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Are patients with serious mental illness more likely to be admitted to nursing homes with more deficiencies in care?

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Abstract

Background—Patients diagnosed with serious mental illness (SMI) who qualify for nursing home placement tend to require high levels of both psychiatric and nursing care. It is unknown, however, whether they are equally likely to be admitted to nursing homes with adequate quality of care compared to other patients.

Methods—We analyzed a national cohort of over 1.3 million new nursing home admissions in 2007 using the Minimum Data Set. The total and healthcare-related deficiency citations for each facility were obtained from the Online Survey, Certification, and Reporting file. Bivariate and multivariate regression analyses determined the association of schizophrenia or bipolar disorder with admissions to facilities with higher deficiencies.

Results—Compared to other patients, patients with schizophrenia (n=23,767) tended to enter nursing homes with both more total deficiencies (13.3 vs 11.2, p<0.001) and more healthcare-related deficiencies (8.6 vs 7.2, p<0.001); and patients with bipolar disorder (n=19,741) were more likely to enter facilities with more problematic care too (12.5 vs 11.2, p<0.001 for total deficiencies; and 8.2 vs 7.2, p<0.001 for healthcare-related deficiencies). After sequentially controlling for the within-county choice of facilities, patient characteristics, and facility covariates, the association of SMI with admitting to higher-deficiency nursing homes persisted.

Conclusions—Patients diagnosed with schizophrenia or bipolar disorder (ie, SMI) were more likely than other patients to be admitted to nursing homes with higher deficiency citations for both overall quality and clinical care quality. Future research is necessary to understand the reasons behind the disparity in quality of nursing home care associated with SMI.

Keywords

serious mental illness; deficiency citations; nursing home quality; schizophrenia; bipolar disorder

INTRODUCTION

Nursing homes in the United States serve patients with diverse physical and mental health disabilities. The prevalence of serious mental illness (SMI) is estimated to be 10–25 percent among existing nursing home residents,^{1–3} while each year approximately 3 percent of new admissions are diagnosed with SMI (schizophrenia or bipolar disorder).^{4–5} Under the Omnibus Budget Reconciliation Act (OBRA) of 1987, nursing homes are required to perform preadmission screening and regular review of all patients with SMI. The aim of this

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requirement is twofold: first, it ensures that patients with SMI also have extensive physical healthcare needs that qualify them for nursing home admission; and second, it ensures that those who are admitted receive appropriate mental and nursing services on an ongoing basis.¹

However, the appropriateness or quality of care in nursing homes has been a major concern of governments and policy makers for several decades.^{6–8} In the mean time, it is shown that nursing homes consist of a tiered system where facilities in the lower tier tend to be dominated by Medicaid reimbursement (which is much lower than private payment rates), lower staffing by licensed nurses, lower occupancy rate, and higher care deficiencies.⁹ A substantial literature has documented the concentration of racial/ethnic minorities to these poor-quality facilities, its social and ecological causes, and potential policy solutions.^{10–15}

Although not previously studied, there are a number of reasons – some paralleling those documented for race/ethnicity – that patients diagnosed with SMI may face similar disparities in the quality of their admitting nursing facilities. First, patients with SMI tend to be poorer, less educated,¹⁶ and having disrupted family support,¹⁷ which, together with their cognitive impairment, may make them less likely to make informed choices with regard to nursing home quality.¹³ Second, nursing homes may lack the expertise and incentives to provide high-level mental health services,^{18–19} particularly to the extent that patients with SMI require more costly services. Therefore, some facilities may be less inclined than others to accept these patients with challenging service needs. Finally, the diagnosis of SMI may lead to negative attitudes or stigmatization²⁰ on the part of nursing home administrators and caregivers. Studies in the acute care setting suggested that stigma may affect the care patterns and service referrals for mentally-ill patients.^{21–22}

Motivated by the concern about the possible disparity in quality of nursing home care associated with serious mental illness, this study examines whether patients diagnosed with SMI are more likely to be admitted to lower quality nursing homes. We measure service quality using the number of deficiency citations each facility receives for noncompliance with a broad set of federal quality standards.²³

METHODS

Data Source and Sample

We analyzed the 2007 national Minimum Data Set (MDS) which includes all patients admitted to Medicare and/or Medicaid certified nursing homes (over 90% of all nursing homes). The MDS contains over 350 assessment items for each patient's socio-demographic, functional, diagnostic, and therapeutic information. Assessments are performed by facility staff upon admission, regularly thereafter, and when the patient has a significant change of health status. Validation studies^{24–26} have shown that MDS records, including those for psychiatric diagnoses, are reliable and meet general criteria for data accuracy.

Our analyses focused on new nursing home admissions, defined as those patients with an admission assessment in 2007 and if they (1) were not transferred from another nursing home, and (2) had no prior nursing home stay during the past 5 years. The admission sample was then linked to the 2007 Online Survey, Certification, and Reporting (OSCAR) file, which is a facility-level database maintained by the Centers for Medicare and Medicaid (CMS) and contains nursing home characteristics (e.g., facility size and ownership) as well as quality violations measured by deficiency citations (described below). Although it has limitations, the OSCAR is generally believed to be accurate and widely used for quality evaluations and policy analyses.^{9, 13–14, 23}

Approximately 5% of admissions were lost during the linkage process. However, the missing records did not differ substantially from included patients in terms of socio-demographics and psychiatric diagnoses. The final analytic sample included 1,314,814 new admissions to 15,386 nursing homes in 2007.

Deficiency Citations as Measures of Quality

All certified homes in the country are subject to on-site inspections to ensure compliance with a set of approximately 180 federal quality standards, which encompass all aspects of service including clinical care, safety, quality of life, patient rights, physical environment, and administration.²⁷ States, under contract with CMS, perform the on-site survey every 9 to 15 months using trained surveyors whose tasks include examining facility operations, reviewing medical records and interviewing residents and staff. State surveyors issue deficiency citations (coded as 1 for a deficiency and 0 for no deficiency) if they determine that service standards for a particular domain are not met. Therefore, the number of deficiencies a facility receives each year represents an external evaluation of the facility's existing quality problems. Depending on the severity and scope of identified deficiencies, facilities may face intermediate sanctions such as civil monetary penalties or even ultimate termination of Medicare/Medicaid reimbursement.²⁸ In this study, we were interested in both the total number of deficiencies (a measure of overall quality)²³ and the number of healthcare-related deficiencies which targets clinical process and outcomes of care (a measure of clinical quality) such as resident assessment, nursing care, rehabilitation, infection control, and physician, dental, and pharmacy services.²³

Independent Variables

The key independent variables were the presence/absence of schizophrenia and bipolar disorder for a patient as determined in the admission assessment.⁴⁻⁵ The 2 psychiatric diagnoses are considered most disabling, frequently associated with functional impairment, and highly relevant to the federal requirement of Preadmission Screening and Resident Review (PASRR) for SMI.^{1, 4} MDS psychiatric diagnoses are based on patients' medical records and are of high validity.²⁴⁻²⁶ MDS records do not provide diagnoses of other types of SMI such as major depression.

We further defined a set of patient- and facility-covariates that were reported as important factors affecting nursing home choice and deficiency citations.^{11-14, 23, 29} In particular, minority race/ethnicity¹³⁻¹⁴ and lower educational attainment¹³ predicted admissions to nursing homes with higher deficiencies. We believed a priori that other individual characteristics, such as geographic proximity of residence to the facility, family support (proxied by marital status) and disease diagnoses, could also shift the decision of placement choices. Furthermore, empirical studies showed that nursing home characteristics such as profit status²³ and staffing levels²⁹ tended to be associated with quality of care measured by deficiency citations. We performed bivariate analyses and confirmed that most of these variables were also associated with the presence of SMI (see Table 1) and therefore can confound the relationship between SMI and deficiencies in care of the admitting facility.

Patient socio-demographic covariates included age, male gender, race/ethnicity (non-Hispanic white, black, and other), education (less than high school diploma, high school diploma, some college/technical school, and bachelor degree or higher), Medicaid eligibility (yes/no), marital status (married or not); distance between the patient's primary residence before admission and the admitting home, which was calculated as the linear arc travel distance between the zip code centroids of patient residence and the nursing home;²² and a designation of urban versus rural area of residence as defined by the US Census Bureau and the Office of Management and Budget.

Patient clinical and diagnostic covariates included the number of activities of daily living (ADLs) that each patient could perform, the cognitive performance scale of each patient,³⁰ whether the patient was admitted to the nursing home from a hospital (versus other source), and a set of binary variables (1/0) for whether the patient was diagnosed with diabetes, other endocrine disease, cardiovascular disease, musculoskeletal disease, dementia, neurological disease except dementia, mental illness except schizophrenia and bipolar disorder, pulmonary disease, sensory disease, and other disease. ADLs included bed mobility, transfer, dressing, eating, toilet use, personal hygiene, and bathing; each ADL component was coded in 5 categories from 0 (independence) to 4 (total dependence), resulting in a total range of the aggregate ADL score as 0–28. The CPS was defined using a validated and MDS-based algorithm developed by Morris et al,³⁰ which ranged from 0 (cognitively intact) to 6 (very severely impaired in cognition). Finally, nursing home covariates (from OSCAR) included ownership type (for-profit, non-profit, and government-owned), whether the nursing home is affiliated with a hospital, whether the nursing home is chain-affiliated, total number of beds, registered nurse (RN) hours per resident day, licensed practical/vocational nurse (LPN/LVN) hours per resident day, and certified nursing assistant (CNA) hours per resident day.²⁹

Statistical Analyses

We performed bivariate analyses to compare characteristics of three patient groups: patients with schizophrenia, patients with bipolar disorder, and other patients (note that the 2 psychiatric groups were defined hierarchically with [the small number of] patients having both diagnoses categorized in the schizophrenia group; the group of other patients had neither diagnosis). ² tests and analyses-of-variance were used for statistical inference as appropriate.

In multivariate analyses we estimated 2 sets of ordinary least squares (OLS) linear models for the total and healthcare-related deficiencies, respectively. Evidence suggests that the state nursing home oversight process, although rooted in federal legislations, tend to vary across states;^{27–28} as a result, concern exists that the intensity of facility review and subsequent citations may reflect a combination of state variations in regulatory practices and each facility's quality. Therefore, we retransformed the deficiency scores and defined the dependent variable of each model as the number of total (or healthcare-related) deficiencies of each nursing home minus the state average number of total (or healthcare-related) deficiencies of all homes in the state.

It is also believed that patient choices of nursing homes are made to a large extent within local areas. In the nursing home literature market competition and nursing home choice is frequently defined using county boundaries.^{9–10, 14} Thus, our regression analyses incorporated county fixed-effects³¹ to reflect the within-county choice process while estimating the effect of SMI on admissions to facilities with varied quality. To estimate both the overall effect of SMI and how this effect may be mediated by patient and facility characteristics, we fit a series of models for each type of deficiency. The base model included schizophrenia, bipolar disorder, and county fixed effects only (model 1). We then sequentially added to the base model patient socio-demographic covariates described above (model 2), clinical and diagnostic covariates (model 3), and nursing home covariates (model 4).

We conducted additional analyses to confirm the robustness of our findings. First, because deficiencies are essentially nonnegative count data that could be better described in a Poisson process, we revised the above analyses and estimated Poisson and negative binomial regression models (the dependent variable being either total or health-related number of

deficiencies). Because of evidence of over-dispersion in Poisson regression models, we reported estimates from the negative binomial models only.

Second, we fit separate logistic regression models to estimate both the overall and adjusted effect of SMI on the likelihood of admission to each of three alternatively-defined facilities believed to be most problematic in care: 1) facilities in the top quartile group of within-state rankings of the total number of deficiencies; 2) facilities in the top quartile group of within-state rankings of the health-related deficiencies; and 3) facilities with a deficiency at G level or higher, which indicates a severe violation of federal standard that put residents in immediate jeopardy or caused them actual harms.²⁷

Finally, to further explore the relationship between SMI and admission to higher-deficiency facilities within subgroups of patients or facility types, we conducted additional OLS regression analyses (as described before) that were stratified by selected patient and facility characteristics (such as marital status, facility profit status). Stratified models controlled for the same covariates as described before except the one used for stratification.

RESULTS

Characteristics of New Admissions

Among the over 1.3 million new admissions in 2007, 23,767 (1.8%) were diagnosed with schizophrenia, and 19,741 (1.5%) with bipolar disorder (Table 1). Compared to other patients, patients with schizophrenia or bipolar disorder were younger (average age 63.5 vs 67.6 vs 80.4), more likely to be Medicaid eligible (38.4% vs 21.4% vs 9.3%), and less likely to be married (10.9% vs 25.4% vs 31.9%). They were also less physically impaired (average # of ADLs 12.1 vs 13.9 vs 16.4), and less likely to be admitted from hospital (71.6% vs 81.5% vs 87.3%). Bivariate analyses suggested that patients with schizophrenia or bipolar disorder were more likely than other patients to enter facilities with higher numbers of total deficiencies (13.3 vs 12.5 vs 11.2 on average), with higher healthcare-related deficiencies (8.6 vs 8.2 vs 7.2 on average), or with deficiencies at G level or higher (23.9% vs 22.5% vs 20.7%).

Independent Impacts of SMI

Table 2 shows that after sequentially controlling for patient and nursing home covariates (OLS models 1–4), schizophrenia and bipolar disorder were independently associated with admissions to nursing homes with higher total and health-related deficiencies. The overall excess numbers of total deficiencies for schizophrenia and bipolar disorder were 1.57 (95% confidence interval [CI] 1.48 – 1.65) and 0.98 (95% CI 0.89 – 1.07), respectively, when within-county choices were assumed (model 1). The overall excess total deficiencies associated with both diagnoses were partially mediated by patient socio-demographics (model 2), clinical & diagnostic characteristics (model 3), and nursing home covariates (model 4). After all these covariates were controlled for (model 4), presence of each SMI continued to predict higher total deficiencies (0.39 [95% CI 0.30–0.48] for schizophrenia, and 0.40 [95% CI 0.30–0.49] for bipolar disorder). Similar patterns of association were found between each diagnosis and higher health-related deficiencies (Table 2).

Table 3 presents the results of parallel analyses based on negative binomial (NB) regression. The incidence rate ratio (IRR) estimated in model 1 indicated that overall, the total deficiencies of the admitting facility were 16% higher for schizophrenic patients, and 9% higher for patients with bipolar disorder, while health-related deficiencies were 15% and 10% higher, respectively, for the 2 types of patients. We transformed IRRs to excess number of deficiencies and found remarkable consistency of the NB estimates with the OLS

estimates for both overall and mediated effects of SMI on admission to higher deficiency facilities.

The results from logistic regression (Table 4) suggested that schizophrenia and bipolar disorder were both associated with increased likelihood of admission to facilities with most problematic services, ie, those in the top quartile group according to rankings of total deficiencies (overall ORs 1.46 [95% CI 1.35–1.58] and 1.31 [1.25–1.38], respectively), those in the top quartile group according to rankings of health-related deficiencies (overall ORs 1.46 [1.34–1.59] and 1.26 [1.20–1.33], respectively), and those with deficiencies at G level or higher (overall ORs 1.19 [1.08–1.31] and 1.10 [1.04–1.15], respectively). The overall associations were largely mediated by patient and facility characteristics but did not totally disappear in analyses focusing on quartile rankings of deficiencies.

Table 5 presents results of stratified OLS analyses which suggested that the association of SMI with excess deficiencies (total or health-related) tended to persist in subgroups but may vary according to patient and facility characteristics. For example, the overall excess number of total deficiencies associated with SMI was higher for patients with age ≥ 65 years (1.51 for schizophrenia, 0.76 for bipolar disorder) than for younger patients (0.75 for schizophrenia, 0.50 for bipolar disorder). The differential excess deficiencies associated with SMI were also found for Medicaid vs non-Medicaid patients, rural vs urban residence, and patients admitted to for-profit vs other facilities.

DISCUSSION

This national study demonstrated that compared to other patients, patients diagnosed with serious mental illness (schizophrenia or bipolar disorder) tended to be admitted to nursing facilities with more government-issued deficiency citations, for both overall and more clinically-oriented services. This association was partially mediated by other patient and nursing home characteristics, but persisted after their effects were controlled for, and persisted in subgroups of patients and admitting facilities.

The ORBA 1987 was intended to provide new protections for all nursing home patients as well as those with SMI, given concerns about the widespread quality problems in nursing homes⁷ and about the inappropriate transferring of mentally-ill patients from psychiatric hospitals to nursing facilities.^{1, 32} The resultant regulations from OBRA 1987 strengthened regulatory enforcement and required annual on-site inspections over care process and outcomes.²⁷ In addition, the PASRR program was specifically designed to prevent SMI patients without accompanying physical/medical disabilities from being “dumped” to nursing homes.³² Evidence suggests that the PASRR mandates helped reduce the prevalence of SMI patients who have no medical co-morbidities in nursing homes.³³ In contrast, there is concern that many nursing homes may lack the essential resources, staff skills, and incentives to serve the unique needs of mentally-ill patients who are “appropriately” placed according to the PASRR requirements.^{18–19}

In light of these ongoing debates, our study provides important new information that patients diagnosed with SMI are more likely than others to be placed in institutions with high deficiencies in care. The claim that they tend to be concentrated in the lower-tier facilities with poorer care⁹ does not mean that the quality of other facilities is superior or even adequate. Nevertheless, the disparity in nursing home care faced by patients with SMI is, to our knowledge, an unstudied or understudied issue. Given the relatively high prevalence of SMI in nursing homes (ie, $>10\%$),^{1–3} they likely represent a group of priority (and vulnerability) that warrants more research and policy attentions.

Although no previous study exists to provide direct explanations of the findings in this study, several plausible factors may contribute to the tendency of SMI patients to enter poorer-quality nursing homes. First, given the current level of demand for nursing home care, many facilities still enjoy substantial flexibility in admitting different types of patients. Nursing home administrators may selectively avoid accepting patients with SMI³⁴ because they are worried about their socially inappropriate and many times dangerous behaviors,² and about the fact that their staff may not be competent enough to serve appropriately these patients. As a result, patients with SMI may be crowded out of the locally reputable nursing homes (ie, in terms of service quality) that are attractive to all prospective entrants; and they may be clustered into nursing homes that tend to house less desirable patients or locate in poor urban areas, have lower occupancy rates, provide less adequate services, and therefore be more inclined to accept these challenging patients.^{35–36}

Due to cognitive abnormalities and possible lack of family support, patients with SMI may show reduced ability to make informed decisions or assert preferences on choices of facilities. It is also likely that SMI patients tend to be socially isolated and have less informal support (such as from other patients or friends) when at the crucial juncture of choosing among alternative placement localities. Therefore, future work is needed to explore the role of social, family, and caregiver factors in explaining the increased likelihood of entering poorer-quality nursing homes for SMI patients.

Our data revealed that patients with SMI were less likely to be admitted directly from a hospital (Table 1). This would suggest that they had less access than other patients to the services of discharge planners or social workers to facilitate nursing home choices. Although a lack of professional referral services might be another explanation for the inferior nursing home placement associated with SMI, we did not have such data to test this hypothesis. We performed stratified analyses according to whether the patient was admitted from a hospital (Table 5) and found that the excess deficiencies faced by SMI patients may differ in the 2 subgroups. Future research is needed to explore the referral process for nursing home admission and the potential disparity for patients with SMI during this process.

Our data also showed that patients diagnosed with SMI were more likely to reside in urban areas, and therefore to be served by large, for-profit facilities. These geographic and facility attributes were found to predict poorer nursing home care in the literature,^{9–10, 23} and our analyses suggested they explained a portion of the overall excess deficiencies associated with SMI. Moreover, disparities associated with SMI tended to be more pronounced for patients with urban residence or those admitted to for-profit facilities (Table 5). Future root causes analyses are needed to further determine the contribution of broader geographic and community factors to SMI patients' admissions to poor-care nursing facilities.

Our findings have important policy implications. Although the PASRR program was intended to assure appropriate nursing home placement and service provision for patients with SMI, this study suggests that they tend to be placed in facilities with more problematic care – a disparity that should be addressed for the goal of PASRR mandates to be achieved. Furthermore, nursing home services, and specialty psychiatric services in particular, are not well reimbursed,³⁷ and many nursing homes in the nation lack the resources and clinical expertise to serve appropriately patients with SMI.¹⁹ Given these patients' more complex healthcare needs, nursing homes that do admit a high number of patients with SMI may incur additional costs, run higher risk for violating federal care standards, and face particular challenges in maintaining financial and service performance. These in turn threaten both the physical and mental healthcare received by their residents with SMI.

This study has several limitations. First, the deficiency data obtained from OSCAR may not be a highly accurate measure of nursing home quality and may be subject to reporting errors.²³ Although our OLS analyses accounted for state variations in the detection of care problems and assignment of citations,^{27–28} there may be regional variations within states in both overall and healthcare-related deficiencies that are attributable to differential inspection processes. Nevertheless, we assumed patient's within-county choice of nursing homes throughout the analyses and the use of county fixed effects should be able to address the issue of regional variations.

Second, nursing home quality is multidimensional and quality measures other than deficiency citations, such as MDS-based quality indicators and nurse staffing, are also critically important. Comparing these other measures between residents with and without SMI is beyond the scope of this study, but represents a direction for future research. Third, the MDS does not provide a full set of diagnoses of mental illnesses (eg, based on the DSM-IV) and our focuses on schizophrenia and bipolar disorder took a narrow perspective. However, the 2 psychiatric conditions are common in nursing homes, and are key targets of federal PASRR mandates. In addition, if true association exists between SMI and admissions to lower-quality facilities, under-coding of SMI cases would lead to an “intention to treat” effect where estimates are biased toward no group differences, and thus to conservative conclusions of this study. Finally, due to the cross-sectional nature of this study, our analyses can demonstrate associations, but not causal effects, between presence of SMI and higher facility deficiencies. Future prospective research is warranted to test more distinctively 2 related questions: whether SMI patients tend to enter facilities with more problematic care and whether SMI patients who are already placed tend to receive poorer care compared to other patients.

Despite these potential limitations, this study suggests that among new admissions to nursing homes in the nation, patients diagnosed with schizophrenia or bipolar disorder were more likely than others to enter facilities with higher deficiency citations for both overall and clinical care quality. This disparity associated with serious mental illness is a previously understudied yet significant issue. Future research is necessary to better understand the reasons behind the observed disparity so as to inform and guide the development of strategies to address this issue.

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References

1. Linkins KW, Lucca AM, Housman M, Smith SA. Use of PASRR programs to assess serious mental illness and service access in nursing homes. *Psychiatr Serv.* Mar; 2006 57(3):325–332. [PubMed: 16524989]
2. McCarthy JF, Blow FC, Kales HC. Disruptive behaviors in Veterans Affairs nursing home residents: how different are residents with serious mental illness? *J Am Geriatr Soc.* Dec; 2004 52(12):2031–2038. [PubMed: 15571538]
3. Bagchi AD, Verdier JM, Simon SE. How many nursing home residents live with a mental illness? *Psychiatr Serv.* Jul; 2009 60(7):958–964. [PubMed: 19564227]

4. Grabowski DC, Aschbrenner KA, Feng Z, Mor V. Mental illness in nursing homes: variations across States. *Health Aff (Millwood)*. May-Jun;2009 28(3):689–700. [PubMed: 19414877]
5. Fullerton CA, McGuire TG, Feng Z, Mor V, Grabowski DC. Trends in mental health admissions to nursing homes, 1999–2005. *Psychiatr Serv*. Jul; 2009 60(7):965–971. [PubMed: 19564228]
6. Vladeck, B. *Unloving care: The nursing home tragedy*. 1980.
7. Institute of Medicine. *Improving the quality of care in nursing homes*. 1986.
8. IOM. Institute of Medicine. *Improving the quality of care in nursing homes*. 2001.
9. Mor V, Zinn J, Angelelli J, Teno JM, Miller SC. Driven to tiers: socioeconomic and racial disparities in the quality of nursing home care. *Milbank Q*. 2004; 82(2):227–256. [PubMed: 15225329]
10. Fennell ML, Miller SC, Mor V. Facility effects on racial differences in nursing home quality of care. *Am J Med Qual*. Jul-Aug;2000 15(4):174–181. [PubMed: 10948790]
11. Fennell ML, Feng Z, Clark MA, Mor V. Elderly hispanics more likely to reside in poor-quality nursing homes. *Health Aff (Millwood)*. Jan-Feb;2010 29(1):65–73. [PubMed: 20048362]
12. Smith DB, Feng Z, Fennell ML, Zinn JS, Mor V. Separate and unequal: racial segregation and disparities in quality across U.S. nursing homes. *Health Aff (Millwood)*. Sep-Oct;2007 26(5): 1448–1458. [PubMed: 17848457]
13. Angelelli J, Grabowski DC, Mor V. Effect of educational level and minority status on nursing home choice after hospital discharge. *Am J Public Health*. Jul; 2006 96(7):1249–1253. [PubMed: 16735621]
14. Grabowski DC. The admission of blacks to high-deficiency nursing homes. *Med Care*. May; 2004 42(5):456–464. [PubMed: 15083106]
15. Smith DB. Population ecology and the racial integration of hospitals and nursing homes in the United States. *the Milbank Quarterly*. 1990; 68(4):561–596. [PubMed: 2292991]
16. Dohrenwend BP, Levav I, Shrout PE, et al. Socioeconomic status and psychiatric disorders: the causation-selection issue. *Science*. Feb 21; 1992 255(5047):946–952. [PubMed: 1546291]
17. Stern S, Doolan M, Staples E, Szmukler GL, Eisler I. Disruption and reconstruction: narrative insights into the experience of family members caring for a relative diagnosed with serious mental illness. *Fam Process*. Fall;1999 38(3):353–369. [PubMed: 10526771]
18. Reichman WE, Coyne AC, Borson S, et al. Psychiatric consultation in the nursing home. A survey of six states. *Am J Geriatr Psychiatry*. Fall;1998 6(4):320–327. [PubMed: 9793580]
19. Li Y. Provision of mental health services in U.S. nursing homes, 1995–2004. *Psychiatr Serv*. Apr; 2010 61(4):349–355. [PubMed: 20360273]
20. Wirth JH, Bodenhausen GV. The role of gender in mental-illness stigma: a national experiment. *Psychol Sci*. Feb; 2009 20(2):169–173. [PubMed: 19175755]
21. Ritson EB. Alcohol, drugs and stigma. *Int J Clin Pract*. Oct-Nov;1999 53(7):549–551. [PubMed: 10692742]
22. Li Y, Glance LG, Cai X, Mukamel DB. Are patients with coexisting mental disorders more likely to receive CABG surgery from low-quality cardiac surgeons? The experience in New York State. *Med Care*. Jul; 2007 45(7):587–593. [PubMed: 17571006]
23. Harrington C, Woolhandler S, Mullan J, Carrillo H, Himmelstein DU. Does investor ownership of nursing homes compromise the quality of care? *Am J Public Health*. Sep; 2001 91(9):1452–1455. [PubMed: 11527781]
24. Hawes C, Morris JN, Phillips CD, Mor V, Fries BE, Nonemaker S. Reliability estimates for the Minimum Data Set for nursing home resident assessment and care screening (MDS). *Gerontologist*. Apr; 1995 35(2):172–178. [PubMed: 7750773]
25. Lawton MP, Casten R, Parmelee PA, Van Haitsma K, Corn J, Kleban MH. Psychometric characteristics of the minimum data set II: validity. *J Am Geriatr Soc*. Jun; 1998 46(6):736–744. [PubMed: 9625190]
26. Mor V, Angelelli J, Jones R, Roy J, Moore T, Morris J. Inter-rater reliability of nursing home quality indicators in the U.S. *BMC Health Serv Res*. Nov 4.2003 3(1):20. [PubMed: 14596684]
27. Harrington C, Mullan JT, Carrillo H. State nursing home enforcement systems. *J Health Polit Policy Law*. Feb; 2004 29(1):43–73. [PubMed: 15027837]

28. Li Y, Harrington C, Spector W, Mukamel D. State regulatory enforcement and nursing home termination from Medicare/Medicaid programs. *Health Serv Res.* 2010 (in press).
29. Harrington C, Zimmerman D, Karon SL, Robinson J, Beutel P. Nursing home staffing and its relationship to deficiencies. *J Gerontol B Psychol Sci Soc Sci.* Sep; 2000 55(5):S278–287. [PubMed: 10985299]
30. Morris JN, Fries BE, Mehr DR, et al. MDS Cognitive Performance Scale. *J Gerontol.* Jul; 1994 49(4):M174–182. [PubMed: 8014392]
31. Hsiao, C. *Analysis of panel data.* Cambridge University Press; 2003. 2nd version
32. HCFA. Medicare and Medicaid programs; preadmission screening and annual resident review. Final rule with comment period. *Fed Regist.* Nov 30; 1992 57(230):56450–56514. [PubMed: 10122884]
33. Mechanic D, McAlpine DD. Use of nursing homes in the care of persons with severe mental illness: 1985 to 1995. *Psychiatr Serv.* Mar; 2000 51(3):354–358. [PubMed: 10686243]
34. Mosher-Ashley PM, Turner BF, O’Neill D. Attitudes of nursing and rest home administrators toward deinstitutionalized elders with psychiatric disorders. *Community Ment Health J.* Aug; 1991 27(4):241–253. [PubMed: 1864074]
35. Jervis LL. Contending with “problem behaviors” in the nursing home. *Arch Psychiatr Nurs.* Feb; 2002 16(1):32–38. [PubMed: 11877604]
36. Reed SC, Andes S, Tobias RA. Concentrated poverty and nursing home bed supply in Chicago. *J Health Care Poor Underserved.* Feb; 2001 12(1):88–102. [PubMed: 11217231]
37. Ickowicz E. The American Geriatrics Society and American Association for Geriatric Psychiatry recommendations for policies in support of quality mental health care in U.S. nursing homes. *J Am Geriatr Soc.* Sep; 2003 51(9):1299–1304. [PubMed: 12919244]

Table 1

Descriptive characteristics by diagnosis of serious mental illness (SMI)

Characteristic	Patients with SMI		
	Schizophrenia* (n=23,767)	Bipolar Disorder* (n=19,741)	Other Patients (n=1,271,306)
	Mean ± SD or Percent		
<i>Patient socio-demographic variable:</i>			
Age in Years	63.5±14.7	67.6±15.0	80.4±12.6
Male	46.9	34.4	36.5
Race/Ethnicity			
White	66.9	85.8	82.2
Black	23.2	8.4	10.3
Other	9.9	5.8	7.5
Education			
<high school diploma	34.8	19.9	25.4
High school diploma	40.0	41.7	43.9
Some college/technical school	16.2	22.1	17.1
Bachelor degree or higher	9.0	16.3	13.6
Medicaid eligible	38.4	21.4	9.3
Married	10.9	25.4	31.9
Distance in miles [¶]	12.8±23.1	10.5±19.3	8.1±15.8
Urban residence	85.1	85.8	82.9
<i>Patient clinical and diagnostic variable:</i>			
Activities of daily living (0-28)	12.1±8.0	13.9±7.2	16.4±6.0
Cognitive performance scale (0-6)	2.0±1.5	1.5±1.5	1.5±1.6
Admitted from hospital	71.6	81.5	87.3
Disease diagnosis			
Diabetes	33.4	32.8	31.9
Other endocrine disease	15.2	23.5	17.7
Cardiovascular disease	64.2	69.5	82.7
Musculoskeletal disease	22.4	33.4	41.6
Dementia	20.2	21.8	24.9
Neurological disease (except dementia)	25.3	28.2	24.8
Mental illness (except SMI)	37.1	47.4	32.7
Pulmonary disease	26.8	27.2	21.2
Sensory disease	5.7	6.7	10.6
Other disease	44.5	52.3	56.6
<i>Nursing home deficiency:</i>			
Total deficiencies	13.3±8.5	12.5±8.3	11.2±7.8
Total deficiencies minus state average	1.5±7.8	1.1±7.4	0.0±6.9
Healthcare deficiencies	8.6±6.6	8.2±6.4	7.2±5.9
Healthcare deficiencies minus state average	1.0±6.1	0.8±5.8	0.0±5.3

Characteristic	Patients with SMI		
	Schizophrenia* (n=23,767)	Bipolar Disorder* (n=19,741)	Other Patients (n=1,271,306)
% nursing homes with any deficiency at G level or higher	23.9	22.5	20.7
<i>Nursing home covariate:</i>			
Ownership			
For-profit	82.7	77.4	69.0
Non-profit	13.4	18.8	27.1
Government	3.9	3.8	3.9
Hospital affiliation			
Chain affiliation	55.7	59.8	56.8
Total number of beds	152.9±104.2	144.3±93.4	138.8±94.0
RN hours per resident day	0.5±0.4	0.6±0.5	0.7±0.6
LPN/LVN hours per resident day	0.8±0.4	0.8±0.4	0.9±0.4
CNA hours per resident day	2.2±0.6	2.3±0.6	2.4±0.6

*P<0.01 for the comparison of each patient or nursing home characteristic to the group of other patients.

^fLinear arc distance between centroids of zip codes of patient primary residence and the admitting nursing home.

RN=registered nurse; LPN/LVN=licensed practical nurse/licensed vocational nurse; CNA=certified nursing assistant.

Table 2

Serious mental illness and admissions to nursing homes with more deficiencies – OLS (ordinary least squares) analyses

	Total deficiencies		Health-related deficiencies	
	-coefficient (excess # of deficiencies)	95% confidence interval	-coefficient (excess # of deficiencies)	95% confidence interval
Model 1: Schizophrenia	1.57	1.48 – 1.65	0.93	0.87 – 1.00
Bipolar disorder	0.98	0.89 – 1.07	0.71	0.65 – 0.78
Model 2: Schizophrenia	0.72	0.62 – 0.80	0.38	0.31 – 0.47
Bipolar disorder	0.70	0.62 – 0.80	0.51	0.45 – 0.59
Model 3: Schizophrenia	0.70	0.60 – 0.79	0.41	0.34 – 0.49
Bipolar disorder	0.64	0.55 – 0.74	0.47	0.40 – 0.54
Model 4: Schizophrenia	0.39	0.30 – 0.48	0.22	0.15 – 0.30
Bipolar disorder	0.40	0.30 – 0.49	0.30	0.23 – 0.37

Note: the dependent variable of all (linear) regression models was the number of total (or health-related) deficiency citations of each nursing home minus the average number of total (or health-related) deficiency citations issued by the state to all nursing homes in the state. Model 1 controlled for county fixed effects only; model 2 controlled for county fixed effects and patient socio-demographic covariates; model 3 controlled for all variables in model 2 plus clinical and diagnostic covariates; and model 4 controlled for all variables in model 3 plus nursing home covariates. All variables were listed in Table 1.

Table 3

Serious mental illness and admissions to nursing homes with more deficiencies – negative binomial regression analyses

	Total deficiencies			Health-related deficiencies		
	Incidence rate ratio (IRR)	95% confidence interval of IRR	Excess # of deficiencies [†]	Incidence rate ratio (IRR)	95% confidence interval of IRR	Excess # of deficiencies [†]
Model 1: Schizophrenia	1.16	1.16 – 1.17	1.79	1.15	1.14 – 1.16	1.08
Bipolar disorder	1.09	1.09 – 1.10	1.01	1.10	1.09 – 1.11	0.72
Model 2: Schizophrenia	1.09	1.08 – 1.09	1.01	1.06	1.05 – 1.07	0.43
Bipolar disorder	1.07	1.06 – 1.08	0.78	1.07	1.06 – 1.08	0.50
Model 3: Schizophrenia	1.08	1.07 – 1.08	0.90	1.07	1.06 – 1.08	0.50
Bipolar disorder	1.06	1.05 – 1.07	0.67	1.07	1.06 – 1.08	0.50
Model 4: Schizophrenia	1.04	1.03 – 1.04	0.45	1.03	1.02 – 1.04	0.22
Bipolar disorder	1.04	1.03 – 1.05	0.45	1.04	1.03 – 1.05	0.29

[†] calculated as (IRR - 1)*11.2 for total deficiencies and (IRR - 1)*7.2 for health-related deficiencies, where 11.2 and 7.2 are total and health-related deficiencies, respectively, for the cohort of non-mentally ill admissions.

Note: the dependent variable of all regression models was the number of total (or health-related) deficiency citations of each nursing home. Model 1 controlled for county fixed effects only; model 2 controlled for county fixed effects and patient socio-demographic covariates; model 3 controlled for all variables in model 2 plus clinical and diagnostic covariates; and model 4 controlled for all variables in model 3 plus nursing home covariates. All variables were listed in Table 1.

Table 4

Serious mental illness and admissions to nursing homes with more deficiencies – logistic regression analyses

	Top quartile ranking by total deficiencies		Top quartile ranking by health-related deficiencies		Any deficiency at G level or higher	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Model 1: Schizophrenia	1.46	1.35 – 1.58	1.46	1.34 – 1.59	1.19	1.08 – 1.31
Bipolar disorder	1.31	1.25 – 1.38	1.26	1.20 – 1.33	1.10	1.04 – 1.15
Model 2: Schizophrenia	1.16	1.08 – 1.25	1.18	1.10 – 1.27	1.10	1.01 – 1.20
Bipolar disorder	1.21	1.16 – 1.27	1.16	1.11 – 1.21	1.05	1.01 – 1.10
Model 3: Schizophrenia	1.15	1.08 – 1.23	1.17	1.09 – 1.24	1.07	0.99 – 1.15
Bipolar disorder	1.19	1.14 – 1.24	1.14	1.09 – 1.18	1.04	0.99 – 1.08
Model 4: Schizophrenia	1.07	1.00 – 1.14	1.08	1.01 – 1.15	1.01	0.94 – 1.09
Bipolar disorder	1.12	1.08 – 1.17	1.07	1.03 – 1.12	1.03	0.98 – 1.08

Note: the dependent variable of each set of regression models was whether the admitting nursing home was in the top quartile group according to within-state rankings of the number of total deficiencies (yes/no), whether the admitting home was in the top quartile group according to within-state rankings of the number of health-related deficiencies (yes/no), or whether the admitting nursing home had a deficiency at G level or higher. Model 1 controlled for county fixed effects only; model 2 controlled for county fixed effects and patient socio-demographic covariates; model 3 controlled for all variables in model 2 plus clinical and diagnostic covariates; and model 4 controlled for all variables in model 3 plus nursing home covariates. All variables were listed in Table 1.

Table 5

Serious mental illness and admissions to nursing homes with more deficiencies – stratified analyses

Characteristic	Excess # of total deficiencies		Excess # of health-related deficiencies	
	Overall*	Fully adjusted (95% CI) [¶]	Overall*	Fully adjusted (95% CI) [¶]
Age<65				
Schizophrenia	0.75	0.05 (−0.30 – 0.40)	0.29	−0.02 (−0.32 – 0.28)
Bipolar disorder	0.50	0.32 (0.08 – 0.55)	0.41	0.27 (0.08 – 0.47)
Age 65				
Schizophrenia	1.51	0.54 (0.33 – 0.75)	1.01	0.38 (0.22 – 0.54)
Bipolar disorder	0.76	0.46 (0.31 – 0.61)	0.55	0.32 (0.20 – 0.44)
Male				
Schizophrenia	1.43	0.14 (−0.18 – 0.47)	0.76	0.03 (−0.24 – 0.31)
Bipolar disorder	1.01	0.42 (0.21 – 0.63)	0.74	0.32 (0.16 – 0.49)
Female				
Schizophrenia	1.60	0.49 (0.25 – 0.73)	1.03	0.35 (0.17 – 0.53)
Bipolar disorder	0.98	0.45 (0.29 – 0.60)	0.71	0.33 (0.20 – 0.45)
White				
Schizophrenia	1.48	0.40 (0.18 – 0.62)	0.96	0.26 (0.09 – 0.44)
Bipolar disorder	1.07	0.42 (0.27 – 0.56)	0.77	0.32 (0.20 – 0.43)
Non-white				
Schizophrenia	1.12	0.19 (−0.25 – 0.62)	0.54	0.06 (−0.27 – 0.39)
Bipolar disorder	0.81	0.34 (−0.05 – 0.72)	0.53	0.23 (−0.07 – 0.53)
<high school graduation				
Schizophrenia	1.47	0.43 (0.15 – 0.72)	0.83	0.25 (0.04 – 0.47)
Bipolar disorder	0.78	0.26 (−0.01 – 0.54)	0.52	0.16 (−0.06 – 0.38)
high school graduation				
Schizophrenia	1.57	0.30 (0.02 – 0.58)	0.95	0.19 (−0.03 – 0.42)
Bipolar disorder	1.05	0.47 (0.32 – 0.62)	0.78	0.36 (0.24 – 0.48)
Medicaid eligible				
Schizophrenia	0.50	−0.02 (−0.39 – 0.35)	0.20	0.06 (−0.24 – 0.37)
Bipolar disorder	0.61	0.26 (−0.03 – 0.55)	0.43	0.18 (−0.04 – 0.40)
Non-Medicaid eligible				
Schizophrenia	1.56	0.53 (0.27 – 0.79)	0.99	0.30 (0.08 – 0.52)
Bipolar disorder	0.87	0.45 (0.30 – 0.60)	0.66	0.34 (0.22 – 0.46)
Married				
Schizophrenia	1.45	0.48 (0.13 – 0.83)	0.96	0.35 (0.07 – 0.63)
Bipolar disorder	0.89	0.46 (0.25 – 0.67)	0.62	0.29 (0.12 – 0.45)
Not married				
Schizophrenia	1.50	0.31 (0.06 – 0.57)	0.88	0.19 (−0.01 – 0.39)
Bipolar disorder	0.98	0.42 (0.25 – 0.58)	0.73	0.33 (0.20 – 0.46)
Admitted from hospital				
Schizophrenia	1.68	0.40 (0.15 – 0.65)	1.10	0.28 (0.08 – 0.47)

Characteristic	Excess # of total deficiencies		Excess # of health-related deficiencies	
	Overall*	Fully adjusted (95% CI) [¶]	Overall*	Fully adjusted (95% CI) [¶]
Bipolar disorder	0.91	0.40 (0.26 – 0.54)	0.66	0.28 (0.17 – 0.39)
Not admitted from hospital				
Schizophrenia	1.04	0.20 (–0.30 – 0.70)	0.41	0.04 (–0.39 – 0.47)
Bipolar disorder	1.11	0.56 (0.20 – 0.92)	0.86	0.50 (0.18 – 0.82)
Urban residence				
Schizophrenia	1.69	0.37 (0.09 – 0.66)	1.06	0.22 (–0.01 – 0.45)
Bipolar disorder	0.98	0.43 (0.27 – 0.58)	0.70	0.30 (0.17 – 0.42)
Rural residence				
Schizophrenia	0.87	0.22 (–0.10 – 0.54)	0.58	0.19 (–0.07 – 0.45)
Bipolar disorder	0.70	0.45 (0.14 – 0.76)	0.62	0.45 (0.19 – 0.71)
For-profit nursing home				
Schizophrenia	2.34	1.11 (0.73 – 1.50)	1.68	0.90 (0.61 – 1.19)
Bipolar disorder	0.93	0.49 (0.20 – 0.77)	0.71	0.39 (0.16 – 0.62)
Nonprofit or government nursing home				
Schizophrenia	1.09	0.15 (–0.13 – 0.44)	0.53	0.04 (–0.19 – 0.28)
Bipolar disorder	0.83	0.41 (0.25 – 0.57)	0.58	0.30 (0.17 – 0.43)
# of beds <100				
Schizophrenia	1.50	0.30 (–0.13 – 0.74)	0.73	0.11 (–0.24 – 0.45)
Bipolar disorder	0.94	0.39 (0.17 – 0.67)	0.66	0.31 (0.07 – 0.54)
# of beds ≥ 100				
Schizophrenia	1.45	0.36 (0.07 – 0.66)	0.91	0.26 (0.02 – 0.49)
Bipolar disorder	0.86	0.43 (0.26 – 0.59)	0.63	0.31 (0.17 – 0.44)

* obtained from OLS (ordinary least squares) linear regression model that adjusted for county fixed effects only.

[¶] obtained from OLS (ordinary least squares) linear regression model that adjusted for county fixed effects, patient socio-demographic and diagnostic characteristics, and nursing home covariates.