hours) for the overall sample and within subpopulations defined by various combinations of household composition, income categories, and employment. Most analyses in the original article use 60% of median for the overall sample, lumping together employed and unemployed, single parents and homemakers, those with children and those without, and so on. With this broader approach, they find that the probability of being time poor

varies most by employment and child status. The number of adults in the household had a significant but small effect, while the effect of income varied greatly by household composition. Kalenkoski and Hamrick (2013) then apply this same definition to study the relationship between time poverty and diet and exercise.

5. Strengths and weaknesses of absolute and relative time poverty measures

As with relative income poverty, relative time poverty ties the threshold to a presumably moving indicator of the standard of living in the society. Using some proportion of the overall median of the distribution of discretionary or leisure time allows the resulting standard of living to move as technology, norms, retirement age and life expectancy, and unemployment change within the society. Such a relative poverty threshold may soon no longer represent a level of free time critical for well-being as the standard of living changes. If the vast majority of a society continues to feel the need to dedicate more time to work and other necessary activities, 60% of median discretionary time gets smaller and smaller. Indeed, as no assumption of basic or subsistence level discretionary or free time is required, it is less critical to "properly" define the focal set of activities, as the threshold is defined with respect to the population distribution of the constructed focal time.

Relative time poverty threshold choices become more complex (and probably unnecessarily so) when the analyst tries to apply different standards of living to different subsets of the population. Should employed people be judged time poor by the standard set by their unemployed peers? Or vice versa? Should individuals in households with more than one adult have their presumably greater free time be judged against a different threshold than a single parent household? Using standards based on the distribution within multiple adult households (or unemployed adults, or households without children) will result in a higher time poverty rate among single adult households (or employed adults, or households with children). Kalenkoski et al. (2011) tested the sensitivity of time poverty rates to varying the medians by household composition alone and in combination with the presence of a young child, income category, and employment status, and concluded that only using the medians of non-employed adults (within household composition by income category groupings) made an appreciable difference. They chose not to break out the population by what might be other important drivers of free time, such as homeowners versus renters or students versus nonstudents.

The DT approach ironically relies on relative thresholds—the observed mean minus one standard deviation—to define "strictly necessary" personal and household labor time. Assuming (as Goodin et al. 2005 do) the time spent in these activities is normally distributed, these definitions of subsistence personal and household labor will always define approximately 84% of the sample as doing more than "strictly necessary" and almost 16% as doing too little, even as societal standards of living move the actual time associated with the 16th percentile up or down.

Among activity sorting approaches that subtract all time spent on activities deemed necessary, the choice to analyze 50%, 60%, and 70% similarly appears to be arbitrary, and little justification is given for using 60% other than its frequent use as the relative poverty threshold in both other time poverty measures and in income poverty measurement. For example, Burchardt's (2008) choice of time poverty threshold is introduced simply as "A commonly-used relative threshold for income poverty is 60 per cent of median income. A rough equivalent for time poverty is 60 per cent of median free time" (p. 20). That is, 60% seems to be winning out because it has been selected in the past. A different choice of threshold might better identify a group at risk of poor outcomes due to lack of time to spend on rest, recovery, or caring for children or needy adults.

Absolute poverty, in contrast, assumes some minimum subsistence level of time allocated to key activities regardless of most individual or household characteristics, and allows these drivers to create differences in time poverty rates. Using the same threshold in later research, as in income poverty measurement, would imply believing that basic basket of necessary time to be constant, despite technological time-saving advancements (e.g., washing machines). Both Vickery (1977) and Harvey and Mukhopadhyay (2007) speak of T_1 as if it was based on using no mechanical appliances, cooking from scratch, etc., but it is unlikely such households exist in their samples. The composition and amounts of timed assumed necessary for those basic activities are subjective and easily criticized as value-laden.

Similarly, the FDT proposal of Hobbes and colleagues (2011) relies on per-activity standards of basic levels of sleep, chores, food, and so on. If, indeed, "FDT is the time not dictated by the necessities of life" (p. 2055), a delineation of time and money needed to meet those necessities would appear key to such an approach. The authors rather gloss over the establishment of these standards: "Since this paper focuses on the principles of FDT assessment rather than exact outcomes, issues of quantification of basic needs are not a major concern here"

(p. 2057). In the appendix figure (p. 2068) in which they further explicate the methodology, the source of the basic needs thresholds is simply “International standards or plausible minimum in primary data”...which appears in a drawing of a cloud.

In contrast, recall that the official U.S. income poverty threshold relied on the USDA's development of a subsistence food budget and on research indicating the proportion of a household's budget typically spent on food. An outstanding question for the absolute time poverty approach, then, appears to be how thresholds are determined, and the balance of science-based standards (e.g., hours of sleep) and more normative ingredients (e.g., necessary leisure). If put into continued use, an accepted absolute time poverty definition might demonstrate the benefits of time-saving technology, moving more people above the threshold, or help highlight the issues facing adults caring for parents with increasing longevity but decreasing pensions.

6. A modest proposal for properties of a time poverty measure

We believe a measure of time poverty would be useful as a complement to income poverty to identify those with relatively little command over key resources needed to support consumption and well-being. Just as income poverty is used to identify groups that may be at higher risk for poor health, education, social, emotional, and mortality outcomes, a time poverty measure would be useful for identifying and investigating those who remain at risk even though their incomes are above poverty, or to capture in the short run benefits to time allocation from an intervention or technological change that may have long run benefits in other domains. Similarly, the time poor may represent a group to specifically target in an intervention, or a group expected to see benefits from an intervention that may not affect those with a favorable amount of discretionary time. Based on the discussion above, we believe that measuring time poverty is in its nascence, and that further clarification of terms and justification of choices is necessary.

To be useful as an outcome measure or marker of risk, a time poverty measure should, *ceteris paribus*:

1. Find higher time poverty among single parent families than among dual parent families (with the same number and age of children), who in turn should have higher rates than childless couples.

2. Find higher time poverty among adults with more than one job than among those with one job (even if the hours worked are equivalent, due to the need to commute between jobs), who in turn should have higher rates than unemployed adults.
3. Identify a group at relatively higher risk for poor outcomes thought to be associated with the ability to allocate and enjoy discretionary or leisure time.
4. Be based on thresholds and standards that are free from arbitrariness or value judgment as much as possible.

The first two properties represent potential natural validators of a time poverty measure. Empirically, comparing rates across the defined groups may show that a time poverty measure is "acting" as expected. The third point highlights a time poverty measure's potential use for research and policy. The fourth property highlights weaknesses in definitions that rely on standards of subsistence-level time for given activities. To date, these thresholds are unsatisfying. As noted above, some absolute time poverty approaches speak of their standards as though they arose from pre-technological households with no labor saving devices or purchases. The FDT and DT approaches seem inviting when one thinks of individuals who spend "excessive" amounts of time on eating, sleeping, or personal care. They differentiate between essentially what a household needs to spend on basic activities and the time and money they actually spend on those activities. That is, both rely on judgments about what is necessary to spend on sleep, food, household chores, and so on, which parallels Vickery (1977) and others before them differentiating "necessary leisure" from the balance of leisure time.

Approaches that rely on some set standard of basic needs can be strengthened by reliance on scientific standards to define "necessary" or "excessive". Hobbes et al. (2011), for example, use a UN Food and Agriculture Organization calorie standard to set food needs, although in application this brings up issues of dietary choices and caloric efficiency, and treats all time costs of food production as marginal costs. Similar thresholds might be available for other needs, such as sleep, but less so for household maintenance, social obligations, or basic consumer goods. In the end, approaches that essentially set thresholds for multiple types of activities in a subsistence time budget are faced with the same difficulties of trying to establish an income poverty budget based on a particular market basket of goods (Blank 2008).

Until such thresholds can be developed, the field would be better served by using relative thresholds. Whether 60% of median or one standard deviation below the mean, such thresholds

move with the standard of living of the society under analysis. In return for ease of calculation, one gives up the ability to analyze how changes in technology and time preferences change time poverty levels across the society, as well as the pretense of the threshold representing a subsistence-level time budget—the term "strictly necessary" should not apply to a standard set by finding the 16th percentile in one's sample. Further work on the choice of threshold is necessary. In income poverty measurement, the "subjective poverty line" is based on surveys that ask what people need to get along in the local community. Over the years, this has tracked well with 50% of the median income, and better with 50% of mean income (Blank 2008). Similar work could inform choices about a time poverty threshold. This would require some level of consensus about what basket of time to consider.

7. Guiding categorization of necessary and discretionary time

One of the challenges researchers face when developing a time poverty measure is categorizing activities to determine what counts towards an individual's time surplus or deficit. This task is not simple. Many categories are not easily delineated into work and free time, and scholars have noted the difficulty of categorizing activities (Harvey and Mukhopadhyay 2007). Previous research has not been systematic (or at least transparent) in categorizing activities, and this can create inconsistent definitions and headcounts of time poverty. Indeed, in a review of eight papers investigating time poverty or scarcity, we find little overlap in how they categorize activities. Only activities labeled as socializing, relaxing, and leisure, and those described as sports, exercise, and recreation had agreement across studies as being discretionary activities (although note above the inclusion of necessary leisure time as non-discretionary by Vickery 1977 and Harvey and Mukhopadhyay 2007). There is substantial disagreement in most other categories. Vickery (1977) and Harvey and Mukhopadhyay (2007), and possibly Burchardt (2008), regard eating and drinking as necessary, while Kalenkoski et al. (2011), Kalenkoski and Hamrick (2013), Aguiar and Hurst (2008), and Spinney and Millward (2010) count it as discretionary. Half of the articles appear to put education in the necessary category, although Burchardt (2008) does so only for employment-required continuing education and Bittman (2002) excludes "hobby education." Those focusing on leisure time have more restrictive definitions (that is, their leisure is a subset of others' discretionary time), but inconsistencies

remain: For example, Aguiar and Hurst (2008) includes personal care activities as leisure, while Bittman (2002) does not.

To address these concerns we build on the existing literature on time poverty by proposing two categories: necessary and discretionary activities. We define necessary activity time as time an individual spends on activities required to meet the basic necessities of life in a given society. This includes activities that are required by law or social norms. Activities meeting this definition are included whether they are done by that individual or by paid labor. Discretionary activity time is time spent on activities that people by and large choose to do. It implies that there is a level of freedom of choice that is not associated with necessary time. Note, again, that while it might be satisfying to differentiate the amount of time within an activity category that is "strictly necessary" from that representing a high level of freedom, the thresholds needed to do so are currently highly subjective and value-laden. Instead, we focus here on assuming individuals make rational or at least satisficing decisions about how to allocate time to various activities given their own realities.

Activities that fall into necessary activity time can be informed by existing frameworks on basic human needs, such as Maslow's (1943) hierarchy of needs. In this framework, physiological and safety needs are necessary. Excessive amounts of time spent on these tasks implies lower well-being, *ceteris paribus*. Love and belonging (the third stage), however, are less clear and do not currently align well with time use activity coding. There should be a focus on the social requirements and norms for activities that fall into this category depending on the context of the research. Again, surveys that assess opinions about the amount of time needed for various activities might offer insight. Focus group interviews or other qualitative data can inform this process, as well as existing ethnographic or anthropological literature. For instance, social norms in some countries may require some minimal amount of time dedicated to religious activities, while other countries may have much less social pressure regarding this time allocation.

We recognize the prevailing challenge of categorizing activities. It is clear that the exercise requires many assumptions, similar to the assumptions made when aggregating income sources to identify families experiencing income poverty. Most importantly, when defining time poverty researchers should be transparent in how they categorize activities, and be explicit about

the logic and criteria for decisions. We outline a few guiding questions that can provide structure to this process:

- Will not participating in an activity socially exclude or place an individual at risk of harm from government or peers? If yes, this is most likely a necessary activity.
- Does the majority of the population participate in an activity as a necessary or discretionary activity? Here exploring past time use data as well as relevant qualitative research may be helpful.
- Are the goods/services produced or procured by the activity needed to maintain a basic lifestyle, whether or not they are done by the individual or by paid labor? If yes, this is most likely a necessary activity.
- Even if an activity is customary within a culture, is there significant personal choice in how much time to spend in that activity? If yes, it is likely a discretionary activity.

8. Conclusions and next steps

In this paper, we review the existing theory and empirical work on time poverty. Income poverty measurement is mature, and despite Blank's protestations about "arbitrary assumptions" (2008, p. 243), there is much consensus about most of the decision points that create poverty measures. Time poverty measurement, in contrast, is currently immature and full of arbitrary assumptions, but there is promise for the future. By applying some of the basic tenets of measurement utilized in defining income poverty, which may be familiar to many readers, we hope to have increased understanding of and appreciation for the concept of time poverty.

We believe time poverty can play an important role in policy research and evaluation and in intervention planning. Policies that increase discretionary time available to the time poor, as with those that increase income among the income poor, will likely have multiple short- and long-term effects among poor individuals and their families. Universal preschool or family leave policies, for example, may see positive effects on time use and time poverty even before changes in important child development outcomes can be detected. Similarly, in developing countries an intervention may inspire reallocation of time away from resource collection to other more desired activities before any change in overall consumption. Time poverty may be an important moderator of intervention uptake or effect. Ignoring time poverty in a community may result in an intervention with low participation rates. In combination with income poverty, it may identify

groups at risk of a number of poor outcomes, and thus groups who may particularly benefit from certain interventions.

Time poverty fits within a broader literature highlighting the need for an expanded set of measures for understanding the state of society, going beyond Gross Domestic Product and income poverty. Like these indicators, it uses a basic unit required in creating quality of life, assessing command over a critical resource. Further, the data requirements are in some ways simpler than multidimensional poverty measures, and a time poverty measure can be validated with respect to other known measures of population well-being, such as subjective well-being. Linking time poverty to well-being may provide a way to incorporate the subjective experience of time without measuring the quality of each minute and yield new information for how we think about time poverty.

In order to be a useful measure, however, more rigor must be applied to measuring the underlying time of interest and in the choice of thresholds against which that sum of time is judged. While we recognize the many assumptions that need to be made when categorizing activities, we highlight the need for a systematic and transparent categorization of time use activities when defining and calculating time poverty. Not all studies have been clear in how they define and categorize activities, and where studies have been transparent, there has been little agreement, limiting comparison across studies. We have defined necessary and discretionary activity time and provided guiding questions to structure categorization of time use activities. This is a critical step in defining time poverty and creating comparable time poverty headcounts.

More work and data are needed to clarify discretion in time poverty. Time poverty research defines discretionary time similarly to discretionary income, in which the analyst does not question whether every dollar on the water bill or included in housing costs is "strictly necessary". People can experience different levels of discretion in how they allocate their time – whether an hour is dedicate to producing income, looking after their children, or to providing food to their families. Similarly, not every hour of leisure time will be experienced in the same way. Sorting activities into necessary and discretionary categories is a necessary simplification for measuring time poverty. Future work should examine whether and how to identify whether categories are actually discretionary. Subjective well-being data linked to activities may be a first step to this question.

Theoretical and methodological discussions should focus on the advantages and disadvantages of relative versus absolute time poverty measures. An absolute measure has implications for cross-country comparisons of time poverty, while implying there is indeed a minimum level of time required to maintain some basic standard of living. Relative time poverty measures do not assume a subsistence level of time, and thus the categorization of activities into necessary and discretionary becomes less critical (as long as it is consistent). Further, more discussion and research is needed on individual versus household time poverty rates. These measures likely tell different stories about deprivation, and individual time poverty could reveal challenges resulting from inequities in intrahousehold allocation of time, tasks, and resources.

While time poverty as a concept was formally established by Vickery (1977), only relatively recently have researchers started to investigate the uses, causes, and potential consequences of time poverty. More importantly, we are aware of no published work that has formally investigated policies that are likely to decrease time poverty, or specifically target those that are time poor. What types of policies might ease the burden of the time poor? Current attention to issues such as child care and universal preschool, family leave and sick pay requirements, providing more predictable work schedules to low wage retail and food service workers, overtime pay, and provision of benefits to part-time employees indirectly address time use and time poverty, particularly among lower income workers. In developing counties, many basic household activities as well as income or food production take considerably more time. Policies improving natural resource management (e.g., improving water access [Cook et al. 2012]), increasing food aid (e.g., decreasing time spent in home production), sex education and family planning initiatives (e.g., time spent in childcare), and conditional cash transfer programs (e.g., increasing the ability of individuals to hire day laborers) may have important benefits to time allocation that have largely been unstudied. These policies may especially benefit women, as they are often responsible for many of the time consuming and labor intensive tasks that can lead to time poverty.

Developing and evaluating policies that explicitly target time poverty can provide deeper insight, and there are many outstanding questions. Does time poverty limit individuals in a vicious cycle of poverty, ill health, and multigenerational deprivation? Is time poverty a societal concern for economically rich and poor countries both? There is clearly a need for more time poverty research if it is to be established as a useful and common measure employed to test and

design policies. Research linking the impacts and inclusion of time poor populations need not be limited to social policies—indeed, it is likely that in economically developing countries there is a link between environmental degradation and the time poor, which has implications for climate change research and policies. Still, if there are to be advances in time use and time poverty research, researchers and policymakers should invest in robust time use data collection methods and employ transparent and systematic estimates of time poverty.

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REVIEWERS' APPENDIX

Appendix A: A brief discussion of multidimensional poverty

One theme in the poverty literature focuses on so-called multi-dimensional poverty (e.g., Oxford Poverty and Human Development Index), which essentially steps back to consider a broader view of resources. These measures may account for psychosocial factors, such as quality of work, engagement in political activities, social connectedness, and psychological well-being, physical health and wellness, and access to basic needs. Haveman (2009) notes the importance of such considerations, arguing that individuals may be socially poor (e.g., socially isolated), house poor (e.g., living in squalid conditions), and health poor (e.g., unhealthy). By moving beyond income, researchers and policymakers hope to capture a more complete view of hardship and move towards a deeper understanding of the human condition. The multi-dimensional poverty literature, however, has yet to reach consensus on what to measure.

Multidimensional poverty measures are largely motivated by the idea that less well-off people tend to experience deprivation as more than just money. In participatory research exercises, OPHI (2012) found supporting evidence for defining poverty beyond just income, with participants describing ill-being as a function of "unemployment, low income, poor health, nutrition, lack of adequate sanitation and clean water, social exclusion, low education, bad housing conditions, violence, shame, disempowerment and so on" (p. 1). A marginal increase in income will amend these deprivations to varying degrees, depending on time and access to markets. Money income is a better indicator of consumption in the context of complete and functioning formal markets, less so in areas where home production and barter predominate.

There is growing support for constructing multi-dimensional measures of poverty, even as promoters argue about which dimensions to include.

> While the Western nations were well served by an income poverty measure a half-century ago, today a variety of additional considerations—including the level of cognitive and noncognitive skills, access to important social institutions (for example, the labor market), the ability to attain minimum standards of food and shelter, and having sufficient time for home production and child care—need to be taken into account (Haveman, 2009, pp. 397-398).

An advantage of a multi-dimensional poverty measure is that it is likely to be more sensitive to policy interventions. For example, if a society changes policy in order to increase school attendance, this will have little effect on income for years, but will have a more immediate effect on measures of schooling (OPHI, 2012) or cognitive and noncognitive skills. Further, the long-term effects of increased education go beyond income. For example, education is positively correlated with health behaviors and outcomes, such as smoking and mortality, and measuring only income can severely underestimate the positive impacts of the policy.

As we stated in the main text, however, multidimensional poverty measures are not without their critics. There are often restrictive data requirements, and cross-country comparisons may be difficult if multidimensional poverty measures are context specific. Few have been repeated, further hindering the ability of policymakers to interpret an index value and gauge relative progress.