Chronic Obstructive Pulmonary Disease (COPD) Excess Days in Acute Care (EDAC) Measure Submission to PQM: Supplemental Attachment

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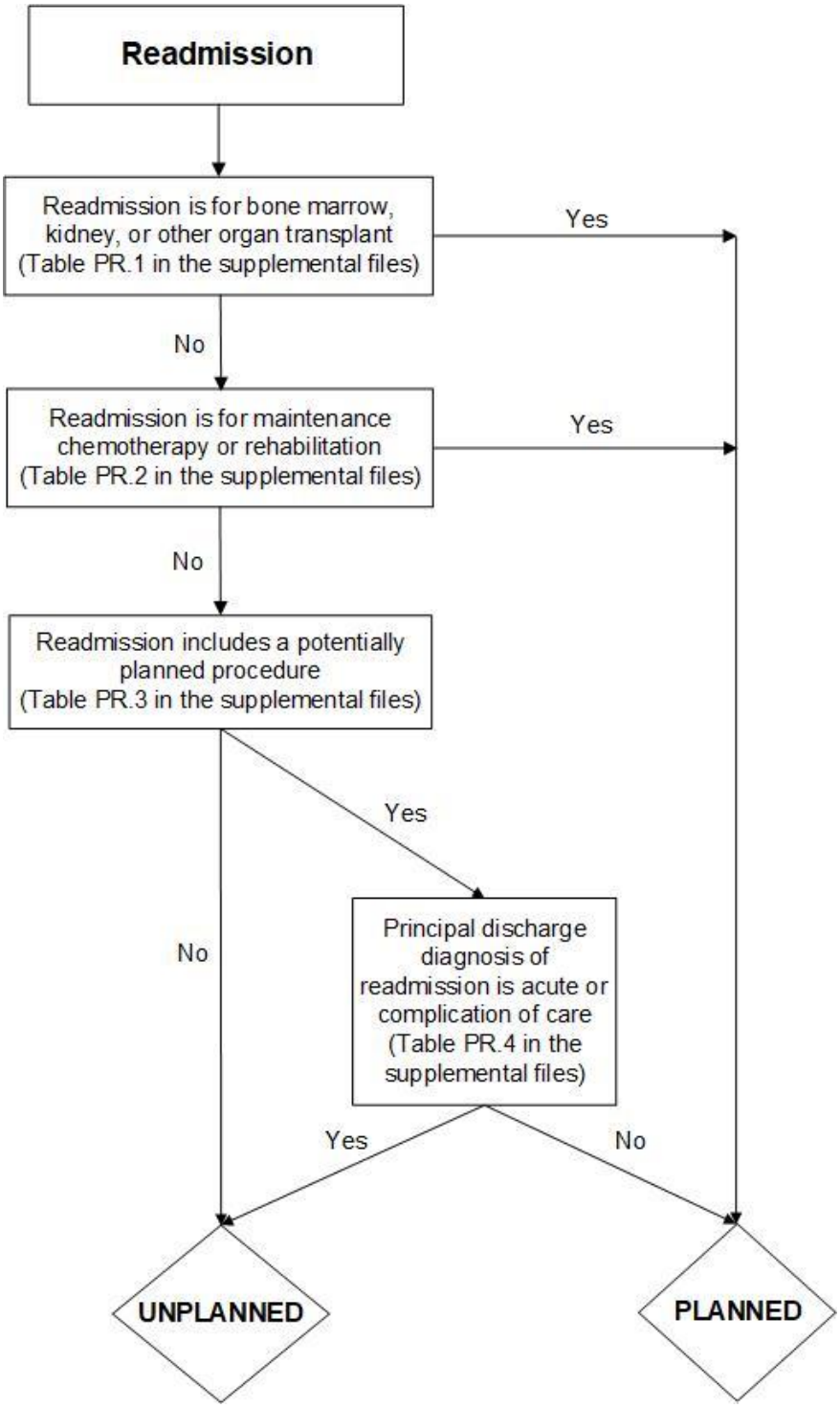
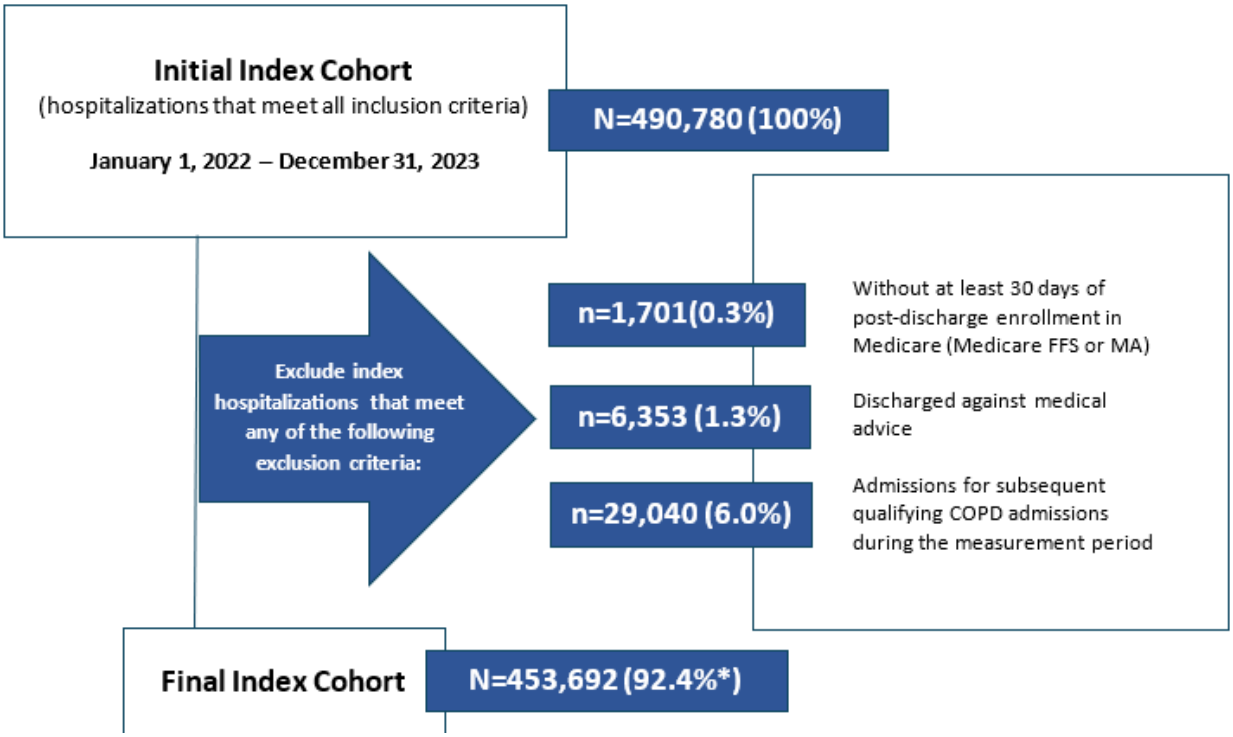
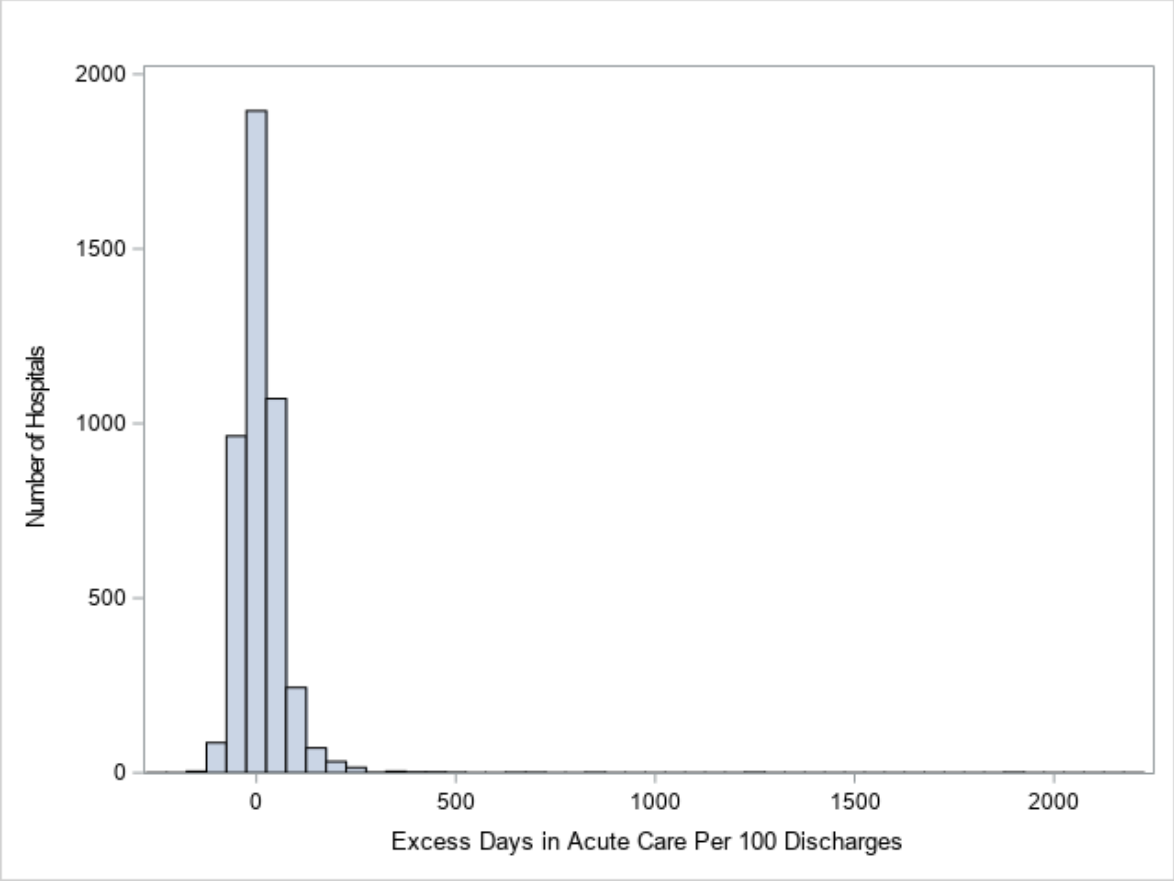


Figure 2. COPD EDAC: Index Cohort (January 1, 2022 – December 31, 2023)



** Admissions may have been counted in more than one exclusion category because they are not mutually exclusive.*

Figure 3. COPD EDAC: Histogram Displaying Hospital Distribution of Risk-Adjusted Measure Scores per 100 Discharges, January 1, 2022 - December 31, 2023 (N = 4,397)



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$$\frac{\sigma^2_{facility-to-facility}}{\sigma^2_{facility-to-facility}+\frac{\sigma^2_{facility-error}}{n}}.$$

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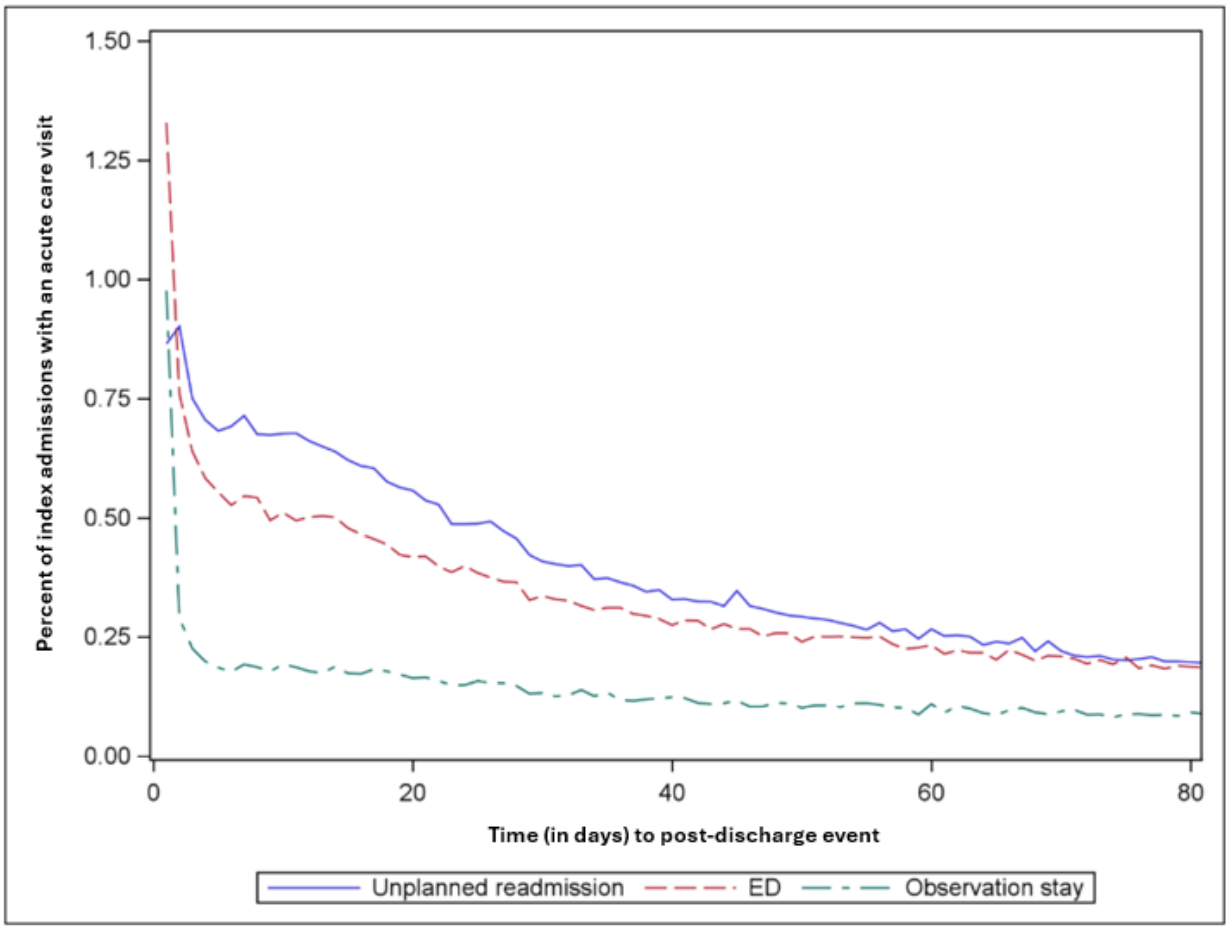

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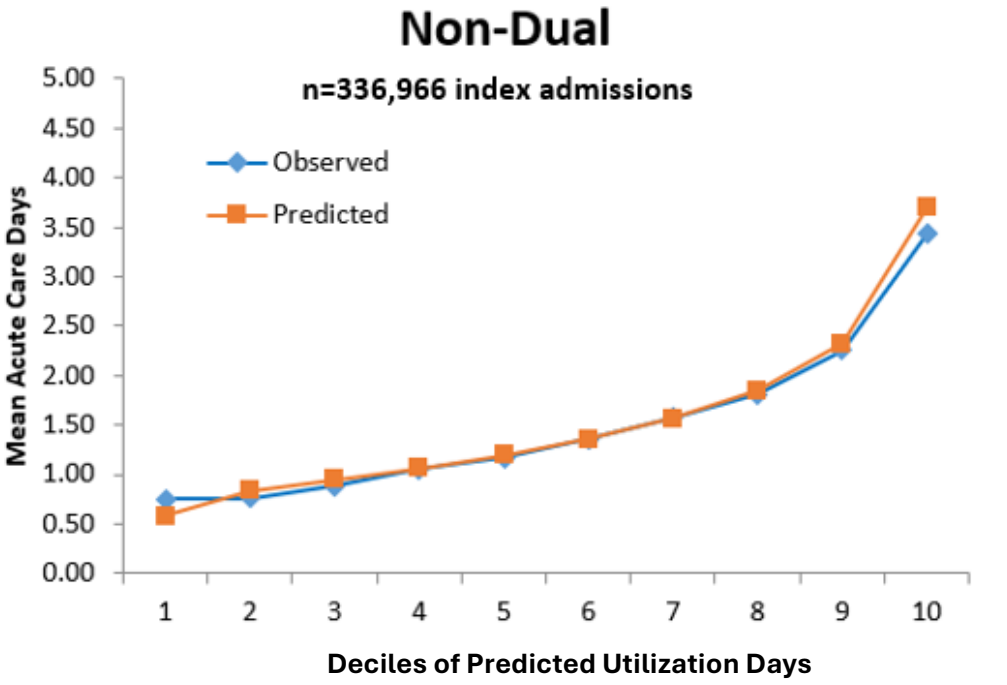

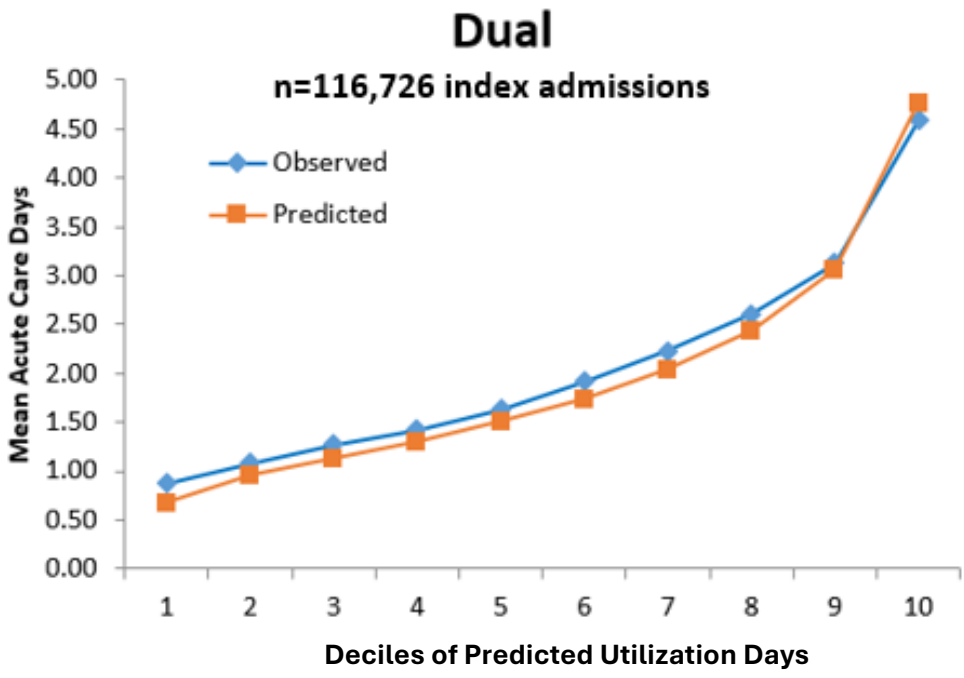

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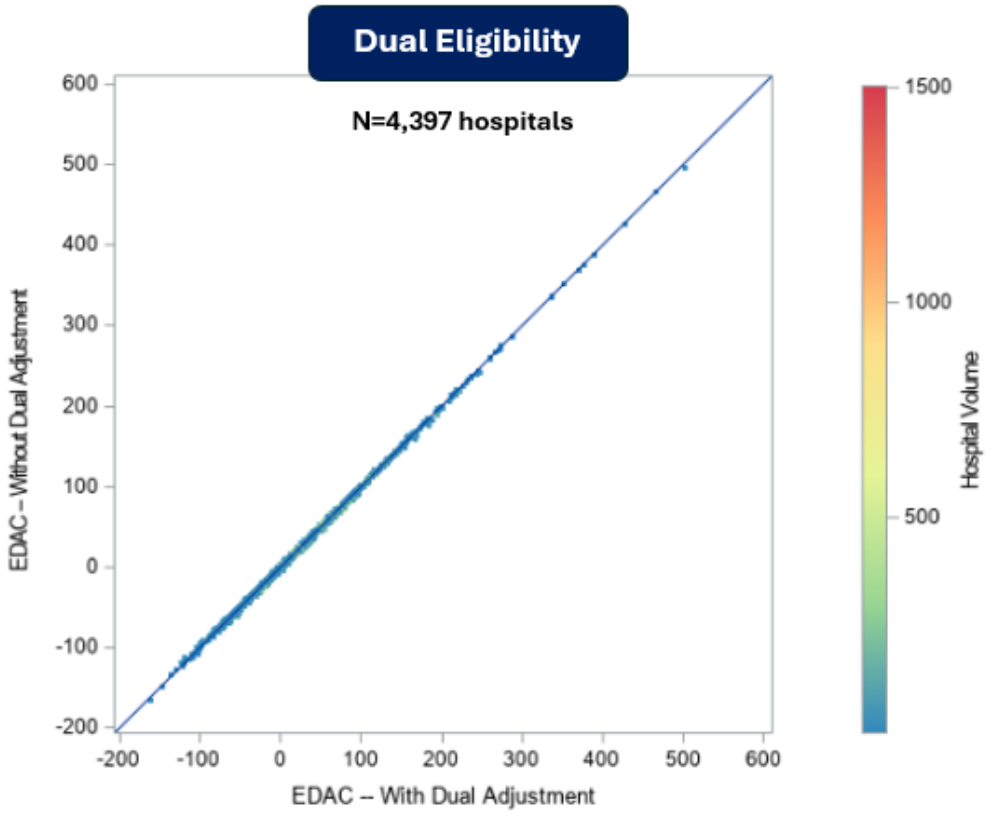

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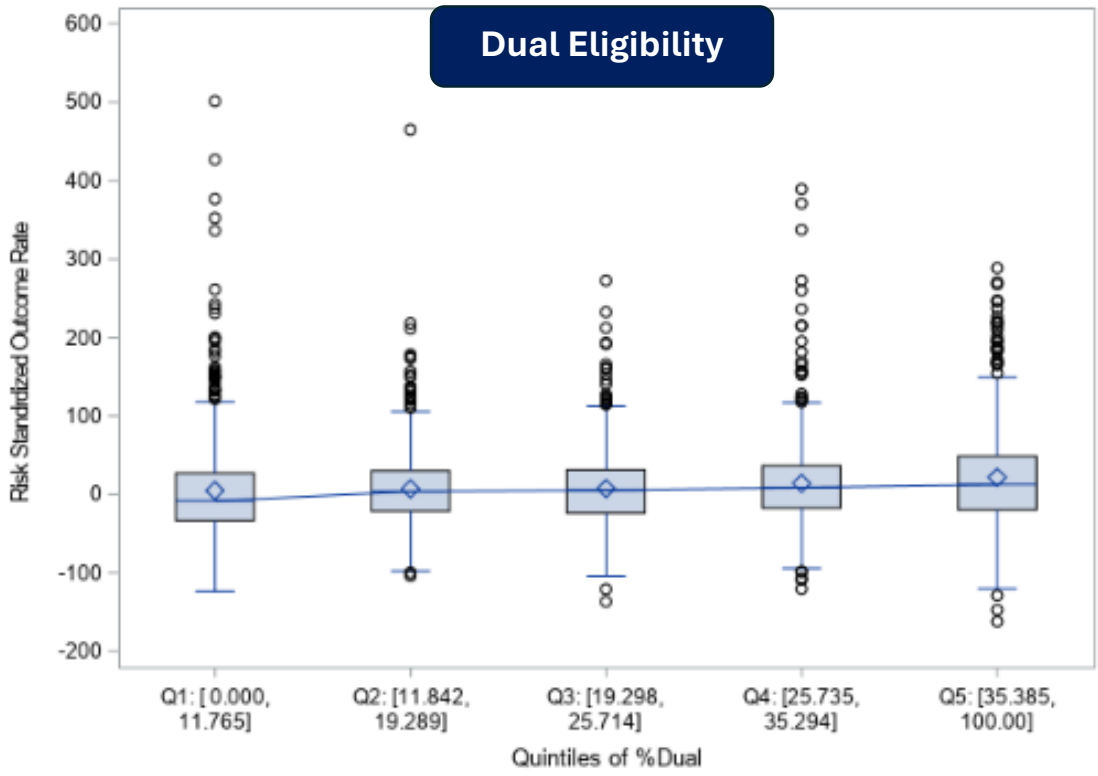

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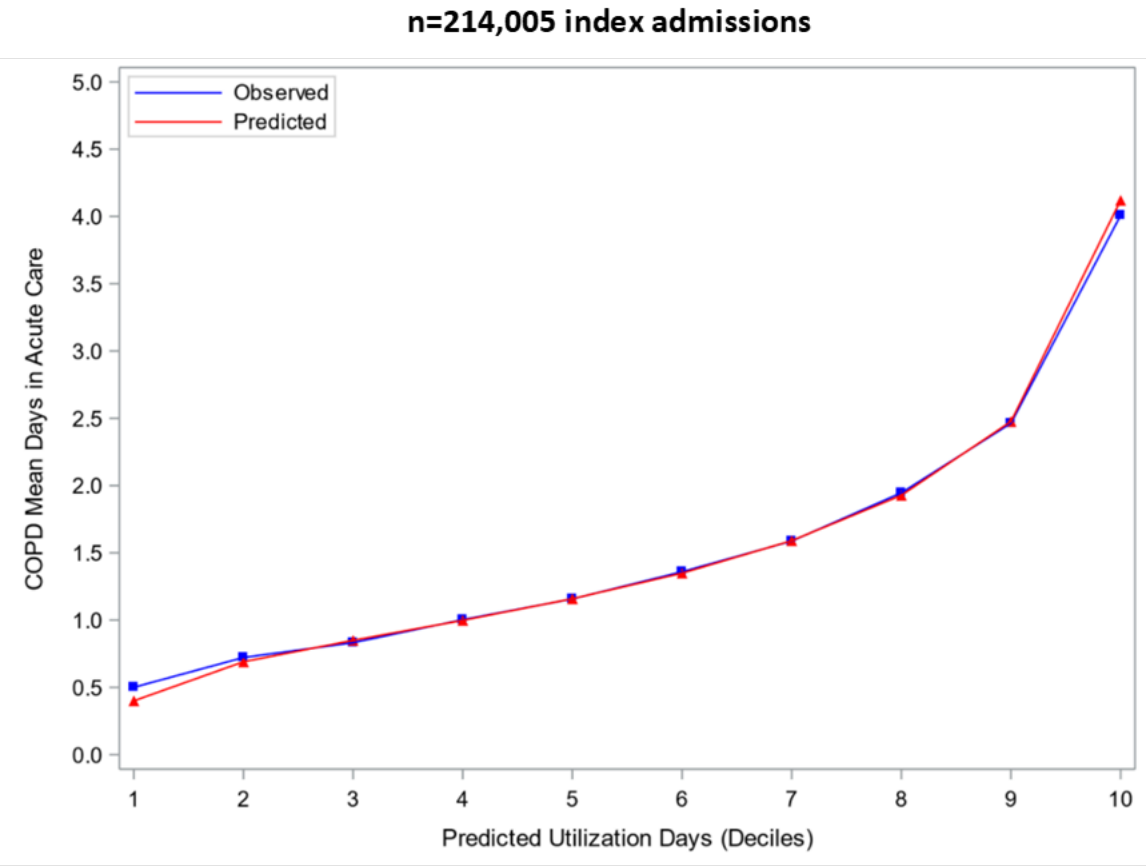

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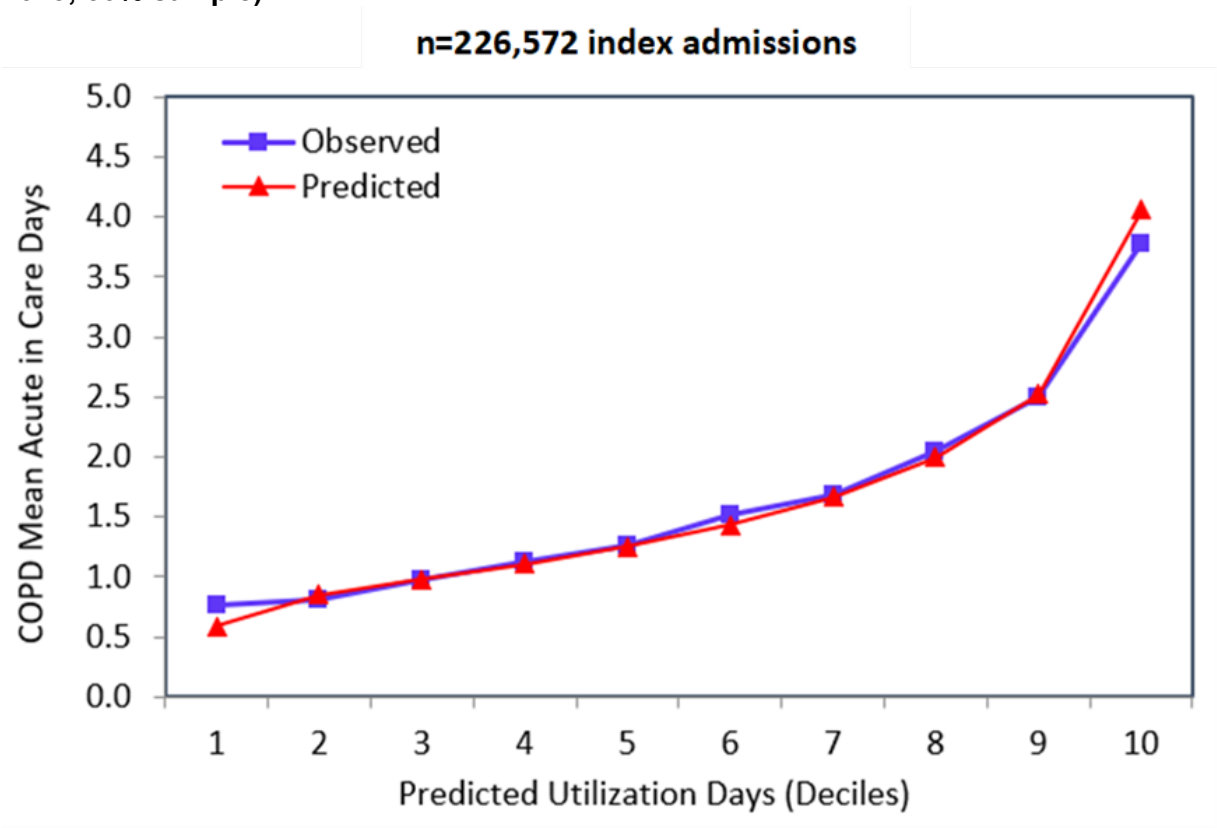

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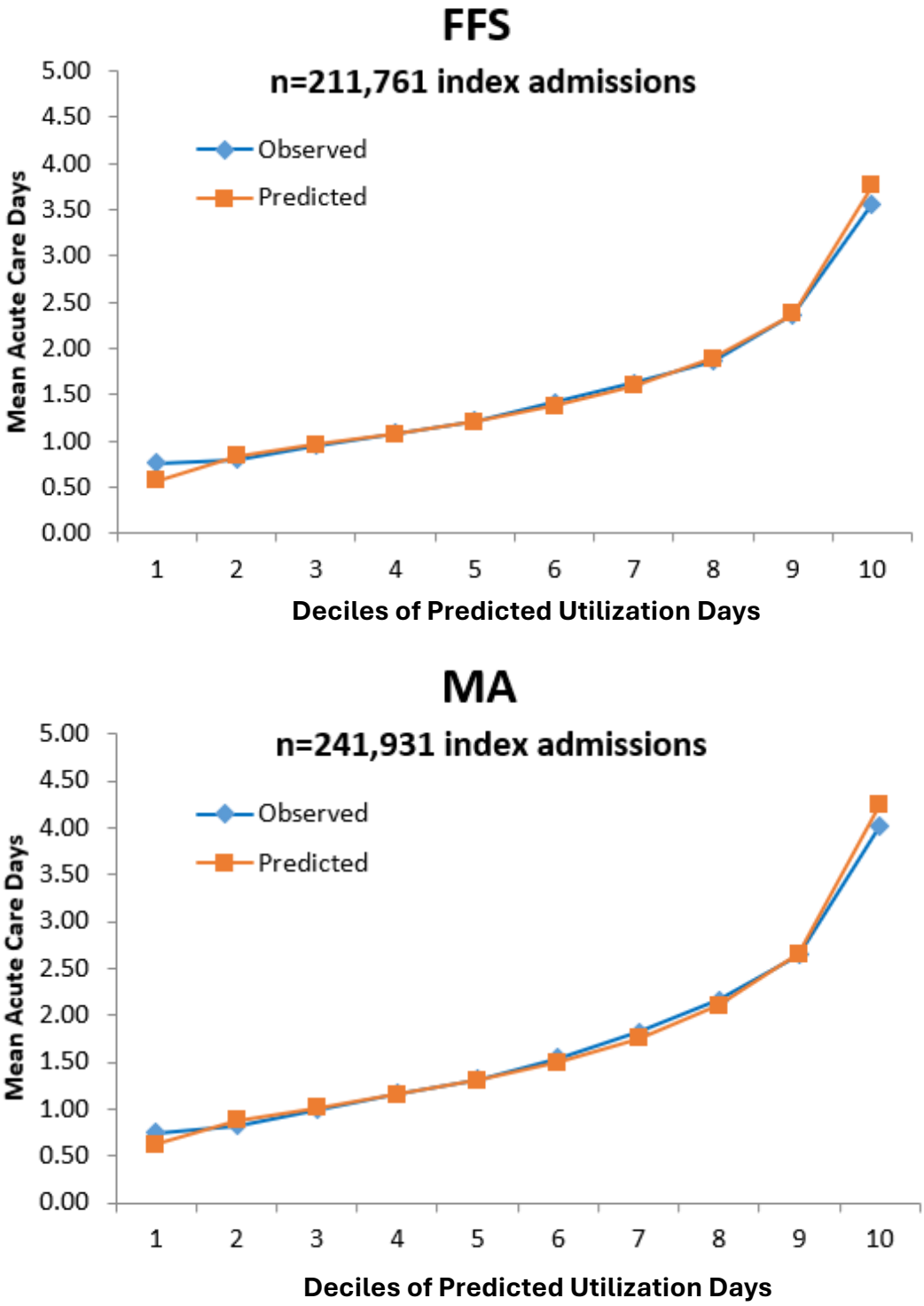

Logic Model

The COPD EDAC measure assesses days spent in acute care within 30 days of discharge from an inpatient hospitalization for COPD. This measure is intended to capture the care transition quality provided to discharged patients hospitalized for COPD by collectively measuring a set of adverse acute care outcomes that can occur post-discharge: emergency department (ED) visits, observation stays, and unplanned readmissions at any time during the 30 days post-discharge. To aggregate all three events, we measure each in terms of days. The outcome is adjusted to account for age and comorbidities and incorporates exposure time to account for survival times shorter than 30 days (for patients who die within 30 days of discharge). The measure is calculated for admissions for patients who are 65 years or older, are enrolled in Medicare Fee-For-Service (FFS) or Medicare Advantage (MA) and are hospitalized in non-federal short-term acute care hospitals. The final risk-adjusted measure scores are reported as the difference of the predicted minus the expected number of days in acute care per 100 discharges. We note that because this is an outcome measure, the goal is to have data for hospitals to use that informs their quality improvement processes, but the outcome results do not dictate which processes hospitals choose to put in place. Below in the “activities” column we state that hospitals should “apply the evidence base” because each hospital will need to address the root cause of any performance issues they see in their outcomes data against the existing processes they have in place.

Inputs	Activities	Outputs	Outcomes	Impacts
• Capacity to measure patient perspectives and lived experience to inform personalized education and guide self-management strategies for COPD. • Patient engagement tools (e.g., inhaler adherence apps, pulse oximeters). • Quality improvement (QI) infrastructure, including Electronic Health Records (EHR) capacity for tracking post-discharge outcomes, QI training, and culture of Transitions of Care (TOC) excellence. • Predictive analytics and risk assessment capacity to identify patients at high risk for readmission or other post-discharge acute care utilization. • CMS hospital specific reports to understand current trends of COPD post-acute care. • Trained multidisciplinary teams that include the following ancillary staff for transition of care: providers, ambulatory staff, respiratory therapists, pharmacists, and discharge planners.	• Engage in root cause analyses on COPD readmissions and post-discharge acute care use to identify trends, conduct routine case reviews while applying QI methods to improve future outcomes. • Create dashboards for tracking post-acute care readmissions outcomes. • Identification of patients for high risk of readmission through predictive analytics. • Implement and apply the evidence-base to address root causes of performance gaps specific to their site. The evidence base supports programs such as discharge planning checklists, including but not limited to inhaler technique education, identification of environmental triggers, safe de-escalation of medications given in the acute setting in favor of maintenance tailored to patient specific needs and perspectives. • Conduct medication reconciliation and ensure prescription fills prior to discharge. • Assist patients with scheduling follow-up	• Established post-discharge COPD care protocols (and within hospital adherence measurement) with patient education, medication reconciliation, and ambulatory clinic follow-up timelines. • Tele-health services and phone-based follow-ups for post-discharge care. • Dashboards tracking 30-day acute care utilization. • Staff trained on how to guide patients with COPD self-management (e.g., medications, exacerbation triggers) and transitions of care. • Increased referrals to outpatient pulmonary rehabilitation and community-based programs such as smoking cessation. • Utilization of data to develop discharge and post discharge processes for iterative feedback loops for QI (along with measuring	**Short-Term:** • Improved communication between inpatient care teams, patients at discharge, and outpatient care teams about post-discharge COPD management. • Higher rates of medication reconciliation, adherence, and prescription fill completion. • Better self-management around environmental COPD triggers. • Greater use of standardized discharge checklists for COPD patients. • Better identification and monitoring of high-risk patients at the time of admission and during post-discharge planning. **Intermediate-Term:** • Higher referral and post-discharge participation in community programs such as pulmonary rehabilitation. • Increased outpatient follow-up attendance post-discharge. • Better identification and proactive management of	• Decreased variation in post-discharge acute care use across hospitals due to increased quality of care. • Strengthened coordination between inpatient and outpatient COPD and other complex comorbidities care. • Improved patient quality of life and functional status. • Lower overall healthcare costs by preventing rehospitalizations from COPD and other conditions, and by improving care after hospital discharge to avoid unnecessary spending. • Improved hospital performance metrics and public reporting outcomes.

Inputs	Activities	Outputs	Outcomes	Impacts
• Capacity to adopt COPD clinical guidelines and integrate into care pathways (e.g., GOLD guidelines, international guidelines). • Data gathering capacity on environmental pollutants and structural/seasonal triggers for COPD exacerbation.	appointments at discharge, along with post-discharge reminders for appointment time and location. • Monitor TOC programs and implement patient-centered strategies to support patient attendance at pulmonary rehabilitation, smoking cessation programs, and any additional specialized ambulatory care. • Utilize telehealth services for post-discharge follow-up to increase ambulatory reach. • Conduct training for staff on best practices around COPD discharges, including inhaler technique coaching, avoiding or coping with COPD triggers and care transitions. • Routine review of benchmark performance using CMS reports and quality improvement programs targeting improvement based on performance.	effectiveness of new processes).	patients with frequent exacerbations. • Enhanced patient satisfaction with care transitions and communication. **Long term:** • Reduction in excess days in acute care within 30 days post-discharge (ED visits, readmissions, observation stays). • Improved COPD disease control and fewer hospitalizations. • Improved hospital performance on publicly reported quality measures (e.g., CMS Hospital Readmissions Reduction Program). • Enhanced system-wide coordination between hospitals and outpatient providers.	

Feedback Mechanisms
• Real-time dashboards flag increases in acute care days post-COPD discharge. • Hospitals benchmark their performance against peer institutions to identify variation in patient post-discharge acute care utilization. • Patient-reported outcomes and experiences such as confidence in self-management and satisfaction with discharge instructions are collected to inform care improvements. • Regular multidisciplinary case review meetings to analyze post-discharge events and refine discharge planning protocols based on data.
Assumptions
• Broad-based interventions to improve post-discharge care can be utilized similarly across different settings and geographic locations. • Hospital connectivity to post-discharge ambulatory settings. • Hospitals have systems in place to track and review COPD-related hospital stays and post-discharge outcomes. • Post-discharge interventions (case management, telemonitoring) are available and feasible. • Provider buy-in for standardized discharge planning and follow-up protocols. • Necessary staff including administrative, physicians, nursing, discharge coordinators, and ambulatory care clinic staff.
External Factors
• Policy and reimbursement models for COPD care transitions (e.g., CMS, private payers). • Provider shortages, particularly pulmonologists and pulmonary rehabilitation programs. • Evolution of COPD medications and technology (e.g., inhalers, oxygen therapy, pulse-ox monitoring AI-driven predictive analytics). • Technological challenges in implementing telehealth solutions. • Variability in patient access to home oxygen, community resources, pulmonary rehabilitation, or caregiver support. • Environmental, structural or seasonal factors affecting COPD exacerbation rates. • Patients have the ability and willingness to engage in self-management.

Summary: The COPD EDAC measure focuses on reducing unnecessary acute care use, including unplanned readmissions, ED visits, and observation stays, within 30 days of discharge for Medicare beneficiaries hospitalized with COPD. This logic model outlines an evidence-based strategy reflecting the intended impact of the measure to improve care transitions by emphasizing early follow-up care, standardized discharge protocols, and patient education tailored to COPD management. It also incorporates real-time data tracking and multidisciplinary care coordination to identify gaps and target high-risk individuals. The goal of the measure is to improve communication with patients, support COPD self-management, advance timely outpatient care, and ultimately lower excess days in acute care while enhancing both patient outcomes and hospital quality performance. Over time, this should lead to better COPD control, and a stronger, more coordinated system between hospital and outpatient care and ultimately improving both patient outcomes and hospital performance.

References for this section align with the narrative presented in sections 6.2.1 and 2.2.

Conceptual Model

The goal of risk adjustment is to adjust for case-mix differences across the hospitals. Risk adjustment supports fair and accurate comparison of outcomes across measured entities by including an adjustment for factors such as patient age, comorbid diseases, and indicators of patient frailty, which are clinically relevant and have relationships with the outcome. In pursuing a risk adjustment approach that best leverages the data, we used a framework based largely on individual ICD-10 codes for risk adjustment. The main advantage of leveraging ICD-10 codes in place of alternative methods that employ an ICD-10 grouper (such as CMS's Condition Categories, or CCs) is the ability to address the clinical heterogeneity found in the broadly defined CCs. Our previous research indicates that the model performance of the mortality measures is significantly improved by using individual codes instead of CCs (Krumholz et al., 2019). The COPD EDAC measure adjusts for case-mix differences between hospitals based on the clinical status of the patient at the time of the index admission. Accordingly, only comorbidities that convey information about the patient at that time or in the 12 months prior, and not complications that arise during the index hospitalization, are included in the risk adjustment. Accordingly, only comorbidities that convey information about the patient at that time or in the 12 months prior, and not complications that arise during the index hospitalization, are included in the risk adjustment. The process for determining patient comorbidities present at the time of the index admission from the index admission claim/encounter data uses a present-on-admission (POA) algorithm (see Section 5.4.2 of the full submission form for details).

The intent is for this measure to adjust for patient demographic and clinical characteristics while illuminating important quality differences. Therefore, this measure does not include an adjustment for social drivers of health because the association between social drivers of health and health outcomes can be due, in part, to differences in the quality of health care that these groups of patients receive. The measure does not adjust for patients' admission source or their discharge disposition (for example, skilled nursing facility) because these factors are associated with the structure of the healthcare system, not solely with patients' clinical comorbidities.

We also considered age, frailty, and an indicator for whether the admission was Medicare Advantage (MA) vs. Fee-for-Service (FFS). Based on evidence from the literature, expert input, guidance from the consensus-based entity for measure endorsement, the Assistant Secretary for Planning and Evaluation, input from other stakeholders, and prior testing results, we included a claims-based indicator of frailty in the final model. This indicator was developed for CMS's Multiple Chronic Conditions (MCC) measure. We did not include sex as a variable since sex can be considered a socio-demographic variable (Goodman et al., 2025). For the combined MA and FFS cohort, the risk-adjustment model was updated to include an MA indicator (versus FFS) as a main effect. This was to adjust for the generally higher prevalence of comorbidities in the MA cohort, especially among the pre-index variables that were derived from services in the outpatient setting (e.g., physician visits).

Clinical risk variables were selected using this conceptual framework together with a data-driven empiric approach as described in Section 5.4.2 of the full measure submission.

Economic Disadvantage

Because our risk variable selection process was based on an empirical approach using individual ICD-10 codes related to a patient's clinical status at admission and in the 12 months prior to admission, we separately considered variables related to economic disadvantage and

their overlap with clinical risk factors. Although some recent literature has evaluated the relationship between these variables and the EDAC outcome, few studies directly address specific causal pathways or examine the role of the hospital in these pathways (see, for example: Hamadi et al., 2019; Jacobs et al., 2018; Kaiser Permanente Washington Health Research Institute, 2022; Rogstad et al., 2022; Joynt Maddox et al., 2019). Our conceptual model described below (and in the Supplemental Attachment) builds on published literature as well as our empirical analyses and identifies several overlapping pathways whereby patients may experience worse outcomes.

Conceptual Model for Clinical Factors and Factors Related to Economic Disadvantage

Our conceptual model described below builds on published literature as well as our empirical analyses and identifies several overlapping pathways whereby patients may experience worse outcomes. These pathways are not mutually exclusive.

- **Comorbidities and economic disadvantage:** Economically disadvantaged patients may have worse health at the time of hospital admission and patient comorbidities are known risk factors for post discharge acute care use in patients hospitalized for COPD (Celli & Wedzicha, 2019). Patients who have lower income/education/literacy or unstable housing may have a worse general health status and may present for their hospitalization with a greater severity of underlying illness, with worse baseline respiratory status and multimorbidity (Owens et al., 2022). These factors, which are characterized by patient-level or neighborhood-/community-level (as proxy for patient-level) variables, may contribute to worse health status at admission due to competing priorities (restrictions based on job, lack of childcare, etc.), lack of access to care (geographic, cultural, or financial), or lack of health insurance. Given that these risk factors all lead to worse general health status, this causal pathway should be largely accounted for by current clinical risk adjustment. We note that patient comorbidities and economic disadvantage variables overlap in their contribution to a higher risk of the outcome, as shown by our empirical evidence (see Section 5.3) demonstrating the attenuating impact of model variables on the odds ratios for admissions with the dual eligibility (DE) variable.
- **Differential care:** A second pathway by which economic disadvantage may contribute to post discharge acute care risk is that patients may not receive equivalent care within a facility (Lloren et al., 2019). For example, it is known that the implementation of evidence-based inpatient and transitional care for COPD varies across hospitals (Rojas et al., 2023), and it has been shown that for other conditions (acute myocardial infarction, pneumonia, and heart failures), that across almost all hospitals (>98% of hospitals with sufficient data for assessment), dually eligible patients have higher rates of post discharge hospital based care (readmission) when compared with patients who are not dually eligible patients in the same hospital (within hospital disparities), after accounting for comorbidities, and area level variables (Silvestri et al., 2022). It is known that individuals with economic disadvantage and chronic conditions including COPD have both lower rates of post-discharge follow up, and higher unadjusted readmission rates (Anderson et al., 2022).
- **Low-quality hospitals:** Economically disadvantaged patients may receive care at lower quality hospitals. Patients of lower income, lower education, or unstable housing may not have the same access to high quality facilities, in part, because such facilities may be less likely to be found in geographic areas with large populations of patients with these factors (Fahrenbach et. al., 2020). Thus, patients with low income may be more likely to be treated in lower quality hospitals, which can contribute to an increased risk of readmission. In addition, or alternatively, low quality hospitals may not implement

evidence-based interventions to reduce the risk of readmission, such as post-discharge follow-up; economically disadvantaged patients are known to have lower rates of follow-up after discharge and higher rates of post-discharge acute care (Anderson et al., 2022).

- **Residual risk:** Economically disadvantaged patients may experience worse health outcomes only partially under the control of the healthcare system. Some economic factors, such as income or wealth, may affect the likelihood of readmission without directly affecting health status at admission or the quality of care received during the hospital stay. For instance, while a hospital may make appropriate care decisions and provide tailored care and education, a lower-income patient may still have a worse outcome post-discharge due to competing economic priorities or a lack of access to care outside of the hospital (Chatterjee et al., 2022).

These proposed pathways overlap and are complex to distinguish analytically. They also have different implications on the decision to risk adjust, or not, depending on the degree to which hospitals can mitigate the increased risk. Furthermore, the ongoing consolidation of the healthcare market puts more control, resources, and accountability on hospitals (that are now increasingly part of large multi-hospital systems) to invest in mitigating these risks (Levinson et al., 2024). However, in some markets, hospital systems choose to close facilities or limit access to care, based on financial decisions, rather than assessments of resource needs (Levins, 2023), including assessment of, and investment in programs that mitigate such needs.

Economic Variables Used in Testing

Based on the available literature and given the limited availability of valid and reliable variables that can be tested in claims data, we selected dual eligibility as a variable for testing.

Dual eligibility for Medicare and Medicaid is available at the patient level in the Medicare Master Beneficiary Summary File. The eligibility threshold for aged 65 or older Medicare patients considers both income and assets. There is also a body of literature demonstrating differential health care and health outcomes among dually eligible beneficiaries (ASPE, 2020).

Please see Section 5.4.2 for the details of the testing approach, results, and interpretation.

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