

# Time-use Profiles, Chronic Role Overload, and Women's Body Weight Trajectories from Middle to Later Life in the Philippines

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## Abstract

Although chronic life strain is often found to be associated with adverse health outcomes, empirical research is lacking on the health implications of persistent role overload that many women around the world are subject to, the so-called double burden of work and family responsibilities. Using data from the Cebu Longitudinal Health and Nutrition Survey (1994–2012), we examined the linkage between time-use profiles and body mass index (BMI) trajectories for Filipino women over an 18-year span. Out of the four classes of women with differential levels of a combination of work and family duties, the group with the heaviest double burden has the highest average BMI. In addition, those who have remained in this class for three or more waves of data not only have higher BMI on average but also have experienced the steepest rate of increase in BMI upon transition from midlife to old age.

## Keywords

body mass index (BMI), double burden, role overload, time use

With caregiving and domestic duties often considered the domain of women in most parts of the world, increasing female representation in the workforce means that a growing number of women are juggling work and family responsibilities—a phenomenon often characterized by the term *double burden* or *second shift* (Bratberg, Dahl, and Risa 2002; Hochschild and Machung 2012). Researchers have explored the potential harm associated with work-and-family-conflict issues (Floderus et al. 2009; Hewitt, Baxter, and Western 2006). However, we know surprisingly little about the long-term health effects of the *combination* of work and family duties for women, especially as they enter into and exit from midlife, a life stage characterized by complex demands from various life domains and potential early onset of chronic illness and disease (Lachman 2004). While engagement in multiple

roles could enhance psychological and emotional well-being, excessive demands from work, caregiving, and household chores could also become a source for elevated stress, especially when such role overload has endured and accumulated over the life course.

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Existing research has suggested an association between demands or stress from paid or domestic work and changes in body weight (Block et al. 2009; Kivimäki et al. 2006). Being overweight or obese, as indicated by a high body mass index (BMI), is associated with higher risks for mortality and morbidity, such as heart disease, type 2 diabetes, and some forms of cancer (Brunner, Chandola, and Marmot 2007). The increasing prevalence of obesity has become a global epidemic (Atella and Kopinska 2014). While key behavior factors, such as excessive calorie intake in food consumption and insufficient physical activity, are well-identified causes for overweight, the understanding of psychosocial factors as underlying mechanisms remains unclear in the literature.

This study is set in Cebu, Philippines. The Philippines is in the middle of an epidemiologic transition: a quarter of adults are overweight, a greater proportion of which are women (Pedro, Barba, and Benavides-de Leon 2008). Recent surveys have identified obesity as an emerging public health issue in the Philippines (Economist Intelligence Unit 2017). Existing studies on obesity in the Philippines have identified socioeconomic status (SES), urban residence, and hours of employment as significant predictors (Adair, Gultiano, and Suchindran 2011; Colchero and Bishai 2008). In this paper, we are interested in documenting an underexplored area of health research, the double demands from work and family over the life course, as a source of potential role overload for women. Using rich time-use diary data from the Cebu Longitudinal Health and Nutrition Survey (CLHNS), we developed time-use profiles to capture the diversity in women's work and family responsibilities. Previous research using these data has identified four classes of women with differential levels of a combination of work and family responsibilities (Chen et al. 2018). We expect those with a heavy double burden in work and family arenas will have a higher BMI than those other groups. In addition, we maintain that excessive dual demands from both arenas for an extended period could amount to chronic life strain. Such wear and tear on the body could have cumulative effects by not only elevating the level of BMI but also accelerating the rate of increase in BMI trajectory.

## BACKGROUND

### *Cumulative Disadvantage and Chronic Overload for Women in Midlife*

The view that health risks accumulate from birth and middle age into old age has been widely

accepted in the field of health and aging. The cumulative disadvantage theory posits that early adversity in life accumulates and translates into additional disadvantages and consequently leads to widening health disparities in later life (Dannefer 2003; O'Rand 2003). A large body of literature on health disparities over the life course has lent support to the cumulative disadvantage theory with a range of health outcomes, including self-reported health, physical functioning, or health problems, such as obesity, hypertension, heart disease, and cognitive decline (Ferraro and Kelley-Moore 2003; Umberson et al. 2014). Validation of the theory has also been found in a variety of national settings, including the United States, China, and European countries, although more work has been done on developed than on developing countries (Chen, Yang, and Liu 2010; Leopold 2018).

Despite these major developments in the study of life-course inequalities, more empirical research that systematically examines the cumulative disadvantage process of health is urgently needed. Existing health literature overwhelmingly centers on the impact of social stratification, most notably on SES or racial-ethnic inequality (Geronimus et al. 2006; Pavea and Latham 2016; Umberson et al. 2014), and pays relatively less attention to other chronic stressors or inequality processes at play. One underexplored research area in the test of the cumulative disadvantage theory in health research is a type of chronic strain that many women around the world are subject to on a daily basis: an overload of work and family responsibilities. These duties can be particularly burdensome in midlife, as care demands for home, spouses, children, and parents intensify or even overlap. Persistent gender inequality in both the workplace and family arena is almost universally observed (Jacobs and Gerson 2005). There is no shortage of literature on work-and-family-conflict issues, as women still shoulder the lion's share of caregiving and housework, despite their increasing presence in the labor market (see review by Bianchi and Milkie 2010). However, many studies tend to be segmented, often exclusively considering one side of the burden, for example, job strain or caregiver stress, with work status or family status as a control (Moen, Kelly, and Lam 2013; Perry-Jenkins et al. 2007). For those that explicitly address work-family conflicts, existing studies often focus on the subjective report of stress or strain (e.g., Roxburgh 2005), only a few have examined the combination of work and family load and their health implications (Barnett and Hyde 2001; Bratberg et al. 2002;

Strazdins et al. 2016), and none have focused on long-term health effects over the life course.

Theoretically, the role strain perspective proposes that the occupancy of multiple work and family roles can lead to role overload, and competing demands from work and family duties can lead to job and family dissatisfaction, tension, and life stress (Davis et al. 2008). There are possible detrimental effects of multiple roles when the number of roles or the time spent on one role exceeds a certain limit (see review by Barnett and Hyde 2001). Some studies suggest that the double burden of paid work and housework is associated with higher risk of physical health deficits and psychological distress for women, especially when they shoulder the main domestic responsibilities (Bratberg et al. 2002; Roxburgh 2002).

Other studies, however, find that the impact of double demands from full-time paid work and childcare on women's physical and psychological health is inconclusive (Floderus et al. 2009; Hewitt et al. 2006; Krantz, Berntsson, and Lundberg 2005). As an alternative to role strain theory, role enhancement theory suggests that engaging in multiple work and family roles could enhance subjective well-being by promoting self-esteem and life satisfaction, and is associated with fewer stress-related mental and physical health problems (Mirowsky and Ross 1986). The beneficial effect of multiple roles is particularly salient among women with higher education in terms of enhancing their autonomy (Ahrens and Ryff 2006). The benefits of multiple roles are also conditional on the number of roles, the time demands, and the quality of each role (Barnett and Hyde 2001).

Additionally, in the discussion on the health implications of double demands from work and family, some researchers have pointed out the importance of taking a closer look at the time spent in each role. Recent studies on time use and health have enriched this line of investigation. Scholars have found that excessive time demands from work and family may indirectly lead to poor health by restraining both physical activities and the time available to prepare and eat healthy food (Strazdins et al. 2016; Venn and Strazdins 2017). Multitasking and feelings of rushing, as sources of stress that oftentimes occur due to time scarcity, can directly lead to poorer self-reported health and psychological well-being (Barnett and Hyde 2001; Offer and Schneider 2011). Time scarcity, as an inevitable result of the double burden of work and family responsibilities, offers explanations for cumulative disadvantage in health brought on by chronic role overload over the life course.

Last, scholars on health and aging have increasingly moved away from the narrow scope of studying older people alone and have taken the "long view of aging" by using longitudinal study designs and studying health trajectories over time (Ferraro 2006). Nonetheless, scholars have devoted more attention to the earlier and later periods of life than to the middle years (Lachman 2015). For example, studies have convincingly demonstrated the "long arm of childhood" by documenting the influence of an array of childhood conditions, including family SES and lifestyles on mortality and other health factors later on in life (Hayward and Gorman 2004; Pavea and Latham 2016). However, life-course inequality and cumulative "insults" do not stop at childhood. Despite ongoing longitudinal studies, such as Midlife Development in the United States (beginning in 1995; Brim, Ryff, and Kessler 2004), empirical studies that focus on middle age and beyond have been limited, especially from the perspective of the cumulative disadvantage theory. A recent review by Lachman (2015) has called for more attention to midlife trajectories, as it is a "pivotal period" in the life course of individuals, as they are "juggling multiple responsibilities and dealing with physical and cognitive signs of aging" (Lachman 2015:330).

### *BMI and Its Linkage to Time Scarcity and Role Overload*

In our endeavor to study competing time demands and, consequently, potential chronic strain for women over the life course, we zero in on a particular type of health outcome: body weight relative to body height, as measured by BMI, for Filipina women. The prevalence of overweight and obesity has been growing to an epidemic proportion in developing countries (Prentice 2006). A growing body of literature has identified changing diets, the rising adoption of sedentary work, genetics, and early-life nutrition as biological, behavioral, and environmental factors that have contributed to the spreading obesity pandemic (Atella and Kopinska 2014; Prentice 2006).

Although we know that increasing intake of food high in saturated fats and sugars, coupled with reduced physical activities, is the main culprit in weight gain, the mechanisms leading to these behavioral patterns are still not clear. Coming from a time availability perspective, competing demands in work and family responsibilities can lead to reduced time for exercise and preparing healthy food (Strazdins et al. 2016; Venn and Strazdins 2017).

At the same time, time scarcity as a result of the double burden from work and family could also translate into psychosocial stress and contribute to an unhealthy lifestyle that includes poor dietary behavior and sleep deprivation. A considerable amount of research on obesity has been directed toward the role of stress as a risk factor (Block et al. 2009; Shimanoe et al. 2015). While acute stress may reduce food intake in the short term, chronic stress is often associated with the release of cortisol, which has been reported to stimulate appetite and to influence eating more energy-dense foods that are high in sugar and fat (Torres and Nowson 2007). Some population-based studies have found job stress, or perceived stress in general, has no or weak association with obesity (Kouvonen et al. 2005; Shimanoe et al. 2015). Other longitudinal studies have found that job strain is associated with weight gain for men already overweight at baseline but has no effect for women (Kivimäki et al. 2006). Others report chronic job strain coupled with low social support leads to obesity (Brunner et al. 2007). Block and colleagues (2009) have found that job strain and work stress turn out to be the most important predictors for weight gain, among multiple domains of psychosocial stress related to work, personal relationships, life constraints, and finances.

### *The Filipino Context*

When it comes to the time bind between work and family responsibilities, Filipino women are not different from women in many other settings around the world. Parreñas (2007) has pointed out that there is a gender ideological clash in Filipino society, which simultaneously greets women's labor force participation and emphasizes their domestic role. On the one hand, the work of women in the public sphere is considered valuable to the national economy and individual households. The female labor force participation rate in the Philippines has remained above 46.6% since 1990 (International Labour Organization 2017). Many women have become a co-economic provider with their husband to the household (Medina 2001).

On the other hand, domestic responsibilities are still the primacy of Filipino women's gender role. Filipino women bear the major share of household chores, caregiving, and household economics (Alcantara 1994; Medina 2001). Although Filipino husbands increasingly share some household tasks, wives still do more than their husbands (Diefenbach 2002). Women's participation in domestic tasks is associated with the family's social and economic

mobility; meanwhile, fulfilling a childrearing responsibility also promotes women's status and decision-making power in the family (Alcantara 1994). As a result of this paradoxical but dual emphasis on women's role in both the private and public spheres, we expect that many Filipino women are subject to a heavy double burden from work and family.

One of the distinctive characteristics of Filipino families is the reciprocal exchange among extended kin (Agree, Biddlecom, and Valente 2005; Miralao 1997). Women's domestic responsibilities continue with the transition to grandparenthood. Close to 60% of Filipino women ages 60 and over co-reside with at least one of their grandchildren (Agree et al. 2005). Our prior work with the same data documented that as these women aged, there was a substantial increase in the proportion of them co-residing with grandchildren (from 20.6% in 2002 to 58.1% in 2012; Chen et al. 2017). Behind the prevalence in migrant Filipina domestic workers around the world, female extended kin (e.g., grandmothers, aunts) often take over household tasks for migrant Filipinas and become a surrogate parent for left-behind children in transnational families (Parreñas 2000). Therefore, when Filipino women enter a later life stage, they may still need to divide their time for work, domestic labor, and caregiving for grandchildren. Our previous study shows that many of these Cebu women were subject to the double burden of work and family demands in a span of 18 years from midlife to later life (Chen et al. 2018).

During our study period (1994–2012), the total fertility rate in the Philippines was 4.1% in 1994 and slightly decreased to 3.1% in 2010 through 2015 (United Nations 2017). Only 11.5% of Filipino women were childless by the end of their reproductive span (Philippine Statistics Authority 2005). Our sample is a cohort of women with higher fertility than the general population because all of them entered the first survey wave while pregnant. Therefore, chronic role overload could be a more prominent issue for them compared to childless women, with regard to their responsibilities as mothers and grandmothers over the life course. During the process of nutrition transition (Popkin and Gordon-Larsen 2004), with many developing countries experiencing shifts to a diet high in saturated fats and sugar, and patterns of lower levels of physical activity, increasing overweight and obesity has become a concern in the Philippines (Adair et al. 2011). Previous research shows that among the women who participated in the same survey

used for our study, the percentage of women overweight and obese (combined) increased sixfold: from 7% in 1983 to 43% in 2005 (Adair et al. 2011). Urbanization, household SES, age, diet, reproductive history, and physical activity at work are predictors of weight gain (Adair et al. 2011). The effect of life stress, such as work–family role overload, is rather underexplored.

### Research Goals

In this paper, we adopt the cumulative disadvantage theory, which provides central guidance to the study of health disparities over the life course in different societies. As Dannefer (2003:S327) stated, “[m]ore formally, cumulative advantage/disadvantage can be defined as the systemic tendency for interindividual divergence in a given characteristic (e.g., money, health, or status) with the passage of time.” Needless to say, money and status are fundamentally important characteristics in relevance to health. However, we believe interindividual divergence in other health-related characteristics deserves closer attention as well, such as chronic double burden of work and family responsibilities and the associated time scarcity and role overload.

First, we describe the diversity in women’s work and family responsibilities by using rich time-use data from a longitudinal data set. On the basis of the patterns of time use, we classify women into groups with different extents of “double burden” in work and family duties. The zero-sum nature of time inevitably means that work, caregiving, housework, and leisure exert competing demands on one’s time. A direct examination of actual time allocation for work and family thus can be an excellent gauge of the extent of overburden. We expect those with heavy demands from both work and family are likely to suffer from a disadvantage in the level of BMI. Second, while we expect diversity in women’s work and family responsibilities—that is, not all women have the same types of demands from the work and family arenas—we posit that time-use patterns also change throughout one’s lifetime. A previous study by our research team has documented that as a woman moves from younger to older adulthood, together with her family role and household composition, her time devoted to work, caregiving, and housework activities also shifts over time (Chen et al. 2018). Following the life course perspective (Elder, Johnson, and Crosnoe 2003), we expect the changes and continuities in women’s work and family responsibilities could differentially affect their BMI level.

Third, we maintain that women’s time-use profiles not only affect their BMI status (i.e., the average level) but also have consequences for their BMI trajectories (i.e., the rate of change). The cumulative disadvantage theory suggests that stressful experiences could accumulate over time, lead to stress proliferation, and therefore widen health inequality over the life course (Dannefer 2003). We expect women who are overburdened with work and family duties for a long period of time to face more cumulative stresses over the life course. As a result, the gap in BMI levels by age across women with different time-use profiles (e.g., intensity and duration of work and family overburden) is expected to widen over time.

## DATA AND METHOD

### Data

We used data from the CLHNS, an ongoing collaborative project of the Carolina Population Center at the University of North Carolina and the Office of Population Studies Foundation at the University of San Carlos in Cebu. The survey follows a cohort of mothers and an index child born in 1983 or 1984 longitudinally. Using a single-stage cluster sampling procedure, 17 urban and 16 rural barangays (local administrative units) were randomly selected from the 255 barangays in Metropolitan Cebu. Cebu is a province of the Philippines, and Metropolitan Cebu is the second largest metropolitan area in this country. The 33 barangays, representing about 28,000 households, were surveyed to locate all pregnant women. Those who gave birth during the period of May 1983 through April 1984 were included in the sample ( $N = 3,327$ ; response rate 90%) and were followed up in 1991, 1994, 1998, 2002, 2005, 2007, and 2012. There is no comparable large sample of women in developing countries who are followed from their reproductive years to older adulthood, making CLHNS uniquely suitable to study changes in women’s life trajectories in the larger context of epidemiological transition (e.g., Dahly and Adair 2007; Schmeer 2010; Zimmer et al. 2017).

In 1994, time-use diary data were collected for the first time, making it Wave 1 for the current analysis, and subsequent Waves 2 through 5 were based on data collected in 1998, 2002, 2005, and 2012. The 2007 data were excluded due to the lack of time-use data. We started our analysis with a sample of women in 1994 that had a mean age of 38. At the time of the last observation in 2012, they were

between ages 45 and 65. After excluding observations with missing values on key variables (about 1% across waves), our analytical sample consisted of 2,262 persons in 1994; 1,986 in 1998; 2,098 in 2002; 2,010 in 2005; and 1,805 in 2012. Among them, 131 had died by the 2012 survey and 261 were lost to follow-up across the surveys. On average, a person was observed more than four times in these longitudinal data, and this altogether yielded 10,161 person-year observations.

### ***Measurement of Key Dependent and Independent Variables: BMI and Time-use Profiles***

Our dependent variable was BMI, calculated as weight (in kilograms) divided by height (in meters) squared. Respondents' weight and height were assessed by trained personnel at each wave of the CLHNS (1994, 1998, 2002, 2005, and 2012). A BMI between 18.5 and 24.9 is commonly considered to be within the normal range (World Health Organization [WHO] Expert Consultation 2004). The average BMI for women in our sample increased as they aged: it was 23.3 in 1994, 23.6 in 1998, 24.2 in 2002, 24.3 in 2005, and 24.8 in 2012.

The key independent variable, time-use profiles, was based on time-use data collected using 24-hour activity diaries (reported for a typical weekday, excluding weekends). Unfortunately, the data did not include any information on weekend time use. Time allocation can largely vary by days, especially between weekdays and weekends, and using a "typical" workday rather than the past 24 hours could induce recall error (National Research Council 2000). We acknowledge this as a limitation, as it could potentially underestimate leisure time or underestimate double burden if a woman works on weekends. We first calculated the amount of time (in hours) spent on each daily activity, then combined these time-use activities into five broad categories: (1) working outside the home for pay, (2) working at home for pay, (3) household chores, (4) caregiving, and (5) personal time. After carefully examining the distribution of daily hours spent on each of these five categories, we collapse daily time use in each of the five categories into three levels of intensity: (1) zero/low intensity, (2) moderate intensity, and (3) high intensity (cutoff points varied by each category; for detailed criteria, see Chen et al. 2018). Using these three intensities across five time-use categories as indicators, we conducted latent class analysis and developed six time-use profiles: (1) high-intensity worker away from home, (2) high-intensity worker

based at home, (3) moderate-intensity worker away from home, (4) moderate-intensity worker based at home, (5) high-intensity caregiver, and (6) homemaker (for detailed documentation of the time-use profiles, see Chen et al. 2018).

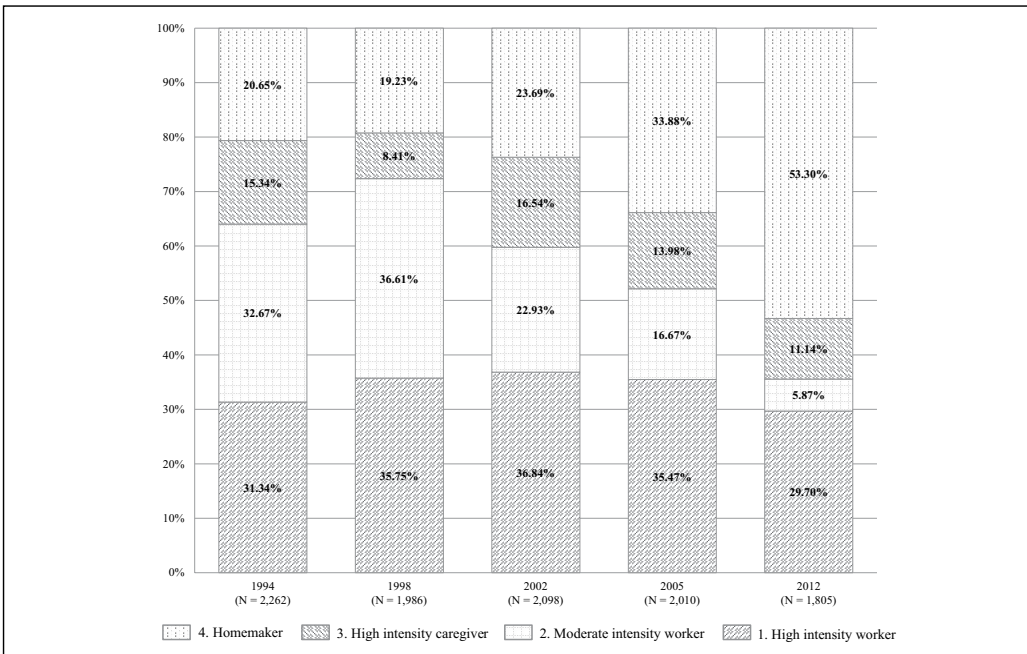
For this paper, we used a simplified version of the typology and classified women in four groups, that is, (1) high-intensity worker, (2) moderate-intensity worker, (3) high-intensity caregiver, and (4) homemaker. Descriptions of each time-use profile are shown in Table 1. The first two classes of women both shoulder a heavy double burden of work and household responsibilities. The high-intensity worker is subject to a heavy workload (inside or outside the home for pay; more than eight hours per day), is most likely to engage in a moderate level of household chores (three to six hours per day) and caregiving, and has a very low level of personal time. The moderate-intensity worker's workload is lighter ( $\leq 8$  hours per day), but her household chores and caregiving duties tend to be heavier than the former, and her level of personal time is slightly higher (probability not shown in Table 1; for a more detailed description, see Chen et al. 2018). Neither high-intensity caregiver nor homemaker engages in any income-generating activities, but both do a heavy load of housework. What distinguishes these two groups is that the first carries a high load of caregiving duties and the latter enjoys the highest level of leisure time.

It is important to note that individuals' time-use patterns change over time, as the women in our sample age. As shown in Figure 1, membership in the moderate-intensity worker group declined sharply over time, from 32.7% in 1994 to 5.9% in 2012. The homemaker group more than doubled from 1994 to 2012. Interestingly, almost a third of the sample were classified as high-intensity workers, and the proportion remained relatively stable over the span of 18 years.

In addition to documenting women's membership in different time-use profiles at each time point and its concurrent association with BMI, we were also interested in longitudinally examining how persistence in a certain time-use profile may be associated with different BMI trajectories. To do so, we operationalized the duration of time-use membership across waves of the survey. Table 2 demonstrates that a sizable proportion of the women were subject to heavy double demands over an extended period. Strikingly, about 26.8% of the sample were classified as high-intensity workers in three waves of the data or more. In contrast, only 18.6% of the sample were homemakers for three or more waves.

**Table I.** Description of Time-use Profiles, Cebu Longitudinal Health and Nutrition Survey, 1994 to 2012 (Pooled Sample, 1994, 1998, 2002, 2005, and 2012).

Variable	High-intensity Worker	Moderate-intensity Worker	High-intensity Caregiver	Homemaker
Work hours	>8	≤8	0	0
Housework hours	3–6	3–6	>6	>6
Caregiving hours	≤1	≤1	>1	≤1
Leisure hours	<3	3–6	3–6	>6
<i>n</i>	3,441	2,388	1,343	2,989



**Figure I.** Distribution of Time-use Profiles, Cebu Longitudinal Health and Nutrition Survey, 1994 to 2012.

*Time-use Profiles and Their Association with Excessive Demands from Work and Family*

We conceptualized women’s time-use profiles as a source of chronic role overload. Membership in each of the four categories represents the combination of work, household chores, and caregiving duties, with the high-intensity worker shouldering the heaviest double burden overall. Since we did not directly measure stress, we conducted additional analyses to examine whether our time-use profiles were associated with the manifestation of stress and strain in life. From its 2002 wave (but not available in earlier

waves), CLHNS asked respondents to evaluate the levels of demandingness from work and household activities on the basis of seven characteristics: (1) physical demandingness, (2) dexterity, (3) level of multitasking, (4) mathematical skills, (5) reading skills, (6) the importance of teamwork, and (7) stress. For each characteristic, the responses were recorded on a 0-to-3 scale, in which 0 indicated not demanding and 3 the most demanding. We summed responses of all seven characteristics to form an additive scale that measured demandingness from work and home separately, ranging from 0 to 21, and a summary index that combined both. Table 3 shows averages of these scales by time-use profiles. In addition, we also

**Table 2.** Percentages in Duration of Time-use Profiles, Cebu Longitudinal Health and Nutrition Survey, 1994 to 2012 (N = 10,161; Pooled Sample, 1994, 1998, 2002, 2005, and 2012).

Category	None	One Wave	Two Waves	Three Waves or More
High-intensity worker	31.58	23.92	17.66	26.84
Moderate-intensity worker	34.90	32.78	21.74	10.58
High-intensity caregiver	56.82	28.33	11.11	3.74
Homemaker	28.68	30.75	22.01	18.57

**Table 3.** Mean Scale of Demandingness from Work and Family Responsibilities, by Time-use Profiles, Cebu Longitudinal Health and Nutrition Survey, 2002 to 2012.

Variable	High-intensity Worker	Moderate-intensity Worker	High-intensity Caregiver	Homemaker
Scale of demandingness from work	10.65 (2.87)	9.99 (3.15)	5.14 (5.74)	4.44* (5.49)
Scale of demandingness from home	10.10 (3.18)	10.21 (3.19)	10.95 (3.04)	10.67 (3.17)
Scale of demandingness from both work and home	20.75 (5.45)	20.20 (5.68)	16.09 (7.10)	15.11* (6.58)
Physical demandingness from work	1.73 (.74)	1.66 (.76)	.81 (.98)	.70* (.94)
Stress from work	1.77 (.61)	1.66 (.61)	.80 (.92)	.71* (.91)
Physical demandingness from home	1.58 (.66)	1.66 (.66)	1.74 (.67)	1.59 (.64)
Stress from home	1.53 (.57)	1.59 (.58)	1.66 (.59)	1.59 (.57)
<i>n</i>	2,022	923	830	2,140

\* $p < .05$  (signifies significant differences among different time-use profiles on the basis of one-way ANOVA test).

singled out two single-item characteristics, physical demandingness and stress, as both could be most relevant for BMI. As expected, high-intensity workers and moderate-intensity workers were exposed to higher demands from work than caregivers and homemakers. However, their mean scores of demandingness from home were not significantly different from the other two groups, suggesting that they were at much higher risk of double burden from their work and family roles. High-intensity workers had the highest mean score of demandingness overall and reported the highest level of stress from work.

### Control Variables

We also controlled for potential confounders of the relationship between time-use profiles and BMI. They included two domains of covariates: demographic characteristics and SES characteristics. For

the former, we controlled for women's marital status (1 = married; 0 = not married) and household composition (number of children ages 0 to 17, number of adults ages 18 to 59, and number of older adults ages 60 and older). We also controlled for women's pregnancy status. As for SES, we included two measures at the individual and household level: (1) years of education and (2) a quartile index measuring household assets, with those in a higher quartile indicating a higher level of household SES. In terms of community-level SES, we used an urbanicity score that has been validated in earlier studies using CLHNS, which quantifies the concentration of amenities typically found in urban communities (Dahly and Adair 2007; Zimmer et al. 2017). It ranged from 7 to 61, with higher value indicating a higher level of urbanization. Table 4 presents descriptive statistics of sample characteristics by survey year.



**Table 4.** Descriptive Statistics of Respondents by Survey Year, Cebu Longitudinal Health and Nutrition Survey, 1994 to 2012.

Variable	1994	1998	2002	2005	2012
Body mass index	23.32 (3.92)	23.62 (4.11)	24.24 (4.28)	24.29 (4.33)	24.84 (4.66)
Age in years	37.94 (6.13)	41.93 (6.12)	45.14 (6.14)	47.86 (6.07)	55.09 (5.93)
Education in years	7.32 (3.83)	7.44 (3.90)	7.29 (3.82)	7.31 (3.80)	7.28 (3.82)
Assets score (%)					
1st quartile (lowest)	30.50	25.13	24.98	33.48	29.64
2nd quartile	15.87	23.46	32.75	20.30	20.78
3rd quartile	30.37	29.71	17.25	22.19	23.21
4th quartile (highest)	23.25	21.70	25.02	24.03	26.37
Urbanicity	35.76 (13.21)	38.84 (13.73)	41.25 (14.13)	40.47 (13.63)	43.93 (12.62)
Household composition					
Number of children (ages 0–17)	4.20 (1.84)	3.64 (1.97)	2.58 (2.06)	2.24 (1.92)	1.84 (1.74)
Number of adults (ages 18–59)	2.83 (1.39)	3.09 (1.40)	4.04 (1.52)	4.18 (1.52)	3.80 (1.93)
Number of older adults (ages 60+)	.14 (.42)	.12 (.39)	.16 (.44)	.20 (.48)	.48 (.70)
Married (%)	93.54	91.09	88.51	86.12	75.40
Pregnant (%)	4.77	2.57	1.43	.50	.00
<i>n</i> of persons	2,262	1,986	2,098	2,010	1,805

Note: Values for categorical variables are in percentages. Mean values, followed by standard deviations in parentheses, are presented for all other variables.

## Method

To investigate the effect of Filipino women's time-use profiles on their BMI from midlife to later life, we used growth curve models to account for intraindividual changes in time-use profiles and then examined both intraindividual and interindividual differences in BMI trajectories (Raudenbush and Bryk 2002). With time-variant covariates, this analytic approach allows individuals to serve as their own controls, and thus we were able to control for both intra- and interindividual confounds. By allowing random-effect variations across individuals, it also takes into account the unknown heterogeneity across individuals. The model is represented by equation (1).

$$\text{BMI}_{it} = \beta_{0i} + \beta_{1i}\text{AgeC}_{it} + \beta_{2i}\text{AgeC}_{it}^2 + \beta_{3i}\text{TUP}_{it} + \beta_{4i}\text{AgeC}_{it} \times \text{TUP}_{it} + e_{it}. \quad (1)$$

Age is the analytical time metric and centered by mean of age ( $\text{AgeC}_{it}$ ) so that the intercept

reflects the level of BMI at the average age of 45. We began with a change trajectory model of BMI of individual  $i$  at time  $t$  ( $\text{BMI}_{it}$ ) as a function of age ( $\text{AgeC}_{it}$ ) and its quadratic term due to its better empirical fit and a theoretical expectation of a non-linear pattern of BMI increase. We further added our key independent variable, measures of time-use profiles, and other time-varying variables. Because we hypothesized that the effect of time-use profiles would be age dependent, we also added interaction terms between age and the time-use profiles measures at level 1.

We then posited a level 2 submodel for interindividual differences in change, where the coefficients  $\beta$ s in the level 1 model were further modeled as dependent variables. Although technically it is possible to model all of the  $\beta$ s, we chose models based on our theoretical hypotheses. We began with two unconditional models of the intercept model  $\beta_{0i}$  and linear rate of change  $\beta_{1i}$  at level 2 but also tested a model on  $\beta_{2i}$  (quadratic rate of change) later. Other predictor variables

**Table 5.** Growth Curve Models Predicting the Effect of Time-use Profiles on Body Mass Index, Cebu Longitudinal Health and Nutrition Survey, 1994 to 2012.

Variable	Model 1	Model 2	Model 3
Time-use profiles (ref = high-intensity worker)			
Moderate-intensity worker	-.37*** (.05)	-.26*** (.05)	-.25*** (.05)
High-intensity caregiver	-.39*** (.06)	-.35*** (.06)	-.33*** (.06)
Homemaker	-.17*** (.05)	-.22*** (.05)	-.24*** (.05)
Age (centered on the mean)		.10*** (.01)	.08*** (.01)
Age (centered), squared		-.00*** (.00)	-.00*** (.00)
Moderate-intensity worker × age		-.00 (.01)	-.00 (.01)
High-intensity caregiver × age		-.00 (.01)	-.01 (.01)
Homemaker × age		-.01 (.01)	-.00 (.01)
Education (in years)			.09*** (.02)
Assets score (ref = 1st quartile)			
2nd quartile			.27*** (.05)
3rd quartile			.35*** (.06)
4th quartile			.67*** (.07)
Urbanicity			.03*** (.00)
Household composition			
Number of children			-.08*** (.01)
Number of adults			.05*** (.01)
Number of older adults			.00 (.05)
Married			.35*** (.08)
Pregnant			1.54*** (.12)
Attrition status			
Died	-.49 (.38)	-.60 (.38)	-.42 (.36)
Loss to follow-up	.46 (.27)	.65* (.27)	.35 (.26)
Random effects–variance components			
Level 1: within person	1.86*** (.04)	1.84*** (.04)	1.77*** (.03)
Level 2: in intercept	16.58*** (.53)	16.58*** (.52)	15.26*** (.48)
Level 2: in linear growth rate	.03*** (.00)	.02*** (.00)	.02*** (.00)
Constant	23.84*** (.10)	24.39*** (.10)	21.98*** (.23)
BIC (smaller is better)	46,080	45,567	45,183
n of persons	2,292	2,292	2,292
n of person-year observations	10,161	10,161	10,161

Note: BIC = Bayesian information criterion; ref = reference.

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$  (two-tailed tests).

**Table 6.** Growth Curve Models Predicting the Effect of Duration of Being a High-intensity Worker on Body Mass Index, Cebu Longitudinal Health and Nutrition Survey, 1994 to 2012.

Variable	Model 1	Model 2	Model 3
Duration of being a high-intensity worker (ref = none)			
One wave	.54* (.22)	.65** (.23)	.60** (.22)
Two waves	.74** (.25)	.84*** (.26)	.72** (.25)
Three or more waves	1.14*** (.22)	1.38*** (.23)	1.10*** (.23)
Age (centered on the mean)		.08*** (.01)	.06*** (.01)
Age (centered), squared		-.00*** (.00)	-.00*** (.00)
High-intensity worker in one wave × age		.02 (.01)	.02 (.01)
High-intensity worker in two waves × age		.02 (.01)	.02 (.01)
High-intensity worker in three or more waves × age		.04*** (.01)	.04*** (.01)
Education (in years)			.09*** (.02)
Assets score (ref = 1st quartile)			
2nd quartile			.27*** (.05)
3rd quartile			.34*** (.06)
4th quartile			.66*** (.07)
Urbanicity			.03*** (.00)
Household composition			
Number of children			-.08*** (.01)
Number of adults			.05*** (.01)
Number of older adults			.00 (.05)
Married			.34*** (.08)
Pregnant			1.54*** (.12)
Attrition status			
Died	-.28 (.38)	-.38 (.38)	-.25 (.37)
Loss to follow-up	.64* (.27)	.82*** (.27)	.48 (.26)
Random effects–variance components			
Level 1: within person	1.86*** (.04)	1.85*** (.04)	1.78*** (.03)
Level 2: in intercept	16.44*** (.53)	16.39*** (.51)	15.16*** (.48)

(continued)

**Table 6.** (continued)

Variable	Model 1	Model 2	Model 3
Level 2: in linear growth rate	.03*** (.00)	.02*** (.00)	.02*** (.00)
Constant	23.08*** (.15)	23.54*** (.16)	21.30*** (.25)
BIC (smaller is better)	46,124	45,560	45,194
<i>n</i> of persons	2,292	2,292	2,292
<i>n</i> of person-year observations	10,161	10,161	10,161

Note: BIC = Bayesian information criterion; ref = reference.  
\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$  (two-tailed tests).

were entered at level 1 for time-varying covariates (e.g., marital status) and at level 2 for time-constant covariates (e.g., education). We addressed the potential bias introduced by attrition and death by using a simple but effective strategy, namely, by entering dummy variables indicating the deceased and nonrespondent identities (Raudenbush and Bryk 2002).

$$\beta_{0i} = \gamma_{00} + \gamma_{01}X_{i1} + \gamma_{02}X_{i2} + \dots + \gamma_{0k}X_{ik} + u_{0i}. \quad (2)$$

$$\beta_{1i} = \gamma_{10} + \gamma_{11}X_{i1} + \gamma_{12}X_{i2} + \dots + \gamma_{1k}X_{ik} + u_{1i}. \quad (3)$$

Our growth curve models consisted of two major steps. First, we were interested in whether the four-category time-use profiles predicted the intercept (e.g., an average level of BMI) and the slope (rate of increase in BMI trajectory). Second, we modeled whether the duration of being engaged in a heavy double burden from work and family (e.g., being a high-intensity worker in more than three waves of data) was particularly vulnerable to a higher average level of BMI as well as an accelerated rate of BMI increase.

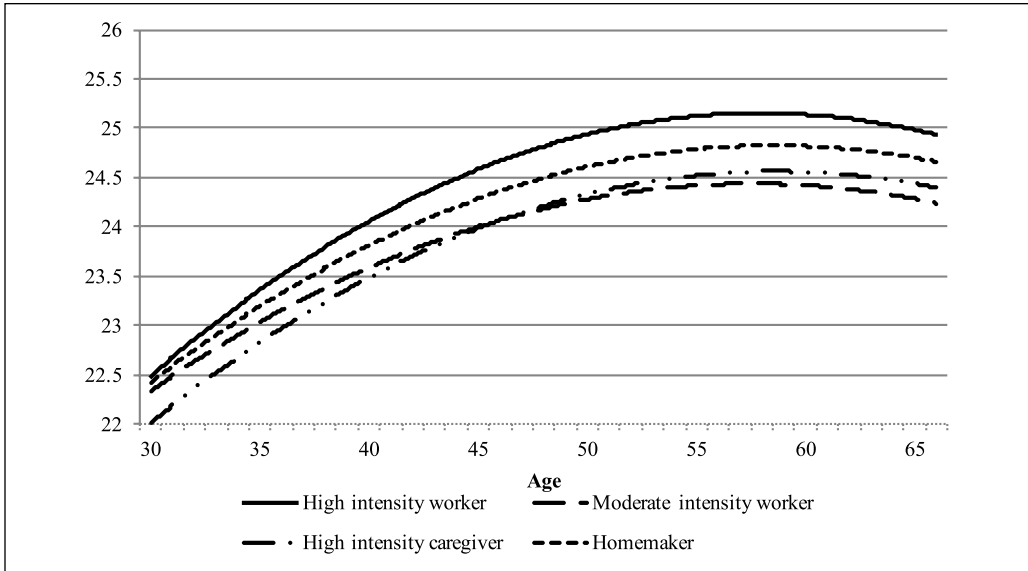
## RESULTS

Results from growth curve models are presented in Tables 5 and 6. Table 5 presents the effect of time-use profiles on Filipino women's BMI trajectories. The main effect of time-use profiles reflects its effect on average BMI at age 45 (the centered age value), and the interaction effects of time-use profiles by age reflect the effects of time-use profiles on the rate of change of BMI trajectories. From Model 1 to Model 3, we add time-use profiles, their interactions with age, and other control variables gradually, and results show a statistically significant effect of

time-use profiles on BMI, consistently across models, after controlling for sociodemographic and socioeconomic characteristics (Model 3). Women who are high-intensity workers, on average, are highest in their BMI among the four time-use profiles: at age 45, their BMI is .25 higher than that of moderate-intensity workers, .33 higher than that of high-intensity caregivers, and .24 higher than that of homemakers. Interaction effects of time-use profiles by age, however, do not show any significant effect, which suggests that variation in BMI among time-use profiles is stable and persistent across age.

To illustrate the effects visually, we display BMI trajectories in Figure 2 by using all the coefficients in Model 3 from Table 5 varying by our key predictor variable (time-use profiles) while holding all the control variables at their means (for continuous variables) and modes (for dummy variables). Figure 2 shows a clear disadvantage for high-intensity workers, with their BMI level being the highest across the life course compared to the other three groups. The differences among the BMI levels of the other three groups are not statistically significant (supplementary analysis with different reference groups not shown). After the age of 50, the BMI level of high-intensity workers increases above 25, crossing the threshold for overweight (WHO Expert Consultation 2004), while the average BMI of the other three time-use profiles remains under 25.

Table 5 also indicates that those with a higher level of education and household assets, and those living in more urban areas, are more likely to have a higher level of BMI. This is consistent with findings from other developing countries in the middle of an epidemiological transition and economic development, where higher household and individual SES may bring risks to adult overweight since higher SES is associated with increased consump-



**Figure 2.** Predicted Body Mass Index Trajectories by Time-use Profiles, Cebu Longitudinal Health and Nutrition Survey, 1994 to 2012.

tion of high-fat, high-sugar diets and reduced physical activity (Popkin and Gordon-Larsen 2004).

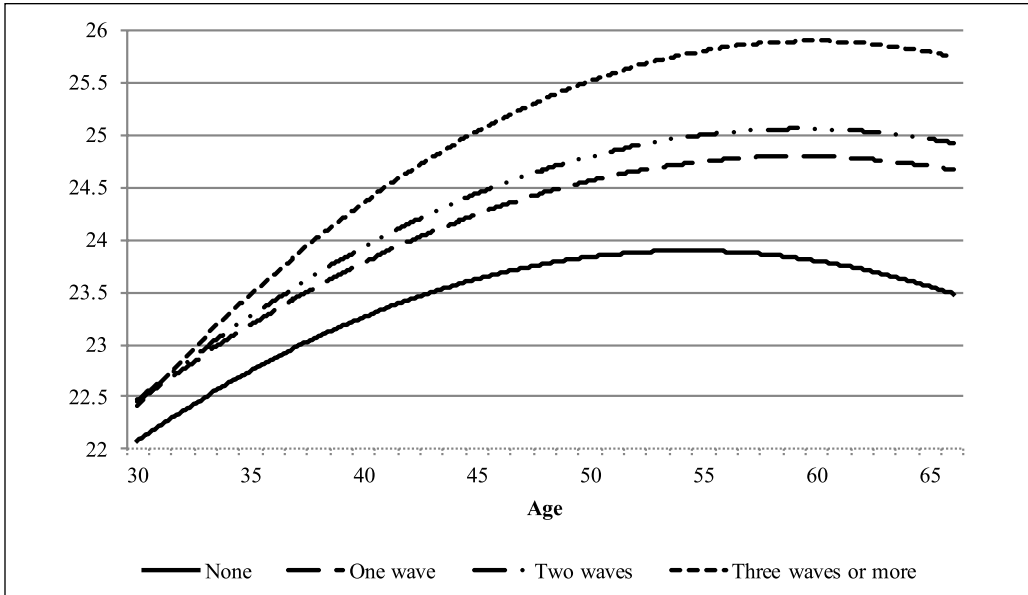
Table 6 further explores whether the duration of being a high-intensity worker (one wave, two waves, three or more waves, compared with none) has any effect on BMI trajectories. Results from Model 3 show not only a clear main effect of longer duration but also a significant interaction effect with age (High-intensity Worker in Three or More Waves  $\times$  Age). This suggests that the duration effect is significant at both the intercept and slope level. To begin with the main effect of duration, it shows that a longer duration of being a high-intensity worker is associated with a higher BMI level at age 45 (the centered age value), with an increase of .60 for one wave, .72 for two waves, and 1.10 for three or more waves. Furthermore, the significant interaction effect of being a high-intensity worker in three waves or more indicates a more rapid increase in BMI by age under this circumstance.

We again display the effect visually in Figure 3, which shows that being a high-intensity worker for an extended period of time has a detrimental effect on BMI trajectories. Being a high-intensity worker in three or more waves of the data not only translates into a higher BMI level, but the rate of increase in BMI is also considerably sharper compared with the other groups. To illustrate the magnitude of the divergence, we translate the BMI differences into

weight differences. For someone with average height (1.51 m) at age 30, the predicted weight difference between a woman who is a high-intensity worker and one who is not is .9 kg. After having remained in this category for three waves or more, the gap between her and someone who has never been in this category diverge to as large as 2.7 kg.

## DISCUSSION

The appeal of the cumulative disadvantage theory to health research lies in its simple, basic premise that variation in strains and resources accumulates over the life course, leading to “interindividual divergence” in the health trajectory. Given that SES is widely accepted as a fundamental cause of health inequality (Link and Phelan 1995), health studies on life course heavily focus on socioeconomic disadvantage as a source of numerous health problems and a catalyst of accelerated aging. Nonetheless, disadvantage and hardship can manifest in a wide range of ways, reflecting varying types of inequality in social systems. A recent overview of the growing body of work applying the cumulative disadvantage theory insightfully points to its broad relevance as a general sociological construct (Dannefer forthcoming). We believe our study provides an important extension of the theory in the study of women’s health. Our empirical analyses have clearly



**Figure 3.** Predicted Body Mass Index Trajectories by Duration of Being a High-intensity Worker, Cebu Longitudinal Health and Nutrition Survey, 1994 to 2012.

identified chronic role overload over the life course as a source of disadvantage for women, with excessive demands from both work and family arenas, day in and day out, taking a toll on women's BMI trajectories as they transition from midlife into older adulthood.

Our time-use profiles document that close to one third of the women in the sample fall into the high-intensity worker category. These are women steadily engaged in a high level of work for pay (more than eight hours a day) and do three to six daily hours of housework and caregiving. The label itself is a misnomer because the extent to which overwork spreads to both work and family duties. Further, over a quarter of the women were consistently categorized as high-intensity workers (in more than three waves of data) during an 18-year span. In contrast to what is generally observed for older adults in developed countries, who often experience a surge in leisure time (Gauthier and Smeeding 2003), it is striking that a large number of Filipino women in our sample are still subject to a heavy double burden as they transition from midlife to old age. The heavy workload, together with increasing caregiving responsibilities as grandmothers, could eliminate time for personal care.

We believe our use of time-use profiles is an innovative way to document the multiple burdens women commonly face in a developing country,

where boundaries of work and family are often fluid, and standard survey questions on employment and household structure may fail to capture the full extent of these responsibilities. Although we do not directly measure subjective role strain, the zero-sum nature of time inevitably means that the time for work, caregiving, housework, and self-care (including physical exercise) crowd each other out. Our additional analyses on the association between time-use profiles and perceptions of demandingness and stress confirm the validity of time-use profiles as a gauge of chronic role overload. Those who are subject to heavy demands from work and family responsibilities thus face the consequence of time scarcity and an elevated level of stress, and this, in turn, translates into an adverse BMI trajectory.

More importantly, our growth curve models on BMI trajectories provide direct evidence that time-use profiles are significantly associated with BMI statuses as well as their rates of increase over the life course. Those who are subject to extreme demands of work and family, that is, high-intensity workers, have the highest level of BMI throughout the observed life course. In addition, those who remain high-intensity workers for three or more waves of the survey not only have higher risks of overweight but also are subject to accelerated rates of increase of BMI over time.

It is important to note that the effects we observe are net of SES. Undoubtedly, the role of SES has been well documented in affecting BMI (Atella and Kopinska 2014; Colchero and Bishai 2008; Schmeer 2010). However, women with higher SES often report having less time and feeling more time pressure in both Asian and non-Asian settings (Cha and Suh 2017; Roxburgh 2002). Women who are high-intensity workers (i.e., have high time pressure) in our sample are more likely to come from higher-SES households and report a higher level of education. Our study therefore lends to the argument that time is also an important health resource, thus shedding light on the link between exposure to chronic role overload and increasing health disparities in later life and extending the cumulative disadvantage theory in a new direction.

Although our analyses are exclusively on women, and we are not able to compare men and women's time-use profiles, we believe our study helps to elucidate the health implications of gender roles and gendered life course. Although work-and-family conflicts are certainly not unique experiences to women alone, women around the world continue to shoulder more responsibilities for domestic and caregiving work than men, despite their increasing opportunities and participation in the labor market. The persistence of gendered household division of labor in many countries reflects deep-rooted gender stratification. Although a full study on the gendered process has to involve men, our study provides insight into the health implications of a heightened sense of burden and stress that results from work and family overload, which affects women more severely than men.

The Filipino women in our sample may be a particularly vulnerable group, caught between the high fertility norms in the 1980s and work roles that are often ascribed within a rapidly developing region (Alcantara 1994; Medina 2001). Even in developed countries, such as the United States, where gender ideology is more egalitarian although by no means equitable, women are still disproportionately more likely than men to do more housework and to be caretakers and are increasingly becoming "sandwiched" between the care of children and elderly parents in midlife (Grundy and Henretta 2006; Keene and Prokos 2007). For example, U.S. studies have documented women to be considerably more likely to feel overburdened with work and family responsibilities and to have a heightened level of stress relative to men in dual-earner families (Offer and Schneider 2011). We

speculate that our selective sample of Filipino women may not be unique in their experience, and therefore our study could have enormous implications for studying women's health in other settings.

We acknowledge that we only focus on the effect of age, or life course, in our longitudinal data analysis from 1994 to 2012. During this period, Filipino society has experienced extensive social and economic growth. Rapid economic development and ongoing health transition means different cohorts of women could be impacted differently by changes in the larger social context. However, our study sample was drawn from women who gave birth in 1983 and 1984, with a mean age of 26 and a standard deviation of 6. The relative lack of heterogeneity in age does not lend itself to separate age and cohort effects. As cumulative disadvantage is a systemic tendency of the cohort as well as the individual aging process, future studies using an accelerated longitudinal study design are warranted.

Another apparent limitation of using the time-use profiles over the life course as a source of role strain is that we do not directly measure them. However, our results are remarkably consistent with existing studies on BMI that include perceived stress or strain in different settings. Although these studies vary by their operationalization of stress, ranging from reported job strain to an overall measure of psychosocial stress, they all have documented an association between stress level and weight change (Block et al. 2009; Kivimäki et al. 2006). In spite of the fact that these studies are based on panel data, none of them have been able to track BMI trajectory over time, such as how we have done in this paper, by following a cohort of women as they transition from midlife to old age. By contextualizing women's body weight changes through the lens of the cumulative disadvantage theory, we advance the literature by establishing linkages across various life domains during the process of aging. In future work, we will utilize dietary, health behavior and biomarker data, such as allostatic load, and thus map out the complex mechanisms through which time-use patterns can be linked to BMI. Despite our limitations, we believe our study is a step forward in documenting the health implications of women's work, family, and social contributions over the life course, particularly during the critical period as they transition from midlife to old age. We believe our study should spark further research on the implications of role overload and time scarcity in diverse settings.

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