Diabetes Prevalence Among Racial-Ethnic Minority Group Members With Severe Mental Illness Taking Antipsychotics: Double Jeopardy?

Christina Mangurian, M.D., M.A.S., Walker Keenan, B.S., John W. Newcomer, M.D., Eric Vittinghoff, Ph.D., Jennifer M. Creasman, M.S.P.H., Dean Schillinger, M.D.

Objective: This study assessed differences in diabetes prevalence based on race-ethnicity among people with severe mental illnesses.

Methods: This retrospective cohort study examined diabetes prevalence in 2009 among California Medicaid enrollees with severe mental illness who were screened for diabetes (N=19,364). Poisson regression assessed differences in diabetes prevalence by race-ethnicity. The sample was standardized to the U.S. population.

Results: The overall prevalence of diabetes was 32.0%. The adjusted prevalence for all minority groups with severe mental illness, except for Asians, was significantly higher than for whites (1.21–1.28 adjusted prevalence ratios). With inverse probability weighting to reduce selection bias captured by measured factors, estimated prevalence of diabetes among screened participants was 27.3%.

Conclusions: The prevalence of diabetes in minority groups with severe mental illness was significantly higher than among whites with severe mental illness. Mental health administrators should implement universal diabetes screening with specific outreach efforts targeting minority populations with severe mental illness.

Psychiatric Services 2017; 68:843–846; doi: 10.1176/appi.ps.201600356

There is a significant mortality gap between people with severe mental illness (for example, schizophrenia and bipolar disorder) and the general population, with estimates of earlier mortality ranging from ten to 25 years, most commonly from cardiovascular disease (CVD) (1,2). Because diabetes is a potent CVD risk factor, it is concerning that a large systematic review of studies conducted between 1987 and 2005 estimated that 15% of people with severe mental illness have type 2 diabetes (3), a prevalence two to three times higher than age-matched samples from the general population (8.4% in the general population, according to data from the 2005–2010 National Health and Nutrition Examination Survey [NHANES]) (4). Antipsychotic medications, particularly second-generation antipsychotics, contribute to the risk of diabetes (5). In fact, in 2004 the American Diabetes Association recommended annual diabetes screening for anyone taking second-generation antipsychotic medications, regardless of age or predisposing factors (6).

Despite differences in diabetes prevalence among U.S. racial-ethnic populations (4), no large studies have rigorously explored differences in diabetes among diverse populations with severe mental illness taking antipsychotic medications (7). This lack of data is concerning, given reviews suggesting that individuals from racial-ethnic minority groups who have severe mental illness may have a higher risk of developing diabetes from antipsychotic treatment, implying a double disease burden in this cohort (7,8).

Our study filled this gap in the literature by examining racial-ethnic differences in diabetes prevalence in a large, diverse population with severe mental illness taking antipsychotic medications. To our knowledge, this is the largest study examining diabetes among outpatients served in any public mental health care system.

METHODS

This retrospective cohort study examined administrative, pharmacy, and billing data from California Medicaid (Medi-Cal) and the Client and Service Information (CSI) system from January 1 to December 31, 2009. The CSI system utilizes encounter-based data to track state- and county-funded outpatient mental health service use in California. After obtaining approvals as previously described (9), the California Department of Health Care Services combined these databases and provided a unique deidentified data set to investigators.

The following criteria characterized the cohort (N=19,364): age ≥18 and <68, utilized community mental health services, prescribed an antipsychotic medication at least once during

the study period, enrolled in Medi-Cal, not dually eligible for Medicare, and either screened for diabetes (glucose-specific fasting serum test [CPT codes 82947, 82948, 82950, or 82951] or hemoglobin A1c (CPT code 83036]) or had preexisting diabetes during the study period. The dually eligible population was excluded because Medicare laboratory billing data were unavailable. Of note, diabetes screening guidelines for anyone taking second-generation antipsychotic medications were distributed to health plans before the study period (6). However, there was variable enforcement of the guidelines and no formal policies on diabetes screening of antipsychotic-treated adults.

The primary outcome measure was diabetes, defined by a diabetes diagnosis (*ICD-9* codes 249.xx, 250.xx, 253.xx, and 648.xx) or an antidiabetic prescription claim during the study period. [A table in an online supplement to this report lists the antipsychotic classes and specific medications.] The database included additional variables, such as age, gender, race-ethnicity, county type, psychiatric diagnosis, and substance use disorder diagnoses. Individuals with multiple psychiatric comorbidities were classified hierarchically, and counties were dichotomized into rural or urban, as previously described (9).

Descriptive statistics were used to show the distribution of demographic and clinical characteristics by diabetes status. To facilitate comparisons with the general population, we estimated adjusted diabetes prevalence by using direct standardization to the distribution of the adult U.S. population by age, sex, and race-ethnicity on the basis of U.S. Census Bureau data for 2009. In this procedure, overall diabetes prevalence was estimated by a weighted average of sample diabetes prevalence within each age, sex, and racial-ethnic stratum, with weights given by the proportions of the overall U.S. population accounted for by each subgroup.

Adjusted Poisson regression models were used to estimate the overall effects on prevalence of diabetes of gender, race-ethnicity, age, county type, psychiatric diagnosis, substance use diagnosis, and health care utilization. We used a directed acyclic graph to summarize hypothesized causal relationships between variables in order to distinguish the confounders and mediators of each predictor. Models specific to each predictor of interest were used to estimate overall effects, by adjusting for variables that influence the predictor variable and diabetes (confounders) but excluding factors on the causal pathway between them (mediators). Models excluding confounders would provide biased estimates, whereas models including mediators would at best estimate direct effects via other pathways. Poisson regression was used as the best approximation of prevalence ratio. Because California delegates delivery of mental health services to its counties, we used robust standard errors to account for clustering of outcomes by county and to accommodate use of a Poisson model for a binary outcome. As previously described, seven rural counties were grouped, and one county was excluded (9).

Given the low diabetes screening rates we have previously documented (9), estimating diabetes prevalence in the screened sample could have overestimated prevalence, because patients with diabetes risk factors, some unmeasured, were almost surely overrepresented the screened sample. To address this, we used inverse weighting based on available covariates to remove some but probably not all of the selection bias. In addition, to provide a conservative lower bound, we estimated prevalence by using the entire sample, which we recognize is biased low by omission of cases among the unscreened [see online supplement].

RESULTS

The prevalence of diabetes in this sample was 32.0% (N=6,195 of 19,364). Table 1 shows adjusted differences in prevalence on the basis of patient characteristics. Compared with the rate among white patients, diabetes prevalence was higher among black patients (adjusted prevalence ratio [APR]=1.24) and Hispanic patients (APR=1.28) ($p<.001$). In addition, compared with the rate among patients with schizophrenia, diabetes prevalence was significantly lower among patients with bipolar disorder (APR=.88) and major depressive disorder (APR=.83) ($p<.001$).

After direct standardization to the demographic distribution of the U.S. population, the adjusted prevalence was 27.3%. Differences in prevalence were found by race-ethnicity, with whites having the lowest prevalence (26.5%) and other minority groups having higher rates (blacks, 29.7%; Hispanics, 29.7%; Asians, 27.2%; and other, 28.4%).

With inverse probability weighting to reduce selection bias captured by measured factors (9), the estimated overall prevalence of diabetes was 27.8% [see online supplement]. The standardized lower-bound estimate of diabetes, which was based on the larger parent study that included close to 70% who were unscreened for diabetes, was 9.6% (9).

DISCUSSION

Our study filled a gap in the literature by documenting a significantly higher risk of diabetes among racial-ethnic minority group members with severe mental illness, compared with their white counterparts, even after the rate was standardized to the U.S. population and the analysis controlled for confounding variables. Our results confirm findings from smaller studies that certain racial-ethnic minority groups with severe mental illness have higher prevalence of diabetes than whites (7). This high diabetes prevalence is concerning because health care disparities are well documented for both racial-ethnic minority populations (10) and populations with severe mental illness (11), making this subpopulation at especially high risk for disparities in care (7,8).

Our study confirms prior findings of high prevalence of diabetes among people with severe mental illness (3). The standardized and adjusted prevalence of diabetes among people with severe mental illness taking antipsychotic medications in California was estimated to be 27.3%,

or about 2.5 times that of the general U.S. population (10.2%), according to NHANES data during that time period (2009) (4).

The main limitation was that we could assess prevalence only among those who were tested for diabetes and who had *ICD-9* diabetes diagnoses or claims for diabetes medications; thus our findings may overestimate true prevalence, primarily because patients at high suspicion of diabetes are almost surely preferentially screened. In contrast, lack of screening almost certainly leads to missed cases of diabetes, because 25%–50% of all patients with type 2 diabetes in the United States are undiagnosed (12). Because dually eligible (Medicaid and Medicare) patients were excluded, diabetes prevalence may have been underestimated. In addition, we did not have data on antipsychotic medication exposure or the timing of exposure relative to diabetes diagnosis.

Future studies should examine both diabetes incidence and prevalence longitudinally among diverse populations with severe mental illness taking antipsychotic medications. Examining potential racial-ethnic differences more thoroughly may help stratify risk levels within certain high-risk subpopulations. Although accurate understanding of risk is clearly important, recent findings indicate that use of the U.S. Preventive Services Task Force screening guidelines identifies diabetes in only about half of those served in community health centers (13). A large study should be conducted to systematically screen all people with severe mental illness served in community mental health settings to obtain an accurate assessment of missed diagnoses.

Culturally and linguistically appropriate integration models are needed to address the health care needs of minority populations with severe mental illness. As a first step, we recommend systemwide efforts to improve diabetes screening and care for all people with severe mental illness, because such efforts can be effective in reducing disparities. Unfortunately, systemwide efforts are complicated, because the public mental health and general medical care systems often operate in separate digital, financial, operational, and structural silos. Many people with severe mental illness are publicly insured and receive care in community mental health clinics (14). Therefore, we believe that integrating primary care into these public mental health settings may improve health screening in this population. Regrettably, evidence-based models to integrate primary care into behavioral health care have not yet been developed (15).

TABLE 1. Association of characteristics of California Medicaid enrollees with severe mental illness and diabetes prevalence

	Total (N=19,364)		Diabetes (N=6,195)					
Characteristic	N	%	N	%	p	APR[a]	95% CI	p
Sex[b]					.774			.006
Male	7,943	41.0	2,552	32.1		1.09	1.02–1.13	
Female (reference)	11,421	59.0	3,643	31.9				
Race-ethnicity[b]					<.001			<.001
Asian or Pacific Islander	2,534	13.1	805	31.8		1.09	.86–1.38	
Black	3,617	18.7	1,281	35.4		1.24	1.10–1.41	
Hispanic	3,877	20.0	1,281	35.4		1.28	1.19–1.39	
Other	2,129	11.0	741	34.8		1.21	1.14–1.28	
White (reference)	7,207	37.2	2,087	29.0				
Age[b,c]					<.001			<.001
18–27 (reference)	2,025	10.5	276	13.6				
28–37	2,795	14.4	608	21.8		1.62	1.48–1.78	
38–47	4,762	24.6	1,454	30.5		2.32	2.05–2.63	
48–57	6,616	34.2	2,535	38.3		2.92	2.65–3.22	
58–67	3,166	16.3	1,322	41.8		3.23	2.85–3.66	
County type[b]					.195			.013
Rural	469	2.4	174	37.1		1.32	1.06–1.65	
Urban (reference)	18,895	97.6	6,021	31.9				
Psychiatric diagnosis[d]					<.001			<.001
Anxiety disorder or other	1,734	9.0	525	30.3		.92	.78–1.09	
Bipolar disorder	2,742	14.2	773	28.2		.88	.80–.98	
Major depressive disorder	4,401	22.7	1,335	30.3		.83	.78–.90	
Schizophrenia spectrum disorder (reference)	10,487	54.2	3,562	34.0				
Comorbid drug or alcohol use disorder[e]					<.001			<.010
Yes	3,185	16.4	894	28.1		.99	.84–.98	
No (reference)	16,179	83.6	5,301	32.8				

[a] APR, adjusted prevalence ratio. Each adjusted model depended on the specific variable and its position, along with a directed acyclic graph (DAG or causal graph). A DAG was created to identify confounders and mediators of the predictors of interest.

[b] The adjusted model controlled for the three main demographic variables (sex, race-ethnicity, and age) and county type, unless the variable was the predictor variable of interest.

[c] The age categories were those provided by the California Department of Health Care Services to the study investigators.

[d] The adjusted model controlled for the main demographic variables, county type, and comorbid substance use disorder.

[e] The adjusted model controlled for the main demographic variables, county type, and psychiatric diagnosis.

CONCLUSIONS

The prevalence of diabetes among people with severe mental illness taking antipsychotic medications was significantly higher than in the general population. Racial-ethnic minority group members with severe mental illness taking antipsychotic medications had higher prevalence of diabetes compared with whites. Because racial-ethnic minority populations with

severe mental illness are extremely vulnerable to health care disparities, they deserve particular public health and clinical attention.

AUTHOR AND ARTICLE INFORMATION

With the exception of Dr. Newcomer, the authors are with the School of Medicine, University of California, San Francisco (UCSF), where Dr. Mangurian is with the Department of Psychiatry and the Weill Institute for Neurosciences, Dr. Vittinghoff is with the Department of Epidemiology and Biostatistics, Ms. Creasman is with the Clinical and Translational Science Institute (CTSI), and Dr. Schillinger is with the Department of Medicine. Dr. Mangurian and Dr. Schillinger are also with Zuckerberg San Francisco General Hospital, San Francisco. Dr. Newcomer is with the Department of Integrated Medical Sciences, Charles E. Schmidt College of Medicine, Florida Atlantic University, Boca Raton. Send correspondence to Dr. Mangurian (e-mail: christina.mangurian@ucsf.edu).

Dr. Mangurian was supported by grant K23MH093689 from the National Institute of Mental Health; by the UCSF Hellman Fellows Award for Early-Career Faculty; and by the National Center for Research Resources, the National Center for Advancing Translational Sciences, and the Office of the Director, National Institutes of Health (NIH) through UCSF-CTSI grant KL2 RR024130. Mr. Keenan was supported by R25MD006832 from the National Institute on Minority Health and Health Disparities (NIMHD). Dr. Schillinger was supported by NIH center grant P30DK092924 from the National Institute of Diabetes and Digestive and Kidney Diseases to the Health Delivery Systems Center for Diabetes Translational Research and by NIMHD grant P60MD006902 to the Comprehensive Center of Excellence for Health and Risk in Minority Youth and Young Adults. This study was initiated during a state quality improvement project to integrate primary care and mental health care, called the California Mental Health Care Management Program (CalMEND). The project was a collaboration between the California Department of Mental Health and the Pharmacy Benefits Division of the California Department of Health Care Services. The authors acknowledge John Igwe and other CalMEND staff for their assistance in combining administrative databases without compensation and Martha Shumway, Ph.D., for initial coding of the data. They also thank Penelope Knapp, M.D., for assistance in understanding how the California Department of Mental Health's policies and procedures during the study period may have influenced findings. The authors also thank Nicholas Riano, B.A., for assistance in manuscript preparation.

Dr. Newcomer reports receipt of grant support from Otsuka America Pharmaceutical, Inc., and consulting fees from Reviva Pharmaceuticals and service on a data safety monitoring board for Amgen. The other authors report no financial relationships with commercial interests.

Received July 29, 2016; revision received November 29, 2016; accepted January 5, 2017; published online April 15, 2017.

REFERENCES

1. Olfson M, Gerhard T, Huang C, et al: Premature mortality among adults with schizophrenia in the United States. JAMA Psychiatry 72:1172–1181, 2015
2. Walker ER, McGee RE, Druss BG: Mortality in mental disorders and global disease burden implications: a systematic review and meta-analysis. JAMA Psychiatry 72:334–341, 2015
3. Osborn DP, Wright CA, Levy G, et al: Relative risk of diabetes, dyslipidaemia, hypertension and the metabolic syndrome in people with severe mental illnesses: systematic review and metaanalysis. BMC Psychiatry 8:84, 2008
4. Selvin E, Parrinello CM, Sacks DB, et al: Trends in prevalence and control of diabetes in the United States, 1988–1994 and 1999–2010. Annals of Internal Medicine 160:517–525, 2014
5. Newcomer JW: Second-generation (atypical) antipsychotics and metabolic effects: a comprehensive literature review. CNS Drugs 19 (suppl 1):1–93, 2005
6. American Diabetes Association, American Psychiatric Association, American Association of Clinical Endocrinologists, et al: Consensus development conference on antipsychotic drugs and obesity and diabetes. Diabetes Care 27:596–601, 2004
7. Carliner H, Collins PY, Cabassa LJ, et al: Prevalence of cardiovascular risk factors among racial and ethnic minorities with schizophrenia spectrum and bipolar disorders: a critical literature review. Comprehensive Psychiatry 55:233–247, 2014
8. Mangurian C, Newcomer JW, Modlin C, et al: Diabetes and cardiovascular care among people with severe mental illness: a literature review. Journal of General Internal Medicine 31:1083–1091, 2016
9. Mangurian C, Newcomer JW, Vittinghoff E, et al: Diabetes screening among underserved adults with severe mental illness who take antipsychotic medications. JAMA Internal Medicine 175:1977–1979, 2015
10. Smedley BD, Stith AY, Nelson AR: Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care. Washington, DC, National Academies Press, 2003
11. Institute of Medicine, Committee on Crossing the Quality Chasm: Improving the Quality of Health Care for Mental and Substance-Use Conditions. Washington, DC, National Academies Press, 2006
12. National Diabetes Fact Sheet: General Information and National Estimates on Diabetes in the United States, 2011. Atlanta, Centers for Disease Control and Prevention, 2011
13. O'Brien MJ, Lee JY, Carnethon MR, et al: Detecting dysglycemia using the 2015 United States Preventive Services Task Force screening criteria: a cohort analysis of community health center patients. PLoS Medicine 13:e1002074, 2016
14. McAlpine DD, Mechanic D: Utilization of specialty mental health care among persons with severe mental illness: the roles of demographics, need, insurance, and risk. Health Services Research 35:277–292, 2000
15. Reilly S, Planner C, Gask L, et al: Collaborative care approaches for people with severe mental illness. Cochrane Database of Systematic Reviews 4:CD009531, 2013