Population Health

The Effects of Telecommuting Intensity on Employee Health

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Abstract

Purpose. *To investigate the influence of the intensity of telecommuting on employee health.*

Design. *Study design comprised a longitudinal analysis of employee demographic data, medical claims, health risk assessment data, and remote connectivity hours.*

Setting. *Data from Prudential Financial served as the setting.*

Subjects. *Active employees ages 18 to 64 years who completed the health risk assessment between 2010 and 2011 were the study subjects.*

Measures. *Measures included telecommuting status and intensity, and eight indicators of health risk status (obesity, depression, stress, tobacco use, alcohol abuse, poor nutrition, physical inactivity, and an overall risk measure), with employee age, sex, race-ethnicity, job grade, management status, and work location as control variables.*

Analysis. *Health risks were determined for nontelecommuters and telecommuters working remotely ≤ 8, 9 to 32, 33 to 72, and ≥ 73 hours per month. Longitudinal models for each health risk were estimated, controlling for demographic and job characteristics.*

Results. *Telecommuting health risks varied by telecommuting intensity. Nontelecommuters were at greater risk for obesity, alcohol abuse, physical inactivity, and tobacco use, and were at greater overall risk than at least one of the telecommuting groups. Employees who telecommuted ≤ 8 hours per month were significantly less likely than nontelecommuters to experience depression. There was no association between telecommuting and stress or nutrition.*

Conclusion. *Results suggest that employees may benefit from telecommuting opportunities.*

Key Words: Employers, Telecommuting, Health Risks, Flexible Work Arrangements, Work-Life Balance, Prevention Research. Manuscript format: research; Research purpose: modeling/relationship testing; Study design: quasi-experimental; Outcome measure: behavioral and biometric; Setting: workplace; Health focus: fitness/physical activity, medical self-care, stress management, and weight control; Strategy: behavior change and policy; Target population: adults; Target population circumstances: adult employees at Prudential Financial

PURPOSE

Background

Telecommuting is defined as working from a home office or, less commonly, from another offsite location of the employee's choosing. In recent years, employers have embraced telecommuting. In 2012, about two thirds of employers allowed employees to work from home occasionally—nearly double the rate of 2005.[1] New technologies that allow workers to connect remotely to the workplace have likely facilitated this trend.

Most employers who offer telecommuting consider it a strategic decision for their business[2] rather than a benefit they provide to employees. Increasingly, workers are demanding more flexible work arrangements. Offering a telecommuting option allows employers to attract nonlocal talent and retain employees who move to a community distant from the company's office. Telecommuting can also reduce real estate costs, because employers may not need to provide workspace for all employees. Finally, telecommuting helps employers address 24-hours-per-day, 7-days-per-week business continuation needs.

In 2013, Yahoo! Inc. initiated a much-publicized and highly controversial reversal of its telecommuting policy.[3] The rationale for this reversal, provided by Yahoo! Chief Executive Officer Marissa Mayer, was that individuals are more collaborative and innovative when they are physically together. This news led other companies, including Best Buy, to reconsider their telecommuting policies.[4] The backlash against this decision was based on a perception that employees who had worked from home would be

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negatively affected by returning to the office.

Many articles in the popular press on telecommuting extol the benefits of telecommuting on various aspects of employee health, such as work-life balance.[4,5] However, only a handful of empirical studies substantiate these claims, and most are dated.[6–8] These studies found a positive impact of telecommuting on job satisfaction, quality of life, and role-related stress, but they did not examine the influence of telecommuting on a more diverse set of health indicators. Also, only one study examined the impact of telecommuting intensity on health, despite several articles suggesting that workers who work from home occasionally or just 1 to 2 days per week may reap the most health benefits.[6]

Less discussed is the potential for telecommuting to have a negative impact on employee health. Employees who work from home may adopt such health habits as overeating, eating less nutritious food, and smoking, because there are fewer social cues to limit these behaviors. Employees who work from home may also work more hours, because there is no set time to return home at the end of the day. Thus, telecommuters may actually have less time to exercise or participate in other activities that maintain or improve their health.[9] Employees who work from home may be less aware of the ergonomics of their home office and other job safety concerns, which may lead to muscular pain or avoidable accidents.[9] Telecommuters may also be at increased risk for social isolation[9] and for having fewer relationships with coworkers.[6] This reduced social connection may lead to an increased risk for depression and stress.

More information is needed about the effects of working from home on employee health. The purpose of this retrospective study was to examine the relationship between telecommuting intensity and selected health indicators. We examined the health indicators that are modifiable by good health behaviors and preventive care, including biometric, psychosocial, and behavioral health risks.

We predicted that working from home would have a positive impact on these health indicators, because working from home empowers employees to make decisions that are beneficial to them and reduces the time and stress associated with commuting. We expected that the number of days spent telecommuting would affect the results. Specifically, we predicted that employees who work from the office most of the time but occasionally take advantage of flexibility would have the greatest health benefits from telecommuting. These employees reap the benefits of being at the work site, such as receiving positive social cues and building relationships with coworkers, while also using work-from-home options to facilitate work-life balance. We used data from Prudential Financial Inc., one of the world's largest financial services institutions, to investigate these hypotheses.

Work Flexibility at Prudential Financial

The work flexibility program at Prudential Financial began in the early 1970s, when occasional special arrangements between managers and employees were made for part-time workers and for women entering the workforce for the first time or returning from childbirth. In 1998, Prudential formalized its flexibility program, Business-Based Flexibility, with a policy, guidelines, and training that outlined five alternative work arrangements. These arrangements include part-time work, job sharing, compressed schedules, flex time, and telecommuting of which there are four variations: 100% remote work, standard or regularly scheduled work from a nonoffice location, occasional or as-needed telecommuting, and hoteling. *Hoteling* entails giving up a permanent personal desk or office and instead reserving a designated shared space for days spent at the office.

As technology at Prudential improved to handle secure, trouble-free remote access to company systems, telecommuting became increasingly useful for handling shift work among employees in the technology areas. Societal and business changes (e.g., the rise of dual-earner and single-parent households, expectations that employers commit to greater work-life balance for employees, and the need to diversify options for emergency business continuance) made it necessary to offer more Prudential employees flexibility as to where, when, and how they work. Today, telecommuting is the most requested and used alternative work arrangement at Prudential. Most of Prudential's U.S. employees have remote access capabilities, and more than 70% access company systems remotely at least once per month. These include employees with formal standard arrangements and those with occasional, as-needed flexibility.

Prudential has found that flexibility is highly valued by its employees and contributes to their satisfaction in a number of areas. In a 2009 analysis of employee retention drivers, Prudential found that access to flexibility, tied with paid time off, was the primary retention driver for entry-level to director-level employees. Flexibility was also a top driver among more senior-level employees. Overall, Prudential found that employees who self-identified as having an alternative work arrangement on the 2012 annual employee opinion survey reported higher overall satisfaction with the company and higher overall job satisfaction compared with those who do not have an alternative work arrangement but would like one. Prudential also found that those with an alternative work arrangement reported considerably higher work-life satisfaction and satisfaction with their pay than other employee groups.

METHODS

Design

We created a study database for a cohort of Prudential Financial employees from 2010 to 2011. We deidentified all data to protect employee confidentiality. The database contained (1) employee demographic data, (2) medical claims, (3) WebMD Health Risk Assessment (HRA) data, and (4) employee remote connectivity hours. The demographic data included health insurance enrollment, employee age, sex, geographic location, and job characteristics. We used medical claims, including eligibility and incurred services during the time frame, to determine study eligibility and measure clinical severity (DxCG). HRA data were from the WebMD HRA, which Prudential administers annually

to all employees enrolling in health insurance. Participation in the HRA is voluntary, and measures are based on employee self-report. A typical participation rate is approximately 78%. Employee remote connectivity hours were the number of hours that the employee logged into the Prudential network remotely each month.

Sample

After creating the database, we applied study eligibility criteria to identify the study sample. To be included in the study, the employee had to (1) be an active employee, (2) be age 18 to 64 years, (3) have continuous medical enrollment between 2010 and 2011, and (4) have completed the HRA in 2010 and 2011 with valid nutrition, weight, and exercise values. We excluded from the study employees who were on short-term disability or who were pregnant. We also excluded individuals who were employed as agents for Prudential Financial during the time frame, because that position requires travel with reliance on remote connectivity.

Measures

Telecommuting Status. We categorized employees into telecommuting categories that best described how they used the benefit. We defined three broad categories: nontelecommuter, off-hour telecommuter, and prime time telecommuter. *Nontelecommuters* were employees with no remote hours in the database. The telecommuting data allowed us to identify whether the employee logged in remotely during prime work hours (Monday through Friday, 6 A.M. to 6 P.M. in the employee's time zone) or off-business hours (weekends and weekdays outside of the 6 A.M. to 6 P.M. period). Employees were identified as *off-hour telecommuters* if 50% or fewer of their remote hours were during prime work hours. Employees were identified as *prime time telecommuters* if 51% or more of their remote hours were during prime work hours. We further stratified prime time telecommuters into four intensity levels on the basis of their number of remote connection hours per month: low intensity (≤8 hours), medium intensity (9–32 hours), high intensity (33–72 hours), and very high intensity (≥73 hours).

Health Risks. We used the WebMD HRA data to measure eight health risks that were the outcomes of interest in the study. We examined one biometric health risk (obesity), two psychosocial health risks (depression, stress), four behavioral health risks (tobacco use, alcohol abuse, poor nutrition, physical inactivity), and one overall risk measure (Edington score). We defined these risks as follows:

- Obesity risk was defined as body mass index greater than 30 kg/m^2. Values less than 15 kg/m^2 were deemed invalid. All invalid data were removed and coded as missing data.
- Employees were identified as at high risk for depression if they indicated on the survey that they had felt "down," depressed, or hopeless during the past 2 weeks.
- Employees were identified as at high risk for stress if they indicated that they agreed or strongly agreed with the statement, "In the past year, stress has affected my health or well-being."
- Risk for alcohol abuse was defined differently for males and females, in accordance with the definition used by the Centers for Disease Control and Prevention. High risk for alcohol dependence was defined as two or more drinks per day for females and three or more drinks per day for males.
- Employees were identified as at high risk for poor nutrition if they reported having an average of four or fewer servings of fruits and vegetables daily.
- Employees were identified as at high risk for physical inactivity if they reported fewer than 3 days of cardiovascular exercise per week.
- Employees were identified as having a high risk for tobacco use if they reported currently using cigarettes, cigars, pipes, or smokeless tobacco.
- The Edington score of overall risk is determined by the number of health risk factors for each person. Calculation of the Edington risk score includes evaluation of risks for alcohol and drug use, stress, blood pressure, body mass index, total cholesterol, low high-density lipoprotein, and chronic illness (heart problems, cancer, or stroke); missed work >5 days last year; dissatisfaction with life or job; poor perception of health; sedentary lifestyle; no use or seldom use of safety belt; and current tobacco use. Five or more of these risk factors indicates high risk.

Control Variables. We included the following employee characteristics as control variables: age, sex, race/ethnicity, job grade, management status (defined as having one or more employees who report to the individual), and work location (Northeast, South, Midwest, West). Job grade was a categorical variable that ranged from 1 to 4, where job grade 1 was the highest level (highest paid) and 4 was the lowest level (lowest paid). Poor health or current health issues may also underlie decisions to telecommute. Specifically, employees may be more likely to telecommute if they are in poor health. If this is the case, there would be selection into the telecommuter group. Therefore, we created and controlled for a diagnosis cost grouper (DxCG) risk score, which is a measure of clinical severity based on demographics and claims data. It is different from the Edington score, which is an index of health risks based on self-reported survey data.

Analysis

We used the SAS (SAS Institute Inc., Cary, North Carolina) statistical package version 9.3 for all analyses. After we applied eligibility criteria and identified our study sample, we used the telecommuting categories to identify the telecommuting status of all employees in 2010 and 2011. Categories differed from year to year for some employees who changed their telecommuting habits over time.

Next, we calculated summary statistics for all employee characteristics (age, sex, race/ethnicity, job grade, management status, and work location). We examined health risks and changes in health risks for each year. We also examined the distribution of all study variables by telecommuter status each year and used one-way analyses of variance to determine whether any differences were significant.

To measure the association between telecommuting and health risks (alco-

Table 1
Characteristics of the Study Population by Telecommuting Category, 2011*

Characteristic	Nontelecommuter (n = 804)	Off-Hour Telecommuter (n = 747)	All (n = 2152)	Prime-Time Telecommuter (n = 2152)			
				Low (≤8 h/mo) (n = 696)	Medium (9–32 h/mo) (n = 698)	High (33–72 h/mo) (n = 420)	Very High (≥73 h/mo) (n = 338)
Age							
17–34 y	20.3	23.1	56.7	29.9	16.9	5.9	3.9
35–44 y	19.4	21.6	59.0	19.7	18.4	11.9	9.1
45–54 y	24.1	21.7	54.2	18.7	16.1	12.3	7.1
55–64 y	34.2	17.3	48.5	19.9	12.8	6.9	8.9
Sex							
Female	24.0	18.4	57.7	22.6	16.6	10.2	8.3
Male	20.5	27.0	52.5	22.3	16.8	8.8	4.6
Race							
Asian	12.6	31.2	56.3	19.8	21.5	10.9	4.0
Black/African-American	33.8	14.3	52.0	23.9	11.1	9.2	7.8
Hispanic/Latino	21.2	24.2	54.5	19.4	20.0	10.9	4.2
Other	22.7	20.5	56.8	18.2	20.5	9.1	9.1
White	21.8	21.9	56.3	22.7	16.9	9.6	7.1
Job grade							
1 (highest)	12.0	32.7	55.3	15.4	23.3	12.8	3.8
2	11.4	29.3	59.3	15.8	20.2	15.0	8.3
3	17.6	21.0	61.5	25.9	18.5	9.8	7.2
4 (lowest)	41.3	13.5	45.2	25.1	9.6	4.5	6.0
DxCG risk score							
Mean	85.3	75.4	75.2	66.5	73.9	84.6	93.9
Median	39.0	31.0	34.5	29.0	35.5	44.0	48.0
FLSA status							
Executive management	12.9	33.5	53.6	17.0	22.7	11.3	2.6
Management	12.5	26.6	60.9	20.0	20.3	12.8	7.8
Nonmanagement	35.9	14.3	49.8	26.1	11.6	5.8	6.3
Region							
Midwest	36.4	25.2	38.4	18.3	10.1	3.7	6.2
Northeast	15.4	21.9	62.7	24.5	19.0	11.5	7.7
South	69.5	12.8	17.7	10.8	4.6	1.3	1.0
West	42.3	28.2	29.6	15.5	8.5	4.2	1.4

* DxCG indicates diagnosis cost grouper; and FLSA, Fair Labor Standards Act.

hol abuse, depression, physical inactivity, poor nutrition, stress, tobacco use, obesity, and Edington risk score), we estimated general linear mixed models (GLMMs) that predicted risk status (high risk or not at risk) for each health risk outcome using SAS PROC GLIMMIX. GLMs allow for nonnormal response data (e.g., 1 = high risk, 0 = not at risk) and longitudinal correlation among responses. GLIMMIX is a SAS procedure that is used to estimate GLMs. Models were specified with logit link and a binomial distribution to accommodate the dichotomous outcomes. The model included year (2010, 2011) and all employee characteristics as controls. Telecommuting category, management status, and job grade were allowed to vary by year. We included an interaction term between year and telecommuting category to measure how telecommuting status influenced change in health risk over time. After estimating each model, we calculated the predicted probability of being at risk for the average employee in each telecommuting category.

RESULTS

Demographic Characteristics

The study sample included 3703 Prudential employees in 2010 and 2011. Telecommuting at Prudential increased from 2010 to 2011, reflecting an increase in the number of employees who were prime time telecommuters (n = 59) and a shift toward higher intensity telecommuting categories. In 2011, there were 804 nontelecommuters (21.7%), 747 off-hour telecommuters (20.2%), and 2152 prime time telecommuters (58.1%). Overall, about 88% of the sample were younger than 55 years, 62% were female, 75% were white, 59% were managers, and 79% resided in the Northeast. The most prevalent job grade category was level 3. The most popular amount of prime-time telecommuting was 9 to 32 hours per month (medium intensity).

Table 1 provides the distribution of telecommuter status by employee characteristic. Employees in the oldest age group were less likely to telecommute than those in younger age groups. Females were more likely than males to telecommute. Of all the race/ethnicity categories, black/African-American employees were least likely to telecommute, whereas Asian employees were the most likely to telecommute. Employees in the lowest job

Table 2
Percentage of Study Population With High Health Risks and Percentage Change Between 2010 and 2011

Measure	2010		2011		2010–2011 Change	
	High Risk	Missing Data	High Risk	Missing Data	High Risk	Missing Data
Biometric risk: obesity	25.7	0.0	26.7	0.0	1.0	0.0
Psychosocial risks						
Depression	15.8	0.0	13.8	0.0	–2.0	0.0
Stress	28.7	0.0	30.8	0.0	2.2	0.0
Behavioral risks						
Alcohol abuse	4.8	0.0	4.3	0.0	–0.5	0.0
Physical inactivity	42.2	0.0	38.7	0.0	–3.5	0.0
Poor nutrition	86.7	0.0	83.1	0.0	–3.6	0.0
Tobacco use	10.1	0.0	9.3	0.0	–0.9	0.0
Edington score	3.4	0.0	3.6	0.0	0.2	0.0

grade were less likely to telecommute than employees in higher job grades. Nonmanagers were less likely to telecommute than managers. Employees in the South were less likely to telecommute than employees in other parts of the country. Very high telecommuters (≥73 h/mo) had the highest mean and median DxCG scores.

Unadjusted Health Risk Trends

As shown in Table 2, the most prevalent health risk was poor nutrition (>80%). Between 2010 and 2011, the percentage of employees at high health risk declined the most for poor nutrition (–3.6 percentage points), physical inactivity (–3.5 percentage points), and depression (–2.0 percentage points). The percentage of employees at high health risk declined less than one percentage point for tobacco use and alcohol abuse. Several health risks became more prevalent in 2011. The percentage of employees at high health risk increased the most for stress (+2.2 percentage points), followed by obesity (+1.0 percentage points) and Edington risk score (+0.2 percentage points).

The percentage of employees at high risk for health problems in 2011 is shown for each telecommuting category in Table 3. Of the three telecommuting categories, nontelecommuters had the highest percentage of employees at risk for most of the health risks examined: obesity, depression, poor nutrition, physical inactivity, tobacco use, and Edington score. Off-hour telecommuters had the highest risk for alcohol abuse (7.1%). The only health risk for which the prime time telecommuters had the highest risk was stress. Prime time telecommuters had a .1–percentage point higher risk for stress compared with off-hour telecommuters (31.2% vs. 31.1%) and a 1.7–percentage point higher risk for stress compared with nontelecommuters (31.2% vs. 29.5%). The differences across the three telecommuter categories for stress and physical inactivity were the only differences that were not significant at the .05 probability level.

There was notable variation in the percentage of at-risk employees by age, sex, race/ethnicity, job grade, management status, and region (Table 4). For example, older age groups had a higher percentage at risk for obesity, physical inactivity, and overall Edington score. Younger age groups had a higher percentage at risk for depression, alcohol abuse, poor nutrition, and tobacco use. Compared with males, females had a higher percentage at risk for obesity, depression, stress, and overall Edington score. Males had a higher percentage at risk for alcohol abuse, physical inactivity, poor nutrition, and tobacco use. Compared with lower job grades, employees with the highest job grade were more likely to be at risk for stress, alcohol abuse, and physical inactivity but were less likely to be at risk for nutrition, tobacco use, and Edington risk. The race/ethnicity group and the region that had the highest percentage at risk also varied by health risk.

Telecommuter Status and Employee Health Risks

Table 5 provides the regression estimates (beta coefficients) from the longitudinal models predicting risk status for each measure. Prime time and off-hour telecommuters were compared with nontelecommuters (the reference group). Coefficients that were significantly different from zero using a .05 significance level are denoted with an asterisk. Management status, region, and DxCG score were also included in the models, but their coefficients are not shown. The adjusted probability for being at risk for health problems, calculated from the regression coefficients, is displayed in the Figure for each telecommuting category. An asterisk above the bar indicates that the probability was sig-

Table 3
Percentage of Employees With High Health Risks by Telecommuting Category, 2011

Measure	Nontelecommuters	Off-Hour Telecommuters	Prime Time Telecommuters	*p*
Observations, No.	804	747	2152	
Biometric risk: obesity	33.1	20.5	26.3	
Psychosocial risks				
Depression	16.4	12.6	13.2	0.0475
Stress	29.5	31.1	31.2	0.6582
Behavioral risks				
Alcohol abuse	4.9	7.1	3.1	<0.0001
Poor nutrition	86.2	81.8	82.4	0.0274
Physical inactivity	40.4	39.1	38.0	0.4597
Tobacco use	12.3	8.2	8.5	0.0033
Edington score	5.7	3.1	2.9	0.0009

Table 4
Percentage of Employees With High Health Risks by Employee Characteristic, 2011*

Characteristic	Biometric Risk: Obesity	Psychosocial Risks		Behavioral Risks				Overall Edington Score
		Depression	Stress	Alcohol Abuse	Physical Inactivity	Poor Nutrition	Tobacco Use	
Age								
17–34 y	19.0	14.6	27.0	6.6	39.2	86.6	10.6	2.9
35–44 y	27.6	14.1	33.8	4.4	39.6	84.1	9.0	3.3
45–54 y	29.5	13.6	31.7	3.0	37.0	81.7	9.1	4.0
55–64 y	34.9	11.8	30.7	2.0	40.6	76.5	7.2	4.4
Gender								
Female	28.9	14.9	33.2	1.1	37.4	80.7	8.9	3.9
Male	22.8	12.0	26.8	9.4	40.9	87.0	9.8	2.9
Race								
Asian	8.9	13.0	27.1	1.6	48.2	86.6	4.5	1.6
Black/African-American	45.5	12.6	24.8	2.1	36.0	90.5	9.5	4.4
Hispanic/Latino	25.1	15.0	28.7	3.0	38.9	86.2	7.2	1.2
Other	31.1	15.6	42.2	6.7	33.3	97.8	17.8	6.7
White	25.0	14.0	32.1	4.9	38.4	81.1	9.6	3.7
Job grade								
1 (highest)	17.2	11.1	35.5	5.0	40.1	72.4	2.2	0.7
2	20.7	11.9	32.6	4.1	38.2	81.0	5.9	3.0
3	27.6	13.6	29.9	4.8	39.1	84.0	10.0	3.5
4 (lowest)	33.5	16.6	29.0	3.4	38.3	86.8	13.4	4.9
FLSA status								
Executive management	16.2	9.3	34.8	6.4	38.7	73.0	2.0	—
Management	23.4	12.9	31.5	4.2	39.5	81.7	7.0	3.1
Nonmanagement	32.2	15.6	29.4	4.1	37.8	86.3	13.1	4.7
Region								
Midwest	30.2	13.1	28.2	7.9	38.6	84.9	9.9	3.7
Northeast	26.2	13.8	30.7	3.8	38.5	82.8	9.2	3.4
South	28.2	14.1	33.8	4.3	41.3	83.9	8.5	4.9
West	14.1	12.7	35.2	2.8	38.0	81.7	7.0	2.8

* FLSA indicates Fair Labor Standards Act.

nificantly different from that for the nontelecommuting category.

Consistent with the unadjusted results, the direction of the regression estimates suggests that employees who telecommute are less likely to be at risk for most health risks studied. Only some of these results were significant, however, after controlling for observable employee and job characteristics. The results that were significant were all behavioral risks. Specifically, prime time telecommuters working at least 73 hours per month (very high intensity) had a significantly lower risk for alcohol abuse compared with nontelecommuters (1.8% vs. 2.9%). Employees in this group had the highest DxCG risk score. Prime time telecommuters working 9 to 32 hours per month (medium intensity) had a significantly lower risk for physical inactivity compared with nontelecommuters (35% vs. 41%). Prime time telecommuters working 33 to 72 hours per month (high intensity) had a significantly lower tobacco risk compared with nontelecommuters (4.5% vs. 7.2%).

In the Edington risk model, we found that three of the prime time telecommuter categories (low, medium, and very high) had significantly lower Edington risk scores compared with nontelecommuters. This result suggests that nontelecommuters are more likely to have multiple health risks compared with prime time telecommuters. We did not find a significant relationship between working from home and risk of obesity, poor nutrition, or stress.

We were expecting that health risks would improve over time for telecommuters compared with nontelecommuters. Our results did not substantiate that expectation, with one exception. We found that employees who worked from home 8 hours per month or less (low-intensity telecommuters) were likely to reduce their risk for depression at a greater rate than nontelecommuters during the 2-year study period. We did not find that employees who worked from home had a significantly reduced trend for alcohol abuse, physical inactivity, poor nutrition, stress, tobacco use, obesity, or overall risk as indicated by the Edington score.

Of the employee covariates included, we found that younger age predicted risk for alcohol abuse, depression, and poor nutrition. Older age predicted risk for obesity. Female sex predicted risk for depression and stress. Males had an increased risk of alcohol abuse, poor nutrition, and tobacco use. Employees who were Asian had an increased risk of physical inactivity and a decreased risk for obesity. Employees who were African-American had an increased risk of poor nutrition and obesity and a decreased risk for stress. None of the

Table 5
Relationship Between Telecommuting Category and Health Risk, Adjusting for Employee Characteristics†

Longitudinal Model (Time Nested Within Person)	Biometric Risk: Obesity	Psychosocial Risks		Behavioral Risks				Overall Edington Risk
		Depression	Stress	Alcohol Abuse	Physical Inactivity	Poor Nutrition	Tobacco Use	
Intercept	–2.132‡	–1.315‡	–1.295‡	–1.151‡	–0.308	2.866‡	–1.433‡	–3.330‡
Telecommuting status								
Off-hour	–0.308‡	–0.126	–0.044	–0.049	–0.122	0.080	–0.149	–0.310
Prime time								
Low (≤8 h/mo)	–0.150	–0.083	0.033	–0.061	–0.189	–0.017	–0.100	–0.571‡
Medium (9–32 h/mo)	–0.146	–0.056	–0.037	–0.503	–0.249‡	–0.110	–0.175	–0.997‡
High (33–72 h/mo)	–0.202	–0.202	0.040	–0.024	–0.140	0.009	–0.426‡	–0.321
Very high (≥73 h/mo)	–0.113	–0.151	0.137	–1.423‡	–0.015	0.194	–0.263	–1.233‡
Nontelecommuter (reference)								
Time	0.034	–0.016	0.077	–0.139	–0.155‡	–0.168‡	–0.062	0.002
Telecommuting status * time								
Time * off hours	0.037	–0.087	0.052	0.137	–0.016	–0.177	0.018	0.062
Prime time								
Time * low	–0.021	–0.276‡	–0.025	–0.048	0.080	–0.047	–0.095	0.149
Time * medium	–0.032	–0.244	0.066	0.192	–0.012	–0.132	0.078	0.225
Time * high	0.118	–0.161	–0.014	–0.335	0.024	–0.166	–0.064	–0.273
Time * very high	–0.101	–0.013	–0.047	0.960	–0.122	–0.138	–0.063	0.569
Time * nontelecommuter (reference)								
Age	0.031‡	–0.009‡	0.001	–0.022‡	0.002	–0.012‡	0.000	0.015
Female	–0.065	0.223‡	0.326‡	–2.072‡	–0.119	–0.643‡	–0.278‡	–0.053
Race/ethnicity								
Asian	–0.950‡	0.053	–0.208	–0.796	0.407‡	0.507	–0.742	–0.674
Black/African-American	0.858‡	–0.278	–0.357‡	–0.620	–0.009	0.799‡	–0.246	–0.044
Hispanic/Latino	0.108	0.008	–0.052	–0.651	0.128	0.193	–0.384	–0.679
Other	0.275	–0.040	0.512	0.556	–0.132	1.135	0.679	0.306
White (reference)								
Job grade								
1 (highest)	–0.608‡	–0.299	0.478‡	0.172	0.076	–0.725‡	–1.140‡	–0.858
2	–0.260‡	–0.279	0.330‡	0.065	0.115	–0.198	–0.373‡	–0.035
3	–0.057	–0.052	0.176	–0.035	0.125	–0.061	–0.107	0.006
4 (lowest and reference)								

† Beta coefficients are provided for each variable. Models also included management status, region, and a diagnosis cost grouper.
‡ Significant at the 0.05 level.

other racial/ethnic groups had significant results.

The highest job grade (grade 1) had a somewhat protective effect on employee health risk. Specifically, this job grade had a decreased risk for poor nutrition, tobacco, and obesity; however, it also had an increased risk for stress. Another covariate, DxCG score, was associated with a higher risk for obesity, depression, and Edington risk. Work location in the Midwest (vs. Northeast) significantly predicted alcohol abuse. Employees who were managers had a decreased risk for tobacco.

Looking across all health risks in the Figure indicates that, after controlling for employee characteristics, telecommuters had favorable (but not necessarily significant) obesity, depression, physical inactivity, tobacco use, alcohol abuse, and Edington risk scores compared with nontelecommuters. Findings varied by the intensity of telecommuting (i.e., the category based on the number of hours worked from home per month). There was a trend for a U-shaped or J-shaped relationship; that is, employees in the middle-intensity telecommuter categories had the lowest predicted risk, and the nontelecommuters and very high-intensity telecommuters had higher predicted risk. The U-shaped relationship was observed for depression, poor nutrition, physical inactivity, and (to a lesser extent) obesity risk. For alcohol abuse, tobacco use, and Edington risk score, the predicted probability of being at risk declined with increasing telecommuting intensity. For stress risk, the predicted probability of being at risk appeared to increase with increasing telecommuting intensity.

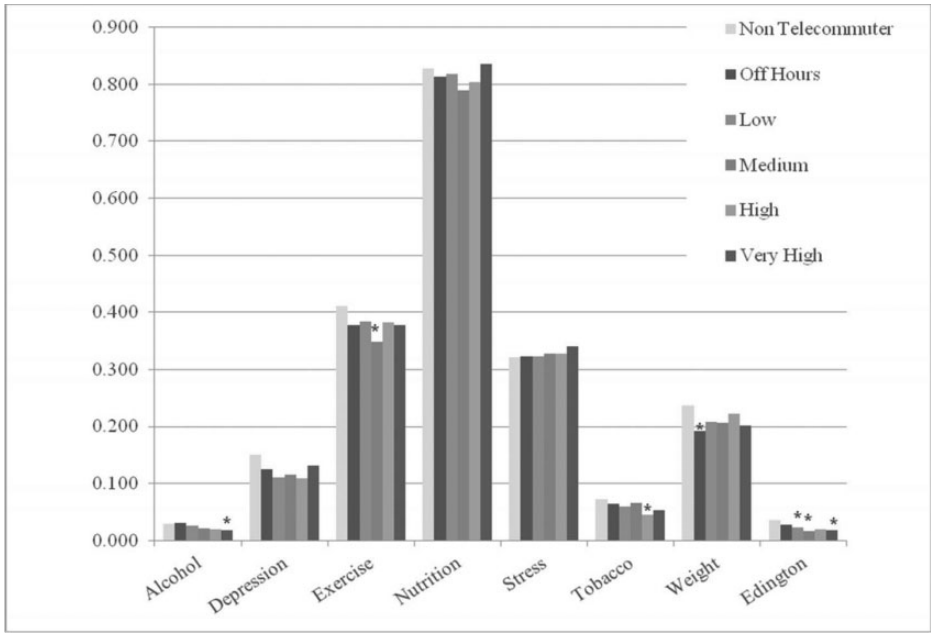
DISCUSSION

We found evidence that telecommuting might reduce health risks. Specifically, we found that prime-time telecommuters who work 8 hours per month or less were more likely than nontelecommuters to reduce their risk for depression over time. Because Prudential's telecommuting policy had been ongoing for a number of years before this study was conducted, it is possible that we did not find additional significant findings because telecommuters had already reduced their risk before risks were measured for this study.

We also found that the cross-sectional relationship between telecommuting and lower health risks varied by telecommuting intensity for alcohol

Figure

Predicted Probability for Being at Risk for Health Problems, Adjusted for Employee Characteristics



Statistically significant differences from the nontelecommuting group are shown with an asterisk.

abuse, physical inactivity, tobacco use, obesity, and Edington risk. Our finding that there were no instances of nontelecommuters having a significantly lower health risk compared with telecommuters is generally consistent with previous studies that showed beneficial health effects of telecommuting.[6–8]

This study provides some support for the "sweet spot" hypothesis—that is, employees who used telecommuting occasionally but did not work from home most of the time had the best outcomes. However, we found a linear relationship for alcohol abuse, tobacco use, and Edington risk score, suggesting that the more employees telecommute, the lower their risk. We found an opposite effect for stress, in which the more employees telecommuted, the higher their risk. This result was not expected, given that telecommuting has been posited as a stress reliever. Other factors might have influenced this result. If high users of telecommuting tend to overwork, that could account for their stress. There also may be personal stressors that precipitated the request to telecommute, such as pressing care needs for a child, spouse, or aging parent. Similarly, personal illness that still allows an employee to work but may restrict his or her travel to the office could be a factor that predicts both stress and telecommuting. In that case, the availability of telecommuting can aid in retention but not ameliorate prevailing stress. We did not take account of the length of commute—differences in length of commute could certainly have confounded our analyses, particularly for lower-intensity telecommuters and nontelecommuters. Given our results, employers that offer telecommuting may want to monitor the stress levels of telecommuters to ensure that they do not increase with more exposure to telecommuting. Stress is a risk factor for serious illnesses, including hypertension, atherosclerosis, and disorders of immune function.[10] Telecommuting could also negatively affect other aspects of health not studied in this investigation.

This study has several strengths. First, we used administrative data on the number of remote hours worked to measure telecommuting status. Data on the extent to which employees telecommute are rarely available or linkable to other data sources. Second, we measured five categories of telecommuting intensity rather than examining the broad categories of telecommuters vs. nontelecommuters. This allowed us to assess the dose-response relationship. Third, we were able to measure multiple employee and job characteristics, including job grade, management status, and clinical severity—all of which may influence health outcomes—separately from telecommuting status. Indeed, we found that after we controlled for these characteristics, the differences in health risks across telecommuting categories faded. Fourth, we examined a range of modifiable health risks, some of which may cause employers particular concern because of their link to health care costs.

Our study has several limitations. There may be unobservable or unmeasured characteristics that are correlated with telecommuting status and also related to health risks. For example, employees who work from home may be intrinsically more motivated to improve their health than employees who work from the office. Some outcomes may be related to personality type. For example, employees who are introverts may find more satisfaction and health benefits from working at home than those who are extroverts. Employees who work in the office may have more demanding managers, or they may be confined to the office because their work activities cannot be accomplished from home. Demographic, job grade, and regional differences may drive the observed differences in both telecommuting and self-reported health risks. Other potential confounders that are likely to affect patterns of telecommuting and health risk include family structure, socioeconomic status, and an individual's social network. We studied only the Prudential employees who were enrolled in health insurance benefits and who completed the HRA in 2 consecutive years. Prudential has a high HRA completion rate; however, individuals who complete the HRA may be different from those who do not.

Our study covered only a 2-year period. It may take a longer exposure for telecommuting to have an impact on health risks. Unfortunately, we did not have a longer period of data available to us to extend the time frame. We also did not have a baseline year available to measure pre-post telecommuting effects. There may be an immediate effect of telecommuting on health that we were not able to capture because some employees may have been telecommuting for years prior to the study time frame. Another limitation was that we relied on self-reported data to measure health risks. More objective measures of health risk would be ideal, but self-report is the most practical way to obtain this information, and it has been found to be reasonably accurate.[11] We measured the relationship between telecommuting and health cross-sectionally and over time. Because the direction of causality is impossible to determine from cross-sectional studies, results from the analysis that examined the impact of telecommuting over time provide the stronger evidence. However, our short time frame limited our power to study this and, as mentioned above, the telecommuters may have already experienced reductions in health risks.

The results from this study are not necessarily generalizable to all employers because specific characteristics of the Prudential program may influence the relationship between telecommuting intensity and health outcomes. For example, Prudential Financial has taken a number of steps to create a successful flexibility program and to promote a supportive culture of flexibility that may not be common across employers. Prudential has developed a high level of management comfort with the program over the years through extensive outreach and communications. Communications disseminated include those that describe the business case for flexibility, feature success stories, provide access to e-training and centralized online resources, and direct managers and employees on how to access personal support from human resources practitioners. Reinforcing messages have come in tandem with the company's strong commitments to diversity and overall work/life effectiveness. Prudential's diversity and inclusion approaches include the acknowledgment that employees may vary in their life needs and work styles, and managers are encouraged to lead their staff using innovative and progressive practices, such as work flexibility.

Another characteristic of Prudential's program is that it encourages employees to initiate requests for flexibility and encourages managers to base their decisions on business needs. As the program title suggests, access to flexibility at Prudential is business based. The company policy on flexibility simply states that the firm supports its use whenever it serves the business as well as the employee.

Our study adds to the literature showing that employees may benefit from telecommuting opportunities. The positive health risk trends observed may translate into improved productivity and reduced health care costs. Future research should examine the relationship between telecommuting status and health care costs and the relationship between telecommuting status, work productivity, and performance. In addition, qualitative research that investigates the reasons that employees choose to telecommute and how employees work differently when they are in the office versus at home may lead to a better understanding of the mechanisms underlying observed trends.

SO WHAT? Implications for Health Promotion Practitioners and Researchers

What is already known on this topic?

Studies on the benefits of telecommuting on various aspects of employee health found a positive impact of telecommuting on job satisfaction, quality of life, and role-related stress, but did not examine the influence of telecommuting on a more diverse set of health indicators.

What does this article add?

The authors found evidence that employees who telecommute 8 hours per month or less during regular work hours were more likely than nontelecommuters to reduce their risk for depression over time. In addition, they found a cross-sectional relationship between telecommuting and lower health risks that varied by telecommuting intensity for alcohol abuse, physical inactivity, tobacco use, obesity, and Edington risk.

What are the implications for health promotion practice or research?

The positive health risk trends observed from telecommuting opportunities may translate into productivity gains and reduced health care costs. Future researchers should examine the relationship between telecommuting status and health care costs and between telecommuting status and work productivity and performance.

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