Health, Work-Family Conflict, and Organizational Characteristics in Nursing Homes: Multi-level Findings From the Work, Family and Health Network

Orfeu M. Buxton
Harvard Medical School, Brigham and Women's Hospital

Lisa Berkman
Harvard School of Public Health

Phyllis Moen
University of Minnesota

Mary Durham
Kaiser Permanente

Georgia Karuntzos
RTI International

Erin Kelly
University of Minnesota

Leslie Hammer
Portland State University

ABSTRACT

As women have increasingly joined the full time labor force in the United States, balancing the responsibilities of caring for families is especially challenging for women in lower/middle wage jobs. Family strains may be detrimental to health, and chronic stress may be taking a toll on the health of the nation. We studied direct care employees in an extended care company with nursing homes across New England to test a workplace intervention. Our multi-level study, a part of the Work, Family and Health Network, finds variations and clusters in work and family conditions and organizational and employee characteristics across worksites, and associations with two important employee health outcomes (sleep problems, tobacco consumption). Conditions that have strongest associations with smoking and sleep disruption include race/ethnicity, education, schedule control and psychological distress for tobacco, and occupational status, total workhours, and family supportive supervisor support and psychological distress for sleep deficiency.

Introduction and Background

Over the last decades as women have increasingly joined the full time labor force in the United States, it has become clear that balancing the responsibilities of caring for families- both young children and adults- is difficult while also maintaining full time employment. This may be especially challenging for women in lower and middle wage jobs where benefits are fewer and economic resources flowing to families are constrained. It is further complicated in the United States by the absence of many publicly mandated social protection policies that enable work and family responsibilities and demands to be supported. Public and private companies have become increasingly concerned with this situation, especially those companies with female dominated labor forces. The health care sector, including short and long term care, is a major industry experiencing such challenges. While nursing and related occupations have become more gender integrated, still today many of those working in such jobs are women. Many of them are also in an age group when family formation is common. The challenge to health care organizations is to maintain a high quality workforce delivering high quality care to patients while at the same time remaining economically viable in a competitive market constrained by many regulations and patient reimbursement policies. This situation has resulted in several companies being very open to ways to recruit a talented workforce and maintain low rates of turnover and high quality care by incorporating more family friendly workplaces strategies in their environments. The aim of this paper is to describe social, economic and health related characteristics of thirty long term care facilities and their employees in one company. These are the first findings of an ongoing randomized field experiment where we introduce a work/family intervention with the aim of improving employee health and wellbeing as well as the well being of residents of the facilities and the health of employee's families.

We have become concerned about the possibility that in the United States, job and family strains (such as those experienced by many employees in our study) may be detrimental to women's (and men's health) and well-being and that this chronic stress may be taking an unexpected toll on the health of the nation. For instance, the life expectancy of US women over the last 50 years has lagged behind most other industrialized countries and we suspect that dramatic changes in work family life and weak social protection policies may be responsible for some of this lag, especially for working mothers. There has been a great deal written about this situation but to date there have been few interventions, especially using strong experimental study designs, to test the effect of policy and practice changes aimed at improving work/family life on physical and mental health of employees and their families and also to assess the impact on companies as they implement such policies and practices.

We are especially interested in the impact of such practices on low and middle-income workers who often have fewer financial resources to buffer the impact of potential work/family strains for themselves or their families. Workers in these low

and middle- income setting commonly have weak family leave protection or short term sickness absence policies as well. Because most of the strain reported to date is among women, we also wanted to conduct our study in a predominantly female labor force. Therefore as we designed the study, we selected a long term care company that had many nursing homes across New England to test our intervention. Long term care is an important industry to work in for several reasons: first, long term care and nursing in general is a growing industry in the US and includes many US workers. Secondly, the workforce is largely female. Finally, long term care institutions are highly regulated industries since the health and safety of many residents is critical in such settings. At the same time, across the industry, turn over and sickness absence is high. These are factors that contribute to poor resident outcomes and are ones that motivate employers to seek ways to reduce turn over and sickness absence, especially as it relates to family issues.

The aim of this paper is to describe our study, its design and findings related to 1.variations and clusters in work and family conditions and organizational and employee characteristics across nursing homes in one large company and 2. associations between two important health outcomes (sleep problems and tobacco consumption) and these same characteristics in employees in each nursing home, using multilevel methods.

METHODS

Study Design and randomization: the Work, Family and Health Network Study

This study is part of large network research effort to understand the ways in which modification of workplace practices and policies improves the health of employees, their families and the industries involved. Our study involved interventions in two industries. In this paper we report baseline results from one industry in long term care. The design of the study is a group randomized worksite trial in which we randomized 30 facilities in one company to either a work family intervention or standard care. The intervention, START, included a) participatory work redesign activities that identify new work practices and processes to increase employees' control over work time while still meeting business needs and b) supervisory training about strategies to demonstrate support for employees' personal and family lives while also supporting employee job performance. The intervention, START, is described in depth elsewhere.

Facilities were randomized using an adaptive randomization design to better accommodate the rapidly changing nature of the company in which facilities are added and lost over the period of the intervention. Such an adaptive method permits us to randomize sites close to the period of baseline data collection rather than far in advance and minimizes the chances that facilities are not available to enter the study. The method further ensures likelihood of balance of characteristics of facilities between intervention and control groups. To implement the randomization method, we modified a biased-coin randomization technique (Frane, 1998). All

analyses whether baseline associations presented in this study or subsequent papers of the effect of the intervention all take into account the multilevel nature of the intervention and are designed to assess whether nursing homes receiving the intervention are different from those who did not.

Research Site
The company that we identified to partner with us in this research was a large company in New England. Here we refer to this company as LEEF.   We initially identified the nursing home after sending letters to several potential companies with appropriate characteristics e.g. (large number of facilities, geographic proximity to each other, stability and willingness to participate in such a study and donate some level of company time for respondents to participate in both the intervention and the evaluation). After several meetings with the New England CEO, heads of units related to human resources and clinical care as well as regional directors, LEEF confirmed its continued interest. They saw the clear value to them in improving employee work life balance and thought it could not only improve the well being of employees, but also of residents and overall corporate productivity. They also had a strong commitment to culture change that was congruent with our efforts.

Thirty LEEF facilities were identified for this study. Facilities were excluded for a number of reasons including if they were just purchased by the company and not at capacity to be involved in the study, if they were in very isolated settings in which no comparable matching site could be randomized, if they were very small or if management of them was particularly precarious. However, once the 30 sites were identified they had equal chances of being randomized to intervention or control. In each of 30 facilities, all employees who were direct care workers were invited to participate. While in this paper, we report on baseline results, the study design calls for 6,12 and 18 month follow ups to assess outcomes related to the intervention. Furthermore, employees with partners and children between specified ages were invited to be part of a family study. In this paper, we do not discuss their characteristics since they are reported in a later manuscript. Below is a chart that shows the study design and randomization scheme as well as the number of participants invited to participate and response rates showing those for whom we have baseline data, including biomarkers related to cardiovascular risk and sleep.

FIGURE 1: Consort diagram showing flow of recruitment, response rates and randomization
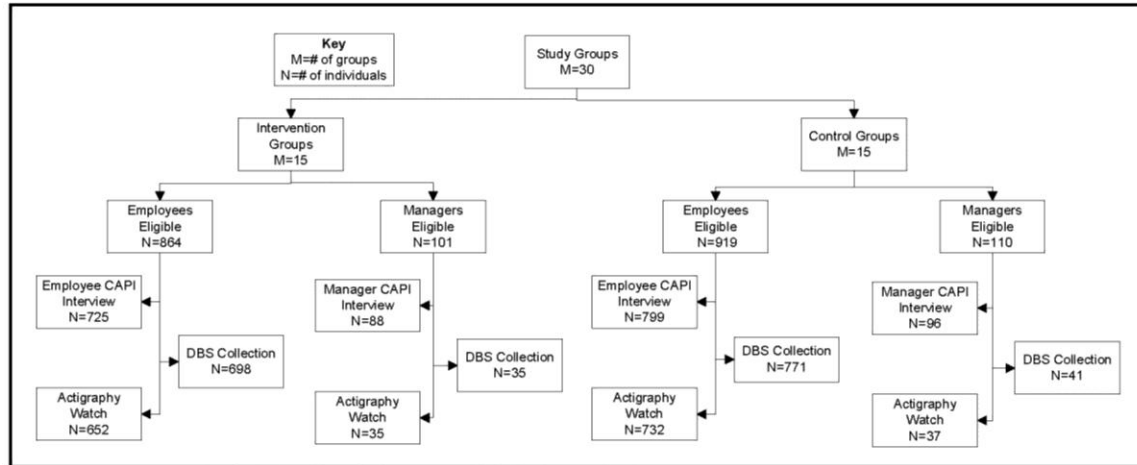
Note: CAPI = computer-assisted telephone interviewing; DBS = dried blood spot collection

Measures of exposures and outcomes:

In subsequent analyses, we include the following variables in our models.

Measures of work place organization assessed from employees

Job strain was assessed using survey items about psychological job demands and job control, or decision authority, based on the work of Karasek and colleagues (Karasek & Theorell, 1990; Karesek et al., 1998). Employees were asked questions about having enough time to get work done and working very fast and hard (psychological job demands) as well as decision making, freedom to decide how to do work and having a say about what happens on the job (decision authority). Subjects responded that they strongly disagreed, disagreed, neither, agreed or strongly agreed (valued 1 - 5, respectively) that these elements were part of their jobs. These ordinal responses for psychological job demands and decision authority were summed separately and analyzed continuously.

Work-family conflict is a form of interrole conflict in which role pressures from work and family domains are not compatible. (Greenhaus & Beutell, 1985). This measure is hypothesized to be bidirectional in nature (family-to-work and work-to-home) and was operationalized here using Netemeyer's validated Work-Family Conflict (WTFC) and Family-Work Conflict (FTWC) Scales (Netemeyer et al., 1996). Employees were asked five questions regarding conflict in each direction. Responses were coded 1-5 (strongly agree to strongly disagree) and averaged to create a continuous measure in which higher scores reflect greater work-family conflict. Specifically, WTFC was assessed through questions pertaining to the demands of work interfering with family or personal time, whether the amount of time that work takes up makes it difficult to fulfill family or personal responsibilities, things employees want to do at home that don't get done due to work demands, whether work produces strain that makes it difficult to fulfill family or personal duties and whether employees have to make changes to family or personal plans due to work-related duties. Similarly, FTWC was assessed through questions relating to the demands of family or personal relationships interfering with work-related activities, whether employees have to put off doing things at

work because of home demands, things employees want to do at work not getting done due to family or personal demands, whether home life interferes with work responsibilities (such as getting to work on time, accomplishing daily tasks and working overtime), and whether family-related stain interferes with employee's ability to perform job-related duties.

Family-supportive supervisor behaviors (FSSB) represent a unique construct from general supervisory support and assess employee appraisals of supervisor's behavior relating integrating work and family. FSSB has been found to be negatively and significantly associated with WTFC and turnover intentions and positively and significantly related to positive work-to-family and family-to-work spillover as well as job satisfaction (Hammer, Kossek, Yraggui, Bodner & Hansen, 2009). Specifically, employees were asked about family-related supervisory support in four domains: emotional support (supervisor makes you feel comfortable talking to him/her about conflicts between work and non-work), instrumental support (supervisor works effectively with employees to creatively solve conflicts between work and non-work), role modeling (supervisor demonstrates effective behaviors in how to juggle work and non-work issues) and creative management (supervisor organizes departmental work or until to jointly benefit employees and the company). In the current analysis, we have employed a short form of FSSB derived from employee responses to four items, categorized 1-5 (strongly agree to strongly disagree) and averaged to generate an overall score, with higher scores reflecting greater FSSB.

Schedule control was used to measure the degree to which employees control the arrangement of the hours that they work. Thomas and Ganster hypothesized that inflexibility surrounding work hours could contribute to work-family conflict and created a 14-item scale to reflect the construct. Here, we utilized a shortened, 8-item version of Thomas and Gansters' scale, which was piloted in a information technology worksite and was found to be a strong predictor of work-family conflict, negative work-family spillover and time adequacy in multivariate, longitudinal models. Employees were asked how much choice they have over the following: when they take vacation or days off, when they take off a few hours, when they begin and end each work day, the total number of hours they work each week, doing some work at home or another location than their company office, the number of personal phones they can make or receive while at work, the amount or times they take work home and the possibility of shifting to a part-time schedule from full-time while remaining in their current position (and vice versa). Responses were coded 1-5 (very little to very much) and averaged such that higher scores reflect greater control over work.

Health measures of employees

A number of employee physical and self-reported health outcomes were measured, including as major outcomes of the intervention risk factors related to cardiovascular disease and biomarkers of sleep. These included cardiovascular/metabolic risks related to blood pressure and hypertension, glycosylated hemoglobin and diabetes, cholesterol (Total and HDL), height, weight, BMI, smoking status. Biomarkers of cardiometabolic risk were assessed from either dried blood spots or in place direct blood assessments (HbA1c). Additional spots are

frozen for innovative assays the network identifies in the future. In addition we assessed markers of sleep quality and duration through actigraphy and self report and we have indicators of psychological distress.

Both systolic and diastolic blood pressures were determined by averaging three in-person measures using a wrist-cuff device. Blood pressure was also assessed through self-reported measures pertaining to whether a doctor had ever told the respondent they had high blood pressure and whether they were taking blood pressure medication at the time (yes/no for both). Hypertensive status was determined by combining self-reported and physical measures. Five hypertensive classes were created: normal, pre-hypertensive, undiagnosed hypertensive, controlled hypertensive and uncontrolled hypertensive. An employee was considered to exhibit uncontrolled and controlled hypertension if they responded that a doctor had told them they had high blood pressure. Additionally, uncontrolled hypertensives were those respondents who also had physical systolic or diastolic measures over 140 or 90, respectively. If employees responded that a doctor had not told them they had high blood pressure, they were classified as undiagnosed hypertensive, pre-hypertensive or normal. In particular, undiagnosed hypertensives exhibited physical systolic and diastolic blood pressure readings over 140 and 90, respectively. Controlled hypertensives exhibited systolic and diastolic blood pressure readings ranging between 120 and 140 and between 80 and 90, respectively. Finally, a respondent's hypertensive status was classified as normal if their systolic and diastolic blood pressure readings were less than or equal to 120 and 80, respectively.

Dried blood spots were also collected on consenting employees. Trained study staff pricked the subject's finger with a sterile lancet and proceeded to place 5 blood spots onto filter paper. A DCA machine was used to produce a hemoglobin reading (HbA1c) from the blood specimen. A dichotomous measure of diabetes was created using a cutoff point of 6.5% hemoglobin (equivalent to 48 mmol/mol) Thus, subjects were considered to exhibit diabetes if their HbA1c was greater than or equal to 6.5 and not to have diabetes if their HbA1c was between 0 and 6.5. Similarly, C-Reactive protein, an indicator of inflammation, was also measured using dried blood spots and analyzed continuously.

Total cholesterol, HDL and medication status were ascertained from dried blood spots and and then asking employees whether they were currently taking any drugs for their cholesterol (yes/no).

Interviewers utilized stadiometers and scales to measure height and weight, respectively. Subjects removed shoes, hats, hair ornaments and heavy outer garments before measures were taken. Body mass index (BMI) was calculated by dividing weight in kilograms by height in meters squared. In line with standard cutoffs, participants were considered underweight if their BMI was below 18.5, normal if BMI was between 18.5 and 25, overweight if BMI was between 25 and 30 and obese if BMI was above 30.

Smoking status was self-reported by employees. Respondents were asked how many days they smoke on average in a week as well as how many tobacco cigarettes they smoke on an average day. These responses were multiplied to produce a measure of cigarettes per week.

Sleep deficiency were characterized as sleep habits, including sleep duration, insomnia symptoms, and sleep insufficiency, in the preceding four weeks (Sorensen et al., 2011, Buxton et al., 2009, 2012). Sleep duration was assessed by asking on average over the past month how many hours respondents slept each day. Insomnia symptoms were assessed by asking how often they woke in the middle of the night or early with four response categories from not at all in the last 4 weeks to 3 or more times a week. In an exploratory analysis, Sleep insufficiency was assessed by asking how often they got enough sleep to feel rested upon waking, with five response categories from never to always, similar to the previously used term sleep adequacy. Sleep deficiency was present if any of the following were reported: short sleep duration (<6h/day), sleep insufficiency (never feeling rested on waking), or insomnia symptoms 3 or more times a week (Sorensen et al., 2011, Buxton et al., 2009, 2012).

Actigraphy assessed indicators of sleep duration

Psychological Distress was assessed through the K6 scale, which is widely used as a mental health screening scale in the United States and has been utilized in numerous psychiatric and social epidemiology studies, including the National Household Survey on Drug Abuse (e.g., Centers for Disease Control and Prevention, 2004; US Department of Health and Human Services, 2004). The scale has also been validated extensively in the clinical setting. Compared to structured diagnosed interviews, a gold standard in mental health assessment, the K6 demonstrates high sensitivity and specificity (area under the curve = 0.86) as well as excellent internal consistency (alpha = 0.89) (Kessler et al., 2003). The scale consists of 6 items asking about the mental health status of the employee in the past 30 days, including how much of the time the respondent felt sad, nervous, restless/fidgety, hopeless, worthless and that everything was an effort. Responses were scored 1 (none of the time) to 5 (all of the time) and summed to generate a continuous psychological distress score, ranging from 6 to 30, with higher scores indicating higher level of distress.

Sociodemographic conditions of employees

A number of sociodemographic variables were reported by employees. Respondents answered how old they were in years, and age was categorized less than or equal to 25 years, 25 to 35 years, 35 to 45 years, 45 to 55 years, 55 to 65 years and over 65 years. Gender was measured through self-reports and analyzed as a dichotomous variable (male/female). In order to assess race/ethnicity, employees were asked how they would describe their race, selecting all options that applied as well as whether they were Hispanic of Latin. These responses were used to construct a race/ethnicity variable with the following categories: Non-Hispanic White, Non-Hispanic Black, Latino and other or mixed race. Additionally, employees indicated whether they were born in the United States (yes/no) to assess foreign born status. Education was evaluated by asking the employees the highest grade of school completed. Responses were categorized as having secondary education or less and post-secondary education.

Marital and partner status of the employee was determined through the following question: Are you currently married or do you have a permanent romantic

partner that lives with you? If currently married or currently living with a romantic partner, this variable was coded yes and, otherwise, no. Caregiver status was measured by employee responses pertaining to the provision of at least 3 hours of care per week to an adult relative inside or outside of the home (ie: help with shopping, medical care or assistance in financial/budget planning) in the past 6 months. <u>Caregiver status</u> was dichotomized yes/no.

   <u>Occupation </u>was assessed by asking employees about their official job titles. Self-reported responses were coded registered nurse or licensed practical nurse (RN/LPN), certified nurse assistant (CNA) and other, including administration. <u>Household income</u> was determined by asking employees to determine which range in $5,000 increments best describes their total household income in the past 12 months. These responses were then categorized in relation to the U.S. Poverty Thresholds for 2011 (less than or equal to 100% of the poverty threshold to less than 200% of the poverty threshold and greater than 200% of the poverty threshold).

   To measure the <u>number of children in household</u>, employees were asked how many children live in the home for four or more days a week. Responses were categorized as none or more than zero. <u>Family stage</u> was based on the number of children in the household and employee's age, both reported by employee. Specifically, we categorized respondents as in five categories: under age 40 with no children, with children 0-5 years old, with children ages 6-18 years, with children 19 years and older and over age 40 with no children.

Analyses: MF and QW

RESULTS

1. **Nursing facility and Sample characteristics**

Both characteristics of nursing homes and those of respondents within nursing homes are important to identify.   Table one shows characteristics of nursing homes by state, number of certified beds, residents, RN hours/resident data, CNA resident hours/ day, Medicare Staff rating, and Medicare quality rating. Nursing homes vary in size with the largest number of beds being 176 and the smallest 38. There are also differences in staffing patterns with generally higher levels of RN and CNA hours in Maine than in other states. Similarly Medicare staffing and quality ratings are higher in Maine than in other states. These findings are shown in Table 1.

Table 1: Facilities Characteristics

State	Number of Facilities	Certified Beds M (SD) [min-max]	Residents M (SD) [min -max]	RN hours/ resident day M (SD) [min -max]	CNA hours/ resident day M (SD) [min-max]	Medicare Staff Rating M (SD) [min-max]	Medicare Quality Rating[†] M (SD) [min-max]
MA	12	129 (28) [90-183]	119 (27) [80-151]	0.75 (0.1) [0.5-0.9]	2.3 (0.1) [2.0-2.4]	3.5 (0.5) [3-4]	2.9 (1.04) [1-4]
ME	6	74 (20) [38-100]	70 (21) [30-98]	1.1 (0.1) [0.8-1.2]	2.6 (0.2) [2.2-2.8]	4.2 (0.4) [4-5]	3.7 (0.7) [2-4]
NH	5	124 (38) [78-176]	97 (46) [40-167]	0.77 (0.1) [0.5-1.0]	2.3 (0.1) [2.1-2.4]	3.2 (0.4) [3-4]	2.6 (1.3) [2-4]
CT	4	132 (25) [97-150]	119 (24) [89-154]	0.72 (0.1) [0.5-0.9]	2.1 (0.2) [1.7-2.3]	3.2 (0.7) [2-4]	2.5 (0.5) [2-3]
RI	2	144 (5) [140-148]	78 (8) [72-84]	0.88 (0.1) [0.8-0.9]	2.3 (0.2) [2.-2.3]	4 (0) [4]	2.5 (0.7) [2-3]
VT	1	44	36	0.8	2.6	3	3
Summary	**5 (3.5)** **[1-11]**	**104 (37)** **[38-183]**	**80 (36)** **[30-167]**	**0.8 (0.1)** **[0.5-1.2]**	**2.4 (0.2)** **[1.7-2.4]**	**3.5 (0.6)** **[2-4]**	**2.9 (0.6)** **[1-4]**

Overall, we enrolled 1524 men and women of whom 1399 were women and 125 men. These employees were classified all as direct care workers in the long term care industry including such occupations as nurses, certified nursing assistants, and a small number of administrators. Excluded from our study were employees in custodial, kitchen and food preparation and other employees who had no direct contact with residents. We selected direct care workers for participation in this RCT because they had a common set of policies and regulations and our intervention was explicitly designed to increase supervisor support and job flexibility into this set of occupations. Managers of these employees are also interviewed and included in this study. There were an additional 184 managers enrolled in this study and they were also a focal point of the intervention related to supervisor support. Since, however there outcomes are not included as a priori outcomes in this study, we do not show additional data for them.

Table 2: LEEF Sociodemographic and work conditions

	Men N=125	Women N=1399
DEMOGRAPHIC MEASURES		
	%	%
Age[a] (years)		
≤25	10.4	19.7
>25 to ≤35	38.4	24.0
>35 to ≤45	34.4	23.8
>45 to ≤55	14.4	20.9
>55 to ≤65	2.4	10.5
>65		1.07
Married/Partnered (yes)	52.0	63.8
Caregiver (yes)	27.2	30.3
Race/Ethnicity[b]		
White	43.2	66.6
Black	28.8	11.7
Latino	15.2	13.2
Other	12.8	8.5
Foreign Born (yes)	43.2	25.1
Occupation[c]		
Nurse	24.0	28.5
LNA	74.4	67.4
Other	1.6	4.1
Education[d]		
Secondary of less	27.2	39.27
Post Secondary	72.8	60.73
Poverty Level[e] (relative to national threshold)		
≤100% to ≤ 200%	70.8	65.0
>200%	29.2	35.0
Kids <18 in HH (yes)	31.2	48.0
Family Stage[f]		
≤ 40 years old and no children	46.4	20.3
Youngest child ≤ 5 years	20.0	21.3
Youngest child ≤ 18 years	11.2	26.7
Youngest child ≥ 19 years	2.4	8.8

[a] N=125 for men, N=1397 for women; [b] N=1398 for women; [c] N=1397 for women; [d] N=1398 for women; [e] N=123 for men, N=1211 for women; [f] N=1398 for women

Table 3: LEEF Work measures and health conditions

	Mean (SD)	Mean (SD)
	43.63 (1.88)	39.62 (10.45)
Psychological Distress[a]	11.11 (3.66)	11.97 (4.32)
Decision Authority[b]	3.50 (0.73)	3.45 (0.76)
Job Demands[c]	3.71 (0.82)	3.83 (0.75)
Family to Work Conflict[d]	2.05 (0.65)	2.07 (0.57)
Work to Family Conflict[e]	2.68 (0.92)	2.80 (0.91)
FSSB[f]	3.77 (0.87)	3.68 (0.88)
Schedule Control[g]	2.71 (0.77)	2.65 (0.73)
HgBA1c[h] (% hemoglobin)	5.53 (0.65)	5.51 (0.60)
Cigarettes per week	15.4 (34.87)	24.2 (46.66)
Total Cholesterol	238.49 (56.82)	216.74 (55.95)
HDL Cholesterol	49.38 (18.49)	52.09 (16.85)
C- Reactive Protein	2.906 (3.87)	4.21 (9.48)
	%	**%**
Blood Pressure Class[i]		
Normal	35.8	60.0
Pre-hypertensive	31.7	13.6
Undiagnosed hypertensive	3.3	2.2
Hypertensive, controlled	17.9	21.3
Hypertensive, not controlled	11.4	2.96
Hypertension[i] (yes)	14.6	5.2
Diabetes Class[j]		
Normal	93.1	90.7
Undiagnosed diabetes	1.7	1.0
Diabetic, controlled	1.7	5.1
Diabetic, not controlled	3.5	3.1
Diabetes[k] (yes)	5.2	4.3
BMI Class		
Underweight and normal	28.8	30.7
Overweight and Obese	71.2	69.4
Smoker[l] (yes)	23.4	30.9
Sleep deficient[m] (yes)	69.4	68.3

[a] N= 124 for men, N=1396 for women; [b] N=1386 for women; [c] N=1398 for women; [d] N=1397 for women; [e] N=1395 for women; [f] N=1385 for women; [g] N=124 for men, N=1385 for women; [h] N=116 for men, N= 1337 for women; [i] N=124 for men, N=1398 for women; [j] N=118 for men, N=1315 for women; [k] N=120 for men, N=1322 for women; [l] N=120 for men, N=1319 for women; [m] N=123, N= 1386 for men; [n] N=116 for men, N= 1344 for women; [o] N=116 for men, N=1337 for women; [p] N=124 for men, N= 1398 for women; [q] N=124; N=1398

Just under 50% of women in our sample were between the ages of 25 and 45, a prime age group to have children at home or elderly parent needing support. The men in the sample were on average slightly younger. 63.8% of women and 52% of men were married. The majority of women had at least one child at home were 33.8% of men had children living in the household. Our sample is quite diverse with 25% of women and 43.2% of men being foreign born. Almost 12% of women and 28.8 % of men were Black and 13.2 and 15.2 % of women and men respectively were Hispanic. Almost half the sample had some post secondary education and an additional 11% of women and 23% of men having a college degree or more. Approximately 22% of the sample was under 200% of the poverty line for household income the vast majority of men and women in our sample are CNA's. In terms of job strain, women have higher levels of demands than men do and men have higher levels of decision authority. In terms of work family conflict, almost 20 % of women report moderately high levels of work to family conflict with approximately 5% of men and women reporting the highest levels of work to family conflict. The converse- family to work conflict – is much lower for both men and women. In terms of supervisory support, around 75 % of men and women report moderately high or high levels of supportive behaviors by their supervisor. With regard to schedule control however, levels are much lower with over 40% of men and women reporting low or moderately low levels of control. Since these are critical domains we hypothesize will be influenced by our intervention we will return to the way these conditions vary across nursing homes and among individuals in our baseline analyses.

We hypothesize that there are a set of physical and mental health conditions that are the major outcomes of our intervention, in addition to the work place conditions related to work family conflict and supervisory support and control. We show the distribution of major health outcomes of interest. These outcomes relate to a cluster of cardiovascular risk factors, both self-reported and actigraphy assessed patterns of sleep and sleep problems and psychological distress. Between 4-5% of our cohort reports diabetes and meets our biomarker criteria for being diabetic. About 14% of men and 55 of women report themselves to by hypertensive but if we couple the reports with their actual blood pressure readings the percentage is much higher with over 30% of men potentially being hypertensive if we include those not diagnosed and uncontrolled and controlled. About 23% and 31% of men and women report being smokers. Almost 70% of men and women are in the overweight or obese categories and just under 70% report being sleep deficient.

2. **Associations of characteristics among nursing homes: clustering of characteristics**

There are two sets of issues that are of central concern to us in these analyses. The first is to understand the ways in which social, demographic, health or organizational characteristics vary across the 30 nursing home facilities in our company and they ways they are correlated.   Capacity of facilities to modify their organizational behavior may depend heavily on both the compositional and

contextual conditions that are specific to each facility. For instance, in terms of compositional variables, facilities in which there are many women with young children or those in which there are many recent immigrants may face one set of issues related to work place change whereas those with older workers and fewer foreign born may face another set of issues. In terms of contextual conditions, facilities with a history of high turn over rates, low supervisory support and lower ratings for Medicare quality may find it harder to implement certain practices than those facilities with better indicators of overall strength and capacity. And, of course, compositional and contextual conditions may be correlated. Thus the initial aim of our analyses is to describe the pattern of associations among these workplace and employee characteristics. A secondary goal of these analyses is to ensure that intervention and control sites are balanced with regard to potentially important modifying or moderating conditions so that we can control for such conditions in subsequent analyses when we assess the impact of the intervention on outcomes.

The second issue relates to the ways in which baseline social and occupational characteristics of employees are associated with physical health conditions. We then proceed to identify to cases of health outcomes of interest where we examine explicitly whether associations may result from compositional or contextual conditions in section 3. While these associations are complex and will be subject of many individual investigations here we present cross sectional associations.

How are nursing homes the same or different?

A cluster analysis of each of the 30 nursing home by a set of demographic, work, and health characteristics reveals interesting clustering of facilities. We initially ran cluster analysis for each of the three domains individually to see how facilities cluster on a discrete set of inter-related characteristics. We then looked at how they cluster together across these three domains.

With regard to sociodemographic characteristics of employees, there emerged from the cluster analysis two clusters, one comprising 10 nursing homes and 529 employees and a second cluster of 20 nursing homes and 995 employees. The principal differentiating factor between these two clusters is race where 35.5 percent of employees are white in cluster 1 and 80% are white in cluster 2. In addition, cluster 2 includes more people over 40 with no children under 18 in the household than cluster 1 (56.5% vs 48.6%). Other characteristics are not notably different.

With regard to work characteristics, there are 4 clusters with 8,11,9 and 2 facilities in each one respectively. Interestingly the most significant difference among these facilities is related to reporting of work family conflict and schedule control, although job demands vary among clusters as well.

The third domain of importance to us relates to the health outcomes we hypothesize will improve as a result of the intervention. These include blood pressure, BMI and

cigarettes per week as shown here. Other outcomes including diabetes and HbA1c did not vary across facilities are not included in this model. Here there are three clusters of 5, 21 and 4 facilities respectively. For the health outcomes, we are still seeing higher cigarette smoking associated with lower BP and BMI (cluster 3). Cluster 2 is much healthier than cluster 1 (data in appendix)

In the last step we examine how all three domains lead to multidimensional clusters. Figures 3, 4 and 5 shows the 4 clusters which emerged from this analysis and how they are different across sociodemographic, work and health domains. The first figure (3) show that two clusters look very similar in terms of race with the first two being predominantly white and the second two very diverse with less than half the cohort being white.
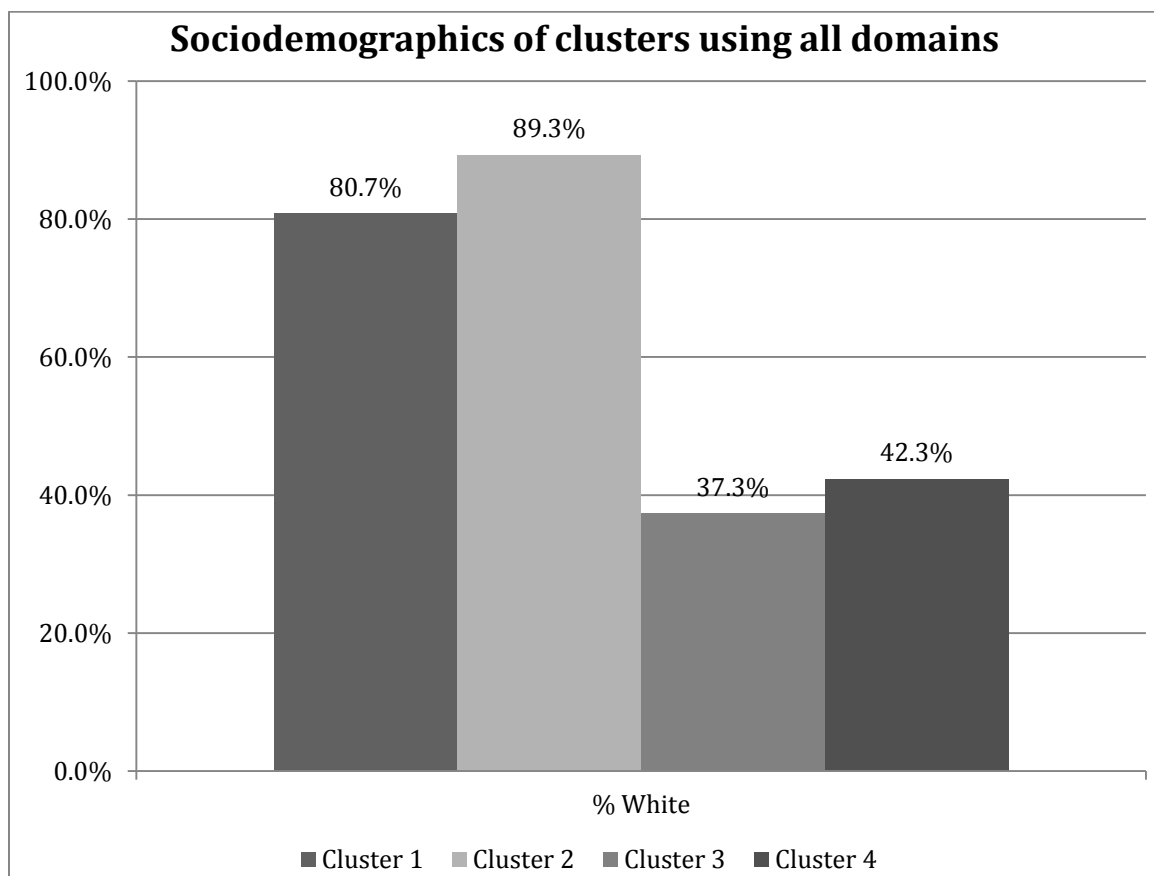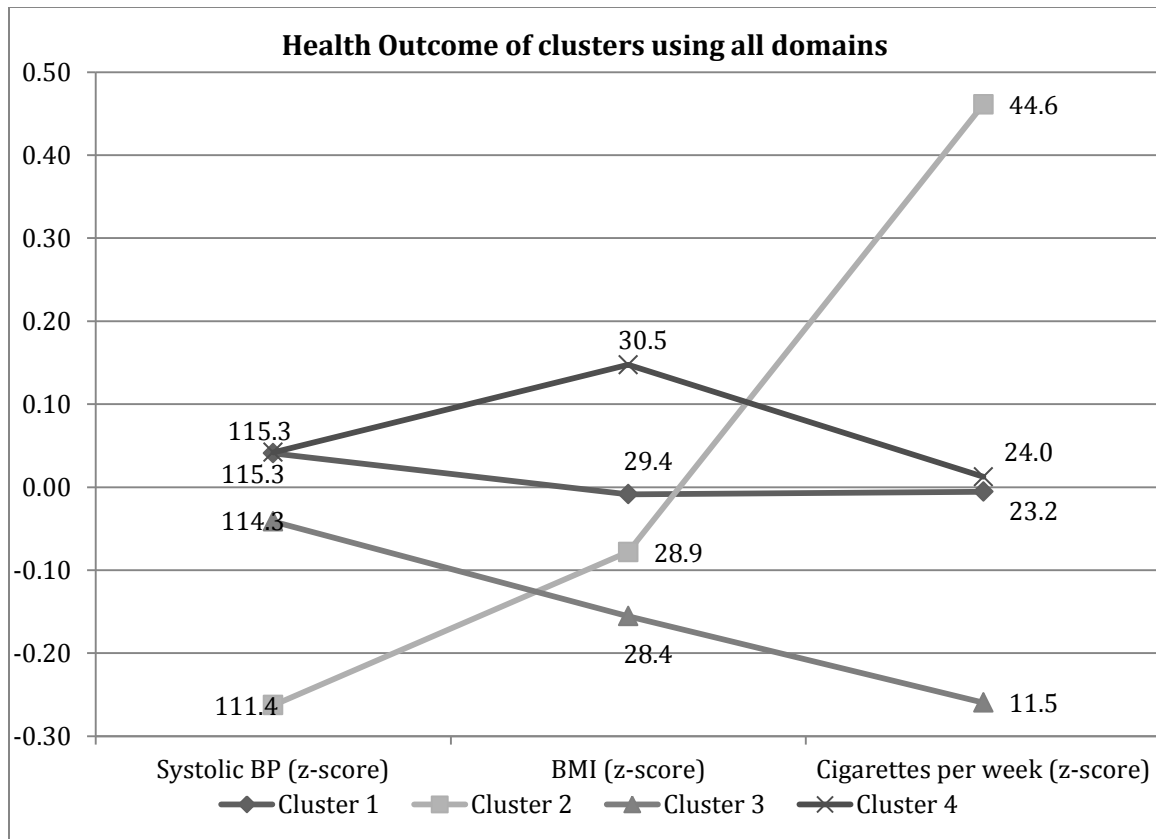

In figure 4, the means of the work measures are shown across the 4 clusters and it is clear that cluster 1 is highest on job strain and work family conflict—although it is lower on schedule control. Cluster 4 is low on work family conflict and schedule control with 2 and 3 in the middle of these clusters.

Work Measures of clusters using all domains
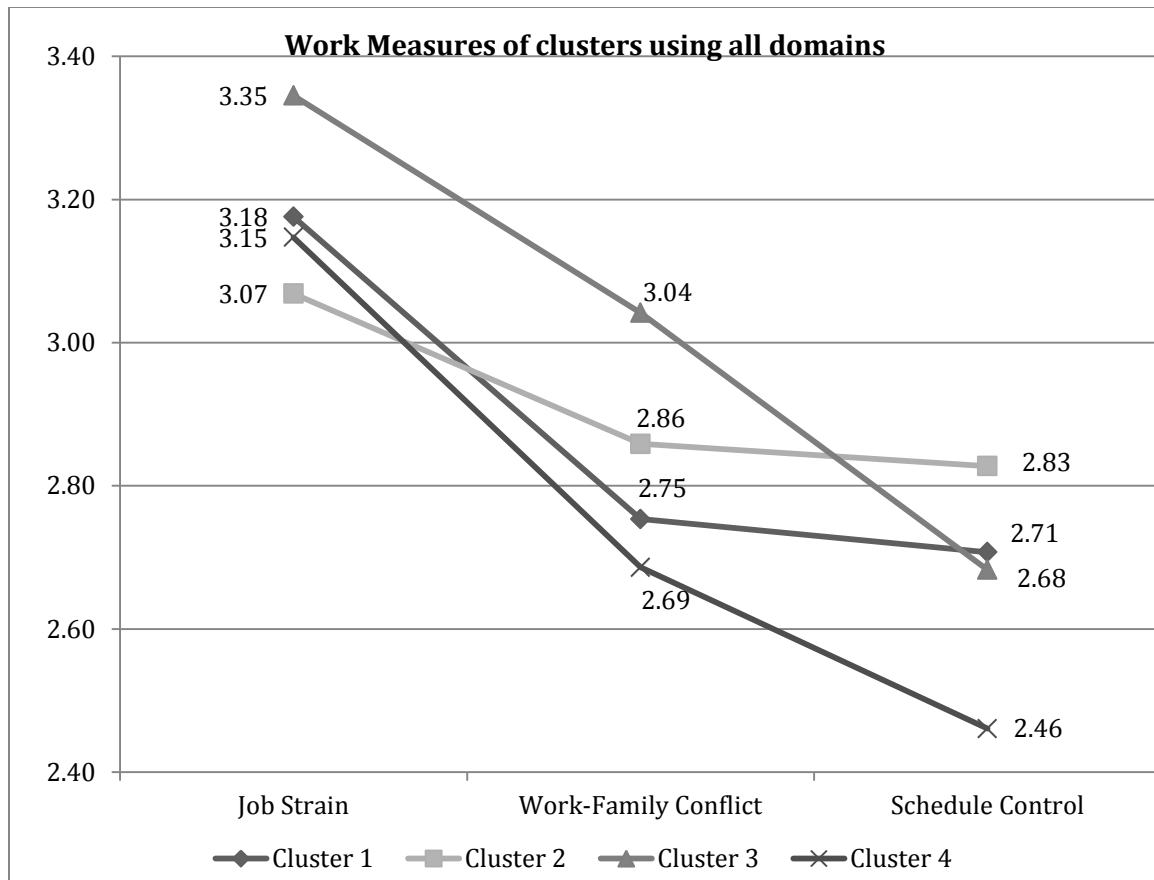
In the final cluster figure we see that 4 is the outlier in terms of patterns being very low in blood pressure and highest in smoking. All other cluster are ranked very similarly across the health outcomes.

3. **Multilevel level models of tobacco use and sleep deficiency: an illustration of compositional and contextual effects.**

In this last section, we identify two key conditions which we hypothesize are strongly linked to work life conditions and which also are tied to cardiometabolic risk. They are two of our key outcomes variables in our randomized field study. Here our aim is to examine in these cross sectional data, if they are associated with sociodemographic or working conditions at the level of the nursing home and/or individual employee. These results suggest for smoking there is a large site level effect on smoking but it is not linked to any of the specific variables we have identified in the model. For sleep, all site level impacts are not significant once individual level variables are included in the model. Conditions that have strongest associations with smoking and sleep disruption include

Health Outcome of clusters using all domains

3. Associations between work and family conflict, job strain and characteristics of nursing homes and health and health behaviors

Overall, we see significant clustering of sites. Not all nursing homes are alike- even those belonging to one company. Undoubtedly geography drives some of the facility level differences here and in future analyses, we hope to better integrate geographic data in our analyses.

3. Multilevel level models of tobacco use and sleep deficiency: an illustration of compositional and contextual effects.
In this last section, we identify two key conditions which we hypothesize are strongly linked to work life conditions and which also are tied to cardiometabolic risk. They are two of our key outcomes variables in our randomized field study. Here our aim is to examine in these cross sectional data, if they are associated with sociodemographic or working conditions at the level of the nursing home and/or individual employee. These results suggest for smoking there is a large site level effect on smoking but it is not linked to any of the specific variables we have identified in the model. For sleep, all site level impacts are not significant once individual level variables are included in the model. Conditions that have strongest associations with smoking and sleep disruption include race/ethnicity education, schedule control and psychological distress for tobacco and occupation (being a

CAN), total hours worked and family supportive supervisory support and psychological distress for sleep deficiency.

Table 4: Multilevel Models

	Cigarettes per week Estimate (SE) N=1351	Sleep deficiency Estimate (SE) N=1333
Intercept	-17.72 (32.62)	2.44 (1.98)
Sociodemographic Characteristics		
Age	0.18 (0.11)	0.001 (0.01)
Married (yes)	-0.29 (2.69)	0.16 (0.14)
Race/Ethnicity		
White	Ref	Ref
Black	**-18.22 (5.15)***	-0.34 (0.24)
Latino	**-14.29 (4.90)***	0.27 (0.24)
Other/Mixed race	-8.60 (4.79)	-0.29 (0.23)
Foreign Born (yes)	**-17.14 (3.79)***	-0.32 (0.19)*
Occupation		
Administrative	Ref	Ref
Nurse/Licensed Practical Nurse	-11.29 (6.56)*	-0.55 (0.36)
Certified Nurse's Assistant	-9.74 (6.60)	**-0.78 (0.36)***
Education		
Secondary or less	Ref	Ref
Post-secondary Education	**-9.70 (2.90)***	0.08 (0.15)
Poverty Level		
Poverty Level ≤ 100%	2.89 (5.80)	0.28 (0.30)
Poverty Level ≤ 200%	5.32 (3.99)	0.01 (0.20)
Poverty Level ≤ 300%	0.22 (3.60)	0.06 (0.18)
Poverty Level > 300%	Ref	Ref
Poverty Level missing	3.60 (4.62)	0.32 (0.23)
Kids less than 18 years old in home (yes)	3.25 (2.72)	0.11 (0.14)
Total hours work/week	-0.01 (0.12)	**0.01 (0.02)***
Work Measures		
Decision Authority	-0.78 (1.85)	-0.13 (0.09)
Job Demands	0.66 (1.81)	0.11 (0.09)
Work-to-Family Conflict	0.24 (1.57)	-0.26 (0.42)
Family Supportive Supervisory Behavior	2.49 (1.51)*	**-0.14 (0.08)***
Schedule Control	**-4.58 (1.89)***	-0.04 (0.47)
Site Level Variables		
Percent white	-4.47 (9.58)	-0.03 (0.37)
Site-level manager reported organizational climate	10.15 (11.16)	-0.17 (0.23)
Site level schedule control	8.10 (5.04)	-0.33 (0.43)
Other		
Psychological Distress	**0.80 (0.32)***	**0.10 (0.02)***
Site-level Variability	**68.8 (33.2)***	0.07 (0.06)*

*p<0.10, **p<0.05, ***p<0.01