ORIGINAL ARTICLE

Secondary Conditions in a Community-Based Sample of Women With Physical Disabilities Over a 1-Year Period

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ABSTRACT. Nosek MA, Hughes RB, Petersen NJ, Taylor HB, Robinson-Whelen S, Byrne M, Morgan R. Secondary conditions in a community-based sample of women with physical disabilities over a 1-year period. Arch Phys Med Rehabil 2006;87:320-7.

Objective: To examine prevalence and predictors of secondary conditions in women with physical disabilities.

Design: Cross-sectional.

Setting: Women were recruited through private and public health clinics and various community organizations.

Participants: A sample of 443 predominantly ethnic minority women with physical disabilities.

Interventions: Not applicable.

Main Outcome Measure: Health Conditions Checklist interference score.

Results: Aggregated data over a 1-year period showed that nearly the entire sample reported interference from pain (94.5%) and fatigue (93.7%) and that at least three quarters of the sample reported problems with spasticity (85.4%), weakness (81.8%), sleep problems (80.2%), vision impairment (77.9%), and circulatory problems (77.9%). Obesity was substantially more prevalent in this sample (47.6%) than in the general population of women (34.0%). The mean number of secondary conditions per woman \pm standard deviation was 14.6 ± 6.2 (range, 1-42), with 75% of the sample endorsing 10 or more conditions. On average, women reported experiencing 5.7 ± 4.03 (range, 0–20) conditions that they rated as significant or chronic. A third (33.4%) of the variance in interference scores was accounted for in the regression analysis, with significant variance accounted for by race, disability type (women with joint and connective tissue disorders and women with postpolio reported the highest overall interference scores), greater functional limitations, and lower levels of general mental health.

Conclusions: Secondary conditions in women with physical disabilities are substantially more problematic than reported previously in the literature. Further research is needed to de-

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termine health disparities of women with and without disabilities. Measurement issues and the clinical relevance of these findings are discussed.

Key Words: Comorbidity; Connective tissue diseases; Disabled persons; Joint diseases; Multiple sclerosis; Muscle weakness; Nervous system; Neurodegenerative diseases; Neuromuscular diseases; Obesity; Pain; Rehabilitation; Rheumatic diseases, Spinal cord injuries; Trauma; Women; Women's health.

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PPROXIMATELY 20 YEARS AGO, secondary conditions ${f A}$ were recognized as a problem of national significance, and they now comprise a focus of research and prevention programs for people with disabilities.^{1,2} The national public health agenda has expanded its emphasis from disability prevention to the prevention of secondary conditions, as documented in *Healthy People 2010.*³ Although the field of physical medicine and rehabilitation has become familiar with the term "secondary conditions," researchers have yet to agree on a precise definition and practitioners still question the construct as clinically applicable. A few studies have examined secondary conditions in women with disabilities; however, they typically use measurement instruments that do not include conditions unique to women. This article addresses these problems of definition and sex relevance and provides new information about women with disabilities by presenting results of a yearlong study of secondary conditions in a diverse, communitybased sample of 443 women with physical disabilities.

Secondary conditions are defined here as highly preventable medical, physical, cognitive, emotional, or psychosocial complications of physical impairment.^{4,5} Attributed to environmental and attitudinal barriers to health-promoting behaviors and community participation in addition to the natural sequelae of disabling conditions, secondary conditions are strongly related to adverse outcomes in quality of life and health.⁴⁻⁶

In the early 1990s, Seekins et al^{7,8} developed the Secondary Condition Surveillance Instrument (SCSI) to measure the prevalence, severity, and interference of 40 secondary conditions. These researchers documented that primary impairments did not predict specific groupings of secondary conditions and that certain secondary conditions would be evident across a variety of impairments.⁹ They conducted various studies by using the SCSI including a survey (N=594) that indicated that the most prevalent secondary conditions were mobility problems, joint and muscle pain, chronic pain, fatigue, and physical deconditioning.¹⁰ Furthermore, they documented that community-living persons with mobility impairments consistently report an average of 14 secondary conditions annually. A 2004 surveil-lance study¹¹ conducted in the State of Washington showed that 87% of respondents with disabilities and 49% without disabilities reported at least 1 "secondary" condition within the past 12 months. Disability was the strongest predictor of pain,

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weight problems, fatigue, problems getting around, falls and other injuries, sleep problems, muscle spasms, and bowel and bladder problems.

Only a few studies have examined sex differences in relation to patterns of secondary conditions. One study of persons with spinal cord injury (SCI) found that, compared with men, women's outcomes included greater effects of pain, fatigue, and skin problems.¹² Based on a modification of the SCSI,⁸ a study of women with disabilities (N=165) indicated that the most frequently reported secondary conditions were fatigue, mobility problems, physical deconditioning, spasticity, and joint pain, followed by depression, chronic pain, access problems, weight problems, and isolation, with a mean of 12 conditions per woman within the previous year.¹³ Another survey (N=386)found that nearly 1 in 4 women with disabilities reported problems with hypertension.¹⁴ Only 1 study¹⁵ found that, when compared with women without disabilities, women with disabilities more frequently reported chronic urinary tract infections (UTIs), heart disease, and depression. Compared with men, women have disproportionately high rates of pain, a disparity that has been linked with women's higher prevalence of disabilities associated with pain including rheumatoid arthritis, osteoarthritis, multiple sclerosis (MS), and fibromyalgia.¹⁶ Krause and Broderick¹⁷ found that in a sample of 512 persons with SCI, women (40% of the total sample) reported more poor mental health days than men. Depression and stress have been found to be significantly more prevalent in women with disabilities compared with their male counterparts.18-21

Many secondary conditions are preventable or mutable through appropriate health promotion interventions designed to enhance functioning in the community and improve quality of life.^{10,22-28} This awareness sparks the growing interest in expanding our understanding of secondary conditions, including their prevalence and incidence and their physical, emotional, social, and economic impact.

Our decision to focus on women is well justified. Several of the most prevalent secondary conditions are more common among women, including pain, fatigue, weight problems, and depression. Although these conditions are often primary among women in general, they typically constitute secondary conditions for women with a primary physical impairment. Women with disabilities, who are faced with sex- and disability-related health disparities, comprise 24.4% (26 million) of all U.S. women,^{29,30} a number that is growing with the aging of the U.S. population.

In this study, we sought answers to the following questions: (1) Which secondary conditions are the most prevalent, cause the greatest interference in daily life, and are the most problematic (prevalence multiplied by interference) for women with physical disabilities? (2) What are the demographic, general health, and disability-related predictors of the level of impact secondary conditions have on the daily lives of women? and (3) Which primary disability types are associated with the greatest interference from selected secondary conditions?

METHODS

Sample and Procedures

Women were eligible for the study who (1) were at least 18 years old, (2) lived in the local metropolitan area, (3) had the diagnosis of a physical disability or any condition that causes a limitation in 1 or more major life activities including mobility and self-care and home management, and (4) had no known cognitive impairments or mental health problems or problems understanding English or Spanish that would significantly impair their ability to respond to questions during an interview.

Women were excluded from the study who presented with current (1) substance abuse, (2) suicidality, (3) plans to leave the metropolitan area within the following year, (4) no telephone, and/or (5) a disability of less than 1-year duration.

After obtaining approval by the institutional review board for human subjects, participants were recruited through private and public health clinics, the center's database of women with disabilities who express interest in our research studies, and various community organizations. Interested women were informed, in their preference of English or Spanish, that the study sought to examine disability-related characteristics, health conditions, and health care expenses among women with physical disabilities. The women were also informed that they would be asked to complete 7 approximately 30-minute long interviews (an initial interview and 6 bimonthly phone interviews) over the course of a year. A total of 717 women were invited to participate in a screening interview. Of these, 230 could not be screened (eg, reasons included no time, did not feel well, transportation difficulties, family waiting), 37 did not meet the eligibility requirements before screening, and 7 were found ineligible during the screening interview. A sample of 443 women met the study criteria (response rate, 62%), gave written informed consent, and participated in the enrollment interview.

There was a 19% attrition rate over the course of 1 year. Of the original sample of 443 participants, 401 completed visit 3, 388 completed visit 5, and 360 completed visit 7. A total of 253 participants, or 57% of the sample at enrollment, had complete data for visits 1, 3, 5, and 7. The data summarized and reported here consist of the initial enrollment interview data (visit 1) and data from visits 3, 5, and 7, in which information about secondary conditions was collected.

Data Collection

Data were collected by means of survey questionnaires administered in structured interviews. The following measures were used to collect data pertaining to demographics, disability status, and health conditions.

Demographics. Basic demographic questions included age, race and ethnicity, educational level, marital status, sexual orientation, employment status, personal and household income, and health insurance information.

Disability-related information. Information was gathered about disability including disability type, age at onset, and duration. Disability severity was measured by the 10-item physical functioning subscale of the Medical Outcomes Survey 36-Item Short-Form Health Survey (SF-36).³¹ To determine primary disability, participants were asked to indicate their disabling conditions from a list of 16 physically disabling conditions plus an open-ended "other condition." If more than 1 of these conditions were checked, participants were asked to indicate which one was the most limiting for them and that was labeled their primary disability.

Secondary conditions. The Health Conditions Checklist includes 42 secondary and chronic health conditions and constitutes an adaptation of the SCSI.⁹ We excluded conditions that resulted from or reflected participants' interaction with their environment, such as difficulties with access and equipment injuries and added female-specific conditions including yeast infection, vaginal infection, and menstrual problems. Participants rated the extent to which each health condition affected their activity and independence (interference rating) in the past 2 months by using 0 for no or an insignificant problem, 1 for a mild or infrequent problem, 2 for a moderate or occasional problem, 3 for a significant or chronic problem, and

4 for never had this condition. We classified respondents as endorsing the condition if they responded with 1, 2, or 3.

Body mass index. Women were asked to self-report their body weight and height, which were used to calculate body mass index (BMI) (in kg/m^2).³²

Data Analysis

Descriptive statistics of secondary conditions were calculated several ways. Prevalence at visit 1 was calculated for each health condition by dividing the number of women endorsing the condition as at least a mild or infrequent problem in the past 2 months (interference rating of 1–3) by the total number of participants. It is likely that the prevalence statistics calculated in this way yielded underestimations because the rating of 0, which represented not currently having the condition as well as having a condition that had caused no problems in the past 2 months, was not considered an endorsement of the condition. In calculating the prevalence of arthritis, we eliminated endorsements by 182 women who also reported rheumatoid or osteoarthritis as their primary disability because we were interested in identifying secondary conditions, not primary disabilities. A mean interference score for each health condition was calculated by dividing the sum of the interference scores for that item by the number endorsing the item. A problem index was calculated by multiplying each condition's prevalence by its mean interference score, indicating the relative significance of problems identified by the greatest number of women.

To examine health conditions experienced by individual participants, the total number of conditions each woman endorsed (those given an interference rating of 1, 2, or 3) was tallied to create a number of health conditions. This statistic also represents an underestimation for the same reason presented above for prevalence. We calculated an individual interference score for each participant (ie, a summation of interference ratings for each condition endorsed). This measure served as the dependent variable in a regression analysis to determine the demographic, general health, and disability-related predictors of secondary conditions.

The final 2 prevalence calculations used the subsample of 253 women for whom data were available at all time points where secondary conditions data were collected (ie, 1, 3, 5, and 7). Percentages of women who ever endorsed a condition included those who reported at least mild or infrequent interference at least once. Percentages of new cases for each secondary condition in a 1-year period were calculated by determining the number of women who did not endorse the condition at visit 1 but did endorse it (rating it 1, 2, or 3) at least once thereafter and dividing this by the number of women who did not endorse the custom-ary formula for calculating incidence rates; however, because this was not a population-based sample, we do not use this term.

The regression model used to examine interference scores in general and for selected individual conditions used dummy-coded variables. Disability type was entered by using 5 dummy-coded variables to represent the 6 disability types. Joint and connective tissue diseases (JCTDs), the largest disability group in our sample, served as the reference group. For race and ethnicity, the reference group was non-Hispanic white; for marital status, in a coupled relationship; for education, less than a high school diploma; and for work status, the reference group was not working.

RESULTS

Characteristics of the Sample

The demographic and disability characteristics of the diverse sample of 443 women with disabilities are presented in table 1. Most of the women were over the age of 52, and only about one third were married or living as married. This was a very low socioeconomic sample with the median annual household income barely exceeding \$11,000. Although relatively well educated, only 16% of the women were gainfully employed.

Women in this sample generally had long-term, severe physical disabilities. The mean duration was more than a decade, most acquired their disability at midlife, and nearly 7 out of every 10 women required at least 1 assistive device. About half had JCTDs and the other half had SCI, stroke, MS, and postpoliomyelitis. Scores on the SF-36 physical functioning subscale were well below the U.S. norms for physical functioning in women (mean \pm standard deviation, 23.43 \pm 24.24 vs mean, 81.47 \pm 24.60).³¹

Prevalence for the Entire Sample

The prevalence, mean interference score, and problem index for each secondary health condition across the entire sample

Table 1: Demographic and Disability Characteristics of	of	the
Sample (N=443)		

· · ·	
Age (y)	52.97±11.29 (18–83)
Race and ethnicity	
Non-Hispanic whites	35 (157)
African Americans	34 (150)
Hispanics	24 (105)
Other	7 (31)
Interviews conducted in Spanish	12 (52)
Education	
Graduated from HS or GED	28 (125)
HS graduate and college/	
technical school	42 (187)
College degree or more	17 (74)
Not working for pay	84 (372)
Income	
Median personal, annual (\$)	7086 (mean, 9696±11,599)
Median household, annual (\$)	11,364 (mean, 21,445±28,410)
Currently married or living as	
married	36 (158)
Heterosexual	97 (422)
Primary disability	
Duration (y)	12.50±13.59 (1–72)
Age at disability onset (y)	40.52±16.55 (0–76)
Joint and connective tissue	
diseases	48 (215)
SCI	12 (53)
Stroke	10 (45)
MS	9 (42)
Polio	6 (25)
Other	14 (63)
Assistive device use	
Used at least 1 assistive device	69 (304)
Used a power wheelchair	12 (54)
Manual wheelchair	20 (89)
Walker	22 (98)

NOTE. Values are mean \pm standard deviation (SD) (range) or % (n) or as indicated.

Abbreviations: GED, General Educational Development diploma; HS, high school.

		Visit 1 (N=443)		Visits 1, 3, 5, 7 (n=253)		
Secondary Condition	Prevalence (%)	Mean Interference	Problem Index	Ever Endorsed (%)	Rate of New Cases (%)	
Pain	83.75	2.55	2.13	94.46	50.59	
Fatigue	77.43	2.38	1.85	93.67	57.66	
Vision impairment	62.53	2.30	1.44	77.87	34.56	
Weakness	62.53	2.36	1.48	81.81	44.68	
Circulatory problems	60.05	2.39	1.44	77.86	35.30	
Sleep problems/disturbances	59.82	2.37	1.42	80.24	45.16	
Spasticity	58.01	2.32	1.35	85.38	47.20	
Depression	56.88	2.24	1.28	73.12	38.92	
Blood pressure problems	56.21	2.51	1.41	68.38	27.65	
Memory problems	50.34	1.79	0.90	71.54	34.60	
Bowel problems	45.60	2.19	1.00	66.01	30.69	
Stomach problems	38.83	2.21	0.86	58.10	29.31	
Diabetes	36.34	2.64	0.96	35.57	2.47	
Injuries	31.15	2.12	0.66	49.81	22.85	
Other bladder problems	28.89	2.23	0.64	49.01	17.65	
UTI	27.77	2.15	0.60	41.10	14.49	
Arthritis	27.54	2.38	0.65	41.10	11.27	
Osteoporosis	25.51	2.30	0.59	38.34	12.01	
Hearing impairment	22.35	1.62	0.36	35.97	14.09	
Carpal tunnel	18.51	2.17	0.40	30.83	14.84	
Cardiovascular problems	18.28	2.28	0.42	30.04	18.53	
Yeast infection/vaginal infection	17.83	2.03	0.36	31.62	11.61	
Contractures	17.61	2.40	0.42	44.67	22.96	
Heart disease	16.25	2.32	0.38	21.34	7.52	
Respiratory infection	15.58	2.16	0.34	28.07	10.94	
Anemia	14.22	2.24	0.32	28.06	12.54	
Menstrual problems	11.29	2.34	0.26	15.81	5.88	
Speech impairment	10.38	1.48	0.15	18.19	9.88	
Sexual dysfunction	10.38	2.22	0.23	19.37	8.80	
Scoliosis	9.71	2.14	0.21	15.81	5.26	
Dysreflexia	9.71	2.09	0.20	15.02	4.64	
COPD	7.45	2.64	0.20	11.46	6.74	
Peripheral vascular disease	6.77	2.37	0.16	18.58	12.11	
Pressure ulcers	5.42	1.67	0.09	11.07	4.43	
Other mental illness	5.42	2.58	0.14	13.44	6.13	
Restrictive lung disease	3.39	2.47	0.08	5.93	3.78	
Carotid artery disease	3.16	2.57	0.08	7.12	4.08	
Epilepsy	3.16	2.71	0.09	5.93	1.62	
Cancer	2.48	2.73	0.07	5.54	2.42	
Amputation	2.26	2.90	0.07	4.35	1.88	
Sexually transmitted diseases	2.26	1.60	0.04	4.35	1.08	
Alcohol or other drug problems*	0.90	2.00	0.02	1.19	0.53	

 Table 2: Summary Statistics for Secondary Conditions in 1 Year in Women With Physical Disabilities

Abbreviation: COPD, chronic obstructive pulmonary disease.

*Statistics for alcohol or other drug problems were affected by the exclusion criteria for participation in the study.

are listed in table 2. At visit 1, the most prevalent secondary conditions for this sample were in descending order: pain, fatigue, vision impairment, weakness, circulatory problems, sleep problems, spasticity, depression, blood pressure problems, and memory problems. When prevalence was weighted by multiplying it with the mean interference score to arrive at a problem index, the order of conditions for the entire sample changed slightly to pain, fatigue, weakness, vision impairment, circulatory problems, sleep problems, blood pressure problems, spasticity, depression, and bowel problems.

Even higher rates of occurrence emerged when aggregated data over a 1-year period were examined. Nearly the entire sample reported interference from pain and fatigue. At least three quarters of the sample reported problems with spasticity, weakness, sleep problems, vision impairment, and circulatory problems at some time over the course of the year. Conditions that had the highest rates of new cases in 1 year were fatigue, pain, spasticity, sleep problems, weakness, depression, circulatory problems, memory problems, vision impairment, and bowel problems.

Nearly three quarters of the sample were classified as either overweight or obese according to current national BMI standards (normative, <25.0kg/m²; overweight, 25.0-29.9kg/m²; obese, ≥ 30.0 kg/m²). Women with MS were the least likely to be overweight or obese, and women with JCTD and amputation were the most likely to be overweight or obese.

The number of secondary conditions per woman was substantial (table 3), with a mean for the whole sample of 14.64 ± 6.2 (range, 1-42); three quarters of the sample endorsed 10 or more conditions. When the number of secondary

Table 3: Mean Number of Secondary Conditions by Interference Rating

		0		
Level of Interference	Ν	$\text{Mean} \pm \text{SD}$	Min	Max
No. of SC	443	$14.64 {\pm} 6.20$	1	42
No. of SC, no problems within				
past 2mo	443	$2.55 {\pm} 2.73$	0	28
No. of SC, mild or infrequent	443	2.52 ± 2.04	0	12
No. of SC,				
moderate/occasional	443	3.86±2.46	0	12
No. of SC, significant/chronic	443	5.71±4.03	0	20

Abbreviations: Max, maximum; Min, minimum; SC, secondary conditions.

conditions per woman was broken down by interference level, we found a mean of 5.71 ± 4.03 (range, 0-20) conditions per woman were rated as significant or chronic. Almost all the women reported at least 1 secondary condition at the mild or occasional or significant or chronic level of interference.

Predictors of Individual Interference Score

The individual interference score, or sum of all interference ratings for a participant at visit 1, ranged from 0 to 70, with a mean of 27.37 ± 13.42 . A multiple regression analysis (table 4) included the variables age, race, marital status, education, work status, disability type and duration, and the SF-36 physical

functioning subscale and mental health index. Of the variables entered in the analysis, significant predictors were race, disability type, functional limitations, and mental health index, together accounting for 33.4% of the variance in individual interference scores ($F_{18,424}$ =13.31, *P*<.001). Women who identified themselves as in the "other" racial or ethnic group reported higher overall interference scores compared with non-Hispanic white women. With regard to disability type, women with JCTDs reported significantly more interference from secondary conditions than women with SCI, MS, and "other" disabilities. Thus, women with JCTDs and postpolio reported the highest overall interference scores. Women who had more limitations in physical functioning and lower levels of general mental health tended to report higher individual interference scores.

Association of Secondary Conditions and Primary Disability

Because pain, fatigue, and weakness ranked as the most prevalent and problematic of all secondary conditions measured in each primary disability group, we chose them for a closer examination of associations with primary disabilities in the context of age, race and ethnicity, marital status, education, work status, disability duration, physical functioning, and mental health. Additionally, we selected sleep problems as the dependent variable in a regression analysis, expecting it to have a low association with primary disability, as well as UTI,

Table 4	۱·	Regression	Results	for	Individual	Interference	Scores
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	Over	all	Pain		Fatigue		Weakness		Sleep Problems		UTI	
Label	PE	SE	PE	SE	PE	SE	PE	SE	PE	SE	PE	SE
Age	0.00	0.05	-0.00	0.00	0.00	0.01	-0.01	0.01	-0.00	0.01	-0.01*	0.00
White (reference group)												
African American	-0.21	1.36	0.05	0.12	0.05	0.13	-0.07	0.14	-0.03	0.14	-0.17	0.13
Hispanic, Latina	-1.99	1.62	-0.08	0.15	-0.17	0.15	-0.15	0.16	-0.14	0.17	0.15	0.15
Other	4.85*	2.46	0.26	0.22	0.37	0.23	0.15	0.25	-0.05	0.26	-0.11	0.23
In a coupled relationship (reference group)												
Noncouple	-0.79	1.16	-0.09	0.11	-0.27*	0.11	-0.04	0.12	0.06	0.12	0.14	0.11
Less than a HS diploma (reference group)												
Graduate from HS or GED	1.32	1.81	0.18	0.17	0.22	0.17	0.16	0.18	0.16	0.19	-0.12	0.17
HS graduate + college/technical												
school	2.43	1.49	0.26	0.14	0.19	0.14	0.23	0.15	0.15	0.16	0.05	0.14
College degree or more	2.09	1.91	-0.07	0.17	0.37*	0.18	0.24	0.19	0.13	0.20	0.01	0.18
Not working (reference group)												
Working full time	-0.90	2.12	-0.06	0.19	0.26	0.20	-0.34	0.21	-0.18	0.23	-0.02	0.20
Working part time	-0.42	1.88	-0.30	0.17	0.07	0.18	-0.04	0.19	0.17	0.20	0.14	0.18
JCTDs (reference group)												
SCI	-3.78*	1.87	-0.49^{+}	0.17	-0.71 [‡]	0.18	-0.48*	0.19	-0.58^{+}	0.20	0.28	0.17
Postpolio	-0.56	2.77	-0.03	0.25	0.37	0.26	0.77 [†]	0.28	0.23	0.30	-0.18	0.26
Stroke	-1.72	1.82	-0.67^{\ddagger}	0.17	-0.63^{+}	0.17	0.08	0.19	-0.32	0.19	-0.21	0.17
MS	-6.91^{+}	2.10	-0.84^{\pm}	0.19	-0.02	0.20	0.31	0.21	-0.67^{+}	0.22	0.28	0.20
Other	-4.33^{+}	1.65	-0.46^{+}	0.15	-0.22	0.16	0.05	0.17	-0.39*	0.17	-0.24	0.15
Total time since onset of disability												
(mo)	0.000	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	0.00*	0.00
Physical functioning index (range,												
0–100)	-0.13 [‡]	0.02	-0.01^{+}	0.00	-0.01^{\ddagger}	0.00	-0.02^{+}	0.00	-0.01*	0.00	-0.00	0.00
Mental health index (range, 0-100)	-0.25^{+}	0.02	-0.01^{+}	0.00	-0.02 [‡]	0.00	-0.02^{+}	0.00	-0.02^{\ddagger}	0.00	-0.00	0.00

Abbreviations: PE, parameter estimate; SE, standard error.

**P*≤.05. †*P*≤.01.

[‡]P≤.001.

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	Ра	in	Fatigue		Weakness		Sleep Problems		UTIs	
Primary Disability	Prev (%)	Interfer	Prev (%)	Interfer	Prev (%)	Interfer	Prev (%)	Interfer	Prev (%)	Interfer
JCTD	92.09	2.65	82.79	2.47	62.79	2.30	68.37	2.50	25.12	2.20
SCI	84.91	2.31	64.15	2.09	49.06	2.23	47.17	2.12	45.28	2.08
Postpolio	84.00	2.71	92.00	2.61	80.00	2.60	76.00	2.00	28.00	2.14
Stroke	73.33	2.48	62.22	2.21	68.89	2.39	60.00	2.37	17.78	2.00
MS	66.67	2.50	85.71	2.47	78.57	2.55	47.62	2.10	45.24	2.26
Other	59.26	2.75	59.26	2.13	29.63	2.38	29.63	2.63	7.41	1.50

Table 5: Prevalence (Prev) and Mean Interference (Interfer) Scores for Selected Secondary Conditions by Primary Disability

expecting it to have a high association with primary disability. See table 4 for the results of these analyses.

We succeeded in predicting 20.9% of the variance in interference from pain ($F_{18,424}$ =7.50, *P*<.000), 24.9% of the variance in interference from weakness ($F_{18,424}$ =9.12, *P*<.000); 25.7% of the variance in interference from fatigue ($F_{18,424}$ =9.48, *P*<.000), and 19.8 of the variance in interference from sleep problems ($F_{18,424}$ =7.07, *P*<.000). For all 4 dependent variables, more interference was associated with disability type, lower physical functioning, and lower mental health scores.

Table 5 presents the prevalence and interference scores for pain, weakness, fatigue, sleep problems, and UTI by primary disability type. Women with JCTDs reported significantly more interference from pain than women with SCI, stroke, MS, and "other" primary disability. Women with JCTDs, postpolio, and "other" disabilities reported the highest mean interference from pain.

Women with JCTDs reported significantly more interference from weakness than women with SCI; however, they reported significantly less than women with postpolio. The highest interference scores for weakness were reported by women with postpolio and MS.

Women with JCTDs also reported significantly more interference from fatigue than did women with SCI and women with stroke. The highest mean interference scores were reported by women with postpolio, JCTDs, and MS. Fatigue was also associated with more education and not being in a coupled relationship.

Results from the regression models for sleep problems and UTI did not support our expectations. For sleep problems, disability type was a significant predictor; the highest mean scores were reported by women with "other" disabilities, JCTDs, and stroke. We were surprised to find that the model for UTI was relatively weak, predicting only 5.9% of the variance ($F_{18,424}=2.54$, *P*<.000). Women who were younger and women who had their disability for a longer period of time reported higher interference from UTI. Although women with SCI or MS reported the highest prevalence and interference scores for UTI, there was no association between UTI and primary disability after all the other variables were entered into the model.

DISCUSSION

By all measures, the number of health problems experienced by women in addition to their primary disabling condition and the level of interference with activities and independence because of those problems was substantial. On average, women in the study experienced more than 14 secondary conditions, a number that equals or slightly exceeds that found in previous studies.¹³ Our additional finding that more than a third of these secondary conditions were described as being significant or chronic indicates a problem of even more depth and complexity.

Prevalence

Across all primary disability categories, the most prevalent and problematic secondary conditions for women were pain and fatigue, followed in varying order according to disability group by vision impairment, weakness, circulatory problems, sleep problems, spasticity, depression, blood pressure problems, and memory problems. Additionally, obesity was substantially more prevalent in this sample (47.6%) than was indicated in the 2002 National Health Interview Survey for the general population of women (21.4%).³³

Interference

Our second question involved the impact of secondary conditions on women's daily lives. Results indicate that race and ethnicity, disability type, functional limitations, and mental health index were significantly associated with interference scores. Our sample was unusual and valuable in its diversity, with about a third non-Hispanic white, a third African American, and a quarter Hispanic. Half of the Hispanic women participated in Spanish. Even with this degree of statistical power for analysis of race and ethnicity and secondary conditions interference, the only significant finding was that the "other" racial or ethnic group reported higher overall interference scores compared with non-Hispanic white women. Despite the absence of significance for African-American and Hispanic women, it cannot be said that no difference exists in their experience of secondary conditions compared with other groups. Further investigation is needed on cultural attitudes toward illness, disability, women and the role of access to health care on the experience of secondary conditions for women in minority cultures.

Women who had substantial functional limitations or low scores on the mental health index reported the highest interference from secondary conditions. Time-series analyses must be conducted with the data to determine the direction of influence. The directionality of the relation between mental health problems and other secondary conditions may be particularly difficult to determine. Potentially confounding factors should also be examined, such as the quality of relationships and barriers to accessing health care. Primary disability was significantly related to overall interference scores, with women with JCTDs and postpolio reporting the highest scores.

Association of Primary Disability and Secondary Conditions

In examining interference scores for selected conditions, we found that interference because of pain, weakness, fatigue, and sleep problems was significantly associated with primary disability, lower levels of physical functioning, and lower mental health index. Because joint pain is integral to JCTDs, SCI, MS, and stroke, we expected elevated scores on pain interference. We did not, however, expect the finding that pain interference was greater for women with postpolio and "other" primary conditions (eg, cerebral palsy, neuromuscular disorders, spina bifida) than found in women with JCTDs. Similar to the findings of Ravesloot,³⁴ we found pain to be highly prevalent in our sample but could not compare our findings with theirs because they did not report interference scores nor controlled comparisons to other disability groups nor sex-specific findings. At most we can say that we have expanded on the extant literature.

Our findings were comparable to those of Coyle et al,¹³ who also found pain and fatigue to be among the most prevalent secondary conditions for women with physical disabilities. They found that women with MS had higher problem index scores for bladder problems, bowel problems, and sexual dysfunction than women in the mixed disability group. In our sample, women with MS reported higher problem index scores for UTIs, other bladder problems, and bowel problems, but lower problem index scores for sexual dysfunction compared with women with SCI, postpolio, JCTDs, or stroke.

Our findings for fatigue, weakness, and sleep problems followed a similar pattern of significant associations with primary disability. Our failure to find significant associations between UTI and primary disability is counterintuitive because women with SCI or MS reported the highest prevalence. Future research should examine the risks for UTIs and conditions unique to women that are introduced by variables not included here (eg, environmental barriers, assistive devices, hygiene practices, personal assistance).

We endorse a multifaceted model of disability that includes primary disabling condition, age at onset and duration of disability, functional limitations, and use of assistive devices in multivariate analyses of health outcomes. Our experience suggests that commonalities in women are best represented in measures of functioning rather than diagnostic category.

Study Limitations

The limitations of this study involve method and measurement issues. Because this was a community-based and not a population-based sample, we were limited in our use of the terms prevalence and incidence, as well as generalizability to the population of women with physical disabilities. Although the first of its kind and widely used, the tool we used to evaluate secondary conditions has its limitations. The response category of 0 (had the condition at some point, but not in the past 2 months or it had been an insignificant problem in the past 2 months) caused difficulties in interpretation. Future work should refine the measure so it can distinguish between a past problem and a recent but insignificant problem and differentiate severity ratings from chronicity ratings. For example, a rating of 1 indicates either a mild or infrequent problem, increasing the individual differences in response patterns and adding to the difficulty of interpretation.

Future Research

We call on the field of rehabilitation research to agree on the definition of secondary conditions. Such a consensus will support the development of psychometrically sound instruments that will be inclusive of conditions unique to women and useful for researchers and clinicians outside the field of rehabilitation. Other conditions, such as fertility problems and pregnancy, should be evaluated in future investigations.

We also call on the field to initiate sex-comparative research on secondary conditions and, even more important, to compare findings with prevalence statistics in women without disabilities. This will require carefully controlled studies using measurement techniques that can accurately distinguish between

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the symptoms of a health condition and disability-related limitations in physical functioning.

CONCLUSIONS

As shown by this study, secondary conditions are linked with a complex and intricate web of factors, a web with distinct differences for women compared with men given their different socioeconomic and interpersonal realities in our society. Infrastructure changes in rehabilitation are needed to address these issues. Careful attention and creative problem solving on the part of both primary care providers and disability specialists, and a willingness to involve those from other disciplines (eg, gynecology, cardiology, behavioral sciences) as well as the women themselves in developing treatment strategies, can have a magnified benefit in preventing and managing secondary conditions in women with physical disabilities.

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