The Influence of Type and Severity of Mental Illness on Receipt of Screening Mammography

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BACKGROUND: Women with mental illness may be at risk for failure to receive recommended preventive services such as mammography. Little is known about whether the type or severity of mental illness influences receipt of preventive services.

OBJECTIVE: To measure the influence of type and severity of mental illness on receipt of mammography.

DESIGN: Retrospective study of administrative claims data, 1996 to 2001.

SUBJECTS: Privately insured women age 40 to 64 years, with and without claims for mental illness, and who were eligible for mammography between 1996 and 2001.

MEASUREMENT: Odds ratios (OR) for receipt of screening mammography, any mammography, and follow-up mammography, adjusted for age, rural location, utilization of nonmental health services, and severity and type of the mental disorder. Severity measures were based on utilization of outpatient and inpatient mental health services and presence of comorbid substance use disorder.

RESULTS: Women with any mental disorder were significantly less likely to receive mammography than controls. This was strongly influenced by severity of mental illness (any mammography: moderate severity OR 0.62; confidence interval [CI] 0.59 to 0.66: high severity OR 0.38; CI 0.33 to 0.43). Whereas severity contributed to lower receipt of mammography among women with mood and anxiety disorders, women with psychotic, alcohol, and substance abuse disorders had decreased odds for receipt of mammography regardless of severity.

CONCLUSIONS: Women with mental disorders are at risk for failure to receive mammography, a recommended preventive service. Women with severe mental illness or psychotic and substance abuse disorders should be targeted to ensure delivery of mammography.

KEY WORDS: mammography; breast cancer; mental illness; psychosis; depression; preventive services.
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Because mammography has been shown to reduce death from breast cancer in women, the American Preventive Services Task Force and the American Cancer Society recommend that all women undergo mammography a minimum of every 1 to 2 years beginning at age 40 years and annual screening beginning at age 50 years.[1,2] According to the Centers for Disease Control, in 2002, 75.9% of women 40 years and older reported mammography screening in the past 2 years.[3] Patient (e.g., insurance, personal preference, rural residence) and provider (e.g., time, reimbursement) factors influence receipt of mammography.[4–12]

However, the literature examining mammography among women with mental disorders has been contradictory.[13–16] Carney et al.[13] reported high rates of receipt among women seeking mental health care at a university clinic. Low-income, urban, and culturally diverse women who screened positive for mental disorders had similar rates of mammography as women who had negative mental health screens. Notably, women who screened positive for psychotic disorders actually had higher rates of mammography than women without any mental disorder (67 vs 56%).[16] Over half of a sample of women attending a mental health clinic had received mammography in the prior year, and psychiatric status was not a significant predictor of mammography.[15] Alternatively, Druss et al.[14] evaluated women receiving care at Veterans Health Administration facilities. He reported that the presence of psychiatric conditions, substance abuse, or dual-diagnosis predicted lower rates of mammography compared with women without such conditions. These findings are supported by a study suggesting that a high burden of depressive symptoms was an independent predictor for not receiving subsequent mammography.[17] Finally, in Australia, women with mental disorders reported barriers to receiving breast examination, such as embarrassment, unfamiliar health care providers, and fragmentation of health care.[8]

The limitations of these studies (e.g., small sample sizes, veteran population, and samples drawn from mental health settings) make it difficult to generalize the results to broader populations of women with mental disorders. Importantly, the influence of *severity* of mental conditions indicated by mental disorder comorbidity and service utilization has not been considered. Because lack of insurance is a predictor of screening failure, we analyzed private insurance claims to study the effect of mental disorders for a population-based sample of women with benefits for screening mammography. We hypothesized that both the category and severity of mental illness would be associated with failure to receive mammography.

METHODS

Data Source

The data represent a 100% sample of Wellmark Blue Cross/Blue Shield of Iowa inpatient and outpatient provider and

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administrative claims from January 1, 1996 through December 31, 2001. The data included all Common Procedural Terminology (CPT) codes and International Classification of Disease, Volume 9, *International Classification of Diseases-Ninth Revision* (ICD-9) codes for claims made by all network providers. Visit, procedural, and provider-type information was available on members who filed claims (>80% of all enrollees) during 1996 and 2001.

Subjects

The subjects were women eligible to receive mammography based on age 40 to 64 years anytime during 1996 and 2001 and who filed 1 or more claims for medical services. Race information was not collected on claims forms. Insurance coverage was similar among subjects, with only a small proportion (<10%) enrolled in a managed care plan. All women enrolled in Wellmark's health insurance plans have the same access and coverage for mammography. Women with fewer than 12 months of follow-up were excluded. This study was approved by the University of Iowa's Institutional Review Board.

Eligibility Period

The start date for mammography follow-up began on the first claim date for women aged 41 to 64 or on a woman's 40th birthday if claims were submitted before age 40. The end date for follow-up was the last claim date for women younger than age 64, the day before a woman's 65th birthday, or the day before the diagnosis of in situ or malignant breast cancer (ICD-9 174, 233.0). Follow-up was discontinued on the day before the diagnosis of an in situ or breast cancer diagnosis because of expected increases in mammography frequency. Follow-up was also discontinued at age 65 due to Medicare eligibility.

Classification of Mammography

We included screening and diagnostic mammograms (ICD-9: V76.11, V76.12; CPT: 76090-76092) because prior reports suggest that administrative claims data cannot distinguish between the 2 types of mammography.[18] A dichotomous classification was used to determine whether women did or did not receive mammography at any time during the eligibility period.

For women who received an initial mammogram, follow-up mammography was also analyzed. Women eligible for the follow-up analysis included those who received a subsequent mammogram within 10 to 26 months of the initial mammogram or women who did not receive a subsequent mammogram but who had at least 26 months of follow-up occurring after the initial mammogram. The 10 to 26-month time period was chosen because national guidelines recommend that women 40 years of age or older receive screening mammography every 1 to 2 years. The 10 to 26-month period ensures that women had sufficient time to receive follow-up mammography. Women who received follow-up mammography fewer than 10 months before the initial mammogram were excluded because of potential clinical indications for shorter follow-up (e.g., known breast cancer risk, breast lumps).

Classification of Mental Disorders

Subjects were grouped into the mental disorder category if ICD-9 codes (290.00 to 319.00, 607.84, 608.89, 625.00, 625.80, 780.09, 780.52, 780.54, 780.59, 787.60) occurred before the end of the eligibility period in inpatient claims or outpatient visits. The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV), has organized mental disorders into 17 major diagnostic categories based on ICD-9 codes.[19] We collapsed these into 9 DSM-IV mental disorders (adjustment, anxiety, mood, psychotic, sexual, sleep, somatoform, substance, and other disorder) and assigned subjects into a single diagnostic category .

Categorization was determined by the most frequently occurring mental disorder diagnosis based on the following hierarchy: (1) mental disorder hospitalization, (2) psychiatrist diagnoses, and (3) diagnoses made by any other provider type. In instances of low overall prevalence of a category (e.g., dissociative disorder), or where an ICD-9 code was not listed in the DSM-IV, the condition was assigned to an "other" category. Women were included in only 1 mental disorder category. Women with mental health claims occurring only after the end of the eligibility period were excluded. It is difficult to determine the onset of mental disorders using administrative claims data, especially given the chronicity (e.g., social phobias, schizophrenia) or episodic nature (e.g., major depression) of most mental health conditions. Thus, the claims data do not necessarily reflect when the condition actually occurred. For this reason, we chose to include all women who had a mental health condition before the end of the eligibility period, regardless of whether the coding of the mental health condition did or did not predate mammography, as our intent was to study the association between mental disorders and receipt of mammography. Exclusion of women without mental health diagnoses before receipt of mammography would exclude women with symptoms predating the first appearance of a mental health claim.

The severity of the mental disorder was based on the presence of a hospitalization for the mental disorder during the eligibility period and presence of a dual diagnosis, defined as claims for a substance abuse disorder in addition to a nonsubstance mental disorder. High severity indicates that women had a mental disorder hospitalization and a dual diagnosis; medium severity indicates that women had either a mental disorder hospitalization or a dual diagnosis; and low severity indicates that women had neither a mental disorder hospitalization nor a dual diagnosis and had received only outpatient care for the mental disorder.

Classification of Controls

Women who had no claims for mental disorders at any time during 1996 and 2001, but who met eligibility criteria for mammography, comprised the control group.

Covariates

The analyses were controlled for age (40 to 49, 50 to 64 years), number of months of eligibility for mammography, residence (rural vs urban), number of nonmental health care visits to primary care providers (PCPs) and obstetricians/gynecologists (ob/gyn), and severity of the mental disorder. Subjects were classified as residing in an urban or rural county based on the metropolitan statistical area definition.[20] Primary care providers included General Internists, general practitioners, nurse practitioners, and family practitioners. Only 1 visit per day

was counted. Number of health care visits, contact with primary care providers and ob/gyns, and residence have been shown in prior studies to correlate with receipt of preventive services.[21,22]

Measurements

Demographic and clinical characteristics were compared using χ^2 tests for categorical variables and *t* tests for continuous variables. Logistic regression was used for all analyses to determine whether receipt of mammography differed for women with mental disorders (based on the classification and severity) as compared with women without mental disorders. Unadjusted and adjusted odds ratio (OR) are presented to describe the influence of potential confounders. Alpha was set at 0.05 and all statistical tests were 2-tailed. Analyses were conducted with SAS version 8.2.[23]

RESULTS

Overall, 191,356 women were eligible to receive mammography between January 1, 1996 and December 31, 2001. Thirty-one percent (n=59,673) of all eligible women met mental disorder criteria. The majority (85%) of women with mental disorders only received outpatient treatment for their mental disorder (i.e., low severity). Twelve percent and 2% of women had medium and high-severity mental disorders, respectively.

Women with mental illness, regardless of severity, were slightly younger, had 6 more months of eligibility, and more nonmental health care visits to PCPs and ob/gyns than women without mental illness (Table 1). They were also less likely to reside in rural areas than women without mental illness. Table 2 reflects the characteristics of women with mental disorders, by severity. With increasing severity, increased utilization of both mental health and medical services was noted.

Table 3 displays unadjusted and adjusted analyses. In the unadjusted analyses, overall receipt of mammography was high for these insured women, 76% for women without mental disorder claims and 57 to 81% for women with mental disorder claims depending on the severity of the disorder. Adjusting for age, nonmental health care visits to PCPs and ob/gyns, months of eligibility, and residence had a significant effect on the odds of mammography receipt. In the unadjusted analyses, women with any type of high-severity mental disorder had 0.70 times the odds (95% confidence interval [CI]: 0.63 to 0.79) of having received mammography than women without mental disorders, and the odds were further reduced (OR 0.38; 95% CI: 0.33 to 0.43) after adjusting for the above variables.

Both the category and severity of the mental disorder influenced receipt of mammography (Table 3). The odds of any receipt for women with low-severity mental illness ranged from 0.59 (psychotic disorders) to 1.80 (sexual disorder). For medium severity, the odds ranged from 0.35 (other disorder) to 1.47 (sexual disorder). For women with high-severity mental illness, the odds ranged from 0.17 (somatoform disorder) to 0.60 (sexual disorders). As shown in the cases of common mental disorders such as mood and anxiety disorders, low-severity mental illness had minimal effect on mammography, but increasing severity markedly influenced receiving mammography. For instance, women with low-severity mood disorders were only 7% less likely to have ever had mammography, versus women with higher severity mood disorders who were 66% less likely. In contrast, psychotic and substance abuse disorders had overall low receipt regardless of severity, suggesting that mental illness type also contributes to receipt.

We also considered whether women had received a second mammogram within 10 to 26 months from the first documented claim for mammography (Table 4). Over two-thirds of all women received a second mammogram. Again, severity of mental disorders influenced the receipt of a second mammogram within 10 to 26 months regardless of type of disorder. Women with low-severity mental disorders were nearly as likely to receive a second mammogram as women without mental disorders (OR, 0.95; 95% CI, 0.92 to 0.99), but women classified as high severity were less likely to receive a second mammogram (OR, 0.63; 95% CI. 0.53 to 0.75).

DISCUSSION

Our results suggest that both the category and severity of the mental disorder are associated with initial and subsequent mammography for insured women with mammography benefits. Women with anxiety, mood, psychotic, and substance disorders were at the greatest risk for not receiving mammography. Women with high-severity mental disorders were the least likely to have received mammography. Furthermore, the severity of mental disorders was also associated with not receiving a second mammogram.

The effect of adjusting for important confounders is highlighted by these analyses. The unadjusted rates show that women with low-severity mental illness were actually more likely to have received mammography than women without mental disorders. This finding supports Druss's[14] observation that persons with mental illness have to have *more visits* to primary care providers to receive similar levels of preventive services. In this work, controlling for nonmental health utilization diminishes receipt of mammography. We were unable to control for mental health utilization, given that the controls had no such utilization. However, we noted that although

Table 1. Demographic Characteristics of Women Eligible for Mammography Between 1996 and 2001*

	Mental Disorder *N*=59,673	No Mental Disorder *N*=131,683
Age, mean y (+SD)	48.3 ± 6.9	49.8 ± 7.5
Duration of eligibility, mean number of mo (+SD)	48.2 ± 20.2	42.4 ± 20.3
Mean number of nonmental health care visits (+SD)†	20.0 ± 20.0	11.9 ± 13.0
Rural residence, *n* (%)	33,408 (56)	78,503 (60)

**All differences were statistically significant ($P<.0001$) based on the t test and the χ^2 statistic for rural residence.*
†*Includes nonmental health care visits to PCPs and ob/gyn.*
PCPs, primary care providers; ob/gyn, obstetricians/gynecologists.

Table 2. Characteristics of Women with Mental Disorders According to the Severity of the Mental Illness*

	Any Mental Disorder (*N*=59,673)	Low Severity Mental Disorder (*N*=50,936)	Medium-Severity Mental Disorder (*N*=7,261)	High-Severity Mental Disorder (*N*=1,476)
Age (y), mean ± SD	48.3 (6.9)	48.3 (6.9)	48.5 (7.0)	48.0 (7.0)
Duration of eligibility (mo), mean ± SD	48.2 (20.2)	48.0 (20.3)	49.3 (19.9)	49.4 (19.7)
# of nonmental health care visits†, mean ± SD	20.0 (20.0)	19.2 (19.0)	24.0 (24.1)	27.2 (27.1)
# of outpatient mental disorder visits,‡ mean ± SD	5.6 (16.3)	4.6 (13.1)	10.4 (25.7)	18.6 (36.1)
	n (%)	*n* (%)	*n* (%)	*n* (%)
Rural residence	33,408 (56.0)	28,544 (56.0)	4,074 (56.1)	1,029 (53.5)
Predominant mental disorder				
Adjustment disorder	8,656 (14.5)	8,131 (16.0)	481 (6.6)	44 (3.0)
Anxiety disorder	9,340 (15.7)	8,397 (16.5)	863 (11.9)	80 (5.4)
Mood disorder	22,512 (37.7)	18,958 (37.2)	3,014 (41.5)	540 (36.6)
Other disorder	2,113 (3.5)	1,690 (3.3)	369 (5.1)	54 (3.7)
Psychotic disorder	525 (0.9)	300 (0.6)	182 (2.5)	43 (2.9)
Sexual disorder	3,175 (5.3)	2,818 (5.5)	331 (4.6)	26 (1.8)
Sleep disorder	3,454 (5.8)	3,298 (6.5)	152 (2.1)	4 (0.3)
Somatoform disorder	3,121 (5.3)	2,951 (5.8)	158 (2.2)	12 (0.8)
Substance disorder	6,777 (11.4)	4,393 (8.6)	1,711 (23.6)	673 (45.6)
Number of mental disorders				
1	35,896 (60.2)	34,261 (67.3)	1,635 (22.5)	0 (0.0)
2	14,774 (24.8)	11,443 (22.5)	2,890 (39.8)	44 (29.9)
3	5,989 (10.0)	3,888 (7.6)	1,638 (22.6)	463 (31.4)
4+	3,014 (5.1)	1,344 (2.6)	1,098 (15.1)	572 (38.8)
Hospitalization for mental disorder				
Primary hospitalization	2,856 (4.8)	0 (0.0)	2,027 (27.9)	829 (56.2)
Any hospitalization	5,236 (8.8)	0 (0.0)	3,760 (51.8)	1,476 (100.0)
Dual diagnosis	4,977 (8.3)	0 (0.0)	3,501 (48.2)	1,476 (100.0)
Single visit for mental disorder claim	20,105 (33.7)	19,399 (38.1)	698 (9.6)	8 (0.5)

**High severity indicates that the subject had a mental disorder hospitalization and a dual diagnosis; medium severity indicates that the subject had either a mental disorder hospitalization or a dual diagnosis; low severity indicates that the subject had neither a mental disorder hospitalization nor a dual diagnosis and only received outpatient treatment for the mental disorder.*

†Includes nonmental health care visits to PCPs and ob/gyn.

‡Includes mental health care visits to mental health providers and mental health care visits to PCPs. Visits to PCPs for both a mental disorder and a nonmental disorder are included in nonmental health care utilization.

PCPs, primary care providers; ob/gyn, obstetricians/gynecologists.

mental health visits linearly increased with severity, severity remained an independent predictor of low receipt of mammography. It is unlikely, therefore, that mental health contact played an important role in receipt of mammography.

The severity measure chosen for this study was based on the need to blend the best specification of mental disorder category, with overall intensity of care. This was done by selecting the diagnostic category (e.g., mood disorders) based on clinical prominence, and considering that inpatient visits and comorbid substance abuse likely suggested higher severity with regard to utilization and treatment outcomes. Substance abuse has been shown to frequently be secondary to other primary mental disorders.[24] Other considerations of severity were not selected for a variety of reasons. We did not look at overall number of outpatient visits, given that few visits may represent either appropriate therapy for less severe cases or inappropriate therapy if the need was actually greater. A greater number of outpatient visits may actually suggest that persons were receiving psychotherapy, in addition to medication checks, which may only reflect treatment preference. Moreover, outpatient visits to specialists (e.g., cardiologists) would not be expected to relate to receipt of mammography. Thus, only outpatient visits to primary care providers and ob/gyns were considered as these visits are the most likely to influence receipt of mammography.

This study cannot answer why mental illness is associated with receipt of mammography for women with similar insurance coverage for mammography. We speculate that several factors may be salient. First, patients with mental disorders, especially those with more severe mental illness, may have difficulty navigating the medical system.[25–27] Reasons may include difficulty in communicating with health care providers, poorly integrated medical and psychiatric care, and patient uncertainty regarding the availability of care.[28] The negative stigma of mental disorders may affect providers' care for persons with these conditions.[29] Competing demands posed by patients with mental disorders may preclude provider opportunities to address preventive care. Finally, we do not know from this study whether women with mental disorders were offered or scheduled mammography and did not report for testing. This issue may be related to the literature on compliance,[17,30–34] especially in women with depression, anxiety, and psychotic disorders and merits additional study. In addition, fear or anxiety about the results of mammography may prevent some women from undergoing screening.[35,36] Barriers such as embarrassment, or fear of being treated rudely may also be prohibitive.[8,13]

Other limitations should be noted. Our sample included insured women from Iowa, a racially homogeneous state limiting generalization of the results to uninsured and ethnically

Table 3. Receipt of Mammography at Any Time During the Eligibility Period According to Covariates and Category and Severity* of Mental Illness, 1996 to 2001

	Mammography Receipt, *n* (%)	OR (95% CI)	
		Unadjusted Analyses	Adjusted Analyses†
Age (y)			
40 to 49	79,593 (75.3)	0.73 (0.71 to 0.74)	0.75 (0.74 to 0.77)
50 to 64	69,171 (80.8)	1.00 (referent)	1.00 (referent)
Residence			
Urban	63,307 (79.7)	1.00 (referent)	1.00 (referent)
Rural	85,457 (76.4)	0.82 (0.81 to 0.84)	0.77 (0.76 to 0.79)
Duration of eligibility (mo)‡	N/A	1.03 (1.03 to 1.03)	1.02 (1.02 to 1.03)
Nonmental health care visits‡	N/A	1.07 (1.06 to 1.07)	1.04 (1.04 to 1.04)
No mental disorder§	100,861 (76.1)	1.00 (referent)	1.00 (referent)
Any mental disorder			
Low severity	41,295 (81.1)	1.31 (1.28 to 1.34)	0.98 (0.95 to 1.01)
Medium severity	5,579 (76.8)	1.01 (0.96 to 1.07)	0.62 (0.59 to 0.66)
High severity	1,029 (69.7)	0.70 (0.63 to 0.79)	0.38 (0.33 to 0.43)
Adjustment disorder			
Low severity	6,672 (82.1)	1.40 (1.32 to 1.48)	1.08 (1.02 to 1.15)
Medium severity	388 (80.7)	1.27 (1.02 to 1.60)	0.77 (0.60 to 0.98)
High severity	25 (56.8)	0.40 (0.22 to 0.73)	0.24 (0.12 to 0.48)
Anxiety disorder			
Low severity	6,775 (80.7)	1.28 (1.21 to 1.35)	0.87 (0.82 to 0.92)
Medium severity	689 (79.8)	1.21 (1.02 to 1.43)	0.62 (0.52 to 0.74)
High severity	58 (72.5)	0.81 (0.49 to 1.32)	0.26 (0.15 to 0.46)
Mood disorder			
Low severity	15,238 (80.4)	1.25 (1.20 to 1.30)	0.93 (0.89 to 0.97)
Medium severity	2,357 (78.2)	1.10 (1.00 to 1.20)	0.63 (0.57 to 0.69)
High severity	369 (68.3)	0.66 (0.55 to 0.79)	0.34 (0.28 to 0.42)
Other disorder			
Low severity	1,390 (82.2)	1.42 (1.25 to 1.60)	0.90 (0.78 to 1.02)
Medium severity	263 (71.3)	0.76 (0.60 to 0.95)	0.35 (0.27 to 0.45)
High severity	35 (64.8)	0.56 (0.32 to 0.98)	0.26 (0.14 to 0.50)
Psychotic disorder			
Low severity	224 (74.7)	0.90 (0.69 to 1.17)	0.59 (0.45 to 0.78)
Medium severity	131 (72.0)	0.78 (0.57 to 1.08)	0.47 (0.33 to 0.67)
High severity	33 (76.7)	1.01 (0.50 to 2.05)	0.56 (0.26 to 1.21)
Sexual disorder			
Low severity	2,506 (88.9)	2.45 (2.18 to 2.76)	1.80 (1.59 to 2.04)
Medium severity	286 (86.4)	1.94 (1.42 to 2.66)	1.47 (1.06 to 2.04)
High severity	20 (76.9)	1.02 (0.41 to 2.54)	0.60 (0.22 to 1.63)
Sleep disorder			
Low severity	2,812 (85.3)	1.77 (1.60 to 1.95)	1.10 (0.99 to 1.21)
Medium severity	120 (78.9)	1.15 (0.78 to 1.69)	0.54 (0.35 to 0.82)
High severity	4 (100.0)	N/A	N/A
Somatoform disorder			
Low severity	2,440 (82.7)	1.46 (1.32 to 1.61)	0.96 (0.87 to 1.07)
Medium severity	125 (79.1)	1.16 (0.79 to 1.70)	0.62 (0.41 to 0.93)
High severity	6 (50.0)	0.31 (0.10 to 0.95)	0.17 (0.04 to 0.62)
Substance disorder			
Low severity	3,238 (73.7)	0.86 (0.80 to 0.92)	0.66 (0.62 to 0.71)
Medium severity	1,220 (71.3)	0.76 (0.68 to 0.84)	0.48 (0.43 to 0.54)
High severity	471 (71.2)	0.75 (0.64 to 0.89)	0.36 (0.30 to 0.44)

**High severity indicates that the subject had a mental disorder hospitalization and a dual diagnosis; medium severity indicates that the subject had either a mental disorder hospitalization or a dual diagnosis; low severity indicates that the subject had neither a mental disorder hospitalization nor a dual diagnosis and only received outpatient treatment for the mental disorder.*

†*Adjusted for age (40 to 49 vs 50 to 64 years), residence (rural vs urban), nonmental health care utilization to primary care providers and ob/gyns, and number of months of eligibility.*

‡*For a one-unit increase.*

§*Referent group for all analyses assessing category and severity of mental disorder.*

PCPs, primary care providers; ob/gyn, obstetricians/gynecologists.

diverse populations. Second, women who did not visit health care providers during the study period could not be analyzed as we relied on claims data. It is not known whether these women were more or less likely to have mental disorders compared with women in the study. Physicians' failure to bill for services or subjects with multiple insurers may have resulted in underreporting. Mental disorders may be undercoded in claims data, either because physicians do not recognize the mental disorder, or because patients are apprehensive about a mental disorder appearing in their medical records.[37] Third, differences in length of observation and women with more than 1 mental disorder being classified into a single category based on clinical prominence may have affected the results. Finally, we considered women with mental disorder claims and looked

Table 4. Receipt of Mammography within 10 to 26 mo According to Category and Severity of Mental Illness* for Women Who Received a Mammogram During the Eligibility Period, 1996 to 2001

	Mammography Receipt, *n* (%)	OR (95% CI)	
		Unadjusted Analyses	Adjusted Analyses†
Age (y)			
40 to 49	34,684 (67.6)	0.42 (0.41 to 0.44)	0.45 (0.43 to 0.46)
50 to 64	41,962 (83.1)	1.00 (referent)	1.00 (referent)
Residence			
Urban	33,474 (76.5)	1.00 (referent)	1.00 (referent)
Rural	43,172 (74.4)	0.89 (0.87 to 0.92)	0.83 (0.81 to 0.86)
Duration of eligibility (mo)‡	N/A	0.97 (0.97 to 0.98)	0.97 (0.97 to 0.97)
Nonmental health care visits‡	N/A	1.00 (1.00 to 1.01)	1.02 (1.02 to 1.02)
No mental disorder§	51,635 (76.2)	1.00 (referent)	1.00 (referent)
Any mental disorder			
Low severity	21,851 (74.1)	0.89 (0.87 to 0.92)	0.95 (0.92 to 0.99)
Medium severity	2,691 (69.5)	0.71 (0.66 to 0.76)	0.71 (0.66 to 0.76)
High severity	469 (67.9)	0.66 (0.56 to 0.77)	0.63 (0.53 to 0.75)
Adjustment disorder			
Low severity	3,461 (72.2)	0.81 (0.76 to 0.87)	0.96 (0.90 to 1.03)
Medium severity	189 (71.3)	0.78 (0.59 to 1.01)	0.78 (0.59 to 1.04)
High severity	16 (88.9)	2.50 (0.57 to 10.86)	2.26 (0.51 to 10.14)
Anxiety disorder			
Low severity	3,744 (76.2)	1.00 (0.93 to 1.07)	0.98 (0.91 to 1.05)
Medium severity	362 (71.8)	0.80 (0.65 to 0.97)	0.70 (0.57 to 0.85)
High severity	25 (69.4)	0.71 (0.35 to 1.44)	0.35 (0.17 to 0.74)
Mood disorder			
Low severity	7,774 (73.2)	0.85 (0.81 to 0.89)	0.90 (0.86 to 0.95)
Medium severity	1,125 (68.5)	0.68 (0.61 to 0.75)	0.67 (0.60 to 0.75)
High severity	156 (64.2)	0.56 (0.43 to 0.73)	0.56 (0.42 to 0.73)
Other disorder			
Low severity	796 (76.8)	1.03 (0.89 to 1.20)	0.95 (0.82 to 1.11)
Medium severity	123 (66.1)	0.61 (0.45 to 0.83)	0.52 (0.37 to 0.71)
High severity	15 (65.2)	0.58 (0.25 to 1.38)	0.36 (0.14 to 0.91)
Psychotic disorder			
Low severity	123 (78.8)	1.16 (0.79 to 1.71)	1.01 (0.68 to 1.51)
Medium severity	69 (75.0)	0.94 (0.58 to 1.50)	0.75 (0.46 to 1.23)
High severity	12 (60.0)	0.47 (0.19 to 1.14)	0.31 (0.12 to 0.83)
Sexual disorder			
Low severity	1,428 (76.6)	1.02 (0.92 to 1.14)	1.11 (0.99 to 1.25)
Medium severity	132 (67.0)	0.63 (0.47 to 0.85)	0.73 (0.54 to 1.00)
High severity	12 (80.0)	1.25 (0.35 to 4.42)	1.28 (0.35 to 4.67)
Sleep disorder			
Low severity	1,619 (77.0)	1.04 (0.94 to 1.16)	0.97 (0.87 to 1.08)
Medium severity	61 (72.6)	0.83 (0.51 to 1.34)	0.72 (0.43 to 1.19)
High severity	3 (100.0)	N/A	N/A
Somatoform disorder			
Low severity	1,310 (74.6)	0.92 (0.82 to 1.02)	0.96 (0.86 to 1.08)
Medium severity	55 (68.8)	0.69 (0.43 to 1.10)	0.69 (0.42 to 1.13)
High severity	1 (50.0)	0.31 (0.02 to 5.01)	0.04 (0.00 to 1.12)
Substance disorder			
Low severity	1,596 (71.6)	0.79 (0.72 to 0.86)	0.80 (0.73 to 0.89)
Medium severity	575 (69.9)	0.72 (0.62 to 0.84)	0.70 (0.60 to 0.82)
High severity	229 (69.2)	0.70 (0.55 to 0.89)	0.65 (0.51 to 0.83)

**High severity indicates that the subject had a mental disorder hospitalization and a dual diagnosis; medium severity indicates that the subject had either a mental disorder hospitalization or a dual diagnosis; low severity indicates that the subject had neither a mental disorder hospitalization nor a dual diagnosis and only received outpatient treatment for the mental disorder; analyses only includes women who ever received mammography and received a mammogram within 10 to 26 months of initial mammogram or who did not receive a mammogram within 10 to 26 months of initial mammogram but who did have at least 26 months of follow-up to ensure sufficient time to observe a mammogram had it occurred.*

†*Adjusted for age (40 to 49 vs 50 to 64 years), residence (rural vs urban), nonmental health care utilization to primary care providers and ob/gyns, and number of months of eligibility.*

‡*For a one-unit increase.*

§*Reference group for all analyses assessing category and severity of mental disorder.*

PCPs, primary care providers; ob/gyn, obstetricians/gynecologists.

both retrospectively and prospectively for receipt of mammography; thus, we could not determine a cause (mental disorder) and effect (receipt of mammography) relationship. However, the assumption of cause and effect does not take into account the chronic and episodic nature of many mental disorders and that women may have been having disorders before claims. Using claims data can only establish associations.

The strengths of this study are important to note. This large population-based study considered both the type and severity of the mental disorder, prior utilization, and rural dwelling among women with the same insurance benefits for

mammography in a fee-for-service environment (less than 10% were in managed care plans). Contrary to studies evaluating the mammography experiences of women in single clinic systems, this study supports results from prior studies indicating that delivery of mammography is negatively affected by the presence of a mental disorder. Although a large percentage of women in our sample had claims for mental disorders during the years under study, this is consistent with the National Comorbidity Survey (47% of women had any lifetime mental disorder), and work performed by the World Health Organization.[38,39]

If type and severity of mental disorders affect the delivery of medical services, what are the next steps that should be taken? Models of care include delivery in the inpatient setting, integrated outpatient services, or the assumption of principal medical care by mental health specialists.[40] Inpatient delivery is supported by recent literature evaluating medical service utilization in substance users,[41,42] and patients enrolled in integrated mental health/primary care clinic were more likely to receive 15 of 17 preventive services and report improvement in self-reported physical quality of life.[43] Integrated women's health clinical and mental health services are associated with favorable utilization of Pap smears and breast examinations.[8] Principal care models have been developed in community mental health centers and in the Veterans Administration to address the medical needs of individuals with mental disorders. Although mental health providers may take the lead in ordering preventive services or in delivering specialty care while addressing mental health needs (e.g., HIV/AIDS care), those services requiring special equipment (e.g., mammography or colonoscopy) may not be readily available in these settings.[44–46]

In summary, women with anxiety, mood, psychotic, and substance disorders represent an at-risk group for failure to receive mammography. Attention should be paid to these women, especially those with more severe mental illness or those without a source of primary medical care. This work highlights the need for integrated and targeted systems of medical and psychiatric care. In addition, future studies are needed to assess the role of organizational, provider, or patient characteristics in lower rates of services received by women with mental disorders.

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