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Household responsibilities, income, and ambulatory blood pressure among working men and women

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Abstract

Objective—To test the hypothesis that a greater perceived responsibility for household tasks and a greater number of hours spent doing these tasks would be associated with elevated ambulatory systolic (SBP) and diastolic blood pressure (DBP). The connection between job characteristics and cardiovascular outcomes has been widely studied. However, less is known about links between household work characteristics and cardiovascular health.

Methods—113 employed unmedicated hypertensive men and women underwent one day of ambulatory blood pressure (ABP) monitoring. Participants provided information on 1) the number of hours spent doing and 2) their degree of responsibility for seven household tasks (child care, pet care, caring for ill/elderly, household chores, house/car repair, yardwork, finances). Associations between task hours and responsibility ratings in relation to SBP and DBP were estimated using generalized estimating equations, with covariates age, race, gender, body mass index, location, posture. Interactions with gender and socioeconomic position were assessed.

Results—A greater perceived responsibility for household tasks, but not the hours spent doing these tasks, was associated with higher ambulatory SBP (b(95% confidence interval (CI))=0.93(0.29–1.56), $p=0.004$) and DBP (b(95% CI)=0.30(0.10–0.51), $p=0.003$). Significant interactions with income indicated that associations between household responsibilities and ABP were most pronounced among low income participants (SBP: b(95% CI)=1.40(0.58–2.21), $p<0.001$; DBP: b(95% CI)=0.48(0.18–0.78), $p<0.01$). The task most strongly associated with BP was household chores. No interactions with gender were observed.

Conclusions—Greater perceived responsibility for household tasks was associated with elevated ABP, particularly for lower income participants. Household obligations may have important implications for cardiovascular health, meriting further empirical attention.

Keywords

blood pressure; housework; home stress; socioeconomic status; gender; income

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Introduction

A large literature shows relations between job characteristics or job-related stressors and cardiovascular health (1). However, less attention has been paid to stressors related to the home environment. There has been some indication that home-related stressors may be associated with cardiovascular health, particularly for women. For example, in the Interheart study of 24,767 men and women, work and home stress were related to myocardial infarction among men, whereas only home stress was related to myocardial infarction among women (2). Other studies have found factors such as caregiving for a spouse or children (3–4), or the presence of children at home to be associated with cardiovascular risk indicators among women (5–6). For example, Luecken and colleagues showed that employed women with children at home had elevated urinary cortisol excretions and elevated home strain compared to those without children (6). In a classic study, Frankenhaeuser found that, in contrast to their male counterparts, female managers failed to “unwind” at home after work as indicated by a failure of BP to drop and an elevation in norepinephrine at home relative to work (7).

Many of these observations are believed to be due to household responsibilities and strain associated with these responsibilities, particularly for women who are employed. For example, in a small sample of 21 male and female managers, Lundberg and Frankenhaeuser (5) showed that the female managers reported being more stressed by their unpaid workload at home and showed higher urinary norepinephrine levels at work and home compared to the men. Brisson and colleagues (8) found that employed, university-educated white collar women who reported a high level of family responsibilities (largely childcare) had elevated SBP and DBP relative to their counterparts with fewer responsibilities. Notably, Bird (9) found that higher perceived responsibility for household tasks, rather than the actual number of hours doing these tasks, was associated with distress, particularly for those who were employed. Thus, the perception of responsibility for these household tasks may be more important for health than the time spent doing them.

Although there is indication that the burden of household responsibilities is related to indicators of cardiovascular risk among employed individuals, many of these studies infer household responsibilities from the simple presence of children at home or from the participant’s location at work or home. Many studies have included very small samples or single gender samples. Thus, the aim of the present investigation was to examine the perceived responsibility for household tasks as well as the hours spent doing these tasks in relation to ambulatory BP among a relatively large sample of employed men and women enrolled in a larger clinical trial (prior to receiving any intervention). We hypothesized that greater perceived responsibility associated with household tasks and to a lesser extent the time spent doing these tasks would be associated with elevated BP assessed during routine activities of daily living using ambulatory BP monitoring. We further hypothesized that these associations would be stronger for women than for men. We examined any interactions between household tasks and socioeconomic factors, given prior evidence that socioeconomic position (7–8) may modify relations between household demands and cardiovascular risk.

Methods

Participants

As described in detail elsewhere (10), participants were recruited from newspaper, television, and radio advertisements, local clinics, and screenings at community health fairs and local shopping centers. Participants were recruited for a randomized clinical trial of exercise and weight loss in men and women with high BP. However, all the assessments

described in the present report were derived from baseline measures completed prior to randomization. Participants were eligible for the trial if they were at least 29 years old, with unmedicated high normal BP or stage 1 to 2 hypertension (mean clinic SBP=130–180 mm Hg and/or mean clinic DBP=85–110 mm Hg on four separate occasions over a 3-week period). In addition, participants were sedentary (not currently performing regular aerobic exercise) and overweight or obese (body mass index (BMI)=25–37 kg/m²), as defined in the National Institutes of Health statement on obesity treatment (11).

133 subjects were enrolled in the study. Three subjects were excluded from this analysis due to missing home responsibilities data (n=2) or missing BP data (n=1). The sample was restricted to employed individuals due to the potential differential meaning and impact of home responsibilities by employment status. Thus, 17 additional individuals who described themselves as retired, a student, a homemaker or unemployed were excluded from this analysis. Primary models included 113 participants (64 women, 49 men). Two individuals who reported spending 168 hours/week or more (>24 hours/day) on home-related tasks were excluded from models including this home task hours variable and two individuals missing income data were excluded from models incorporating income. Those excluded did not significantly differ on any study variables than those included in this analysis.

Measures

Assessments included a medical history, a physical examination, questionnaires, assessment of clinic BP and anthropometrics. Participants also underwent one day of ambulatory BP monitoring. Baseline data collection was conducted from 9/1994–11/1997. This study was approved by the Institutional Review Board at Duke University Medical Center, Durham, NC, and informed consent was obtained from all participants.

Clinic Blood Pressure—BP measurements were obtained by a trained technician with a random zero sphygmomanometer and were standardized for cuff size and position. Measurements were made on 4 separate visits over a 3-week period. At each visit, BP was measured 4 times at 2-minute intervals after an initial rest period of 5 minutes. The first BP measurement of each visit was discarded and the average of the remaining 3 measurements represented the clinic-visit BP. The overall clinic BP was then determined by averaging the mean BP over the 4 visits.

Ambulatory blood pressure—Subjects were fitted with an Accutracker II ambulatory BP monitor (Suntech, Raleigh, NC) between 8:00 am and 10:00 pm on a typical workday, and SBP and DBP recordings were verified by simultaneous manual readings. The Accutracker II measures BP noninvasively using the auscultatory technique, in which a microphone records and processes Korotkoff sounds; it uses ECG R-wave gating to correctly identify Korotkoff sounds originating from the brachial artery. The Accutracker II model has been validated independently (12). The monitor was programmed to obtain readings at an average frequency of four times per hour until bedtime. During ambulatory monitoring, subjects were instructed to maintain a diary, which included information about their posture, location (work, home, other), mood, and activities to be completed at the time of each ABP assessment. All readings were reviewed and artifactual readings edited by trained staff members as previously described (13).

Household responsibilities—Participants also completed a household task questionnaire adapted from (7,14). This questionnaire listed 10 tasks (child care; caring for an ill or elderly family member or friend; pet care; participating in job training program/ furthering education/taking classes; volunteer work/community service/union activities; irregular paid work; household chores (laundry, cooking, cleaning, etc.); yard work/

gardening; household or car repair/maintenance; paying bills/keeping records/managing finances) for which it asked participants to rate the hours per week that they spent on each of these tasks, as well as whose responsibility the duty primarily is (1=largely other's responsibility, 2=responsibility about equally shared, 3=largely your responsibility; 4=totally your responsibility). The 7 items applying to the household (child care; caring for an ill or elderly family member or friend; pet care; household chores (laundry, cooling, cleaning, etc.); yard work/gardening; household or car repair/maintenance; paying bills/keeping records/managing finances) were selected in an a priori manner for this analysis to quantify workload at home. The hours spent on these 7 tasks as well as their responsibility ratings were separately summed to yield 1) the hours the participant spent on household tasks, and 2) responsibility ratings for household tasks. Items which did not apply to the participant were scored as 0. An alternate scoring in which home responsibility ratings for those tasks that applied to the individual were averaged (sum of responsibility ratings/number of items which applied to them) was also considered. Findings were comparable, and therefore the sum scoring method is used here to estimate the total burden/responsibility for household tasks.

Other self-report measures—At baseline, participants completed questionnaires that included assessments of demographics (age, race, marital status, number of children at home, income, education, employment status). Total annual household income was reported in \$15,000 increments and tertiled based upon the sample distribution for analysis. Education was classified as less than college (high school, some college, vocational), college degree, greater than college.

Data reduction and analysis

Given evidence of skew, task hours were square root transformed prior to analysis. Differences in household task hours and household responsibility ratings by gender were tested via t-tests. Associations between household responsibilities or household task hours and ABP were estimated via generalized estimating equations (GEE), given the dependence of individual BP readings within individuals, with an identity link and a first order autoregressive covariance matrix. SBP and DBP were examined separately. Hours spent and perceived responsibility for household tasks were examined both separately and together in relation to ABP. Age, race/ethnicity, body mass index (BMI), and posture were selected a priori as covariates. Interactions between household indices and gender, the number of children living at home, location, and income, considered separately, were entered into GEE models. Any significant interactions were probed and stratified models presented. Sum scores for household hours and responsibility ratings were used in primary models. In secondary models, each household task was considered separately. Analyses were performed in SAS v 9.2 (SAS Institute, Cary, NC). All tests were two tailed at $\alpha=0.05$.

Results

Sample characteristics

Most participants were Black, college educated or higher, married, and by design, obese and hypertensive (Table 1). Participants reported spending about 24.5 hours a week on household tasks, and their total household responsibility ratings of 13.2, indicating a moderate level of responsibility. Household responsibility ratings and task hours were moderately correlated ($r=0.29$, $p=0.001$).

Factors associated with a greater number of household task hours were the presence of children at home and to a lesser extent low income. Those with children at home worked a greater number of household hours (mean (M) (standard deviation (SD))=40.1 (32.5) hours/

week) than those without children at home ($M (SD)=25.4 (22.6)$ hours/week; $t(101)=-2.71$, $p=0.008$). Those with low income showed the highest task hours ($M (SD)=14.0 (5.1)$), versus medium ($M (SD)=12.8 (3.9)$) or high income ($M(SD)=12.4 (3.7)$; $F (2, 104)=2.80$, $p=0.07$) individuals. There were no significant gender differences in the reported hours spent on household tasks.

Marital status and to a lesser extent gender were associated with household responsibility. Individuals who were divorced or widowed reported the most household responsibility ($M (SD)=16.2 (4.6)$) followed by single individuals ($M (SD)=13.9 (5.4)$) and married/partnered individuals ($M (SD)=12.2 (3.7)$; $F(2, 109)=8.53$, $p=0.0004$). Women ($M (SD) =14.04 (4.25)$) reported marginally higher household responsibility than did men ($M (SD)=12.64 (4.43)$; $t(df)=-1.69 (111)$, $p=0.09$).

Household tasks and ABP

Higher household responsibility ratings were associated with significantly elevated ambulatory SBP ($b (95\%CI)=0.93 (0.29-1.56)$, $p=0.004$) and DBP ($b (95\%CI)=0.30 (0.10-0.51)$, $p=0.003$) in multivariable models; however, the number of reported hours doing these tasks was not (SBP: $b (95\%CI)=0.19 (-0.81-1.19)$, $p=0.70$; DBP: $b (95\%CI)=-0.18 (-0.75-0.39)$, $p=0.54$). Accordingly, when household responsibility ratings and household task hours were included together in multivariable models, only higher household responsibility ratings were associated with elevated ABP (Table 2). Mean ABP levels by tertile of the home responsibility scale at work and at home are presented in Table 3.

Variation by gender and socioeconomic position

No significant interactions between gender or educational attainment and household responsibilities or task hours in relation to ABP were apparent. However, there was a significant interaction between household responsibilities and household income ($p's<0.05$), with associations between household responsibilities and ABP most pronounced among individuals in the lowest income tertile ($<\$45,000$ /year; Table 4).

Individual household tasks and BP

Investigation of individual household tasks revealed that household chores were most strongly associated with elevated ambulatory SBP and DBP, followed by household/car repair and maintenance and paying bills/keeping finances (Table 5). Task responsibility ratings showed similar relations to ABP by gender, with the exception of pet care and household or car repair/maintenance, which showed significant interactions by gender in relation to DBP ($p's<0.05$). Responsibility for pet care was associated with elevated ambulatory DBP only among men (men: $b (95\%CI)=1.42 (0.48-2.37)$, $p=0.004$; women: $b (95\%CI)= -0.44 (-1.60-0.71)$ $p=0.45$) and responsibility for household or car repair/maintenance associated with elevated ambulatory DBP only among women (women: $b (95\%CI)=1.36 (0.44-2.29)$ $p=0.004$; men ($b (95\%CI) =-0.34 (-1.63-0.95)$ $p=0.61$).

Additional analyses

Associations between home responsibilities and ABP remained when additionally controlling for marital status or children at home (data not shown). Further, there were no significant interactions between the presence of children at home, race, education, marital status, or location and household responsibilities or task hours in relation to ABP, nor were there any 3-way interactions with any of these variables, gender, and household variables in relation to BP.

Discussion

Greater perceived responsibility over household tasks, but not a greater number of hours doing these tasks, was associated with elevated ambulatory SBP and DBP among employed men and women. These associations were most apparent among those individuals in the lowest tertile of household income. Further, the household activity showing the most pronounced association with ABP was household chores. Although women reported somewhat higher household responsibility than men, associations between household responsibilities and task hours and BP were similar across men and women.

Whereas there has been considerable research on characteristics of jobs or workplaces in relation to cardiovascular health, there has been comparatively less research on household work and cardiovascular health. Prior work has suggested the potential importance of home workload, particularly for women's health (5–8). However, the present study is notable in its examination of both men and women, its measurement of ABP, and the fact that both household responsibilities and the hours spent doing these tasks were quantified. Notably, it was the perception of responsibility for household tasks among these employed men and women, rather than the hours spent doing these tasks that was associated with elevated ABP. These findings are consistent with prior work showing that the perceived responsibility for household tasks, rather than the time spent doing these tasks, is most distressing (9).

Associations between household responsibilities and ABP were similar between men and women. While some studies show no gender differences (2), other studies have shown that women are especially affected by home-related factors such as the presence of children (5,7) or strain and time pressure associated with work-home conflict (5,15). Whereas in the present study we found a somewhat greater perceived responsibility for household tasks among women relative to men, this difference was less pronounced in our sample than in other studies (5,9). Multiple factors differ between these studies, including era, community vs. workplace samples, socioeconomic level, race/ethnicity of the participants, country, as well as the specific household tasks queried. In this study, the division of responsibilities and associations between health outcomes appeared more similar between men and women. Further, although the absolute levels of perceived responsibility varied somewhat by marital status, marital status did not modify relations between these household factors and ABP.

We observed significant interactions between household responsibilities and household income in relation to ABP, with associations between household responsibilities and both SBP and DBP most pronounced among low income individuals. In fact, associations between household responsibilities and ABP were not evident among the high income individuals. These findings stand in contrast to some work showing associations between home-related factors and deleterious psychophysiologic responses to be more pronounced among women with a higher educational attainment or who were middle managers (7–8). Importantly, it is well-established that lower income is associated with higher BP (16). Thus, our findings are more akin to other work showing that multiple adverse social and economic factors act together in a synergistic fashion to increase risk (1,17). Notably, we found significant interactions between household responsibilities and income, but not education. Thus, access to material resources, rather than social standing more broadly, may help buffer against any deleterious effects of household tasks. This income may be called upon assist with the burden associated with household responsibilities.

When individual household responsibilities were examined separately, household chores were most strongly associated with elevated ABP. Household chores are notable for their routine nature, often characterized by a relatively low level of challenge and few intrinsic rewards (18). Childcare was not associated with elevated blood pressure in this study. Other

studies have found the presence of children at home, or childcare-related burden, to be associated with greater ABP and related parameters (5–6,8). However, this finding is not universal, with others finding that male and female parents actually show the greatest decrease in ABP between work and evening non-work hours (19). We did not find childcare or the presence of children at home to be associated with elevated ABP, nor did the presence of children at home appear to moderate the observed associations.

Several limitations deserve mention. The measure of household tasks, although consistent with other measures used in this literature, was a self-report instrument in which important psychometric properties (e.g., predictive validity) have not been well established. Further, while employment status was known, the full time or part time nature of this work, or the hours spent at work, was not, limiting the ability to assess total workload. Although a significant interaction between income and household responsibilities was noted, power was likely limited for many of the 2- and 3-way interactions tested here. This analysis represents a secondary analysis of existing data collected prior to the intervention among participants enrolled in a clinical trial. Further research specifically designed to address relations between home responsibilities and workload should be undertaken in future work. Finally, the sample included sedentary, overweight and obese individuals with elevated BP volunteering for a randomized clinical trial, which may limit the generalizability of results.

This study had several notable strengths. It is one of the few studies that queried about household tasks directly instead of inferring it solely from other factors such as the presence of children at home. Hours spent doing tasks as well as the perceived responsibility were assessed, allowing comparison with these factors. Further, household task domains were listed separately, allowing detailed examination of individual domains of household responsibility. This sample included a large representation of Black men and women, standing in contrast to the largely White samples that characterize this literature. BP was determined in persons' daily lives by ABP monitoring, which provides greater precision than hospital-based or clinic measurements. Finally, both men and women were included, allowing comparison between the genders.

In summary, this study found that a greater perceived responsibility for household tasks, but not necessarily the time spent doing these tasks, was associated with higher ambulatory SBP and DBP for both men and women. These associations were most pronounced among low income individuals, suggesting that a lack of financial resources may compound these effects, or that the presence of resources may buffer against deleterious effects of household responsibilities. This work supports the notion that fairly routine aspects of the home environment may have important implications for both men and women's cardiovascular health.

Abbreviations

ABP	Ambulatory blood pressure
CI	Confidence interval
BP	Blood pressure
SBP	Systolic blood pressure
DBP	Diastolic blood pressure
BMI	Body mass index
GEE	Generalized Estimating Equations

M Mean
SD Standard deviation

Acknowledgments

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Table 1

Sample characteristics

N	113
Gender (n, % female)	64 (56.6)
Age (Mean, SD)	46.9 (8.3)
Race (n, %)	
White	29 (25.7)
Black	84 (74.3)
BMI (Mean, SD)	32.6 (4.2)
Ambulatory SBP (M, SD)	142.7 (12.7)
Ambulatory DBP (M, SD)	87.9 (6.2)
Clinic SBP (M, SD)	141.3 (10.8)
Clinic DBP (M, SD)	93.6 (5.02)
Education [†]	
High school	13 (11.6)
Vocational/some college	26 (23.2)
College degree	33 (29.5)
Graduate school	40 (35.7)
Income (n, %)	
<\$45,000	41 (36.9)
\$45,000-<\$75,000	37 (33.3)
>=\$75,000	33 (29.7)
Children living at home (n, % yes)	61 (55.0)
Marital status (n, %)	
Single	15 (13.4)
Married	75 (68.0)
Divorced/widowed	22 (19.6)
Home responsibility score (Mean, SD)	13.2 (4.4)
Hours spent on home tasks (Median (IQR))	24.5 (26.5)

[†] High school and vocational/some college combined for analysis

Table 2

Relation between home responsibilities, task hours, and ABP

	Ambulatory SBP b (95%CI)	Ambulatory DBP b (95%CI)
Home responsibilities	0.99 (0.37–1.62) **	0.34 (0.15–0.53) ***
Home task hours [‡]	–0.23 (–1.02–0.56)	–0.32 (–0.82–0.17)
Age	0.49 (0.10–0.87) *	–0.002 (–0.14–0.13)
Gender (male)	–1.19 (–5.57–3.19)	2.61 (0.48–4.74) *
Race (White)	–4.02 (–8.91–0.88)	–3.04 (–6.04– –0.05) *
BMI	–0.32 (–1.00–0.36)	–0.24 (–0.49–0.01) [‡]
Location		
Home	Referent	Referent
Work	–0.57 (–2.00–0.85)	0.65 (–0.46–1.76)
Other	–0.23 (–1.64–1.17)	0.86 (–0.20–1.93)
Missing	–1.61 (–3.66–0.44)	1.19 (–0.19–2.57) [‡]
Posture		
Sitting	Referent	Referent
Standing	3.90 (2.90–4.90) ****	1.32 (0.66–1.97) ****
Reclining	–5.97 (–8.15– –3.80) ****	–8.53 (–10.17– –6.89) ****
Missing	1.17 (–0.86–3.20)	0.73 (–0.63–2.08)

[‡] Square root transformed[‡] p<0.10,

* p<0.05,

** p<0.01,

*** p<0.001,

**** p<0.0001

Table 3

ABP at work and at home by tertile of home responsibility

	Home responsibility		
	Tertile 1 (n=33)	Tertile 2 (n=43)	Tertile 3 (n=37)
SBP, M (SD)	139.6 (11.0)	142.7 (11.3)	145.5 (15.1)
DBP, M (SD)	85.7 (4.6)	88.1 (6.9)	89.5 (6.2)
SBP at home, M (SD)	138.0 (12.1)	141.7 (12.9)	144.2 (17.2)
DBP at home M (SD)	82.0 (5.9)	85.7 (8.9)	85.2 (7.1)
SBP at work, M (SD)	141.1 (9.5)	142.8 (10.8)	146.5 (14.2)
DBP at work, M (SD)	87.3 (5.6)	88.7 (6.5)	90.5 (7.7)

Table 4

Relation between home responsibilities and ABP by income

	Ambulatory SBP b (95%CI), p			Ambulatory DBP b (95%CI), p		
	Annual household income			Annual household income		
	<\$45,000	\$45,000—<\$75,000	≥\$75,000	<\$45,000	\$45,000—<\$75,000	≥\$75,000
Home	1.40	0.70	−0.43	0.48	0.45	−0.39
Responsibilities	(0.58–2.21)***	(−0.26–1.65)	(−1.35–0.49)	(0.18–0.78)**	(0.04–0.86)*	(−0.89–0.11)

Covariates: Age, race, gender, posture, location, BMI

* p<0.05,

** p<0.01,

*** p<0.001

Table 5

Responsibility for individual household tasks in relation to ABP

	SBP b (95%CI)	DBP b (95%CI)
Childcare	1.60 (−0.36–3.58)	0.64 (−0.32–1.60)
Caring for ill or elderly	0.94 (−1.33–3.23)	0.21 (−0.80–1.22)
Pet care	1.01 (−1.24–3.26)	0.27 (−0.51–1.05)
Household chores	4.42 (2.27–6.56) ****	1.87 (0.85–2.89) ***
Yard work/gardening	1.05 (−0.88–2.97)	0.08 (−0.73–0.89)
Household or car repair/maintenance	2.64 (0.70–4.57) **	0.68 (−0.17–1.54)
Paying bills/keeping records/finances	1.66 (−0.24–3.55) [†]	0.96 (0.21–1.70) [*]

Covariates: Age, race, gender, posture, location, BMI

[†]
p<0.10,^{*}
p<0.05,^{**}
p<0.01,^{***}
p<0.001,^{****}
p<0.0001