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Increased Risk for Metabolic Syndrome in Persons Seeking Care for Mental Disorders

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Background. *An increased risk for metabolic syndrome has been described for persons with psychotic and mood disorders. Our objectives were to determine whether the odds for metabolic syndrome (MetSyn) were increased among insured adults with and without mental illness, and to determine whether this risk extends beyond psychotic and affective disorders.*
Method. *This was a retrospective analysis of a 100% sample of Blue Cross/Blue Shield of Iowa claims data. Three definitions of MetSyn were examined: 1) presence of any 3 or more components of MetSyn (obesity, hypertriglyceridemia, hypercholesterolemia, hypertension, and glucose intolerance/diabetes mellitus), 2) criteria #1 and/or claim for glucose intolerance/diabetes mellitus, and 3) criteria #1, criteria #2, and/or claim for obesity. ICD-9 codes were used to define obesity, hypertriglyceridemia, hypercholesterolemia, hypertension, and glucose intolerance/diabetes mellitus. Multivariate logistic regression was used to investigate the association between mental illness and MetSyn.*
Results. *Prevalence of MetSyn for subjects with any mental illness as compared to those without was 4.9% vs. 2.0% (criteria #1), 8.1% vs. 4.2% (criteria #2), and 13.2% vs. 6.2% (criteria #3). MetSyn was more common (OR = 1.3–1.5) for subjects with any mental illness as compared to those without, regardless of which definition of MetSyn was used. Subjects with sexual disorders (OR = 1.7–1.8), sleep disorders (OR = 1.2–1.7), and mood disorders (OR = 1.3–1.6) had significantly higher odds of MetSyn compared to those without claims for mental disorders, regardless of which definition of MetSyn was used.*
Conclusions. *These results suggest that MetSyn is not only problematic among persons with psychosis and affective disorders, but that it also affects patients with other forms of mental illness. Clinicians should have a heightened awareness of metabolic risk factors, particularly when mental illness is present.*

Keywords Metabolic syndrome, Mental illness, Administrative claims

INTRODUCTION

Approximately 47 million US adults (22%) meet criteria for metabolic syndrome (MetSyn), which is characterized by central obesity, hypertension, dyslipidemia, insulin resistance, and low high-density lipoprotein (HDL) cholesterol (1–3). Few studies to date have examined the relationship between mental illness and MetSyn (4–7). Of these studies, most of which are cross-sectional and limited by small sample sizes (n = 35-6,189), have examined the association between MetSyn and schizophrenia (4,7), major depression (5,6), and anxiety (6). Results suggest that 37–63% of patients with schizophrenia and approximately 12% of patients with depression meet MetSyn clinical criteria. Anxiety disorder was not associated with a greater risk of MetSyn. However, these studies may not be representative of many persons with mental illness due to stringent inclusion/exclusion criteria (e.g., exclusion of persons with known cardiovascular disease or diabetes).

Persons with mental illness may have a higher risk of MetSyn for disease and treatment specific reasons, such as

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psychotropic medication-induced weight gain, increased substance abuse, poorer dietary habits, sedentary lifestyles, and increased central obesity, all of which are factors that contribute to or are associated with MetSyn (8–15). The amount of weight gain varies by specific antipsychotic agent, but is typically greater for atypical agents than for conventional neuroleptics. Chlorprozamine, a conventional neuroleptic, has been associated with weight gain of 16% over optimal ideal body weight and other studies have suggested that patients may gain an average of 4 kg during a 3-month period of therapy (16). Clozapine, an atypical antipsychotic agent, has been associated with an average of 8 kg of weight gain and is most rapid during the first 12-weeks of therapy, although weight gain continues to occur at a slower rate for many years (16,17). Persons with mental illness are two times more likely to smoke than persons without mental illness and are 2–7 times more likely to abuse alcohol (8,11). At least one study has reported that excessive alcohol consumption is related to an increased risk of MetSyn (18). Furthermore, poorer dietary choices among persons with mental illness may increase the risk of MetSyn. Persons with psychosis are reported to consume less fruits and vegetables, have diets higher in saturated fat, and have 3.4 times as much visceral fat as compared to subjects without mental illness (12,14,15). A review article outlined multiple etiological factors, including pathophysiologic mechanisms (e.g., HPA axis) and anti-psychotic medication that increase the risk of MetSyn among patients with psychosis (19). Furthermore, it has also been suggested that MetSyn is not directly related to the type of antipsychotic used (i.e., atypical vs. typical), but that psychosis itself is an indirect risk factor for the development of MetSyn, likely due to many of the lifestyle factors already mentioned (15). Finally, although MetSyn may not be directly related to the type of antipsychotic used, it is reported that different antipsychotics are associated with different rates of metabolic abnormalities, which in addition to the psychosis, may contribute, independently, to the increased risk of MetSyn via other factors (20).

These same factors may confer an increased risk for MetSyn in other forms of mental illness. For instance, major depression is also associated with obesity, complicated by antidepressant induced weight gain, and associated with poorer lifestyle choices during depressive episodes (16,21). It is plausible that persons with other forms of mental illness also may be more susceptible to developing MetSyn given similar lifestyle factors and the untoward effects of needed psychiatric treatment.

The objective of this study is to determine if a population-based sample of persons with mental illness are at higher risk for MetSyn and if the type of disorder (e.g., mood disorders) influences the degree of risk as compared to persons without mental illness. We hypothesize that the presence of *any* mental illness increases the risk of MetSyn, but that particular disorders, such as psychotic disorders, are associated with a particularly higher risk because of disease and treatment specific reasons, as previously mentioned.

METHODS

This study was approved by the University of Iowa's Institutional Review Board. The data source was a 100% sample of Wellmark Blue Cross/Blue Shield of Iowa administrative claims data from January 1, 1996 to December 31, 2001. The data is comprised of inpatient and outpatient claims submitted by all healthcare providers and includes ICD-9 diagnostic codes. The study population included all adults ages 18–64 who filed at least one claim for medical service during 1996–2001 and who were residents of Iowa during the study period. The basic medical insurance coverage was similar among subjects, with only a small proportion (<10%) enrolled in a managed care plan. Medical records and information on race were unavailable.

Key components of MetSyn clinical criteria include central obesity (waist circumference >102 cm in men or >88 cm in women), hypertriglyceridemia (≥150 mg/dL), low HDL cholesterol (<40 mg/dL in men or <50 mg/dL in women), hypertension (≥130/85 mm Hg), and insulin resistance (blood glucose ≥ 110 mg/dL) as defined by The Third Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (ATP III) (3). ICD-9 codes were used as proxies for the clinical criteria of MetSyn as defined in the ATP III report given that administrative claims data do not include clinical criteria. The following ICD-9 codes were ascertained: obesity (ICD-9 278.0x), hypertriglyceridemia (ICD-9 272.1x), hypercholesterolemia (ICD-9 272.0x, 272.2x-272.9x), hypertension (ICD-9 401.xx-405.xx), and/or diabetes mellitus/glucose intolerance (ICD-9 250.xx, 790.2x). Because coding for the components of metabolic syndrome may be under-reported in claims data, we considered three different classifications described in the literature for MetSyn in order to increase the sensitivity of diagnosis of MetSyn when of using insurance claims:

1. ATP III criteria: Claims for three or more components of MetSyn (obesity, hypertriglyceridemia, hypercholesterolemia, hypertension, diabetes mellitus/glucose intolerance) were detected.
2. Criteria #2 includes subjects who met ATP III criteria (criteria #1) and/or who had a claim for glucose intolerance/diabetes mellitus. Subjects who met this criterion based on a claim for glucose intolerance/diabetes mellitus did not necessarily have claims for the remaining four components of MetSyn. This method of classification was examined based on a report that 98% of patients with type 2 diabetes mellitus have at least one additional component of MetSyn and that 78% have at least two additional components (22).
3. Criteria #3 includes subjects who met ATP III criteria (criteria #1), subjects who met criteria #2, and/or subjects who had a claim for obesity. Subjects who met this criterion based on a claim for obesity did not necessarily have claims for the remaining four components of MetSyn. This method

of classification was also examined based on evidence that suggests that the majority of obese patients meet MetSyn criteria (23).

In addition, if the ICD-9 code for MetSyn (ICD-9 277.7) was present, a subject was considered to meet each of the three criteria. However, few subjects had indication of this ICD-9 code following the introduction of the code on October 1, 2001 (24). Criteria 1 should be considered the "purest" definition for detection of MetSyn when using claims data given that it more closely represents ATP III criteria and criteria 3 should be considered the broadest definition.

The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) (25) has organized mental disorders into 17 major diagnostic categories based on ICD-9 codes. Subjects were classified as having a mental illness if ICD-9 codes (290–319, 607.84, 608.89, 625.00, 625.80, 780.09, 780.52, 780.54, 780.59, 787.60) for mental disorders were identified in the claims data at any time during 1996–2001. In order to ensure specificity of the mental disorder, subjects included in the mental disorder group were required to have a hospitalization for the mental disorder, and/or one or more psychiatrist diagnosed mental disorders in the inpatient and/or outpatient setting, and/or two or more outpatient visits with any type of provider (e.g., primary care, psychiatry, specialty care, etc.) for the mental disorder (26). Subjects with only a single outpatient visit for a mental disorder were excluded from the analyses in order to ensure high specificity of the mental disorder diagnosis. These patients likely include those who did not receive further follow-up or who were mistakenly diagnosed as having a mental illness given the lack of further supporting claims.

We examined 10 specific mental disorders (adjustment, anxiety, cognitive, mood, psychotic, sexual, sleep, somatoform, substance, and "other" disorder) and assigned subjects into a single diagnostic category based on the *most clinically prominent* disorder in the claims data. Categorization was determined by a combination of the most frequently occurring mental disorder diagnosis and the severity of the mental disorder, based on the hierarchy of mental disorder hospitalization, psychiatrist diagnoses, and by 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. Each subject was included in only one mental disorder category due to the hierarchy of categorization. Results of the study did not differ when subjects with a single mental disorder claim were included in the analyses (data not shown).

Multivariate logistic regression was used to calculate odds ratios (OR) to determine if MetSyn, defined by each of the three criteria described previously, was more common for subjects with any mental illness and the 10 specific mental disorders of interest based on the severity of the mental illness as compared to subjects without mental illness. Analyses were adjusted for age, gender, and number of non-mental healthcare visits during the study period. Alpha was set at 0.05 (two-sided) for all comparisons. Statistical analyses were performed with SAS version 8.2 (SAS Institute, Inc., Cary, NC).

RESULTS

A total of 866,982 subjects met inclusion criteria, and 15.5% (n = 133,977) had a mental illness. Table 1 shows the demographic and clinical information for subjects with mental illness as compared to those without mental illness. Subjects with mental illness were more likely ($P < 0.0001$) to be women, to be older, and have approximately nine more non-mental healthcare visits during the entire study period as compared to subjects without mental illness. In general, subjects with mental illness were seen 2.5 times more often by healthcare providers than patients without mental illness. They were also more likely ($P < 0.0001$) to have claims for each of the five components of MetSyn: hypertension, obesity, hypercholesterolemia, hypertriglyceridemia, and diabetes mellitus/glucose intolerance. Subjects with mental illness had approximately 15.9 more months of follow-up (41.6 vs. 25.7) than subjects without mental illness..

Table 2 shows characteristics of patients with and without mental illness who met criteria for MetSyn. Regardless of the criteria used to define MetSyn, subjects with mental illness were more likely ($P < 0.05$) to be female, younger, have more non-mental healthcare utilization, and longer duration of follow-up. In general, prevalence of hypertension, obesity, hypercholesterolemia, hypertriglyceridemia, and glucose intolerance/diabetes mellitus were more common in subjects with mental illness than those without, with few exceptions.

Table 1 Demographic and Clinical Information for Subjects with and without Mental Illness, 1996–2001

	Mental Illness		No Mental Illness	
Number of subjects, n (%)	133,977	(15.5)	733,005	(84.5)
Female, n (%)	81,306	(60.7)	388,638	(53.0)
Age (years), mean (SD)	39.7	(11.6)	38.2	(12.9)
Health care utilization[a], mean (SD)	15.1	(18.4)	6.1	(9.5)
Follow-up[b] (months), mean (SD)				
Hypertension, n (%)	29,580	(22.1)	90,586	(12.4)
Obesity, n (%)	10,397	(7.8)	20,408	(2.3)
Hypercholesterolemia, n (%)	29,522	(22.0)	93,954	(12.8)
Hypertriglyceridemia, n (%)	1,943	(1.5)	4,826	(0.7)
Glucose intolerance/ Diabetes mellitus, n (%)	8,696	(6.5)	26,850	(3.7)

P value < 0.0001 for all comparisons.

[a]Number of non-mental healthcare visits during the entire study period.

[b]Calculated from first medical visit to last medical visit during study period, 1996–2001.

Table 2 Demographic and Clinical Information for Subjects with and without Mental Illness Who Met Criteria for Metabolic Syndrome, 1996–2001

	Criteria 1[a]				Criteria 2[b]				Criteria 3[c]			
	Mental Illness		No Mental Illness		Mental Illness		No Mental Illness		Mental Illness		No Mental Illness	
Number of subjects, n (%)	6,531	(30.7)	14,727	(69.3)	10,899	(26.0)	31,042	(74.0)	17,681	(28.2)	45,110	(71.8)
Female, n (%)	3,490	(53.4)	7,040	(47.8)	5,794	(53.2)	14,771	(47.6)	11,256	(63.7)	24,840	(55.1)
Age (years), mean (SD)	49.5	(8.4)	52.0	(8.4)	48.0	(9.8)	49.6	(10.6)	44.7	(10.8)	46.7	(11.6)
Health care utilization[d], mean (SD)	35.8	(28.1)	21.6	(18.2)	31.6	(27.0)	16.9	(16.9)	27.6	(24.9)	15.3	(15.7)
Follow-up[e] (months), mean (SD)	57.0	(17.5)	48.1	(21.8)	52.3	(20.6)	40.0	(24.1)	51.0	(20.7)	39.8	(23.8)
Hypertension, n (%)	6,148	(94.1)	13,923	(94.5)	7,604	(69.8)	18,577	(59.8)	9,316	(52.7)	21,943	(48.6)
Obesity, n (%)	3,345	(51.2)	5,811	(39.5)	3,615	(33.2)	6,340	(20.4)	10,397	(58.8)	20,408	(45.2)
Hypercholesterolemia, n (%)	6,068	(92.9)	13,826	(93.9)	7,057	(64.8)	17,348	(55.9)	8,271	(46.8)	19,582	(43.4)
Hypertriglyceridemia, n (%)	1,184	(18.1)	2,489	(16.9)	1,197	(11.0)	2,562	(8.3)	1,218	(6.9)	2,609	(5.8)
Glucose intolerance/Diabetes mellitus, n (%)	4,328	(66.3)	10,535	(71.5)	8,696	(79.8)	26,850	(86.5)	8,696	(49.2)	26,850	(59.5)
# of criteria, mean (SD)	3.2	(0.5)	3.2	(0.4)	2.6	(0.9)	2.3	(0.9)	2.1	(1.0)	2.0	(0.9)

[a]At least 3 of the 5 ATP III criteria (obesity, hypertriglyceridemia, hypercholesterolemia, hypertension, diabetes mellitus/glucose intolerance).
[b]Criteria 1 and/or claim for diabetes mellitus/glucose intolerance.
[c]Criteria 1, Criteria 2, and/or claim for obesity.
[d]Number of non-mental healthcare visits during the entire study period.
[e]Calculated from first medical visit to last medical visit during study period, 1996–2001.
P value < 0.05 for all comparisons.

Table 3 Prevalence and Adjusted Odds of Metabolic Syndrome for Subjects with Any Mental Illness and Specific Mental Disorders as Compared to Subjects without Mental Illness[a], 1996–2001

	Prevalence of Metabolic Syndrome						Multivariate Analyses					
	Criteria 1[b]		Criteria 2[c]		Criteria 3[d]		Criteria 1[b]		Criteria 2[c]		Criteria 3[d]	
Type of Mental Disorder	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
No mental illness (n = 733,005)	14,727	(2.0)	31,042	(4.2)	45,110	(6.2)	1.00		1.00		1.00	
Any mental illness (n = 133,977)	6,531	(4.9)	10,899	(8.1)	17,681	(13.2)	1.54	(1.49–1.59)	1.28	(1.25–1.31)	1.48	(1.45–1.51)
Adjustment disorder (n = 24,902)	731	(2.9)	1,311	(5.3)	2,371	(9.5)	1.27	(1.17–1.38)	1.04	(0.98–1.11)	1.23	(1.17–1.28)
Anxiety disorder (n = 16,976)	790	(4.7)	1,228	(7.2)	2,007	(11.8)	1.15	(1.06–1.25)	0.89	(0.83–0.95)	1.03	(0.98–1.09)
Cognitive disorder (n = 1,543)	172	(11.2)	313	(20.3)	399	(25.9)	1.43	(1.18–1.72)	1.75	(1.52–2.03)	1.88	(1.65–2.15)
Mood disorder (n = 52,599)	2,627	(5.0)	4,414	(8.4)	7,712	(14.7)	1.60	(1.53–1.68)	1.34	(1.29–1.39)	1.64	(1.59–1.68)
Psychotic disorder (n = 1,428)	89	(6.2)	191	(13.4)	250	(17.5)	0.91	(0.71–1.18)	1.35	(1.13–1.61)	1.37	(1.17–1.61)
Sexual disorder (n = 7,528)	731	(9.7)	1,189	(15.8)	1,465	(19.5)	1.81	(1.66–1.98)	1.66	(1.55–1.79)	1.68	(1.58–1.79)
Somatoform disorder (n = 3,999)	175	(4.4)	265	(6.6)	474	(11.9)	0.90	(0.75–1.08)	0.69	(0.60–0.80)	0.88	(0.79–0.98)
Sleep disorder (n = 4,428)	403	(9.1)	547	(12.4)	863	(19.5)	1.72	(1.52–1.93)	1.18	(1.06–1.31)	1.49	(1.37–1.62)
Substance disorder (n = 15,987)	647	(4.1)	1,154	(7.2)	1,677	(10.5)	1.16	(1.06–1.27)	1.04	(0.97–1.11)	1.12	(1.06–1.18)
Other disorder (n = 4,487)	166	(3.6)	287	(6.3)	463	(10.1)	1.33	(1.12–1.59)	1.14	(1.00–1.31)	1.26	(1.12–1.40)

[a]Adjusted for age, gender, and number of non-mental healthcare visits during the study period.
[b]At least 3 of the 5 ATP III criteria (obesity, hypertriglyceridemia, hypercholesterolemia, hypertension, diabetes mellitus/glucose intolerance).
[c]Criteria 1 and/or claim for diabetes mellitus/glucose intolerance.
[d]Criteria 1, Criteria 2, and/or claim for obesity.

Table 3 shows the prevalence and odds of MetSyn for subjects with any mental illness and for specific mental disorders according to the three described clinical classifications for MetSyn. When using the ATP III classification (i.e., presence of at least three of the five MetSyn components), 4.9% of subjects with any form of mental illness met MetSyn criteria as compared to 2.0% of subjects without mental illness. The prevalence of MetSyn was 8.1% for subjects with mental illness as compared to 4.2% for subjects without mental illness when using criteria 2. As expected, the prevalence of MetSyn was highest when using criteria 3 (13.2% vs. 6.2% for subjects with and without mental illness, respectively). The unadjusted prevalence rates for metabolic syndrome when using any form of the classification criteria was higher for all categories of mental illness compared to no mental illness.

When controlling for age, gender, and non-mental health care visits, and using the strictest ATP III classification (criteria 1), subjects with any form of mental illness were 1.5 times more likely (95% CI: 1.49–1.59) to have MetSyn than subjects without mental illness. When using criteria 2 the prevalence of MetSyn was 1.3 times more common, (95% CI: 1.25–1.31). The prevalence was also elevated when using criteria 3 (OR = 1.48; 95% CI: 1.45–1.51).

As shown in Table 3, the adjusted odds of MetSyn were significantly elevated for persons with mental illness as compared to those without, with few exceptions. When using standard ATP III criteria, subjects with all forms of mental illness, with the exception of psychosis and somatoform disorders, had elevated odds for MetSyn. When using criteria 2, odds ratios for mood, psychotic, sexual, and cognitive disorders were significantly increased. These findings continued to hold when criteria 3 was used. Although subjects with psychosis were similarly likely to meet criteria for MetSyn as subjects without mental disorders when using criteria 1, they were more likely to meet criteria when obesity (OR = 1.37) (criteria 3) or diabetes mellitus/glucose intolerance (OR = 1.35) (criteria 2) codes were used to select for MetSyn.

Rarely were any mental conditions less likely to be associated with metabolic syndrome when compared to persons without mental conditions. Notable exceptions included anxiety and somatoform disorders (Table 3).

Subjects with glucose intolerance/diabetes mellitus were more than 47 times more likely to meet criteria for MetSyn than subjects without glucose intolerance/diabetes mellitus (OR = 47.82; 95% CI: 46.2–49.5) in adjusted analyses, which helps to validate the inclusion of criteria 2. Moreover, subjects with obesity were more then 25 times more likely to meet criteria for MetSyn than subjects without claims for obesity (OR = 25.52; 95% CI: 24.6–26.4) in adjusted analyses, which helps to validate the inclusion of criteria 3.

DISCUSSION

Our study suggests that MetSyn is more common among subjects with mental illness than those without, and the risk is significantly increased for subjects with specific categories of mental illness, including psychotic, mood, cognitive and sexual disorders. It is important to note that the overall prevalence of MetSyn using the standard ATP III criteria in this population (2.5%) was low as compared to other reports, especially among patients with psychosis or mood disorders (1,2,4,5). This low overall prevalence is likely the result of the lower sensitivity of claims data to case find for this condition given under-coding of conditions such as obesity.

Obesity is thought to be the most important predictor of MetSyn and is prevalent among persons with mental illness (27). For instance, persons with bipolar disorder are more likely to have central obesity than persons without mental illness (28). Categorically defined weight gain (over 7% of baseline weight) was observed in up to 55% of schizophrenics being treated with atypical antipsychotic medications (29). We were surprised to find that subjects with psychotic disorders were somewhat less likely to meet ATP III MetSyn criteria, especially since treatment with atypical anti-psychotics has been reported to result in weight gain and glucose intolerance/diabetes mellitus, both of which are significant risk factors for development of MetSyn (9). However, these subjects were significantly more likely to meet MetSyn criteria when inclusion of glucose intolerance/diabetes mellitus (criteria 2) and/or obesity (criteria 3) was specified. It must be noted that obesity codes may not be well represented in administrative claims data, suggesting that the risk of MetSyn may be even greater than reported.

Although much recent attention has been paid to the development of diabetes mellitus and MetSyn in persons with schizophrenia, our results suggest that the risk for MetSyn must be considered in nearly all patients with mental illness. Whether the risk for MetSyn is increased by treatment factors (psychopharmacology induced weight gain) or factors inherent to the mental condition (psychomotor slowing or lack of ambition), these findings highlight the need for mental health providers to assess for and counsel patients regarding physical activity, obesity, and smoking cessation. Weight loss programs, including exercise, nutrition, and behavioral interventions, have been successful for persons with chronic mental illness (30,31). Smoking cessation counseling is imperative given that patients with mental illness are twice as likely to smoke as patients without mental illness and because smokers are 1.6 times more likely to have MetSyn than non-smokers (32). Reported rates of smoking cessation counseling are low, although persons with components of MetSyn (e.g., obesity) are somewhat more likely to receive counseling (33). Results from at least one study suggest that patients with schizophrenia can achieve success with smoking cessation programs and that the effects are long-lasting (>2-years) (34).

It is important to note the strengths and limitations of this study. Unlike studies conducted in a single hospital or clinic setting, our study analyzed a large population-based sample of adults ages 18–64, the data representing practice patterns of a diverse group of physicians in a wide geographical area. Subjects were not excluded based on presence of other medical comorbidity as has been done in prior studies. Because MetSyn may be a precursor to other conditions such as myocardial infarction, or can occur concomitantly with them, excluding subjects with medical co-morbidity seems artificial. The average follow-up period was more than two years for subjects without mental illness and more than three years for subjects with mental illness. Because subjects with and without mental illness had multiple years of follow-up and many opportunities for diagnosis of the components of MetSyn due to the high number of healthcare visits, we do not believe that differential surveillance was responsible for the increased risk of MetSyn. Given that subjects with and without mental illness visited providers and were followed, in general, for more than two years, it is unlikely that they went undiagnosed. Instead, it is more likely that non-reporting of obesity and other components of MetSyn by healthcare providers influence the reported odds and prevalence rates of MetSyn.

As mentioned previously, these claims data do not capture the true magnitude of MetSyn. Hypertension and hypercholesterolemia are most commonly noted in the claims data, but hypertriglyceridemia and obesity are less commonly reported.

We believe the odds of MetSyn reported in this study are underestimates for all subjects given that the presence of a mental illness likely does not contribute to differential coding of the components of MetSyn for persons with or without mental illness. It is unlikely that healthcare providers would more commonly report presence of obesity or a diagnosis of hypertriglyceridemia, hypertension, hypercholesterolemia, or glucose intolerance/diabetes mellitus for purposes of insurance claim reporting for subjects with mental illness than for those without, although diagnosis and treatment of these conditions for subjects with and without mental illness may be subject to differential surveillance. With the introduction of the MetSyn ICD-9 code in October 2001 and heightened attention to this condition, it is possible that claims data will be more useful in future years. Investigators who wish to use administrative claims data to examine MetSyn or specific components of MetSyn should be cautious in interpreting the results from claims data unless medical records and/or laboratory values are also available. Although we examined six years of data (1996–2001), we did not restrict our analyses to subjects with a certain number of claims or a certain length of follow-up. However, we noted that restriction did not significantly increase prevalence rates of MetSyn. The final limitation of this work is that these privately insured subjects are atypical of the under- or uninsured chronically, severely mentally ill who may have a higher risk factor burden for MetSyn.

We believe this is the first report of the association between all forms of mental illness and MetSyn using population-based data. Future studies with access to medical records, pharmacy records, and laboratory values will better determine the prevalence of this condition in persons with mental disorders. Importantly, this study suggests that MetSyn is not only problematic for patients with psychosis or affective disorders, but that it also affects patients with other mental disorders, including cognitive and sexual disorders. Mental health providers should engage in proactive screening, lifestyle counseling, and referral for medical treatment of MetSyn in persons with mental illness.

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