



Employment arrangement, job stress, and health-related quality of life[☆]



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ABSTRACT

Objective: We aimed to understand the characteristics of U.S. workers in non-standard employment arrangements, and to assess associations between job stress and Health-related Quality of Life (HRQL) by employment arrangement.

Background: As employers struggle to stay in business under increasing economic pressures, they may rely more on non-standard employment arrangements, thereby increasing the pool of contingent workers. Worker exposure to job stress may vary by employment arrangement. Excessive exposure to stressors at work is considered to be a potential health hazard, and may adversely affect health and HRQL.

Methods: We used the Quality of Worklife (QWL) module which supplemented the General Social Survey (GSS) in 2002, 2006, 2010, and 2014. GSS is a biannual, nationally representative cross-sectional survey of U.S. households that yields a representative sample of the civilian, non-institutionalized, English-speaking, U.S. adult population. The QWL module assesses an array of psychosocial working conditions and quality of work life topics among GSS respondents. We used pooled QWL responses from 2002 to 2014 by only those who reported being employed at the time of the survey. After adjusting for sampling probabilities, including subsampling for non-respondents and correcting for the number of adults in the household, 6005 respondents were included in our analyses. We grouped respondents according to their employment arrangement, including: (i) independent contractors (contractor), (ii) on call workers (on call), (iii) workers paid by a temporary agency (temporary), (iv) workers who work for a contractor (under contract), or (v) workers in standard employment arrangements (standard). Respondents were further grouped into those who were stressed and those who were not stressed at work. Descriptive population prevalence rates were calculated by employment arrangement for select demographic and organizational characteristics, psychosocial working conditions, work-family balance, and health and well-being outcomes. We also assessed the effect of employment arrangement on job stress, and whether job stress was associated with the number of reported unhealthy days and days with activity limitations. These two health and well-being outcomes capture aspects of worker HRQL.

Results: Our results underscored the importance of employment arrangement in understanding job stress and associated worker health and well-being outcomes. Between 2002 and 2014, the prevalence of workers in non-standard employment arrangements increased from 19% to 21%; however, the observed trend did not monotonically increase during that period. Compared with workers in standard arrangements, independent contractors and on call workers were significantly less likely to report experiencing job stress. For workers in standard arrangements and for contractors, we observed significant association between perceived job stress and reported unhealthy days. We observed a similar association for reported days with activity limitations, for workers in standard and temporary arrangements.

Conclusion: The major contribution of our study was to highlight the differences in job stress and HRQL by employment arrangement. Our results demonstrated the importance of studying each of these employment arrangements separately and in depth. Furthermore, employment arrangement was an important predictor of job stress, and compared with non-stressed workers, stressed workers across all employment arrangements reported more unhealthy days and more days with activity limitations.

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1. Introduction

Employment arrangements may be broadly categorized into standard and non-standard. Workers in standard employment arrangements are typically employed full-time, and expect to remain employed, often by the same employer, and be able to advance their career in the long term. Workers in non-standard employment arrangements include those who are independent contractors, on call workers, temporary help agency workers, and workers provided by contract firms (Katz and Krueger, 2016; U.S. Government Accountability Office (GAO), 2015).

Employment arrangements may also be broadly categorized into contingent and non-contingent. The U.S. Bureau of Labor Statistics (BLS) defines contingent workers as those who do not have an explicit or implicit contract for long-term employment, or in other words, workers whose jobs are not expected to continue in the future (BLS, 1995). Thus, workers in both standard and non-standard employment arrangements may be considered contingent, based on the expected duration of their employment (BLS, 1995; GAO, 2015). Because contingent work is not defined consistently, estimates of the number of contingent workers are disparate. A recent report estimated that over the past two decades, the proportion of contingent workers in the overall U.S. workforce ranged from 1.8% in 2005 to 40.4% in 2010, depending on the definition of contingent work and the data source used (GAO, 2015).

Within the category of contingent workers, both BLS and the General Social Survey (GSS) identify a set of core contingent workers, which includes on call workers, temporary help agency workers, and workers provided by contract firms (GAO, 2015). Compared with workers in standard arrangements and independent contractors, core contingent workers are more likely to be young, Hispanic, have no high school degree, and have low family income. Core contingent workers are also more likely to experience job insecurity, have an increased risk of injury on the job, and lack employer-provided fringe benefits such as retirement and health-care benefits (GAO, 2015).

A European conceptual model linking non-standard employment arrangements to adverse health outcomes and low quality of life is consistent with U.S. findings (Benach et al., 2014). The authors of this model used the term precarious employment to describe non-standard employment arrangements and contingent work. Their findings highlighted that when compared with workers in standard arrangements, workers in precarious employment arrangements reported experiencing worse working conditions, receiving less occupational safety and health training and information about their work environment, and having less access to safety equipment. Workers in precarious employment arrangements were also at a higher risk of suffering occupational injuries (Benach et al., 2014).

Based on these U.S. and European findings, workers in non-standard employment arrangements may be exposed to higher job stress than workers in standard employment arrangements. Exposure to job stress is considered a potential health hazard. Excessive exposure to stressors at work may adversely affect health and Health-related Quality of Life (HRQL) (Alterman et al., 2013; Raykov, 2010). HRQL is a multi-dimensional concept that combines several metrics that include morbidity and mortality due to injuries and illnesses (Ray, 2014; Bowden and Foy-Rushby, 2003; Wilson and Cleary, 1995), physical and mental functioning, and self-perceptions of overall health (Hennessy et al., 1994; Guyatt et al., 1993). Studies have also linked job stress to costly outcomes such as absenteeism, poor physical and mental health, and increased healthcare utilization (Linton et al., 2015; Ganster and Rosen, 2013; McEwen, 2008; Goetzal et al., 1998).

As employers struggle to stay in business under increasing economic pressures, they may rely more on non-standard employment arrangements. Because workers in non-standard employment arrangements vary in characteristics and working conditions from workers in standard arrangements, the objective of this study was to assess the prevalence of job stress across employment arrangements and associated differences in worker HRQL. We used the Quality of Worklife (QWL) module that supplemented the GSS four times between 2002 and 2014, and included responses to worker health and well-being items that can be used to assess HRQL. To our knowledge, no previous studies have examined the association of job stress and HRQL by employment arrangement using GSS QWL data.

Specifically, our study aimed to: (1) provide descriptive population prevalence rates by employment arrangement of selected demographic characteristics (i.e., age, gender, race and ethnicity, education, and income), organizational characteristics (e.g., broadly-defined occupation, and National Occupational Research Agenda (NORA) industrial sectors; for more information on NORA see <http://www.cdc.gov/niosh/nora/sector.html>), psychosocial working conditions (e.g., job demands, job control, and support), work-family balance, health and well-being outcomes (e.g., job stress, previous work injury, general health), stress prevalence by survey year, and differences in general health, unhealthy days, and days with activity limitations by stress experience; (2) assess the effect of employment arrangement on job stress, controlling for covariates; and, (3) assess how job stress among workers in different employment arrangements was associated with experienced unhealthy days and days with activity limitations, controlling for covariates.

2. Data and methods

2.1. Data

Funded by the National Science Foundation, GSS is a biannual, nationally representative cross-sectional survey of U.S. households conducted through face-to-face personal interviews by the National Opinion Research Center. GSS utilizes a multi-stage probability design yielding a representative sample of the civilian, non-institutionalized, English-speaking, U.S. adult population (Grosch et al., 2006). In 2002, 2006, 2010, and 2014, GSS was supplemented with a QWL module (for details, see <http://www.cdc.gov/niosh/topics/stress/qwlquest.html>). Developed by the National Institute for Occupational Safety and Health (NIOSH) with contributions by its partners, the QWL module assessed an array of psychosocial working conditions and quality of work life topics among GSS respondents who were either employed or looking for work.

We analyzed pooled GSS QWL (referred to hereafter as QWL) data from all four survey years to explore relationships among workers in different employment arrangements and their job stress, and the associated differences in their HRQL. We used QWL responses of only those who reported being employed at the time of the survey. A total of 5736 respondents identified themselves as working part- or full-time across the four survey years. After adjusting for sampling probabilities, including subsampling for non-respondents (approximately 70% response rate each survey year) and correcting for the number of adults in the household, the nationally representative sample we used in our analyses increased to 6005 respondents.

2.2. Descriptive analyses

We distributed the study sample into five mutually exclusive groups based on responses to the question: *How would you describe*

your employment arrangement in your main job? Response categories were: (1) independent contractor/independent consultant/freelance worker (contractor), (2) on call worker/works only when called (on call), (3) paid by temporary agency (temporary), (4) working for a contractor who provides workers and services to others under contract (under contract), and (5) regular permanent employee (standard). We estimated the number and proportion of workers in each employment arrangement category and used an overall chi-square test to assess the statistical significance of each characteristic, condition, or outcome examined.

2.2.1. Demographic characteristics by employment arrangement

We examined the distribution of the study sample by employment arrangement for the following categorical characteristics: age; gender (male, female); race and ethnicity (American Indian or Alaskan native/Asian or Pacific Islander, Black, Multiracial, White, Hispanic); education (1–7 years, 8 years, 9–11 years, High school degree, 13–15 years, Bachelor's degree, Post graduate study or degree); and personal income (\$10,000 or less, \$10,001–\$25,000, \$25,001–\$50,000, \$50,001–\$75,000, above \$75,000).

2.2.2. Organizational characteristics by employment arrangement

We examined the distribution of the study sample by employment arrangement for the following categorical characteristics: (1) occupation (management, services, sales, natural resources, production); (2) NORA sector (based on NORA industry classifications); (3) part-time work (*When you worked in [the previous year], was it usually full or part time?*); (4) hours worked in a typical week (*Number of hours worked last week or normally work* – number of hours); and (5) type of work shift (*Which of the following best describes your usual work schedule?* – day, afternoon, night, split, irregular/on call, rotating).

2.2.3. Psychosocial working conditions by employment arrangement

We examined the distribution of the study sample by employment arrangement for the following conditions: (1) overwork (*I have too much work to do everything well*); (2) work fast (*My job requires that I work very fast*); (3) lots of say (*I have a lot of say about what happens on my job*); (4) freedom to decide (*I am given a lot of freedom to decide how to do my own work*); (5) supervisor support (*My supervisor is helpful to me in getting the job done*); (6) co-worker help (*The people I work with can be relied on when I need help*); (7) opportunity to learn at work (*My job requires that I keep learning new things*); (8) job security (*The job security is good*); (9) fringe benefits (*My fringe benefits are good*); and (10) safety and health (*The safety and health conditions where I work are good*). Responses were provided on a 4-point Likert scale ranging from 1 = strongly disagree to 4 = strongly agree. We collapsed responses into a binary variable with the following two categories 1 = yes (strongly agree, agree) and 0 = no (disagree, strongly disagree). Responses to “overwork” and “work fast” assessed job demands, responses to “lots of say” and “freedom to decide” assessed job control, and responses to “supervisor support” and “co-worker help” assessed support. These psychosocial working conditions are often regarded as indicators of stress (Van Der Doef and Maes, 1999; Radmacher and Sheridan, 1995; Sauter and Murphy, 1995; Johnson, 1989; Karasek, 1989).

2.2.4. Work-family balance by employment arrangement

To assess potential conflict among work and family demands, we analyzed responses to two questions: Family interferes with work (*How often do the demands of your family interfere with your work on the job?*) and work interferes with family (*How often do the demands of your job interfere with your family life?*). We collapsed the 4-point Likert scale responses into a binary variable (yes = frequently, sometimes; no = rarely, never).

2.2.5. Health and well-being outcomes by employment arrangement

We assessed responses to seven health and well-being outcomes. The primary outcome variable of interest was job stress measured through the survey question, *How stressful is your work?* We collapsed responses from a 5-point Likert scale into the following two categories: (1) those who reported being stressed at work (stressed; response options 5 = always, and 4 = often), and (2) those who reported not being stressed at work (non-stressed; response options 3 = sometimes, 2 = rarely, and 1 = never). We used these two categories as a binary response variable, with 1 = stressed and 0 = non-stressed. This is in line and allows for comparison with earlier studies that used QWL data (see for example Grosch et al., 2006).

The other two outcome variables included job satisfaction (*All in all, how satisfied would you say you are with your job?* – yes = very satisfied, somewhat satisfied; no = not too satisfied, not at all satisfied) and injured at work (*In the past 12 months, how many times have you been injured on the job?* – yes = one or more times; no = otherwise).

To understand how job stress affects worker HRQL, we also used four items from the Centers for Disease Control and Prevention (CDC) HRQOL-4 index. Developed in the 1980s, the HRQOL-4 has been used to derive metrics for government-wide initiatives such as Healthy People 2010 and 2020, and assess the health status of the U.S. population both at the national and state levels (ODPHP DHHS, 2014). Variables from the HRQOL-4 have been used in national level surveys such as CDC's Behavioral Risk Factor Surveillance System and the National Health and Nutrition Examination Survey. The four core questions from the HRQOL-4 were: (1) *Would you say that in general your health is excellent, very good, good, fair, or poor?* (Likert scale ranging from 1 = poor to 5 = excellent); (2) *Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?*; (3) *Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?*; and, (4) *During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?*

2.2.6. Stress prevalence by survey year and employment arrangement

We examined the distribution of stressed workers over the four survey years by employment arrangement, to assess whether some arrangements or years were associated with higher levels of stress.

2.2.7. Additional analyses of HRQOL-4 questions by employment arrangement

We examined responses to HRQOL-4 questions by employment arrangement. To measure healthy days lost, which we termed “unhealthy days,” we summed responses to questions 2 and 3 (days with poor physical health, and days with poor mental health). The construct of healthy days, although simple, has been tested for construct validity, concurrent validity, and HRQL predictive validity (<http://www.cdc.gov/hrqol/pdfs/mhd.pdf>). We used responses to question 4 to estimate “days with activity limitations.” We also calculated the mean scores for responses to each of the four HRQOL-4 questions and the newly created item of unhealthy days. We then compared the group mean scores between those who reported being stressed and those who reported not being stressed at work.

2.3. Regression analyses

2.3.1. Logistic regression

We estimated the effect of employment arrangement on job stress, controlling for covariates that included demographic characteristics (age, gender, race and ethnicity, education), organizational characteristics (occupation, NORA sector), family interfering with work, and health and well-being outcomes (job satisfaction, previous work-related injuries, general health). Previous studies showed that the demographic variables we included might contribute to stress and affect physical and mental health (Liu et al., 2008; Dembe et al., 2004). Previous studies also showed the importance of work-family balance on stress (Smith and Dejoy, 2012; Raykov, 2010). The objective of this part of the study was to assess how employment arrangements were associated with job stress. Therefore, we did not control for specific psychosocial working conditions separately in the regression analysis. Our underlying assumption was that exposures to stressful psychosocial working conditions were mostly attributed to employment arrangements.

2.3.2. Negative binomial regressions

To understand how job stress was associated with unhealthy days and days with activity limitations by employment arrangement, we estimated separate negative binomial regressions for each employment arrangement, controlling for covariates. We modeled unhealthy days and days with activity limitations as functions of worker demographics (age, gender, race and ethnicity, education), organizational characteristics (occupation, NORA sec-

tor), and health and well-being outcomes (job satisfaction, previous work related injuries, general health).

3. Results

Results are presented under subheadings that correspond to methods subheadings. The shaded columns in the tables below indicate employment arrangements that constitute the core group of contingent workers, as defined by the GSS.

3.1. Descriptive analyses

3.1.1. Demographic characteristics by employment arrangement

Results for demographic characteristics by employment arrangement are presented in Table 1. All demographic characteristics were statistically significant and varied by employment arrangement. Temporary workers (51% were 18–34 years old) and on call workers (43% were 18–34) were younger, while contractors were older (30% were 56 years old and older) than workers in standard arrangements. The majority of workers under contract (70%), temporary workers (66%), and contractors (59%) were male, while the majority of on call (53%) and standard workers (53%) were female. White, non-Hispanic workers represented the highest proportion of workers across all employment arrangement groups. Overall, core contingent workers were less educated than contractors and workers in standard arrangements. Over half of the workers on call (59%) and 44% of temporary workers reported an income

Table 1
Demographic characteristics by employment arrangement, pooled QWL data.

Demographic characteristics	Employment arrangements (% in columns)					
	Contractor	On call	Temporary	Under contract	Standard	All
Age*** ($\chi^2 = 164.1$)						
18–34	154 (19%)	71 (43%)	26 (51%)	59 (33%)	1699 (36%)	2009 (33%)
35–45	211 (25%)	35 (21%)	15 (30%)	40 (22%)	1237 (26%)	1537 (26%)
46–55	216 (26%)	25 (15%)	9 (18%)	53 (30%)	1076 (23%)	1380 (23%)
56 and over	246 (30%)	35 (21%)	1 (2%)	28 (16%)	767 (16%)	1077 (18%)
Total	827	166	51	180	4779	6003
Gender*** ($\chi^2 = 60.8$)						
Male	486 (59%)	78 (47%)	34 (66%)	125 (70%)	2233 (47%)	2956 (49%)
Female	341 (41%)	88 (53%)	17 (34%)	54 (30%)	2546 (53%)	3046 (51%)
Total	827	166	51	179	4779	6002
Race and ethnicity** ($\chi^2 = 14.8$)						
American Indian or Alaskan Native	4 (–)	–	–	3 (2%)	19 (–)	26 (–)
Asian or Pacific Islander	37 (5%)	7 (4%)	–	3 (2%)	135 (3%)	182 (3%)
Black	57 (7%)	18 (11%)	11 (22%)	26 (15%)	585 (12%)	703 (12%)
Multiracial	56 (7%)	16 (10%)	5 (10%)	19 (11%)	291 (6%)	388 (7%)
White	591 (72%)	96 (57%)	22 (44%)	105 (59%)	3242 (68%)	4075 (68%)
Hispanic	77 (9%)	30 (18%)	12 (24%)	22 (12%)	492 (10%)	633 (11%)
Total	822	167	50	178	4764	5981
Education*** ($\chi^2 = 47.0$)						
1–7 years	20 (2%)	8 (5%)	2 (4%)	4 (2%)	53 (1%)	87 (1%)
8 years	9 (1%)	2 (1%)	–	2 (1%)	50 (1%)	61 (1%)
9–11 years	60 (7%)	28 (17%)	6 (12%)	30 (17%)	342 (7%)	466 (8%)
High school graduate	205 (25%)	45 (27%)	18 (35%)	63 (35%)	1218 (26%)	1549 (26%)
13–15 years	229 (28%)	49 (29%)	15 (29%)	46 (26%)	1533 (32%)	1872 (31%)
Bachelor's degree	172 (21%)	18 (11%)	6 (12%)	18 (10%)	853 (18%)	1067 (18%)
Post graduate study or degree	129 (16%)	17 (10%)	4 (8%)	17 (9%)	715 (15%)	882 (15%)
Total	824	167	51	180	4764	5986
Personal income in survey year dollars*** ($\chi^2 = 129.0$)						
\$10,000 or less	162 (24%)	69 (59%)	15 (44%)	34 (21%)	587 (14%)	867 (17%)
\$10,001–\$25,000	171 (26%)	29 (24%)	12 (36%)	59 (36%)	1172 (29%)	1442 (28%)
\$25,001–\$50,000	152 (23%)	11 (9%)	4 (13%)	46 (28%)	1,432 (35%)	1645 (32%)
\$50,001–\$75,000	78 (12%)	4 (4%)	3 (8%)	20 (12%)	562 (14%)	668 (13%)
\$75,000 and above	108 (16%)	5 (4%)	–	5 (3%)	358 (9%)	476 (9%)
Total	672	118	33	163	4111	5098

Note: *** Significant at 0.01, ** Significant at 0.05.

‘–’ Indicates numbers less than 1.

of \$10,000 or less per year, while 23% of workers in standard arrangements and 28% of contractors reported an income of more than \$50,000 per year.

3.1.2. Organizational characteristics by employment arrangement

Results for organizational characteristics by employment arrangement are presented in Table 2. All organizational characteristics were statistically significant. Thirty-nine percent of contractors and 36% of workers in standard arrangements reported working in management occupations during the study period. The highest proportion of workers under contract reported working in construction (34%) and services (31%). Over half of the workers on call reported working in services (52%), while the highest percentages of temporary workers reported working in services (35%) and manufacturing (32%). Across the NORA sectors, contractors reported the highest participation in agriculture, forestry, and fishing (55% or 35 out of 64 workers in the sector) and construction (31%) than any other group of workers in non-standard arrangements. Of all on call workers, 65% reported working part-time, compared with 15% of all workers in standard arrangements. A higher proportion of contractors reported working longer hours than any other group, with 33% of contractors working more than 49 h per week. Contractors also reported the highest proportion of workers with irregular schedules (30%).

3.1.3. Psychosocial working conditions by employment arrangement

Results for psychosocial working conditions by employment arrangement are presented in Table 3. All the psychosocial conditions were significantly associated with employment arrangement, with the exception of supervisor support, co-worker help, and opportunity to learn. Least overworked were those working under contract (22%) and most overworked were temporary workers (32%). Across all employment arrangements, the highest proportion of groups reporting that their job required them to work very fast were temporary workers (72%), while the lowest proportion was reported by contractors (61%) and on call workers (61%). The highest proportion of workers reporting that they had lots of say about what happened on their job (90%) and freedom to decide how they did their work (96%) were contractors, while temporary workers reported the lowest proportions for these conditions (37% and 78%, respectively). Temporary workers also reported the lowest proportions for job security (72%) and good fringe benefits (44%), while workers in standard arrangements reported the highest proportions for these conditions (87% and 74%, respectively). Temporary workers reported the lowest proportion for having safe and healthy conditions where they worked (91%), while contractors reported the highest (96%).

3.1.4. Work-family balance by employment arrangement

Results for work-family balance by employment arrangement are presented in Table 4. The association between family interfer-

Table 2
Organizational characteristics by employment arrangement, pooled QWL data.

Organizational characteristics	Employment arrangements (% in columns)					
	Contractor	On call	Temporary	Under contract	Standard	All
Occupation** ($\chi^2 = 47.9$)						
Management	319 (39%)	46 (28%)	5 (10%)	29 (16%)	1695 (36%)	2094 (35%)
Service	180 (22%)	51 (31%)	12 (22%)	29 (16%)	995 (21%)	1266 (21%)
Sales	135 (16%)	18 (11%)	10 (19%)	30 (17%)	1133 (24%)	1326 (22%)
Natural resources	135 (16%)	20 (12%)	6 (11%)	65 (37%)	348 (7%)	574 (10%)
Production	53 (6%)	28 (17%)	19 (37%)	25 (14%)	548 (12%)	673 (11%)
Total	821	164	52	178	4719	5933
NORA sector*** ($\chi^2 = 42.5$)						
Agriculture, forestry, and fishing	35 (4%)	3 (2%)	1 (2%)	–	25 (1%)	64 (1%)
Construction	123 (15%)	21 (13%)	1 (3%)	58 (34%)	193 (4%)	396 (7%)
Healthcare and social assistance	82 (10%)	20 (12%)	4 (8%)	14 (8%)	672 (14%)	792 (14%)
Manufacturing	36 (4%)	11 (7%)	16 (32%)	15 (8%)	577 (12%)	654 (11%)
Mining	2 (–)	–	–	2 (1%)	9 (–)	13 (–)
Oil and gas extraction	–	–	–	–	1 (–)	1 (–)
Public safety	–	–	–	1 (–)	147 (3%)	148 (3%)
Services	414 (51%)	84 (52%)	17 (35%)	53 (31%)	2098 (45%)	2666 (46%)
Transportation, warehousing, and utilities	38 (5%)	10 (6%)	4 (9%)	16 (9%)	279 (6%)	348 (6%)
Wholesale and retail trade	77 (10%)	14 (9%)	5 (11%)	13 (8%)	654 (14%)	764 (13%)
Total	808	163	49	172	4655	5847
Part-time*** ($\chi^2 = 125.0$)						
Yes	229 (29%)	92 (65%)	16 (30%)	35 (21%)	687 (15%)	1059 (18%)
Total	793	142	54	164	4580	5753
Hours worked per week*** ($\chi^2 = 50.0$)						
1–34	302 (36%)	112 (67%)	20 (38%)	36 (20%)	814 (17%)	1283 (21%)
35–40	199 (24%)	35 (21%)	21 (40%)	76 (43%)	1996 (42%)	2327 (39%)
41–48	53 (6%)	7 (5%)	6 (12%)	22 (12%)	649 (14%)	738 (12%)
49–69	217 (23%)	7 (3%)	5 (10%)	40 (20%)	1183 (23%)	1452 (22%)
70+	57 (10%)	4 (4%)	–	4 (5%)	138 (4%)	203 (5%)
Total	827	166	52	180	4779	6003
Type of work shift*** ($\chi^2 = 69.0$)						
Day	503 (60%)	99 (60%)	31 (60%)	132 (70%)	3543 (70%)	4308 (72%)
Afternoon	15 (2%)	7 (4%)	7 (13%)	5 (3%)	242 (5%)	277 (5%)
Night	14 (2%)	9 (6%)	8 (15%)	16 (9%)	324 (7%)	371 (6%)
Split	20 (2%)	7 (4%)	1 (1%)	4 (2%)	127 (3%)	158 (3%)
Irregular	233 (30%)	39 (24%)	2 (3%)	17 (10%)	266 (6%)	557 (9%)
Rotation	33 (4%)	4 (2%)	4 (8%)	5 (3%)	269 (6%)	316 (5%)
Total	819	166	52	180	4771	5987

Note: *** Significant at 0.01, ** Significant at 0.05.

‘–’ Indicates numbers less than 1.

Table 3

Psychosocial working conditions by employment arrangement, pooled QWL data.

Psychosocial working conditions	Employment arrangements (% in columns)					
	Contractor	On call	Temporary	Under contract	Standard	All
Overwork [*] ($\chi^2 = 7.4$)						
Yes	205 (25%)	46 (28%)	16 (32%)	39 (22%)	1447 (30%)	1753 (29%)
Total	821	166	50	178	4761	5976
Work fast ^{***} ($\chi^2 = 12.7$)						
Yes	498 (61%)	100 (61%)	36 (72%)	113 (63%)	3219 (68%)	3965 (66%)
Total	820	165	50	180	4767	5981
Lots of say ^{***} ($\chi^2 = 65.6$)						
Yes	440 (90%)	55 (60%)	10 (37%)	79 (63%)	1948 (69%)	2533 (72%)
Total	487	84	27	107	2836	3541
Freedom to decide ^{***} ($\chi^2 = 33.3$)						
Yes	778 (96%)	130 (78%)	39 (78%)	158 (88%)	4109 (86%)	5214 (87%)
Total	810	166	50	180	4766	5972
Supervisor support ($\chi^2 = 0.7$)						
Yes	554 (83%)	142 (87%)	41 (82%)	151 (85%)	4011 (85%)	4898 (85%)
Total	669	162	50	178	4279	5778
Co-worker help ($\chi^2 = 0.0$)						
Yes	693 (91%)	152 (92%)	43 (86%)	162 (90%)	4335 (91%)	5385 (91%)
Total	763	165	50	180	4770	5928
Opportunity to learn ($\chi^2 = 3.0$)						
Yes	735 (89%)	140 (84%)	41 (82%)	149 (83%)	4103 (86%)	5168 (86%)
Total	825	166	50	180	4769	5989
Job security ^{***} ($\chi^2 = 12.5$)						
Yes	662 (82%)	137 (83%)	35 (72%)	148 (84%)	4133 (87%)	5115 (86%)
Total	803	166	49	177	4747	5941
Fringe benefits ^{***} ($\chi^2 = 72.2$)						
Yes	473 (60%)	83 (51%)	22 (44%)	114 (64%)	3508 (74%)	4199 (71%)
Total	792	161	49	177	4747	5926
Safety and health [*] ($\chi^2 = 5.0$)						
Yes	762 (96%)	157 (95%)	46 (91%)	169 (94%)	4430 (93%)	5563 (93%)
Total	798	165	50	180	4764	5956

Note: *** Significant at 0.01, ** Significant at 0.05, * Significant at 0.1.

Table 4

Work-family balance by employment arrangement, pooled QWL data.

Work-family balance	Employment arrangements (% in columns)					
	Contractor	On call	Temporary	Under contract	Standard	All
Family interferes with work ^{***} ($\chi^2 = 15.0$)						
Yes	213 (29%)	63 (35%)	8 (20%)	46 (26%)	1328 (28%)	1658 (27%)
Total	734	180	41	178	4742	5875
Work interferes with family ($\chi^2 = 6.30$)						
Yes	376 (46%)	64 (40%)	20 (37%)	66 (37%)	2027 (43%)	2553 (43%)
Total	818	163	53	179	4766	5979

Note: *** Significant at 0.01.

ing with work and employment arrangements was statistically significant. On call workers reported the highest proportion of family interfering with work (35%), while temporary workers reported the lowest (20%). The association between work interfering with family and employment arrangements was not statistically significant.

3.1.5. Health and well-being outcomes by employment arrangement

Results for health and well-being outcomes by employment arrangement are presented in Table 5. All the health and well-being outcomes were significant with the exception of mental health, physical health, and activity limitations. The least stressed were on call workers (20%), while the most stressed were workers under contract (34%). Contractors also reported the highest proportion of days free of issues related to poor mental health during the last 30 days (68%), poor physical health during the last 30 days (68%), and days with activity limitations (54%). Contractors also

reported the highest proportion of job satisfaction (94%), while temporary workers reported the lowest (73%). The highest proportion of previously injured workers was reported by those under contract (14% injured), while the lowest proportion was reported by temporary workers (3%). The highest proportion of general good health in the last 12 months was reported by on call workers (80%), followed by contractors (74%), and the lowest proportion was reported by those working under contract (66%) and temporary workers (67%).

3.1.6. Stress prevalence by survey year and employment arrangement

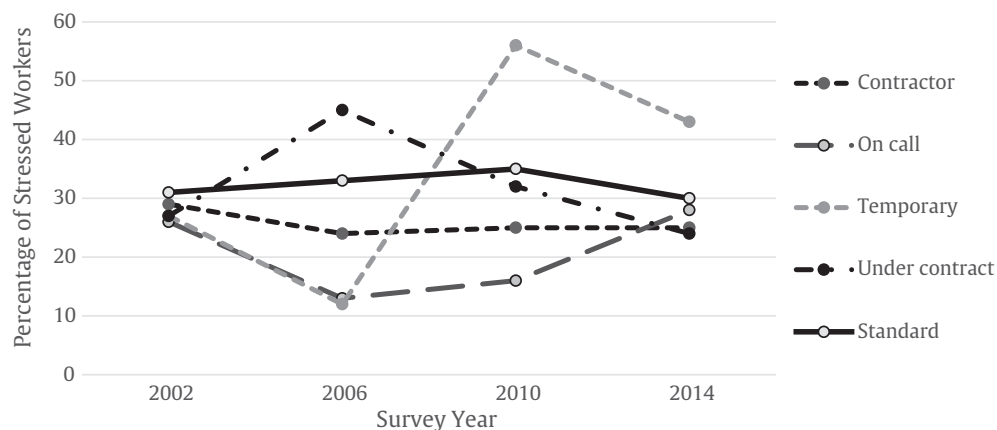
In Fig. 1, we plotted percentages of workers across various employment arrangements who reported being stressed at work during each of the QWL survey years. There was no statistically significant increase or decrease in stress prevalence across all employment categories combined. Overall, across all years, 31%

Table 5

Health and well-being outcomes by employment arrangement, pooled QWL data.

Health and well-being outcomes	Employment arrangements (% in columns)					
	Contractor	On call	Temporary	Under contract	Standard	All
Stressed*** ($\chi^2 = 23.80$)						
Yes	215 (26%)	33 (20%)	17 (33%)	62 (34%)	1521 (32%)	1847 (31%)
Total	827	166	52	180	4779	6003
Job satisfaction*** ($\chi^2 = 54.70$)						
Yes	777 (94%)	135 (81%)	37 (73%)	169 (94%)	4248 (89%)	5365 (90%)
Total	825	166	50	180	4768	5990
Injured* ($\chi^2 = 7.92$)						
No	754 (92%)	153 (92%)	49 (97%)	154 (86%)	4241 (89%)	5351 (89%)
Total	824	166	50	179	4769	5988
General health* ($\chi^2 = 9.40$)						
Good in last 12 months	711 (74%)	132 (80%)	43 (67%)	145 (66%)	4168 (68%)	5198 (69%)
Total	827	166	50	180	4775	5998
Mental health ($\chi^2 = 20.90$)						
No days in poor health during the last 30 days	560 (68%)	110 (66%)	28 (56%)	106 (60%)	2906 (61%)	3711 (62%)
Total	826	166	50	176	4756	5974
Physical health ($\chi^2 = 11.30$)						
No days in poor health during the last 30 days	565 (68%)	109 (66%)	32 (63%)	104 (58%)	3111 (65%)	3921 (66%)
Total	827	166	50	180	4757	5979
Activity limitations ($\chi^2 = 8.10$)						
No activity limitation days during the last 30 days	445 (54%)	83 (50%)	18 (35%)	72 (40%)	2263 (47%)	2881 (48%)
Total	827	166	52	180	4778	6002

Note: *** Significant at 0.01, ** Significant at 0.05, * Significant at 0.1.

**Fig. 1.** Percentage of stressed workers by employment arrangement and survey year.

of U.S. workers were stressed at work. The prevalence of stress across all years was highest among workers under contract (34%), temporary workers (33%), and workers in standard arrangements (32%).

When employment arrangements were studied individually, the prevalence of stressed workers varied across survey years. In 2002, the proportion of stressed workers across all employment arrangements was approximately 30%. In 2006, workers under contract reported the highest prevalence of stress (32%), while temporary workers reported the lowest (11%). However, in 2010, temporary workers reported the highest prevalence of stress (56%), which was also the highest proportion of stress reported in any survey year analyzed. On the other hand, on call workers reported less perceived job stress over the four survey years, which steadily hovered around 30%. In addition to other factors, variations in stress prevalence might reflect the effect of variations in labor market conditions during the survey years analyzed. This type of analysis, however, was beyond the scope of our study.

3.1.7. Additional analyses of HRQOL-4 questions by employment arrangement

Results of the differences and corresponding mean comparisons of general health scores, unhealthy days, and days with activity limitations by stress experience and employment arrangement are presented in Table 6. Non-stressed workers were healthier across all employment arrangements. For example, on average, non-stressed temporary workers rated their general health at 3.7 on a scale of 1 (poor) to 5 (very good), while stressed temporary workers rated their general health at 3.4. This means that there was a difference of 0.3 points in a range of 4 points (5–1) among stressed and non-stressed temporary workers. On average, stressed workers experienced four more unhealthy days (physical and mental) than non-stressed workers within a thirty day period. Stressed workers also lost more than one extra day of usual activities in a thirty day period, on average, when compared with non-stressed workers. The difference in “mean days unable to do usual activities” associated with stress was particularly high for temporary workers (difference = 4.01 days among stressed and non-stressed).

Table 6

Differences and corresponding mean comparisons of HRQOL-4 metrics by employment arrangement, pooled QWL data.

		Contractor	On call	Temporary	Under contract	Standard	All
General health	Mean for stressed (poor = 1)	3.5	3.2	3.4	3.3	3.5	3.5
	Difference of stressed from non-stressed	−0.4 ^{***} (0.08)	−0.4 ^{**} (0.21)	−0.3 (0.31)	−0.3 ^{**} (0.17)	−0.2 ^{***} (0.03)	−0.2 ^{***} (0.02)
Days of poor physical health in previous 30 days	Mean for stressed	4.2	2.9	5.6	4.4	3.4	3.6
	Difference of stressed from non-stressed	2 ^{***} (0.52)	0.3 (1.31)	4.3 ^{***} (1.55)	1.6 [*] (1.03)	1.3 ^{***} (0.19)	1.4 ^{***} (0.17)
Days of poor mental health in previous 30 days [^]	Mean for stressed	5.7	5.6	4.8	6.3	5.7	5.8
	Difference of stressed from non-stressed	3.5 ^{***} (0.55)	2.1 (1.55)	1.1 (2.14)	3.2 ^{**} (1.24)	3.4 ^{***} (0.22)	3.3 ^{***} (0.19)
Unhealthy days in previous 30 days (sum of poor physical health and poor mental health days)	Mean for stressed	8.4	7.6	9.8	9.5	8.3	8.4
	Difference of stressed from non-stressed	4.4 ^{***} (0.70)	2.4 [*] (1.8)	4.8 ^{**} (2.5)	3.9 ^{***} (1.5)	5.5 ^{***} (0.27)	4.1 ^{***} (0.24)
Days with activity limitations in previous 30 days	Mean for stressed	2.2	1.8	4.9	2.9	1.9	2.1
	Difference of stressed from non-stressed	1.15 ^{***} (0.33)	1.55 (0.81)	4.01 ^{***} (1.53)	1.25 [*] (0.93)	1 ^{***} (0.13)	1.4 ^{***} (0.12)

Note: ^{***} Significant at 0.01, ^{**} Significant at 0.05, ^{*} Significant at 0.1.[^] The means of poor physical health days and poor mental health days will not necessarily add up to mean number of unhealthy days as unhealthy days = MAX [30; physically + mentally unhealthy days].

3.2. Regression analyses

3.2.1. Logistic regression

Results of the odds ratios and their corresponding standard errors for the effect of employment arrangement on job stress are presented in Table 7. We found employment arrangement to be an important risk factor for perceived job stress. Temporary workers (OR = 1.39) and workers under contract (OR = 1.26) had higher odds of job stress when compared with employees in standard arrangements, although the differences were not statistically significant. Contractors (OR = 0.71) and on call workers (OR = 0.54) had significantly lower odds of job stress compared with workers in standard arrangements. Black (OR = 0.60) and Hispanic workers (OR = 0.73) had significantly lower odds of experiencing job stress than white workers. Having achieved a higher educational level was associated with higher odds of experiencing job stress (OR = 1.08). Workers in all other occupations had significantly lower odds of experiencing job stress when compared with workers in management. Family-work interference (OR = 1.75) and previous injury (OR = 1.74) were associated with higher odds of job stress, while job satisfaction (OR = 0.26) and good general health (OR = 0.71) were associated with lower odds of job stress.

3.2.2. Negative binomial regressions

We used negative binomial regressions to understand the association between perceived job stress among workers in non-standard employment arrangements and the number of unhealthy days and days with activity limitations, which could in turn affect worker HRQL. Results are shown as incidence rate ratios (IRR), the exponents of the regression coefficients, whose interpretation is similar to that of the odds ratios of logistic regressions.

Results of the strength of association between job stress and unhealthy days by employment arrangement are presented in Table 8. Results varied across employment arrangement groups. Workers with perceived job stress were at higher risk of experiencing unhealthy days. The relative risk of experiencing unhealthy days (incidence) among workers in standard arrangements and contractors was almost twice as high for those with job stress compared with those without job stress (IRR = 1.8), after controlling for covariates. The risk of experiencing unhealthy days was lower and not statistically significant among stressed workers in the core

Table 7

Employment arrangement and associated job stress across various characteristics, logistic regression results, pooled QWL data.

	Stressed Odds ratio (standard error)
<i>Employment arrangement (ref. standard)</i>	
Contractor	0.71 ^{***} (0.074)
On call	0.54 ^{***} (0.131)
Temporary	1.39 (0.525)
Under contract	1.26 (0.236)
<i>Demographic characteristics</i>	
Age	0.99 (0.002)
Gender (ref. Male)	1.07 (0.079)
<i>Race and ethnicity (ref. White)</i>	
American Indian or Alaskan Native	0.73 (0.400)
Asian or Pacific Islander	0.74 (0.168)
Black	0.60 ^{***} (0.073)
Multiracial	0.99 (0.142)
Hispanic	0.73 [*] (0.089)
Education (years of schooling)	1.08 [*] (0.033)
<i>Organizational characteristics</i>	
Occupation (ref. Managerial)	
Services	0.65 ^{***} (0.070)
Sales and office	0.63 ^{***} (0.067)
Natural resources, construction, and maintenance	0.71 [*] (0.112)
Production, transportation, and material occupations	0.61 ^{***} (0.087)
<i>NORA sector (ref. Wholesale and retail trade)</i>	
Agriculture, forestry, and fishing	0.97 ^{***} (0.110)
Construction	1.27 (0.373)
Healthcare and social assistance	1.22 (0.225)
Manufacturing	1.31 (0.195)
Mining	1.01 (0.155)
Oil and gas extraction	0.85 (0.555)
Public safety	1.33 (0.334)
Services	0.92 (0.111)
Transportation, warehousing, and utilities	1.22 (0.218)
<i>Work-family balance</i>	
Family-work interference (ref. No)	1.75 ^{***} (0.124)
<i>Health and well-being</i>	
Job satisfaction (ref. N")	0.26 ^{***} (0.027)
Injured (ref. No)	1.74 ^{***} (0.196)
General health (ref. Poor)	0.71 ^{**} (0.071)
Constant	2.32 ^{***} (0.762)
Observations	5636
Overall model fit (Chi-square)	358.06 ^{***}

Note: ^{***} Significant at 0.01, ^{**} Significant at 0.05, ^{*} Significant at 0.1.

Table 8

Association of job stress and unhealthy days by employment arrangement, negative binomial regression results, pooled QWL data.

	Unhealthy Days Incidence Rate Ratio - IRR (standard error)				
	Contractor	On call	Temporary	Under contract	Standard
Stressed (yes for perceived stress)	1.75 ^{***} (0.316)	2.27 (1.180)	1.34 (0.869)	1.48 (0.438)	1.76 ^{***} (0.106)
Demographic characteristics					
Age (years)	0.99 (0.005)	1.01 (0.012)	1.02 (0.022)	1.02 (0.012)	0.99 ⁺ (0.002)
Gender (0 if male)	1.64 ^{***} (0.303)	2.29 (1.070)	0.62 (0.312)	1.17 (0.465)	1.42 ^{***} (0.089)
Race and ethnicity (ref. White)					
Black	0.68 (0.208)	0.86 (0.522)	0.30 (0.189)	0.74 ⁺ (0.316)	0.80 ⁺ (0.067)
American Indian	1.84 (1.726)	–	–	0.06 (0.093)	0.70 (0.302)
Asian	0.49 (0.216)	0.65 (0.784)	0.89 (1.346)	–	0.90 (0.163)
Multiracial	1.03 (0.324)	0.72 (0.524)	2.02 (1.534)	2.73 (1.188)	1.18 (0.137)
Hispanic	1.07 (0.322)	0.70 (0.432)	0.42 (0.284)	0.90 (0.421)	0.832 (0.081)
Education (years)	0.94 (0.057)	0.90 (0.131)	1.07 (0.280)	1.04 (0.142)	0.91 ^{***} (0.023)
Organizational characteristics					
Occupation (ref. Managerial)					
Services	0.86 (0.224)	1.89 (1.077)	1.22 (1.506)	1.04 (0.566)	0.99 (0.086)
Sales	0.95 (0.239)	1.73 (1.214)	0.44 (0.400)	0.80 (0.442)	1.16 (0.096)
Natural resources	1.41 (0.415)	3.53 (3.567)	0.10 (0.136)	0.59 (0.370)	0.86 (0.118)
Production	0.69 (0.319)	0.87 (0.632)	1.03 (0.962)	0.81 (0.465)	1.07 (0.124)
NORA sector (ref. Wholesale and retail trade)					
Agriculture	0.73 (0.336)	2.01 (2.554)	–	0.29 (0.512)	0.56 (0.242)
Construction	1.04 (0.403)	0.64 (0.675)	–	0.88 (0.607)	0.93 (0.164)
Healthcare and social assistance	1.06 (0.413)	0.30 (0.254)	0.18 (0.274)	0.97 (0.718)	0.98 (0.114)
Manufacturing	0.65 (0.304)	1.66 (1.698)	0.58 (0.567)	1.42 (1.053)	0.85 (0.104)
Mining	0.17 (0.276)	–	–	–	0.12 ^{***} (0.089)
Oil and gas extraction	–	–	–	–	–
Public safety	–	–	–	–	0.83 (0.153)
Services	0.99 (0.286)	0.52 (0.359)	1.20 (1.441)	0.94 (0.549)	0.99 (0.093)
Transportation, warehousing, and utilities	1.60 (0.858)	0.53 (0.541)	0.33 (0.401)	0.87 (0.637)	0.94 (0.129)
Health and well-being outcomes					
Job Satisfaction (Satisfied)	0.37 ^{***} (0.125)	1.09 (0.566)	1.20 (0.736)	1.17 ⁺ (0.675)	0.60 ^{***} (0.054)
Injured (No)	2.13 ^{***} (0.567)	1.38 (1.088)	1.43 (1.477)	1.91 (0.780)	1.67 ^{***} (0.153)
General health (Good)	0.28 ^{***} (0.065)	0.50 (0.256)	0.13 ^{***} (0.099)	0.28 ^{***} (0.103)	0.39 ^{***} (0.032)
Constant	97.30 ^{***} (74.390)	5.56 (8.569)	285.9 ^{***} (593.600)	19.38 (30.960)	43.14 ^{***} (12.040)
Observations	789	159	56	160	4481
Overall model fit (Chi-square)	96.40 ^{***}	18.70	28.62	43.95 ^{***}	479.54 ^{***}

Note: *** Significant at 0.01, ** Significant at 0.05, + Significant at 0.1.

‘–’ Indicates zero observations.

contingent group, and especially those in temporary work arrangements.

Similar but larger effects were observed in days of activity limitations, presented in Table 9. After controlling for covariates, in the standard arrangement category stressed workers had almost double the risk of experiencing days with limited activity (IRR = 1.83) when compared with non-stressed workers. Among temporary workers, those who were stressed were at five times the risk of experiencing days with limited activity (IRR = 5.16) when compared with those who were not stressed.

4. Discussion

Our analyses underscored the importance of employment arrangement in understanding job stress and associated worker health and well-being outcomes. Similarly to the 2005 BLS report, we found that core contingent workers were younger, predominantly male, and less educated, when compared with workers in standard arrangements (GAO, 2015). Within the core contingent group, temporary and under contract workers were younger, predominantly male, non-white, and less educated than on call workers. Workers in different employment arrangements not only differed in terms of demographic characteristics, but also in terms of their exposures to psychosocial stressors at work, their perceived job stress, and HRQL. Like Alterman et al. (2013), we found

that non-standard work arrangements were most prevalent in agriculture, forestry, and fishing, construction, and manufacturing. We were unable to study certain industrial sectors such as mining and oil and gas extraction, as there were very few observations in those sectors in QWL.

While we observed some similarities among our findings and findings from earlier studies, we also observed some differences. Katz and Krueger (2016) used the RAND-American Life Panel survey, a version of the BLS Contingent Worker Survey module administered in 2005 and 2015, to compare the growth in non-standard employment arrangements in the United States. They found an increase in non-standard work arrangements from 10.1% of the country's workforce in 2005, to 15.8% in 2015. Our analysis showed an increase from 19% in 2002 to 21% in 2014. The years available in QWL included 2006 and 2010, which respectively coincided with the period before and barely after the latest recession. The trend we observed was not monotonically increasing; although the variation was not statistically significant, non-standard work arrangement prevalence varied by survey year. While the questions used to capture these trends were similar across the two studies, part of the observed differences in trends might be due to the differences in survey methodologies. Differences might also be due to the fact that BLS prevalence estimates reported for 2005 were much lower than the 2002 and 2006 QWL estimates (as shown in Table 1), and that the survey years compared were different. Interestingly, Alterman et al. (2013), estimated that 18.7% of U.S.

Table 9

Effect of job stress on activity limitations by employment arrangement, negative binomial regression results, pooled QWL data.

	Activity limitations IRR (standard error)				
	Contractor	On call	Temporary	Under contract	Standard
Stressed	1.47 (0.451)	1.87 (1.176)	5.16 [*] (3.652)	1.25 (0.561)	1.83 ^{***} (0.209)
Demographic characteristics					
Age (years)	0.99 (0.010)	1.03 (0.019)	1.15 ^{***} (0.027)	1.04 [*] (0.020)	0.99 (0.005)
Gender (0 if male)	2.12 ^{***} (0.640)	0.67 (0.497)	0.01 ^{***} (0.006)	0.458 (0.274)	1.39 ^{***} (0.045)
Race and ethnicity (ref. White)					
American Indian	8.56 [*] (13.014)	–	–	–	0.28 ^{***} (0.154)
Asian	1.11 (1.099)	7.39 (11.368)	–	–	1.07 (0.296)
Black	0.66 (0.407)	0.55 (0.474)	–	0.23 [*] (0.161)	1.18 (0.223)
Multiracial	1.44 (0.794)	0.713 (0.770)	4.09 (8.999)	1.47 (0.973)	0.93 (0.218)
Hispanic	0.89 (0.455)	0.46 (0.386)	7.46 ^{***} (5.422)	0.39 (0.284)	0.473 ^{***} (0.095)
Education (years)	1.11 (0.129)	1.16 (0.237)	4.32 ^{***} (1.445)	1.39 (0.248)	0.9 ^{***} (0.025)
Organizational characteristics					
Occupation (ref. Managerial)					
Services	0.675 (0.407)	0.59 (0.455)	–	1.09 (0.832)	0.54 ^{***} (0.089)
Sales	1.27 (0.562)	3.46 (3.730)	8.08 (19.260)	1.20 (0.859)	0.76 (0.128)
Natural resources	1.96 (0.966)	1.22 (1.798)	0.016 ^{***} (0.021)	1.77 (1.559)	0.43 ^{***} (0.121)
Production	0.59 (0.476)	0.36 (0.388)	1.01 (1.109)	5.55 (4.873)	0.75 (0.189)
NORA sector (ref. Wholesale and retail trade)					
Agriculture	0.89 (0.682)	0.59 (1.128)	–	–	–
Construction	0.57 (0.375)	2.11 (3.292)	–	1.16 (1.032)	0.87 (0.285)
Healthcare and social assistance	0.50 (0.316)	1.05 (1.304)	0.01 (0.021)	1.06 (0.893)	0.86 (0.556)
Manufacturing	0.30 (0.290)	0.73 (1.135)	0.39 (0.668)	0.31 (0.262)	0.69 (0.171)
Mining	0.318 (0.816)	–	–	–	0.23 (0.188)
Oil and gas extraction	–	–	–	–	–
Public safety	–	–	–	–	0.88 (0.387)
Services	0.80 (0.392)	1.47 (1.431)	0.01 (0.025)	1.65 (1.126)	1.14 (0.228)
Transportation, warehousing, and utilities	1.15 (1.049)	0.47 (0.791)	–	0.05 [*] (0.054)	0.87 (0.229)
Health and well-being					
Job Satisfaction (Satisfied)	0.24 [*] (0.153)	0.65 (0.469)	2.86 (2.079)	8.26 [*] (8.109)	0.50 ^{***} (0.076)
Injured (No)	3.78 ^{***} (1.751)	0.60 (0.802)	3.36 (7.520)	1.37 (0.853)	3.24 ^{***} (0.548)
General health (Good)	0.23 ^{***} (0.095)	0.22 [*] (0.156)	0.002 ^{***} (0.003)	0.05 ^{***} (0.023)	0.34 ^{***} (0.035)
Constant	16.40 [*] (22.900)	5.76 [*] (13.540)	11.30 ^{**} (16.242)	2.46 (4.650)	18.78 ^{***} (9.600)
Observations	789	159	56	160	4481
Overall model fit (Chi-square)	54.20 ^{***}	23.70	62.35 ^{***}	1911.30 ^{***}	2472.30 ^{***}

Note: *** Significant at 0.01, ** Significant at 0.05, * Significant at 0.1.

‘–’ Indicates zero observations.

workers were in non-standard employment arrangements in 2010, in contrast to our 21.5%. [Alterman et al. \(2013\)](#), used similar survey items and data from the National Health Interview Survey (NHIS), which included a larger number of observations than the QWL.

Income and hours of work are often considered significant contributors to job stress ([Grosch et al., 2006](#)). Like [Grosch et al. \(2006\)](#), we found significant variations in hours of work within employment arrangement ([Table 3](#)). Also, we found that the odds of job stress increased with increasing hours of work across employment arrangements, except for temporary arrangements. In our regression analyses, we did not control for hours of work separately because we assumed that similar to the effect of other psychosocial stressors, the effect of hours of work was endogenized, or was part of the direct effect of employment arrangement, on job stress. The significantly high correlation between employment arrangement and hours of work ([Table 2](#)) supported this assumption. Similarly, we did not control for income separately, and used job satisfaction as a proxy, instead. A limited number of respondent reported on their income. Therefore, including income as a separate covariate would have further decreased statistical power due to the reduced number of observations.

We found that employment arrangement was a significant contributor to job stress. Although the relationship between employment arrangement and perceived stressors can be bidirectional, i.e., stressors at their current job might drive workers to choose a different employment arrangement for their next job, we believe this was not true in our case because of the way we designed

our analysis. Workers' responses to the perceived stressors at work question had already taken into consideration their individual employment arrangement. Though cross-sectional, the data reflected the observed exposure to stressors within the type of employment arrangement workers were grouped into. In other words, employment arrangement was not a choice or decision variable for the workers who were asked about their exposures to stressors. This allowed us to study the effect, and not just the association, of employment arrangement on job stress. Furthermore, in comparison to workers in standard arrangements, contractors and on call workers were significantly less likely to report experiencing job stress. The high decision latitude enjoyed by contractors alongside their high job satisfaction, may offset their high job demands and result in them experiencing low job stress. On call workers, on the other hand, reported low job demands. In spite of also reporting lower decision latitude and lower job satisfaction than workers in standard arrangements, on call workers reported lower job stress. This could be due to an offsetting effect of their lower job demands.

For workers in standard arrangements and for contractors, we observed a significant association between perceived job stress and unhealthy days. Intuitively, we would assume that higher job stress would affect workers both mentally and physically, and this is one of the major conclusions of the literature on job stress. The risks were much lower and not statistically significant among stressed workers in the core contingent group, and especially those in temporary work arrangements. Although this might

be counter-intuitive, it was in line with previous research findings. Studies reviewed by Benach and his colleagues, indicated that sickness absence tended to be less frequent among temporary workers, possibly reflecting sickness presenteeism (Benach et al., 2014). In other words, temporary workers might not report unhealthy days accurately and go to work even when they feel unwell. In our regression results for days with activity limitations, we found that temporary workers reported significant and increased risk of experiencing days with activity limitations.

Additional analyses would help us understand some interesting results we cannot fully explain. For example, we will need to understand why on call workers reported the highest family interference with work while temporary workers reported the lowest. Being on call could result in experiencing difficulty finding reliable day care for children or accommodating other family needs but it is not clear why temporary workers would experience less family interference with work than any other group.

5. Limitations (methodological considerations)

Our study had several limitations. The major limitation was due to the cross-sectional nature of the data, which limited our ability to assess causality. Secondly, certain industries such as mining and oil and gas extraction were poorly represented in the data. The modest number of observations in certain categories due to the small sample size, specifically across temporary workers, resulted in wide confidence intervals. This may have in turn resulted in underestimation or overestimation of the relationship of employment arrangement with job stress, health, and HRQL.

6. Conclusion

The major contribution of our study was to highlight the differences in job stress, health, and HRQL by employment arrangement. Employment arrangement is considered as a social determinant of health and well-being. Because employers are under increasing economic pressures, they may rely more on non-standard employment arrangements to stay in business. Therefore, it is important to understand how employment arrangement may affect worker health and well-being. Our results demonstrated the importance of studying each of these employment arrangements separately and in depth. Furthermore, employment arrangement was an important predictor of job stress, and stressed workers reported higher numbers of days lost due to poor physical and mental health across all employment arrangements.

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References

Alterman, T., Luckhaupt, S.E., Dahlhamer, J.M., Ward, B.W., Calvert, G.M., 2013. Prevalence rates of work organization characteristics among workers in the US: data from the 2010 National Health Interview Survey. *AJIM* 56 (6), 647–659.

- Benach, J., Vives, A., Amable, M., Vanroelen, C., Tarafa, G., Muntaner, C., 2014. Precarious employment: understanding an emerging social determinant of health. *Public Health* 35 (1), 229.
- Bowden, A., Foy-Rushby, J.A., 2003. A systematic and critical review of the process of translation and adaptation of generic health-related quality of life measures in Africa, Asia, Eastern Europe, the Middle East, South America. *Soc. Sci. Med.* 57, 1289–1306.
- Bureau of Labor Statistics (BLS), United States Department of Labor (USDOL), 1995. Contingent and Alternative Employment Arrangements (USDOL 05-1433). Washington, DC. <<http://www.bls.gov/news.release/pdf/conemp.pdf>>.
- Dembe, A.E., Erickson, J.B., Delbos, R.B., 2004. Predictors of work-related injuries and illnesses: national survey findings. *J. Occup. Env. Hyg.* 1, 542–550.
- Ganster, D.C., Rosen, C.C., 2013. Work stress and employee health. *A multidisciplinary review. JOM* 39, 1085–1122.
- Goetzl, R.Z., Anderson, D.R., Whitmer, R.W., Ozminowski, R.J., Dunn, R.L., Wasserman, J., Health Enhancement Research Organization (HERO) Research Committee, 1998. The relationship between modifiable health risks and health care expenditures: an analysis of the multi-employer HERO health risk and cost database. *JOEM* 40 (10), 843–854.
- Grosch, J.W., Caruso, C.C., Rosa, R.R., Sauter, S.L., 2006. Long hours of work in the US: Associations with demographic and organizational characteristics, psychosocial working conditions, and health. *AJIM* 49 (11), 943–952.
- Guyatt, G.H., Feeny, D.H., Patrick, D.L., 1993. Measuring health-related quality of life. *Ann. Int. Med.* 118 (8), 622–629.
- Hennessy, C.H., Moriarty, D.G., Zack, M.M., Scherr, P.A., Brackbill, R., 1994. Measuring health-related quality of life for public health surveillance. *Public Health Rep.* 109, 665–672.
- Johnson, J.J., 1989. Control, collectivity and the psychosocial work environment. In: Sauter, S.L., Hurrell, J.J., Jr., Cooper, C. (Eds.), *Job Control and Worker Health*. John Wiley & Sons, New York, pp. 55–74.
- Karasek, R., 1989. Control in the workplace and its health-related aspects. In: Sauter, S.L., Hurrell, J.J., Jr., Cooper, C. (Eds.), *Job Control and Worker Health*. John Wiley & Sons, New York, pp. 129–159.
- Katz, L.F., Krueger, A.B., 2016. The Rise and Nature of Alternative Work Arrangements in the United States, 1995–2015. NBER Working Paper No. w22667. Available at SSRN: <<https://ssrn.com/abstract=2843380>>.
- Linton, S.J., Kecklund, G., Franklin, K.A., Leissner, L.C., Sivertsen, B., Lindberg, E., Svensson, A.C., Hansson, S.O., Sundin, Ö., Hetta, J., Björkelund, C., Hall, C., 2015. The effect of the work environment on future sleep disturbances: a systematic review. *Sleep Med. Rev.* 23, 10–19.
- Liu, C., Spector, P.E., Shi, L., 2008. Use of both qualitative and quantitative approaches to study job stress in different gender and occupational groups. *J. Occup. Health Psychol.* 13 (4), 357–370.
- McEwen, B.S., 2008. Central effects of stress hormones in health and disease: understanding the protective and damaging effects of stress and stress mediators. *Eur. J. Pharmacol.* 583 (2–3), 174–185.
- Office of Disease Prevention and Health Promotion (ODPHP), U.S. Department of Health and Human Services (DHHS). Healthy People 2020. Washington, DC: ODPHP. Publication No. B0132. <https://www.healthypeople.gov/?_ga=1.3504240.1374049404.1458923710>.
- Radmacher, S.A., Sheridan, C.L., 1995. An investigation of the demand-control model of job strain. In: Sauter, S.L., Murphy, L.R. (Eds.), *Organizational Risk Factors for Job Stress*. American Psychological Association, Washington D.C., pp. 127–138.
- Ray, T.K., 2014. Measuring cost effectiveness of Total Worker Health programs: making the case for health-related quality of life. *TWH in Action Newsletter*. <<http://www.cdc.gov/niosh/TWH/newsletter/TWHnews3n1A.html>>.
- Raykov, M.M., 2010. Underemployment and Health-Related Quality of Life. 71. ProQuest Information & Learning, US. Retrieved from <<http://proxy1.nku.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2010-99230-119&site=ehost-live>>. Available from EBSCOhost psych database.
- Sauter, S.L., Murphy, L.R., 1995. The changing face of work and stress. In: Sauter, S.L., Murphy, L.R. (Eds.), *Organizational Risk Factors for Job Stress*. American Psychological Association, Washington, DC, pp. 1–6.
- Smith, T.D., DeJoy, D.M., 2012. Occupational injury in America: an analysis of risk factors using data from the General Social Survey (GSS). *JSR* 43 (1), 67–74.
- U.S. Government Accountability Office (GAO), 2015. Contingent Workforce: Size, Characteristics, Earnings, and Benefits (GAO Publication No. GAO-15-168R). Washington, DC. <<http://gao.gov/assets/670/669899.pdf>>.
- Van Der Doef, M., Maes, S., 1999. The job demand-control (-support) model and psychological well-being: a review of 20 years of empirical research. *Work Stress* 13, 87–114.
- Wilson, I.B., Cleary, P.D., 1995. Linking clinical variables with health-related quality of life. *JAMA* 273 (1), 59–65.