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Serious Mental Illness in Nursing Homes: Quality Concerns

Dylan J. Jester
University of South Florida

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by

Dylan J. Jester

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Co-Major Professor: Ross Andel, Ph.D.
Co-Major Professor: Victor Molinari, Ph.D.
John R. Bowblis, Ph.D.
Debra Dobbs, Ph.D.
Janice C. Zgibor, R.Ph., Ph.D.

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DEDICATION

This dissertation is dedicated to Kathryn Hyer, Ph.D., M.P.P., her memory, and her legacy. Dr. Hyer was a brilliant, compassionate, and fiercely hardworking mentor. She was known for her dependability and poise during times of great frustration and stress, and for her tremendously generous disposition. She was a powerful advocate for vulnerable older adults and sought to improve long-term care services and supports in Florida and across the nation. Dr. Hyer's profound impact on my career and life will be far-reaching for years to come. Words cannot describe how much she is missed.

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ABSTRACT

Objective: This dissertation is made of two academic papers followed by a chapter discussing policy implications of the findings. The objective of this dissertation is to better understand if high-serious mental illness (SMI) nursing homes (NHs) provide poorer quality of care (e.g., operationalized as staffing levels, NH Compare quality star ratings, and health deficiencies) and whether quality in high-SMI NHs is confounded by payer mix (e.g., the proportion of residents who are Medicaid-reimbursed). A modified Donabedian Structure, Process, Outcome (SPO) Model was used as the main theoretical framework.

Methods: Data came from the Certification and Survey Provider Enhanced Reports (CASPER) from 2016 for Chapter 2 and from 2014 to 2017 for Chapter 3. Quality star ratings from the NH Compare website were extracted. Multistep linear models were used for Chapter 2 to measure the effect of high-SMI status on staffing levels and NH Compare quality star ratings. Generalized linear mixed effects models (negative binomial) and linear mixed effects models were used for Chapter 3 to measure the effect of high-SMI status on the number of deficiencies, a weighted deficiency score, and the likelihood of deficiencies by scope and severity.

Results: Chapter 2 found that *Structure* proxies such as the proportion of Medicaid-reimbursed residents confounded the relationship between high-SMI status and *Process* (e.g., staffing levels) and *Bottom-Up* (e.g., quality star ratings) proxies of quality. High-SMI NHs with a large proportion of Medicaid-reimbursed residents provided lower nurse staffing levels of all types and lower star ratings on overall stars, health inspection stars, overall staffing stars, and registered nurse staffing stars in comparison to high-SMI NHs with a low proportion of Medicaid-

reimbursed residents. High-SMI NHs received more deficiencies and a greater deficiency score per inspection. However, these *Top-Down* proxies of quality were attenuated by the inclusion of *Structure* proxies such as payer mix. Deficiencies given to high-SMI NHs were associated with wider scope, especially Pattern and Widespread. In an exploratory aim, high-SMI NHs were more likely to be cited for resident abuse, neglect, or involuntary seclusion and the policies that prohibit and monitor for risk of abuse and neglect in comparison to low-SMI NHs when looking exclusively at deficiencies cited for Actual Harm or Immediate Jeopardy.

Conclusion: High-SMI NHs are unlike "typical" NHs as a majority of the residents have unique behavioral and mental healthcare needs. Findings from this dissertation suggest that quality in these facilities – measured via *Top-Down* (health deficiencies), *Bottom-Up* (NH Compare quality star ratings), or *Process* proxies (staffing levels) – is lower on average after controlling for a variety of confounding variables. One confounding factor that attenuates but does not fully explain differences in quality is a *Structure* proxy, payer mix. Specifically, the proportion of residents reimbursed through Medicaid affects the staffing levels, quality star ratings, and health deficiencies given to high-SMI NHs. A potential solution to improve quality in these facilities may be increasing Medicaid reimbursement rates, while tying the increased rates to specific staffing-related expenditures. In conclusion, high-SMI NHs provide poorer quality of care on average, though part of this association is explained by the lower margins provided by Medicaid.

CHAPTER 1:

INTRODUCTION

It is increasingly clear that those with serious mental illness (SMI) will become a large proportion of the residents occupying nursing homes (NHs) as the population ages. Prior literature has used a "narrow" and "broad" definition of SMI in NHs, with the former focusing exclusively on schizophrenia-spectrum, bipolar-spectrum, and other psychotic disorders, and the latter including anxiety-spectrum disorders (Grabowski, Aschbrenner, Feng, & Mor, 2009). Policymakers have long questioned if NHs provide an appropriate level of care for adults with SMI. In the 1960's and 1970's, the United States shuttered psychiatric hospitals in response to highly-publicized lawsuits. District Court Case *Lake v. Cameron* (1967) and Supreme Court Case *O'Connor v. Donaldson* (1975) were two alarming examples of involuntary institutionalization of persons with SMI (Yohanna, 2013). These two cases required change in mental health law that prohibited the confinement of non-dangerous persons who are able and willing to live within the community (*O'Connor v. Donaldson*, 1975), and that the burden of exhausting alternative living placements would not be borne by the patient (*Lake v. Cameron*, 1967). It is thought that these landmark decisions led to persons with SMI being admitted to NHs less frequently (Carling, 1981), while the vast majority were discharged to the community.

The Omnibus Budget Reconciliation Act (OBRA) of 1987 criticized the quality of care delivered in NHs. One portion of OBRA 1987 drew attention to the inappropriate use of physical restraints and the use of chemical restraints (i.e., antipsychotics) in persons with Alzheimer's disease or related dementias (ADRD) (OBRA, 1987). By 1999, a Supreme Court Case *Olmstead*

v. L.C. declared that segregation of persons with intellectual disabilities and SMI violated the Americans with Disabilities Act of 1990 and was labeled as discriminatory. Under the Olmstead Decision, all persons with SMI must live in the least restrictive setting as possible. This spurred the development of tools such as the Pre-Admission Screening and Annual Resident Review (PASRR; 1992 Code of Federal Regulations: §483.102) to screen for SMI and provide a barrier for NH admission if skilled nursing services were not found to be absolutely necessary. However, the adequacy of PASRR has been questioned (Levinson, 2007), and the vast majority of states (92%) continue to have no specific mention of SMI in their regulations (Street, Molinari, & Cohen, 2013).

In the late-1990's, mental healthcare for older adults was fragmented, focused on institutionalized care, and laden with poor community-based services despite the growth of managed care (Jeste et al., 1999). From the early 2000s to present, the prevalence of SMI in NHs increased (Fullerton, McGuire, Feng, Mor, & Grabowski, 2009; Hua, Cornell, Zimmerman, Winfree, & Thomas, 2021; Lemke & Schaefer, 2010; Rahman, Grabowski, Intrator, Cai & Mor, 2013) though variability exists by state and by "broad" or "narrow" definition of SMI (Grabowski et al., 2009; Hua et al., 2021). Among Medicaid beneficiaries, an SMI diagnosis increases the likelihood of NH admission (Andrews, Bartels, Xie & Peacock, 2009), suggesting that barriers related to the SMI diagnosis may be driving the greater rate of admission to NHs rather than Medicaid-reliance itself. Barriers may include the adequacy of community-based settings to meet the cognitive, functional, and psychiatric needs of older adults with SMI (Bartels, 2011).

Medical Profile of Residents with SMI

Younger (< 65 years) Medicaid-reimbursed NH residents are more likely to have an SMI diagnosis (38%) in comparison to older (≥ 65 years) Medicaid-reimbursed NH residents (20%) (Nelson & Bowblis, 2017). The lower proportion of older adults with SMI in NHs may be linked to a higher risk of mortality among adults with SMI, including deaths due to natural causes (e.g., illness) and deaths due to unnatural causes (e.g., suicide, unintentional injury) (Walker, McGee, & Druss, 2015). Younger NH residents with SMI require significantly greater services than younger individuals with SMI that dwell within the community. Presumably, behavioral issues, comorbidities, cognitive decline, and functional impairment warrant the higher NH level of care (Bartels, Mueser, & Miles, 1997; McCarthy, Blow, & Kales, 2004). Generally, persons with SMI are more medically ill than the average population. This multimorbidity is intimately related to the social determinants of health, such as homelessness, substance and tobacco use, lack of adequate mental health services, lack of transportation, poverty-related health expenditures, and a sedentary lifestyle, and may be exacerbated by unintended adverse effects from chronic psychotropic medication use (Bartels, 2004).

Life-long treatment of schizophrenia-spectrum and occasionally bipolar-spectrum disorders with second-generation antipsychotics is linked to weight gain and obesity, metabolic syndrome, type 2 diabetes mellitus, and a variety of heart conditions (American Geriatrics Society, 2019; Bartels, 2004). In comparison to older NH residents without SMI (e.g., aged 65 years or older), older residents with SMI are more likely to have an ADRD diagnosis, Parkinson's disease, diabetes mellitus, obesity, and respiratory diseases such as chronic obstructive pulmonary disease, despite also having lower rates of dependence on activities of daily living (Aschbrenner, Grabowski, Cai, Bartels, & Mor, 2011a). Similarly, younger residents

with SMI aged less than 65 years are more likely to have an ADRD diagnosis, Parkinson's disease, obesity, and chronic obstructive pulmonary disease, despite also having lower rates of dependence on activities of daily living in comparison to younger NH residents without SMI (Aschbrenner et al., 2011a). Both older NH residents with and without SMI have higher rates of congestive heart failure and arteriosclerotic heart disease in comparison to young NH residents without SMI (Aschbrenner et al., 2011a).

All forms of SMI increase the risk of developing ADRD if the resident survives sufficiently long; meta-analyses suggest a greater risk of developing ADRD for schizophrenia (Cai & Huang, 2018), bipolar disorder (Diniz et al., 2017), and anxiety disorders (Gulpers et al., 2016). Additionally, unipolar depression is related to an increased risk of ADRD, with strong connections to vascular dementia (Diniz, Butters, Albert, Dew, & Reynolds, 2013; Ownby, Crocco, Acevedo, John, & Loewenstein, 2006). However, NHs were never structured to adequately address the common and persistent mental health and behavioral concerns that come with SMI and ADRD (van der Linde et al., 2016). A greater level of low-care status at older age (14% with SMI versus 7% without SMI) and at younger age (33% with SMI versus 9% without SMI) paired with the unique mental healthcare needs of residents with SMI has caused policymakers to criticize the adequacy of NH placement (Aschbrenner et al., 2011a).

Low Care Status & Long-Stay Conversion

Specifically, one quarter (23%) of adults under the age of 65 living with schizophrenia will be newly-admitted to NHs with a low care status, though this number drops to 8% for those with schizophrenia over the age of 65 (Aschbrenner, Cai, Grabowski, Bartels, & Mor, 2011b). Less drastic, albeit consistent, images can be gleaned from new NH admissions for persons with bipolar disorder (10% when under 65 years versus 5% when older than 65 years) (Aschbrenner

et al., 2011b). Social factors also affect newly-admitted residents with SMI, as those under the age of 65 are more likely to never be married (63% for those with schizophrenia, 39% for those with bipolar disorder), and are more racially diverse (35% of those with schizophrenia under the age of 65 are non-white versus 25% when 65 years or older) than residents over the age of 65 (Aschbrenner et al., 2011b). Additionally, younger residents with schizophrenia (57%) or bipolar disorder (38%) are more likely to be male in comparison to older residents with schizophrenia (36%) or bipolar disorder (33%) (Aschbrenner et al., 2011b).

When exclusively looking at long-stay Medicaid-reimbursed residents, roughly 57% of younger persons with SMI and 25% of older persons with SMI have zero or one activity of daily living impairment (Nelson & Bowblis, 2017). In addition to low-care status, those with SMI convert to long-stay NH status at a higher rate (51% for those with SMI versus 35% of those without SMI) (Aschbrenner et al., 2011a). This higher rate of conversion to long-stay status is consistent for older adults with SMI (54% with SMI versus 35% without SMI) and younger adults with SMI (48% with SMI versus 34% without SMI) (Aschbrenner et al., 2011a). This suggests that long-stay conversion is not an age-related confounding factor, but rather a unique experience associated with having an SMI diagnosis.

Together, these findings suggest that some NH residents with SMI may require a less restrictive site of care such as home and community-based services and supports or assisted living communities despite living long-term in a NH. Due to the higher long-stay conversion among adults with SMI and better identification of psychiatric illnesses among prospective NH residents through PASRR, a large number of residents have clustered in a small number of facilities, creating “high-SMI” NHs.

High-SMI Facilities & Quality

High-SMI NHs have lower nurse staffing levels (Jester, Bowblis, & Hyer, 2020), poorer resident-level quality measures (e.g., restraint use, hospitalization, pressure ulcers; McGarry et al., 2019; Rahman et al., 2013), and lower ratings on overall quality, quality measure, overall staffing, and registered nurse staffing star ratings on the NH Compare website (Jester et al., 2020). These high-SMI facilities are more likely to be reimbursed through Medicaid, be for-profit, and have a lower resident acuity on average (Jester et al., 2020). Because residents with SMI are more likely to be admitted to NHs with lower quality star ratings (Temkin-Greener, Campbell, Cai, Hasselberg, & Li, 2018), it is unclear whether the large number of residents with SMI directly contributes to poorer quality (e.g., through lower margins due to Medicaid) or whether these residents are differentially admitted to lower "tier" NHs due to their payer source (Mor, Zinn, Angelelli, Teno, & Miller, 2004). This dissertation will examine the role of payer mix as a confounding factor in the relationship between high-SMI status and NH quality across three proxies (e.g., staffing levels, NH Compare star ratings, health deficiencies).

Conceptual Framework

According to Mukamel, Haeder, & Weimer (2014), quality of care can be adjusted from a top-down approach or a bottom-up approach. In the top-down approach, federal regulation mandates specific criteria that all participating entities must meet. In NHs, this results in compliance to both federal (Centers for Medicare & Medicaid Services (CMS) standards) and state (additionally defined regulations if desired by the state) guidelines to receive Medicare and Medicaid reimbursement (Mukamel et al., 2014). State surveyors issue fines and moratoriums when quality is not meeting these strict guidelines, all of which is tracked over time by CMS. Some examples of top-down strategies for NHs have included direct regulation (e.g., F-tag health

deficiency citations), minimum staffing standards (Bowblis, 2011), and increased continuity of care through Medicaid bed-hold policies (Intrator, Schleinitz, Grabowski, Zinn, & Mor, 2009). In comparison to top-down approaches that focus on regulation, NH Compare star ratings attempt to improve quality through a bottom-up approach. This method stimulates innovation and performance through public reporting, thus shaming facilities that provide poor quality of care while also drawing attention to exemplary facilities.

These two approaches for regulating quality at the federal-level or consumer-level can be appended to a Donabedian Structure, Process, Outcome (SPO) Model (Donabedian, 1966). In this modified framework (see Figure 1), *Structural Characteristics* of the healthcare system (e.g., proportion of residents with SMI, proportion of residents who are Medicaid-reimbursed, profit-status, chain-status) can indirectly affect quality through the provision of care via staffing levels (*Process*) or directly through resource availability. *Process Characteristics* include the level and training of direct and indirect-care services delivered to residents as well as contextual factors such as patient-oriented culture. Both *Structure* and *Process* proxies directly impact NH quality. For example, Medicaid reimbursement rates (*Structure*) are associated with overall and registered nurse staffing levels in NHs (Harrington, Swan, & Carrillo, 2007) and increased certified nursing assistant staffing levels are associated with deficiency scores (Hyer et al., 2011) and quality star ratings (Boscart et al., 2018). While the direct effects of *Structure* and *Process* on quality are important to measure, these constructs also interact with NH Compare star ratings from the consumer (*Bottom-Up Approach*) and health deficiencies from the federal government (*Top-Down Approach*).

Because one cannot directly measure the multi-faceted construct of NH quality (*Outcome*) with complete accuracy, proxies are used by health services researchers. These

proxies include staffing levels (*Process*), health deficiencies (*Top-Down Approach*), and NH Compare quality star ratings or resident-level quality metrics (*Bottom-Up Approach*). For example, profit status (e.g., being for-profit or not for-profit; *Structure*) and patient safety culture (*Process*) are both associated with better NH quality as measured by *Bottom-Up* proxies such as resident-level metrics (e.g., hospitalization rate, improvement in mobility, pain, and functioning; Grabowski, Feng, Hirth, Rahman, & Mor, 2013) and *Top-Down* and *Bottom-Up* proxies such as health deficiencies, substantiated complaints, fines, and quality star ratings (Li, Cen, Cai, & Temkin-Greener, 2019).

Another contextual factor that affects all portions of the modified SPO model is geographic (state) differences. Although NHs are regulated at the federal-level, states differ in the complaint and inspection process (Peterson, Bowblis, Jester, & Hyer, 2020), Medicaid reimbursement rates (American Health Care Association, 2018), direct-care minimum staffing standards (Bowblis, 2011), community-based mental health services and workforce availability (Substance Abuse and Mental Health Services Administration, 2019), and in demographics (e.g., a large number of NHs are in California, Texas, and Florida for their aging population but not in Montana or Alaska). Therefore, including state effects is necessary when measuring NH quality or any component of the modified SPO model.

Organization

This dissertation is made of two academic papers followed by a chapter discussing the policy implications of the findings. The objective of this dissertation is to better understand if high-SMI NHs provide poorer quality of care (e.g., operationalized as staffing levels, NH Compare quality star ratings, and health deficiencies) and whether quality in high-SMI NHs is confounded by payer mix (e.g., the proportion of residents who are Medicaid-reimbursed).

Chapter 2 Aims

Chapter 2 will examine the role of high-SMI status on staffing levels and NH Compare quality star ratings. *Hypothesis 1*: Payer mix will attenuate but not fully explain the association between high-SMI status and staffing levels. *Hypothesis 2*: Payer mix will attenuate but not fully explain the association between high-SMI status and quality star ratings. *Hypothesis 3*: When stratified by the proportion of Medicaid-reimbursed residents, high-SMI NHs that are "high-Medicaid" will have substantially lower staffing levels and NH Compare quality star ratings in comparison to high-SMI NHs that are "low-Medicaid".

Chapter 3 Aims

Chapter 3 will examine the role of high-SMI status on regulatory health deficiencies. Past studies have focused only on the number of deficiencies and a weighted deficiency score (Li, Cai, & Cram, 2011; Rahman et al., 2013). While this Chapter also examines these outcomes, it will explore the scope and severity of deficiencies. Moreover, the role of payer mix as a confounding factor in the relationship between high-SMI status and regulatory deficiencies will be expanded. *Hypothesis 1*: High-SMI NHs will have a greater number of deficiencies, higher deficiency score, and greater severity and wider scope of cited deficiencies per inspection in comparison to all other NHs. *Hypothesis 2*: Payer mix will reduce but not completely attenuate the effect of high-SMI status on these outcomes. Finally, an exploratory aim will identify the most frequent deficiencies and the most frequent deficiencies that were cited for Actual Harm or Immediate Jeopardy by SMI status.

Chapter 4 Aims

Chapter 4 will serve as the discussion for Chapters 2 and 3 with a focus on implications for policy development. The role of Medicaid reimbursement rates, public reporting, gaming, the

quality of mental healthcare in NHs, and strategies to reduce NH placement for older adults with SMI will be highlighted in the section for Chapter 2. The role of staffing, abuse and neglect in high-SMI NHs, and behavioral healthcare deficiencies will be discussed in the section for Chapter 3. Limitations, future directions, and final thoughts will be provided after Chapter 4.

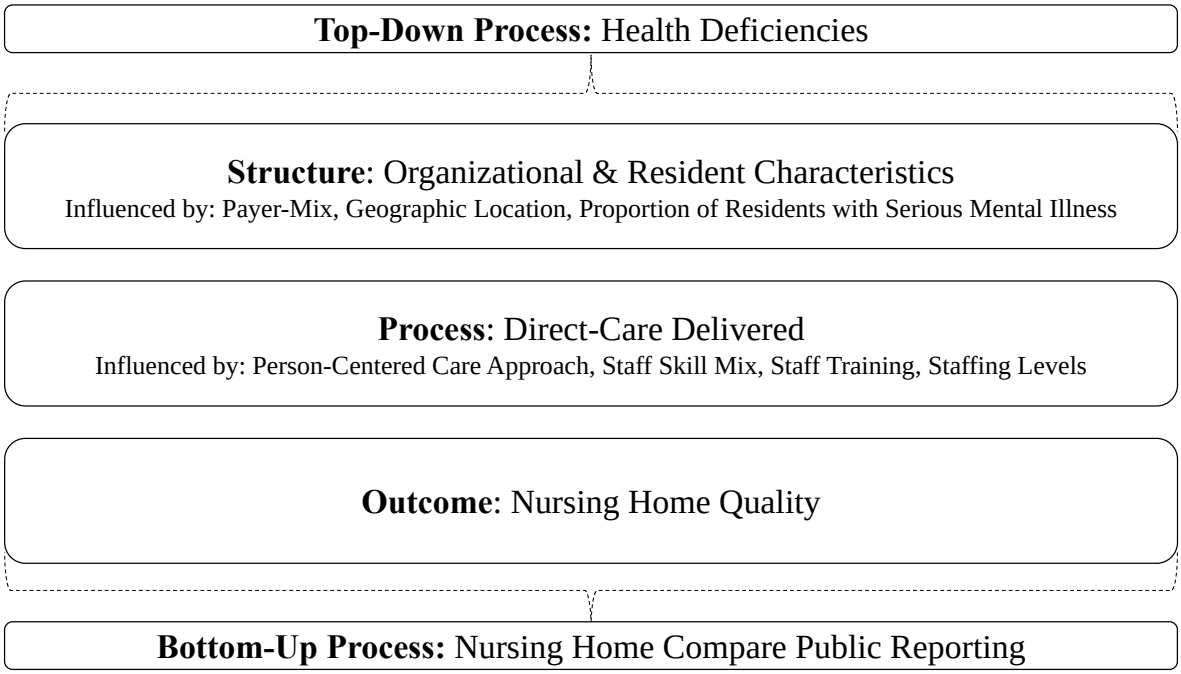

Figure 1. Conceptual model using a modified Donabedian Structure, Process, Outcome approach

CHAPTER 2:

STAFFING & QUALITY STAR RATINGS

Both nurse staffing (Antwi & Bowblis, 2018; Dellefield, Castle, McGilton, & Spilsbury, 2015; Hyer et al., 2011; Lin, 2014; Paek, Zhang, Wan, Unruh, & Meemon, 2016) and non-nurse staffing levels (e.g., activities staff, social services; Bowblis & Roberts, 2020; Vongxaiburana, Thomas, Frahm, & Hyer, 2011) are associated with higher NH quality. Staffing levels are directly related to the financial performance of the NH and rely heavily on reimbursement rates from federal and state entities (e.g., Medicare, Medicaid) or from private sources through the resident and their family (e.g., long-term care insurance, private pay). Prior work suggests that states with higher minimum nurse staffing requirements will have higher nurse staffing levels (Bowblis, 2011; Hyer, Temple, & Johnson, 2009). Unfortunately, Medicaid reimbursement – the predominant payer of residents with SMI – provides poor financial margins for NHs and varies dramatically by state (American Health Care Association, 2018). While prior work suggests that high-SMI NHs provide lower staffing levels (Jester et al., 2020), less is known about whether the proportion of Medicaid-reimbursed residents confounds this relationship.

In addition to staffing levels, another proxy of NH quality is the NH Compare quality star ratings. In 2002, CMS launched an initiative that sought to publish quality report cards for all certified NHs in the United States. Over six years, the NH Compare report cards were simplified and restructured. In 2008, NH Compare rolled out a five-star quality rating system to objectively determine NH quality on a variety of domains, including overall stars, health inspection stars (deficiencies), quality measure stars, overall staffing stars, and registered nurse staffing stars

(CMS, 2018). Ratings were made publicly available for prospective residents and their families to review. Stars also acted as incentives for quality improvement by drawing attention to high-quality facilities. Although this consumer attention positively impacted high-quality facilities, it ultimately reduced the market-share of poorly-performing NHs (Werner, Konetzka, & Polsky, 2016) and furthered a "tiered" system of NH quality where poorer residents reimbursed through Medicaid clustered in facilities that were of lower quality (Mor et al., 2004). While prior work suggests that high-SMI NHs receive lower ratings in overall stars, quality measure stars, overall staffing stars, and registered nurse staffing stars (Jester et al., 2020), less is known whether the proportion of Medicaid-reimbursed residents confounds this relationship.

Chapter 2 Aims

Chapter 2 will examine the role of high-SMI status on staffing levels and NH Compare quality star ratings. *Hypothesis 1*: Payer mix will attenuate but not fully explain the association between high-SMI status and staffing levels (*Structure* confounding *Process* proxy of quality). *Hypothesis 2*: Payer mix will attenuate but not fully explain the association between high-SMI status and quality star ratings (*Structure* confounding *Bottom-Up* proxy of quality). *Hypothesis 3*: When stratified by the proportion of Medicaid-reimbursed residents, high-SMI NHs that are "high-Medicaid" will have substantially lower staffing levels and NH Compare quality star ratings in comparison to high-SMI NHs that are "low-Medicaid".

Methods

Data

Data came from the Certification and Survey Provider Enhanced Reports (CASPER) and the NH Compare website. To reflect the state of the NH industry in the continental United States in 2016, the sample includes one inspection per NH that occurred closest to and within 270 days

of July 1st, 2016 among freestanding NHs with at least 10 residents (excluded *n* = 936). See Jester and colleagues (2020) for further exclusion criteria related to improbable staffing levels, such as facilities that reported outliers or zero staffing levels. The analytic sample resulted in 14,460 unique NHs in the continental United States. CASPER data were then merged with NH Compare quality star ratings, corresponding to scores from the CMS December 1st, 2018 extraction period. Because NH Compare uses historical data to calculate five-star ratings and the health inspection F-tags changed on November 27th, 2017, the December 1st, 2018 extraction date indexed the prior two inspection cycles for each NH (i.e., 2017, 2016) when calculating the overall quality star rating and health inspection star rating (CMS, 2018). These quality star ratings would most closely fit the CASPER data to index quality in 2016 and 2017.

Defining High-SMI Facilities

To identify NHs that predominantly serve residents with SMI, the proportion of residents as having SMI was identified in CASPER (F110 from Form CMS-672) and divided by the total number of residents (F78 from Form CMS-672) (CMS, 2012). CMS uses Form 672 to classify SMI as schizophrenia, schizoaffective disorder, schizophreniform disorder, delusional disorder, psychotic mood disorders, and anxiety disorders (CMS, 2012). It does not include depressive disorders without psychosis or ADRD. NHs were split into quartiles by the proportion of residents with SMI in the facility. The first and fourth quartiles of the proportion of residents with SMI were labeled "low-SMI" (≤19.28%) and "high-SMI" NHs (≥44.62%). This is consistent with the 'broad' definition of SMI used in the literature (Grabowski et al., 2009). Sensitivity analyses by Jester and colleagues (2020) conclude that quartile categorization of SMI status does not differ statistically from using the proportion of residents with SMI when modeling staffing and quality star outcomes.

Facility Characteristics

Organizational structure includes chain-status (i.e., operated by the same owner), continuing care retirement community (CCRC; i.e., NHs that are affiliated with a complex that provides independent or assisted living), and the size of the NH as measured by the number of beds. Facility ownership was categorized as for-profit, not for-profit, or government-owned. Special care units were identified as ADRD or non-ADRD. Payer-mix was defined as the proportion of residents who were reimbursed by Medicare, Medicaid, and other sources (i.e., primarily private pay). Occupancy rate was calculated as the resident census divided by the total number of beds. NHs were categorized as providing a medical director only, a physician extender only without a medical director, a full medical team that includes a medical director and physician extenders, or no medical team at all. These covariates make up *Structure* in the modified Donabedian SPO framework and directly affect resources available to improve *Process* proxies such as staffing levels.

Staffing Levels

To compare staffing levels across facilities of drastically different sizes, staffing levels were converted to hours per resident-day (HPRD; Konetzka, Stearns, & Park, 2008). HPRD were calculated by summing the number of full-time, part-time, and contract staff, multiplying by 70 hours, and dividing by 14 days (Konetzka et al., 2008). This provides an average level of staffing in the facility during the inspection period and uses reported staffing data validated by surveyors. For example, a registered nurse HPRD of 0.50 would indicate that on average, a resident may receive 30 minutes of registered nurse-related services per day. Staffing levels included: direct-care nurse staffing (registered nurses, licensed practical nurses, certified nursing assistants), non-direct-care administrative registered nurse staffing, social services (social workers and other

social services combined), and activities staff (therapeutic recreation and activities staff combined). Staffing is considered a *Process* proxy in the modified Donabedian SPO framework, but is often used by health services researchers to index the quality of care being delivered (*Outcome*).

NH Compare Star Ratings

Quality star ratings were extracted from the NH Compare website. Star ratings range from one (low) to five stars (high) on a variety of outcomes. Overall stars are first calculated by extracting the health inspection rating, adding or subtracting one star based on the overall staffing rating, and adding or subtracting one star based on the quality measure rating (CMS, 2018). Health inspection stars take into consideration both the health inspection results (e.g., deficiencies) but also the number of repeat inspection visits required for tracking compliance (CMS, 2018). Quality measure stars are calculated by the NHs' performance on 13 quality measures from the Minimum Data Set resident-level data and the Medicare claims databases for long-stay (e.g., percent of residents who received an antipsychotic) and short-stay resident outcomes (e.g., percent residents who report moderate or severe pain) over the four most recent calendar quarters (CMS, 2018). Two of the star ratings from NH Compare focus on the direct-care nurse staffing levels provided in the facility.

Overall staffing stars index registered nurse, licensed practical nurse, and certified nursing assistant hours after adjusting for case mix. Adjusting the staffing levels by case mix is necessary because facilities with residents who are of lower acuity would appropriately have lower staffing levels than facilities with highly-acute residents. For example, NH "X" has many residents with functional limitations and medical comorbidities while NH "Y" has few residents with functional limitations and medical comorbidities. In this scenario, NH "X" would require

higher staffing levels to appropriately meet the needs of their residents. If they both provided the same staffing levels with drastically different case mixes, NH "X" could receive a lower staffing score on NH Compare. Registered nurse staffing stars are adjusted for case mix as well (CMS, 2018). These star ratings use validated payroll-based data on a daily level reported through the Payroll-Based Journaling (PBJ) data system at CMS. Prospective residents may use these publicly-available ratings to objectively evaluate NH quality, which serves as a *Bottom-Up Approach* to regulating quality.

Effect of Medicaid-Reimbursed Census on Quality Outcomes

To examine the role of payer mix (*Structure*), high-SMI facilities were stratified by the proportion of Medicaid-reimbursed residents into quartiles. Because the sample sizes are lower in the NH Compare dataset, cutoffs were as follows: "high-Medicaid" (≥ 82.23%, 75th Percentile, n = 804) and "low-Medicaid" (≤ 61.69%, 25th Percentile, n = 804) for the NH Compare dataset and "high-Medicaid" (≥ 82.77%, 75th Percentile, n = 904) and "low-Medicaid" (≤ 62.07%, 25th Percentile, n = 905) for the full dataset that includes staffing levels.

Statistical Analyses

Multistep linear regression models were used to identify whether state effects, structural characteristics and the medical team, and payer mix attenuated the effect of high-SMI status on staffing levels and quality star ratings. To examine the potential confounding effect of high-Medicaid status in high-SMI NHs, linear models were stratified by Medicaid status with the first quartile as the reference group. All model estimates included 95% confidence intervals. Confidence intervals are favored over *p*-values in this dissertation because analyses are at the population-level and the sample size exceeds several thousand facilities, therefore Type II errors may be more common.

Results

Staffing Levels in High-SMI Facilities

Beta estimates represent differences in staffing levels attributable to high-SMI status in HPRD. For example, -0.20 HPRD suggests that high-SMI NHs reported 12 fewer minutes per resident-day of staffing in comparison to all other NHs. In comparison to all other NHs, high-SMI NHs reported lower administrative registered nurse staffing (β = -0.01, p = .03), registered nurse staffing (β = -0.02, p = <.001), certified nursing assistant staffing (β = -0.07, p = < .001), and higher social services staffing (β = 0.00, p = .006) after controlling for *Structure* proxies (e.g., organizational structure, payer mix, medical team factors, and state fixed effects). After adding structural characteristics and payer mix, the relationship between high-SMI status and activities staffing was no longer statistically significant (fully-adjusted model: β = 0.00, p = .62). After adding payer mix, the relationship between high-SMI status and licensed practical nurse staffing was no longer statistically significant (fully-adjusted model: β = -0.00, p = .62). See Table 1 and Figure 2 for multistep linear models, suggesting that payer mix – a major *Structure* proxy – attenuates the effect of high-SMI status on all staffing types (*Process* proxies of quality) in comparison to univariate effects.

Effect of Medicaid

Beta estimates represent differences in staffing levels by Medicaid status with low-Medicaid-high-SMI NHs as the comparison group. In comparison to low-Medicaid-high-SMI facilities, high-Medicaid-high-SMI NHs reported lower administrative registered nurse staffing (β = -0.06, p < .001), registered nurse staffing (β = -0.11, p < .001), licensed practical nurse staffing (β = -0.06, p < .001), and certified nursing assistant staffing (β = -0.21, p < .001) after controlling for *Structure* proxies (e.g., organizational structure, payer mix, medical team factors,

and state fixed effects) and stratifying by Medicaid status (see Figure 3). No differences were found for activities staff (β = 0.01, *p* = .42) or social services staffing (β = -0.00, *p* = .36) when comparing high-Medicaid versus low-Medicaid-high-SMI NHs. See Table 2 for the stratified multistep linear models that show how *Process* proxies such as staffing levels may be confounded by *Structure* proxies such as payer mix in high-SMI NHs.

Quality Ratings of High-SMI Facilities

Beta estimates represent differences in star ratings attributable to high-SMI status. For example, -0.50 suggests that high-SMI NHs reported 0.50 fewer stars in comparison to all other NHs. In comparison to all other NHs, high-SMI status was associated with lower star ratings in overall quality stars (β = -0.08, *p* = .006), quality measure stars (β = -0.16, *p* = <.001), overall staffing stars (β = -0.08, *p* = < .001), and registered nurse staffing stars (β = -0.12, *p* = < .001) after controlling for *Structure* and *Process* proxies (e.g., organizational structure, medical team factors, staffing levels, and state fixed effects). After adding payer mix, the relationship between high-SMI status and health inspection stars was no longer significant (fully-adjusted model: β = -0.00, *p* = .99). See Table 3 and Figure 4 for multistep linear models, suggesting that payer mix – a major *Structure* proxy – attenuates the effect of high-SMI status on all star ratings (*Bottom-Up* proxy of quality).

Effect of Medicaid

Beta estimates represent differences in star ratings by Medicaid status with low-Medicaid-high-SMI NHs as the comparison group. In comparison to low-Medicaid-high-SMI facilities, high-Medicaid-high-SMI NHs were associated with lower star ratings in overall quality stars (β = -0.44, *p* < .001), health inspection stars (β = -0.39, *p* < .001), overall staffing stars (β = -0.51, *p* < .001), and registered nurse staffing stars (β = -0.56, *p* < .001) after controlling for

Structure and *Process* proxies (e.g., organizational structure, medical team factors, staffing levels, and state fixed effects) and stratifying by Medicaid status (see Figure 5). No differences were found for quality measure stars ($\beta = -0.03$, $p = .62$) when comparing high-Medicaid versus low-Medicaid-high-SMI NHs. See Table 4 for the stratified multistep linear models that show how *Bottom-Up* proxies such as quality star ratings may be confounded by *Structure* proxies such as payer mix in high-SMI NHs.

Summary

Chapter 2 found that *Structure* proxies such as the proportion of Medicaid-reimbursed residents confounded the relationship between high-SMI status and *Process* (e.g., staffing levels) and *Bottom-Up* (e.g., quality star ratings) proxies of quality. High-SMI NHs with a large proportion of Medicaid-reimbursed residents provided lower nurse staffing levels of all types and lower star ratings on overall stars, health inspection stars, overall staffing stars, and registered nurse staffing stars in comparison to high-SMI NHs with a low proportion of Medicaid-reimbursed residents. Chapter 4 will provide a combined discussion for Chapters 2 and 3.

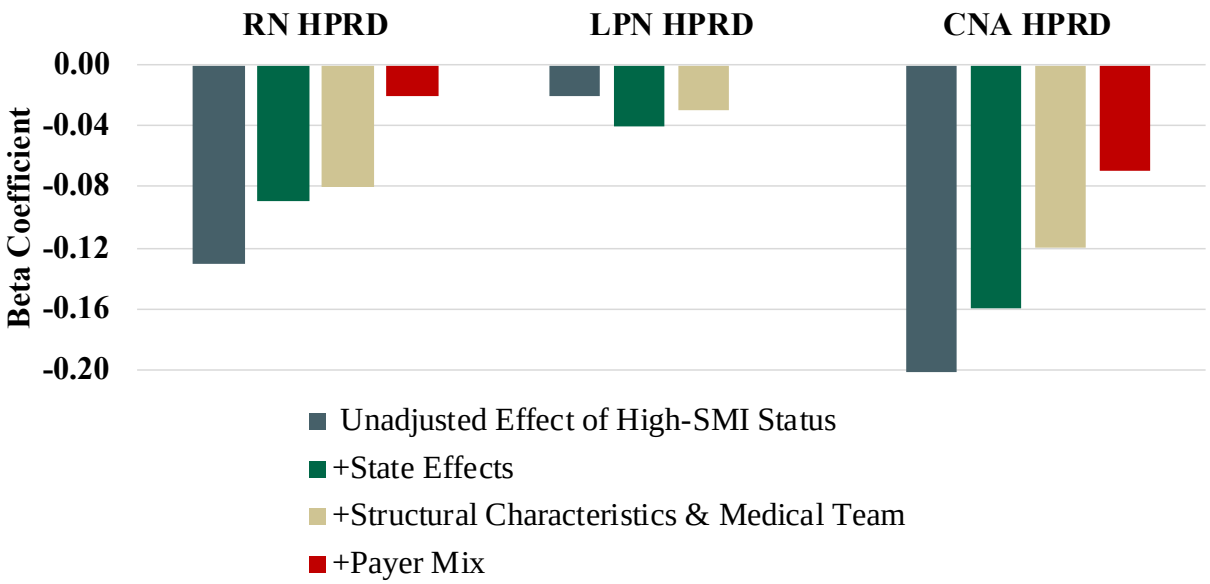

Figure 2. Effect of high-SMI status on nurse staffing levels (*n* = 14,460)

Note. The y-axis represents differences in staffing levels attributable to high-SMI status in hours per resident-day (HPRD). For example, -0.20 HPRD suggests that high-SMI nursing homes reported 12 fewer minutes per resident-day of staffing in comparison to all other nursing homes. Structural characteristics include bed size, chain status, profit status, continuing care retirement community status, special care units, and occupancy. Payer mix includes % Medicaid paying and % Medicare paying. SMI = Serious mental illness. RN = Registered nurse. LPN = Licensed practical nurse. CNA = Certified nursing assistant.

Table 1. Multistep linear model showing the association of high-SMI status with staffing levels (n = 14,460)

Models	Administrative Registered Nurse β (95% CI)	Registered Nurse β (95% CI)	Licensed Practical Nurse β (95% CI)	Certified Nursing Assistant β (95% CI)	Activities Staff β (95% CI)	Social Services β (95% CI)
Mean (SD)	0.23 (0.16)	0.46 (0.33)	0.84 (0.36)	2.27 (0.67)	0.20 (0.19)	0.11 (0.07)
High-SMI Status						
Univariate	**-0.03** [-0.03, -0.02]	**-0.13** [-0.14, -0.12]	**-0.02** [-0.03, -0.01]	**-0.21** [-0.23, -0.18]	**-0.02** [-0.03, -0.01]	**-0.01** [-0.01, -0.01]
+State Effects	**-0.03** [-0.04, -0.03]	**-0.09** [-0.10, -0.08]	**-0.04** [-0.05, -0.03]	**-0.16** [-0.18, -0.13]	**-0.01** [-0.02, -0.00]	**-0.01** [-0.01, -0.00]
+Structural Characteristics & Medical Team	**-0.03** [-0.03, -0.02]	**-0.08** [-0.09, -0.07]	**-0.03** [-0.04, -0.02]	**-0.12** [-0.15, -0.10]	-0.00 [-0.01, 0.01]	**-0.00** [-0.01, -0.00]
+Payer Mix	**-0.01** [-0.01, -0.00]	**-0.02** [-0.03, -0.01]	-0.00 [-0.02, 0.01]	**-0.07** [-0.09, -0.05]	0.00 [-0.01, 0.01]	**0.00** [0.00, 0.01]

Note. Beta estimates represent differences in staffing levels attributable to high-SMI status in hours per resident-day (HPRD). For example, -0.20 HPRD suggests that high-SMI nursing homes reported 12 fewer minutes per resident-day of staffing in comparison to all other nursing homes. Structural characteristics include bed size, chain status, profit status, continuing care retirement community status, special care units, and occupancy. Payer mix includes % Medicaid paying and % Medicare paying. Bold indicates statistical significance. SMI = Serious mental illness.

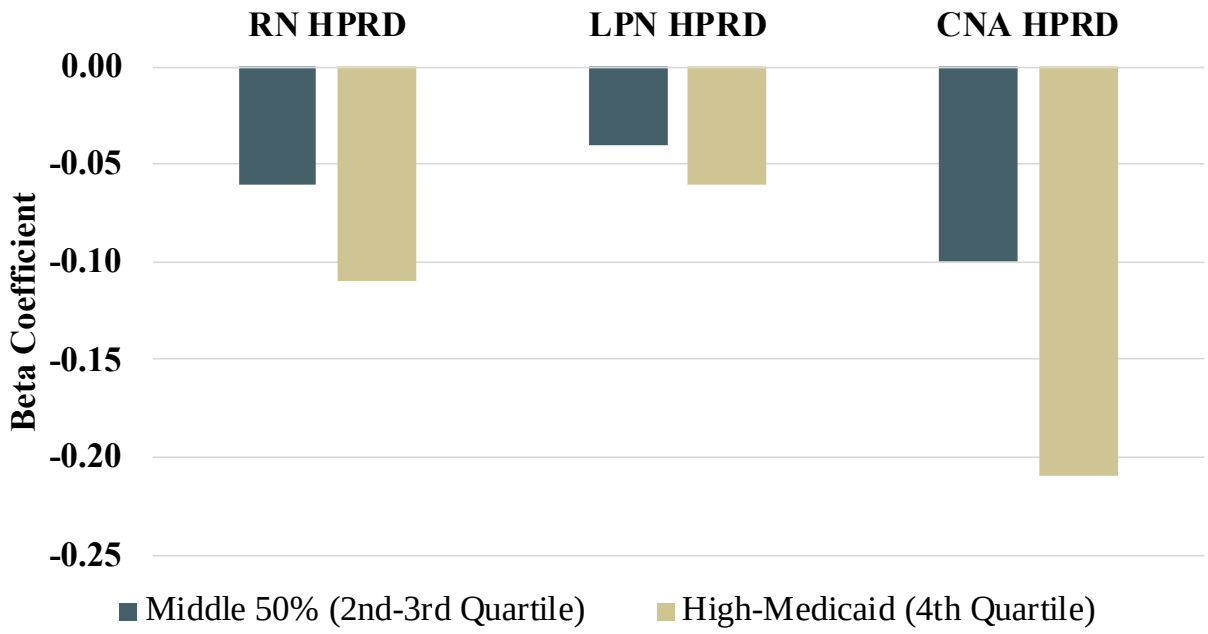

Figure 3. Effect of high-Medicaid status on high-SMI staffing levels (*n* = 3,615)

Note. The y-axis represents differences in staffing levels by Medicaid status in hours per resident-day (HPRD). For example, -0.20 HPRD suggests that high-Medicaid nursing homes reported 12 fewer minutes per resident-day of staffing in comparison to low-Medicaid nursing homes. All beta coefficients are in comparison to the Medicaid 1st Quartile (*M* = 45.92%, *n* = 905), 2nd-3rd Quartile (*M* = 72.93%, *n* = 1,806), 4th Quartile (*M* = 89.86%, *n* = 904). These models control for all covariates. SMI = Serious mental illness. RN = Registered nurse. LPN = Licensed practical nurse. CNA = Certified nursing assistant.

Table 2. Multistep linear model showing the association of high-SMI status and high-Medicaid status with staffing levels (n = 3,615)

Medicaid Quartile among High-SMI Nursing Homes	**Administrative Registered Nurse β (95% CI)**	**Registered Nurse β (95% CI)**	**Licensed Practical Nurse β (95% CI)**	**Certified Nursing Assistant β (95% CI)**	**Activities Staff β (95% CI)**	**Social Services β (95% CI)**
Mean (SD)	0.21 (0.16)	0.36 (0.26)	0.83 (0.35)	2.11 (0.68)	0.19 (0.14)	0.10 (0.07)
Univariate Effects						
1st Quartile [Ref]	-	-	-	-	-	-
2nd-3rd Quartile	**-0.02** [-0.03, -0.01]	**-0.09** [-0.11, -0.07]	0.01 [-0.02, 0.04]	**-0.15** [-0.21, -0.10]	**-0.04** [-0.05, -0.03]	**-0.02** [-0.02, -0.01]
4th Quartile	**-0.06** [-0.07, -0.05]	**-0.14** [-0.16, -0.12]	**-0.04** [-0.08, -0.01]	**-0.28** [-0.34, -0.22]	**-0.01** [-0.03, -0.00]	-0.01 [-0.01, 0.00]
+State Effects						
2nd-3rd Quartile	**-0.03** [-0.05, -0.02]	**-0.07** [-0.08, -0.05]	**-0.05** [-0.07, -0.02]	**-0.17** [-0.23, -0.12]	**-0.03** [-0.04, -0.02]	**-0.01** [-0.02, -0.01]
4th Quartile	**-0.06** [-0.08, -0.05]	**-0.12** [-0.14, -0.10]	**-0.07** [-0.10, -0.04]	**-0.28** [-0.34, -0.22]	-0.01 [-0.02, 0.00]	-0.01 [-0.01, 0.00]
+Structural Characteristics & Medical Team						
2nd-3rd Quartile	**-0.03** [-0.05, -0.02]	**-0.06** [-0.07, -0.04]	**-0.04** [-0.07, -0.01]	**-0.10** [-0.15, -0.05]	**-0.02** [-0.03, -0.01]	**-0.01** [-0.02, -0.00]
4th Quartile	**-0.06** [-0.07, -0.05]	**-0.11** [-0.13, -0.09]	**-0.06** [-0.09, -0.03]	**-0.21** [-0.27, -0.15]	0.01 [-0.01, 0.02]	-0.00 [-0.01, 0.00]

Note. Beta estimates represent differences in staffing levels by Medicaid status in hours per resident-day (HPRD). For example, -0.20 HPRD suggests that high-Medicaid nursing homes reported 12 fewer minutes per resident-day of staffing in comparison to low-Medicaid nursing homes. Structural characteristics include bed size, chain status, profit status, continuing care retirement community status, special care units, and occupancy. Bold indicates statistical significance. SMI = Serious mental illness. Medicaid proportions are 1st Quartile (M = 45.92%, n = 905), 2nd-3rd Quartile (M = 72.93%, n = 1,806), 4th Quartile (M = 89.86%, n = 904). Cutoff values are: 62.07% for the 25th percentile and 82.77% for the 75th percentile. SMI = Serious mental illness.

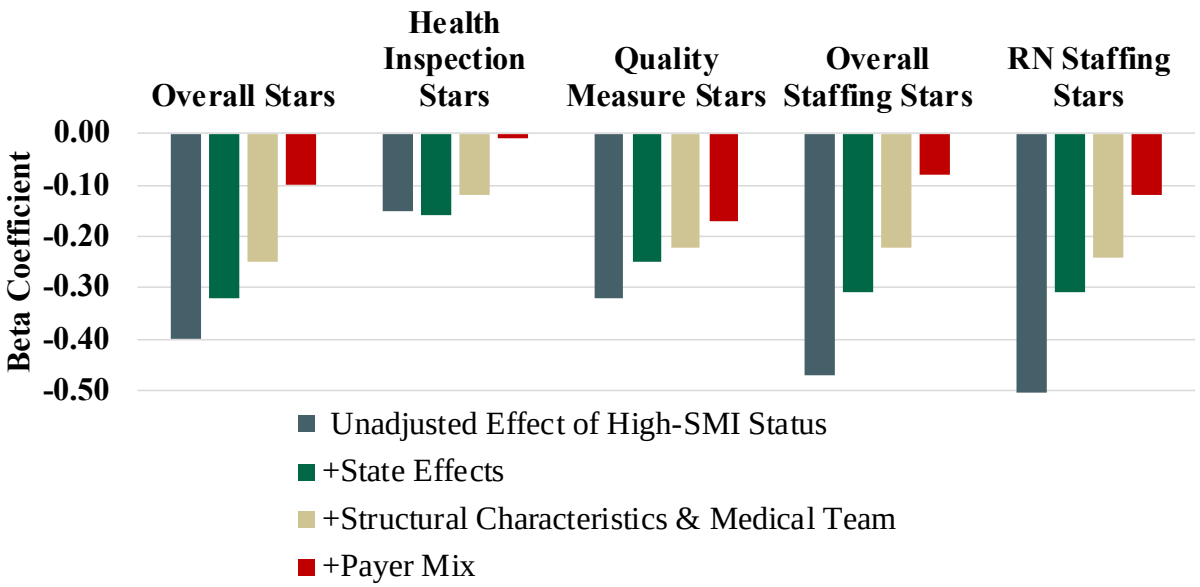

Figure 4. Effect of high-SMI status on quality star ratings (*n* = 12,525)

Note. The y-axis represents differences in star ratings attributable to high-SMI status. For example, -0.50 suggests that high-SMI nursing homes reported 0.50 fewer stars in comparison to all other nursing homes. Structural characteristics include bed size, chain status, profit status, continuing care retirement community status, special care units, and occupancy. Payer mix includes % Medicaid paying and % Medicare paying. SMI = Serious mental illness. RN = Registered nurse.

Table 3. Multistep linear model showing the association of high-SMI status with nursing home quality stars (n = 12,525)

Models	Overall Stars β (95% CI)	Health Inspection Stars β (95% CI)	Quality Measure Stars β (95% CI)	Overall Staffing Stars β (95% CI)	RN Staffing Stars β (95% CI)
Mean (SD)	3.27 (1.40)	2.78 (1.28)	3.96 (1.22)	3.01 (1.25)	3.23 (1.32)
High-SMI Status					
Univariate	**-0.40** [-0.46, -0.35]	**-0.15** [-0.20, -0.10]	**-0.32** [-0.37, -0.27]	**-0.47** [-0.52, -0.42]	**-0.51** [-0.56, -0.46]
+State Effects	**-0.32** [-0.38, -0.27]	**-0.16** [-0.22, -0.11]	**-0.25** [-0.29, -0.20]	**-0.31** [-0.36, -0.27]	**-0.31** [-0.36, -0.27]
+Structural Characteristics & Medical Team	**-0.25** [-0.30, -0.19]	**-0.12** [-0.17, -0.07]	**-0.22** [-0.27, -0.17]	**-0.22** [-0.26, -0.18]	**-0.24** [-0.29, -0.20]
+Payer Mix	**-0.10** [-0.15, -0.04]	-0.01 [-0.07, 0.04]	**-0.17** [-0.21, -0.12]	**-0.08** [-0.12, -0.04]	**-0.12** [-0.16, -0.07]
+Staffing	**-0.08** [-0.13, -0.02]	-0.00 [-0.05, 0.05]	**-0.16** [-0.21, -0.11]	- -	- -

Note. Beta estimates represent differences in star ratings attributable to high-SMI status. For example, -0.50 suggests that high-SMI nursing homes reported 0.50 fewer stars in comparison to all other nursing homes. Structural characteristics include bed size, chain status, profit status, continuing care retirement community status, special care units, and occupancy. Payer mix includes % Medicaid paying and % Medicare paying. Staffing includes direct-care nurse (registered nurse, licensed practical nurse, and certified nursing assistant), administrative registered nurse, activities staff, and social services staffing. Bold indicates statistical significance. SMI = Serious mental illness. RN = Registered nurse.

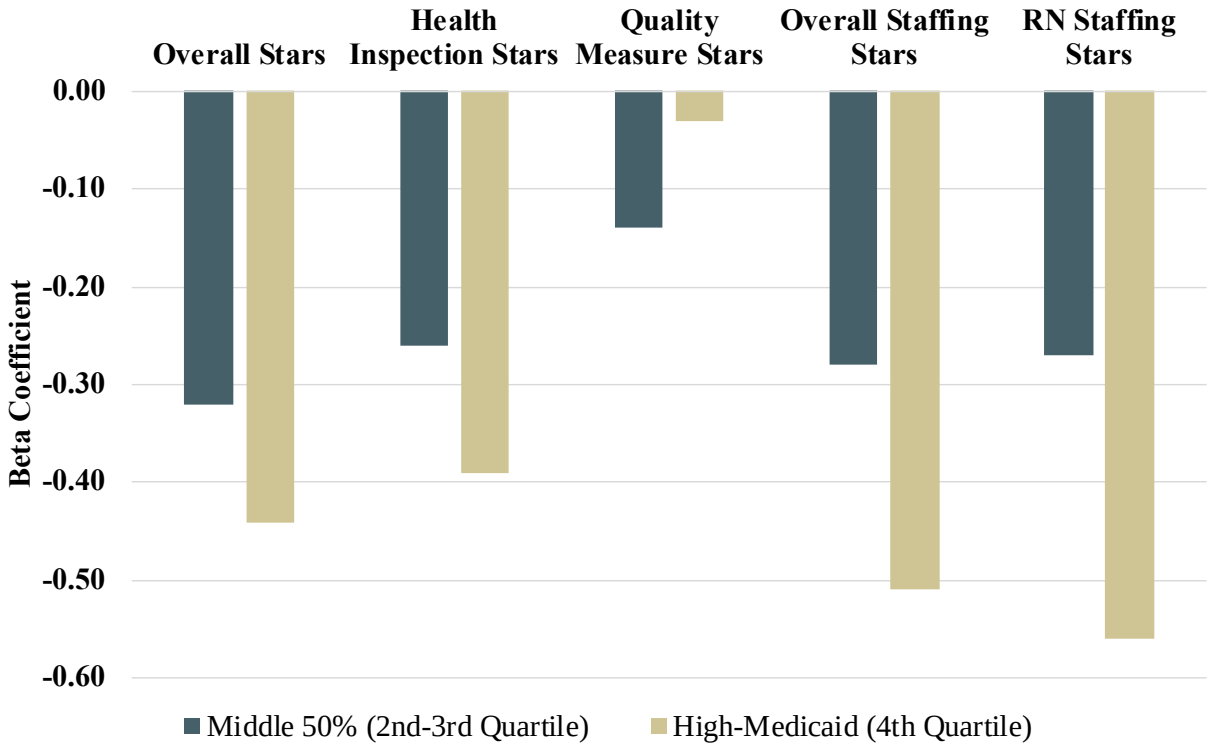

Figure 5. Effect of high-Medicaid status on high-SMI quality star ratings (*n* = 3,216)

Note. The y-axis represents differences in star ratings by Medicaid status. For example, -0.50 suggests that high-Medicaid nursing homes reported 0.50 fewer stars in comparison to low-Medicaid nursing homes. All beta coefficients are in comparison to the Medicaid 1st Quartile (*M* = 45.53%, *n* = 804). Medicaid proportions are 2nd-3rd Quartile (*M* = 72.39%, *n* = 1,608), 4th Quartile (*M* = 89.10%, *n* = 804). These models control for all covariates, except staffing for the staffing-related stars. SMI = Serious mental illness. RN = Registered nurse.

Table 4. Multistep linear model showing the association of high-SMI status and high-Medicaid status with nursing home quality star ratings (n = 3,216)

Medicaid Quartile among High-SMI Nursing Homes	**Overall Stars** β (95% CI)	**Health Inspection Stars** β (95% CI)	**Quality Measure Stars** β (95% CI)	**Overall Staffing Stars** β (95% CI)	**RN Staffing Stars** β (95% CI)
Mean (SD)	2.97 (1.40)	2.67 (1.28)	3.72 (1.30)	2.67 (1.24)	2.85 (1.30)
Univariate Effects					
1st Quartile [Ref]	-	-	-	-	-
2nd-3rd Quartile	**-0.63** [-0.74, -0.51]	**-0.42** [-0.53, -0.31]	**-0.27** [-0.38, -0.16]	**-0.53** [-0.64, -0.43]	**-0.53** [-0.63, -0.42]
4th Quartile	**-0.76** [-0.90, -0.63]	**-0.52** [-0.65, -0.40]	**-0.19** [-0.31, -0.06]	**-0.79** [-0.91, -0.67]	**-0.86** [-0.99, -0.74]
+State Effects					
2nd-3rd Quartile	**-0.58** [-0.69, -0.46]	**-0.44** [-0.55, -0.33]	**-0.21** [-0.32, -0.10]	**-0.43** [-0.52, -0.34]	**-0.37** [-0.47, -0.28]
4th Quartile	**-0.71** [-0.84, -0.57]	**-0.55** [-0.68, -0.42]	-0.09 [-0.22, 0.04]	**-0.66** [-0.77, -0.56]	**-0.67** [-0.78, -0.56]
+Structural Characteristics & Medical Team					
2nd-3rd Quartile	**-0.40** [-0.52, -0.29]	**-0.31** [-0.42, -0.20]	**-0.18** [-0.29, -0.06]	**-0.28** [-0.38, -0.19]	**-0.27** [-0.37, -0.18]
4th Quartile	**-0.56** [-0.70, -0.42]	**-0.45** [-0.58, -0.32]	-0.08 [-0.21, 0.05]	**-0.51** [-0.62, -0.40]	**-0.56** [-0.67, -0.45]
+Staffing					
2nd-3rd Quartile	**-0.32** [-0.43, -0.20]	**-0.26** [-0.38, -0.15]	**-0.14** [-0.26, -0.03]	-	-
4th Quartile	**-0.44** [-0.58, -0.30]	**-0.39** [-0.52, -0.25]	-0.03 [-0.17, 0.10]	-	-

Note. Beta estimates represent differences in star ratings by Medicaid status. For example, -0.50 suggests that high-Medicaid nursing homes reported 0.50 fewer stars in comparison to low-Medicaid nursing homes. Structural characteristics include bed size, chain status, profit status, continuing care retirement community status, special care units, and occupancy. Staffing includes direct-care nurse (registered nurse, licensed practical nurse, and certified nursing assistant), administrative registered nurse, activities staff, and social services staffing. Bold indicates statistical significance. SMI = Serious mental illness. RN = Registered nurse. Medicaid proportions are 1st Quartile (M = 45.53%, n = 804), 2nd-3rd Quartile (M = 72.39%, n = 1,608), 4th Quartile (M = 89.10%, n = 804). Cutoff values are: 61.69% for the 25th percentile and 82.23% for the 75th percentile.

CHAPTER 3:

HEALTH DEFICIENCIES

All certified NHs are inspected annually on average to assure that the facility is meeting regulatory standards. If the inspection team determines a regulatory standard is not being met, as outlined in the State Operations Manual (CMS, 2017), surveyors can issue a deficiency indicating that the facility has a problem that needs remediation. In addition, the inspection team will determine the severity (e.g., ranging from Potential for Minimal Harm to Immediate Jeopardy) and scope of the issue (e.g., ranging from Isolated to Widespread) (CMS, 2018). As a measure of quality (*Top-Down Approach*), deficiencies can be weighted into an overall deficiency score. This weighted deficiency score assigns points to deficiencies by their severity and scope as per an algorithm developed by CMS (CMS, 2018; Table A1). A greater number of total deficiencies and a higher weighted deficiency score are associated with worse quality and both measures are highly correlated (Bowblis & Roberts, 2020).

Within this context of regulatory deficiencies, three studies to date have focused on the association between regulatory deficiencies and the proportion of residents with SMI. Li and colleagues (2011) found that residents with schizophrenia or bipolar disorder were more likely to enter NHs that received a greater number of deficiencies after controlling for a host of resident-level and facility-level covariates. Conversely, Rahman and colleagues (2013) found that a weighted deficiency score was not related to the proportion of residents with schizophrenia or bipolar disorder in the facility. Jester and colleagues (2020) found that high-SMI NHs were not

associated with NH Compare's star rating for deficiencies (e.g., health inspection star rating) after controlling for structural characteristics, payer mix, staffing levels, and state fixed-effects.

This Chapter differs from previous literature in a few important ways. First, past work utilized the proportion of residents with SMI (Rahman et al., 2013), whereas this Chapter categorizes NHs into quartiles based on this proportion (Jester et al., 2020). The advantage of this is that non-linear effects of the proportion of SMI on quality outcomes may be present. Second, past studies have focused only on the number of deficiencies and the weighted deficiency score (Li et al., 2011; Rahman et al., 2013) or the health inspection quality star rating (Jester et al., 2020). While this Chapter also examines the number of deficiencies and the weighted deficiency score, it also explores the scope and severity of deficiencies given as well as the most frequent deficiencies by SMI status. Finally, most studies are dated, using data from the mid-2000s (Li et al., 2011; Rahman et al., 2013). This study utilizes more recent data from 2014-2017, which takes into consideration recent developments in the NH industry (e.g., introduction of Minimum Data Set 3.0, public reporting of antipsychotic medication use, development of the NH Compare quality star ratings) that may result in different deficiency patterns.

Chapter 3 Aims

Chapter 3 will examine the role of high-SMI status on regulatory deficiencies and the role of payer mix as a confounding factor. *Hypothesis 1*: High-SMI NHs will have a greater number of deficiencies, higher deficiency score, and greater severity and wider scope of cited deficiencies per inspection in comparison to all other NHs (*Top-Down* proxy of quality). *Hypothesis 2*: Payer mix will reduce but not completely attenuate the effect of high-SMI status on these outcomes (*Structure* confounding *Top-Down* proxy of quality). Finally, an exploratory

aim will list the most frequent deficiencies and the most frequent deficiencies that were cited for Actual Harm or Immediate Jeopardy by SMI status.

Methods

Data

Data came from CASPER. To reflect the state of the NH industry in the continental United States in 2016-2017 but before the regulatory changes on November 27th, 2017, the sample includes one inspection per NH that occurred closest to and within 270 days of February 4th, 2017 (CMS, 2018). For our analytic sample of NHs in 2016-2017, it was restricted to freestanding, non-hospital-based, NHs with at least 10 residents in the continental United States (excluded n = 1,026). This left an analytic sample of 14,698 unique NHs. Finally, NHs were matched to all recertification inspections that occurred from November 01st, 2014 to November 01st, 2017. This left a final sample of 14,698 NHs, 41,717 unique recertification inspections, and 246,528 deficiencies over the three-year period.

Defining High-SMI Facilities

To identify NHs that predominantly serve residents with SMI, the proportion of residents as having SMI was identified in CASPER (F110 from Form CMS-672) and divided by the total number of residents (F78 from Form CMS-672) (CMS, 2012). CMS uses Form 672 to classify SMI as schizophrenia, schizoaffective disorder, schizophreniform disorder, delusional disorder, psychotic mood disorders, and anxiety disorders (CMS, 2012). It does not include depressive disorders without psychosis or ADRD. NHs were split into quartiles by the proportion of residents with SMI in the facility. The first and fourth quartiles were identified as "low-SMI" (≤19.70%) and "high-SMI" NHs (≥44.62%) based on their proportion of residents with SMI. NHs with greater than 19.70% or less than 44.62% of their residents with SMI (quartiles two and

three) were labeled as the "Middle 50%." This is consistent with the 'broad' definition of SMI used in the literature (Grabowski et al., 2009). Sensitivity analyses by Jester and colleagues (2020) conclude that quartile categorization of SMI status does not differ statistically from using the proportion of residents with SMI when modeling staffing and quality star outcomes.

Facility Characteristics

Organizational structure includes chain-status, CCRC status, and the size of the NH as measured by the number of beds. Facility ownership was categorized as for-profit, not for-profit, or government-owned. Special care units were identified as ADRD or non-ADRD. Payer-mix was defined as the proportion of residents who were reimbursed by Medicare, Medicaid, and other sources (i.e., primarily private pay). These covariates make up the *Structure* of the modified Donabedian SPO framework and directly affect *Top-Down* proxies of quality such as regulatory health deficiencies.

Health Deficiencies

Each deficiency includes two items, the regulation that is specifically being violated (F-Tag) and the scope and severity of the deficiency (Grade). Each inspection was scored in accordance with CMS guidelines that awarded greater points for more severe and more widespread deficiencies, and additional points due to violation of certain deficiency categories (Table A1). These points were summed to create a weighted deficiency score per inspection but did not include compliance points, scores from previous inspections, or complaints (CMS, 2018).

Severity of deficiencies was categorized as *Potential for Minimal Harm*, *Potential for More than Minimal Harm*, *Actual Harm*, and *Immediate Jeopardy* (Table A1). Immediate Jeopardy is described in the State Operations Manual (CMS, 2019) as death of a resident, significant functional decline (e.g., physical, psychological, social) not attributable to a disease

or aging, physical disfigurement including amputation, avoidable excruciating pain, or other harm that jeopardizes the life of a resident. Scope of deficiencies was categorized as *Isolated*, *Pattern*, or *Widespread* (Table A1).

Statistical Analyses

To examine the effect of high-SMI status on the number of deficiencies and weighted deficiency score per inspection, linear mixed effects models (PROC MIXED in SAS; lmer in R) were used. Generalized linear mixed effects models were used to estimate the effect of high-SMI status on the scope and severity of deficiencies (PROC GLIMMIX in SAS). Because scope and severity categories represent count data (e.g., the number of "Isolated" deficiencies per inspection), a negative binomial mixed effects model was used. In all models, inspections were clustered at the NH-level (41,717 inspections in 14,698 NHs) and a random variance was included. All model estimates included 95% confidence intervals. Confidence intervals are favored over *p*-values in this dissertation because analyses are at the population-level and the sample size exceeds several thousand facilities, therefore Type II errors may be more common.

To examine the potentially-confounding relationship between payer mix (*Structure*) and the deficiency outcomes (*Top-Down* proxy of quality), models were first conducted with no other covariates beyond state fixed-effects. Next, models were further adjusted for organizational structure, profit status, and the availability of special care units. Finally, models were fully adjusted for the main covariate of interest, payer mix.

Next, individual deficiencies were compared by SMI status. Given the large sample sizes for the top 10 deficiencies, *p*-values were not reported. However, chi-square tests were used to compare deficiencies that were cited for Actual Harm or Immediate Jeopardy in high-SMI versus low-SMI NHs as these deficiency grades were rarer and required formal statistical testing. To

better understand whether abuse, neglect, and involuntary seclusion deficiencies were found among many high-SMI NHs or clustered within a few high-SMI NHs, facilities were categorized as having received none, one, or more than one F223 or F224 deficiency. Due to the very small sample sizes, formal statistical tests were not conducted.

Results

From November 1st, 2014 to November 1st, 2017, 41,717 inspections were completed with 246,528 cited deficiencies. On average, high-SMI NHs had more deficiencies ($p = .001$), a greater weighted deficiency score ($p < .001$), more Pattern and Widespread deficiencies ($p < .001$), and more Potential for Minimal Harm and More than Minimal Harm deficiencies ($p < .001$; $p = .01$) per inspection in comparison to all other NHs at the univariate level (see Table 5).

After controlling for state differences, high-SMI NHs received 0.58 (95% CI: 0.44, 0.71; $p < .001$) more deficiencies and 4.69 (95% CI: 3.12, 6.26; $p < .001$) more points on a weighted deficiency score per inspection in comparison to all other NHs (see Table 6). Adjusting for proxies of *Structure* (i.e., organizational structure, profit status, and the availability of special care units) did not appreciably change the findings (see Table 7). However, further adjusting for payer mix fully attenuated the relationships between high-SMI status and the number of deficiencies ($p = .06$) and the weighted deficiency score ($p = .15$) per inspection (see Table 8).

Grade of the Deficiencies

After controlling for state differences, high-SMI NHs were cited 9% (95% CI: 1.06, 1.12; $p < .001$) more often for Isolated deficiencies, 16% (95% CI: 1.12, 1.20; $p < .001$) more often for Pattern deficiencies, and 15% (95% CI: 1.11, 1.20; $p < .001$) more often for Widespread deficiencies per inspection in comparison to all other NHs (see Table 6). Adjusting for proxies of *Structure* (i.e., organizational structure, profit status, and the availability of special care units) did

not appreciably change the findings (see Table 7). However, further adjusting for payer mix revealed that high-SMI NHs were 3% (95% CI: 1.00, 1.07; $p = .04$) more often cited for Pattern deficiencies and 7% (95% CI: 1.02, 1.11; $p = .004$) more often cited for Widespread deficiencies per inspection in comparison to all other NHs (see Table 8). Payer mix fully attenuated the effect of high-SMI status on receiving Isolated deficiencies ($p = .32$).

After controlling for state differences, high-SMI NHs were cited 25% (95% CI: 1.18, 1.33; $p < .001$) more often for Potential for Minimal Harm deficiencies and 11% (95% CI: 1.09, 1.14; $p < .001$) more often for More than Minimal Harm deficiencies per inspection in comparison to all other NHs (see Table 6). Adjusting for proxies of *Structure* (i.e., organizational structure, profit status, and the availability of special care units) did not appreciably change the findings (see Table 7). However, further adjusting for facility payer mix revealed that high-SMI NHs were 11% (95% CI: 1.04, 1.18; $p = .001$) more often cited for Potential for Minimal Harm deficiencies and 3% (95% CI: 1.00, 1.05; $p = .04$) more often cited for More than Minimal Harm deficiencies per inspection in comparison to all other NHs (see Table 8). In all analyses, high-SMI NHs did not differ on Actual Harm or Immediate Jeopardy deficiencies in comparison to all other NHs.

Most Common Deficiencies

See Table 9 for the top 10 most frequent deficiencies by SMI status. The most common deficiencies included: F441 infection control, F371 food procurement, storage, and preparation, F323 freedom from accidents and hazards, F309 providing care for the highest level of well-being, and F431 drug recording, labeling, and storage. Noticeably, the top 10 most frequent deficiencies did not differ appreciably by SMI status.

Table 10 shows the top 10 most frequent deficiencies that were cited for Actual Harm or Immediate Jeopardy by SMI status. The three most frequent deficiencies that were cited for Actual Harm or Immediate Jeopardy were: 1) F323 freedom from accident hazards, and receiving supervision or supportive devices to prevent hazards, 2) F314 adequate services to prevent, treat, and heal pressure sores, and 3) F309 providing care at the highest level for physical, mental, and psychosocial health.

Deficiencies for Abuse, Neglect, & Involuntary Seclusion

Deficiencies related to resident abuse or neglect (F223; i.e., verbal, sexual, physical, and mental abuse, corporal punishment, and involuntary seclusion; CMS, 2017) were 2.12 times greater in high-SMI NHs (4.32% of all deficiencies that were cited for Actual Harm or Immediate Jeopardy, ranked 4th) than in low-SMI NHs (2.04%, ranked 12th), $p < .001$. Deficiencies regarding policies to prohibit and monitor for risk of abuse and neglect (F224) were 1.60 times greater in high-SMI NHs (3.46%, ranked 7th), in comparison to low-SMI NHs (2.16% ranked 10th), $p = .02$. However, deficiencies related to developing policies to screen potential employees, protect residents, and investigate cases of abuse and neglect (F226) were statistically equivalent between high-SMI NHs (3.16% ranked 8th) and low-SMI NHs (2.84%, ranked 6th), $p = .57$.

Receiving Multiple Deficiencies for F223 or F224

In total, 589 F223 abuse, neglect, and involuntary seclusion deficiencies were given to 565 NHs over the three-year period. Roughly 5.55% of all high-SMI NHs ($n = 204$) and 2.86% of all low-SMI NHs ($n = 105$) received at least one F223 deficiency. Among facilities that received an F223 deficiency, high-SMI NHs were 20% more likely to receive multiple F223 deficiencies over the three-year period (3.43% versus 2.86%).

In total, 544 F224 policies to prohibit and monitor for risk of abuse and neglect deficiencies were given to 528 NHs over the three-year period. Roughly 4.54% of all high-SMI NHs (n = 167) and 2.69% of all low-SMI NHs (n = 99) received at least one F224 deficiency. Among facilities that received an F224 deficiency, high-SMI NHs were 19% more likely to receive multiple F224 deficiencies over the three-year period (2.40% versus 2.02%).

Summary

The objective of Chapter 3 was to ascertain whether high-SMI NHs provided poorer quality of care as determined by a *Top-Down* proxy of quality (health deficiencies) and whether payer mix (*Structure*) confounded this relationship. High-SMI NHs received more deficiencies and a greater deficiency score per inspection in comparison to all other NHs after controlling for state and structural effects. However, these findings were attenuated by the inclusion of payer mix, suggesting that the proportion of residents reimbursed through Medicaid strongly affects the number of deficiencies and weighted deficiency score on any given inspection.

Deficiencies given to high-SMI NHs were associated with wider scope, especially Pattern and Widespread. Regarding severity, high-SMI NHs were more likely to be cited for deficiencies resulting in Potential for Minimal Harm. When examining the most common deficiencies by SMI status, no differences were found. However, high-SMI NHs were more likely to be cited for resident abuse, neglect, or involuntary seclusion and the policies that prohibit and monitor for risk of abuse and neglect in comparison to low-SMI NHs when looking exclusively at deficiencies cited for Actual Harm or Immediate Jeopardy. Chapter 4 will provide a combined discussion for Chapters 2 and 3.

Table 5. Descriptive statistics at the inspection-level (*n* = 41,717 inspections)

	All Other NHs *n* = 31,305	**High-SMI *n* = 10,412**	
Outcome	**Mean (SD)**	**Mean (SD)**	***p***
Number of Deficiencies	5.86 (5.00)	6.05 (5.11)	.001
Weighted Deficiency Score	41.51 (61.63)	45.59 (69.92)	< .001
Deficiency Scope*	**Mean (SD)**	**Mean (SD)**	***p***
Isolated	3.47 (3.33)	3.30 (3.29)	< .001
Pattern	1.82 (2.46)	2.01 (2.63)	< .001
Widespread	0.58 (1.09)	0.74 (1.30)	< .001
Deficiency Severity*	**Mean (SD)**	**Mean (SD)**	***p***
Potential for Minimal Harm	0.25 (0.60)	0.28 (0.66)	< .001
More than Minimal Harm	5.44 (4.63)	5.57 (4.69)	.01
Actual Harm	0.12 (0.49)	0.13 (0.52)	.17
Immediate Jeopardy	0.05 (0.42)	0.06 (0.47)	.07

Note. '*' The average number of deficiencies per category are reported per inspection. NHs = Nursing homes. SD = Standard deviation. SMI = Serious mental illness.

Table 6. Effect of high-SMI status on deficiency outcomes controlling for state effects (*n* = 41,717 inspections)

Outcome	**High-SMI vs. All Other NHs β [95% CI]**	***p***
Number of Deficiencies*	0.58 [0.44, 0.71]	< .001
Weighted Deficiency Score*	4.69 [3.12, 6.26]	< .001
Deficiency Scope^	**Incidence Rate Ratio [95% CI]**	***p***
Isolated	1.09 [1.06, 1.12]	< .001
Pattern	1.16 [1.12, 1.20]	< .001
Widespread	1.15 [1.11, 1.20]	< .001
Deficiency Severity^	**Incidence Rate Ratio [95% CI]**	***p***
Potential for Minimal Harm	1.25 [1.18, 1.33]	< .001
More than Minimal Harm	1.11 [1.09, 1.14]	< .001
Actual Harm	1.07 [0.98, 1.18]	.14
Immediate Jeopardy	1.19 [1.00, 1.42]	.06

Note. Incidence rate ratios were estimated by exponentiating the beta coefficient given by the negative binomial models (e^{β}). All models are at the inspection-level (*N* = 41,717) and estimate unique variance attributable to the facility in a mixed model. '*' indicates a linear mixed model. '^' indicates a negative-binomial mixed model. NHs = Nursing homes. SMI = Serious mental illness.

Table 7. Effect of high-SMI status on deficiency outcomes controlling for state effects and structural characteristics (*n* = 41,713 inspections)

Outcome	**High-SMI vs. All Other NHs β [95% CI]**	***p***
Number of Deficiencies*	0.43 [0.30, 0.56]	< .001
Weighted Deficiency Score*	3.58 [2.01, 5.15]	< .001
Deficiency Scope^	**Incidence Rate Ratio [95% CI]**	***p***
Isolated	1.06 [1.04, 1.09]	< .001
Pattern	1.12 [1.09, 1.16]	< .001
Widespread	1.13 [1.08, 1.18]	< .001
Deficiency Severity^	**Incidence Rate Ratio [95% CI]**	***p***
Potential for Minimal Harm	1.21 [1.14, 1.29]	< .001
More than Minimal Harm	1.08 [1.06, 1.11]	< .001
Actual Harm[a]	1.03 [0.93, 1.15]	.55
Immediate Jeopardy[a]	1.14 [0.94, 1.37]	.18

Note. Incidence rate ratios were estimated by exponentiating the beta coefficient given by the negative binomial models (e^{β}). '*' indicates a linear mixed model. '^' indicates a negative-binomial mixed model. All models are at the inspection-level (*N* = 41,713) and estimate unique variance attributable to the facility in a mixed model. Structural characteristics include bed size, continuing care retirement community status, chain status, profit status, and whether a special care unit was available. [a] = The estimated G Matrices (random effects) were not positive definite, suggesting that there was too little variability in the random effect to provide an accurate estimate. Fixed effects should still provide an accurate estimate. NHs = Nursing homes. SMI = Serious mental illness.

Table 8. Effect of high-SMI status on deficiency outcomes controlling for state effects, structural characteristics, and payer mix (*n* = 41,713 inspections)

Outcome	**High-SMI vs. All Other NHs β [95% CI]**	***p***
Number of Deficiencies*	0.13 [-0.00, 0.27]	.06
Weighted Deficiency Score*	1.18 [-0.43, 2.79]	.15
Deficiency Scope^	**Incidence Rate Ratio [95% CI]**	***p***
Isolated	1.01 [0.99, 1.04]	.32
Pattern	1.03 [1.00, 1.07]	.04
Widespread	1.07 [1.02, 1.11]	.004
Deficiency Severity^	**Incidence Rate Ratio [95% CI]**	***p***
Potential for Minimal Harm	1.11 [1.04, 1.18]	.001
More than Minimal Harm	1.03 [1.00, 1.05]	.04
Actual Harm[a]	1.01 [0.91, 1.12]	.85
Immediate Jeopardy[a]	1.04 [0.86, 1.25]	.72

Note. Incidence rate ratios were estimated by exponentiating the beta coefficient given by the negative binomial models (e^{β}). '*' indicates a linear mixed model. '^' indicates a negative-binomial mixed model. All models are at the inspection-level (*N* = 41,713) and estimate unique variance attributable to the facility in a mixed model. Structural characteristics include bed size, continuing care retirement community status, chain status, profit status, and whether a special care unit was available. [a] = The estimated G Matrices (random effects) were not positive definite, suggesting that there was too little variability in the random effect to provide an accurate estimate. Fixed effects should still provide an accurate estimate. NHs = Nursing homes. SMI = Serious mental illness.

Table 9. Distribution of the 10 most prevalent deficiencies by SMI status

Rank	Low-SMI (*n* = 58,543 Deficiencies)	Middle 50% (*n* = 125,013 Deficiencies)	High-SMI (*n* = 62,972 Deficiencies)
#1	F371: Food Procurement, Storage, Preparation, Service **6.78%** (*n* = 3,972)	F441: Infection Control, Prevent Spread, Linens **6.57%** (*n* = 8,210)	F441: Infection Control, Prevent Spread, Linens **6.47%** (*n* = 4,072)
#2	F441: Infection Control, Prevent Spread, Linens **6.72%** (*n* = 3,936)	F371: Food Procurement, Storage, Preparation, Service **6.13%** (*n* = 7,664)	F371: Food Procurement, Storage, Preparation, Service **6.31%** (*n* = 3,974)
#3	F323: Freedom of Accident Hazards/Supervision/Devices **4.85%** (*n* = 2,842)	F323: Freedom of Accident Hazards/Supervision/Devices **4.80%** (*n* = 5,999)	F323: Freedom of Accident Hazards/Supervision/Devices **4.71%** (*n* = 2,969)
#4	F309: Provide Care/Services for Highest Well-Being **4.53%** (*n* = 2,654)	F309: Provide Care/Services for Highest Well-Being **4.34%** (*n* = 5,422)	F309: Provide Care/Services for Highest Well-Being **3.71%** (*n* = 2,335)
#5	F431: Drug Records, Label/Store Drugs & Biologics **4.31%** (*n* = 2,523)	F431: Drug Records, Label/Store Drugs & Biologics **3.77%** (*n* = 4,714)	F431: Drug Records, Label/Store Drugs & Biologics **3.66%** (*n* = 2,302)
#6	F329: Drug Regimen is Free from Unnecessary Drugs **3.67%** (*n* = 2,151)	F329: Drug Regimen is Free from Unnecessary Drugs **3.57%** (*n* = 4,461)	F329: Drug Regimen is Free from Unnecessary Drugs **3.38%** (*n* = 2,127)
#7	F279: Develop Comprehensive Care Plans **3.57%** (*n* = 2,091)	F279: Develop Comprehensive Care Plans **3.32%** (*n* = 4,148)	F279: Develop Comprehensive Care Plans **3.28%** (*n* = 2,066)
#8	F514: Resident Records are Complete, Accurate, Accessible **2.84%** (*n* = 1,661)	F514: Resident Records are Complete, Accurate, Accessible **2.73%** (*n* = 3,416)	F514: Resident Records are Complete, Accurate, Accessible **2.48%** (*n* = 1,563)
#9	F241: Dignity and Respect of Individuality **2.57%** (*n* = 1,507)	F241: Dignity and Respect of Individuality **2.66%** (*n* = 3,331)	F241: Dignity and Respect of Individuality **2.47%** (*n* = 1,557)
#10	F281: Services Provided Meet Professional Standards **2.48%** (*n* = 1,450)	F282: Services by Qualified Persons per the Care Plan **2.44%** (*n* = 3,047)	F282: Services by Qualified Persons per the Care Plan **2.40%** (*n* = 1,509)

Note. SMI = Serious mental illness.

Table 10. Distribution of the 10 most prevalent deficiencies that were cited for Actual Harm or Immediate Jeopardy by SMI status

Rank	Low-SMI (*n* = 1,621 G-L Deficiencies)	Middle 50% (*n* = 3,846 G-L Deficiencies)	High-SMI (*n* = 1,993 G-L Deficiencies)	*p*
#1	F323: Freedom of Accident Hazards/Supervision/Devices **23.20%** (*n* = 376)	F323: Freedom of Accident Hazards/Supervision/Devices **23.45%** (*n* = 902)	F323: Freedom of Accident Hazards/Supervision/Devices **21.27%** (*n* = 424)	F323: .17
#2	F314: Treatment/Services to Prevent/Heal Pressure Sores **16.66%** (*n* = 270)	F314: Treatment/Services to Prevent/Heal Pressure Sores **17.08%** (*n* = 657)	F314: Treatment/Services to Prevent/Heal Pressure Sores **15.55%** (*n* = 310)	F314: .37
#3	F309: Provide Care/Services for Highest Well-Being **13.57%** (*n* = 220)	F309: Provide Care/Services for Highest Well-Being **13.05%** (*n* = 502)	F309: Provide Care/Services for Highest Well-Being **13.60%** (*n* = 271)	F309: .98
#4	F325: Maintain Nutrition Status Unless Unavoidable **4.57%** (*n* = 74)	F490: Effective Administration/ Resident Well-Being **3.85%** (*n* =148)	F223: Freedom from Abuse/Involuntary Seclusion **4.32%** (*n* = 86)	F223: <.001
#5	F490: Effective Administration/ Resident Well-Being **3.45%** (*n* =56)	F325: Maintain Nutrition Status Unless Unavoidable **3.77%** (*n* = 145)	F490: Effective Administration/ Resident Well-Being **3.96%** (*n* = 79)	F490: .42
#6	F226: Develop/Implement Abuse/Neglect Policies **2.84%** (*n* = 46)	F282: Services Delivered by Qualified Persons/ Per Care Plan **2.73%** (*n* = 105)	F325: Maintain Nutrition Status Unless Unavoidable **3.71%** (*n* = 74)	F325: .20
#7	F157: Notification of Changes (Injury, Decline, Room, etc.) **2.41%** (*n* = 39)	F157: Notification of Changes (Injury, Decline, Room, etc.) **2.68%** (*n* = 103)	F224: Prohibit Mistreatment/ Neglect/Misappropriation **3.46%** (*n* = 69)	F224: .02
#8	F282: Services Delivered by Qualified Persons/ Per Care Plan **2.34%** (*n* = 38)	F520: QAA Committee-Members/Meet Quarterly/ Plans **2.60%** (*n* = 100)	F226: Develop/Implement Abuse/Neglect Policies **3.16%** (*n* = 63)	F226: .57
#9	F520: QAA Committee-Members/Meet Quarterly/ Plans **2.34%** (*n* = 38)	F224: Prohibit Mistreatment/ Neglect/Misappropriation **2.55%** (*n* = 98)	F520: QAA Committee-Members/Meet Quarterly/ Plans **2.61%** (*n* = 52)	F520: .61
#10	F224: Prohibit Mistreatment/ Neglect/Misappropriation **2.16%** (*n* = 35)	F333: Residents Free of Significant Medication Errors **2.44%** (*n* = 94)	F157: Notification of Changes (Injury, Decline, Room, etc.) **2.36%** (*n* = 47)	F157: .93

Note. Denominators by which the proportions were calculated are the number of deficiencies that were cited for Actual Harm or Immediate Jeopardy for Low-SMI: 1,621, Middle 50%: 3,846, and High-SMI: 1,993. QAA = Quality Assessment and Assurance. SMI = Serious mental illness. *P*-values compare high-SMI vs. low-SMI.

CHAPTER 4:

POLICY RECOMMENDATIONS & CONCLUDING REMARKS

Chapter 2 Discussion

Chapter 2 of this dissertation found that payer mix – specifically the proportion of Medicaid-reimbursed residents – drastically affected the staffing levels and star ratings reported in high-SMI NHs. High-SMI NHs with a higher proportion of Medicaid-reimbursed residents provided lower nurse staffing levels of all types and lower star ratings in comparison to high-SMI NHs with a lower proportion of Medicaid-reimbursed residents. One exception was that high-Medicaid high-SMI NHs did not report lower quality measure star ratings, suggesting that the proportion of Medicaid-reimbursed residents may only affect overall stars, health inspection stars, and staffing stars rather than resident-level quality measure stars.

Using the modified Donabedian SPO Model (see Figure 1), Chapter 2 found that organizational characteristics such as the proportion of residents with SMI and the proportion of residents reimbursed by Medicaid in the facilities (*Structure*) affected both *Process* and *Bottom-Up* proxies of quality such as staffing levels and NH Compare star ratings. This simplified model does not fully take into consideration the interactions among each component, such as the direct effect of *Process* measures on *Bottom-Up* proxies of quality. For example in Table 3, staffing levels (*Process*) further attenuated the effect of high-SMI status (*Structure*) on overall quality, health inspection, and quality measure star ratings (*Bottom-Up*) after already controlling for payer mix (*Structure*). However, some have argued that current quality metrics may not strongly correlate with family or resident satisfaction (Williams, Straker, & Applebaum, 2016). This

shows how complex measuring NH quality can be, and why improving NH quality across the United States is a daunting task.

Medicaid Reimbursement

Structure measures such as the proportion of Medicaid-reimbursed residents attenuate the effect of high-SMI status on proxies of quality (e.g., staffing levels, star ratings). Although the proportion of Medicaid-reimbursed residents should be unfixed, this may not be the case (Mor et al., 2004). Therefore, one solution to improve quality in these facilities could be adjusting the reimbursement-level of Medicaid. The American Health Care Association (2018) has long called for Medicaid reimbursement rates to rise across the United States, suggesting that current levels barely cover the cost of care. If the proportion of residents with Medicaid reimbursement confounds the relationship between high-SMI status and quality outcomes, states will have a path toward potentially improving quality in these facilities by increasing the Medicaid reimbursement rate. Previous work suggests that increasing Medicaid or Medicare reimbursement rates may positively impact staffing levels (Bowblis & Applebaum, 2017; Hackmann, 2019; He, McHenry, & Mellor, 2020; Hyer et al., 2009), but whether increased reimbursement rates directly impact non-staffing quality metrics is less well-understood (Bowblis & Applebaum, 2017; He et al., 2020). While this model may work to improve *Process* proxies of quality, more could be done to adjust *Top-Down* and *Bottom-Up* proxies of quality.

If increased Medicaid reimbursement will not directly impact NH Compare quality star ratings (*Bottom-Up*) or health deficiencies (*Top-Down*), one solution to improve these quality outcomes may be increasing non-direct care staffing levels. For example, increasing staffing levels of administrative registered nurses, social services staff, and activities staff may be associated with better quality of care and quality of life health deficiency outcomes (Bowblis &

Roberts, 2020). Therefore, increasing Medicaid reimbursement rates while tying the premium to specific staff expenditures (e.g., administrative registered nurses, social services staff, activities staff), may be a logical solution to improve non-staffing quality proxies in high-SMI NHs.

Increasing Medicaid reimbursement rates uniformly across the United States is difficult as it is primarily regulated at the state-level. To incentivize states to increase Medicaid reimbursement rates, CMS could match federal dollars to participating states' expenditures. Alternatively at the facility-level, CMS could incentivize NHs that accept a large number of Medicaid-reimbursed residents through matched dollars. The major consequence to increasing Medicaid reimbursement rates is fiscal and therefore inevitably political in nature.

Public Reporting

Public reporting has become a widely used strategy to improve NH quality of care, especially when it becomes mandatory (Langford, Chen, Roberts, & Schneider, 2020; Mukamel, Ye, Glance, & Li, 2015; Werner, Stuart, & Polsky, 2010). Though public reporting may improve quality across thousands of NHs, it may also reduce the market-share of low-quality facilities (8%) and increase the market-share of high-quality facilities (6%) (Werner et al., 2016). Reducing the market-share of low-quality facilities may disproportionally affect less-affluent residents or those with SMI reimbursed through Medicaid. Prior work suggests that non-dually eligible prospective residents (i.e., more affluent individuals not supported by Medicaid) choose to reside in higher star-rated facilities at a greater rate than dually-eligible residents (Konetzka, Grabowski, Perraillon, & Werner, 2015). Conversely among Medicaid beneficiaries, an SMI diagnosis increases the likelihood of NH admission in comparison to a community-based placement (Andrews et al., 2009). Over time this may translate into Medicaid-reimbursed residents clustering in lower quality NHs, many of them with an SMI diagnosis. Therefore, if

improving *Process* or *Structure* measures such as staffing levels and Medicaid-reimbursement rates positively impact NH Compare star ratings or quality metrics (*Bottom-Up*), then high-SMI NHs may not be adversely affected by public reporting.

Gaming

While NH Compare (*Bottom-Up*) is ideal for the consumer who desires greater transparency, researchers have worried about the possibility of "gaming". For example, downcoding and upcoding are when NHs artificially adjust publicly-reported measures to improve their ratings. Examples of downcoding in NHs were found for a variety of adverse resident-level outcomes such as pain, weight loss, and pressure ulcers. That is, a decrease in these adverse outcomes was associated with publicly reporting these measures (Werner, Konetzka, & Kim, 2013; Werner, Konetzka, Stuart, & Polsky, 2011), which was greater than what would be expected through actual quality improvement and vigilance.

One relevant example of gaming is the inaccurate diagnosis of schizophrenia-spectrum disorders in order to discount these residents when publicly-reporting antipsychotic prescription rates (i.e., CMS does not count residents with schizophrenia, Huntington disease, or Tourette's Syndrome when calculating antipsychotic prescription rates; Ogarek et al., 2019). Ogarek and colleagues (2019) found that schizophrenia diagnoses alone and in combination with an ADRD diagnosis increased from 2011 to 2017, while the antipsychotic prescription rate decreased in a whitepaper published by the National Association of State Mental Health Program Directors. Presumably, the decrease in antipsychotic prescriptions was largely due to greater vigilance from CMS after the National Partnership to Improve Dementia Care in 2012 and better identification of schizophrenia-spectrum disorders in older adults after the Diagnostic and Statistical Manual of Mental Disorders – 5 (DSM-5) was published in 2013. However, Ogarek and colleagues (2019)

may be suggesting that a portion of the decrease in antipsychotic utilization never occurred, but rather residents with ADRD were given a comorbid schizophrenia diagnosis to discount their prescription when reporting antipsychotic rates to CMS. Whether this was fully caused by gaming or simply greater identification of geriatric psychotic disorders is not yet understood.

Quality of Mental Healthcare

Although our findings could not index the quality of mental healthcare provided in high-SMI NHs, literature suggests that *Structure* proxies (e.g., proportion Medicaid-reimbursed residents) and *Process* proxies of quality as operationalized by Chapter 2 (e.g., staffing levels) may also be related to the provision of mental healthcare services. In a review of the literature, Grabowski, Aschbrenner, Rome & Bartels (2010) found that worse mental healthcare in NHs is related to: older age of the resident, African-American race, lower nurse staffing levels, rural location of the NH, for-profit facility ownership, and serving a majority Medicaid-reimbursed residents. Moreover, others have suggested that staff training in mental healthcare is inadequate within NHs (Molinari et al., 2008), and non-pharmacological treatments for psychiatric symptoms are limited (Molinari et al., 2009).

Unfortunately, too few geriatric specialists have formal training in SMI and too few mental health providers have formal training in geriatrics (Substance Abuse and Mental Health Services Administration, 2019). In a questionnaire of psychologists, psychiatrists, and nurses working in community living centers (i.e., Veterans Affairs NHs), Muralidharan, Mills, Evans, Fujii, & Molinari (2019) found that providers requested additional training on managing challenging behaviors in residents with SMI (98%), understanding the symptomatology of SMI (90%), communication with residents (78%), using the recovery model of care that focuses on person-centered goals for symptom reduction and optimizing individual strengths (66%), and

stigma reduction and attitudes (63%). Clearly, there exists a need and desire for additional mental healthcare training in NHs which could be addressed through federal efforts. One policy-level solution might be the development of workforce enhancement programs for NH mental healthcare, as the Health Resources and Services Administration developed for geriatrics training in 2016 (Busby-Whitehead, Flaherty, & Potter, 2016).

Reducing NH Placement

If the quality of mental healthcare is low in NHs and if the resident with SMI does not require 24-hour skilled nursing services, discharge to the community or to an assisted living community may be warranted. Prior work from Leedahl and colleagues (2015) suggests that the majority of discharged Medicaid-reimbursed residents with SMI stay within the community (61%), despite perceptions that these residents will "ping-pong" back to NHs soon after discharge. However, not all community-based placements can provide adequate care for convalescing residents with SMI after a hospitalization. For example, Dobbs, Hayes, Chapin, & Oslund (2006) found that a greater number of hospitalizations in residents with SMI is associated with discharge to NHs from residential care or an assisted living community.

Population-based analyses out of Denmark show that acute conditions (e.g., appendicitis, pneumonia, urinary tract infection) and chronic conditions (e.g., chronic obstructive pulmonary disease, congestive heart failure, diabetes) more often lead to a hospitalization in adults with SMI than in those without SMI (Davydow et al., 2016). Unfortunately, those with SMI are at a heightened risk for rehospitalization within 30 days for the same condition (13% increased risk) or a new condition (30% increased risk) in comparison to those without SMI after controlling for a host of demographic factors, socioeconomic status, and comorbidities (Davydow et al., 2016).

Therefore, if policymakers hope to reduce unnecessary NH placement for residents with SMI, addressing the medical profiles of these residents to reduce rehospitalization may be necessary.

One example of adjusting long-term care settings to fit the unique needs of these residents would be the development of specialty licenses in assisted living communities. In Florida, assisted living communities can address mental health concerns of residents with SMI (Limited Mental Health licensure) and provide additional nursing services to care for frail residents and those who are at risk of rehospitalization (Extended Congregate Care, Limited Nursing Services licenses) (Becker, Schonfeld, & Stiles, 2002; Street, Burge, & Quadagno, 2009). Although the proportion of residents with SMI has risen in assisted living communities over time (Hua et al., 2021), few states have adopted specialty licenses to provide mental healthcare services or additional nursing services. These specialty licenses may be necessary to ultimately reduce transfer to a NH for residents with SMI due to their unique needs. Because assisted living is regulated at the state-level, CMS may need to provide financial incentives to states to expedite changes in long-term care regulations.

Chapter 3 Discussion

The objective of Chapter 3 was to ascertain whether high-SMI NHs provided poorer quality of care as determined by regulatory health deficiencies and whether payer mix confounded this relationship. Payer mix fully attenuated the effect of high-SMI status on the number of deficiencies and weighted deficiency score. These findings are consistent with prior work by Rahman and colleagues (2013) suggesting that the proportion of residents with SMI was not associated with a weighted deficiency score. Chapter 3 adds nuance by showing that this finding does not hold when only adjusting for state effects and structural characteristics, suggesting that payer mix is the major confounding factor.

Deficiencies given to high-SMI NHs were associated with a wider scope, especially Pattern and Widespread, though a lesser severity such as Potential for Minimal Harm. High-SMI NHs were more likely to be cited for resident abuse, neglect, or involuntary seclusion and the policies that prohibit and monitor for risk of abuse and neglect in comparison to low-SMI NHs when looking exclusively at deficiencies cited for Actual Harm or Immediate Jeopardy. These findings were novel and call into question other *Process* measures that are not obtained by the CASPER or PBJ datasets such as staff competence and training.

Using the modified Donabedian SPO Model (see Figure 1), Chapter 3 found that organizational characteristics such as the proportion of residents with SMI and the proportion of residents reimbursed by Medicaid in the facilities (*Structure*) affected *Top-Down* proxies of quality such as health deficiencies. What is less well-known is whether staffing variability during this time (*Process*) influenced the incidence of deficiencies, which could be examined further using PBJ daily staffing data. Because lower staffing levels occur with higher deficiency scores in NHs (Hyer et al., 2011; Jester et al., 2020), it is possible that the greater rate of Widespread and Pattern deficiencies and deficiencies related to abuse and neglect were affected by the lower staffing levels found in high-SMI NHs from Chapter 2.

Role of Staffing

Chapter 2 found that high-SMI NHs provided lower staffing levels on average and that staffing levels were confounded by the proportion of residents reimbursed through Medicaid. One solution to improving the health deficiency outcomes in high-SMI NHs found in Chapter 3 (*Top-Down*) may be through increased staffing levels (*Process*). Increasing staffing levels of administrative registered nurses, social services staff, and activities staff may be associated with better quality of care and quality of life health deficiency outcomes (Bowblis & Roberts, 2020).

However, increasing staffing levels may not be attainable if the work environment is poor (*Structure*). Persons with SMI may exhibit greater problematic behaviors in long-term care settings (Cen et al., 2018; Gimm, Chowdhury, & Castle, 2018), especially in the presence of a comorbid ADRD diagnosis (McCarthy et al., 2004), necessitating more staff to adequately address mental health concerns.

Other structural barriers such as mandatory overtime and lack of time to properly care for residents (i.e., low staffing levels) intimately affect the provision of skilled nursing care, and are associated with an increased risk of experiencing resident aggression (Tak, Sweeney, Alterman, Baron, & Calvert, 2010). Instances of assault and injury certainly affect nurse turnover (Jackson, Clare, & Mannix, 2002), though this phenomenon needs to be examined in high-SMI NHs. Lerner, Johantgen, Trinkoff, Storr, & Han (2014) found that certified nursing assistant turnover was associated with total deficiencies, quality of care deficiencies, and resident behavior and facility practices deficiencies, whereas licensed nurse turnover was related to quality of care deficiencies and total deficiencies. Future work is needed to better understand if issues with staffing turnover – another measure of *Process* – co-occurs with the lower staffing levels found in Chapter 2, and whether turnover affects the health deficiency outcomes found in Chapter 3. Additionally, the quality of mental health training for direct-care staff and the utilization of mental healthcare providers in high-SMI NHs should be investigated and correlated with health deficiency outcomes.

Abuse & Neglect

Our findings that high-SMI NHs were more likely to be cited for resident abuse, neglect, and involuntary seclusion and issues with policies to prevent and monitor for abuse and neglect is concerning. While some have focused on abuse and neglect of residents with ADRD (Dong,

Chen, & Simon, 2014), few have assessed residents with SMI. Castle (2011) analyzed data from 2000 to 2007 and found that the proportion of residents with SMI increased the likelihood of an inspection to include a deficiency for abuse, after controlling for staffing, case mix, organizational and structural factors, and external economic factors of the surrounding area. These findings were particularly pronounced for the deficiency F224 prohibit mistreatment, neglect, and misappropriation of resident property (Castle, 2011). Findings from Chapter 3 expand this work to more recent years (2014-2017) and suggest that abuse and neglect may be more pronounced in high-SMI NHs, though the overall incidence is still very low (6% of high-SMI NHs from 2014-2017 were cited at least once).

Using Caregiver Stress Theory, Ramsey-Klawsnik (2000) posit that several types of caregivers may be at-risk of perpetrating abuse. One caregiving group relevant to high-SMI NHs is "The Overwhelmed". These caregivers are well-intentioned, but may resort to verbal and physical abuse when the care requirements exceed their ability to provide adequate services (Ramsey-Klawsnik, 2000). Prior work suggests that shortages in staffing may correlate with overwhelming hours and responsibilities, low compensation, insufficient education or training, occupational burnout, reduced perceived control, and decreased job satisfaction, all of which may increase the likelihood of resident abuse when challenging situations arise (Baker & Heitkemper, 2005; Castle, Ferguson-Rome, & Teresi, 2015; Shinan-Altman & Cohen, 2009). Problematic resident behavior is one challenging situation that direct-care staff must frequently overcome. Inappropriate or aggressive resident behaviors are an occupational hazard for direct-care staff working in NHs (Schmidt, Dichter, Palm, & Hasselhorn, 2012), especially in NHs that are understaffed (Tak et al., 2010).

Findings from Chapter 2 suggest that high-SMI NHs provide lower staffing levels. Although the staffing levels are not adjusted for resident acuity, CMS does adjust the staffing star ratings for resident acuity (CMS, 2018). This is done because some NHs serve residents who require fewer skilled nursing services and thus staffing levels may be appropriately lower. High-SMI NHs did score lower on staffing-related quality star ratings from NH Compare, showing that staffing levels may not be sufficient in these NHs on average. Future work is needed to better understand the antecedents of resident abuse and neglect in high-SMI NHs, and whether staffing shortages or other *Process* factors of care delivery are driving factors (e.g., staff training, staffing turnover, occupational burnout, workplace satisfaction).

Behavioral Healthcare Deficiencies

Long-term care providers largely change behavior due to negative publicity (*Bottom-Up*) and monetary fines (*Top-Down*). Therefore, policies hoping to impact mental healthcare should enact compulsory mandates (e.g., fines for noncompliance, public reporting). In November 2017, CMS implemented new behavioral healthcare deficiencies (§483.40 behavioral health services; CMS, 2017), now addressing training and competency in mental healthcare services after criticism from the academic literature (Grabowski et al., 2010; Molinari et al., 2008). These deficiencies focus on the provision of behavioral health services (F740), competent staff for behavioral health needs (F741), and staff training in behavioral health (F949). One concern with the development of new deficiencies is the multitasking incentive problem (Holmstrom & Milgrom, 1991).

In light of limited resources and great stringency to improve one aspect of quality, initiatives may backfire by affecting other aspects of NH quality, known as the multitasking incentive problem. This has shown up in medication-related deficiency stringency (Bowblis,

Crystal, Intrator, & Lucas, 2011) and state-mandated increases in nurse staffing hours (Thomas, Hyer, Andel, & Weech-Maldonado, 2010). Future work should assess the development and vigilance of behavioral health deficiencies (*Top-Down*) on quality outcomes in high-SMI NHs (e.g., NH Compare star ratings), and whether this change indirectly affected a non-behavioral area of quality due to the multitasking incentive problem.

Limitations & Future Directions

Both chapters have limitations. Chapter 2 was completed with cross-sectional data, which limits the interpretation to correlational and not casual relationships. Moreover, CASPER is limited to a "best estimate" of staffing levels. Future work should use PBJ data to examine daily staffing levels in these facilities. Additionally, "high-SMI" status was limited to the definition of SMI designated by CMS (CMS, 2012). Others have used a narrow definition of SMI as schizophrenia-spectrum and bipolar-spectrum disorders (McGarry et al., 2019), rather than including anxiety-spectrum disorders (Grabowski et al., 2009; Jester et al., 2020). Further, the definition of high-SMI NHs may be considered arbitrary by using quartiles, but is supported by sensitivity analyses conducted in the literature (Jester et al., 2020). It is conceivable that NHs may move between SMI categories, which remains a limitation. For example, high-SMI NHs may be categorized as the Middle 50% one year but high-SMI as the next year due to fluctuations in case mix.

Another concern is the comorbid diagnosis of ADRD (McCarthy et al., 2004). Whether co-occurring ADRD diagnoses drive any of the findings in high-SMI NHs from this dissertation is not yet understood. One future direction that deserves greater examination must be disparities in high-SMI NHs by rurality and socioeconomic status as well as resident-level disparities for racially and ethnically diverse residents. Although both chapters controlled for state fixed effects,

state effects do not fully capture the socioeconomic and rural variability found in each state. On average, economically-disadvantaged facilities (Yuan et al., 2018) and rural facilities may be less likely to receive higher quality star ratings (Lutfiyya, Gessert, & Lipsky, 2013) and have lower direct-care and non-direct care staffing levels (Bowblis, Meng, & Hyer, 2013; Roberts & Bowblis, 2018) in comparison to metropolitan facilities.

Several new deficiencies related to residents with SMI (e.g., behavioral healthcare deficiencies) were developed after November 2017 and should be investigated in the future (CMS, 2017). Due to the rarity of Actual Harm and Immediate Jeopardy deficiencies, the linear and negative binomial mixed effects models had difficulty converging when the model was fully saturated with covariates. This may be due to the fact that little variance exists between NHs in the number of Actual Harm or Immediate Jeopardy deficiencies they receive, causing the random effects model estimate to approach zero. Covariates in the linear and negative binomial mixed effects models were held constant rather than varying over time. This can be considered a limitation, though it likely helped with model convergence.

Finally, the validity of the NH Compare star ratings and staffing levels must be addressed. Before the use of PBJ to examine daily staffing through a validated payroll, NHs were known to "staff up" their facility in the weeks before and after an inspection (Geng, Stevenson, & Grabowski, 2019). Whether this led to fewer deficiencies or exaggerated star ratings is not yet known. Future analyses should use PBJ daily staffing data.

Final Thoughts

High-SMI NHs are unlike "typical" long-term care facilities as a majority of the residents have unique behavioral and mental healthcare needs. Findings from this dissertation suggest that quality in these facilities – measured via *Top-Down*, *Bottom-Up*, or *Process* proxies – is lower on

average after controlling for a variety of confounding variables. One confounding factor that attenuates but does not fully explain differences in quality is payer mix, a proxy of *Structure* in the modified Donabedian SPO Model. Specifically, the proportion of residents reimbursed through Medicaid affects the staffing levels, quality star ratings, and health deficiencies given to high-SMI NHs. A potential solution to improve quality in high-SMI NHs may be increasing Medicaid reimbursement rates while tying the rates to specific staffing-related expenditures.

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APPENDICES

Appendix A: Scoring criteria

Table A1: Deficiency scope and severity scoring criteria

	Deficiency Scope		
Deficiency Severity	Isolated	Pattern	Widespread
Potential for Minimal Harm	**A** 0 points	**B** 0 points	**C** 0 points
Potential for more than Minimal Harm	**D** 4 points	**E** 8 points	**F** 16/20 points
Actual Harm	**G** 20 points	**H** 35/40 points	**I** 45/50 points
Immediate Jeopardy	**J** 50/75 points	**K** 100/125 points	**L** 150/175 points

Note. Deficiencies for resident behavior and nursing home practices (§483.13), quality of life (§483.15), or quality of care (§483.25) will receive the greater of the two values if listed. Letters designated by Centers for Medicare & Medicaid Services are used in the calculation of star ratings for Nursing Home Compare.