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## Racial differences in the availability and use of electroconvulsive therapy for recurrent major depression

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### Abstract

**Background**—Black Americans with depression were less likely to receive electroconvulsive therapy (ECT) than whites during the 1970's and 80's. This pattern was commonly attributed to treatment of blacks in lower quality hospitals where ECT was unavailable. We investigated whether a racial difference in receiving ECT persists, and, if so, whether it arises from lesser ECT availability or from lesser ECT use within hospitals conducting the procedure.

**Methods**—Black or white inpatient stays for recurrent major depression from 1993-2007 (N=419,686) were drawn from an annual sample of US community hospital discharges. The marginal disparity ratio estimated adjusted racial differences in the probabilities of (1) admission to a hospital capable of conducting ECT (availability), and (2) ECT utilization if treated where ECT is conducted (use).

**Results**—Across all hospitals, the probability of receiving ECT for depressed white inpatients (7.0%) greatly exceeded that for blacks (2.0%). Probability of ECT availability was slightly greater for whites than blacks (62.0% versus 57.8%), while probability of use was markedly greater (11.8% versus 3.9%). The white versus black marginal disparity ratio for ECT availability was 1.07 (95% confidence interval 1.06-1.07) and stable over the period, while the ratio for use fell from 3.2 (3.1-3.4) to 2.5 (2.4-2.7).

**Limitations**—Depressed persons treated in outpatient settings or who receive no care are excluded from analyses.

**Conclusions**—Depressed black inpatients continue to be far less likely than whites to receive ECT. The difference arises almost entirely from lesser use of ECT within hospitals where it is available.

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## Keywords

recurrent major depression; electroconvulsive therapy (ECT); racial disparities

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## INTRODUCTION

Black Americans with depression are less likely to receive care than their white counterparts (Gonzalez *et al.*, 2010, Roy-Byrne *et al.*, 2009). When depressed blacks do receive outpatient treatment, it is typically less intensive (Gonzalez *et al.*, 2010, Olfson *et al.*, 2009, Sue *et al.*, 1994), of lower quality (Young *et al.*, 2001), and less commonly provided by specialists. (Young *et al.*, 2001) Little is known about whether comparable racial differences exist in the treatment of severe, chronic depressive illness, which is more likely than milder or transient depression to prompt recognition and treatment seeking (Kessler *et al.*, 2003) and which may have the most dire health consequences. Further, almost nothing is known about the causes of observed racial differences in depression care, which might arise from differences in access to high quality providers, in reimbursement practices, symptomatic presentation of depressive psychopathology (Wohi *et al.*, 1997), health literacy, cultural values (Mojtabai, 2009), or provider bias.

One productive approach to documenting and understanding disparities in the care of severe medical illness is examining whether racial variation in hospital quality explains observed differences in treatment use and health outcomes. For example, studies have shown that lesser black admissions to high quality cardiac and pulmonary care hospital units, rather than inferior treatment of blacks within these facilities, explains much of the racial differences observed in treatment of valvular disease, lung cancer, and myocardial infarction. (Neighbors *et al.*, 2007, Popescu *et al.*, 2011, Schelbert *et al.*, 2005).

No comparable research on depression treatment has yet been conducted, but one promising opportunity for study is racial variation in the availability and use of electroconvulsive therapy (ECT). ECT availability is an objective and important measure of the quality of hospital care for depressed inpatients. ECT is the treatment of choice for treatment-resistant depression and depressive episodes with psychotic features, catatonia, severe suicidality, or food refusal with nutritional compromise (American Psychiatric Association, 2001). ECT is also widely regarded as the most efficacious treatment for major depressive disorder (Pagnin *et al.*, 2004) and is no less effective in blacks than whites. (Williams *et al.*, 2008). Further, ECT requires specialized equipment and personnel and is unavailable at many hospitals. (Hermann *et al.*, 1995). Racial differences in the availability of ECT to depressed inpatients would provide a clear indication of racial differences in the quality of hospital care. In addition, research on receipt of ECT would allow for the first time an understanding of whether racial variation in the quality of treating hospitals explains some or all of observed racial differences in depression care.

Data from the 1970's through the early 1990's indicate that depressed black inpatients were a third to a tenth as likely as whites to receive ECT. (Breakey and Dunn, 2004, Kramer, 1985, 1990, 1999, Morrissey *et al.*, 1981, Olfson *et al.*, 1998, Thompson *et al.*, 1994) Contemporary speculation about the cause of this difference largely focused on *de facto* racial segregation of black Americans into lower quality hospitals. (Asnis *et al.*, 1978, Bailine and Rau, 1981, Kramer, 1990) This inference was supported indirectly by data demonstrating that psychiatric treatment of blacks has been disproportionately conducted in public facilities (Milazzo-Sayre *et al.*, 2000), and that ECT availability was substantially lower in public than private hospitals during the period. (Asnis *et al.*, 1978, Hermann *et al.*, 1998, Kramer, 1990, Mills *et al.*, 1984, Reid *et al.*, 1998, Thompson *et al.*, 1994) Despite

these suggestive findings, the influence of hospital ECT availability on racial patterns in care has never been examined and no recent national data on racial differences in receipt of ECT exist. Further, a study from one hospital reported that the odds of receiving ECT for affective illness for whites was almost three times that of blacks, indicating large racial differences may exist even within hospitals offering the procedure.(Breakey and Dunn, 2004).

We now examine national trends in racial differences in the availability and use of inpatient ECT for recurrent major depressive disorder using data from a large, representative hospital sample over a fifteen-year period from 1993 to 2007. We test hypotheses regarding two putative sources of racial difference in receipt of ECT: 1) depressed black inpatients are less likely than whites to be treated in hospitals capable of conducting ECT, and 2) black inpatients experience lower use of ECT within facilities capable of conducting the procedure. We employ rigorous methods drawn from the growing health disparities literature(Duan *et al.*, 2008) to adjust racial comparisons for clinical, socio-demographic, and hospital characteristics and to explore potential moderators of potential racial differences.

## METHOD

### Data Source

We analyzed data for the years 1993 to 2007 from the Nationwide Inpatient Sample (NIS) of the Healthcare Cost and Utilization Project, a nationally representative survey of US community hospitals conducted by the Agency for Healthcare Research and Quality (AHRQ). Community hospitals are designated annually as nonfederal, short-term, general, or specialty hospitals, including public hospitals and academic medical centers.(2002) Excluded from the survey are freestanding psychiatric and chemical dependency facilities, long-term hospitals, hospital units of institutions, and short-term rehabilitation hospitals. Annual NIS databases contain 5-8 million discharge abstracts from approximately 1,000 hospitals, including up to 15 diagnoses and procedures and other clinical, demographic, hospital, and treatment information. The NIS contains a 20% stratified hospital sample, with sampling probabilities proportional to the number of hospitals in each stratum. Following AHRQ recommendations, we examined years following 1992 using designated trend variables and weights.(Whalen *et al.*, 2008)

### ECT treatment

We conceptualized ECT treatment as the co-occurrence of two related events: admission to a hospital capable of conducting ECT (“ECT availability”); and, conditional on availability, receiving ECT (“ECT use”). Hospitals were considered to offer ECT if they conducted the procedure (ICD-9-CM code 94.27) during at least one visit in the calendar year.

### Subjects

To examine ECT availability, we analyzed stays of black and white inpatients aged 18 years with a principal diagnosis of recurrent major depression (ICD-9-CM codes 296.30-.36). We adjusted sampling weights to maintain depression discharge population estimates for each stratum prior to excluding 152,306 discharges lacking race information. This yielded 419,686 sample discharges representing a national estimate of 2,933,646. To examine ECT use, we analyzed the subset of 252,346 sample discharges from hospitals offering ECT, representing an estimated 1,803,488 discharges.

## Patient and Hospital Characteristics

Patient characteristics studied included race (derived from specification as black, white, Hispanic, Asian/Pacific Islander, Native American, or other), age, sex, depression severity, admission source, income in the patient's ZIP code, and primary payer. From secondary diagnoses we also identified suicide attempts (E950-E959), psychiatric comorbidities (290-319), potential medical contraindications to ECT (2000, American Psychiatric Association, 2001) (diagnoses available on request), and general medical comorbidities (medical diagnoses not specified above). Hospital characteristics included census region and urbanicity, size, and teaching status. Patients were assumed to share their treating hospital's region and urbanicity.

## Statistical Analyses

We described patient and hospital characteristic distributions for black and white inpatient visits, omitting statistical contrasts since exceedingly large samples ensured the statistical significance of unimportant differences. We calculated ECT availability rates for all white and black visits and ECT use rates for visits in hospitals offering ECT.

We tested for racial differences in probabilities of ECT availability and use, using the marginal disparity approach to adjust contrasts for differences in other visit characteristics. (Duan *et al.*, 2008) In this approach predictor variables are classified as “allowable” or “non-allowable”. Allowable covariates characterize treatment preference or clinical need, cannot contribute to disparity, and are used to adjust disparity calculation. Non-allowable covariates are excluded from adjustment. We treated as potential measures of clinical need—and therefore allowable—age, sex, depression severity, psychiatric comorbidity, suicide attempt, potential medical contraindication to ECT, general medical comorbidity, admission source, and year. No covariates measured preference. The marginal disparity approach estimates outcome probabilities for black visits under the counterfactual assumption that they have the same allowable covariate distributions as whites. The marginal disparity ratio is the ratio of an outcome probability for white visits over that for counterfactually adjusted black visits.

To estimate marginal disparity ratios, ECT availability and use outcomes were first modeled in logistic regressions. The availability model was fit using all discharges, while the use model was fit using only discharges from hospitals offering ECT. To avoid tautological prediction of ECT availability by other hospital characteristics, we excluded hospital teaching status and size from the availability model. Variable selection began in bivariate models with each allowable and non-allowable covariate; those with coefficients differing from zero at  $p < .25$  were included in a preliminary multivariate model. Backwards stepwise variable removal continued until remaining coefficients differed from zero at  $p < .05$ . Subsequently, race interaction terms for each retained predictor were similarly introduced and removed.

From the final models we calculated white versus black adjusted odds ratios (AORs) for significant interactions to examine moderation of race effects. We used published equations to calculate disparity ratios with 95% CIs for access and use from main and interaction effects. (Duan *et al.*, 2008) Probability estimates for whites used the covariate distribution of the white sample; estimates for blacks used the non-allowable covariate distribution of the black sample and allowable covariate distribution of the whites.

We reported additional analyses to facilitate comparison with earlier studies: the unadjusted white versus black OR of ECT treatment across all hospitals; and for availability and use, the unadjusted OR of the race effect and the adjusted odds ratio of from the multivariate models prior to addition of race interaction terms. When reporting marginal disparity ratios for the period, we presented corresponding marginal ORs.

To explore whether lesser black ECT availability could be mitigated by transfers to hospitals outside the sample offering ECT, we compared white and black transfer rates from facilities not offering ECT.

Analyses were conducted using SAS 9.2 software.

### **Ethical Considerations**

Analyses were conducted exclusively with publicly available, de-identified data, and were deemed not to be human subjects research by the Director of the Institutional Review Board of the Nathan Kline Institute for Psychiatric Research.

## **RESULTS**

### **ECT Treatment across All Hospitals**

Among depressed inpatients in all hospitals, 7.0% (95% CI 6.4-7.7) of white visits and 2.0% (1.6-2.4) of black visits received ECT, and the unadjusted white versus black OR of ECT treatment was 3.4 (2.8-4.1).

### **ECT Availability**

ECT availability rates among white and black depressed inpatients were 62.0% (95% CI 60.5-63.5) and 57.8% (56.3-59.4), respectively. Characteristics predicting availability are presented in Table 1.

Depressed black inpatients in US community hospitals were younger, from poorer neighborhoods, and were more likely to be uninsured or covered by Medicaid and to be treated in the South, characteristics associated with lower ECT availability rates. Blacks were also more likely to be urban, a characteristic associated with greater availability.

Median household income, region, and urbanicity significantly moderated the association between race and availability (Supplemental Table 1). Higher median income and, to a lesser extent, rural location were associated with larger white versus black AORs for ECT availability, indicating greater racial differences in wealthier and rural neighborhoods. For inpatients treated in the Northeast, South, and West, availability probabilities trended higher for whites than blacks; AORs ranged from 1.0 for low-income, urban Northeastern patients to 1.7 for high income, rural Western patients. Midwestern blacks experienced a trend towards greater ECT availability than whites; AORs ranged from 0.6 in low income, urban neighborhoods to 0.9 in high income, rural settings.

Annual white versus black marginal disparity ratios of ECT availability are presented below in Figure 1. White inpatients experienced minimally greater availability than clinically comparable blacks throughout the 15 year period, with an overall marginal disparity ratio of 1.07 (1.06-1.07, equivalent to a marginal odds ratio of 1.17).

The black rate of transfer from hospitals not offering ECT (8.8%) did not exceed the white rate (12.2%). Additional calculations to facilitate comparison with prior studies were as follows: the unadjusted OR for ECT availability was 1.2 (0.9-1.5), while the AOR from the multivariate logistic model excluding interaction terms was 1.1 (0.9-1.4).

### **ECT Use**

ECT use in hospitals offering the procedure was far higher for whites (11.8%, 95% CI 8.4-14.0) than blacks (3.9%, 3.1-4.6), reflecting conduct of ECT during an estimated

187,000 and 8,500 stays of depressed white and black inpatients, respectively. Characteristics predicting use are presented in Table 2.

Compared to whites, depressed black inpatients in hospitals offering ECT were younger, were more likely to be male, to have been admitted through the emergency department, to be uninsured or covered by Medicaid, and to be treated in the Southern and urban hospitals, characteristics associated with lower use rates. Blacks were also more likely to be diagnosed with severe depression with psychotic features, a characteristic associated with greater use.

Patient age and sex and hospital region and urbanicity significantly moderated the association between race and odds of ECT use (Supplemental Table 2). Racial differences were smaller in older patients. Male sex, Northeast region, and urban location were associated with greater racial treatment differences. AORs of use ranged from 5.0 in 35-44 year old men treated in urban, Northeastern hospitals to 0.7 in women aged 75 years treated in rural, Southern hospitals.

Annual white versus black marginal disparity ratios for ECT use are presented in Figure 1.

Ratios fell from 3.2 (3.1-3.4) in 1993 to 2.3 (2.3-2.4) in 2000, remained stable through 2006, and rose to 2.5 (2.4-2.7) in 2007. A marginal disparity ratio of 2.5 (2.4-2.6, equivalent to a marginal odds ratio of 2.7) was observed for the period. Because treatment year was not retained in the final model, disparity trends reflected underlying relative decline among whites of two characteristics predicting high probability of ECT use: older age and routine admission source.

The unadjusted OR for ECT use was 3.3 (2.8-3.9), while AOR from a model excluding interaction terms was 2.2 (1.9-2.6).

## DISCUSSION

We found that marked racial differences in receipt of inpatient ECT for recurrent major depression have persisted over the past 15 years. These differences do not arise, as has been speculated, from *de facto* racial segregation African Americans into hospitals incapable of providing ECT, but rather from lower use of ECT by black than white inpatients in hospitals where the procedure is conducted. Our findings are reassuring insofar as they preclude one ethically noxious source of racial disparity and suggest equity in an important measure of the quality of hospital care for depression, but they nonetheless provoke concerning questions about the persisting role of race in shaping depression care. Despite declining during the 1990s, the effect of race on use of ECT remains large, comparable to that of important clinical indications such as illness severity, and cannot be explained by racial variation in our measures of depression severity, comorbidity, payer type, or a number of other patient and hospital characteristics. These treatment differences occur against a scientific background of mounting evidence for ECT's superior efficacy (Pagnin *et al.*, 2004) and distinctive role in severe depression. (2000, Fochtmann and Gelenberg, 2005)

If availability does not explain racial differences in receipt of inpatient ECT, what does? Unmeasured racial differences in prior treatment, illness presentation, or provider characteristics may have contributed to the patterns we observed. Even severely depressed black inpatients may be less likely than whites with comparable diagnoses to be perceived as ECT candidates since depressed blacks tend to have histories of less extensive (Olfson *et al.*, 2009, Roy-Byrne *et al.*, 2009, Sue *et al.*, 1994, Sussman *et al.*, 1987) and clinically appropriate (Young *et al.*, 2001) depression treatment. The decline in race effects we observed with increasing patient age— similar to that reported in a prior study (Breakey and Dunn, 2004)—may reflect “catch-up” in the accumulation of treatment histories by older

black Americans. However, in our sample black inpatients were almost twice as likely as whites to be diagnosed with psychotic depression, suggesting providers were more likely to perceive symptoms in blacks which promote, rather than discourage, ECT selection. An ECT trial for unipolar depression similarly found higher rates of psychotic symptoms among black (59%) than white (27%) subjects.(Williams *et al.*, 2008)

As in the majority of large studies on racial and ethnic treatment differences, we could not explore whether differences in provider training and attitudes towards ECT(Hermann *et al.*, 1995)—or providers' racial biases—contributed to our findings. Although we did not have data on the race of providers, a survey of US psychiatrists found that psychiatrist race did not predict whether she or he performed ECT.(Hermann *et al.*, 1998) Racial differences in patient preference for ECT may exist and account for observed treatment differences. In one study of depressed inpatients, those viewing ECT favorably were more likely to receive it, suggesting patient preference influences inpatient ECT use.(Pettinati *et al.*, 1994) No data exist on racial attitudes towards ECT, but black population survey respondents report less willingness than whites to consider medication for hypothetical panic or depressive symptoms and greater concern about treatment risks.(Mojtabai, 2009) Limited data indicate that those who receive ECT develop more positive impressions of the procedure(Kalayam and Steinhart, 1981, Pettinati *et al.*, 1994) and imply that longstanding patterns of inexperience with ECT among black Americans may influence their treatment choices. Disparity research from other fields suggests similar racial patterns in attitudes towards treatment may reflect discrepant information received, driven by differential availability to providers or other racial differences in care quality or volume.(Rich *et al.*, 2009)

Our study has several important limitations. In contrast to some prior studies reporting racial differences in receipt of ECT(Hermann *et al.*, 1998, Kramer, 1985, 1990, 1999), our nationally representative sample excluded freestanding psychiatric facilities. Because black and white use of psychiatric hospitals is comparable(Milazzo-Sayre *et al.*, 2000) and ECT rates in specialty facilities are low(Thompson and Blaine, 1987), their inclusion would have had little impact on our results. Our findings of large regional and urban versus rural effects on ECT availability are consistent with prior work showing extensive geographic variation in ECT availability(Harris, 2006, Hermann *et al.*, 1995), but we could not evaluate some important potential explanations of this variation, such as restrictiveness of state ECT regulations.(Harris, 2006) Lack of health insurance and Medicaid coverage were associated with lower ECT availability and use in our data, but we could not determine the role of managed care on our findings. Because our data excluded depressed persons who were untreated or treated outside inpatient settings, our measures of treatment differences do not account for under-diagnosis of depressive illness in blacks(Neighbors *et al.*, 2003, Snowden, 2003, Strakowski *et al.*, 1996) or racial patterns in use of outpatient ECT. A substantial number of depression discharges were excluded from analysis because they lacked race information, and hospitals' methods of attributing race were not specified. Finally, we did not examine treatment of other racial / ethnic groups who may experience disparities. (McGuire and Miranda, 2008)

Marked racial differences persist in the treatment of depression with ECT, and our work suggests that efforts are needed to improve equity in care for the most severe, chronic, and disabling depressive illness. Data on racial and ethnic patterns in the information patients receive about depression care and in prior treatment experiences, as well as preferences and attitudes, are critical to understanding and remediating disparities. Refining the conceptualization of disparities to distinguish preferences based on differential community values from poorer quality of medical information or care may further clarify the causes of differences in mental health treatment and reveal new targets for disparity reduction.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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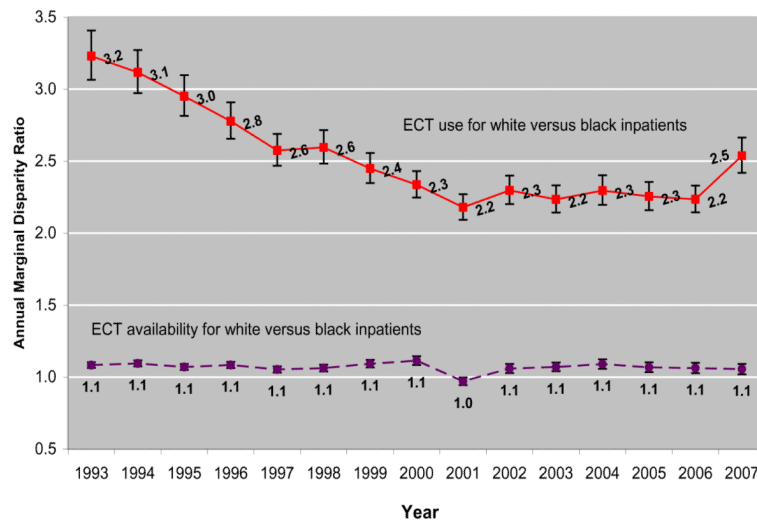
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**Figure.** Annual marginal disparity ratios of ECT availability and use for white versus black inpatients treated for recurrent major depression in US community hospitals, 1993-2007. Marginal disparity ratios calculated using terms from logistic models of ECT access and use. See text for specification of allowable and non-allowable covariates and Tables 1 and 3 for variables included in the models. Above 1, higher ratios indicate greater racial differences. All adjusted risk ratios significantly different from 1 at  $p < .05$  except for access in 2001. Results based on HCUP-NIS weighted sampling of 480,463 discharges of inpatients aged 18 and older with a principal ICD-9-CM diagnosis 296.3x. ECT availability defined as treatment in a hospital where at least one inpatient received ECT during the calendar year.

**Table 1**

Characteristics and ECT availability rates of white and black inpatient stays for recurrent major depression in US community hospitals, by significant predictors of ECT availability

Characteristic	% of patients with characteristic, by race		Rate of ECT availability in %, by race	
	white <sup>1</sup>	black <sup>2</sup>	white <sup>1</sup>	black <sup>2</sup>
All inpatient visits	86.8	13.2	62.0	57.8
<i>Patient Characteristics</i>				
Age, in years				
18-34	25.2	32.4	58.6	55.6
35-44	25.1	34.6	62.0	58.5
45-54	19.9	20.8	60.9	57.3
55-64	9.7	6.1	61.2	59.7
65-74	9.0	3.5	66.6	64.8
75 and older	11.1	2.6	68.7	67.6
Potential medical contraindication to ECT				
No	78.0	82.0	61.5	57.4
Yes	22.0	18.0	63.9	59.7
Median household income in patient ZIP code <sup>‡</sup>				
0-25th percentile	26.3	50.5	51.8	56.5
26th-50th percentile	27.1	24.1	61.8	60.3
51st-75th percentile	23.2	14.5	66.4	58.2
76th-100th percentile	23.3	10.9	69.5	58.3
Primary Payer				
Self pay or other	11.7	15.6	48.9	43.6
Medicaid	17.5	39.1	53.8	56.6
Medicare	34.4	23.5	65.2	63.5
Private	36.4	21.9	67.2	64.1
<i>Hospital Characteristics</i>				
Region <sup>‡</sup>				
West	11.9	9.3	46.1	35.8
South	33.8	46.6	57.0	49.2
Northeast	22.9	19.3	65.0	60.8
Midwest	31.4	24.8	71.3	80.1
Urbanicity <sup>‡</sup>				
Rural	14.5	7.0	27.7	20.3
Urban	85.5	93.0	67.9	60.7

<sup>1</sup>Unweighted sample of n=362,785 discharges.

<sup>2</sup>Unweighted sample of n=56,901 discharges.

<sup>‡</sup>Variable significantly interacted with race to predict ECT availability; see Table 3 for white versus black odds ratios of interaction contrasts from the model. Results based on HCUP-NIS weighted sampling of a total of 419,686 discharges of inpatients aged 18 with a principal ICD-9-CM

diagnosis 296.3x, representing a weighted total of 2,933,646 discharges. ECT availability defined as treatment in a hospital where at least one inpatient received ECT during the calendar year. See text for variable definitions.

**Table 2**

Characteristics and ECT use rates of white and black inpatient stays for recurrent major depression in US community hospitals that offer ECT, by significant predictors of ECT

Characteristic	% of patients with characteristic, by race		Rate of ECT use in %, by race	
	white <sup>1</sup>	black <sup>2</sup>	white <sup>1</sup>	black <sup>2</sup>
All inpatient visits	87.7	12.3	11.8	3.9
<i>Patient Characteristics</i>				
Age, in years <sup>†</sup>				
18-34	23.8	30.7	4.6	1.8
35-44	25.2	35.3	8.1	2.5
45-54	19.7	20.8	10.2	4.5
55-64	9.5	6.2	14.0	6.6
65-74	9.6	3.9	23.4	12.4
75 and older	12.2	3.0	25.6	20.2
Sex <sup>†</sup>				
Male	34.0	39.2	10.8	2.7
Female	66.0	60.8	12.4	4.6
Depression episode severity				
Moderate, mild, or in remission	7.1	5.5	5.4	2.4
Unspecified	31.2	31.2	9.8	2.9
Severe without psychotic features	42.5	30.9	12.5	3.8
Severe with psychotic features	19.2	32.4	16.1	5.0
Suicide attempt				
No	94.9	96.3	12.2	3.9
Yes	5.1	3.7	5.1	2.0
Psychiatric comorbidity				
No	20.4	18.4	16.5	5.1
Yes	79.6	81.6	10.6	3.6
Potential medical contraindication to ECT				
No	22.8	18.7	11.0	3.7
Yes	77.3	81.3	14.6	4.8
Admission source				
Emergency department	38.2	51.1	6.7	2.4
Other hospital or facility	9.9	8.6	10.5	4.1
Routine	51.8	40.3	15.9	5.7
Primary Payer				
Self pay or other	9.1	11.4	4.7	1.5
Medicaid	15.2	38.6	5.5	2.1
Medicare	36.0	25.7	18.3	7.3
Private	39.6	24.3	10.0	4.2
<i>Hospital Characteristics</i>				

Characteristic	% of patients with characteristic, by race		Rate of ECT use in %, by race	
	white <sup>1</sup>	black <sup>2</sup>	white <sup>1</sup>	black <sup>2</sup>
Region <sup>‡</sup>				
West	8.8	5.8	9.7	4.1
Northeast	24.1	20.6	13.2	3.1
South	30.9	40.1	10.3	3.7
Midwest	36.2	33.5	12.7	4.5
Urbanicity <sup>‡</sup>				
Rural	6.1	2.5	12.4	5.6
Urban	93.9	97.5	11.8	3.8

<sup>1</sup>Unweighted sample of n=225,526 discharges.

<sup>2</sup>Unweighted sample of n=26,820 discharges.

<sup>‡</sup>Variable significantly interacted with race to predict ECT access; see Table 4 for white versus black odds ratios of interaction contrasts from the model. Results based on HCUP-NIS weighted sampling of a total of 252,346 discharges of inpatients aged 18 with a principal ICD-9-CM diagnosis 296.3x, representing an estimated 1,803,488 discharges. Hospitals offering ECT defined as those which performed ECT at least once during the calendar year. See text for variable definitions.