Statistical Benchmarks for Process Measures of Quality of Care for Mental and Substance Use Disorders

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Objective: **Benchmarks, representing the level of performance achieved by the best-performing providers, can be used to set achievable goals for improving care, but they have not heretofore been available for mental health care. This article describes the application of a method for developing statistical benchmarks for 12 process measures of quality of care for mental and substance use disorders. *Methods:* Twelve quality measures—taken from a core measure set selected by a multistakeholder panel through a formal consensus process—were constructed from 1994–1995 administrative data on care received by Medicaid beneficiaries in six states. Conformance rates were calculated at the provider level and presented as means, 90th-percentile results, and statistical benchmarks. Sample sizes for each measure ranged from 356 to 4,494 providers and from 1,205 to 78,627 cases. Three measures involved antidepressant treatment, two involved antipsychotic treatment, and one involved mood stabilizers for bipolar disorder. Six other measures involved follow-up treatment visits. *Results:* Benchmarks for provider-level performance ranged from 59.7 percent to 97.7 percent, markedly higher than the mean results, which ranged from 9.4 percent to 65.4 percent. Benchmark results varied widely—in contrast to results for these measures at the 90th percentile of providers and in contrast to performance standards that apply the same numerical goal across varied clinical processes. *Conclusions:* Statistical benchmarks can be applied to results from quality assessment of mental health care. Further research should examine whether incorporating benchmarks into quality improvement activities leads to better mental health care and substance-related care and improved outcomes. (*Psychiatric Services* 57:1461–1467, 2006)**

Over the past decade, quality measurement has become an integral part of the infrastructure of mental health care (1). Increasingly, results from quality measurement are used by hospitals (2), health plans (3), state mental health authorities (4), and payers (5) to encourage accountability among providers (for example, clinicians and hospitals), provide guidance to consumers and policy makers, and facilitate quality improvement.

Process measures constructed from administrative data are commonly used in national and many state quality assessment initiatives. Some have expressed concern that widespread use of these measures is premature, noting that most are based on face validity rather than on rigorous analyses demonstrating links between better performance and improved patient outcomes. Other limitations of these measures have also slowed their implementation. Available measures address relatively few conditions and treatment modalities (6). The mental health care system lacks consensus among stakeholders on the best measures for common use (7). There is a limited capacity to adjust comparisons of performance across providers on the basis of differences in the case mix of providers' patient populations (8). In recent years, however, progress has been made in each of these areas, expanding opportunities for measures to be used to compare performance across providers and to encourage improvements in clinical practice.

Among remaining barriers is the absence of benchmarks to guide quality improvement. Commonly used by managers outside of health care, benchmarks represent the level of performance achieved by the best-performing organization in an industry (9,10). In health care, benchmarks would identify high-performing clinicians, hospitals, and health plans and allow for investigation of contributing practices. The policy makers and

oversight organizations have called for increased use of benchmarks in quality improvement (11,12), and some mental health initiatives have embraced the concept of benchmarks (13–15). However, measurement-based quality improvement activities in health care more commonly rely on comparisons to average results. Such comparisons can be useful to identify outliers from normative practice, but they are less useful for quality improvement activities intended to promote excellent rather than average performance.

Health care organizations have tried establishing standards—numerical performance thresholds—as a basis for interpreting results. Typically lacking an empirical foundation, standards can be arbitrary and set unrealistic expectations. For instance, health care organizations often set uniform standards of 90 percent across measures, despite variability in the degree to which full conformance is achievable or the processes measured are under a provider's control. The National Inventory of Mental Health Quality Measures found that among more than 300 measures, single-site or average results were available for 54 percent (1,6). Performance standards were established for 23 percent. Benchmarks were not available for any process measures assessing quality of care for mental or substance use disorders.

Weissman and colleagues (16,17) pioneered an approach to statistical benchmarks in primary care that uses Bayesian methods to identify high but achievable levels of performance. Their method has several strengths: it is objective and reproducible, and it addresses statistical biases that result from providers who have few patients meeting measure criteria. The impact of these benchmarks on quality improvement has been shown in a randomized controlled trial of audit and feedback of results on five measures of quality of care for diabetes among 70 community physicians. Physicians who received comparisons of their own results with statistical benchmarks subsequently performed better on these measures than physicians who received their results in comparison to the group's average performance (18).

In this study, we report on the development of statistical benchmarks for 12 quality measures of mental health and substance-related care. Developed by nationally prominent organizations, the quality measures are from a core set selected in 2000 for common use by a diverse panel of stakeholders, including consumers, families, clinicians, payers, purchasers, and oversight organizations (19). We applied these measures to assess quality of care for Medicaid beneficiaries in six states using administrative claims data from 1994 and 1995. For each measure, we calculated a statistical benchmark and compared it with the mean result and with the result achieved by the provider at the 90th percentile, evaluating its utility for informing quality improvement.

Methods
Quality measures
Twenty-eight measures assessing clinical processes—including prevention, access, assessment, treatment, continuity, coordination, and safety—were selected for a core measure set by a diverse panel of stakeholders. Selection was based on a formal consensus process guided by a conceptual framework, empirical data, and ratings of meaningfulness, feasibility, and actionability (19). Ten of the 28 measures could be constructed from administrative data and were included in this study. Two measures were dichotomized to evaluate mental disorders and substance use disorders separately, resulting in 12 measures for analysis. The clinical rationale, evidence base, and source of these 12 measures are described below, and measure specifications are summarized in Table 1. Detailed information on these and the other 18 core measures has been published elsewhere (1,19).

Antidepressant medication management. These three Health Plan Employer Data and Information Set (HEDIS) measures are used by the National Committee for Quality Assurance (NCQA) in health plan accreditation (20). The first assesses the proportion of patients initiating an antidepressant medication for depression who complete a 12-week

acute treatment phase, whereas the second examines the proportion of those who complete a six-month continuation phase. Research studies have found that likelihood of remission and relapse, respectively, are diminished by completion of these courses of treatment. The third measure assesses the proportion of patients who attend three clinical visits during the acute treatment phase, a standard supported by expert consensus but not research evidence (21).

Second-generation antipsychotic use for schizophrenia. Developed by the National Association of State Mental Health Program Directors, this measure examines the proportion of patients with schizophrenia or schizoaffective disorder treated with an antipsychotic drug who receive a second-generation antipsychotic (22). Most but not all practice guidelines have recommended that second-generation drugs should be used as first-line agents (23). However, the evidence on the effectiveness and side-effect profile of these agents continues to evolve.

Blood level monitoring with mood stabilizers. Originally developed to evaluate care for Pennsylvania Medicaid beneficiaries, this measure assesses the proportion of patients treated with a mood stabilizer for bipolar disorder whose blood levels are monitored in accordance with clinical practice guidelines (24). Lithium, valproate, and carbamazepine are most effective when blood concentrations fall within specified ranges. Lower levels are associated with increased risks of relapse; higher levels typically cause increased side effects without therapeutic benefit (25).

Continuity of outpatient visits. Developed to assess care for patients of the Department of Veterans Affairs, these two measures assess the proportion of patients hospitalized for either a mental disorder or a substance use disorder who attend a follow-up visit during each 30-day period for six months after discharge (26). Most individuals who receive inpatient psychiatric or substance-related care require follow-up ambulatory care to promote further recovery and prevent relapse. Research studies of the

Table 1

Conformance rates and statistical benchmarks for process measures of quality of care for mental and substance use disorders among Medicaid beneficiaries[a]

Measure	Number of cases	Provider type[b]	Number of providers	Provider-level conformance rates		
				M (%)	90th percentile	Statistical benchmark (%)
Outpatient						
≥3 outpatient follow-up visits within 12 weeks after initiating drug treatment for depression	13,028	OP	4,494	21.4	100.0	89.6
≥12-week duration of antidepressant drug treatment for individuals with depression	13,028	OP	4,494	45.8	100.0	85.6
≥6-month duration of antidepressant drug treatment for individuals with depression	13,028	OP	4,494	39.8	100.0	81.6
≥1 prescription of a second-generation antipsychotic drug for individuals with schizophrenia or schizoaffective disorder receiving any antipsychotic drug in a 6-month period	42,424	OP	3,477	25.2	100.0	64.7
≥1 mood-stabilizer blood level test for individuals with bipolar disorder who had ≥1 mood-stabilizer pharmacy claim in 3 of 4 quarters during a 12-month period	8,907	OP	2,344	14.9	64.8	67.3
≥1 visit in each 30-day interval in a 180-day period after discharge from inpatient mental health care	22,644	OP	4,435	19.1	75.0	75.8
≥1 visit in each 30-day interval in a 180-day period after discharge from inpatient substance-related care	5,205	OP	1,914	9.4	33.3	61.6
≥1 case management visit for individuals with schizophrenia or schizoaffective disorder who had ≥2 hospitalizations or ≥4 emergency department visits during a 12-month period[c]	10,015	OP	1,307	42.3	100.0	97.7
Antipsychotic dosage for the treatment of schizophrenia or schizoaffective disorder between 300 and 1,000 chlorpromazine equivalents during 12-week period after discharge from inpatient mental health care	7,233	OP	2,108	40.0	100.0	94.4
Inpatient						
≥1 psychotherapy visit within 90 days after inpatient treatment or emergency department visit for borderline personality disorder	1,205	IP or ED	356	65.4	100.0	97.2
≥1 outpatient visit attended within 7 days after discharge for a mental disorder	78,627	IP	1,371	25.0	67.1	82.4
≥1 outpatient visit attended within 7 days after discharge for a substance use disorder	18,595	IP	1,046	17.0	50.0	59.7

[a] The eligible population consisted of 11,684,089 Medicaid beneficiaries in 1994 to 1995 from six states (California, Georgia, Indiana, Mississippi, Missouri, and Pennsylvania) for all but one measure.
[b] OP, outpatient; IP, inpatient; ED, emergency department
[c] Results for this measure were calculated from data on 9,170,689 beneficiaries from California, Indiana, Mississippi, and Missouri.

relationship between aftercare and rehospitalization have shown mixed results (27,28).

Case management among high-risk patients with schizophrenia. Derived from the Schizophrenia Patient Outcomes Research Team (PORT) recommendations, this measure examines the proportion of patients with schizophrenia or schizoaffective disorder at high risk of relapse who receive case management services (29).

Research studies have found strong evidence of effectiveness for assertive community treatment and other intensive case management models, but evidence is not conclusive regarding the effectiveness of nonintensive case management (30).

Antipsychotic drug dosing for schizophrenia. Adapted from the Schizophrenia PORT recommendations, this measure assesses the proportion of patients with schizophre-

nia or schizoaffective disorder treated with antipsychotic medication who receive a dosage between 300 and 1,000 chlorpromazine equivalents (31). Controlled trials indicate that, on average, antipsychotic dosages within this range provide the best balance between efficacy and side effects (32).

Psychotherapy after hospital care for borderline personality disorder. Developed by the American Psychi-

atric Association, this measure assesses whether patients receive psychotherapy after an inpatient stay or emergency department visit for borderline personality disorder (33). Randomized controlled trials have established the efficacy of specific types of therapy for this disorder; case-based and observational studies provide support for other types of therapy to varying extents (34).

Timely follow-up after hospitalization. Also used in health plan accreditation, these two measures assess the proportion of patients hospitalized for a mental disorder or substance use disorder who receive a follow-up visit within seven days of discharge (35). Scheduling outpatient appointments proximally to discharge is recommended to support compliance. Research is mixed on the association between the timeliness of follow-up care and the likelihood of relapse (27,28).

Data source
State Medicaid Research Files (SMRF) from the Center for Medicare and Medicaid Services were used to assess mental health care received by Medicaid beneficiaries. These data sets include data on demographic characteristics, enrollment information, and claims for all clinical services and prescription drugs reimbursed by Medicaid. SMRF data from 1994 and 1995 were analyzed for Medicaid beneficiaries in six states—California, Georgia, Indiana, Mississippi, Missouri, and Pennsylvania. These states were chosen on the basis of geographic distribution, data completeness, and lower levels of managed care penetration. Because individuals enrolled in Medicaid managed care plans may not have claims, we excluded these enrollees. We also excluded individuals with dual enrollment in Medicare and those who were institutionalized, because SMRF data are incomplete for these populations. For all but one measure the total eligible sample consisted of 11,684,089 individuals, including 1,256,972 in Pennsylvania, 1,256,428 in Georgia, 7,266,403 in California, 657,426 in Indiana, 510,912 in Mississippi, and 735,948 in Missouri. The measure assessing case

management was limited to 9,170,689 beneficiaries from the latter four states, which used specific codes to reimburse case management services.

Analysis
Conformance rates were calculated for each measure for all eligible individuals in the sample by using detailed specifications obtained from the developers of the measure (available from the authors upon request). Each measure was constructed as a proportion or rate, with the denominator specification describing the eligible sample and the numerator describing the desired characteristics of care. Measure specifications used ICD-9-CM codes for diagnosis and National Drug Codes for medications. Healthcare Common Procedure Coding System (HCPCS) codes were used for procedures and service use. HCPCS level I codes (also known as Current Procedural Terminology [CPT] codes) and level II codes are used nationwide, and level III codes are specific to each state. Many states use the level III codes to reimburse case management, partial programs, and other mental health services.

Provider-level conformance rates were calculated by using unique patient and provider identification numbers in the SMRF data sets. For measures of inpatient and emergency department care, the providers were hospitals. For measures of outpatient care, providers were individual clinicians or clinicians practicing together in a clinic or group. Mean conformance rates and 90th-percentile results were calculated at the provider level for each measure.

Statistical benchmarks were calculated at the provider level by using the methodology developed by Kiefe and colleagues (36). A statistical benchmark for a quality measure was operationally defined as the care received by the top 10 percent of patients, adjusted for the number of patients per provider. The adjustment step is critical, because many providers have only a few patients who meet criteria for a measure, which can skew benchmarks toward the high (for example, 1/1=100 percent) or the low (for example, 0/1=0

percent) ends of the distribution. This method adjusts for small denominators in two ways. First, a Bayesian estimator approach was used to adjust each provider's conformance rate on the basis of his or her sample size, pulling the influence of very small denominators toward the mean result. This was carried out as follows. An adjusted performance fraction (APF) was calculated for each provider: $APF=(x+1)/(d+2)$, where x equals the actual number of patients described in the measure's numerator criteria and d equals the total number of patients for whom the process is appropriate.

Second, an approach using a pared mean (that is, weighted by denominator size) was used to pool results from the top 10 percent of the sample. Providers were ranked in descending order on the basis of their APF. Beginning with the highest-ranked provider, the number of patients in the measure denominator was summed in descending order until a breakpoint of 10 percent of patients was reached. Added to that sum was the total number of patients below the breakpoint who were part of the caseload of providers who had the same conformance rate as the breakpoint provider. From this summed cohort of patients, a benchmark was calculated as the proportion of patients meeting the numerator criteria for the measure.

Results
The eligible sample and number of providers varied widely on the basis of each measure's inclusion criteria (Table 1). Across the nine measures assessing outpatient care, the eligible sample ranged from 5,205 to 42,424 patients. The number of providers treating these patients ranged from 1,307 to 4,494. Among the three hospital measures, the sample ranged from 1,205 patients receiving care in 356 hospitals to 78,627 patients treated in 1,371 hospitals.

Average performance did not reach a conformance rate of 50 percent on any measure of outpatient care. The mean conformance rate was lowest for the measure of continuity of care for substance use disorders (9.4 percent) and highest for the measure of

acute-phase antidepressant adherence (45.8 percent). Among the inpatient measures, average performance was lowest on the measure of follow-up care within seven days of hospitalization for a substance use disorder (17.0 percent) and highest on a measure of psychotherapy for patients with borderline personality disorder (65.4 percent).

For seven of the 12 measures, the performance achieved by the provider at the 90th percentile was 100 percent. The influence of small caseloads on these results can be seen in the following example. Among 4,494 providers who treated one or more patients meeting denominator criteria for acute-phase antidepressant adherence, 1,415 providers had a conformance rate of 100 percent. However, 83.9 percent of these providers treated only one such patient. Statistical benchmarks showed greater variability ranging from 59.7 percent for the measure of timely follow-up care after hospitalization for substance use disorder to 97.7 percent for the measure of case management use among high-risk patients with schizophrenia. Detailed results are shown in Table 1.

Discussion

Collectively, the mean results for these 12 measures provide a snapshot of the quality of mental health and substance-related care for Medicaid beneficiaries. They examine diverse processes of care across several clinical disorders in six states. Overall, the performance depicted by these results is poor, suggesting ample opportunity for more in-depth evaluation and, most likely, for improving care. These findings are consistent with other reports of quality of care received by Medicaid patients (24,37,38). Medicaid beneficiaries have disproportionately low incomes and a large proportion of beneficiaries are from racial or ethnic minority groups—characteristics associated with receiving poor quality of care (39,40).

These findings also demonstrate the limitations of mean results as guidance for providers seeking to improve quality of care. Comparative data can provide guidance to clinicians and managers seeking to inter-

pret the significance of their results in the context of what others have achieved in similar populations. However, mean results—in the case of these 12 measures, ranging from 9.4 to 65.4 percent—give little indication of what level of care is desirable or achievable. Comparisons to these results may motivate improvement among poorly performing providers but provide little guidance for those at or above the mean.

In contrast, comparison to statistical benchmarks provides a higher threshold: an achievable level of excellence. Among the 12 measures in this study, benchmarks ranged from 59.7 to 97.7 percent. In each case, the benchmark was at least 30 percentage points higher than the mean result, providing a meaningful improvement goal for most providers, including many of those with above-average performance.

Contrary to the common practice of establishing a single performance standard (for example, 90 percent conformance) across all measures in a set, variation among the benchmark results makes clear that one standard does not fit all measures. Five of the 12 benchmarks fall between 60 and 80 percent, four fall between 80 and 90 percent, and three fall between 90 and 100 percent.

This variability occurs because process measures differ not only in provider performance but also in the degree to which performance is under the provider's control. For example, hospitals can achieve a 100 percent rate on a measure of the proportion of patients hospitalized for psychiatric care who receive a documented mental status exam each day—a process that is fully under the provider's control. On the other hand, other commonly measured processes, such as antidepressant medication adherence, are influenced by both the provider and the patient. Clinicians may be able to influence adherence through patient education and timely attention to side effects and nonresponse (41), but other factors affecting adherence—such as patient preference, financial barriers, and functional limitations associated with depression—are outside clinicians' control. In such cases, providers achiev-

ing average performance (45.8 percent for the adherence measure) may conclude that this is the best that could be expected. In contrast a benchmark can suggest an achievable level of excellent performance (in this case, 85.6 percent).

Our results illustrate a drawback of a simpler alternative to statistical benchmarks—identification of the performance achieved by the uppermost quartile or decile of providers. In a large sample, many providers will have only a few patients meeting a measure's inclusion criteria. Providers with a small number of patients skew percentile-based benchmarks toward high or low ends of the distribution, making them less meaningful as quality improvement goals. The 90th-percentile result was 100 percent for seven of the 12 measures in our study, driven by a large cohort of providers with only one qualifying patient. One could eliminate from the sample all providers with less than a threshold number of cases, but this raises other problems, particularly when dealing with a smaller sample of providers. The benchmark method we employed adjusts for the small-number effect without a loss of information.

The use of benchmarks does not obviate the need for case-mix adjustment. When results on a measure are influenced by clinical and demographic compositions of patient populations, statistical adjustment may be needed to ensure fair comparisons among providers or fair comparison to a benchmark. Each quality measure addressed here presents different issues with regard to case-mix adjustment, including whether it is needed and which patient characteristics should be adjusted for. Elsewhere we review the status of case-mix adjustment in mental health care (8) and the development of adjustment models for specific quality measures (1). Case-mix adjustment is gradually becoming available for a wider array of measures and populations. As these applications expand, the utility of benchmarks will increase as well.

Limitations to this study include the age of the Medicaid data, because clinical practice may have changed during the intervening decade. However, results for some of these meas-

ures have been examined over the ten-year period, and significant changes have not been observed. Our mean results from 1994 to 1995 on the HEDIS measures are quite similar to NCQA's 2003 Medicaid results (37, 42). Over the past decade, there has been a marked decrease in the length of inpatient stays and growing use of intermediate levels of care, such as partial programs and intensive outpatient programs. Some measures—for example, the HEDIS measure of continuity of care—have specifications that account for use of intermediate levels of care. Nonetheless, results on other measures may have been influenced by temporal trends. Studies using contemporaneous data will be needed to update our results.

As noted earlier, the use of these measures for quality assessment remains controversial in some quarters. First, fewer than half the measures proposed for mental health care examine clinical processes that are supported by evidence from research studies (1,19). Moreover, this evidence base may change over time. For example, as data have continued to emerge on the effectiveness and side effects of second-generation antipsychotics, the effectiveness of these drugs has been subject to shifting assessments of their value relative to traditional agents.

Second, selection of measures for use in national assessment activities has, for the most part, rested on consideration of the measures' face validity rather than on rigorous analysis of their predictive validity or association with improved patient outcomes. Such analyses are available for few measures of mental health care (1,19). Third, the measures used in this study rely on administrative data, which are commonly used for quality measurement because they are relatively inexpensive, are reasonably accurate, and use standardized codes. However, administrative data rely on clinician diagnoses rather than structured diagnostic interviews and lack clinical detail, limiting what can be evaluated (8,43). Additional research is needed on measure validity as well as on data accuracy and the adequacy of current measure specifications.

Finally, process measures are but one method of quality assessment and are ideally used in conjunction with other methods, such as assessment of patient perspectives of care, fidelity to empirically based interventions, and clinical outcomes resulting from treatment. The strengths and weaknesses of these approaches tend to complement one another and, collectively, provide a more robust armamentarium for evaluating quality of care (44).

Conclusions

Despite its limitations, the use of quality measures is rapidly expanding and provides a potentially powerful tool for improving mental health care. Their utility will further increase as case-mix adjustment becomes more sophisticated, health care systems adopt common measures and specifications, and electronic medical records make clinical information more readily accessible. Benchmarks have the potential to enhance measurement-based quality improvement by identifying levels of high performance that are potentially achievable. In identifying top-performing providers, benchmarks may also provide a first step toward determining practices that contribute to excellent care. In general medical care, incorporation of benchmarks into quality improvement activities has been shown to lead to a greater magnitude of improvement (18). Further studies will be needed to determine whether and under what circumstances similar gains can be achieved in mental health care.

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