Prevalence and Correlates of Diabetes in National Schizophrenia Samples

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Abstract

People with schizophrenia may be at increased risk for Type II diabetes because of the side effects of antipsychotic medication, poorer overall physical health, less healthy lifestyles, and poorer health care. The present study uses data bases collected by the Schizophrenia Patient Outcomes Research Team (PORT) to assess the prevalence and demographic and clinical correlates of diabetes within large populations of persons receiving treatment for schizophrenia. In the Schizophrenia PORT, Medicaid and Medicare data from 1991 and more recent interview data were collected regarding the comorbidity of schizophrenia and diabetes: prevalence, quality of life, physical health, and services utilization and costs. The study found that rates of diagnosed diabetes exceeded general population statistics well before the widespread use of the new antipsychotic drugs. Risk factors for diabetes were similar to those observed in the general population. The linkage of diabetes to poor physical health, medical morbidity, and increased service use and cost requires attention. This study of diabetes in the early 1990s suggests that even before the widespread use of the atypical antipsychotic drugs, diabetes was a major problem for persons with schizophrenia.

Keywords: Schizophrenia, diabetes, antipsychotics, hyperglycemia, health services.

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People diagnosed with schizophrenic disorders have significantly higher mortality rates than the general population (Alleback 1989; Mortensen and Juel 1993; Saku et al. 1995; Baxter 1996; Felker et al. 1996; Jeste et al. 1996; Simpson and Tsuang 1996). Increased prevalence and severity of a number of medical conditions are important contributing factors (Tsuang et al. 1983; Dalmau et al. 1997; Dixon et al. 1999). Among these, diabetes is of particular interest. Previous research has suggested that people diagnosed with schizophrenia are more likely to develop type II diabetes (Dynes 1969; McKee et al. 1986; Felker et al. 1996; Mukherjee et al. 1996).

Schizophrenia has been associated with impaired glucose tolerance and insulin resistance (Brambilla et al. 1976; Holden and Mooney 1994; Holden 1995*a*, 1995*b*). A family history of type II diabetes has been found in 18–19 percent of people with schizophrenia (Dynes 1969; Mukherjee et al. 1989). Another risk factor is iatrogenic—namely, the additional burden of weight gain caused by antipsychotics. A recent meta-analysis conducted by Allison and colleagues (1998) ranks the liability of different antipsychotic drugs to cause weight gain. This comprehensive study included 78 primary studies and found that at 10 weeks, clozapine and olanzapine caused the most weight gain, followed by thioridizine, sertindole, chlorpromazine, and risperidone. Other investigators have confirmed the increased weight gain with the atypical antipsychotic drugs, especially clozapine and olanzapine (Wetterling and Murigbrodt 1999; Wirshing et al. 1999).

Further, the new atypical drugs may contribute directly to hyperglycemia (McKee et al. 1986; deBoer and Gaete 1992; Kamran et al. 1994). Hagg et al. (1998) compared 63 psychotic patients taking clozapine with 67 psychotic patients not taking clozapine. A total of 22 percent of patients in the clozapine group had diabetes or impaired glucose tolerance compared with 10 percent in the nonclozapine group. This was a near significant difference. Wirshing and others (1998) describe six cases of acute onset of diabetes that occurred after starting olanzapine (two cases) and clozapine (four cases). The majority of these patients were African-American men. Most, but not all, experienced significant weight gain after starting treatment. Other case reports have appeared in the literature linking olanzapine to diabetes (Lindenmayer and

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Patel 1999; Goldstein et al., in press) and even quetiapine as well (Sobol et al. 1999). Histaminic and serotonergic antagonism are hypothesized to induce weight gain and subsequent changes in glucose homeostatis (Wirshing et al. 1998). Leptin may mediate the increased overeating of persons on atypical antipsychotics (Kraus et al. 1999). Serotonin 1A antagonism is also hypothesized to decrease pancreatic beta-cell responsiveness (Wirshing et al. 1998). Of note, a four-case series reported reduced glycemic control with clozapine not related to weight gain (Popli et al. 1997).

Although antipsychotic drugs appear to increase vulnerability to diabetes among persons with schizophrenia, poor health behaviors are also likely to be important in both the development of diabetes and its impact once diagnosed. It is not surprising that persons with schizophrenia have been found to engage in fewer health-promoting behaviors than nonpsychiatric samples (Holmberg and Kane 1999). Brown and colleagues (1999) evaluated 102 middle-aged persons with schizophrenia residing in the community and found that patients exercised less, smoked more, and ate less healthy diets than normal controls. Multiple studies have shown that persons with schizophrenia smoke cigarettes at almost double the rate of the general population (Lyons 1999). Poverty, unstable living situations, and lower than expected educational attainment are associated with schizophrenia and increase the risk of obesity and other adverse medical sequelae (Dixon et al., in press).

Diabetes is thus an important medical comorbidity in schizophrenia that requires our greater attention and understanding. Most of the previous work on diabetes and schizophrenia has been done with limited samples in narrow geographic regions. The present study takes advantage of large national data bases collected by PORT to assess the prevalence and demographic and clinical correlates of diabetes within large populations of persons receiving treatment for schizophrenia. The PORT contract required collection of claims-based data and direct patient surveys. While each has limitations when considered separately, together such data provide a confluence of evidence about diabetes in schizophrenia. The PORT data permits examination of diabetes prevalence and correlates within national and regional populations that are much more representative of persons with schizophrenia than work that has previously been published.

Methods

The PORT study was designed to examine patterns of treatment for persons with schizophrenia in usual care and the implications of variations in care in light of current scientific knowledge of treatment efficacy. Administrative claims data from the national Medicare program, Medicaid data from one state, and primary data collected via a field study of patient interviews in two states were used in this study. Examination of these samples was required of the PORT contract, and allows for examination of three different and potentially cross-validating populations.

Medicare. Medicare covers disabled persons with previous work experience who are under age 65 and almost all Americans over age 65. The study population consisted of all Medicare enrollees who had at least one service claim during 1991 and who were diagnosed with schizophrenia, which includes the schizoaffective and schizophreniform disorders (International Classification of Diseases–9–Clinical Modification 1989; ICD–9–CM code of 295.xx), in any care setting. Using this selection criterion, the Health Care Financing Administration identified 402,954 subscribers from a total Medicare enrollment of 34.9 million in 1991. The study population was then limited to individuals who were 18 years of age or older, resided in the United States, had Parts A and B coverage during all of 1991, and survived through the end of 1991. Additional exclusions resulted from the identification of persons who had diagnoses on interim claims only, a subscriber number change, or an admitting diagnosis but no discharge diagnosis of schizophrenia during 1991. From the final study population of 331,617 enrollees, a 5 percent systematic random sample was drawn. This sample yielded 16,480 claimants.

To guard against the potential inclusion of persons without schizophrenia in this sample, an algorithm identified those individuals whose records did not show a schizophrenia diagnosis for at least one of the following: (1) an inpatient hospital or physician claim, (2) a clinic or office visit claim, or (3) a physician visit claim in a skilled nursing or custodial care facility. The final sample, based on the exclusion of patients identified by the algorithm as least likely to be diagnosed with schizophrenia, resulted in 14,182 Medicare enrollees with schizophrenia who utilized services during 1991. The analysis sample group thus included 14,182 persons who are representative of the Medicare enrollees who utilized services for schizophrenia in 1991. Persons with a paid inpatient or outpatient claim for diabetes were identified. The age, gender, race, and overall cost of care for persons with a paid claim for diabetes were also obtained from the data base.

Medicaid. Medicaid data from 1991 from a southern state were subjected to the same sample selection criterion used for Medicare. Only persons continuously enrolled for the full year were included, but persons who were dually eligible for Medicare were excluded because their claims would be incomplete. The final sample

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included 6,066 persons. As in the Medicare sample, we assessed the proportion and demographic characteristics as well as the cost of care of people with a paid claim for diabetes care.

Field Study

Overview. The PORT Patient Survey conducted face-to-face interviews with a random sample of 719 persons with a clinical diagnosis of schizophrenia who were currently under usual care in two states, one in the South and the other in the Midwest. The surveys were conducted from 1994 to 1996. After complete description of the study to the subjects, all subjects provided written informed consent for the study and were paid $10 for their time. They completed a 90-minute face-to-face survey conducted by lay interviewers. The details of this procedure are documented elsewhere (Phase II Primary Data Analysis 1997). This study utilized parts of the survey related to presence of medical problems, quality of life, physical health functioning, and medications.

Sampling. A random, though not necessarily epidemiologically representative, sample of persons currently under treatment for schizophrenia in usual care settings served as subjects for this study. These settings included acute inpatient and outpatient programs and spanned the public, private, and Department of Veterans Affairs sectors of care. The sampling strategy was conducted at four levels: (1) state, (2) community, (3) provider, and (4) patient. Once states were selected and agreement to participate was obtained, communities were chosen. Treatment patterns in five communities were sampled across the two states, and at least one rural community was included in each state. Finally, within each provider setting, patients with a diagnosis of schizophrenia were selected at random from treatment rosters. All subjects met the following criteria: having a current clinical diagnosis of schizophrenia, speaking English, being at least 18 years old, being legally competent, and living within the local community sampled.

A total of 663 inpatients were screened as initially eligible for the survey, and 69.1 percent (458) agreed to allow the treatment program to release their names to the study. Of these, 398 met a more detailed eligibility assessment, and 279 of the 398 (70.1%) completed the survey. A total of 1,017 community-based patients met an initial eligibility screen, and 584 (57.4%) of these gave permission to their treatment program to release their names to the study. Subsequent assessments revealed that 550 were actually eligible for the survey and 440 of the 550 (80.0%) completed the survey. Hence two types of sample attrition were encountered: (1) at the point of patients' consent for their treatment providers to release their names to the study, and (2) at the point of consent and completion of the actual survey. The former type of attrition was more substantial than the latter, especially among the community sample.

There were no significant gender, race, or age differences between persons who gave permission to release their names and persons who refused permission to release their names. Staff project coordinators at each site were able to provide information to the research program on the age, gender, and race of persons who refused to release their names without revealing the identity of the refusing individual. Further, among those who released their names, there were no significant gender, race, or age differences between those who consented to participate and those who refused to participate in the study.

Instruments and Measures

Medical comorbidity. Individuals were asked if they have ever been told by a physician that they had any of 12 physical health problems ("lifetime comorbidity"). The 12 physical health problems were high blood pressure, diabetes, sexually transmitted diseases, cancer, breathing problems, heart problems, bowel problems, hearing problems, eyesight problems, teeth problems, skin problems, and seizures. Individuals were also asked to report whether they currently have any of these conditions ("current comorbidity") and if they were currently receiving treatment for any of these disorders. Persons were divided into four diabetes groups to assess the impact of diabetes on overall physical health status, symptoms, life satisfaction, and use of services. These groups were (1) no diabetes, (2) current diabetes receiving treatment, (3) current diabetes not receiving treatment, and (4) lifetime but not current diabetes. We assessed differences among these groups on subjective quality of life and physical health status.

Physical health status. Two measures were used to determine physical health status. The first measure was obtained from respondents' ratings of their physical health on a five-point scale (1 = poor, 5 = excellent) in response to the question "Compared to other people your age, would you say your physical health is excellent, very good, good, fair, or poor?" The second measure was based upon respondents' ratings of their satisfaction with their physical condition on a seven-point (1 = terrible, 7 = delighted) rating scale. This item was taken from the Lehman Quality of Life Interview (LQLI; Lehman, 1983, 1988).

Mental and emotional health. This measure consisted of a single item that asked respondents to rate on a five-point scale (1 = poor, 5 = excellent) their level of mental or emotional health.

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General life satisfaction. This measure represents the mean of responses to two items placed near the beginning and close to the end of the interview. These items asked respondents to rate their overall satisfaction with their lives "as a whole" on a seven-point rating scale (1 = delighted, 7 = terrible). These items were taken from the LQLI.

Medications. All patients were asked if they take any medicine for an emotional problem or problem with their nerves. If they responded yes, they were then asked what medicine they take. Individuals were dichotomized into those receiving antipsychotics with a greater risk for weight gain (in this sample risperidone or clozapine—other atypical antipsychotics were not yet approved) and those who were not prescribed these drugs.

Results

Prevalence and Demographics. Tables 1, 2, and 3 show the prevalence and demographic characteristics of persons with diabetes in the three samples under study. The prevalence of current treated diabetes varied from 9 to 14 percent. The rate of lifetime diabetes reported in the field survey was 15 percent; 86 percent ($n = 67$) of patients with current diabetes were currently receiving diabetes treatment. As indicated in tables 2 and 3, in all three samples, being older, female, and African-American or "other" race was associated with increased likelihood of diabetes. Logistic regression performed on the field study sample indicated that age, race, and gender remained significantly predictive of diabetes. Women were 2.1 times more likely to have diabetes than men, and whites were half as likely to have diabetes as nonwhites. In the field study, lifetime diabetes was associated with lower educational attainment (maximum education 11.2 years [standard deviation (SD) = 2.4] vs. 12.0 [SD = 2.4], $t = 3.03$, $df = 715$, $p < 0.01$) and marital status (never married: $n = 38/367$ [10.35%], ever married: $n = 69/350$ [19.71%], $\chi^2 = 12.36$, $df = 1$, $p < 0.001$).

Diabetes, Physical Health, and Quality of Life. In the field study, physical health status and global life satisfaction were significantly related to membership in diabetes groups (table 4). Persons with current diabetes who are not receiving treatment have the poorest health status, those with current diabetes who are receiving treatment and those with past diabetes are roughly comparable, and those without diabetes report the best health status. Post hoc analyses revealed that persons without diabetes significantly differ on physical health status from those with diabetes but not receiving treatment. Life satisfaction is greatest in persons receiving diabetes treatment and poorest in those with diabetes but not receiving treatment. Post hoc tests on life satisfaction revealed that persons with diabetes who receive treatment have significantly greater life satisfaction than patients without diabetes and those with past but not current diabetes. General life satisfaction was not related to age, gender, or race.

Persons with diabetes reported a greater number of other physical illnesses (3.4 [1.9] vs. 2.2 [1.8], $t = 6.0$, $df = 1,717$, $p < 0.001$). Table 5 shows the comparison of the presence of different illnesses among persons with diabetes compared with persons not reporting diabetes. Persons with diabetes were more likely to have hypertension, heart problems, seizures, hearing problems, and vision problems than persons without diabetes.

Service Utilization and Cost. In the field study, having seen a health professional in the past year was significantly related to membership in diabetes groups (table 4). Persons receiving treatment for diabetes were more likely to have seen a health professional than those without diabetes. Total Medicaid costs were significantly higher for persons with diabetes ($6,566 [SD = 9,097] vs. $8,759 [SD = 9,823], $t = 5.8$, $p < 0.001$). This difference was accounted for by excess somatic care costs for people with diabetes. Total Medicare costs were significantly higher for persons with diabetes ($9,820 [SD = 18,624] vs. $14,851 [SD = $24,236], $t = 8.057$, $df = 11,445$, $p <$

Table 1. Prevalence of diabetes in field study, Medicaid, and Medicare samples

	Prevalence, *n* (%)					
Sample	Lifetime	Current	Current (with treatment)	Any diabetes claim	Inpatient diabetes claim	Outpatient diabetes claim
Field study ($n = 719$)	107 (14.9)	78 (10.8)	67 (9.3)			
Medicaid ($n = 6,066$)				673 (11.1)	130 (2.1)	661 (10.9)
Medicare ($n = 14,182$)				1,766 (12.5)	564 (4.0)	1,685 (11.9)

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Table 2. Gender and race correlates of diabetes in field study, Medicaid, and Medicare samples

	Gender			Race			
Sample	Men with diabetes, *n* (%)	Women with diabetes, *n* (%)	Statistics	Whites with diabetes, *n* (%)	Blacks with diabetes, *n* (%)	Persons of other race with diabetes, *n* (%)	Statistics
Field study (*n* = 719)	49/454 (10.8)	58/265 (21.9)	$\chi^2 = 16.3$, $df = 1$, $p < 0.001$	43/374 (11.5)	54/292 (18.5)	9/51 (17.7)	$\chi^2 = 6.8$, $df = 2$, $p < 0.05$
Medicaid (*n* = 6,066)	94/2,212 (4.3)	579/3,854 (15.0)	$\chi^2 = 164$, $df = 1$, $p < 0.001$	170/1,812 (9.4)	414/3,581 (11.6)	89/673 (13.2)	$\chi^2 = 9.27$, $df = 2$, $p = 0.01$
Medicare (*n* = 14,182)	675/7,660 (8.8)	1,091/6,522 (16.7)	$\chi^2 = 202$, $df = 1$, $p < 0.001$	1,225/10,457 (11.7)	436/2,807 (15.5)	105/918 (11.4)	$\chi^2 = 30.5$, $df = 2$, $p < 0.001$

Table 3. Age correlates of diabetes in field study, Medicaid, and Medicare samples

Sample	People with diabetes, mean age (SD)	People without diabetes, mean age (SD)	Age 18–44 with diabetes, *n* (%)	Age 45–64 with diabetes, *n* (%)	Age 65+ with diabetes, *n* (%)	Statistics
Field study (*n* = 719)	50.2 (12.5)	42.0 (11.4)				$t = 6.8$, $df = 717$, $p < 0.001$
Medicaid (*n* = 6,066)			259/3,866 (6.7)	395/2,099 (18.8)	19/101 (18.8)	$\chi^2 = 208$, $df = 2$, $p < 0.001$
Medicare (*n* = 14,182)			348/6,221 (5.6)	608/4,070 (14.9)	810/3,891 (20.8)	$\chi^2 = 541$, $df = 2$, $p < 0.001$

Note.—SD = standard deviation.

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Table 4. Health status, life satisfaction, and service use of diabetics: Results of analysis of variance on independent variables with least significant difference

Subject group	Physical health status,[a] mean[1] (SD)	Global life satisfaction,[b] mean (SD)	Seen a health professional in past year,[c] *n* (%)
No diabetes, past or current (*n* = 612)	2.97 (1.11) [a]	4.51 (1.52) [a]	321 (52) [a]
Past diabetes, not current (*n* = 26)	3.35 (1.16) [ab]	4.40 (1.65) [ab]	18 (69) [ab]
Current diabetes, receiving treatment (*n* = 67)	3.23 (1.04) [ab]	5.14 (1.33) [b]	48 (72) [b]
Current diabetes, not receiving treatment (*n* = 11)	3.90 (1.38) [b]	4.36 (1.42) [ab]	7 (64) [ab]

Note.—SD = standard deviation.

[1] Means with common letters are not significantly different.

[a] Higher scores reflect poorer health status: F = 4.31; *df* = 3,710; $p < 0.005$.

[b] Higher scores reflect greater life satisfaction: F = 3.66; *df* = 3,712; $p < 0.0$.

[c] F = 390, *df* = 3,712, $p < 0.01$.

Table 5. Physical conditions and diabetes

Physical Condition	People With Co-occuring Condition, *n* (%)		
	Presence in persons with lifetime diabetes (*n* = 107)	Presence in persons without lifetime diabetes (*n* = 612)	χ^2, *df*, *p*
Hypertension	68 (64)	177 (29)	48.6, 1, $p < 0.001$
Sexually transmitted disease	10 (9)	61 (10)	*ns*
Cancer	7 (7)	26 (4)	*ns*
Breathing problems	29 (27)	119 (19)	*ns*
Heart problems	27 (25)	85 (14)	8.9, 1, $p < 0.01$
Bowel problems	32 (30)	140 (23)	*ns*
Seizures	20 (19)	64 (10)	6.0, 1, $p < 0.05$
Hearing problems	25 (23)	68 (11)	12.4, 1, $p < 0.001$
Teeth problems	49 (46)	227 (37)	*ns*
Skin problems	18 (17)	89 (15)	*ns*
Vision problems	76 (71)	316 (52)	13.7, 1, $p < 0.001$

Note.—*ns* = nonsignificant.

0.001). For persons aged 18–44 and 45–64, the difference in costs was $4,494 ($11,435 vs. $15,929) and $5,246 ($10,057 vs. $15,303), respectively. For persons over 65 years old, the difference was $8,407 ($12,600 vs. $21,007).

Antipsychotic Medications. In the field study, 112 (16.4%) of patients reported being prescribed risperidone. A total of 71 (9.8%) reported being prescribed clozapine. Neither lifetime nor current diabetes were related to risperidone or clozapine use.

Discussion

This study found a significant prevalence and impact of diabetes in schizophrenia during the period of time preceding the widespread use of novel antipsychotic medications. While our study did not include a control group, we can compare morbidity rates in our schizophrenia sample to rates of medical conditions reported in the literature. The National Health Interview Survey (NHIS) provides estimates of self-reported rates of selected chronic conditions in the United States noninstitutionalized population

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by age, race, and gender (Adams and Marano 1995). The NHIS 1994 diabetes rate was 1.2 percent for persons aged 18–44 and 6.3 percent for persons aged 45–64. In our field study sample (mean age = 43 years), the rate of lifetime diabetes was 14.9 percent and current diabetes was 10.8 percent. The rate of diabetes thus far exceeded the general population. Further, the consistency between the Medicaid, Medicare, and primary data suggests the validity of the patient self-report.

The associations of being older, being African-American, and being female with the presence of diabetes were consistent across the three data sets. These patterns are consistent with current literature regarding diabetes in the general population (Casparie 1991; Cantor et al. 1995; Haffner 1998). Of particular relevance to this study's sample, African-Americans are at particular risk for diabetes and tend to experience more cardiovascular and other complications (Shaten et al. 1993; Byrne et al. 1994; Galliard et al. 1997). Diabetes is also high among Native American and Latino populations (Harris 1998; Centers for Disease Control and Prevention 1999). Such differences may be due to correlations between race or ethnicity and other risk factors in the United States, although genetic contributions are likely as well (Stern 1993; Byrne et al. 1994; Galliard et al. 1997). The association of lower educational attainment and female gender with diabetes are also consistent with the previous literature indicating poorer diabetes treatment and more complications among women and people with lower socioeconomic status or lower education levels (Connolly and Kesson 1996; Will and Casper 1996; Nilsson et al. 1998; van der Meer and Mackenbach 1999).

A total of 14 percent of persons with current diabetes were not receiving treatment. Further, 27 percent of patients reporting lifetime diabetes reported not having diabetes at the time of the study. It is not possible to ascertain from these data whether the diagnoses of diabetes were correct. However, it is interesting to note that patients' self-reported physical health status was lowest in the group of patients reporting that they have diabetes but were not receiving treatment and was highest in those without diabetes. The enhanced general life satisfaction among persons with diabetes and receiving treatment is somewhat puzzling but may reflect a general nonspecific impact of the receipt of care on perceptions of quality of life.

A diagnosis of diabetes was clearly associated with greater use of services and cost of care. This increase may be due to the diabetes or perhaps to the association of diabetes with other physical illnesses and conditions. Previous work in the 1992 Medicare population suggests that persons with diabetes had costs of care that were 1.5 times greater than costs for other Medicare beneficiaries in 1992 (Krop et al. 1998). Roughly the same overall ratio was observed for patients in this study. However, a breakdown of the differential costs of care for different age groups was revealing; the ratio of the costs of care for persons with diabetes to the costs of care for persons without diabetes increased with age. The relative increased costs of care for older persons with schizophrenia and diabetes may be greater than the increased costs of care due to diabetes for persons who do not have schizophrenia. The cost of diabetes care appeared to become relatively more expensive with age for persons with schizophrenia. Perhaps the burden of additional chronic diseases increases over time. In any event, the implications of diabetes for costs and service are considerable.

Diabetes is a chronic condition that requires active self-care for optimal management (American Diabetes Association 1999). The cognitive, memory, and social functioning dysfunctions common in schizophrenia (e.g., Neuchterlein and Dawson 1984; Braff et al. 1991; Seidman et al. 1992) make it likely that many people with both disorders have trouble understanding, retaining, organizing, and acting on diabetes treatment and self-care recommendations (Adler and Griffith 1991). Communicating effectively with health care providers about symptoms and questions is also of particular importance with diabetes and is also likely to be problematic (Morrison and Bellack 1987; Pary and Barton 1988; Bellack et al. 1990; Krach 1993). Furthermore, tobacco use may interfere with glucose metabolism (Holden 1995*a*), and sedentary, isolated lifestyles and poor diet may increase diabetes risk. These are all too common in the lives of people with schizophrenia. Pilot work on the impact of exercise programs and dietary counseling suggest that these health behaviors can be changed to improve a range of health outcomes (Aquila and Emanuel 1999; Dixon et al., in press).

The possible increased risk of diabetes and weight gain with new atypical antipsychotic drugs is worrisome and requires careful surveillance. We did not find an association between a patient's awareness of a diagnosis of diabetes and use of risperidone and clozapine in the mid-1990s when the interview was conducted. This lack of association could be due to problems with the validity of patient self-report. It could also be that the hypothesized increased incidence of diabetes with clozapine in particular takes some time to develop. However, the elevated rates of treated diabetes found in the Medicare and Medicaid claims coupled with the similarly elevated rates in the primary study of the PORT suggest that one should use caution in attributing problems with diabetes to any single phenomenon (e.g., antipsychotic drug use). Diabetes and schizophrenia clearly have a complex history and relationship that requires further attention. The

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implications for health screening, treatment planning, costs, and locus of care delivery are considerable.

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