

Examining the Relationship Between Symptomatic Burden and Self-reported Productivity Losses Among Patients With Uterine Fibroids in the United States

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Objective: To evaluate the impact of uterine fibroid symptoms on employment and household productivity. **Methods:** An online survey of US women between 18 and 54 was conducted. Productivity was assessed using the health related productivity questionnaire (HRPQ). Descriptive statistics and logistic multivariable regressions examined the relationship between uterine fibroids (UF) symptom experience and employment and household productivity. **Results:** Of 1365 eligible women, 873 (64.0%) were employed. Women lost an average of 0.8 hours to employment-related absenteeism and 4.4 hours due to employment-related presenteeism for 5.1 hours of employment productivity lost/week. Women lost an average of 1.4 hours due to household-related absenteeism and 1.6 hours due to household-related presenteeism for a total of 3.0 hours of household lost productivity. Productivity losses increased with increases in symptom burden. **Conclusion:** UF has a substantial impact on employment-related and household-related productivity.

Uterine leiomyoma also known as uterine fibroids (UF) are benign, monoclonal tumors of the smooth muscle cells of the myometrium¹ which are highly prevalent among women of reproductive age and increase with age.^{1,2} Estimates of self-reported prevalence of UF ranged from 6.9% among 18 to 49 year old US women to 14.1% in women 40 and over.³ While many women with UF are asymptomatic, women report bleeding and non-bleeding symptoms.^{2,4-6} In one study with over 21,000 women aged 15 to 49, the most commonly-reported symptoms were heavy bleeding (60%), prolonged bleeding (37%), bleeding between periods (33%), frequent periods, and irregular periods (36%).³ Other symptoms include: passage of clots, pelvic and low back pain, dyspareunia, and urinary urgency and frequency.^{3,7,8} Although the presence of UF is rarely associated with mortality, UF may cause morbidity and significantly affect health-related quality of life (HRQL).^{1,9} While many studies have looked at the direct costs of UF, few studies have assessed productivity losses associated with UF from considering both paid employment and household chores.

Productivity loss due to missed work time (absenteeism) and limitations in performing work (presenteeism) because of health can result in significant costs to employers above and beyond medical spending.¹⁰ Soliman et al¹¹ conducted a review on the economic burden associated with UF and found that the indirect costs for women with symptomatic or diagnosed UF varied widely and ranged from a total of \$2399 to \$15,549 per woman with UF in the year after diagnosis. Carls et al¹² performed a retrospective analysis using MarketScan Commercial Claims and Encounters and found the absenteeism and disability cost for women with UF treatment ranged from \$5000 to \$25,008 in the year after treatment, depending on the type of intervention. Lerner et al¹³ asked women 18 to 53 years of age with confirmed UF and currently employed at least 15 hours a week to report their UF symptoms in the past 4 weeks and complete the work limitations questionnaire (WLQ). After adjusting for age, race/ethnicity, income, and weekly work hours, women with UF had significantly higher work performance limitations than those without UF and were impaired, on average, 2 out of the 10 days in the prior 2 weeks compared with less than 1 day per week for the control group.¹³ Assuming the same salary between women with and without UF, the difference due to productivity loss would be \$2086 compared with \$1055 (difference: \$1031, $P = 0.020$).¹³ Similar losses in productivity were noted across five European countries when measured by the work productivity and activity impairment: specific health problems questionnaire (WPAI-SHP). The WPAI-SHP absenteeism scores ranged from a mean of 4.3% missed work time in France to 9.3% in Germany and WPAI-SHP presenteeism ranged from a low of 26.6% in France to a high of 37.9% in the United Kingdom.¹⁴

Productivity data published to date indicated a substantial employment impact associated with UF, but there are a lack of data available on the relationship between the extent of UF symptomatic burden and the magnitude of work and household (household chores and tasks associated with daily living) productivity losses. Given that UF affects women during prime employable years (20 to 50s) and a time when women are tasked with multiple roles of caregiving for children, families, and parents, household management, and employment, the impact of UF on work and household productivity needs to be accurately quantified. The purpose of this study was to evaluate the self-report impact of individual UF symptoms on employment-related and household chores-related productivity measured as number of hours lost and percent impact.

METHODS

A cross-sectional online survey was conducted in 2012 among women aged 18 to 54 in 12 countries to evaluate the prevalence, symptomatic experience, economic burden, health productivity burden, and HRQL of endometriosis and UF.⁹ Details on the survey methodology, symptomatic burden and the impact of UF symptoms on HRQL have been published elsewhere.^{9,15} This analysis focuses on the productivity losses in women with self-reported UF in the United States (US). A similar analysis for the endometriosis patients will be presented elsewhere.^{15,16}

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Conflict of Interest: Dr Coyne and Dr Anand are employees of Evidera—Evidence, Value & Access by PPD and were paid scientific consultants for AbbVie in connection with The Impact of study. Dr Soliman, Dr Castelli-Haley, Dr Snabes, and Dr Owens are AbbVie employees and may own AbbVie stock or stock options.

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Survey Participants

Participants were recruited through three survey panels: Harris Poll Online (HPOL), Global Market Insights (GMI) and e-Rewards Opinion Panel.¹⁷ Eligible participants were women aged 18 to 54 at the time of the questionnaire administration, diagnosed with UF and able to read and write in English. Data were weighted using random iterative method (RIM) to produce a nationally representative sample.¹⁸ A weighting algorithm with propensity score adjustment for education, age, race, region, and household income was used so that they survey sample would be representative of the US prespecified population targets. The Copernicus Group Institutional Review Board (CGIRB) reviewed and approved the study and survey materials.

Outcome Measures

The health related productivity questionnaire (HRPQ) is a generic measure that evaluates health-related productivity absenteeism (missed work time) and presenteeism (perceived impairment, unproductive work time job performance) for employment and household-related chores with an option to assess impact on school work. This nine-item questionnaire consists of four sections: (1) current employment status, (2) scheduled hours at work, missed hours at work due to disease or treatment, and impact on work output, (3) impact on household chores-related to productivity, and (4) disease-specific reduction in work status (full-time to part-time), forced time away from job and has been previously validated.¹⁹ The HRPQ was modified to be specific to UF population (ie, “Did uterine fibroids or its treatment keep you from working any of your scheduled hours in the past 7 days”) and was administered to assess current productivity loss using a 1 week recall period to minimize recall bias.

From the HRPQ, the following outcomes were calculated according to the developer’s algorithm²⁰:

1. Number of scheduled work hours in the past 7 days;
2. Employment productivity hours lost due to absenteeism defined as the number of scheduled work hours missed because of UF;
3. Employment productivity hours lost due to presenteeism calculated by multiplying “number of hours scheduled for work minus number of hours lost due to absenteeism” by “percent impact of UF on the number of hours that were worked; where 0% reflects no impact of UF on how much was accomplished and 100% indicates that UF kept the patient from accomplishing anything”;
4. Total number of employment productivity hours lost: Employment productivity hours lost due to absenteeism plus employment productivity hours lost due to presenteeism;
5. Percent hours lost due to absenteeism: (Employment productivity hours lost due to absenteeism/Number of scheduled work hours)*100;
6. Percent hours lost due to presenteeism: (Employment productivity hours lost due to presenteeism/ Number of scheduled work hours)*100;
7. Total percentage hours lost: Percent hours lost due to absenteeism plus Percent hours lost due to presenteeism.

Similar computations were used to calculate the corresponding measures for the household productivity losses.

As part of the survey, participants completed sociodemographic and clinical questions such as age, comorbidities, presence of current and history of UF-related symptoms (pelvic pain/cramping during menstrual period, pelvic pain during non-menstrual period, pain during sex, heavy bleeding during periods, spotting/bleeding between periods, passage of clots, irregular periods, bloating, fatigue/weariness/anemia, infertility). Each symptom was presented and, if present, the symptom severity of each individual symptom was recorded as mild, moderate, or severe. Additionally, an overall question of UF severity was asked.

Statistical Methods

All analyses were completed using SAS version 9.3 (SAS Institute, Cary, NC). Descriptive statistics were used to describe the study population and to evaluate productivity outcomes. Mean and standard deviation were calculated for continuous variables and for categorical variables the number and percent distribution by category were calculated. The relationship between productivity losses and the number of UF-symptoms, type of UF-related symptom, and the severity of symptom was examined.

Logistic multivariable regression analyses were conducted to model the likelihood of absenteeism and of presenteeism. The following potential confounders for UF and productivity loss were included in the models: age (continuous), education level (reference: graduate degree), geographic location (reference: west), “moderate/severe” symptom severity (vs. none/mild) by individual symptoms (as defined above), and the presence of selected comorbid conditions (endometriosis, anemia, diabetes, endometrial hyperplasia, polycystic ovarian syndrome, infertility, irritable bowel disease or inflammatory bowel disease, fibromyalgia, ovarian cysts, pelvic inflammatory disease, primary dysmenorrhea, psoriasis, hypothyroidism, depression, high cholesterol, hypertension or high blood pressure, chronic fatigue syndrome, high triglycerides).

RESULTS

Study Population

In the US, 382,797 survey panel members were invited to participate in the survey. A total of 59,411 (15.5%) completed the prevalence screener with 5879 eligible women aged 18 to 54, of which 2016 had self-reported UF. Two women were excluded based on residence and 37 women were excluded based on inconsistent report of hours worked or household chores in the past 7 days. After women with hysterectomy ($n = 612$) were excluded, the final analysis sample included 1365 eligible women of which 873 (64.0%) were employed and worked for at least 1 hour in the past 7 days.

The mean age of the UF sample was 42.8 years (SD: 0.33), the majority was White (62.6%), married or in a civil union (62.8%), reported some college or a college degree (65.3%), and reported having private insurance (63.8%) (Table 1). There was equal representation in terms of geographic location. The majority were employed full-time (44.9%) or part-time (11.2%). Similar demographic characteristics were observed in the employed subgroup (Table 1).

Women with UF reported both bleeding and non-bleeding symptoms within the prior 4 weeks (Table 2). More than 25% of women reported experiencing the following symptoms as moderate to severe: fatigue/weariness/anemia (44%), heavy bleeding during periods (41%), anxiety/stress (40%), pelvic pain/cramping during menstrual period (38%), lower back pain (37%), bloating (35%), depressed feelings, mood swings (30%), obesity or weight gain (27%), passage of clots (26%), and irregular periods (25%).

Impact of UF on Productivity

Overall Productivity Losses

Women with UF reported losing an average of 0.8 hours (standard error [SE]: 0.2) of employment-related productivity due to absenteeism and an average of 4.4 hours (SE: 0.4) due to presenteeism for a total of 5.1 (SE: 0.5) hours of lost productivity. This equates to 2.1% (SE: 0.4) productivity lost due to absenteeism in the previous week and 12.0% (SE: 1.1) lost due to presenteeism for a total of 14.1% (SE: 1.3) productivity lost as percentage of productivity loss. Women aged 18 to 29 years old reported an average of 14.3 hours (SE: 3.2) lost and 43.8% (SE: 8.1) of work impact in the previous week; significantly more productivity loss than women in age groups 30 to 54 years ($P < 0.05$).

TABLE 1. Demographics of the Study Sample

	Total Sample (n = 1365)	Employed Subgroup (n = 873)
Age, years (mean, SD)	42.82 (0.33)	42.98 (0.39)
Age at diagnosis (mean, SD)	35.86 (0.32)	35.89 (0.37)
Ethnicity (n, %)		
White	986 (62.6%)	626 (60.9%)
Black/African American	198 (22.7%)	135 (24.0%)
Other	181 (14.7%)	112 (15.2%)
Geographic region (n, %)		
Northeast	320 (22.5%)	217 (25.0%)
Midwest	299 (20.2%)	192 (19.0%)
South	459 (35.6%)	288 (36.4%)
West	287 (21.7%)	176 (19.6%)
Marital status (n, %)		
Never married	241 (18.2%)	179 (21.1%)
Married or Civil union	823 (62.8%)	494 (61.1%)
Divorced	165 (9.1%)	122 (10.7%)
Separated	23 (1.4%)	14 (1.0%)
Widow/widower	28 (1.7%)	15 (1.4%)
Living with partner	81 (6.3%)	47 (4.5%)
Declined to answer	4 (0.5%)	2 (0.2%)
Education level (n, %)		
High school or less	161 (21.2%)	69 (14.4%)
Some college/college	907 (65.3%)	580 (68.2%)
Graduate education	297 (13.5%)	224 (17.5%)
Employment status (n, %)		
Employed full time	626 (44.9%)	612 (71.9%)
Employed part time	170 (11.2%)	158 (16.9%)
Self-employed	116 (7.8%)	103 (11.3%)
Not employed, looking for work	102 (7.8%)	—
Not employed, not looking for work	15 (1.5%)	—
Retired	84 (5.8%)	—
Disabled, not able to work	12 (0.6%)	—
Student	21 (1.0%)	—
Stay at home spouse or partner	219 (19.3%)	—
Insurance type (n, %)		
Public	167 (12.2%)	95 (10.8%)
Private	883 (63.8%)	650 (75.4%)
None	186 (13.7%)	83 (9.7%)
Other	129 (10.3%)	45 (4.1%)

SD, standard deviation.

Women with UF lost an average of 1.4 hours (SE: 0.1) of household chores-related productivity due to absenteeism and an average of 1.6 hours (SE: 0.1) due to presenteeism for a total of 3.0 hours (SE: 0.2) of lost productivity. In percent impact, women with UF reported 12.4% (SE: 1.2) productivity lost due to absenteeism in the previous week and 10.2% (SE: 0.6) lost due to presenteeism for a total of 22.5% (SE: 1.4) productivity lost. Women aged 18 to 29 years old reported an average of 5.6 hours (SE 1.2) lost and 56.5% impact (SE: 8.1) on household chores-related productivity in the previous week; significantly more than women in age groups 30 to 54 years as well ($P < 0.05$).

Productivity loss due to absenteeism and presenteeism was compared between women with UF with and without the following symptoms: heavy bleeding during periods, spotting/bleeding between periods, passage of clots, pelvic pressure, lower back pain, general abdominal pain, bloating, and fatigue/weariness/anemia. Women with at any of the above UF symptom reported significantly greater productivity loss compared with women without that symptoms ($P < 0.05$). An increase in total hours lost was observed with the increase in number of symptoms for both employment-related and household chores-related productivity.

Employment-related Productivity Loss

Employment-related, productivity hours lost for absenteeism and presenteeism was impacted by bleeding symptoms. Women who experience spotting/bleeding between periods and passage of clots reported more employment productivity hour lost in the last week due to absenteeism and presenteeism compared with women without the symptoms ($P < 0.05$), and women with heavy bleeding during periods reported significantly more impact on presenteeism (Fig. 1).

For bleeding and non-bleeding symptoms, there were statistically significant differences between women with moderate/severe symptoms and women with none/mild symptoms for employment-related productivity hours loss in the last week due to absenteeism and due to presenteeism ($P < 0.05$) (Fig. 2A). When asked about overall severity of their current UF symptoms, in general impact on productivity increased with the severity in symptoms. (See, Table 3).

Household Chores-related Productivity Loss

The total number of household chores-related productivity hours loss for absenteeism and presenteeism was impacted by both bleeding and non-bleeding symptoms. Women with symptoms reported more household productivity hours lost in the last week due to absenteeism compared with women without symptoms ($P < 0.05$) and more hours lost due to presenteeism, except for bloating ($P < 0.05$) (Fig. 3).

For bleeding and non-bleeding symptoms, there were statistically significant differences between women with moderate/severe symptoms and women with none/mild symptoms for household chores-related productivity loss due to presenteeism ($P < 0.05$) (Fig. 2B). There was a statistically significant difference in the impact on productivity between women with mild UF symptoms compared with women with severe symptoms (Table 4).

Multivariate Determinants of Employment and Household Chores-related Productivity Loss

Results of the multivariate logistic regression modeling of the likelihood of employment-related and household chore-related productivity losses while controlling for age, education, geographic location, UF-related symptoms severity, and comorbidities on employment-related and household chore-related productivity are presented in Table 5.

Employment-related Productivity Loss

Employment presenteeism was less likely to be reported as age increased (odds ratio [OR]: 0.96, $P = 0.02$) and women with high school education or less (vs. a graduate degree) were more likely to report employment absenteeism (OR: 11.6, $P = 0.006$). Women from the northeast were less likely to report presenteeism compared with women in the west (OR: 0.47, $P = 0.04$).

The multivariate logistic regressions also showed that women with irritable bowel disease were more likely to report employment-related presenteeism (OR: 1.93, $P = 0.03$) and women with hypothyroidism were less likely to report employment-related presenteeism (OR: 0.45, $P = 0.003$), and women with high triglycerides were more likely to report employment-related absenteeism (OR: 3.16, $P = 0.03$). Moderate/severe UF-related symptoms were associated with employment-related presenteeism compared with mild or no symptoms: pelvic pain/cramping during menstrual period (OR: 1.77, $P = 0.03$), pelvic pain during non-menstrual period (OR: 3.06, $P = 0.01$), passage of clots (OR: 3.04, $P = 0.0001$), and fatigue/weariness/anemia (OR: 1.74, $P = 0.02$). There were no statistically significant UF symptoms associated with employment-related absenteeism.

Household Chores-related Productivity Loss

Household chores-related presenteeism was more likely to be reported in women with moderate/severe pelvic pain/cramping during

TABLE 2. Prevalence of Currently Experienced Symptoms*

Symptom	Total Sample (<i>n</i> = 1365) [†]		Employed Subgroup (<i>n</i> = 873) [†]	
	Mild/None <i>N</i> (%)	Moderate/Severe <i>N</i> (%)	Mild/None <i>N</i> (%)	Moderate/Severe <i>N</i> (%)
Lower back pain	1365 (63.1)	477 (36.9)	610 (67.8)	263 (32.2)
Fatigue, weariness, anemia	792 (56.2)	573 (43.8)	526 (59.4)	347 (40.6)
Anxiety, stress	817 (59.6)	548 (40.4)	535 (61.0)	338 (39.0)
Bloating	940 (65.1)	425 (34.9)	612 (67.7)	261 (32.3)
Pelvic pain/cramping during menstrual period	897 (61.8)	468 (38.2)	591 (63.3)	282 (36.7)
Heavy bleeding during periods	856 (58.9)	509 (41.1)	557 (60.3)	316 (39.7)
Depressed feelings, mood swings	972 (70.1)	393 (29.9)	648 (74.3)	225 (25.7)
Obesity or weight gain	1,000 (72.9)	365 (27.1)	648 (75.1)	225 (24.9)
Passage of clots	1,053 (73.9)	312 (26.1)	672 (74.0)	201 (26.0)
Irregular periods	1,059 (75.0)	306 (25.0)	676 (77.0)	197 (23.0)
Difficulty having bowel movement	1,136 (82.9)	229 (17.1)	730 (83.7)	143 (16.3)
Frequent urination or urinary urgency	1,087 (80.2)	278 (19.8)	704 (83.4)	169 (16.6)
General abdominal pain	1,202 (87.0)	163 (13.0)	783 (89.4)	90 (10.6)
Pelvic pain during non-menstrual period	1,214 (88.5)	151 (11.5)	785 (89.2)	88 (10.8)
Spotting/bleeding between periods	1,225 (88.8)	140 (11.2)	787 (91.5)	86 (8.5)
Dizziness during period	1,250 (89.8)	115 (10.2)	812 (92.7)	61 (7.3)
Enlargement of the lower abdomen	1,205 (87.3)	160 (12.7)	774 (88.5)	99 (11.5)
Pelvic pressure	1,260 (92.1)	105 (7.9)	818 (94.0)	55 (6.0)
Excessive hair on face or body	1,226 (89.6)	139 (10.4)	789 (90.8)	84 (9.2)
Pain during sex	1,252 (89.6)	113 (10.4)	817 (93.0)	56 (7.0)
Thinning hair on scalp	1,226 (90.8)	139 (9.2)	793 (91.8)	80 (8.2)
Infertility	1,277 (93.3)	88 (6.7)	825 (94.9)	48 (5.1)

*Current: within the last 4 weeks from time of survey administration.

[†]Data weighted using random iterative method (RIM).

menstrual period compared with women reporting none/mild symptom (OR: 1.79, $P = 0.01$). Presenteeism was also more likely in women with the following moderate/severe symptoms: pelvic pain during non-menstrual period (OR: 2.37, $P = 0.005$); passage of clots (OR: 1.90, $P = 0.006$); and fatigue/weariness/anemia (OR: 1.75, $P = 0.003$). Women with polycystic ovarian syndrome were more likely to report household chores-related presenteeism (OR: 2.84, $P = 0.007$) and women with hypothyroidism and high cholesterol were less likely to report household chores-related presenteeism (OR: 0.48, $P = 0.001$; OR: 0.61, $P = 0.02$, respectively). Age, education, geographic location, and ethnicity were not significantly associated with presenteeism.

Household chores absenteeism was more likely to be reported in younger women compared with older women (OR: 0.97, $P = 0.01$) and women from the northeast were less likely to report absenteeism compared with women in the west (OR: 0.34, $P = 0.0004$). Women with moderate/severe pelvic pain/cramping during menstrual period and pelvic pain during non-menstrual period were more likely to report household chores absenteeism (OR: 2.45, $P = 0.001$; OR: 2.30, $P = 0.005$, respectively). Women with fibromyalgia and women with pelvic inflammatory disease were more likely to report household-chore absenteeism (OR: 1.99, $P = 0.03$; OR: 3.29, $P = 0.01$, respectively).

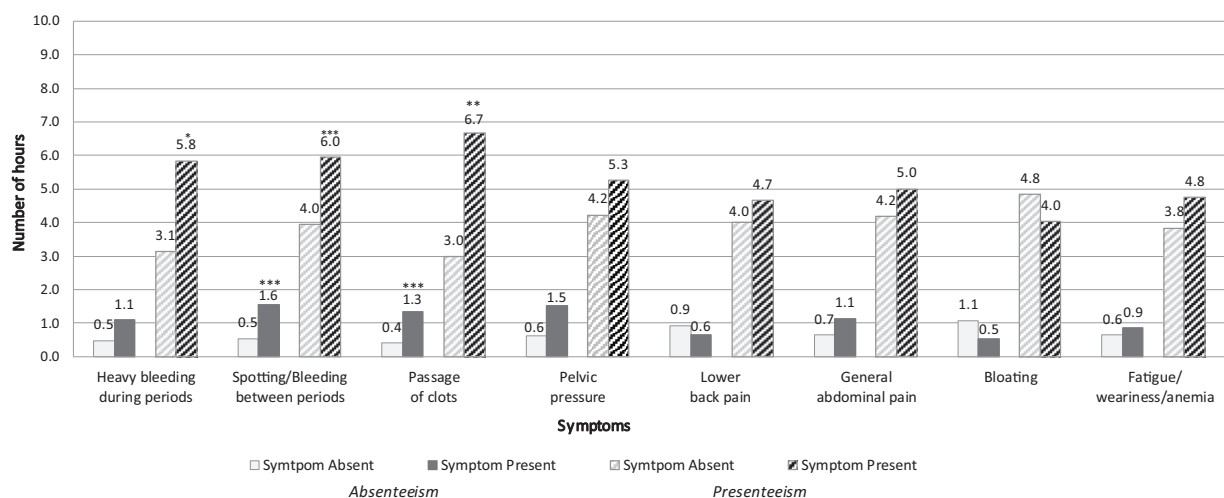


FIGURE 1. Employment-related productivity loss by symptom: absenteeism and presenteeism. * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; NS, not significant.

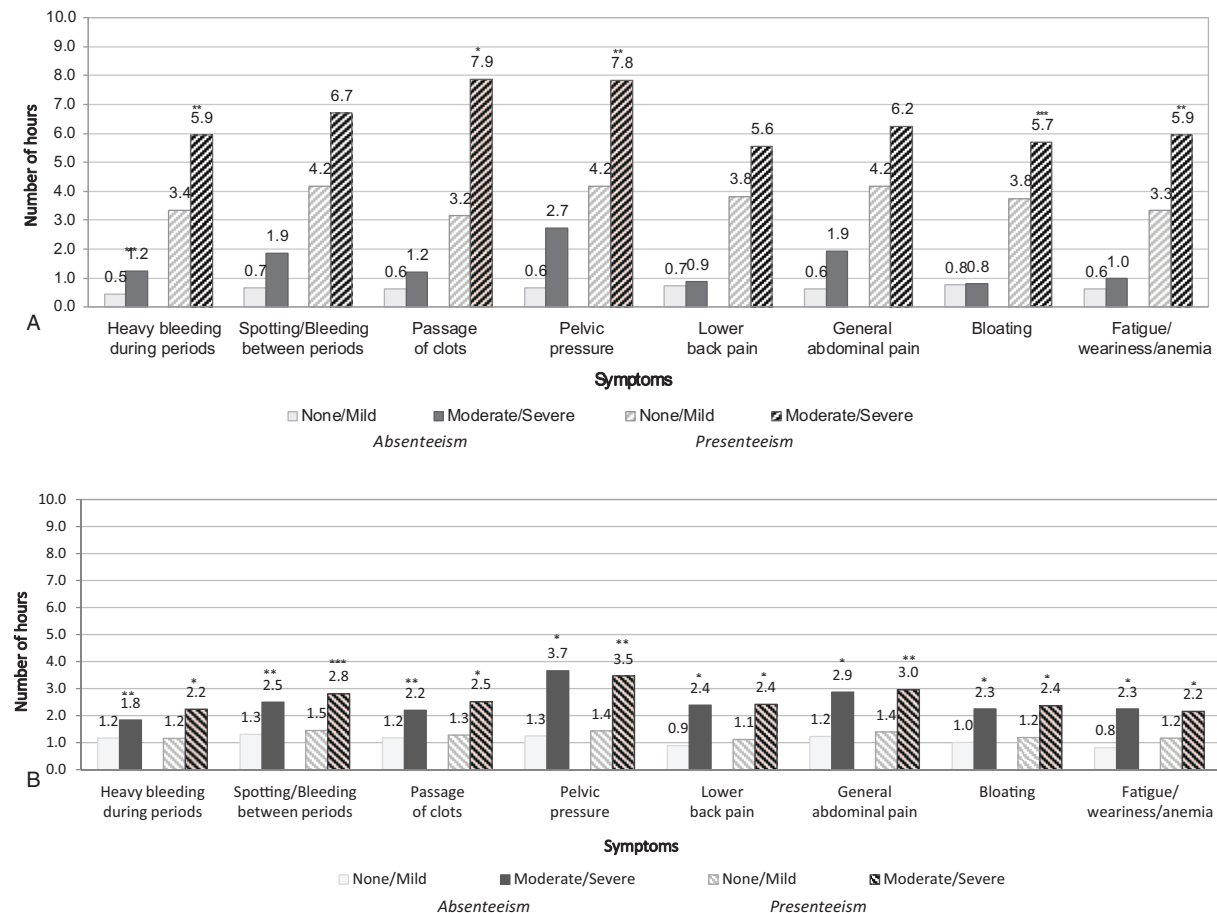


FIGURE 2. (A) Employment-related productivity loss by symptom severity. * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; NS, not significant. (B) Household chores-related productivity loss by symptom severity. * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; NS: not significant.

DISCUSSION

Uterine fibroids have a measurable impact on productivity when considering both presenteeism, lost productivity time while working, and to a lesser extent absenteeism (missed work time). Importantly, productivity loss was not limited to employment-related work, but also to household chores. To our knowledge, this is the first report on UF symptom burden impact on employment-related and household chores-related productivity from the perspective of women with UF. Importantly, household chores-related productivity is significant in women's lives and this increased

burden on women's time and daily activities and should not be downplayed, particularly given the many roles women fill. Women reported a 22.5% decrease in household related productivity due to UF and an average loss of 3.0 hours of planned work in the last week.

These findings were expected since UF is a condition with low mortality and significant HRQL impact that result in a large impact on presenteeism compared with absenteeism. Given that women are, in general, showing up for work it is important to capture both presenteeism and absenteeism to understand the total

TABLE 3. Employment-Related Productivity Loss by Uterine Fibroid Symptom Severity

	Symptom Severity		
	Mild	Moderate	Severe
Hours lost due to absenteeism (mean, SE)	22.14 (1.06)	23.19 (2.02)	18.61 (2.39)
Hours lost due to presenteeism (mean, SE)	2.44 (0.48)*	6.32 (0.73)	10.12 (1.81)
Total hours lost (mean, SE)	2.68 (0.52)*	7.69 (0.85)	12.14 (2.46)
Percent hours lost due to absenteeism (mean, SE)	0.68% (0.34)*	3.70% (0.89)	5.41% (1.85)
Percent hours lost due to presenteeism (mean, SE)	6.15% (1.05)*	17.77% (2.07)*	29.69% (4.56)
Total percent hours lost (mean, SE)	6.83% (1.18)*	21.47% (2.45)*	35.11% (5.40)

Employment related time lost due to absenteeism: $n = 47$ (826 without absenteeism); employment related time lost due to presenteeism: $n = 377$ (vs. 496 without presenteeism). SE, standard error.

* $P < 0.05$ compared with severe symptoms.

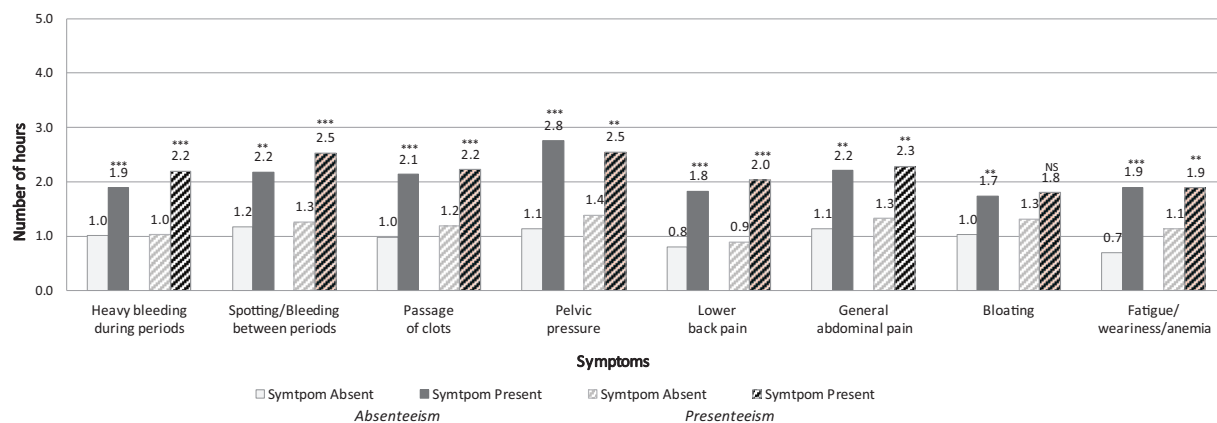


FIGURE 3. Household chores-related productivity loss by symptom: absenteeism and presenteeism. * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; NS: not significant.

impact from the employer's perspective. A prior study showed that work performance, presenteeism, assessed by the WLQ demonstrated that UF interfered with time management 21.7% of the time, the ability to manage mental and interpersonal job tasks was impaired 17.2% of the time, and at-work productivity loss was 4.3% compared with 2.1% ($P = 0.005$) in women without UF.¹³ While the results from the HRPQ does not attribute productivity loss to a particular task, we see similar results in regards to percent impact.

Employment-related productivity loss has a financial impact to the employer and women with UF in terms of missed work days and decreased performance at work. Data from a survey of 800 managers in 12 different industries determined that work loss on productivity varies across job and was dependent on three different factors: ability to replace absent worker, extent of team work, and time sensitivity of the worker's output.²¹ Mitchell and Bates¹⁰ estimated the monetary value of absenteeism and presenteeism using an average daily compensation for a full-time employee with an average wage multiplier to understand the financial magnitude of the impact. On average, the results of this study translate to 4.8 annual absent days from work and 26.4 annual unproductive days at work, outside of the house. Using the 2014 average total compensation of \$33.13/hour the annual absenteeism cost per person is approximately \$1272 (assuming a period of 48 weeks/year).^{10,22} The total number of annual unproductive (presenteeism) days cost \$6997 per person (assuming a period of 48 weeks/year)¹⁰ so the total loss (absenteeism and presenteeism) is approximately \$8269/

year. Applying a conservative prevalence of UF of 6.9%³ to the total number of employed women aged 18 to 54 in 2014 (52,569,000),²³ the total loss in productivity (absenteeism and presenteeism) from UF is approximately \$29.9 billion per year for women age 18 to 54 years old. These estimates are supported by a systematic literature review (2011) which estimated the lost work-hour costs for women 25 to 54 years old in the US with UF ranged from \$1.55 to 17.2 billion annually.²⁴ The productivity data presented in this study demonstrate a financial cost to women with UF and their employers as well as substantial productivity impact at home.

The limitations of this online survey include self-report of UF diagnosis and symptom severity that were not verified by a clinician. Online, web-based, surveys are subject to response bias as respondents are prone to providing information about their disease and comorbidities. Participants for this study were composed of individuals who take part in surveys. While the mode of administration may contribute to selection bias, the large panels increase generalizability of the sample. Socioeconomic status, occupation, job flexibility, number of children at home, other demands at home, and other relevant sociocultural factors were not collected in the study and thus not included in the regression analyses. The lack of this information is certainly a limitation as these factors may have a significant impact into a woman's decision to be absent from work or non-performance of household chores. Other relevant clinical information about UF such as the number and size of the tumors were not collected nor controlled for in the multivariate statistical model. Lastly, to accommodate women's monthly cycle and

TABLE 4. Household Chores-related Productivity Loss by Uterine Fibroid Symptom Severity

	Symptom Severity		
	Mild	Moderate	Severe
Hours lost due to absenteeism (mean, SE)	0.66 (0.11)*	2.16 (0.27)8	3.70 (0.49)
Hours lost due to presenteeism (mean, SE)	1.08 (0.14)*	2.23 (0.27)	2.65 (0.47)
Total hours lost (mean, SE)	1.74 (0.19)*	4.39 (0.45)*	6.35 (0.75)
Percent hours lost due to absenteeism (mean, SE)	5.12% (0.75)*	17.48% (1.98)*	38.12% (5.96)
Percent hours lost due to presenteeism (mean, SE)	6.31% (0.70)*	13.78% (1.15)*	21.27% (2.74)
Total percent hours lost (mean, SE)	11.43% (1.16)*	31.26% (2.53)*	59.39% (5.30)

Household chores related time lost due to absenteeism: $n = 296$ (vs. 1069 without absenteeism); household chores related time lost due to presenteeism: $n = 658$ (vs. 707 without presenteeism).

SE, standard error.

* $P < 0.05$ compared with severe symptoms.

TABLE 5. Determinants of Employment and Household Chores-related Productivity Loss

Model Parameters	Employment-Related		Household Chores-Related	
	Absenteeism Odds Ratio (P value)	Presenteeism Odds Ratio (P value)	Absenteeism Odds Ratio (P value)	Presenteeism Odds Ratio (P value)
Age	0.97 (0.26)	0.96 (0.02)	0.97 (0.01)	0.99 (0.48)
Education level*				
High school	11.60 (0.006)	1.19 (0.93)	1.40 (0.29)	1.11 (0.80)
College	3.93 (0.75)	1.33 (0.42)	1.05 (0.55)	1.08 (0.87)
Geographic region†				
Midwest	0.21 (0.17)	0.68 (0.84)	0.84 (0.31)	0.84 (0.99)
Northeast	0.23 (0.16)	0.47 (0.04)	0.34 (0.0004)	0.66 (0.10)
South	0.47 (0.54)	0.77 (0.61)	0.83 (0.26)	0.89 (0.65)
Ethnicity‡				
Black/African American	4.20 (0.31)	0.86 (0.94)	1.01 (0.48)	0.65 (0.19)
Other	6.28 (0.04)	0.77 (0.57)	0.67 (0.17)	0.84 (0.89)
Current symptom§				
Pelvic pain/cramping during menstrual period	3.13 (0.05)	1.77 (0.03)	2.45 (0.001)	1.79 (0.01)
Pelvic pain during non-menstrual period	2.18 (0.18)	3.06 (0.01)	2.30 (0.005)	2.37 (0.005)
Pain during sex	1.04 (0.95)	1.44 (0.42)	1.18 (0.65)	1.03 (0.92)
Heavy bleeding during periods	1.31 (0.63)	0.71 (0.21)	0.76 (0.30)	1.19 (0.43)
Spotting/bleeding between periods	0.87 (0.87)	2.18 (0.11)	1.64 (0.09)	1.22 (0.50)
Passage of clots	1.46 (0.54)	3.04 (0.0001)	1.47 (0.13)	1.90 (0.006)
Irregular periods	0.42 (0.12)	0.76 (0.37)	1.23 (0.39)	1.06 (0.78)
Bloating	0.99 (0.99)	1.13 (0.62)	1.22 (0.36)	1.20 (0.37)
Fatigue/weariness/anemia	1.47 (0.43)	1.74 (0.02)	1.53 (0.06)	1.75 (0.003)
Infertility	0.63 (0.64)	1.83 (0.29)	0.94 (0.88)	1.06 (0.90)
Comorbidities				
Irritable bowel disease or inflammatory bowel disease	2.16 (0.08)	1.93 (0.03)	0.84 (0.51)	0.89 (0.69)
Hypothyroidism	0.68 (0.42)	0.45 (0.003)	0.74 (0.27)	0.48 (0.001)
Fibromyalgia	1.31 (0.70)	1.33 (0.52)	1.99 (0.03)	1.55 (0.21)
Pelvic inflammatory disease	1.56 (0.49)	0.46 (0.15)	3.29 (0.01)	0.75 (0.54)
Polycystic ovarian syndrome	1.24 (0.66)	1.72 (0.23)	1.25 (0.53)	2.84 (0.007)
High cholesterol	0.60 (0.28)	0.71 (0.19)	1.18 (0.52)	0.61 (0.02)
High triglycerides	3.16 (0.03)	1.36 (0.37)	1.25 (0.52)	1.45 (0.17)

*Reference category: graduate education.

†Reference category: west.

‡Reference category: white.

§Reference category: non/mild symptom report.

||Non-significant comorbidities not included: endometriosis, anemia, diabetes, endometrial hyperplasia, infertility, ovarian cysts, primary dysmenorrhea, psoriasis, depression, hypertension, chronic fatigue syndrome, high triglycerides.

symptom variation, a 4-week recall was used for symptoms while a 1-week recall period was used for the HRPQ to minimize recall bias. This discordance in recall periods may have added additional variance to the analyses that were performed. Despite these limitations, this study provides a reflection of UF symptom burden on productivity and its correlates.

CONCLUSION

UF has a substantial impact on employment-related and household productivity. The impact, measured by self-report on the HRPQ, was observed for both absenteeism and presenteeism with a greater impact on presenteeism. The amount of productivity loss increased with the number of bleeding and non-bleeding symptoms and the severity of symptoms. Multivariate analysis of employment-related and household chore related productivity showed that age, education, geographic location, UF symptom type and severity, and comorbid condition are associated with absenteeism and presenteeism.

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