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RESEARCH ARTICLE

Health Care Utilization and Costs Associated with Physical and Nonphysical-Only Intimate Partner Violence

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Objective. To estimate health care utilization and costs associated with the type of intimate partner violence (IPV) women experience by the timing of their abuse.
Methods. A total of 3,333 women (ages 18–64) were randomly sampled from the membership files of a large health plan located in a metropolitan area and participated in a telephone survey to assess IPV history, including the type of IPV (physical IPV or nonphysical abuse only) and the timing of the abuse (ongoing; recent, not ongoing but occurring in the past 5 years; remote, ending at least 5 years prior). Automated annual health care utilization and costs were assembled over 7.4 years for women with *physical IPV* and *nonphysical abuse only* by the time period during which their abuse occurred (ongoing, recent, remote), and compared with those of never-abused women (reference group).
Results. Mental health utilization was significantly higher for women with physical or nonphysical abuse only compared with never-abused women—with the highest use among women with ongoing abuse (relative risk for those with ongoing abuse: physical, 2.61; nonphysical, 2.18). Physically abused women also used more emergency department, hospital outpatient, primary care, pharmacy, and specialty services; for emergency department, pharmacy, and specialty care, utilization was the highest for women with ongoing abuse. Total annual health care costs were higher for *physically abused* women, with the highest costs for ongoing abuse (42 percent higher compared with nonabused women), followed by recent (24 percent higher) and remote abuse (19 percent higher). Women with recent *nonphysical abuse only* had annual costs that were 33 percent higher than nonabused women.
Conclusion. Physical and nonphysical abuse contributed to higher health care utilization, particularly mental health services utilization.

Key Words. Intimate partner violence, utilization, costs, abuse

Physical and nonphysical types of intimate partner violence (IPV) are common in women, with lifetime prevalence ranging from 17 to 34 percent for physical IPV, and 12 to 35 percent for nonphysical abuse (e.g., verbal threats;

chronic controlling behavior; Coker et al. 2002; Thompson et al. 2006). In addition, each of these types of abuse (physical and nonphysical) has been shown to be independently associated with adverse health outcomes in women, including depression, poor self-reported health, low energy, and diminished social functioning (Coker et al. 2002; Bonomi et al. 2006; Bonomi et al. 2007; Breiding, Black, and Ryan 2008; Ellsberg et al. 2008).

A growing literature has documented elevated health care utilization for women with a history of IPV compared with women without comparable abuse histories (Bergman, Brismar, and Nordin 1992; Plichta 1992; Ulrich et al. 2003; Coker et al. 2004; Fanslow and Robinson 2004; Max et al. 2004; Amar and Gennaro 2005; Arias and Corso 2005; Snow Jones et al. 2006; Rivara et al. 2007). Costs associated with this increased health care utilization are significant, with a recent study, for example, showing that abuse-related health care utilization amounted to US$19.3 million in excess annual costs for every 100,000 women enrolled in a large health plan (Rivara et al. 2007).

Despite a growing literature on the costs of IPV, we found only one *health plan-focused* study that examined costs associated with the specific type(s) of IPV women experienced (Snow Jones et al. 2006). This study estimated the relationship between physical and nonphysical types of IPV and health services utilization and costs in 383 women enrolled in a health maintenance organization. Average annual health care costs (in 2005 dollars) were highest for women who experienced both physical and emotional abuse (US$5,648 versus US$2,101 for never-abused women). When costs were aggregated over a 3-year period, women with physical, sexual, and emotional abuse had the highest costs compared with never-abused women (US$9,673 versus US$4,826), followed by women with physical and emotional abuse (US$9,210) and women with emotional abuse only (US$6,931). In addition, women who were abused in the past year had costs that were 122 percent higher than for never-abused women and 60 percent higher than women who experienced abuse before the past year. In spite of important new information from the study, the sample was small, cost estimates were unstable, and the cost differences between abused and nonabused women were not statistically

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significant in two-sided tests. Additionally, the authors did not consider the costs associated with various types of abuse *according to the timing* of women's abuse.

Max and colleagues (2004) estimated costs of IPV at the *U.S. population level* using data from the Medical Expenditure Panel Survey and the National Violence Against Women Survey. The study found that medical costs (i.e., costs associated with emergency visits, outpatient visits, hospital stays, etc.) amounted to US$2.6 billion per year (1995 dollars)—US$2.4 *billion* attributable to physical assault and US$1.6 *million* to rape by an intimate partner. Mental health service costs amounted to US$1.4 billion per year, with more than 80 percent of these costs attributable to physical assault. The study provided valuable information on health care utilization and costs primarily in victims of physical types of violence. However, it did not consider nonphysical types of abuse, other than stalking, and like the study by Snow Jones et al. (2006), it did not examine health care costs associated with types of abuse *according to the timing* of women's abuse.

Additional studies are needed to examine the relationship between health care utilization and costs associated with the type of IPV according to the timing of the abuse, as different patterns of utilization may be present depending on both the type and timing of women's abuse exposure. For example, women with ongoing physical abuse may be high utilizers of emergency health services, whereas women with ongoing physical or nonphysical abuse *only* may be high utilizers of mental health services for their experiences. The present investigation estimated annual health care utilization and costs associated with physical versus nonphysical types of abuse according to the timing of the abuse exposure (ongoing, recent, or remote), in a cohort of 3,333 women randomly sampled from the membership files of a large health care delivery system. Information from the present study is useful for researchers, clinicians, and policy makers at the health plan level interested in knowing how women present for health care services and how costs are incurred depending on the types and timing of abuse experienced.

METHODS

Study Sample and Data Collection

The study was approved by the institutional review board of Group Health Cooperative, a large integrated health care delivery system serving mostly urban residents in the U.S. Pacific Northwest. The study population comprised English-speaking women ages 18–64, randomly sampled from

enrollment files to participate in a telephone survey to assess IPV and health status (Bonomi et al. 2006; Thompson et al. 2006). An advance letter was mailed to women describing our interest in issues affecting women's health. After the advance letter was sent, we contacted women by telephone to ascertain their interest and consent to participate in the study.

Of 6,666 women randomly sampled, 345 were excluded because they did not meet the sampling criteria identified in the Group Health automated health plan records (209); they were deceased (3); they were too ill (15); or they did not speak English or had a hearing impairment (118). Of the 6,321 remaining women, 1,829 (28.9 percent) refused participation when initially contacted by the study staff, 539 (8.5 percent) started but did not complete the interview, 385 (6.1 percent) could not be located, and 3,568 (56.4 percent) completed the interview. As reported previously, a propensity score analysis showed that respondents did not differ from nonrespondents based on their history of IPV (Rivara et al. 2007).

Next, for the utilization and cost analysis, women were included if they (1) were enrolled at Group Health for at least 12 of the 41 calendar quarters preceding the calendar quarter of sampling (from January 1, 1992, to December 31, 2002); and (2) agreed during the telephone survey to allow the study team to access their automated health care use data (Rivara et al. 2007). Based on these criteria, a total of 3,333 women (of the 3,568 women who agreed to participate in the telephone survey) were included in the analysis.

A woman's start date for the assessment of health care use was January 1, 1992, or her first quarter of enrollment in the health plan as an adult ($\geq$ 18 years of age) from January 1, 1992 to December 31, 2002, whichever was later. The end date was December 31, 2002, or the date of dis-enrollment. A woman could have more than one start and stop date if she dis-enrolled and then re-enrolled in the health plan between 1992 and 2002. To be considered enrolled in a calendar year, a woman had to meet our quarterly enrollment criterion (i.e., enrolled for at least 2 months of a quarter) for all four quarters.

Measurement

We used Andersen's behavioral model of health services use to guide our measurement approach (Andersen 1995). Andersen's model suggests that people's use of health services is a function of their *predisposition* to use health services (e.g., age, education), factors that *enable* or *impede* use (e.g., access to services), and *need* for health services (e.g., presence of symptoms and illness). In the telephone survey, we collected data on *predisposing* characteristics (e.g.,

age), and *need* characteristics (IPV, the primary exposure of interest) that could influence health care use. All participants had access to health care, the major *enabling* component in Andersen's model. We adjusted for comorbid conditions in the year before each utilization year to address health care *needs* that could be associated with service utilization; the methods used to adjust for these conditions are described in detail below.

IPV. IPV victimization since age 18 was assessed using the Women's Experience with Battering (WEB) Scale (Smith, Earp, and DeVellis 1995) and five questions from the Centers for Disease Control's Behavioral Risk Factor Surveillance System (BRFSS) survey on physical (one question), sexual (two questions), and psychological abuse (two questions—verbal threats and chronic controlling behavior) (Thompson et al. 2006). Details of the IPV assessment procedure are described elsewhere (Thompson et al. 2006). In brief, women were asked to name their three most recent adult intimate (heterosexual or homosexual) partners, and answered the WEB questions for each of their three partners. The WEB uses a Likert-type scale ranging from 1 (strongly disagree) to 6 (strongly agree) and assesses fear and disempowerment resulting from abuse exposure. Women who scored 20 or higher on the WEB (score range, 10–60) for any given partner were considered positive for abuse (Coker et al. 2000). If women scored positive on the WEB, they were asked about the date that they started and stopped feeling that way with the partner; this information was used to construct the timing of abuse. Women were also asked whether they had ever experienced each of the physical, sexual, and nonphysical abuse tactics represented in the five BRFSS questions using a binary response option (yes/no). Women who answered "yes" in response to any of the BRFSS questions were considered positive for that abuse type. If women ever experienced any of the abuse types, they were then asked whether the abuse occurred in the past 5 years and in the past year, and when the abuse first happened to them and when it last happened to them. This information (along with the information from the WEB) was used to construct the timing of women's abuse. Based on women's responses to the WEB and BRFSS questions, the following abuse exposure categories were created:

(1) *Physical abuse*: included women who responded affirmatively to the BRFSS questions on physical and/or sexual IPV. This group of women could include those who also had nonphysical/psychological abuse according to the BRFSS questions or the WEB scale.

(2) *Nonphysical/psychological abuse only*: included women who did not report physical and/or sexual IPV according to the BRFSS questions, but who

responded affirmatively to either BRFSS question on verbal threats or controlling behavior, or whose WEB score for any partner was 20 or higher.

For both the physical abuse and nonphysical abuse exposure groups, person-years of utilization data were then categorized relative to the timing of abuse: *ongoing* (i.e., abuse was ongoing), *recent* (i.e., abuse was not ongoing but occurred within the past 5 years), and *remote* (i.e., abuse occurred before past 5 years only). For the physical abuse group (which could include women who also experienced nonphysical abuse), the timing of abuse was computed relative to the timing of their physical abuse exposure only.

We considered categorizing women's abuse as physical IPV only, sexual IPV only, or nonphysical abuse only. However, there were an insufficient number of women who experienced physical abuse *only* and sexual abuse *only* to calculate stable and meaningful health care utilization and cost estimates for these women.

Sociodemographic Factors. Women were asked about their age, household income, employment status, highest grade level completed, race/ethnicity, and number of children living in the home using questions from the U.S. Census Bureau (2002). As described previously, women also answered questions about their health habits (tobacco, alcohol, and recreational drug use), and their health (depressive symptoms, physical symptoms such as chest pain, headache and nausea, weight, and overall health perception) using validated measures; these self-reported data by abuse history (physical versus nonphysical only) are reported elsewhere (Bonomi et al. 2006).

Health Care Utilization. We determined women's health care utilization—including primary, specialty, mental health, emergency department and hospital visits, and pharmacy, laboratory, and radiology services—from January 1, 1992, to December 31, 2002, using Group Health's automated databases (Rivara et al. 2007). Group Health databases accurately capture health services provided by Group Health and other health care providers with whom Group Health contracts (Boudreau et al. 2005). Group Health provides primary care through 25 medical centers, each housing 4–18 practices, and mental health care through eight clinics in more densely populated areas near Seattle and Spokane and a network of over 200 community providers in more rural areas. In all Group Health insurance plans, members may directly request specialty mental health care without referral or other authorization. Mental health services include outpatient

services to mental health specialty providers who provide care within the mental health clinics. Inpatient services and pharmacy fills are not included in the mental health services service category. Group Health operates a network of 29 in-person pharmacies as well as a centralized mail-order pharmacy. Members with no prescription drug coverage are still allowed to fill prescriptions at GHC pharmacies, and the majority choose to do so.

Costs. Costs were allocated for visits to primary care, specialty, and mental health providers, as well as for emergency department, hospital, laboratory, pharmacy, and radiology services. The Group Health cost system captures utilization information on a monthly basis, calculating the precise cost for each unit of service delivered and assigning costs to patients based on the units of service utilized. The Group Health cost system ensures that actual costs from the general ledger are reported, overhead costs are fully allocated to patient care departments, total costs are reduced to the unit of service, and there is systematic verification of the automated data (Rivara et al. 2007). All costs were adjusted to 2004 dollars using the medical care component of the Consumer Price Index for the Seattle–Tacoma–Everett Metropolitan Statistical Area (U.S. Bureau of Labor Statistics 2006).

Comorbid Conditions. We adjusted for comorbid conditions in the year before each utilization year using a limited set of Adjusted Diagnosis Groups (ADGs), the base components of the ACG case mix adjustment system (Starfield et al. 1991; Weiner et al. 1991; Weiner, Starfield, and Lieberman 1992). ADGs are 32 resource-based morbidity groupings that correspond to ambulatory and inpatient ICD-9-CM diagnoses coded by health care personnel. Because ADGs categorize morbidity based on diagnoses over an extended period of time (typically 1 year), for a woman to contribute to a year, she had to be enrolled at Group Health for all four quarters that year. For each utilization year, ACGs were assigned using diagnoses recorded over the preceding 12 months. To avoid overadjusting for IPV-related comorbid conditions, we limited our adjustment to ADGs that are highly related to health care utilization and costs, but that are unlikely to be related to IPV (Rivara et al. 2007). These included the following ADGs: time-limited major conditions; time-limited major primary infections; likely to recur or progressive conditions; unstable chronic medical and surgical conditions; and malignancy (Rivara et al. 2007).

Statistical Analysis

Analysis of variance, Kruskall–Wallis tests, and χ^2 tests were used to test for differences in sociodemographic characteristics in women by IPV history (never, physical, and nonphysical/psychological only). For significant group differences, pair-wise comparisons were undertaken.

Annual health care utilization and costs over the study period (January 1, 1992, to December 31, 2002) were compared for women with a history of physical IPV and nonphysical abuse only by the time period during which their abuse occurred (ongoing, recent, remote), and for women with no IPV history (reference group). For service areas used infrequently (mental health, inpatient, hospital, and emergency), we estimated *any* utilization of such services. For more commonly used services (primary care, specialty, and pharmacy), we estimated the *number* of utilizations.

The unit of analysis was the woman-year, with women contributing on average 7.4 years of utilization data. To account for within-woman correlation across years, we used generalized estimating equations (GEE) with robust standard error estimates assuming an independent working correlation. For *binary* outcomes assessing "any use" of health services (mental health, inpatient, hospital, and emergency visits) and for *counts* of health care utilization (primary and specialty care visits and pharmacy fills), relative risks (RR), and incident rate ratios, respectively, were estimated using GEE with a log link and Poisson errors. For health care costs, regression models estimated cost ratios using a log link and a gamma error distribution.

Multivariable models were adjusted for age, education, calendar year, and comorbid conditions—factors that could influence health care utilization. To adjust for temporal trends, we included an indicator variable for calendar year, allowing for maximum flexibility in temporal change. As noted, we adjusted for non-IPV-related comorbid conditions using the ADG clinical groupings.

We hypothesized that women with a history of physical or nonphysical abuse only would use health services at higher rates than women with no abuse history.

RESULTS

Characteristics of Women

Women with a history of physical abuse were significantly older (mean age, 48.1 years) than women with no history of IPV (46.4 years) and women exposed to nonphysical abuse only (46.1 years) (Table 1). All three groups

Table 1: Characteristics of Women at Time of Survey

	No IPV Ever n = 1787	*Nonphysical IPV Only n = 406*	*Any Physical IPV n = 1140*	*p-value*
Mean age at survey (SD)	46.4 (11.5)	46.1 (10.9)	48.1 (10.0)	<.01
Household income (%)				
<US$25,000	7.9	10.6	12.7	<.01
US$25,000–$49,999	25.1	27.8	32.6	
US$50,000–$74,999	27.5	26.3	26.0	
≥ US$75,000	39.5	35.4	28.8	
Employed at least part time (%)	80.2	85.4	82.1	.04
High school graduate or less (%)	11.2	12.6	11.8	.70
White (%)	82.1	85.5	82.9	.27
Have children in the home (%)	33.5	35.5	33.6	.74
Mean follow-up time, years (SD)	7.5 (3.7)	7.1 (3.7)	7.4 (3.7)	.24

IPV, intimate partner violence.

differed significantly by income level at the time of the survey, with no IPV group reporting the highest income and the physical IPV group reporting the lowest. Women with no history of IPV were also less likely to be employed than women with a history of nonphysical IPV only. There were no differences between exposure groups on race, education, or having children living in the home at the time of the survey.

Unadjusted Health Care Utilization and Costs by Type and Timing of Abuse

Table 2 presents unadjusted health care utilization and costs for women by the type of IPV they experienced and the time frame during which their abuse occurred relative to the health care utilization period examined (ongoing; recent, not current but occurring within the past 5 years; remote, abuse ending at least 5 years prior). Statistical comparisons are made in the multivariable models that adjust for women's age and education, calendar year, and comorbid conditions (Table 3); we comment on differences in health care utilization and costs by exposure groups here.

Adjusted Health Care Utilization and Costs by Type and Timing of Abuse

Table 3 presents health care utilization and costs by the type and timing of abuse experienced by women, after adjusting for age, education, calendar year, and comorbid conditions. Compared with never-abused women, mental health services utilization was significantly higher for women who experi-

Table 2: Unadjusted Annual Health Care Costs and Utilization by Type of IPV and the Time Period during Which the Abuse Occurred

		Nonphysical IPV Only			*Any Physical IPV*		
	No IPV Ever	*Ongoing*†	*Recent*	*Remote*	*Ongoing*	*Recent*	*Remote*
Any utilization of services (%)							
Number of women-years	13,359	714	393	1,451	875	913	6,267
Mental health services	7.3	16.4	14.8	11.3	20.6	16.9	12.6
Inpatient admits	4.7	5.0	8.9	4.1	6.2	7.2	4.9
Hospital outpatient visits	8.3	8.1	11.7	9.9	10.9	11.3	10.6
ER visits	3.8	6.4	5.1	3.6	8.2	6.9	6.1
Number of visits/utilizations							
Primary care	2.9 (2.8)	3.1 (2.9)	3.2 (3.0)	2.8 (2.4)	3.9 (3.5)	3.8 (3.8)	3.6 (3.4)
Pharmacy	11.4 (14.3)	10.4 (12.2)	12.5 (13.0)	11.6 (13.3)	14.4 (17.1)	12.7 (15.1)	16.5 (21.0)
Specialty care	1.4 (2.5)	1.4 (2.5)	1.7 (2.8)	1.4 (2.5)	1.8 (3.1)	1.5 (2.3)	1.7 (3.1)
Costs for services*							
Primary care costs	488 (566)	525 (593)	560 (632)	513 (650)	631 (711)	608 (710)	617 (1017)
Pharmacy costs	378 (915)	299 (487)	429 (677)	425 (948)	479 (820)	376 (625)	565 (1247)
Specialty costs	338 (868)	379 (903)	503 (906)	356 (789)	436 (801)	370 (691)	428 (1087)
Laboratory costs	67 (129)	77 (115)	78 (122)	57 (101)	93 (132)	85 (119)	82 (191)
Radiology costs	163 (465)	173 (544)	242 (896)	170 (427)	212 (561)	147 (296)	218 (537)
Inpatient costs	374 (2822)	325 (1511)	696 (2825)	326 (2015)	363 (1675)	416 (1964)	450 (3294)
Total costs	2311 (5443)	2483 (3603)	3425 (6117)	2415 (4198)	3027 (4038)	2690 (3950)	3094 (6905)

*2004 dollars

†Ongoing, abuse is ongoing; recent, abuse not ongoing but occurred within past 5 years; remote, abuse occurred before past 5 years.

IPV, intimate partner violence.

enced physical abuse or nonphysical abuse only—with the highest service use observed for women whose abuse was ongoing (RR, physical: 2.61; nonphysical only: 2.18), followed by women whose abuse was recent (physical: 2.19; nonphysical only: 1.92) and those whose abuse was remote (physical: 1.71; nonphysical only: 1.57). Physically abused women also had higher utilization of emergency, hospital outpatient, primary care, pharmacy, and specialty services. In the categories of emergency, pharmacy, and specialty services, utilization tended to be highest for women with ongoing physical abuse compared with never-abused women. For hospital outpatient and primary care services, similar RRs were observed for women with ongoing or recent abuse.

Compared with never-abused women, total adjusted annual health care costs were significantly higher for physically abused women, with a trend for the highest costs for women with ongoing abuse (42 percent higher), followed by recent abuse (24 percent higher) and remote abuse (19 percent higher). Physically abused women also had significantly higher costs compared with never-abused women across five services areas—primary care, pharmacy, specialty, laboratory, and radiology—again, with a tendency for the highest costs observed for women with ongoing physical abuse.

Women with ongoing or recent nonphysical abuse only also had higher total annual health care costs compared with never-abused women. However, total costs were the highest among women with recent nonphysical abuse (33 percent higher compared with nonabused women) and then women with ongoing abuse (13 percent higher). Women with recent nonphysical abuse had significantly higher costs in three areas compared with never-abused women: pharmacy, specialty, and radiology.

DISCUSSION

This study partitioned health care utilization and costs by the type of IPV women experienced according to the timing of their abuse (ongoing, recent, or remote) in a large sample of women randomly selected from the membership files of a health plan. Regardless of the type of abuse women experienced (physical or nonphysical), abused women had significantly higher mental health service utilization compared with never-abused women—with the highest use for women whose abuse was ongoing. Of note, mental health utilization was also significantly higher for women with abuse (either type) occurring in the past 5 years (recent) or before past 5 years only (remote)—

Table 3: Adjusted Annual Health Care Costs and Utilization by Type of IPV and the Time Period during Which the Abuse Occurred[†]

	Nonphysical IPV Only			*Any Physical IPV*		
	Ongoing[‡] Versus No IPV	*Recent Versus No IPV*	*Remote Versus No IPV*	*Ongoing Versus No IPV*	*Recent Versus No IPV*	*Remote Versus No IPV*
Any utilization of services	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)	RR (95% CI)
Mental health services	2.18 (1.62, 2.95)	1.92 (1.36, 2.71)	1.57 (1.20, 2.07)	2.61 (2.07, 3.29)	2.19 (1.76, 2.74)	1.71 (1.45, 2.01)
Inpatient admits	0.90 (0.65, 1.24)	1.33 (0.96, 1.85)	0.97 (0.76, 1.25)	0.97 (0.75, 1.27)	1.14 (0.89, 1.46)	1.01 (0.87, 1.17)
Hospital outpatient visits	0.93 (0.73, 1.18)	1.20 (0.88, 1.64)	1.16 (0.95, 1.42)	1.25 (0.99, 1.57)	1.34 (1.08, 1.67)	1.15 (1.03, 1.30)
ER visits	1.59 (1.09, 2.31)	1.15 (0.73, 1.81)	0.98 (0.73, 1.32)	2.00 (1.54, 2.59)	1.68 (1.29, 2.19)	1.52 (1.29, 1.79)
Number of visits/utilizations	IRR (95% CI)	IRR (95% CI)	IRR (95% CI)	IRR (95% CI)	IRR (95% CI)	IRR (95% CI)
Primary care	1.08 (0.96, 1.21)	1.09 (0.96, 1.24)	1.00 (0.93, 1.08)	1.30 (1.17, 1.45)	1.31 (1.18, 1.44)	1.18 (1.12, 1.45)
Pharmacy	0.95 (0.80, 1.12)	1.16 (0.97, 1.37)	0.99 (0.87, 1.12)	1.37 (1.15, 1.61)	1.25 (1.10, 1.42)	1.29 (1.18, 1.40)
Specialty care	1.03 (0.89, 1.21)	1.19 (0.98, 1.44)	1.05 (0.93, 1.18)	1.28 (1.10, 1.50)	1.08 (0.94, 1.23)	1.13 (1.05, 1.23)
Costs for services*	CR (95% CI)	CR (95% CI)	CR (95% CI)	CR (95% CI)	CR (95% CI)	CR (95% CI)
Primary care costs	1.07 (0.94, 1.22)	1.15 (0.99, 1.34)	1.05 (0.96, 1.15)	1.30 (1.16, 1.45)	1.28 (1.16, 1.41)	1.19 (1.13, 1.26)
Pharmacy costs	0.93 (0.73, 1.18)	1.30 (1.03, 1.63)	1.15 (0.92, 1.43)	1.55 (1.22, 1.97)	1.25 (1.05, 1.48)	1.32 (1.17, 1.49)
Specialty costs	1.16 (0.93, 1.44)	1.39 (1.09, 1.76)	1.05 (0.91, 1.21)	1.30 (1.08, 1.55)	1.21 (1.03, 1.42)	1.12 (1.03, 1.24)
Laboratory costs	1.10 (0.94, 1.28)	1.09 (0.91, 1.31)	0.93 (0.83, 1.04)	1.35 (1.16, 1.57)	1.22 (1.08, 1.38)	1.12 (1.05, 1.21)
Radiology costs	1.05 (0.86, 1.27)	1.29 (1.02, 1.64)	0.96 (0.85, 1.09)	1.42 (1.18, 1.71)	1.07 (0.91, 1.26)	1.13 (1.04, 1.23)
Inpatient costs	0.91 (0.52, 1.60)	1.41 (0.71, 2.79)	0.91 (0.59, 1.40)	1.18 (0.74, 1.88)	1.01 (0.64, 1.60)	0.97 (0.77, 1.23)
Total costs	1.13 (0.99, 1.29)	1.33 (1.11, 1.60)	1.07 (0.96, 1.20)	1.42 (1.24, 1.62)	1.24 (1.11, 1.38)	1.19 (1.12, 1.27)

*2004 dollars.

[†]Adjusted for age, education, and calendar year.

[‡]Ongoing, abuse is ongoing; recent, abuse not ongoing but occurred within past 5 years; remote, abuse occurred before past 5 years.

IPV, intimate partner violence; RR, relative risk; IRR, incident rate ratio; CR, cost ratio; 95% CI, 95% confidence interval.

suggesting that abused women are higher users of mental health services, even years after their abuse stops. Prior studies have shown poor self-reported mental health even years after women's abuse stops (Brokaw et al. 2002; Campbell et al. 2002; Bonomi et al. 2006). Physically abused women used more emergency, hospital outpatient, primary care, pharmacy, and specialty services than non-abused women, with most services used while abuse was ongoing.

Our study findings corroborate those from prior studies showing significant health care costs associated with physical types of abuse (Ulrich et al. 2003; Max et al. 2004; Arias and Corso 2005; Snow Jones et al. 2006), and that the highest costs tend to be incurred by women who experienced some type of physical abuse (Snow Jones et al. 2006). Additionally, our study found that total annual health care costs were the highest for physically abused women if their abuse was ongoing or recent, and tended to be highest for nonphysically abused women if their abuse was not ongoing but occurred in the past 5 years. These cost findings—coupled with the elevated health care utilization patterns for physically abused women—suggest a pattern where physically abused women incur the greatest service use and costs while their abuse is ongoing, perhaps because these women seek care for immediate injuries and associated health problems. In contrast, it is possible that it takes additional time for women with nonphysical abuse only to seek services for such experiences. However, of note, mental health services use among the nonphysical abuse only group was highest when the abuse was ongoing (RR, 2.18 versus 1.98 and 1.57 for women with recent and remote abuse, respectively).

The study had limitations that constrain generalizability. Women in the sample were older, of higher income levels, and more highly educated compared with women in the United States (U.S. Census Bureau 2002). However, women were representative of those in the Seattle metropolitan area (Thompson et al. 2006). The response rate was low; however, a propensity score analysis showed that likelihood of response was similar for women with and without IPV histories (Rivara et al. 2007). We had information about the length of women's abuse exposure—7.5 years for women with nonphysical abuse and 11.0 years for the physical abuse group. Duration of abuse was defined as the time between when the woman reported the abuse first happened to her, and when the abuse last happened to her. This abuse duration may not necessarily constitute a period of ongoing or continual abuse.

These limitations notwithstanding, this paper adds to a growing literature noting associations between abuse exposure and health services utilization and costs. Specifically, the study builds on the prior work of Snow Jones et al. (2006); with a large sample of women, we showed significant associations

between health care utilization and costs by the type and timing of abuse exposure. Our finding that mental health services was highest for women, regardless of the type of abuse they experienced, lends support for routine inquiry about abuse history in women presenting for mental health services, and intervention development (Wathen and MacMillan 2003) and augmentation of mental health services for women with abuse histories.

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SUPPORTING INFORMATION

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Appendix SA1: Author Matrix.

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