Published in final edited form as:

Psychiatr Serv. 2012 December ; 63(12): 1171–1177. doi:10.1176/appi.ps.201100408.

The Effect of Race-Ethnicity and Geography on Adoption of Innovations in the Treatment of Schizophrenia

Marcela Horvitz-Lennon, MD MPH, Margarita Alegria, PhD, and Sharon-Lise T. Normand, PhD

RAND Corporation and the University of Pittsburgh School of Medicine, Department of Psychiatry, Pittsburgh PA (MH-L); the Department of Health Care Policy, Harvard Medical School, Boston MA (S-LTN) and the Department of Biostatistics, Harvard School of Public Health, Boston MA (S-LTN); Cambridge Health Alliance and Harvard Medical School (MA)

Abstract

Objective—This study evaluated the effect of race-ethnicity and geography on the adoption of a pharmacological innovation (long-acting injectable risperidone, LAIR) among Medicaid beneficiaries with schizophrenia, and also evaluated the contribution of geographic location to observed racial-ethnic disparities.

Methods—Data source was a claims dataset from the Florida Medicaid program for the 2.5 year period that followed the launch of LAIR in the US market. Study participants were beneficiaries with schizophrenia who had filled at least 1 antipsychotic prescription during the study period. Outcome variable was any use of LAIR; model variables were need indicators and random effects for 11 Medicaid areas, multi-county units used by the Medicaid program to administer benefits. Adjusted probability of use of LAIR for blacks and Latinos versus whites was estimated with logistic regression models.

Results—The study cohort included 13,992 Medicaid beneficiaries: 25% blacks, 37% Latinos, and 38% whites. Unadjusted probability of LAIR use was lower for Latinos than whites and it varied across the state's geographic areas. Adjustment for need confirmed the unadjusted finding of a Latino-white disparity (OR = .58, 95% CI = .49–.70). While the inclusion of geographic location in the model eliminated the Latino-white disparity, doing so confirmed the unadjusted finding of geographic variation in adoption.

Conclusions—Within a state Medicaid program, the initial finding of a Latino-white adoption disparity was driven by geographic disparities in adoption rates and the geographic concentration of Latinos in a low-adoption area. Possible contributors and implications of these results are discussed.

Introduction

Although schizophrenia affects .7% of the US population (1), it has a much larger societal impact due to its early age of onset, chronicity, significant disability, and premature mortality (2). Underuse of recommended interventions is widespread (3), and quality of care is modest at best (4–6). Moreover, minority groups with schizophrenia are less likely than whites to receive recommended interventions (7, 8). While much has been learned about factors associated with adoption of health care innovations (9, 10), little is known on

whether race-ethnicity influences access to innovative treatments for schizophrenia in the period that follows their release to market (11–13).

Several factors are associated with the existence and persistence of racial-ethnic service disparities in the US. The Institute of Medicine conceptualized service disparities as the outcome of both direct race-ethnicity effects and effects mediated by the socio-economic status, insurance coverage, and geographic location of minority groups (14). Geography is treated as a mediator of disparities because it is assumed that for minority groups, geographic location is the result of discrimination and lack of opportunities and not a personal choice (15). As demonstrated by Wennberg and colleagues, the characteristics of the communities where patients live are associated with the volume and quality of care they receive (<http://www.dartmouthatlas.com/index.shtml>) (16). Multiple factors are likely to be implicated in these unwarranted geographic variations in care; key among them are differences in clinicians' treatment practices and other characteristics of the health care system (17). Because minority groups are not homogeneously distributed across the US, geographic disparities can confound the estimation of racial-ethnic service disparities when the latter are assessed over large and diverse geographic areas (18, 19).

We sought to assess the effect of race-ethnicity and geography on the adoption of an evidence-based innovation among Medicaid beneficiaries with schizophrenia residing in Florida. In addition, we sought to assess the contribution of geographic location to observed racial-ethnic disparities. We focused on Medicaid because of its primary role as payor of health services for people with schizophrenia (20), and selected Florida because of its size, and its diverse population. The evidence-based innovation is the long-acting injectable formulation of the atypical antipsychotic risperidone, approved by the US Food and Drug Administration (FDA) on October 29 2003. Two characteristics of the antipsychotic prescribing practices prevalent in the US during the period that preceded the launch of long-acting injectable risperidone (LAIR) render this drug an interesting case study. First, LAIR is the only atypical long-acting injectable antipsychotic available in the US. This is significant because in the early 2000's, atypical antipsychotics were generally thought to be more effective and safer than conventional antipsychotics (21). Second, despite the recommendation by key clinical guidelines to consider long-acting injectable antipsychotics for persons with poor medication adherence (23–25), multiple studies conducted prior to the launch of LAIR show low use of long-acting injectable antipsychotics in the US (26–28), perhaps because providers perceive these agents as coercive (29, 30). Hence, at the time of its market launch, LAIR held the promise of ensuring greater adherence to atypical antipsychotics, a medication class that was regarded as therapeutically superior (31, 32). Third, disparities research on these antipsychotic practices (use of atypicals, use of long-acting injectables) suggests the existence of racial disparities working in different directions. While studies show that use of the purportedly superior atypicals is lower among blacks than whites (8, 22), some (e.g., (22) but not all (27) studies conducted before the launch of LAIR show that use of the purportedly coercive long-acting injectable antipsychotics is higher among blacks than whites.

Methods

We studied racial-ethnic disparities in adoption of LAIR among black, Latino, and non-Latino white Florida Medicaid beneficiaries with comparable need for LAIR. In our primary model, we used the disparities definition proposed by the Institute of Medicine and only adjusted for need variables. We estimated a second model that included geographic location to evaluate whether geographic disparities exist and whether geography affects the racial-ethnic disparity estimates.

Data Sources and Study Population

We used enrollment files and medical and pharmacy claims from the Florida state Medicaid program for the period 1/1/2004 – 6/30/2006. Our study population was a cohort of continuously enrolled adults aged 18–64 years who during the study period had at least two claims recorded on two different dates with a diagnosis of schizophrenia or schizoaffective disorder (*International Classification of Diseases, Ninth Revision* [ICD-9] diagnostic code 295.xx) and who had filled at least 1 antipsychotic prescription. We defined continuous enrollment as having no more than two consecutive months of lapsed Medicaid enrollment and at least 23 months of enrollment over the 30-month study period. We excluded beneficiaries who had less than 3 months of enrollment prior to the 1st filled antipsychotic prescription. We also excluded beneficiaries with Medicare coverage or with more than 2 months of Health Maintenance Organization coverage during the study period because we could not observe all their care.

Key Variables

Outcome Variable—Our main outcome variable was any use of LAIR, a binary-valued variable defined as 1 or more LAIR fills observed during the study period. We identified LAIR prescriptions of all strengths through national drug codes, unique product identifiers for all human drugs commercialized in the US.

Explanatory Variables—Our main explanatory variable was race-ethnicity defined as black, Latino, and non-Latino white. The Florida Medicaid program uses a racial classification that describes beneficiaries as white, black, Hispanic, Oriental, American Indian, or “Other.” Because less than 1% of people in our cohort were classified as Oriental or American Indian during the study period, these groups were excluded from the analyses. While the percent of people who were classified as black or white varied little during the study period, the percent of people classified as “Other” and Hispanic varied dramatically due to changes in data recording. Analyses of beneficiaries present in the data in fiscal years (FYs) 2005 and 2006 (i.e., between 7/1/2004 and 6/30/2005) showed that 92% of beneficiaries classified as Hispanic in FY 2006 had been classified as “Other” in FY 2005. Conversely, analyses of individuals classified as “Other” in FY 2005 who were also observed in FY 2006 revealed that 71% were reclassified as Hispanic in FY 2006. Most of the remaining 29% remained “Other,” suggesting that they too were Hispanic. Because a majority of those classified as “Other” during our study period were classified as Hispanic in previous or subsequent years, we reclassified the “Other” group as “*Ever Hispanic*.” As a result of this decision, we have some minor misclassification in our racial-ethnic groups. Individuals classified as Hispanic or “Ever Hispanic” are referred to as Latinos.

Our second primary explanatory variable was geographic location defined by 11 geographic units used by the Florida Medicaid program to administer benefits (<http://www.fdhc.state.fl.us/Medicaid/Areas>). Because of their geographic, cultural, and socioeconomic differences, these geographic units –henceforth referred to as *areas*– have some latitude to discharge their administrative and quality management functions. Florida Medicaid areas encompass one to sixteen contiguous counties (median = 5). Beneficiaries were assigned to the area they resided at the date of the first filled prescription for an antipsychotic drug.

Our model included several variables found to be associated with adherence to antipsychotic medication, the main indicator of need for LAIR (33–36): age (continuous); sex; substance use disorder comorbidity; and three measures of illness severity (psychiatric comorbidity, intensity of use of inpatient services for schizophrenia, and benefit mechanism). Benefit mechanism is considered an indicator of illness severity because Social Security Insurance

(SSI) eligibility suggests a more chronic and disabling illness. Because patients' physical health status may influence the decision to prescribe LAIR, we also included two measures of medical comorbidity: metabolic comorbidity and other medical comorbidity.

Race-ethnicity, age, sex, and geographic location were assessed at the date of the first filled antipsychotic prescription. All other variables were constructed with data observed during the 3-month period preceding the 1st filled antipsychotic prescription. The comorbidity measures required the observation of 1 or more claims with selected ICD-9 diagnoses. Diagnoses used to construct the psychiatric comorbidity variable were major depression, dysthymia, panic disorder, obsessive compulsive disorder, and specific personality disorders among others. Diagnoses used to construct the substance use disorder comorbidity variable were abuse/dependence of drugs or alcohol. Diagnoses used to construct the metabolic comorbidity variable were diabetes, dyslipidemias, and obesity. Diagnoses used to construct the other medical comorbidity variable included cardiovascular and cerebrovascular disorders, neurologic disorders, and hypertension among others. ICD-9 codes used are available from the authors upon request. Intensity of inpatient service use was defined as the total number of inpatient days for schizophrenia. Benefit mechanism was a categorical variable reflecting the mechanism most frequently observed (SSI versus Aid for Families and Dependent Children [AFDC]).

Statistical Analyses

The unit of observation for our analyses was the beneficiary. We used logistic regression to model the log-odds of the probability of LAIR use as a function of race-ethnicity (blacks and Latinos versus non-Latino whites) and explanatory variables. The primary model included age, sex, all the comorbidity variables, intensity of inpatient use, and benefit mechanism. The secondary model included all primary model variables as well as random effects for each geographic region to account for within-region correlation. This strategy reflected our assumption that, all else being equal, the probability of use of LAIR for two beneficiaries living in the same area would be more alike than the probability for two beneficiaries living in two different areas. We assumed the random effects arose from a normal distribution. To assess for racial/ethnic effects that are uncorrelated with geographic effects, we also ran the secondary model including geographic region as a fixed effect.

Data were analyzed using SAS version 9.1 (20). We fit a random effects model with Proc NLMixed and used a critical value of .05 to evaluate statistical significance of the P values. We report our adjusted findings as odds ratios (OR) and 95% confidence intervals (CI).

Our study was granted exempt status by the University of Pittsburgh IRB because we used previously collected data that had no personal identifiers (study was initiated when first author was at University of Pittsburgh).

Results

Study Sample Characteristics

We observed the care received by 13,992 Medicaid beneficiaries during the study period. Our sample included 25% blacks, 37% Latinos, and 38% whites. Mean age was 44 $\pm$ 11.4 years and 52% were female. Three percent and 11% had any substance use disorder and any psychiatric comorbidity, respectively, and mean number of schizophrenia-related inpatient days was .6 $\pm$ 3.4, with a range of 0–67 days. Eight percent and 18% had any metabolic and any other medical comorbidity, respectively. Medicaid eligibility was mediated by SSI for 89% of the sample. As shown in Table 1, the racial-ethnic groups differed with regard to all the need variables.

Probability of LAIR Use

Unadjusted analyses—The overall unadjusted probability of LAIR use was 6.5%. Probability of LAIR use was comparable for blacks and whites (8.2% vs. 7.2%; OR = 1.66, CI = .99–1.36). Latinos, however, had a lower probability of LAIR use than whites (4.6% vs. 7.2%; OR = .62, CI = .53–.73).

The unadjusted probability of LAIR use varied across the Medicaid areas. Probability of LAIR use was lowest in areas 2 and 11 (3.1% and 3.7%, respectively), and highest in areas 1 and 9 (12.3% and 14.2%, respectively) (Table 2). While all racial-ethnic groups were unequally distributed across the state (Table 2), Latinos were the most concentrated, with 73% of Latino beneficiaries residing in area 11 (Miami Dade and Monroe counties). Although blacks were as likely as whites to reside in the two areas with the highest rates of LAIR use (10.9% and 10.8%, respectively), a higher proportion of them resided in the two areas with the lowest rates of LAIR use (38% and 28%, blacks and whites respectively).

Multivariate analyses

Primary Model: Adjustment for need variables did not fundamentally change our unadjusted findings (Table 3). Blacks did not differ significantly from whites in their probability of LAIR use (OR = .98, CI = .82–1.16), yet Latinos' probability of LAIR use was lower than that of whites (OR = .58, CI = .49–.70).

Secondary Model: Inclusion of the geographic random effects in the model eliminated the Latino-white disparity (Table 3), a result that remained unchanged when area was included as a fixed effect (results not shown). Further, the odds of LAIR use varied substantially across areas, ranging from a low of .44, CI = .30–.64 in area 11, to a high of 1.91, CI = 1.18–3.10 in area 1. Compared to the state average, odds of LAIR use were significantly lower for areas 2 and 11, and significantly higher for areas 1 and 9.

Other Findings: In both models, odds of LAIR use were higher for beneficiaries of younger age or with SSI benefits, and those with heavier inpatient use for schizophrenia or medical comorbidities (Table 3).

Discussion

Our Florida-wide study of LAIR use among Medicaid beneficiaries during the 30-month period that followed its FDA approval offers a unique window into the process of adoption of mental health innovations within a large and diverse state Medicaid program. Whether racial-ethnic disparities exist in the adoption of LAIR depends on whether geographic effects are accounted for. When we assessed for adoption disparities within the entire Florida Medicaid state program, we found that Latinos had a lower probability of LAIR use than whites. Once we accounted for beneficiaries' geographic location, the Latino-white adoption disparity evaporated. The explanation for the powerful effect of geography on the estimation of ethnic disparities lies in two phenomena: the geographic concentration of Latino Medicaid beneficiaries, and geographic disparities in LAIR adoption within the state of Florida. Because choice of geographic area of residence depends on unobserved subject and geographic factors that may be related to medication use, our results are only associative and not causative.

We are only aware of three previous studies that have produced evidence of disparities in the adoption of antipsychotic medications in the US. A study conducted in the Veterans Health Administration (VHA) found that black and Latino veterans with schizophrenia were less likely than whites to use ziprasidone immediately following its launch into the US market

(11). However, authors found little evidence of disparities across administrative VHA regions. Opolka and colls assessed for racial-ethnic disparities in receipt of olanzapine versus a conventional oral antipsychotic among Texas Medicaid adults with schizophrenia during a 20-month period that covered the market launch of olanzapine (13). Upon adjusting for health status and geographic region, they found that blacks but not Mexican-Americans were less likely than whites to receive olanzapine. Authors also found geographic variation in adjusted probability of olanzapine use. In a similarly designed study, Opolka and colls assessed for racial differences in receipt of olanzapine versus an established atypical antipsychotic; they did not find racial disparities but found geographic variations (12). Our study differs from these studies in two respects. First, we framed our study both conceptually and methodologically as an investigation of disparities in the adoption of a new medical technology. Because policy remedies differ depending on whether the main issue is racial-ethnic versus geographic variations (37), we explicitly sought to disentangle the effects of race-ethnicity and geography in the estimation of racial-ethnic disparities. Second, we contrasted probability of use of the innovation versus use of all other antipsychotics and systematically assessed for geographic disparities through a random effects approach that accounted for within-region correlation.

Our finding that the Florida Medicaid areas differed in their LAIR adoption rates adds to a small body of research suggesting geographic variation in adoption of mental health innovations within state Medicaid programs (12, 13, 38, 39). Why would geographic variations exist for fee for service Medicaid beneficiaries subject to the same drug coverage and utilization management policies, and unaffected by potential differences in managed care contracts? Although we were unable to generate evidence on the drivers of these variations, the literature points to possible explanations. The rate at which an innovation spreads through the health care system is associated with factors related to patients (race-ethnicity, socioeconomic status, and preferences); clinicians (knowledge and attitudes); the system of care (policies, organizational structure, and culture); and private sector initiatives (advocacy, pharmaceutical promotion) (3, 9, 10, 40–46). Evidence of differences in use of long-acting injectable antipsychotics across US facilities subject to the same regulatory and financial constraints (47, 48) suggests that the culture and the organizational structure in which prescribers operate may have played an important role in the observed geographic variations in adoption of LAIR. While cultural factors of relevance include opinion leaders and attitudes toward and exposure to pharmaceutical promotion, a key structural factor is the availability of nursing staff to administer injections (49, 50).

Our finding that geographic disparities confounded the estimation of racial-ethnic disparities when these were assessed for the entire state is in keeping with studies of other populations (19, 51). However, as far as we are aware, ours is the first such finding for a Medicaid population with schizophrenia.

In the absence of extraneous dynamics, rate of adoption of new health care technologies should be similar for all those who stand to benefit from its use. Although the field no longer regards atypical antipsychotics as the standard of care (52), and recent studies have produced mixed evidence on the effectiveness of long-acting injectable antipsychotics and LAIR (53, 54), our study peers into a time when LAIR held the promise of delivering the advantages of both atypicals and long-acting injectable antipsychotics.

Our study has some limitations. First, because of the observational nature of our design, our study may not have compared racial-ethnic groups that were entirely balanced with regard to history of poor medication adherence and other factors affecting need for long-acting injectable antipsychotics. Second, the generalizability of our study may be limited due to our

focus on Florida, a state that differs from many others because of its racial-ethnic diversity and its restrictive requirements for Medicaid eligibility.

In conclusion, our results indicate that within a state Medicaid program, the initial finding of a Latino-white disparity in the adoption of a novel treatment for schizophrenia was driven by geographic disparities in adoption rates and the geographic concentration of Latinos in a low-adoption area. When we accounted for place of residence, the ethnic disparity disappeared. Our study adds to an expanding body of evidence suggesting that as a result of the heterogeneous distribution of racial-ethnic groups, racial-ethnic disparity estimates that represent average effects over large geographic areas may be confounded by the unaccounted effects of geographic variations. This evidence has important implications for efforts to eradicate disparities and improve quality of care for all.

References

1. Saha S, Chant D, Welham J, et al. A systematic review of the prevalence of schizophrenia. *PLoS Medicine*. 2005; 2:e141. [PubMed: 15916472]
2. USDHHS. Mental Health: A Report of the Surgeon General. Rockville, MD: U.S. Department of Health and Human Services, Office of the Surgeon General; 1999.
3. Horvitz-Lennon M, Donohue JM, Domino ME, et al. Improving quality and diffusing best practices: The case of schizophrenia. *Health Affairs (Millwood)*. 2009; 28:701–712.
4. Young AS, Sullivan G, Burnam MA, et al. Measuring the quality of outpatient treatment for schizophrenia. *Archives of General Psychiatry*. 1998; 55:611–617. [PubMed: 9672051]
5. Lehman AF, Steinwachs DM. Project SC-IotP: Patterns of usual care for schizophrenia: Initial results from the schizophrenia patient outcomes research team (PORT) client survey. *Schizophrenia Bulletin*. 1998; 24:11–20. [PubMed: 9502543]
6. Busch AB, Lehman AF, Goldman H, et al. Changes over time and disparities in schizophrenia treatment quality. *Medical Care*. 2009; 47:199–207. [PubMed: 19169121]
7. Wang PS, Demler O, Kessler RC. Adequacy of treatment for serious mental illness in the United States. *American Journal of Public Health*. 2002; 92:92–98. [PubMed: 11772769]
8. Kuno E, Rothbard AB. Racial disparities in antipsychotic prescription patterns for patients with schizophrenia. *American Journal of Psychiatry*. 2002; 159:567–572. [PubMed: 11925294]
9. Cabana MD, Rand CS, Powe NR, et al. Why don't physicians follow clinical practice guidelines?: A framework for improvement. *Journal of the American Medical Association*. 1999; 282:1458–1465. [PubMed: 10535437]
10. Greenhalgh T, Robert G, Macfarlane F, et al. Diffusion of innovations in service organizations: Systematic review and recommendations. *The Milbank Quarterly*. 2004; 82:581–629. [PubMed: 15595944]
11. Valenstein M, McCarthy JF, Ignacio RV, et al. Patient- and facility-level factors associated with diffusion of a new antipsychotic in the VA health system. *Psychiatric Services*. 2006; 57:70–76. [PubMed: 16399965]
12. Opolka JL, Rascati KL, Brown CM, et al. Ethnicity and prescription patterns for haloperidol, risperidone, and olanzapine. *Psychiatric Services*. 2004; 55:151–156. [PubMed: 14762239]
13. Opolka JL, Rascati KL, Brown CM, et al. Ethnic differences in use of antipsychotic medication among Texas Medicaid clients with schizophrenia. *Journal of Clinical Psychiatry*. 2003; 64:635–639. [PubMed: 12823076]
14. Smedley, BD.; Stith, AY.; Nelson, AR. Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care. Washington, DC: National Academy Press; 2003.
15. McGuire TG, Alegria M, Cook BL, et al. Implementing the Institute of Medicine definition of disparities: An application to mental health care. *Health Services Research*. 2006; 41:1979–2005. [PubMed: 16987312]
16. Fisher ES, Wennberg DE, Stukel TA, et al. The implications of regional variations in Medicare spending. Part 1: The content, quality, and accessibility of care. *Annals of Internal Medicine*. 2003; 138:273–287. [PubMed: 12585825]

17. Wennberg JE. Time to tackle unwarranted variations in practice. *British Medical Journal*. 2011
18. Baicker K, Chandra A, Skinner JS. Geographic variation in health care and the problem of measuring racial disparities. *Perspectives in Biology and Medicine*. 2005; 48:S42–S53. [PubMed: 15842086]
19. Chandra, A.; Skinner, JS. *Geography and Racial Health Disparities*. Cambridge, MA: Social Science Research Network (SSRN); 2003.
20. Frank, RG.; Glied, SA. *Better but Not Well: Mental Health Policy in the U.S. since 1950*. Baltimore: Johns Hopkins University Press; 2006.
21. Kane JM, Leucht S, Carpenter D, et al. The Expert Consensus Guideline Series. Optimizing pharmacologic treatment of psychotic disorders. Introduction: Methods, commentary, and summary. *Journal of Clinical Psychiatry*. 2003; 64:5–19. [PubMed: 14640142]
22. Kreyenbuhl J, Zito JM, Buchanan RW, et al. Racial disparity in the pharmacological management of schizophrenia. *Schizophrenia Bulletin*. 2003; 29:183–194. [PubMed: 14552495]
23. Lehman AF, Kreyenbuhl J, Buchanan RW, et al. The schizophrenia patient outcomes research team (PORT): Updated treatment recommendations 2003. *Schizophrenia Bulletin*. 2004; 30:193–217. [PubMed: 15279040]
24. Lehman AF, Lieberman JA, Dixon LB, et al. Practice guideline for the treatment of patients with schizophrenia, second edition. *American Journal of Psychiatry*. 2004; 161:1–56. [PubMed: 15000267]
25. Lehman AF, Steinwachs DM. Co-Investigators of the PORT Project: Translating research into practice: The schizophrenia patient outcomes research team (PORT) treatment recommendations. *Schizophrenia Bulletin*. 1998; 24:1–10. [PubMed: 9502542]
26. Rosenheck RA, Desai R, Steinwachs D, et al. Benchmarking treatment of schizophrenia: A comparison of service delivery by the national government and by state and local providers. *Journal of Nervous & Mental Disease*. 2000; 188:209–216. [PubMed: 10789997]
27. West JC, Marcus SC, Wilk J, et al. Use of depot antipsychotic medications for medication nonadherence in schizophrenia. *Schizophrenia Bulletin*. 2008; 34:995–1001. [PubMed: 18093962]
28. Fayek M, Flowers C, Signorelli D, et al. Psychopharmacology: Underuse of evidence-based treatments in psychiatry. *Psychiatric Services*. 2003; 54:1453–1454. 1456. [PubMed: 14600298]
29. Glazer WM. Who receives long-acting antipsychotic medications? *Psychiatric Services*. 2007; 58 437–
30. Heres S, Hamann J, Kissling W, et al. Attitudes of psychiatrists toward antipsychotic depot medication. *Journal of Clinical Psychiatry*. 2006; 67:1948–1953. [PubMed: 17194274]
31. Burton SC. Strategies for improving adherence to second-generation antipsychotics in patients with schizophrenia by increasing ease of use. *Journal of Psychiatric Practice*. 2005; 11:369–378. [PubMed: 16304505]
32. Chue P. Risperidone long-acting injection. *Expert Review of Neurotherapeutics*. 2003; 3:435–446. [PubMed: 19810928]
33. Fenton WS, Blyler CR, Heinssen RK. Determinants of medication compliance in schizophrenia: Empirical and clinical findings. *Schizophrenia Bulletin*. 1997; 23:637–651. [PubMed: 9366000]
34. Valenstein M, Blow FC, Copeland LA, et al. Poor antipsychotic adherence among patients with schizophrenia: Medication and patient factors. *Schizophrenia Bulletin*. 2004; 30:255–264. [PubMed: 15279044]
35. Lacro JP, Dunn LB, Dolder CR, et al. Prevalence of and risk factors for medication nonadherence in patients with schizophrenia: A comprehensive review of recent literature. *Journal of Clinical Psychiatry*. 2002; 63:892–909. [PubMed: 12416599]
36. Gilmer TP, Dolder CR, Lacro JP, et al. Adherence to treatment with antipsychotic medication and health care costs among Medicaid beneficiaries with schizophrenia. *American Journal of Psychiatry*. 2004; 161:692–699. [PubMed: 15056516]
37. Fisher, ES.; Goodman, DC.; Chandra, A. A Brief Report Of The Dartmouth Atlas Project. Dartmouth Institute for Health Policy and Clinical Practice / Robert Wood Johnson Foundation; 2008. Regional and Racial Variation in Health Care Among Medicare Beneficiaries. Available from: <http://www.rwjf.org/qualityequality/product.jsp?id=36729>.

38. Liu GG, Sun SX, Christensen DB, et al. Choice of atypical antipsychotic therapy for patients with schizophrenia: An analysis of a Medicaid population. *Current Therapeutic Research*. 2005; 66:463–474.
39. Rascati KL, Johnsrud MT, Crismon ML, et al. Olanzapine versus risperidone in the treatment of schizophrenia : A comparison of costs among Texas Medicaid recipients. *Pharmacoeconomics*. 2003; 21:683–697. [PubMed: 12828491]
40. Landon BE, Wilson IB, Cleary PD. A conceptual model of the effects of health care organizations on the quality of medical care. *Journal of the American Medical Association*. 1998; 279:1377–1382. [PubMed: 9582046]
41. Drake R, Skinner J, Goldman HH. What explains the diffusion of treatments for mental illness? *American Journal of Psychiatry*. 2008; 165:1385–1392. [PubMed: 18981070]
42. Domino ME, Frank RG, Rosenheck R. The diffusion of new antipsychotic medications and formulary policy. *Schizophrenia Bulletin*. 2003; 29:95–104. [PubMed: 12908664]
43. Smedley BD. Moving beyond access: Achieving equity in state health care reform. *Health Affairs*. 2008; 27:447–455. [PubMed: 18332501]
44. Zuvekas SH, Taliaferro GS. Pathways to access: Health insurance, the health care delivery system, and racial/ethnic disparities, 1996–1999. *Health Affairs*. 2003; 22:139–153. [PubMed: 12674417]
45. Alegria M, Perez DJ, Williams S. The role of public policies in reducing mental health status disparities for people of color. *Health Affairs*. 2003; 22:51–64. [PubMed: 14515881]
46. Figueiras A, Caamano F, Gestal-Otero JJ. Influence of physician's education, drug information and medical-care settings on the quality of drugs prescribed. *European Journal of Clinical Pharmacology*. 2000; 56:747–753. [PubMed: 11214787]
47. Valenstein M, Copeland LA, Owen R, et al. Adherence assessments and the use of depot antipsychotics in patients with schizophrenia. *Journal of Clinical Psychiatry*. 2001; 62:545–551. [PubMed: 11488366]
48. Citrome L, Levine J, Allingham B. Utilization of depot neuroleptic medication in psychiatric inpatients. *Psychopharmacology Bulletin*. 1996; 32:321–326. [PubMed: 8961774]
49. Arbuckle MR, Gameroff MJ, Marcus SC, et al. Psychiatric opinion and antipsychotic selection in the management of schizophrenia. *Psychiatric Services*. 2008; 59:561–565. [PubMed: 18451017]
50. Greenhalgh T, Robert G, Macfarlane F, et al. Diffusion of innovations in service organizations: Systematic review and recommendations. *Milbank Quarterly*. 2004; 82:581–629. [PubMed: 15595944]
51. Skinner J, Weinstein JN, Sporer SM, et al. Racial, ethnic, and geographic disparities in rates of knee arthroplasty among Medicare patients. *New England Journal of Medicine*. 2003; 349:1350–1359. [PubMed: 14523144]
52. Carpenter WT, Buchanan RW. Lessons to take home from CATIE. *Psychiatric Services*. 2008; 59:523–525. [PubMed: 18451009]
53. Rosenheck RA, Krystal JH, Lew R, et al. Long-acting risperidone and oral antipsychotics in unstable schizophrenia. *New England Journal of Medicine*. 2011; 364:842–851. [PubMed: 21366475]
54. Tiihonen J, Haukka J, Taylor M, et al. A nationwide cohort study of oral and depot antipsychotics after first hospitalization for schizophrenia. *American Journal of Psychiatry*. 2011; 168:603–609. [PubMed: 21362741]

Table 1

Sample Characteristics, by Racial-Ethnic Group

Variable	All		Blacks		Latinos		Whites		P Value
	N	%	N	%	N	%	N	%	
Age, mean $\pm$ SD	44 $\pm$ 11.4		42 $\pm$ 11.2		45 $\pm$ 11.2		45 $\pm$ 11.4		<.001
Female	7320	52.3	1748	49.6	2919	56.9	2653	49.7	<.001
Psychiatric comorbidity	1546	11.1	346	9.8	640	12.5	560	10.5	<.001
Substance use disorder comorbidity	466	3.3	182	5.2	114	2.2	170	3.2	<.001
Inpatient days, mean $\pm$ SD	.6 $\pm$ 3.4		.9 $\pm$ 4.0		.6 $\pm$ 3.5		.5 $\pm$ 2.9		<.001
Metabolic comorbidity	1178	8.4	277	7.9	522	10.2	379	7.1	<.001
Other medical comorbidity	2443	17.5	662	18.8	992	19.4	789	14.8	<.001
Social Security Insurance (SSI)	12,428	88.8	3,275	93.0	4,753	93.0	4400	82.4	<.001
Total beneficiaries	13,992	100.0	3523	25.2	5126	36.6	5343	38.2	

Table 2

Racial-Ethnic Distribution of Adult Medicaid Beneficiaries with Schizophrenia across 11 Florida Medicaid Areas, Ordered in Ascending Unadjusted Probability of LAIR Use

Medicaid Area	2	11	8	7	4	6	10	5	3	1	9											
Probability of LAIR use [‡]	3.1	3.7	6.5	6.8	6.8	7.8	8.7	9.4	9.8	12.3	14.2											
	Number (N) and Percent* (%) of Beneficiaries in Area																					
	N	%	N	%	N	%	N	%	N	%	N	%										
All	605	4.3	6037	43.2	372	2.7	753	5.4	1283	9.2	606	4.3	945	6.8	1088	7.8	325	2.3	798	5.7		
Blacks	273	7.8	1052	29.9	5.7	1.6	209	5.9	486	13.8	137	3.9	427	12.1	168	4.8	331	9.4	9.1	2.6	292	8.3
Latinos	69	1.4	3749	73.1	86	1.7	197	3.8	178	3.5	135	2.6	269	5.3	123	2.4	157	3.1	33	.6	130	2.5
Whites	263	4.9	1236	23.1	229	4.3	347	6.5	619	11.6	334	6.3	484	9.1	654	12.2	600	11.2	201	3.8	376	7.0

[‡] These are unadjusted probabilities not fitted with a random effects model

* Row percent: shaded in pink if 10% and in orange if 50% of racial-ethnic group in Area

Table 3
Adjusted Estimates for Probability of LAIR Use, Florida Medicaid, January 1, 2004 – June 30, 2006.

Beneficiary Characteristic	Primary Model					Secondary Model ⁴				
	Log-Odds Ratio	SE	P-Value	Odds Ratio	95% CI for OR	Log-Odds Ratio	SE	P-Value	Odds Ratio	95% CI for OR
Black *	-.023	.087	NS	.98	.82–1.16	.084	.089	NS	1.09	.89–1.33
Latino *	-.542	.092	<.000	.58	.49–.70	-.108	.101	NS	.90	.72–1.12
Age	-.027	.003	<.000	.97	.97–.98	-.022	.003	<.000	.98	.97–.99
Female	-.083	.075	NS	.92	.80–1.07	-.126	.076	NS	.88	.74–1.04
Substance use disorder comorbidity [‡]	.081	.158	NS	1.08	.80–1.48	.023	.160	NS	1.02	.72–1.46
Psychiatric comorbidity [‡]	.202	.105	NS	1.22	.99–1.50	.214	.107	NS	1.24	.98–1.57
Intensity of inpatient use	.131	.007	<.000	1.14	1.12–1.16	.142	.008	<.000	1.15	1.13–1.17
AFDC [∞]	-1.275	.373	.001	0.27	.13–.58	-1.234	.379	.009	.29	.13–.68
Metabolic comorbidity [‡]	.632	.109	<.000	1.88	1.52–2.33	.625	.111	.000	1.87	1.46–2.39
Other medical comorbidity [‡]	.706	.087	<.000	2.03	1.71–2.40	.771	.088	<.000	2.16	1.78–2.63
Area 1						.649	.217	.014	1.91	1.18–3.10
2						-.777	.248	.011	.46	.26–.80
3						.377	.179	NS	1.46	.98–2.17
4						-.146	.182	NS	.86	.58–1.30
5						.258	.185	NS	1.29	.86–1.95
6						.009	.207	NS	1.01	.64–1.60
7						-.132	.201	NS	.88	.56–1.37
8						.067	.234	NS	1.07	.64–1.80
9						.633	.181	.006	1.88	1.26–2.82
10						-.025	.181	NS	.98	.65–1.46
11						-.830	.170	.001	.44	.30–.64

⁴ Between-area variance component estimated as .23 (p-value = .056)

* Reference category = white

Reference category = absence of comorbidity

Reference category = SSI