ASSOCIATIONS BETWEEN MENTAL HEALTH AND DIABETES: FINDINGS FROM THE SOUTH CAROLINA MEDICAID MANAGED CARE PROGRAM IN 2006–2008

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Objectives: To assess differences in services associated with mental health status and prescriptions among Medicaid patients diagnosed with diabetes mellitus.

Design: Secondary data analyses of South Carolina (SC) Medicaid enrollees.

Participants: SC Medicaid enrollees with a diagnosis of diabetes mellitus ($N=555$) continuously enrolled in either managed care (MC) or fee for service (FFS) programs between 2006 and 2008.

Main Outcome Measures: Health Plan Employer Data and Information Set (HEDIS)-based diabetes management service outcomes including: 1) whether the recipient received a nephrology exam; 2) the number of eye exams received; 3) the number of low-density lipoprotein cholesterol services received; and 4) the number of Hemoglobin A_{1c} blood tests conducted. Outcomes were fitted to regression models adjusting for sex, race, health program provider type (MC or FFS), rurality, poverty indexes, clinical risk group status, whether there was a female head of household, and indicators for classes of prescription pharmaceuticals (antipsychotics, antidepressants, and anticonvulsants).

Results: There are significant differences in the incidence of diabetes management service-use between enrollees in management plans and between recipients of classes of pharmaceuticals and mental health status. Enrollees in FFS have fewer claims associated with diabetes management services compared to counterparts in MC.

Conclusions: Our early findings demonstrate the importance of efforts to collect HEDIS measures data and their potential as a resource for assessing quality of care. More importantly, this study illustrates the association between mental health status and associated pharmaceutical prescriptions. (*Ethn Dis*. 2010;20: 239–243)

Key Words: Medicaid, Disparity, Diabetes, Managed Care, Fee for Service, Mental Health

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INTRODUCTION

Access to quality health care is essential to eliminate socioeconomic and racial health disparities,[1] however, numerous studies document substantial evidence of continued disparity in both healthcare access and utilization. When compared to Whites and Asians, African Americans and Hispanics were found to have significantly lower control of diabetes.[2,3] Disparities in the treatment and control of illnesses such as diabetes represent potentially avoidable costs to individuals and to the Medicaid system. In addition, people diagnosed with diabetes are more likely to have comorbid mental disorders which have a substantial negative effect on the ability to self-manage diabetes.[2,3] Classes of pharmaceuticals associated with mental health are also suspected of contributing to or preceding diagnosis of diabetes due to pharmacological side effects.[4] Potential cost savings for diabetes patients could be addressed through the implementation of more effective disease management strategies which may differ depending on whether diabetes patients have comorbid mental health issues.

The South Carolina (SC) Medicaid Managed Care provides health care for an increasing proportion of the state's Medicaid population. Between 2005 and 2008, enrollment increased from 72,000 to more than 400,000 beneficiaries.[5] The growing population of beneficiaries in the SC Medicaid Managed Care Program provides an excellent opportunity for studying the effects of managed care (MC) on access and utilization over time.

Each participating healthcare provider in South Carolina implements one of two distinct healthcare provider models: health maintenance organization (HMO) or primary care case management (PCCM). In HMO programs, the state Medicaid agency directly contracts with a health plan that assumes the risk of providing services through its own physician staff or through staff with contracted physician organizations. In the PCCM model, the Medicaid agency contracts for services with a primary care gatekeeper entity that coordinates primary and specialty care; the gatekeeper entity is paid fee for service (FFS) plus a monthly coordination fee. Payments by the Medicaid Managed Care (MMC) to physician organizations is through full capitation (prospective payment for each individual patient adjusting for some measures of age, sex, or health status), FFS (retrospective payment paid per service), or a mixture of the two.[6]

In a previous study (Lòpez-DeFede A, unpublished data, 2009), we focused on patients diagnosed with diabetes and investigated whether there were disparities in Health Plan Employer Data and Information Set (HEDIS) measures across different healthcare plans. In the present study, we further distinguish those patients in need of mental health services. Our interest lies in whether services differ for mental health patients, and whether services differ depending on whether patients are prescribed antipsychotics, antidepressants, or anticonvulsants. Each of the three pharma-

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ceutical classifications considered here has been linked to diabetes through different biological mechanisms. Atypical antipsychotics are more closely linked with rapid weight gain and the onset of diabetes than other pharmaceutical therapy classifications.[7]

Previous studies investigating vulnerable populations have noted racial differences in diabetes prevalence. Whites had a prevalence of 13.9 per 1,000 in 1950, a rate that declined then subsequently grew to 11.9 per 1,000 in 1997. African Americans, on the other hand, had a prevalence which ranged from 17.2 to 28.9 per 1,000 in the same period.[8] While we noted some racial differences in our previous study of the population studied here (Lòpez-DeFede A, unpublished data, 2009). we also pointed out that racial discrepancies may be comingled with rurality effects. That previous study provides baseline results that helped design and focus the current explorations of the impact of MMC enrollment on quality healthcare access and utilization relative to mental health and associated pharmaceuticals. Germane to the present interest in prescription pharmaceuticals related to mental health, other researchers have illustrated discrepancies in patient outcomes depending on the type of antidiabetic medication.[9]

The present investigation differs in two important ways from previous research on MMC and racial disparities. First, this analysis is limited to South Carolina Medicaid Managed Care enrollees; and second, our analysis focuses on various HEDIS quality outcome measures for healthcare access and utilization. Throughout our investigations, we adjust for rural residency and race since they have been shown to be significantly associated with various healthcare outcomes. This study differs from our previous research in that we now have merged important information on mental health services and classifications of associated pharmaceuticals.

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Table 1. Sex and race characteristics of study group (*N*=555)

	2006	2007	2008
Females	303	158	461
African American	212	131	343
White	95	58	153
Other	39	20	59

METHODS

Annually, data across all managed healthcare plans in the SC Medicaid Program are converted into HEDIS measures. These measures assess quality of care and provide an opportunity to examine differences in the quality of care provided to Medicaid enrollees in South Carolina. Components of these measures are summarized in Table 1 and Table 2.

Enrollees were classified according to the following sociodemographic categories for analysis: age, sex, race, clinical risk group, provider type (MC or FFS), and Townsend index of social deprivation area.[10] (The Townsend index creates distinctions among enrollees similar to socioeconomic status.) Our study population consisted of Medicaid beneficiaries enrolled continuously for at least 36 months. Data from the 2006, 2007, and 2008 South Carolina state fiscal years (July to June), based on 555 persons, are presented here. Patients under Medicaid Managed Care were aged 18 to 73 years (average=46.8) in 2006, while under FFS they were aged 22 to 74 years (average=53.8).

Table 2. Tabulations of clinical risk group*

Clinical risk group	2006	2007	2008
1 – Low	214	228	236
2 - Low	7	5	7
3 - Low	19	13	16
4 - Medium	0	0	3
5 - Medium	68	71	83
6 - Medium	176	163	139
7 - High	64	64	61
8 - High	0	1	2
9 - High	7	10	8

* *N*=555 patients

Mental health diagnosis was ascertained for the sample with moderate to severe mental illness using ICD-9 codes associated with mood disorders (269.00–310.4), personality disorders (301.00–301.83) and psychotic disorders (295.2–298.9). The number of prescriptions for classifications of pharmaceuticals was converted to an annual binary indicator of whether the patient received a drug classification. That is, for each of the study years, we generated three binary indicators (one for each of the 2006, 2007, and 2008 calendar years) for whether each patient was ever prescribed antipsychotics, antidepressants, or anticonvulsants. This simplification was utilized due to the lack of detailed information for prescriptions (ie, we did not know the number of days a given prescription was intended).

Analyses focused on four HEDIS-associated service measures: emergency room visits, diabetes-related inpatient procedures, diabetes-related outpatient procedures, and number of prescriptions. For each service measure, we evaluated the association of the outcome with quality as distilled into a HEDIS-compliance measure. Covariates of interest included race (African American vs White/other), residency (whether the Townsend index indicates social deprivation), and health program (fee for service vs managed care). We adjusted models for sex (male vs female) and age (in years).

The final set of covariates included indicators of clinical risk status using 3M™ Clinical Risk Grouping Software (CRG) Wallingford, CT, which defined clinical risk status of each enrollee for each year. The nine designated categories were aggregated into three groups, which comprised low risk (healthy or no history of significant acute diseases), medium risk (history of chronic conditions), and high risk (history of significant chronic disease in 3 or more organ systems and/or catastrophic condition). For each patient, we included an indicator of whether there were associated mental health services for each year. Independent of mental health patient-status, we included indicator variables for whether patients were prescribed antipsychotic, antidepressant, or anticonvulsant pharmaceuticals. Indicators for drug prescriptions were created per person-year.

For hemoglobin A_{1c}, eye exams, lipoprotein (LDL) testing, and nephrology, we tabulated whether each patient received each service in a given year. The four indicators of service were then summed to obtain a HEDIS-measure-based indicator of quality of care. This summed score was the primary covariate of interest in models assessing the number of visits to the emergency room, number of inpatient procedures, number of outpatient procedures, and the number of prescription refills. We hypothesized that as HEDIS-based measures of quality of care increased, the number of services would decrease even after adjusting for sex, age, race, and health plan type (FFS vs MC).

Count-data regression model coefficients were exponentiated and interpreted as incidence rate ratios. Individual Wald tests for predictors were examined for significance at the .05 level of significance. To model counts of services, we utilized mixed-effect Poisson regression models wherein the indicator for each year was treated as a gamma-distributed random effect. We also considered mixed-effect negative binomial and mixed-effect generalized Poisson models[11] wherein the indicator for each year was treated as a normally distributed random effect.

Table 3. Random-effects negative binomial regression model estimates for the number of emergency room visits*

Variable	Incidence rate ratio	Std error	*P* value	95% confidence interval	
Age in decades	.849	.033	<.001	.785928	.916322
Male	.889	.107	.329	.702205	1.125749
African American	1.046	.092	.612	.880099	1.242186
HEDIS	.859	.017	<.001	.827035	.892030
FFS	.417	.041	<.001	.344256	.506304
Mental health Dx	1.430	.079	<.001	1.283661	1.592634
Antipsychotic Rx	.834	.095	.113	.666797	1.043531
Antidepression Rx	1.312	.105	.001	1.121716	1.535024
Anticonvulsion Rx	1.597	.129	<.001	1.363130	1.871379

* There are 1,781 outcomes for 555 patients in the analyzed data.

RESULTS

Persons enrolled in FFS programs were less likely per-person (IRR=0.42, *P*<.001) to visit the emergency room (Table 3). This discrepancy was constant across clinical risk group status and Townsend Index classification. Age in decades was protective (IRR=0.85, *P*<.001), and the HEDIS measure of quality of care was protective (IRR=0.86, *P*<.001). Thus, the more HEDIS-related services that were received, the fewer emergency room visits a person had. Patients identified as having mental health needs were much more likely to require emergency visits (IRR=1.43, *P*<.001); similarly, patients having been prescribed anticonvulsants or antidepressants were much more likely to visit the emergency room (IRR=1.66, *P*<0.001, and IRR=1.30, *P*=.001, respectively).

Age in decades was protective (IRR=0.56, *P*=.036), while being African American and the HEDIS measure of quality care was associated with a higher likelihood (IRR=3.17, *P*=.036, and IRR=1.30, *P*=.019, respectively) of inpatient procedures related to diabetes (Table 4). Mental health status and whether having been prescribed antipsychotics, antidepressants, or anticonvulsants were not significantly associated with inpatient procedures. All other outcomes were analyzed using random-effect negative binomial regression models. Random-effects variance for this outcome, however, were not estimable and we used a generalized Poisson model for which standard errors were adjusted using the modified sandwich variance estimator.[12]

Table 4. Generalized Poisson regression model estimates for the likelihood of an inpatient procedure*

Variable	Incidence rate ratio	Std error	*P* value	95% confidence interval	
Age in decades	.557	.156	.036	.321678	.963468
Male	1.239	.999	.790	.255417	6.013341
African American	3.171	1.743	.036	1.080093	9.311848
HEDIS	1.303	.147	.019	1.044697	1.625753
FFS	1.127	.575	.814	.414631	3.065279
Mental health Dx	2.414	1.753	.225	.581658	10.022560
Antipsychotic Rx	.363	.352	.296	.054394	2.428935
Antidepression Rx	1.261	1.433	.838	.136039	11.690710
Anticonvulsion Rx	.643	.496	.567	.142227	2.911351

* There are 1,781 outcomes for 555 patients in the analyzed data.

Table 5. Random-effects negative binomial regression model estimates for the number of outpatient procedures*

Variable	Incidence rate ratio	Std error	*P* value	95% confidence interval	
Age in decades	.990	.025	.681	.941010	1.040527
Male	.827	.066	.018	.706826	.967788
African American	.834	.049	.002	.744109	.934894
HEDIS	1.118	.014	<.001	1.090603	1.145665
FFS	.509	.033	<.001	.448332	.577603
Mental health Dx	1.137	.039	<.001	1.061760	1.216603
Antipsychotic Rx	.967	.070	.646	.840295	1.113899
Antidepression Rx	1.037	.047	.418	.949166	1.133979
Anticonvulsion Rx	1.240	.063	<.001	1.121308	1.370269

* There are 1,781 outcomes for 555 patients in the analyzed data.

Persons enrolled in FFS programs were much less likely (IRR=0.51, *P*<.001) to have outpatient visits (Table 5). This discrepancy was constant across clinical risk group status and Townsend Index classification. Age in decades was not associated with this outcome, though males and African Americans were less likely to receive this healthcare service (IRR=0.83, *P*=.018 and IRR=0.83, *P*=.002, respectively). The HEDIS measure of quality care was directly related to the outcome (IRR=1.12, *P*<.001). Thus, the more HEDIS-related services that were received, the more likely the person was to have an outpatient procedure. Mental health patients and those patients prescribed anticonvulsants were more likely to require outpatient visits (IRR=1.14, *P*<.001 and IRR=1.24, *P*<.001, respectively).

Persons in FFS programs were much less likely to have filled prescriptions (Table 6). This discrepancy was constant across Townsend Index classification and was related to clinical risk groups. Persons in low and medium clinical risk groups (IRR=0.20, *P*<.001 and IRR=0.57, *P*<.001 in FFS) were less likely to have filled prescriptions. Age in decades also was marginally associated with this outcome (IRR=1.07, *P*=.053), with older patients receiving more prescriptions. The HEDIS measure of quality care was directly related to the outcome (IRR=1.10, *P*<.001). Thus, the more HEDIS-related services the person received, the more likely he or she was to have a prescription. Persons prescribed antipsychotics were less likely to have higher numbers of prescriptions (IRR=0.72, *P*<.001) while those receiving antidepressants and anticonvulsants were more likely to fill higher numbers of prescriptions (IRR=1.16, *P*=.013 and IRR=1.28, *P*<.001, respectively).

Table 6. Random-effects negative binomial regression model estimates for the number of prescription refills*

Variable	Incidence rate ratio	Std error	*P* value	95% confidence interval	
Age in decades	1.069	.037	.053	.999277	1.142939
Male	.863	.092	.167	.700064	1.063705
African American	.950	.074	.511	.816362	1.106297
HEDIS	1.096	.017	<.001	1.063287	1.129311
FFS×Crg(low)	.198	.050	<.001	.121059	.325027
FFS×Crg(med)	.570	.082	<.001	.429162	.756545
FFS×Crg(high)	.751	.113	.057	.559590	1.008133
MC×Crg(low)	1.011	.122	.928	.797810	1.281118
MC×Crg(med)	.904	.101	.366	.726190	1.125089
Mental health Dx	1.071	.047	.117	.982895	1.167039
Antipsychotic Rx	.717	.065	<.001	.600697	.855339
Antidepression Rx	1.157	.068	.013	1.031964	1.298087
Anticonvulsion Rx	1.280	.083	<.001	1.127205	1.453363

* There are 1,781 outcomes for 555 patients in the analyzed data.

For some outcomes, African Americans received fewer services, while for other outcomes no discrepancy was noted for race.

DISCUSSION

Our results offer insight into the nature and potential associations behind differences in quality of health care. Some measures are significant and directional across multiple outcomes. For example, persons living in a rural area tend to receive fewer services. For some outcomes, African Americans received fewer services, while for other outcomes no discrepancy was noted for race. Part of this inconsistency is explained through the inability of models to distinguish race effects from residency (rural vs urban) effects. That is, there are more African Americans living in urban areas enrolled in MMC compared to the enrollment patterns found within the South Carolina Medicaid population. Thus, residency effects (such as mentioned above) are somewhat confounded with race effects. For each decade a person ages, the likelihood of receiving most services declines. Second, these results suggest that individual socioeconomic characteristics play an important role in helping to distinguish the race effects. As such, it will be important for future studies to

incorporate measures of deprivation using census ZIP Census Tract Areas (ZCTA) to classify enrollees into low, medium, or high deprivation areas.[13] This type of classification can help explain differing proportions of observed differences across racial and quality measures. Third, part (but not all) of the racial differences in clinical quality outcomes may be explained by disproportionate enrollment of African Americans in certain healthcare plans. Future studies must account for individual differences between MMC plans' characteristics (eg, total enrollment, model type, and age of health plan in South Carolina). Adjustments will need to account for clustering of enrollees within health plans, (ie, one health plan currently enrolls over fifty percent of beneficiaries in SC Medicaid Managed Care). Additionally, future studies should consider geographic variation, as used in hierarchical generalized linear models,[14] to demonstrate that the between-region racial variation was greater than the within-region racial variation.

These results have important clinical implications. Historically, HEDIS data have been used primarily for plan-to-plan comparisons; health plan officials did not have access to data about disparities. Our analyses, however, do demonstrate that efforts to collect HEDIS measures data are a potential resource for tracking quality of care. Our results bolster the need to examine the reasons for existing difference within and among plans. Identifying managed care plans that succeed at enhancing quality of care will serve to shape future programmatic and policy strategies that benefit all Medicaid recipients.

This study has limitations. It was not designed to determine the specific features of managed care that are associated with racial disparities, nor was the dataset rich enough to allow subject-specific statistical modeling. Rather, our analyses are gross characterizations of outcomes that do not attempt to model causality; such models would require substantially more data on enrollees under substantially longer periods of observation. The sample population is small and may not adequately represent the statewide growth of the Medicaid managed care population. Our measures of pharmaceutical usage were converted to dichotomous measures of whether each drug was prescribed any time during the year. We had no measure of frequency of usage, or strength of prescription. While we had measures of how many times drugs were prescribed, we did not have measures of dosage. Without dosage information, there was no way to scale each measure and so only a dichotomous indicator was ultimately used in our analyses. Future studies should utilize more expansive utilization measures to shed light on the associations uncovered in this study.

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