ABSTRACT

Title of Dissertation:	CORPORATE MORAL HAZARD IN U.S. HEALTH INSURANCE: CHURN AND DENIAL RATES
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Abstract

BACKGROUND: Health insurance churn is common in the U.S. People move in and out of coverage as jobs, incomes, and eligibility change. I treat churn as a feature of, not an exception in, a multi-payer system. These transitions disrupt access, cause incentive misalignment, and may shift costs between payers. I test whether commercial payers, anticipating disenrollment, tighten adjudication in ways consistent with what I define in this context as corporate moral hazard. If so, denial rates should rise just before the switch to Medicare.

QUESTIONS: I attempt to determine whether claim denial rates increase around the Medicare eligibility cliff in a manner consistent with corporate moral hazard by commercial insurers.

1) Around the predictable transition from commercial coverage to Medicare at age 65, do commercial insurers exhibit higher claim denial rates in the years preceding eligibility?

2) If commercial denial rates rise before age 65, are payer strategies a potential driver for this change?

METHODS: I develop a conceptual framework that redefines moral hazard in the context of US health insurance as cost containment strategies employed by commercial payers. I start by mapping fiscal flows. Who pays whom, for what, and on what risk terms? From this, I develop a taxonomy of health insurance products based on fiscal model (e.g., fee-for-service, capitation, shadow contracts). The taxonomy helps me illustrate that many kinds of coverage transitions occur, and that incentives differ by financial archetype. I then focus on the most predictable transition, which is commercial coverage to Medicare at age 65. I utilize the New Hampshire All-Payer Claims Database (2018–2023) to examine denial patterns surrounding this transition. I standardize my data-parsing framework as reproducible code, the Delayed Services Algorithm (DSA), which constitutes the study's core methodological contribution. Since data cost and access constraints limited my work to a single state, the DSA is a transferable methodological resource for researchers exploring similar behaviors in other contexts. I also identify services that are more frequently denied and categorize them into meaningful groups using the New York State 3M Ambulatory Patient Group (APG) system. I conduct interviews with clinicians, medical billing experts, vendors, and payer staff to explain the quantitative trends and identify cost containment mechanisms used by commercial payers and how they may present around insurance transitions.

FINDINGS: After controlling for patient and clinician fixed effects, there were statistically significant increases in denial rates, with rates rising by 2.1 % points at age 60 and then decreasing by approximately 8.6 % points after the Medicare transition. The increase in denial rates was most prominent in categories such as laboratory-based testing, durable medical

equipment, musculoskeletal, and gastrointestinal procedures. Payer-side and non-payer-side respondents explained denial variation through different mechanisms. Payer leaders admitted to average enrollment spans impacting claim adjudication for high-cost claims.

CORPORATE MORAL HAZARD IN U.S. HEALTH INSURANCE: CHURN AND DENIAL RATES

by

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Preface

My work on health insurance churn stems from what I observe in data and in practice every day. When coverage lapses or changes, people lose access, bills get messy, and clinicians spend time chasing approvals. I wanted to understand those dynamics more clearly, especially how churn shapes payer behavior in a multi-payer health finance system. This dissertation brings together years of analysis and applied work. In the past decade, I have worn many hats. I have worked inside commercial insurance, as a federal consultant, and as a health policy academic. While my lens changed, the problem of insurance instability was consistent. For my dissertation, I chose to investigate insurance churn and its impact on access, denial rates, and payer decision-making. I map fiscal flows, develop a taxonomy of insurance products by financial archetype, and then examine the most predictable transition in the U.S. system: the shift from commercial coverage to Medicare at age 65.

I am grateful to my advisor, Rob, and my examining committee for their steady guidance and feedback. I also thank my current and former colleagues at Harvard University, Mathematica, Blue Cross Blue Shield, and Kaiser Permanente for engaging in in-depth conversations about my research question. I intend for my research to help reduce insurance instability. I hope the findings from my work point towards policies that make coverage more stable, care more continuous, and administration one day less burdensome.

Dedication

This dissertation is lovingly dedicated to my daughters, Emaan and Amaal. Your curiosity, persistence, and stubbornness are inspirational and helped me reach the finish line.

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List of Abbreviations

Abbreviation	Full Form
ACA	Affordable Care Act
ACO	Accountable Care Organization
AHRQ	Agency for Healthcare Research and Quality
APG	Ambulatory Patient Groups
BPCI-A	Bundled Payments for Care Improvement – Advanced
CAA	Consolidated Appropriations Act (2023)
CHIP	Children's Health Insurance Program
CI	Confidence Interval
CJR	Comprehensive Care for Joint Replacement
CMS	Centers for Medicare & Medicaid Services
COBRA	Consolidated Omnibus Budget Reconciliation Act
CPT	Current Procedural Terminology
DSA	Delayed Services Algorithm
EHR	Electronic Health Record
EPO	Exclusive Provider Organization
FEHB	Federal Employees Health Benefits
FFCRA	Families First Coronavirus Response Act
FFS	Fee-for-Service
HCPCS	Healthcare Common Procedure Coding System
HDHP	High-Deductible Health Plan
HL7 FHIR	Health Level Seven – Fast Healthcare Interoperability Resources
HMO	Health Maintenance Organization
IND	Indemnity Insurance
IRB	Institutional Review Board
LPM	Linear Probability Model
MA	Medicare Advantage
MCO	Managed Care Organization
MEPS	Medical Expenditure Panel Survey
MIPS	Merit-based Incentive Payment System
MMP	Medicare-Medicaid Plan
MR	Medicare Reference (Category in Regression)
MSSP	Medicare Shared Savings Program
NCQA	National Committee for Quality Assurance
NH APCD	New Hampshire All-Payer Claims Database
NPI	National Provider Identifier
P2P	Peer-to-Peer
PA	Prior Authorization

PBM	Pharmacy Benefit Manager
PMPM	Per-Member-Per-Month
POS	Point of Service
PPO	Preferred Provider Organization
QHP	Qualified Health Plan
ROI	Return on Investment
SEP	Special Enrollment Period
SNP	Special Needs Plan
TAF	Transformed Medicaid Statistical Information System Analytic Files
TRICARE	TRICARE Health Program
VA	Veterans Affairs
VAP	Veterans Affairs Program

1. INTRODUCTION

The right to healthcare is recognized as a fundamental human right under the 1966 International Covenant on Economic, Social, and Cultural Rights. Central to this right is the entitlement to access care.[1] However, universal access to healthcare remains an unfulfilled goal.[2] While emerging economies confront unique challenges in improving care delivery, the United States, despite its status as a high-resource nation, faces significant struggles in ensuring access for its residents. A critical barrier within the U.S. healthcare system is the escalating cost of care, which far surpasses that of other advanced economies. Although there is ongoing debate about the primary drivers of these costs, it is clear that affordability is an issue.[3]

Given the close relationship between access and affordability, it is essential to examine the U.S. healthcare financing system to understand how it supports the American population. The U.S. operates a multi-payer system that includes private insurers alongside various government programs.[4] Despite its complexity and design to meet diverse needs, significant gaps remain, leaving at least 25.3 million individuals uninsured in the US in 2023.[5] While the number of individuals without insurance appears to be declining over time, a significant fraction of the population with coverage remains underinsured. A 2022 study reported that 9% of Americans were uninsured and 43% were underinsured, based on a representative survey sample.[6] Without comprehensive universal safety nets, achieving full access to healthcare for all remains an elusive goal. For instance, the Families First Coronavirus Response Act expanded access to coverage through continuous enrollment during the public health emergency. Yet, it did not eliminate the number of uninsured individuals in the U.S.[7]

The multi-payer structure of the US health payer system mandates insurance churn. Health insurance churn is the phenomenon where individuals gain, lose, or switch health

insurance coverage.[8] Churn affects access and downstream utilization.[9] It can lead to delays in treatment, interruptions in ongoing care, and challenges in managing chronic conditions, impacting the overall patterns of healthcare utilization.[10–12] It also shifts payer incentives at the point of adjudication. When a transition is imminent (e.g., from commercial coverage to Medicare), the incumbent plan has a shorter time horizon and a stronger reason to control costs. Those incentives are evident where access is operationalized, specifically in prior authorization and claim adjudication. I hypothesize that the impact of churn should be observable as higher claim denial rates around predictable transitions, even before utilization changes. At the same time, denial rates can vary for reasons unrelated to churn. Important confounders include patient health and both clinician and patient characteristics. I treat claim denial rates as the primary, measurable proxy for access, adjusted for these confounders.

1.1 RESEARCH SCOPE

Health insurance coverage in the United States is not stable. People churn in and out of different product types. These transitions can interrupt care delivery and are a feature of a multi-payer system without universal safety nets. Churn can distort payer incentives, as they are likely to optimize costs and care for the anticipated enrollment duration, rather than the patient's lifetime. I start by defining corporate moral hazard as a direct consequence of this incentive misalignment. I begin by tracing how dollars and risk move. Who buys coverage, who holds financial risk, how intermediaries are paid, and where clinicians get compensated. From that map, I developed a classification of insurance products based on financing architecture, including claim-based payment, prospective or capitated arrangements, global budgets, performance add-ons, shadow price contracts, and carved-out services managed by separate entities. Grouping products by financial archetype clarifies incentives at handoff points.

Different archetypes encourage different behaviors, especially in utilization management, claim adjudication, and appeal processing. This helps identify where pressure to deny or delay payment is most likely to surface across common transitions.

Among these, I concentrate on the most scheduled handoff in American coverage, which is the move from commercial insurance to Medicare at age 65. Since the timing is predictable, the incumbent commercial plan faces a short time horizon for the member's costs. I define and test a form of corporate moral hazard specific to this setting, which occurs when a plan anticipates imminent liability transfer; it may then tighten authorization or post-service adjudication to protect its balance sheet. If that behavior exists, it should be visible where payer decisions are recorded, which is at the denial of claim lines for specific service types.

The core question is simple: Do claim denials increase in the years before the age-65 transition in a way consistent with strategic behavior by commercial insurers? To answer this question, I sought claims databases wherever I could find them, but was constrained by issues of availability and affordability. As of Dec 2024, 28 states in the US had some form of APCDs. Of these only 15 states provide public access, but costs and approval timelines vary greatly across states.[13] Despite numerous access barriers, one small state offered to the public at no cost a valuable resource: the New Hampshire All-Payer Claims Database (APCD). I use the New Hampshire APCD for the years 2018–2023. I construct a pre-eligibility window before the Medicare threshold and examine claim line-level denial patterns before and after age 65. Denials serve as my observable indicator of possible payer gatekeeping. They occur upstream of many utilization changes and are consistently recorded across payers, making them a practical proxy for access decisions. I adjust for patient health and demographics, as well as clinician-level fixed effects, to isolate the impact of payers on denial rates for specific procedure types by different

product lines. I pair quantitative results with qualitative evidence. I conduct semi-structured interviews with clinicians, revenue-cycle leaders, and personnel involved in utilization management. These conversations help interpret patterns, reveal policy and vendor changes that might affect guidelines, and how medical necessity criteria are operationalized in day-to-day adjudication.

1.2 RESEARCH QUESTION

Since denial behavior varies by transition and is hard to assess comprehensively, I focus this dissertation on one well-timed shift and pose the following questions.

Question 1: Around the predictable transition from commercial coverage to Medicare at age 65, do commercial insurers exhibit higher claim denial rates in the years preceding eligibility?

Question 2: If commercial denial rates rise before age 65, are payer strategies a potential driver for this change?

1.3 LIMITATIONS

The scope has limits. I do not directly estimate health outcomes, and I focus on one transition type centered on age 65, so the findings may not generalize to all coverage changes. Claims data also capture post-service denials more fully than pre-service authorization decisions. My quantitative data is also limited geographically, focusing only on the state of New Hampshire. Despite these constraints, this work offers a finance-grounded framework and quantitative evidence linking predictable churn to measurable shifts in denial behavior.

2. LITERATURE REVIEW

2.1 BACKGROUND OF THE STUDY

Health insurance in the United States is fragmented, yet it plays a crucial role in the country's healthcare delivery and access.[4] Unlike many other developed nations, the U.S. does not have a universal healthcare system.[14] Instead, health insurance is a mix of private and public programs, each with its own set of rules, eligibility requirements, and coverage options. The fragmented nature of this system results in significant disparities in access to care, coverage, and costs.[15] Insurance churn, a beneficiary's transition from one payer to another, is a natural consequence of the multiplicity of payments in a system that allows, and even encourages, competition in healthcare finance, with such competition played out against a backdrop of publicly funded healthcare entitlements and safety-net programs. [8,16] It is essential to study health insurance churn in the context of healthcare access because it can impact continuity of care, quality of care, as well as health disparities, which disproportionately affect vulnerable populations, including low-income individuals, minorities, and those with unstable employment.[17] Insights from churn studies can inform policies aimed at reducing churn, such as improving enrollment processes, extending grace periods for coverage lapses, or creating more stable insurance options. Understanding the impact of churn on healthcare access and utilization provides policymakers with evidence to design interventions that enhance the stability of coverage, ultimately improving public health.[18]

2.2 PURPOSE OF THE LITERATURE REVIEW

I use the literature review to do two things. First, I review the literature about health insurance churn in the United States and its impact on care delivery and administrative burden. I focus on evidence linking coverage instability to access problems and changes in utilization. Next, I look for work that connects churn-induced changes in access and utilization to payer incentives in the U.S., in particular, whether misaligned financial incentives could encourage tighter authorization or denial behavior as members approach a coverage change. I scan for studies that address corporate moral hazard, vendor-driven utilization management, and how fiscal models influence adjudication decisions.

2.3 HEALTH INSURANCE CHURN IN THE UNITED STATES

Historically, insurance churn has been linked to adverse health outcomes. For instance, studies have shown that disruptions in insurance coverage can lead to increased emergency department visits, lower medication adherence, and poorer self-reported health status among patients.[19–24] Specifically, among low-income populations, the Affordable Care Act's (ACA) implementation has resulted in a notable reduction in uninsurance rates on the one hand. Still, it has also led to significant churn on the other hand. Estimates suggest that over 35% of adults with incomes below 200% of the federal poverty level experience shifts in eligibility between Medicaid and marketplace insurance within six months.[25,26] This instability can complicate access to necessary healthcare services, particularly for vulnerable groups such as women during the perinatal period, who experience high rates of coverage transitions.[27] The impact of churn is particularly evident in specific populations, such as cancer patients and low-income women. Research indicates that full implementation of the ACA was associated with a reduction in uninsurance among nonelderly cancer patients. Yet, many still faced significant churn, which

complicated their access to continuous care.[28] Similarly, Medicaid expansion has been shown to improve insurance continuity for low-income women, yet the complexities of transitioning between Medicaid and private insurance can still disrupt care.[19,29] These findings underscore the need for policies that promote stability in insurance coverage, such as guaranteed eligibility periods and better integration between Medicaid and marketplace plans.[10,30]

Moreover, the historical context of health insurance in the U.S. reveals that economic factors, such as unemployment and changes in family income, play a crucial role in exacerbating churn. Economic downturns often lead to increased rates of uninsurance and transitions between coverage types, as individuals lose jobs and, consequently, employer-sponsored group insurance.[24,31] The interplay between economic conditions and health insurance stability highlights the importance of addressing both healthcare policy and financial support systems to mitigate the adverse effects of churn.

In more recent times, the COVID-19 pandemic has had a profound impact on health insurance churn in the United States, influencing both enrollment patterns and the stability of coverage among various populations. The pandemic led to significant fluctuations in health insurance status, primarily driven by economic disruptions and changes in public health policy. One of the most notable trends during the pandemic was an increase in Medicaid enrollment.

Approximately 5 million additional individuals were enrolled in Medicaid by September 2020, a trend observed across both expansion and non-expansion states.[32] This surge in enrollment can be attributed to the economic fallout from the pandemic, which pushed many individuals into lower income brackets, thereby increasing their eligibility for Medicaid. Furthermore, the early phase of the pandemic saw a decrease in Medicaid disenrollment, which contributed to a higher-than-expected retention rate among beneficiaries.[33] Families First

Coronavirus Response Act (FFCRA) incentivized State Medicaid programs to keep beneficiaries continuously enrolled in exchange for increased federal funding.[34] Many states adopted continuous eligibility requirements for Medicaid, which helped stabilize coverage for vulnerable populations.[35] These policies, along with the expansion of Medicaid, played a crucial role in improving access to health insurance during the pandemic, particularly for marginalized groups.[36] However, under the Consolidated Appropriations Act of 2023, the federal government removed the continuous enrollment requirement for Medicaid, allowing states to begin disenrolling individuals who no longer met eligibility criteria starting April 1, 2023.[34] As a result, a significant number of people were expected to lose their Medicaid coverage, potentially facing gaps in insurance if they were unable to secure a job or afford a healthcare plan through the marketplace.

2.4 DEMOGRAPHIC AND SOCIOECONOMIC VARIATION

Demographic variables such as race, ethnicity, and age significantly impact health insurance churn rates in the U.S.[37] Racial and ethnic minorities, particularly Black and Hispanic populations, experience higher rates of churn compared to their White counterparts. This disparity is closely tied to income inequality, job market segregation, and structural barriers to healthcare access.[38] For example, Hispanic individuals are more likely to be employed in industries that do not offer health insurance benefits, such as agriculture, construction, and the service sector. Additionally, language barriers and immigration status can further complicate access to insurance coverage, leading to higher rates of churn within this demographic.[39] Similarly, Black individuals face higher rates of job insecurity. They are more likely to rely on

Medicaid for health coverage, making them more susceptible to losing coverage when eligibility criteria change.[40]

Age is another critical factor in health insurance churn. Young adults, particularly those transitioning out of their parents' insurance or who are in low-wage jobs without benefits, are highly susceptible to churn.[41] Individuals in their twenties are more likely to have unstable employment. They are less likely to have accumulated enough financial resources to afford consistent coverage, leading to frequent lapses in insurance.[42] In contrast, older adults, especially those nearing eligibility for Medicare, tend to experience more stable coverage.[43]

Geographic factors also influence churn, with individuals in rural areas experiencing higher rates of churn compared to those in urban areas. Rural populations often have limited access to both employer-sponsored insurance and healthcare services, which increases the likelihood of frequent insurance changes and periods of uninsurance.[44] Additionally, state-level variations in Medicaid expansion have led to significant geographic disparities in churn, with states that did not expand Medicaid seeing higher rates of churn among low-income populations.[10,45]

Socioeconomic factors also play a key role in determining an individual's likelihood of experiencing health insurance churn.[17] Lower-income individuals are particularly vulnerable to churn, primarily because their insurance status is often tied to employment or fluctuating eligibility for public programs, such as Medicaid. When individuals switch jobs, they may lose employer-sponsored insurance or transition in and out of Medicaid eligibility. This group is often forced to navigate between different insurance plans or periods of no coverage, contributing to high rates of churn.[25]

Income volatility is a primary driver of this phenomenon. Many low-income workers, particularly those in part-time, seasonal, or gig employment, experience fluctuating earnings, which impacts their ability to maintain consistent health insurance coverage.[46] For instance, small increases in income may disqualify them from Medicaid, but their earnings may still be too low to afford marketplace plans or employer-based coverage. This results in frequent cycling between Medicaid, marketplace plans, and uninsured status, exacerbating health inequities and increasing the likelihood of care gaps.[25]

Educational attainment is another crucial socioeconomic factor in health insurance churn.[28,47] Individuals with lower levels of education are less likely to have stable, high-paying jobs that offer employer-sponsored insurance. These individuals are also less likely to have the resources or knowledge to navigate the complex health insurance market, making them more susceptible to losing coverage during transitions or life events. On the other hand, individuals with higher education levels typically have stable employment and access to better benefits, resulting in lower rates of insurance churn.[48]

2.5 IMPACT ON HEALTHCARE ACCESS AND UTILIZATION

2.5.1 ACCESS TO PRIMARY CARE AND SPECIALISTS

Insurance churn impacts access to both primary and specialty care in the US. Research indicates that individuals experiencing churn are more likely to face barriers in establishing a regular source of care, which is crucial for managing chronic conditions and receiving preventive services.[10] Furthermore, the impact of churn on primary care access is exacerbated by the overall shortage of primary care physicians in certain regions.[49] Quality of care is also impacted by

health insurance churn. Insurance-related disparities exist in the quality of primary care, and individuals who frequently change insurance plans tend to receive lower-quality care.[50]

One of the bigger challenges associated with insurance churn is the limited availability of specialty clinicians willing to accept certain types of insurance, particularly Medicaid. Research indicates that specialists often exhibit reluctance to accept public insurance due to lower reimbursement rates, which exacerbates access issues for patients with Medicaid or other public insurance plans.[45,51] This reluctance can lead to significant disparities in access to specialty care, particularly for children and low-income families.[52,53] For instance, a study found that children with public insurance faced substantial barriers in accessing outpatient specialty care, primarily due to specialists' hesitance to accept public health insurance[54]. Moreover, the geographic distribution of specialty care physicians further complicates access for individuals experiencing insurance churn. Areas with fewer specialty clinicians or those located far from urban centers often see reduced access to necessary care, particularly for patients who may be unable to travel long distances due to financial or health constraints. [54] This is particularly concerning for populations with chronic conditions that require ongoing specialty care, as gaps in insurance coverage can lead to delays in treatment and poorer health outcomes.[55] The impact of insurance churn on access to specialty care is also reflected in the experiences of young adults and those with chronic illnesses. Young adults who frequently transition between different insurance plans often report difficulties maintaining continuity of care with specialists.[56] This lack of continuity can hinder effective management of chronic conditions, as patients may struggle to establish long-term relationships with clinicians who understand their medical history. Also, individuals with unstable insurance coverage are more likely to delay

seeking specialty care, leading to exacerbated health issues and increased reliance on emergency services.[10]

2.5.2 IMPACT ON HEALTH OUTCOMES

Insurance churn not only impacts access but also can affect healthcare outcomes. Research has shown that individuals with unstable insurance coverage often experience delays in receiving necessary medical care, which can worsen health conditions. For instance, a study found that patients with intermittent or discontinuous insurance coverage reported more problems with accessing care and higher costs, suggesting that even temporary gaps in coverage can have adverse effects on health outcomes.[55] This disruption can be particularly detrimental for individuals with chronic conditions, who require consistent management and follow-up care.[57]

Health insurance churn has also been linked to disparities in health outcomes based on the type of insurance. For example, patients with Medicaid often face longer wait times for treatment and poorer health outcomes compared to those with private insurance. A study found that patients with Medicaid insurance had longer delays in receiving radiation therapy for head and neck cancers, which negatively impacted their treatment outcomes. [58] Similarly, individuals with unstable insurance coverage may be less likely to receive timely interventions for acute conditions, leading to higher rates of complications and hospitalizations.[59]

When patients frequently change their insurance coverage, they may also change their physicians, resulting in fragmented care. This fragmentation can hinder the effectiveness of interventions designed to improve continuity of care, as clinicians may struggle to establish lasting relationships with patients who are constantly in a state of transition.[23,60,61] Furthermore, the ability of healthcare systems to invest in population health initiatives may be compromised

by these dynamics, as the return on investment is diminished when patient-physician relationships are not stable.[60]

2.5.3 DIRECT AND INDIRECT COSTS

Direct costs associated with switching health care coverage primarily include administrative expenses, out-of-pocket costs, and potential loss of benefits. When individuals change their insurance plans, they often encounter administrative hurdles, including enrollment fees, costs associated with obtaining new insurance cards, and the time spent navigating the new system. Consumers in the U.S. Health Insurance Marketplace often face challenges due to the varying features of plans, which can lead to confusion and additional costs in understanding new benefits and coverage options.[62] Moreover, switching plans may result in increased out-of-pocket expenses. Changes in insurance networks can compel patients to switch clinicians, resulting in additional costs in terms of time and effort, as well as potentially higher copayments or deductibles associated with new plans.[60] This disruption can be particularly costly for individuals with ongoing medical needs who may require continuity of care with their established clinicians.

Indirect costs can be more challenging to quantify, but are also significant. These costs often manifest as disruptions in care continuity, which can lead to adverse health outcomes. Gaps in insurance coverage can result in delays in receiving necessary medical care, ultimately exacerbating health issues and increasing long-term healthcare costs.[63] The loss of continuity can also lead to increased emergency department visits, as individuals may forgo regular check-ups and preventive care due to uncertainty about their new coverage.[60] Additionally, the psychological burden of switching insurance can affect individuals' health behaviors. Changes in coverage can lead to anxiety and stress, which may deter individuals from seeking care

altogether.[64] This phenomenon is particularly pronounced among vulnerable populations who may already face barriers to accessing healthcare. For example, children from low-income families are often more likely to experience gaps in coverage, which can lead to significant health disparities.[65]

2.5.4 IMPACT ON SUB-POPULATIONS

Health insurance switching in the U.S. significantly affects both medication adherence and continuity of care, posing challenges for patients with chronic conditions. One major issue is the presence of coverage gaps that occur during insurance transitions, which can delay access to essential medications. These delays often result in patients skipping doses or stopping treatments entirely, a particularly concerning problem for individuals with conditions such as diabetes or hypertension.[66,67] Additionally, changes in formularies between plans can force patients to switch medications or face increased out-of-pocket costs. Such disruptions in treatment regimens can severely impact adherence, with some patients abandoning their medications altogether due to cost barriers or a lack of coverage.[68]

Administrative delays, such as the need for new referrals or prior authorizations, further exacerbate the situation by interrupting ongoing treatments. These delays, in turn, can lead to missed preventive screenings, delayed diagnoses, and worsening health outcomes over time, especially for chronic conditions where continuity in treatment is crucial.[69] Vulnerable populations, particularly those on Medicaid, are disproportionately affected by these issues. Medicaid churn creates severe disruptions in both medication adherence and continuity of care.[18] These populations often face additional barriers in navigating the complexities of insurance switching, further exacerbating health disparities. Behavioral health patients, especially those

receiving mental health or substance abuse treatment, are also at significant risk. Interruptions in therapy, medication management, or support services can lead to relapses or worsening symptoms, undermining the effectiveness of their care.[70]

2.6 UNDERSTANDING PAYER INCENTIVES AND GAPS IN LITERATURE

Health insurance in the United States is highly fragmented. There are about 318,000 different health plans, and hundreds of thousands of billing and diagnosis codes for services. Each plan can set its own benefits, paperwork requirements, and payment rules. As a result, the same medical visit can be billed in multiple ways, and the steps to obtain payment can vary significantly.[71] Each claim can involve up to 14 different steps to be processed, and insurers may administer these steps internally or outsource them to specialized revenue-cycle management firms. There are no required data standards for these transactions, leading to frequent manual processes or reliance on PDF documents for questions or disputes.[71,72] This complexity provides insurers with numerous opportunities to slow things down. They can request additional documents, question whether a service was medically necessary, or deny a claim because a code was missing or a form was completed incorrectly. Even when a claim is valid, slight differences in rules can lead to delays, appeals, and resubmissions. Patients, clinicians, and billing staff spend a significant amount of time on the phone or in portals attempting to resolve these issues. All of this administrative churn is expensive. The United States spends between $265 billion and $1 trillion annually on healthcare administration, which is significantly more than other high-income countries.[71,73] More than 25% of this cost is associated with billing and insurance.[74] A system with too many plans and rules invites denials and delays, and those frictions drive enormous waste. People end up paying the price.

In the literature, I see two clear threads. First, churn hurts patients. It disrupts access, lowers use, and worsens outcomes. Second, payers add administrative hurdles. They slow claims with prior authorizations, extra paperwork, and delays. I also see a gap. The literature recognizes that churn is detrimental and also demonstrates that payers employ delay tactics; however, there is no evidence to suggest a direct connection between these two behaviors. There is no study linking payers' anticipation of churn, which is built into a multi-payer system, to delays and denials in claim adjudication. This gap drives my next steps: I classify payers by financial archetype and test whether denials and delays rise when member tenure is expected to be short. Next, I test for changes in denial patterns around the commercial-to-Medicare transition and subsequently attempt to identify the drivers of these changes.

3.0 CONCEPTUAL FRAMEWORK

I frame payer behavior through incentives, not product labels. The conceptual move is to follow the money and the risk. Who funds coverage, who holds downside risk, how intermediaries are compensated, and where are utilization controls established? Grouping plans into financial archetypes clarifies the levers available to payers and how a member's time horizon with the plan shapes those levers. Churn shortens that horizon, creating conditions in which corporate moral hazard can emerge. If incentives tighten as disenrollment approaches, gatekeeping should intensify and manifest as claim-line denials, particularly for discretionary, high-cost, or deferred services.

3.1 FROM INDIVIDUAL TO CORPORATE MORAL HAZARD

The concept of moral hazard originates in the field of insurance, dating back to the late 17th and early 18th centuries in England, where it was first applied in the context of marine and

fire insurance. The term itself is believed to have been popularized in the mid-19th century by economists and insurance underwriters. However, early uses can be traced back to insurance contracts that warned policyholders of the dangers that arose when they altered their behavior after securing coverage. By the late 1800s, moral hazard had entered mainstream economic discussions, particularly through the work of insurance theorists and actuarial societies, as a way to describe situations in which individuals insulated from risk behave differently than they would if fully exposed to that risk. [75]

In the 20th century, moral hazard emerged as a core concept in information economics, formalized by scholars such as Kenneth Arrow in his 1963 work on uncertainty and medical care, and Mark Pauly in 1968, in the context of health insurance. Arrow framed moral hazard as arising when an individual's behavior changes because they do not bear the full consequences of their actions. At the same time, Pauly emphasized the welfare and efficiency implications of insurance-induced overutilization.[76,77]

In its classical formulation, moral hazard describes how individuals, once shielded from the full consequences of risk through insurance, may alter their behavior, often by increasing utilization of covered services, because the financial burden has shifted to the insurer. This framing focuses on the insured as the source of inefficiency. Yet the principle of *uberrima fides*, "utmost faith," establishes that the duty to act honestly and fairly extends equally to the insurer, particularly in claims adjudication.[78] When insurers themselves depart from this duty, exploiting asymmetries of information, regulatory gaps, and contractual opacity to reduce payouts, the same logic of incentive distortion applies, but in reverse. I extend the concept of moral hazard to what I term "corporate moral hazard", which refers to the tendency of health insurance payers to strategically manipulate coverage determinations, claims processes, and

payment rules in ways that maximize their own financial gain while undermining the value of the coverage they offer. Just as individual moral hazard emerges from insulation from cost, corporate moral hazard arises from insulation from competitive and regulatory accountability reinforced by complex contract structures, opaque utilization review criteria, and market frictions such as limited switching opportunities outside of open enrollment periods or special enrollment periods.

3.2 CORPORATE MORAL HAZARD AND INCENTIVE STRUCTURES IN U.S. HEALTH INSURANCE

The architecture of the U.S. health insurance market compounds these issues through complexity and opacity. Plan designs vary widely, benefit language can be ambiguous, and proprietary criteria for coverage determinations are often hard to access. Patients, clinicians, and even regulators may not understand the underlying rules that drive claim approvals or denials. This asymmetry of information erodes the disciplining effect of market competition, as consumers cannot easily compare the real value of coverage across plans. Furthermore, the health insurance market is structurally inelastic in the short term due to enrollment restrictions, including annual open enrollment periods, special enrollment eligibility requirements, and lock-in rules for specific public programs.[79] These features create a lag in market response; even if a payer systematically underperforms in claims payment fairness, consumers may be unable to switch until the next enrollment window, which is often months away. This inertia shields payers from immediate competitive pressure, allowing suboptimal or exploitative practices to persist. The combination of contractual opacity, weak regulatory enforcement, and market frictions ensures that corporate moral hazard in payer behavior is not only possible but economically rational from the insurer's perspective.

The fiscal flow structures embedded in U.S. health insurance payment models determine

not only how funds move between payers and clinicians, but also where corporate moral hazard is most likely to emerge. Each payment archetype creates distinct points of leverage where payers can intervene in claim adjudication, benefit interpretation, or rate-setting to optimize their financial position. By examining corporate moral hazard through the lens of fiscal flows, I aim to highlight that these potential behaviors are not random deviations from contractual obligations, but rather possible and predictable responses to the incentive structures created by payment models. In the U.S. market, the combination of opaque claims adjudication standards, limited consumer ability to switch plans outside of open enrollment, and the technical complexity of payment arrangements suggests that corporate moral hazard may be deeply embedded in the system's financial architecture. This integration of moral hazard theory with fiscal flow analysis provides a framework for identifying where and how payer-driven incentive distortions arise, as well as for evaluating their potential impact on patient access, clinician reimbursement, and overall health system efficiency.

3.3 MAPPING U.S. INSURANCE PRODUCTS TO CORE FISCAL FLOW MODELS

The U.S. health payer landscape encompasses a wide array of insurance products, yet most can be traced back to a limited set of underlying payment models. These core models include fee-for-service, full and partial capitation, bundled payments, performance-based incentives, global budgets, plan carveouts, and shadow price contracts. These models form the financial backbone of the system. Examining the fiscal flows within each model reveals their embedded incentive structures and highlights where different payers may potentially exploit opportunities for moral hazard.

3.3.1 FEE-FOR-SERVICE (FFS)

In a fee-for-service (FFS) model, payers, whether commercial insurers or public programs, reimburse clinicians retrospectively for each service performed. Traditionally, these models are assumed to transfer utilization risks to the payer, with moral hazard arising from overutilization led by clinicians. The argument is that FFS models can contribute to rising healthcare costs without necessarily improving the quality of care.[80,81] However, often less discussed is the fact that FFS models also grant the payer broad discretion over claim adjudication. From a fiscal flow standpoint, payer-side moral hazard can manifest as insurers strategically withholding or reducing payments through restrictive interpretations of medical necessity. The absence of standardized clinical guidelines across payers, coupled with the discretion to apply proprietary utilization review criteria, enables payers to optimize financial performance by limiting or reducing reimbursement to clinicians. This lack of transparency in claim adjudication processes allows payers to exert control over fiscal flows, influencing not only clinician payment but also the nature and timeliness of care delivery.[71,82]

FFS components embedded within hybrid arrangements can be found across a wide range of U.S. insurance products. These include traditional Medicare Parts A and B, commercial Preferred Provider Organizations (PPOs), Exclusive Provider Organizations (EPOs), Point of Service (POS) plans, High-Deductible Health Plans (HDHPs), and catastrophic health insurance products. Specific public programs, such as TRICARE Select, the Veterans Health Administration (VA) Health Care system, the Indian Health Service (IHS), and some Medicaid fee-for-service arrangements, also operate fully or partially under this model.[83] Additionally, FFS pricing mechanisms are often embedded in COBRA continuation coverage, the Federal Employees Health Benefits (FEHB) Program, and Qualified Health Plans (QHPs) sold on the

individual marketplace. While these products differ in scope, regulation, and patient cost-sharing, the shared fiscal flow logic of FFS exposes them to similar payer-side moral hazard dynamics.

3.3.2 FULL CAPITATION

Full capitation is a payment model in which the payer provides a fixed per-member-per-month (PMPM) payment intended to cover the full scope of agreed-upon services for a defined population, regardless of the actual care delivered. Under this arrangement, the fiscal flow is entirely prospective, with utilization risk shifted almost wholly to the clinician or the risk-bearing entity, such as a managed care organization.[84] The payer's role in claim-level adjudication is minimized for in-scope services, but the payer retains control through rate-setting, contract terms, and oversight mechanisms. From a payer-side moral hazard perspective, the central lever is in the rate and risk adjustment strategy.[85] Payers can deliberately set capitation rates below actuarially sound levels or use risk adjustment methodologies that understate the expected cost of the population, creating an implicit pressure on clinicians to absorb unreimbursed expenses. Payers can also use narrow interpretations of coverage requirements to exclude high-cost services from the capitated scope, effectively retaining control over certain expenditures and reducing estimated PMPM. Additionally, payers may withhold portions of the capitation payment as performance reserves tied to quality measures.

Another form of payer-side moral hazard arises when the payer strategically selects populations for full capitation who are expected to have lower-than-average costs, while keeping higher-risk groups in arrangements that preserve payer control over utilization. In some cases, the payer may also rely on delayed payments or administrative complexity, such as requiring extensive documentation for certain services, even under a global budget, to suppress clinician

cash flow and limit expenditure. Although full capitation is positioned as a predictable and stable funding mechanism, the payer's control over rate-setting and contract design ensures that it remains a tool for cost containment in ways that can constrain patient access.

Full capitation is a defining feature of many U.S. insurance products, particularly Medicaid Managed Care Organizations (MCOs), where states pay MCOs a fixed PMPM to cover nearly all benefits for enrollees. It is also prevalent in Medicare Advantage (Part C) plans, where CMS pays private insurers on a capitated basis to cover all Medicare-covered services for enrollees, as well as in Special Needs Plans (SNPs), which are specifically designed for specific populations. Some Health Maintenance Organizations (HMOs), especially staff-model HMOs like Kaiser Permanente, operate almost entirely under full capitation for both primary and specialty care. Integrated care programs for dual eligibles, such as Medicare-Medicaid Plans (MMPs), also rely on full capitation, as do specific arrangements within the Federal Employees Health Benefits (FEHB) Program and TRICARE Prime.

3.3.3 PARTIAL CAPITATION

Partial capitation blends a fixed prospective payment for a defined set of services with fee-for-service reimbursement for all other care. For example, a payer might pay a primary care group a per-member-per-month (PMPM) rate to cover all primary care services, while continuing to reimburse specialty or inpatient care on an FFS basis. From a fiscal flow perspective, this creates two distinct revenue streams, one fixed and one variable, each with its own set of levers for payer intervention.[86]

In theory, the capitated portion transfers some utilization risk to clinicians while allowing payers to stabilize spending in high-volume service categories. However, because the FFS component still flows through retrospective adjudication, payers retain substantial discretion

over whether and how claims are paid. This opens space for payer-side moral hazard through utilization management strategies for the non-capitated portion. Payers can also manipulate the capitated component by setting rates below actuarially sound levels, under-adjusting for patient risk, or redefining the service set included in the capitated scope, thereby effectively shifting more of the cost burden to clinicians without explicit rate changes.[86]

Another layer of payer moral hazard emerges in contract design. Payers can use asymmetric information about population risk to lock clinicians into partial capitation arrangements that appear balanced on paper but are unfavorable in practice. For example, a payer might selectively capitate low-cost services while retaining direct control over high-cost, high-margin services, thereby maintaining the ability to apply aggressive utilization review. This selective risk transfer can be framed as value-based care; however, the underlying fiscal flow still enables the payer to mitigate its own exposure while preserving avenues for cost containment through claim-level discretion.

Partial capitation models are embedded in a range of U.S. insurance products. They are common in Medicare Advantage primary care capitation arrangements, many Accountable Care Organizations (ACOs) participating in Medicare Shared Savings, Medicaid managed care programs with carved-out behavioral health or pharmacy benefits, and some commercial Point of Service (POS) or HMO products where only certain service categories are capitated. The Individual Health Insurance Marketplace includes Qualified Health Plans (QHPs) that contract with clinician groups under partial capitation for primary care or preventive services while reimbursing specialty and hospital care on an FFS basis. Employer-sponsored plans, both fully insured and self-funded, may also use partial capitation for selected services, as do some TRICARE Prime arrangements and Federal Employees Health Benefits (FEHB) Program

options. Across these products, the split-flow structure of partial capitation allows payers to retain discretion over a significant share of spending.

3.3.4 CARVE OUTS

Although full capitation is often described as a comprehensive risk transfer from payer to clinician, in practice, capitated arrangements frequently include carve-outs that exclude certain services from the capitated scope. A carve-out occurs when high-cost, unpredictable, or politically sensitive services, such as organ transplantation, specialty drugs, or behavioral health, are separated from the global payment and reimbursed under an alternative structure, typically fee-for-service (FFS) or through a specialized vendor. This practice reflects a strategic choice by payers to limit exposure to financial volatility, while still capturing the predictability and administrative efficiencies of capitation for routine services.[87]

From the payer perspective, carve-outs are risk management tools. Capitation payments are typically set based on actuarial projections of expected costs. Including rare, high-cost services can destabilize those projections, forcing payers to either raise premiums or accept greater uncertainty in their margins. By excluding such services, payers protect the predictability of their capitation payments and retain flexibility to contract separately with specialty vendors or reinsurers. Narrow interpretations of coverage requirements further allow payers to control which expenditures remain outside the capitated bundle, shaping the risk environment to their advantage.[88] From the perspective of vendors, specialty benefit managers, third-party administrators, or subcontracted utilization management firms, carve-outs represent both a business opportunity and a structural feature of how risk is distributed in U.S. health care financing. When a payer decides to exclude certain high-cost or complex services from a

capitated arrangement, it often contracts with a specialized vendor to administer those benefits. Examples include pharmacy benefit managers (PBMs) for high-cost specialty drugs, behavioral health management companies, or transplant centers of excellence. By managing prior authorization, appeals, and specialty networks, vendors effectively control access to high-cost care, shaping both patient experience and clinician behavior. For clinicians, this introduces another layer of administrative oversight, often perceived as burdensome. For payers, however, it represents an extension of control by proxy: even though the service is outside the capitated bundle, utilization is still monitored through the vendor's infrastructure.

3.3.5 GLOBAL BUDGETS

Global budgets are an alternative payment model in which hospitals or health systems receive a fixed annual budget to cover the cost of delivering care to a defined population. Unlike capitation, which allocates payment on a per-member basis, global budgets are set at the aggregate level, effectively capping total revenue regardless of patient volume. A central feature of global budgets is their emphasis on spending predictability. However, the model is not without challenges. Setting the budget requires careful calibration to strike a balance between financial stability and cost containment. If budgets are set too low, hospitals may struggle to maintain quality or access. If set too high, the system risks locking in excess spending. Additionally, global budgets may create incentives to shift care outside the budgeted setting. The best-known example in the United States is Maryland's all-payer hospital global budget program.[89]

3.3.6 PERFORMANCE-BASED ADD-ONS

Performance-based add-ons are payment enhancements layered on top of an underlying payment model, either fee-for-service (FFS), capitation, or a hybrid arrangement. The payer

awards additional payments, or withholds a portion of payment, based on the clinician's performance against specified metrics such as quality scores, patient satisfaction, utilization rates, or preventive care targets. In fiscal flow terms, this creates a conditional revenue stream controlled entirely by the payer, often calculated retrospectively after performance measurement.[90]

Because payers control both the performance benchmarks and the measurement methodologies, they have substantial discretion in determining whether clinicians receive these payments. Payers may set unrealistically high thresholds, manipulate benchmarks after the contract period begins, or use opaque attribution methods that disadvantage clinicians. In some cases, payers tie add-on eligibility to administratively burdensome reporting requirements, knowing that smaller or resource-limited clinicians/practices may fail to meet them. These strategies allow payers to advertise value-based care incentives while reducing actual payout exposure.

Performance-based add-ons are prevalent in both public and private markets. In Medicare, they are embedded in Medicare Advantage Star Ratings, the Merit-based Incentive Payment System (MIPS) in traditional Medicare, and quality bonus payments in some Medicare Shared Savings Program (MSSP) ACO tracks. Medicaid managed care contracts often include pay-for-performance pools tied to access and quality measures. Many commercial plans, including HMOs, PPOs, and POS products, use quality incentive programs with physician groups, accountable care arrangements, or hospital systems. Federal employee plans in the FEHB Program and certain TRICARE arrangements also integrate add-ons for preventive care, chronic disease control, and cost-efficiency metrics.

3.3.7 BUNDLED PAYMENTS

Bundled payments consolidate reimbursement for all services associated with a defined episode of care into a single fixed payment. The episode is triggered by a diagnosis, procedure, or care event and includes all relevant services for a set period post-event. Fiscal flows in bundled payments shift some utilization risk to clinicians for the services within the bundle, while payers retain the ability to define episode parameters, exclusions, and payment rates.[91]

Since payers control the definition of the bundle and the scope of included services, they can structure episodes in a way that minimizes their own payout risk. This may involve carving out expensive services, narrowing the episode window, or defining triggers in ways that reduce eligible cases. Payers can also exploit coding disputes to deny that a service belongs within a given episode, shifting costs back to the clinician. Adjusting bundle prices downward based on aggregate historical averages without adequate case-mix adjustment can also disadvantage clinicians who treat sicker or more complex patients. Even in voluntary programs, payers may selectively target bundles for high-cost conditions where they expect to gain financially through reduced payouts.

Bundled payments are most prominently used in Medicare through initiatives like the Bundled Payments for Care Improvement Advanced (BPCI-A) and the Comprehensive Care for Joint Replacement (CJR) model. Medicaid programs in some states utilize bundled payments for maternity care, orthopedic procedures, or the management of chronic conditions. In the commercial market, bundled payment contracts are increasingly used for high-volume, high-cost episodes such as cardiac surgery, oncology care, and joint replacements, often layered into PPO or EPO products. The Veterans Health Administration (VA) and Indian Health Service (IHS) have also piloted bundled payment approaches for select conditions.

3.3.8 SHADOW PRICE CONTRACTS

Shadow price contracts establish reimbursement rates by reference to an external benchmark, such as Medicare rates or a negotiated network fee schedule, while allowing the payer to apply internal claim edits, utilization reviews, and medical necessity determinations before releasing payment. While the "shadow price" appears to guarantee a rate, actual payment is contingent on payer-controlled adjudication processes. The fiscal flow remains per-service (like FFS), but the payer retains extensive discretion to alter, delay, or reduce payments on a claim-by-claim basis.[92]

Payers can use shadow price contracts to publicly signal alignment with transparent benchmarks while privately controlling costs through denial optimization. This may involve downcoding claims, applying restrictive clinical guidelines, or splitting claims into non-payable components. Out-of-network claims pegged to a percentage of Medicare rates can be reduced through proprietary repricing methodologies. The payer's discretion extends to redefining covered services under the benchmark, selectively targeting high-cost claims for review, or delaying payment as a cash-flow management tactic. This dynamic allows payers to appear compliant with fair pricing while exercising significant back-end control to suppress spending.[92]

Shadow price arrangements are standard in commercial PPO and EPO products, particularly for out-of-network reimbursement, which is often pegged to Medicare plus formulas. They are also used in High-Deductible Health Plans (HDHPs) and catastrophic plans for specialty care claims, as well as in specific employer-sponsored plans and COBRA coverage when the plan leases a national PPO network. Public payers may use shadow pricing in limited contexts, such as Medicaid out-of-network reimbursement or Medicare Advantage plans that reference Medicare fee schedules but apply their own medical necessity rules.

4.0 INTRODUCTION TO THE METHODS SECTION

I employed a mixed-methods approach to investigate how health insurance churn affects claim adjudication and payer behavior. The quantitative component draws on the New Hampshire All-Payer Claims Database (NH APCD), which provides detailed claim line-level data across commercial and public payers. These data enable the study of coverage transitions, specifically the transition from commercial coverage to Medicare Advantage, as well as patterns of denial before and after the transition, providing a comprehensive view of how churn unfolds in practice. The quantitative analysis is limited to the state of New Hampshire due to data availability, cost, and access issues. I tried to generate an algorithm to reproduce this analysis for other states and regions. To complement the quantitative findings, the qualitative component draws on semi-structured interviews with payers, regulators, and medical billing experts. These conversations aim to explain the mechanisms that could account for the variation in denial observed in the quantitative analysis. They provide insight into how payer incentives may misalign when they anticipate churn and how it may translate into corporate moral hazard. Taken together, the claims analysis and stakeholder interviews create a fuller picture than either approach could provide alone. The quantitative work grounds the study in measurable outcomes, while the qualitative narratives reveal the mechanisms and reasoning behind those outcomes. Integrating both these streams of evidence enables the connection of observed patterns in the data to the incentive structures that shape them, yielding a more comprehensive understanding of how churn influences payer behavior and, ultimately, patient care.

4.1 QUANTITATIVE SECONDARY RESEARCH

4.1.1 STUDY DESIGN AND DATA SOURCE

I conducted a retrospective, cross-sectional study using the New Hampshire All-Payer Claims Database (NH APCD), a comprehensive source of adjudicated medical claims submitted by both private and public payers across the state. The study sample included outpatient claims processed between 2018 and 2023. The database includes claim line-level information, including procedure codes, denial status, servicing clinicians and billing entities, beneficiary sex, age, county of residence, and associated diagnosis codes. Due to the encryption of member identifiers, I was unable to follow individuals over time and had to analyze the data as pooled cross-sections rather than a panel. The analytic sample comprised all beneficiaries aged 55 to 75 who had at least one submitted claim during the study period. I restricted the sample to individuals 55 to 64 with commercial health insurance and 65 to 75 with a Medicare Advantage plan. I did not impose any requirement for continuous enrollment.

4.1.2 STUDY CONTEXT: NEW HAMPSHIRE'S COMMERCIAL INSURANCE MARKET

The New Hampshire public-use APCD only includes claims from the fully insured commercial market. It does not include most claims from self-funded employers because they are not required to submit data to the APCD under the Employee Retirement Income Security Act of 1974 (ERISA), even though some choose to do so voluntarily.[93,94] As a result, my sample includes only fully insured beneficiaries. I intentionally focused on this group because self-funded plans operate under different financial incentives and may handle claims differently. Excluding them allowed me to study claim behavior within a more consistent segment of the commercial insurance market. Within the fully insured space, New Hampshire has a relatively

small commercial insurance market with only a few major carriers. The main insurers operating in the fully insured market include Aetna, Ambetter, Anthem Blue Cross Blue Shield, Cigna, Harvard Pilgrim, Tufts, and UnitedHealthcare.[95] Anthem, formerly known as Elevance Health, dominates the market and accounts for roughly 63% of the large group enrollment in the state.[96] The individual insurance market is even more lean. The main insurers offering marketplace plans in New Hampshire include Ambetter, Anthem, Harvard Pilgrim, and WellSense.[97] New Hampshire uses the Federally Facilitated Marketplace (FFM), which means individuals purchase health insurance through the federal HealthCare.gov platform rather than a state-run exchange.

On the Medicare Advantage side New Hampshire again has more consolidation, with WellSense, Humana, United and Aetna.[98,99] Meanwhile, Anthem and Martin's Point Health Care have announced their exit from the Medicare Advantage market in New Hampshire starting in 2026.[100,101] Although this shift falls outside the time period examined in this dissertation, it signals broader market fluidity and realignment of payer strategies in the state. Another peculiar characteristic is New Hampshire's reinsurance program under Section 1332 Waiver. In 2021, New Hampshire implemented a Section 1332 State Innovation Waiver, authorizing a reinsurance program to stabilize the individual market and reduce premiums.[102] Reinsurance allows insurers to transfer a portion of high-cost claim risk to a state-managed fund, offsetting their financial exposure. While the state's reinsurance program may mitigate high-cost claim denials in the individual market, this analysis cannot account for its impact due to data limitations.

4.1.3 IDENTIFICATION OF DENIED SERVICES IN COMMERCIAL INSURANCE

I first calculated the denial rate by procedure code among commercially insured individuals aged 55 to 59. Denial rate was defined as the proportion of claims for a given CPT or HCPCS code that were marked as denied by the payer as their final status. Next, I calculated denial rates by procedure codes for individuals aged 60-64, also within the commercially insured cohort. I cross-referenced denial rates for this cohort with those of their younger counterparts. I retained only those codes for which the denial rate was at least 10 percentage points higher in the 60–64 group compared to the 55–59 group. This step was designed to identify services for which denial patterns may shift as individuals approach Medicare eligibility. The rationale behind limiting the sample was twofold: first, to determine the proportion of services that experienced an uptick in denial patterns, and second, to identify the types of services that showed this trend. Identifying service types at this stage helped me have more nuanced conversations during the qualitative interviews.

4.1.4 ADJUSTMENT FOR CLINICIAN AND BENEFICIARY FACTORS

As a first step, I aimed to isolate the drivers of this uptick in denial patterns within the commercial population, after adjusting for clinician and patient characteristics. I mapped our identified codes back to claim line-level data and limited our sample to the associated claims. Using denial status as the outcome variable, I estimated the likelihood of a claim being denied using a linear probability model (LPM). This approach enabled me to incorporate higher-level fixed effects and focus on the direction and pattern of associations, rather than the magnitude of the coefficients. I also ran a logit as a sensitivity test; the results are in Appendix C. The goal of this analysis was not to infer causality but to determine if payer type is associated with denial

status after adjusting for clinician and patient characteristics. The model includes fixed effects at the billing entity, procedure code, and beneficiary county levels to account for systematic variation in denial rates across clinicians, services, and regions. For this first model, our sample included beneficiaries aged 55 to 64 with commercial coverage. Covariates included beneficiary sex, age bracket, county of residence, as well as the Charlson's comorbidity index to account for risk adjustment. I also included controls for payer type to see what types of commercial plans were more likely to deny claims. I wanted to see if payer type was associated with denial status after adjusting for clinician and patient covariates. Also, to assess whether denials increased as individuals approached Medicare eligibility, I included two cohort indicators for pre-Medicare age groups (60–62 and 63–64), with ages 55–59 serving as the reference category.

4.1.5 LINKING IDENTIFIED PROCEDURE CODES TO MEDICARE ADVANTAGE CLAIMS

As a second step, I now wanted to see how the denial patterns changed post Medicare transition. I next mapped the list of identified procedure codes in the commercial population to Medicare Advantage claims. For this phase of the analysis, I restricted the sample to two cohorts: commercially insured beneficiaries aged 55-64 and Medicare Advantage beneficiaries aged 65-75. This approach allowed me to directly compare denial patterns across payer types around the Medicare eligibility threshold. If age were the only predictor of denial, presumably driven by an increase in demand for services, then I would expect denial rates to keep rising or at least remain consistent post-transition.

4.1.6 DEVELOPING THE DELAYED SERVICES ALGORITHM

Since I am working with data from a singular state, I wanted the identification methodology that I am using in my dissertation to be reproducible. I generated standardized code in STATA to recreate the same analysis using data from other states or sources. This is a central methodological contribution of my dissertation. The development of the Delayed Services Algorithm (DSA), a portable and reproducible tool designed to identify procedure codes associated with increased denial rates before Medicare eligibility. Building on the identification process outlined above, the DSA was created to systematically detect services that may be subject to coverage restrictions or denial strategies among commercially insured individuals approaching age 65.

To ensure broader applicability, I generated reproducible code that implements the methodology outlined above, calculating denial rates by age band, identifying discontinuities in denial patterns before and leading up to the Medicare eligibility threshold, and flagging procedures with a pre-Medicare spike in denials followed by a drop post-transition. The resulting algorithm is designed to be adaptable across claims datasets, enabling researchers and policymakers to identify delayed services using standard administrative claims fields. Since the DSA can be implemented at the payer, clinician, or physician group level, it offers a scalable approach to assessing potential patterns of care rationing or denial resulting from anticipated churn.

4.1.7 MODEL SPECIFICATION: PIECEWISE LINEAR MODEL

I examined how denial rates changed with age in the years leading up to and following Medicare eligibility. Since age is recorded in single years, my data do not allow fine-grained

modeling of month-to-month changes or continuous trajectories. Instead, I used a piecewise linear regression with kinks at age 60 and age 65. This approach divides the age range into segments and estimates separate slopes within each segment, while also allowing for immediate changes in the level of denials at the knot points. The knot at age 60 was chosen to capture potential anticipatory changes in denial practices in the early 60s, as payers may alter utilization management strategies as beneficiaries approach Medicare eligibility. The choice for the cut-off at age 60 was arbitrary, and Appendix A shows results with alternative specifications. The knot at age 65 marks the transition to Medicare coverage and allows us to measure both the discontinuity at eligibility and the slope of denial rates thereafter. In this setup, coefficients on the slope terms indicate the average yearly change in denial probability within each age segment. In contrast, coefficients on the level-change terms capture the size of any immediate jump or drop in denial rates at the exact ages of 60 and 65.

$$\Pr(denial = 1) = \beta 0 + \beta 1 \cdot s1(Age) + \beta 2 \cdot s2(Age) + \beta 3 \cdot s3(Age)$$
$$+ \beta 4.\text{post60} + \beta 5.\text{post65} + \beta.covariate + fixed\ effects + \varepsilon$$

where
s1(Age) = min(Age, 59)
s2(Age) = max{ min(Age, 65) - 60, 0 }
s3(Age) = max{ Age- 65, 0 }
post60= indicator(Age ≥ 60)
post65 = indicator(Age≥ 65)

I include fixed effects for billing entity-by-year, procedure code, and county. I also control for product type, sex, and comorbidity burden to handle differences in case mix and practice patterns. $\beta 1, \beta 2, \beta 3$ capture the marginal effect of age per year, between the ranges 55 to 59, 60 to 64, and 65 plus, respectively. $\beta 4\ and\ \beta 5$ represent jumps or level shifts at age 60 and 65, respectively. This setup enables me to estimate five key aspects: the pre-60 trend, the immediate change at age 60, the trend between ages 60 and 65, the immediate change at age 65, and the

post-65 trend. This model aligns with my goal of determining whether denial rates rise before Medicare eligibility and consequently fall.

4.1.8 JUSTIFICATION FOR PIECEWISE MODELING APPROACH

Scanning the literature revealed that studies examining health outcomes around insurance transitions, particularly shifts from commercial coverage to public programs such as Medicare, most commonly rely on difference-in-differences (DiD) or regression discontinuity designs (RDD).[60,103,104] While both methods are well-established, they were not well-suited to the structure of my data or the goals of my analysis. First, DiD is most effective when applied to panel data and but more importantly requires baseline trends to be identical between the control and treatment group. While DiD may be used with cross sectional data, it may not be the best model to tease out unobserved heterogeneity.[105] Additionally, because most individuals transition to Medicare at age 65 rather than retaining commercial coverage, it is unlikely that the baseline trends for the control group (those who keep commercial insurance) and the treatment group (those who switch to Medicare) are comparable. I could also not use a different age cohort as an alternative control group since they are less likely to face upticks in denial rates compared to their older counterparts. Second, a standard RDD centers inference on a single cutoff, in this context, age 65, when most individuals become eligible for Medicare. While standard RDD is useful for estimating local effects at that threshold, it would not allow me to characterize trends leading up to the transition or to examine gradual behavioral changes in claims adjudication as individuals approach Medicare eligibility. Although a multi–cutoff regression discontinuity design was a potential strategy, I chose not to use it due to substantial heterogeneity across commercial plans, which could introduce bias and complicate the interpretation.[106] In addition, much of the existing literature on insurance transitions focuses on utilization and health

outcomes, for example, changes in hospitalizations, prescription drug use, or preventive care uptake around age-based transitions to Medicare.[103] In contrast, my outcome of interest, claim denials, reflects a process-level payer behavior that can change incrementally and strategically over time. Denial rates may not shift abruptly at a single policy cutoff but instead intensify gradually as commercial insurers respond to financial incentives and anticipate beneficiary transitions into Medicare. This dynamic behavior is better captured through piecewise linear functions, which allow denial trends to vary across distinct age segments. Rather than forcing a single average treatment effect, as in DiD, or focusing solely on the discontinuity at age 65 as in RDD, the piecewise specification aligns with the theoretical expectation that denial behavior is potentially anticipatory. The choice of a piecewise framework is not only compatible with the structure of my data but also grounded in the economic behavior underlying claim adjudication.

For these reasons, I opted for a piecewise linear regression model. This approach allowed me to segment the age cohorts into meaningful intervals and model changes in denial rates both before and after age 65, rather than estimating only a single discontinuous jump at the eligibility threshold. A piecewise framework provided the flexibility to capture anticipatory behavior in claims adjudication behavior that may begin years before age 65 as well as any post-transition shifts in denial patterns. In this way, the piecewise model aligns closely with the theoretical understanding of commercial insurer incentives around churn and offers a more comprehensive view of how denial behavior evolves around the transition to Medicare. By examining the buildup of denial activity before the transition, this framework allowed me to detect patterns consistent with corporate moral hazard, where commercial payers potentially shift costs strategically as beneficiaries age into Medicare.

4.1.9 SENSITIVITY CHECKS

I ran multiple sensitivity checks to establish the validity of the results. Firstly, I re-estimated the model using a logistic specification. This was done to verify that our findings were not dependent on the choice of a linear probability model and to confirm that the estimated relationships were consistent under a nonlinear link. The logit model included the same spline terms, level-change indicators, covariates, and fixed effects as the primary specification. I focus on the linear probability estimates for ease of interpretation, but the logistic regression served as a check on the robustness of the direction and shape of the effects. Secondly, I re-estimated the piecewise linear model using a singular kink at age 65. The original knot at 60 was chosen to capture possible anticipatory payer behavior several years before Medicare eligibility, but it was not based on a specific policy threshold. Lastly, I reran the piecewise linear model using all claims, not just the services identified as having an uptick in denials. All alternative specification results can be found in Appendix A.

4.1.10 CLASSIFICATION OF DELAYED SERVICES

After establishing that payer type was significantly associated with claim denial rates, even after controlling for covariates, I next attempted to categorize the types of denied services. I characterized the types of outpatient procedures that showed an uptick in deniability among commercially insured individuals just before their transition to Medicare. This step allowed me to move beyond aggregate denial trends and begin unpacking which clinical services were most subject to coverage restrictions or scrutiny under commercial plans, thereby offering insight into the underlying patterns of service-level rationing or delay. I used the New York State 3M Ambulatory Patient Group (APG) system, which organizes services into clinically coherent

outpatient care categories. APG mapping enabled a structured analysis of how denied services are distributed across clinical domains over time.

4.1.11 ETHICAL CONSIDERATIONS

This study used deidentified publicly available administrative claims data and was deemed exempt from review by the University of Maryland Institutional Review Board.

4.1.12 LINK TO NEXT METHOD

To complement the quantitative analysis of denial patterns in claims data, I conducted qualitative interviews with industry experts and stakeholders. The claims-based models identify whether denial rates rise before Medicare eligibility and fall afterwards. Still, they cannot explain why insurers behave in this way or how organizational processes shape those patterns. Interviews provide this missing perspective by offering insight into payer incentives, utilization management practices, and the role of vendors and guidelines in adjudication decisions. Taken together, the quantitative methods establish the timing and magnitude of changes in denial behavior. At the same time, the interviews help interpret the mechanisms behind those changes, allowing us to connect statistical evidence with a deeper understanding of coverage policy and operational decision-making.

4.2 QUALITATIVE PRIMARY RESEARCH

I used semi-structured interviews because they provided a consistent framework across respondents while allowing experts to elaborate on their unique experiences.

4.2.1 RECRUITMENT AND SAMPLING

For the qualitative component of this study, I conducted expert interviews with professionals, including health insurance payers, medical billing experts, third-party contractors, and academics with expertise in coverage policy and claims adjudication. Since these individuals often hold senior positions within complex organizations, they can be challenging to identify and reach through conventional recruitment strategies. I therefore used a snowball sampling approach. I began by contacting individuals in my professional network and then asked participants to suggest other individuals who had relevant expertise or complementary perspectives. This strategy enabled me to overcome organizational barriers, extend my reach beyond my immediate contacts, and engage with respondents involved in various aspects of payer operations, including medical billing, utilization review, claims processing, and vendor relations.

I selected a semi-structured interview format, which provided a consistent set of guiding questions across respondents while still allowing participants to elaborate on their experiences in applying medical necessity guidelines, implementing utilization management practices, and preparing for coverage transitions such as Medicare eligibility. In total, 29 invitation emails were sent to potential participants, of whom six did not respond, resulting in a final sample of 23 completed interviews. This number was sufficient to achieve thematic saturation, as no new themes emerged in the later interviews. The study was considered exempt by the Institutional Review Board, and all participants provided informed consent. Copies of the consent forms are included in Appendix A.

4.4.2 DATA COLLECTION

Interviews were conducted in a semi-structured format, with most sessions recorded using the Otter application. Recordings were automatically transcribed and then reviewed for accuracy before being coded and analyzed. For participants who did not consent to being recorded (a total of 5), I relied on detailed manual note-taking to capture their responses. Regardless of method, all data were anonymized during transcription or note consolidation, and personally identifying details were removed.

4.2.3 DATA ANALYSIS

I began analysis with an initial coding framework informed by the study's research questions and concepts drawn from the literature on payer incentives and medical necessity review. I then applied inductive coding to capture new themes that emerged during the interviews. Coding was conducted iteratively, with transcripts reviewed multiple times to refine categories and identify cross-cutting patterns. I compared responses across professional roles and organizational settings to highlight variation in how denial processes were described. Data were manually managed and organized, with codes grouped into higher-level themes that reflected the findings.

5 RESULTS

5.1 COMMERCIAL CLAIM DENIAL UPTICK AROUND THE MEDICARE ELIGIBILITY CLIFF: EVIDENCE FROM THE NH APCD

The NH All Payers Claims database (2018-2023) showed an increase in denial rates for patients approaching Medicare eligibility.

5.1.1 SAMPLE DESCRIPTION

The final sample comprised 6,425,961 unique beneficiaries and 7,060,239 adjudicated medical claim lines submitted between 2018 and 2023. Of these, 5,290,824 individuals were commercially insured, ages 55–64 years, and 1,135,137 were enrolled in Medicare Advantage, ages 65–75 years. The commercial group accounted for 5,900,698 claim lines and 5,712,684 unique claims, with an average of 1.08 claims per beneficiary. Within the Medicare Advantage group, there were 1,159,541 claim lines and 1,114,011 unique claims, corresponding to an average of 0.98 claims per beneficiary. Overall, 60% of the sample consisted of females, with a slightly higher proportion among commercially insured individuals (61%) compared to Medicare Advantage enrollees (57%). The mean age was 59.7 years in the commercial group and 69.8 years in the Medicare Advantage group. The comorbidity burden, as measured by the Charlson Comorbidity Index, was lower in the commercial group (0.16) compared with Medicare Advantage beneficiaries (0.28). Among the commercially insured, 46.1% were enrolled in a health maintenance organization (HMO), 24.0% in a preferred provider organization (PPO), 10.1% in a point-of-service (POS) plan, 2.7% in an exclusive provider organization (EPO), and 0.4% in an indemnity plan. Medicare Advantage beneficiaries made up 16.7% of the full sample.

Characteristic	Commercial (55–64 y)	Medicare Adv (65–75 y)	Overall
Claim Lines	5,900,698	1,159,541	7,060,239
Claims	5,712,684	1,114,011	6,826,695
Beneficiaries	5,290,824	1,135,137	6,425,961
Average claims/Bene	1.08	0.98	1.06
Female, n (%)	3,220,272 (61%)	642,430 (57%)	3,862,702 (60%)
Age, mean (SD), y	59.65 (2.84)	69.76 (3.04)	61.31 (4.72)
Charlson Comorbidity Index, mean (SD)	0.16 (0.42)	0.28 (0.57)	0.18 (0.45)
HMO, n (%)	3,194,886 (46.1%)		3,194,886
PPO, n (%)	1,663,865 (24.0%)		1,663,865
POS, n (%)	699,011 (10.1%)		699,011
EPO, n (%)	185,057 (2.7%)		185,057
IND, n (%)	30,062 (0.4%)		30,062
Medicare Advantage, n (%)		1,159,541 (16.7%)	1,159,541

Table 1: Characteristics of Study Population (NH APCD, 2018–2023)

5.1.2 ANALYSIS

I began by identifying the set of procedures billed to commercially insured beneficiaries in our cohort. In 2023, a total of 5,807 unique procedures were billed for individuals aged 55 to 59 years, and 6,144 were billed for those aged 60 to 64 years in an outpatient setting. Of all the procedures billed, 4923 procedures overlapped between these two groups. Among these overlapping procedures, 1344 codes (*27.3*%) experienced a 10-percentage point or higher increase in denial rate in the older group. Unadjusted data showing aggregate denial rates for these select codes of overlapping codes by age and product type can be seen in Figure 1.

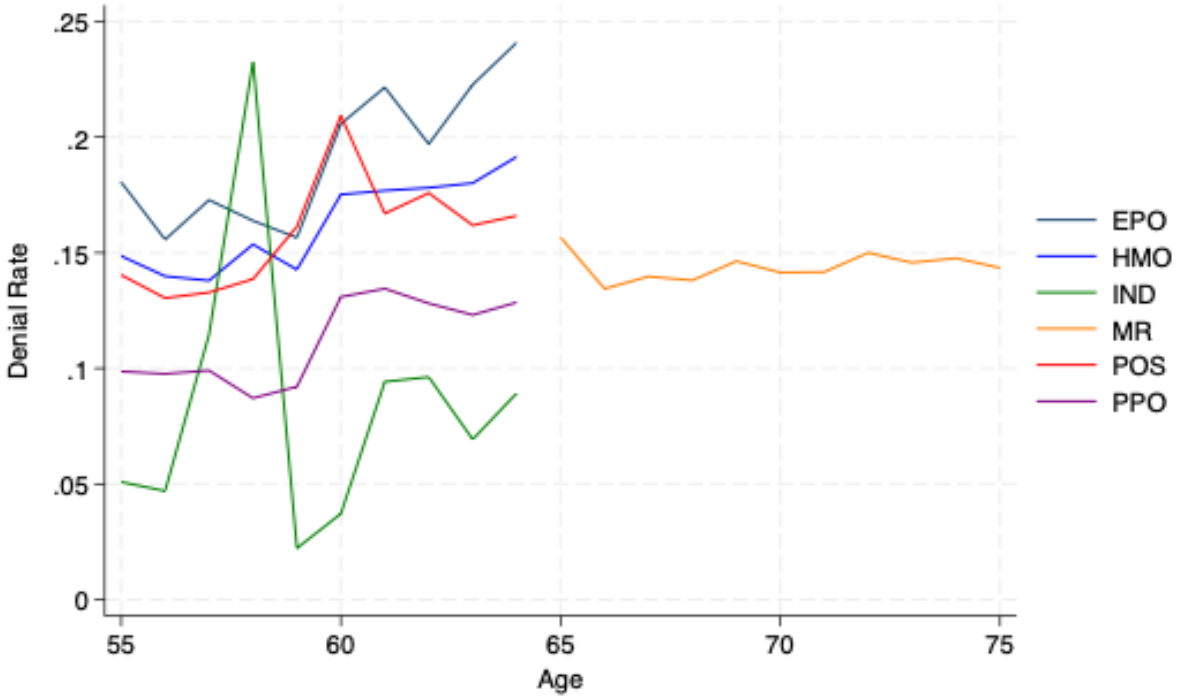

Figure 1: Unadjusted trends in denial rates by Age and Insurance Product

Notes:
EPO Exclusive Provider Organization
HMO Health Maintenance Organization
IND Indemnity
MR Medicare Advantage
POS Point of Service
PPO Preferred Provider Organization

To streamline the procedure code identification process, I expanded on the code I used and converted it into a delayed services algorithm. See Appendix C.

As a next step, I wanted to model these trends for our select procedure codes, controlling for available patient and clinician characteristics only in the commercial cohort, to see if they were correlated with product type. To assess the association between insurance type and denial rates, I estimated a linear probability model at the claim line level. The dependent variable was an indicator for whether the claim was denied. The model included beneficiary-level covariates (sex, Charlson Comorbidity Index, and age group), insurance type (EPO, HMO, POS, and PPO),

and multiple fixed effects, including procedure code, billing entity ID, calendar year, and county of residence. Robust standard errors were clustered at both the individual and claim levels to account for repeated observations. Results are shown in Table 2. Denial rates were significantly higher among individuals aged 60 to 64 years compared with those aged 55 to 59 years. Denial rates increased as patients approached Medicare eligibility. Holding everything else equal, I find that people aged 60–61 are 2.35 percentage points more likely to have a claim denied than those aged 55–59, and people aged 62–64 are 2.82 points more likely. I don't see meaningful differences by sex, and comorbidity burden isn't linked to denial probability. Using indemnity plans as the reference group, denial rates are higher for every other commercial plan type: EPO (+10.4 percentage points), HMO (+6.8 percentage points), POS (+5.6 percentage points), and PPO (+2.4 percentage points). These differences persist even after adjusting for clinician, service, time, and county factors (see Table 2).

Next, I wanted to extend this model to include the Medicare Advantage population and used a piecewise regression model to examine denial rates among individuals aged 55-60, 60-65, and 65 and above. The choice of cutoffs was informed but ultimately discretionary. Sensitivity checks reported in the Appendix provide alternative model estimates. According to this primary model, there were statistically significant jumps in denial rates, with rates rising by 2.1% at age 60 and then decreasing by approximately 8.6% points after the Medicare transition. The slopes within these age ranges were not significant. After controlling for patient and clinician fixed effects, HMOs appeared to have the highest denial rates. In contrast, indemnity insurance had the lowest, with all other commercial product types falling in between. Results presented in Table 3. Also see Figure 2.

Variable	Coefficient	Std. Err.	t	p-value	95% CI (Lower)	95% CI (Upper)
Sex						
Male	0.0025	0.0015	1.64	0.101	–0.0005	0.0055
Unknown	–0.1292	0.0623	–2.07	0.038	–0.2513	–0.0071
Charlson's Comorbidity Index	–0.0013	0.0016	–0.81	0.418	–0.0046	0.0019
Age Group 60-61	0.0235	0.0016	14.41	<0.001	0.0203	0.0267
Age Group 62-64	0.0282	0.0019	15.07	<0.001	0.0245	0.0319
Commercial Insurance Type						
EPO	0.1039	0.0085	12.22	<0.001	0.0872	0.1205
HMO	0.0676	0.0074	9.18	<0.001	0.0531	0.082
POS	0.0564	0.0076	7.46	<0.001	0.0416	0.0712
PPO	0.0243	0.0074	3.27	0.001	0.0097	0.0388
Constant	0.081	0.0074	11.01	<0.001	0.0666	0.0954

Notes

1. The regression includes fixed effects for member county (11 categories), billing entity (10,063 categories), calendar year (5 categories after dropping the reference year), and procedure code (2,791 categories after dropping 11 redundant levels).

2. Robust standard errors are clustered at both the person and claim level to account for intra-person and intra-claim correlation.

Table 2: Modeling denial rates with clinician and patient level controls

Variable	Coefficient	Std. Err.	t	p-value	95% CI (Lower, Upper)
Age Segments					
Segment 1 (<60 slope)	-0.0003	0.0010	-0.2600	0.7940	-0.0023, 0.0017
Segment 2 (60–64 slope)	0.0016	0.0011	1.4200	0.1560	-0.0006, 0.0038
Segment 3 (65+ slope)	-0.0001	0.0006	-0.1200	0.9070	-0.0012, 0.0011
Level shift at 60	0.0216	0.0037	5.8300	0.0000	0.0143, 0.0288
Level shift at 65	-0.0858	0.0147	-5.8300	0.0000	-0.1147, -0.057
Charlson Comorbidity Index	-0.0003	0.0017	-0.1900	0.8460	-0.0038, 0.0031
Sex					
Male	0.0027	0.0019	1.44	0.15	-0.001, 0.0064
Unknown	-0.0783	0.0524	-1.5	0.135	-0.1809, 0.0243
Commercial Insurance Type					
EPO	-0.0377	0.0126	-2.99	0.003	-0.0623, -0.013
IND	-0.0998	0.0161	-6.2	0	-0.1314, -0.0683
POS	-0.0490	0.0100	-4.9	0	-0.0685, -0.0294
PPO	-0.0806	0.0116	-6.92	0	-0.1034, -0.0578
Constant	0.2051	0.0556	3.69	0	0.0962, 0.314

Notes
1. The regression includes fixed effects for member county (10 categories), billing entity-by-year (24,255 categories), and procedure code (2,803 categories).
2. Robust standard errors are clustered at both the person and billing entity level to account for intra-person and intra-billing entity correlation.

Table 3: Piecewise Model-Denial Rates by Age and Product Type

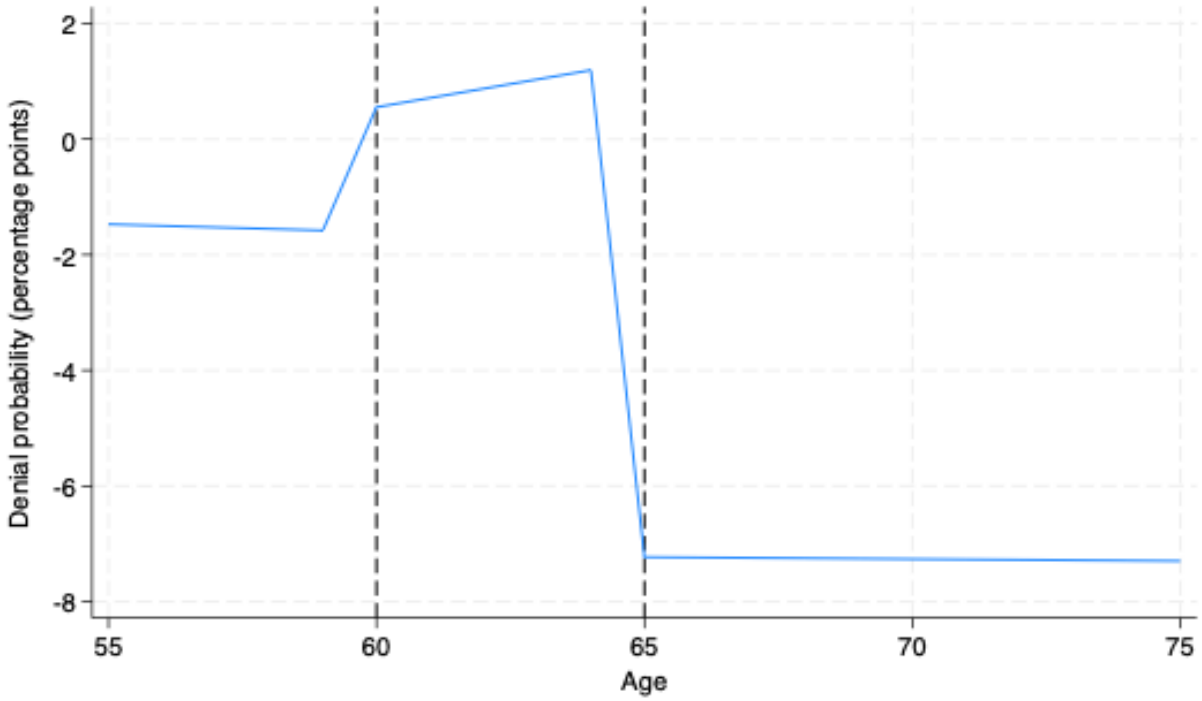

Figure 2: Predicted Denial by Age Based on Primary Model for NH APCD 2018-2023

After establishing a statistically significant correlation between denials and insurance product type, I characterized our services, which showed an uptick in denials. I wanted to understand which service categories are more likely to be denied, in order to probe respondents during the expert interviews. I categorized denied claims across 33 outpatient service groups from 2018 to 2023 (Table 4). Denials were concentrated in a few high-volume areas. Laboratory procedures accounted for the most significant number of denials, increasing from 141 in 2018 to 180 in 2023. Durable Medical Equipment (DME), ambulance services, and medical supplies were also consistently high, with annual denials ranging from 158 to 175.

Musculoskeletal and gastrointestinal procedures were also frequently denied. Musculoskeletal denials dropped from 159 in 2018 to 117 in 2022, then rose again to 133 in 2023. Some categories showed steady growth. Denials for behavioral health and substance abuse rose from 2 in 2018 to 13 in 2023. Radiology increased from 44 to 51, and cardiovascular

procedures climbed to 71 in 2023, the highest level recorded. Other categories showed declines. Denials for anesthesia, radiology, otolaryngology, and skin procedures fell modestly. The number of female reproductive procedures dropped from 31 in 2018 to 19 in 2020, then rebounded to 26 in 2023. Case management and breast procedures fluctuated without a clear trend.

Service Type	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Anesthesia	70	78	70	66	65	61
Behavioral health illnesses and substance abuse therapies	2	4	6	9	9	13
Breast procedures	14	7	11	4	6	10
Cardiovascular procedures	64	53	68	63	57	71
Case Management	8	11	10	7	15	9
Chemotherapy and other drugs	38	36	51	44	53	47
Dental and Oral Surgery Procedures	1			1	1	1
DME, Ambulance Services and Medical Supplies	161	174	158	175	159	166
Female Reproductive system procedures	31	25	19	21	24	26
Gastrointestinal system procedures	89	95	94	83	82	82
Genitourinary system procedures	30	33	33	31	34	25
Hematologic and lymphatic procedures	9	14	15	9	10	12
Hepatobiliary procedures	9	8	14	7	8	8
Incidental procedures and services	36	33	27	34	33	28
Laboratory	141	162	145	150	171	180
Male Reproductive system procedures	7	9	14	7	12	11
Musculoskeletal system procedures	159	137	141	148	117	133
Neurologic system procedures	46	57	59	40	42	42
Nuclear Medicine	17	17	19	16	19	18
Ophthalmologic system procedures	35	42	37	32	43	36
Other ancillary tests and procedures	25	29	26	35	34	35
Otolaryngologic system procedures	62	66	58	65	60	57
Pathology	22	22	24	18	22	18
Preventive Medicine and Related Services	14	12	22	20	20	13
Pulmonary procedures	22	30	29	25	23	30
Radiation Therapy	15	14	12	11	14	10
Radiologic procedures	44	39	42	46	31	51

Radiology	63	69	63	62	61	58
Rehabilitation	10	8	9	7	8	9
Skin and integumentary system procedures	87	80	89	79	87	77
Thoracic and chest procedures	16	12	8	7	6	6
Transplant procedures	1		1	1		1

Table 4: Delayed Services Categorization Using Ambulatory Patient Groups

5.1.3 DISCUSSION

I found statistically significant variation in claim denial rates across age groups, insurance types, and service categories in NH's outpatient claims data. Denials increased for certain services as beneficiaries approached Medicare eligibility, with a significant inflection point observed at age 60 and 65. Even after controlling for beneficiary and clinician characteristics, I identified higher denial rates among older commercially insured adults compared with their younger counterparts, as well as persistent differences across plan types.

This pattern raises questions about the correlation between the two and whether it could be driven by the presence of corporate moral hazard, i.e., insurers denying services when long-term accountability diminishes due to impending disenrollment. I found meaningful differences in denial rates across commercial product types. EPO and HMO plans were associated with substantially higher denial probabilities compared with PPO or indemnity plan coverage. These differences persisted even after adjusting for service mix, clinician characteristics, and risk adjustments for beneficiary health status. I could not control for benefit design, which could be a significant confounder; however, I was able to identify service types where claims were more likely to be denied. For example, denials were concentrated in a subset of categories, including laboratory services, DME and medical supplies, and musculoskeletal and gastrointestinal procedures. Limiting my sample to services that showed an uptick in denials was not cherry picking but a strategic move to identify potential gray areas that are unregulated. These gray

areas can give payers more discretion in utilization management compared to other service categories that have more safeguards built around them. These are areas where variability in medical necessity criteria may allow payers greater discretion. The observed increase in denials for behavioral health, radiologic, and cardiovascular procedures over time suggests evolving payer strategies that may reflect cost-containment priorities or shifting definitions of medical necessity. These service categories also later align with the cost containment priorities revealed during the qualitative interviews.

Commercial insurers may likely engage in strategic claim adjudication as beneficiaries near age-based coverage transitions. These practices, although opaque, can have a material impact on access to care and raise concerns about continuity of care, particularly for older adults. However, the quantitative data alone do not have the granularity to identify mechanisms for variation patterns in denial. I have listed more limitations in the section below.

5.1.4 WEAKNESSES AND LIMITATIONS

The quantitative analysis has several significant limitations. First, the study was based on claims data from a single state, which may limit the generalizability of findings to other states with different payer mixes, regulatory environments, or physician market structures. Denial practices may vary based on local insurer policies, regional coding norms, or state-level utilization review procedures that were not captured in this analysis. Second, our data included only commercial insurance and Medicare Advantage claims; traditional fee-for-service Medicare was not represented. As a result, I was unable to compare denial patterns between Medicare Advantage and traditional Medicare directly, nor could I determine whether the observed trends were specific to the managed care environment or reflected broader Medicare-wide practices.

However, because conventional Medicare is known to have lower denial rates than commercial insurance, our estimates are likely conservative, and the actual decline in denial rates following the transition to Medicare may be even greater.

Third, I lacked access to plan-level benefit design and prior authorization requirements, which could influence claim denial rates. For example, high-deductible health plans or tiered networks may be associated with different denial patterns that I could not disentangle due to data limitations, which prevented me from identifying specific payers. Fourth, because member identifiers were encrypted, I was unable to track individuals longitudinally across payer types or enrollment transitions. This prevented us from observing the whole trajectory of a member's service use, appeals, or coverage experience across commercial and Medicare Advantage plans. Consequently, I treated the sample as pooled cross-sectional data rather than a true panel. Fifth, while I adjusted for multiple observable characteristics, including age, sex, comorbidity burden, and billing entity identifiers, unmeasured confounders such as socioeconomic status, health literacy, or medical billing behavior could still bias the estimates. Similarly, our use of a linear probability model, while interpretable, may oversimplify complex relationships between predictors and denial likelihood. Despite these limitations, my analysis offers valuable insights into payer behavior during a major coverage transition and highlights potential misalignments in incentives.

5.2 INTERVIEW THEMES

I invited 29 individuals to participate in qualitative interviews, and 23 agreed, yielding a response rate of 79.3%. Of these 23 participants, 16 worked for payers or vendor organizations, 3 were medical-billing experts, 2 were academics, and 2 were clinicians. All had more than 10 years of experience in their fields, and 13 were male.

A defining feature of this sample is the seniority and decision authority of the respondents. Each interviewee operated at a level of influence where strategic policy decisions about coverage, adjudication, and related workflows are made. While I do not list titles, respondents consistently described responsibilities consistent with senior leadership or equivalent decision-making roles (e.g., overseeing benefit design parameters, adjudication policies, and vendor management). This vantage point provided deep insight into how rules are interpreted, how exceptions are managed, and how organizational incentives are translated into day-to-day decision making. My aim in interviewing this group was to elicit granular accounts from individuals positioned to see both policy and operations. The mix of payers and vendors, billing experts, academics, and clinicians enabled methodological triangulation across perspectives, linking how policies are framed and how they are implemented. This sample enhances the credibility and explanatory power of the quantitative findings by highlighting convergences and tensions across different roles that interact within the US healthcare system.

When reporting results, I maintain strict standards of anonymity. Quotations are paraphrased as needed to remove potentially identifying details, and role labels are kept broad. Any contextual markers, such as specific product lines, institutions, or geographies, that could enable re-identification are masked. To protect confidentiality, I report only aggregate counts and broad role categories in Table 5. I do not disclose the names of organizations, job titles, or granular geographical details.

Respondent Type/Characteristics	Payers	Vendors	Medical Billing	Academics	Clinicians
Sample size	10	6	3	2	2
Male (n, %)	7, 70%	2, 33.33%	1, 33.3%	1, 50%	2, 100%
Average Experience	10-15 years	15-20 years	10-15 years	10 years	25-30 years
Role Type	Director 5 Vice-President 3 Senior Manager 2	CEO 1 Sales Rep 2 Editor 2 Manager 1	Director 1 Senior Manager 1	Full Professors 2	Family Medicine 1 Endocrinologist 1
Geography	Midwest 50% Northeast 30% West 10% South 10%	West 50% Midwest 33.33% Northeast 16.7%	Northeast 66.6% Midwest 33.3%	Northeast 100%	Northeast 100%

Table 5: Interview Respondent Characteristics

5.2.1 ALL RESPONDENTS AGREE CHURN DISRUPTS CONTINUITY OF CARE BUT DISAGREE ON THE CAUSE.

Across interviews, participants agreed that churn disrupts the continuity of care even without gaps in coverage. However, they identified different underlying causes depending on their industry. Payers emphasized limited beneficiary literacy about upcoming plan changes and weak warm handoffs from clinicians as primary drivers of breakdowns during insurance transitions. In their view, delays are not inevitable, and most transitions can be bridged smoothly if there is required member education and structured clinician transfers. Payer side respondents argued that communication breakdowns between clinicians lead to disruptions in care. One respondent said:

"Discharge summaries don't reach new primary care teams, referrals don't go through, medication lists are not reconciled, and care plans are not explicitly handed to the next person." Operational gaps, according to payers, arise from weak coordination amongst clinicians.

Clinicians, on the other hand, traced disruption to the rules that change underneath patients as new networks exclude established specialists or hospitals. They also mentioned changes in prior authorization and claim processing criteria. Other issues highlighted by clinicians included disruptions in medication regimens and the need for new documentation. Since these rules vary across insurance products, care plans that are progressing can suddenly come to a halt. As one interviewee, who is Vice President at a large payer organization, put it, *"Continuity of care is the first thing that comes to mind with churn…. new rules apply, and active treatment plans can stall."* Both groups converged on the observation that when transitions occur, active plans of care are frequently delayed and that the reasons for breaks in continuity of care are usually administrative rather than clinical. Interviewees noted that many patients are unaware of how to notify their care team of an impending plan change, do not understand that networks can change, or mistakenly assume that prior authorizations can be carried over. Payers contribute to these delays, even if coverage is continuous, since claim processing requirements change. Medication access is a recurring friction point where a plan switch can make a drug too expensive or uncovered.

The interviews redefined churn as a transfer of administrative regimes. The risk to patients is not only whether they are covered, but also whether authorizations and networks follow them. This lens of examining churn points highlights a corporate and structural moral hazard that arises from coordination deficits, where the costs of transitions are externalized to patients and downstream payers. Conceptually, this finding is situated within multi-payer environments

where fee-for-service and partial-capitation incentives make administrative friction financially tolerable, or even advantageous, to one party. At the same time, clinical risk is borne by another. The interviews justify measuring churn not just as coverage transitions but as rule-set transitions.

5.2.2 PAYERS AND MEDICAL BILLERS DISAGREE ON REASONS BEHIND PRE-MEDICARE DENIAL INCREASES SEEN IN NEW HAMPHIRE DATA

Across interviews, stakeholders acknowledged the empirical pattern identified in the New Hampshire data, which showed that denial rates for commercially insured adults increased in the months preceding Medicare eligibility; however, explanations diverged by role. Payers generally framed the phenomenon as a by-product of member behavior around the transition to Medicare. A subset of workers may opt for early retirement and transition into lower-premium, higher-friction commercial products before reaching age 65 and Medicare eligibility. These plans often have narrower networks and higher cost-sharing features that naturally yield more denials. They added that large payers usually aim to retain members in Medicare Advantage, which weakens the incentive to obstruct care near age 65. Some payers pointed out to clinician's incentives to increase intensity of treatment prior to Medicare transition, since they are often more likely to get reimbursed at a higher rate from commercial plans compared to Medicare ones. This overutilization may explain the increase in denial rates as seen in the data, according to payers.

Medical billing experts and front-line revenue cycle staff offered a contrasting account. They reported increasingly frequent documentation requests and longer cycle times before decisions for older, commercially insured patients. Even when services ultimately met medical necessity, approvals often arrived only after time-consuming appeals and peer-to-peer (P2P) consults. They described these encounters as unnecessary and pulling physicians away from direct care. From their vantage point, the pre-Medicare denial bump reflects escalating administrative friction

rather than clinical inappropriateness, with older members' higher comorbidity loads simply increasing the number of boxes that must be checked perfectly to pass on first submission. Medical billing respondents questioned whether New Hampshire's denial patterns would generalize to other states and emphasized that such patterns might vary by region. They argued that market structures matter. A medical billing director at a large hospital network said, *"In more fragmented markets, we face larger volumes of payer-specific policies and portals… which increases administrative burden".* In such situations, denial rates can rise independently of any change in clinical thresholds.

There were, however, points of convergence. Payers and billers agreed that older commercial members tend to present with more complex histories, and this complexity increases the documentation burden and the likelihood that something essential is missing when a claim is initially submitted.

5.2.3 MEDICAL-NECESSITY CRITERIA ARE NOT NEUTRAL AND THERE IS SIGNIFICANT VARIATION ACROSS PAYERS

Across interviews, participants repeatedly emphasized that "medical necessity" is not a single, standardized concept. It is a moving target defined by a mix of national guidelines, plan-specific policies, and local coverage rules. InterQual and MCG were named as the two dominant guideline sets. Most organizations license one or both, and many medical billing experts have learned to document against them. These companies offer both payer-facing products and clinician-facing solutions. Clients pay an annual fee, which is tied to the size of the payer or practice in terms of the number of lives covered in the service area.

Respondents were clear that these tools do not produce uniform outcomes. For example, MCG operates on the premise that a service is typically approved unless there is a valid reason

for denial. On the other hand, InterQual works in the opposite direction, where a service is not approved until medical necessity is established. A senior executive in the medical necessity space said, *"MCG is designed for physicians and InterQual is more for nurses."* Even when using the same medical necessity platform, variations in processes occur. For example, MCG's ambulatory service guideline, inpatient service guideline, and general requirement guidelines vary in the way claims are processed, even for the same procedure code.

Plans frequently layer their own rules on top, update at different cadences, or have their own lists of exceptions for the same services. The result is that two patients with clinically similar conditions can experience different outcomes depending on their claim adjudication process. Participants also described how payers publish internal medical policies that can supersede InterQual or MCG criteria. Those policies may reflect local coverage determinations, network design choices, cost management priorities, or may simply be a result of new codes/procedures for which guidelines don't exist. One medical director at a large payer noted, *"In practice, the medical policy stack is hierarchical. InterQual or MCG provides a baseline. Plan policies can narrow or broaden coverage."* State regulations, NCQA standards, and CMS rules add still more variation, particularly when comparing Medicare Advantage and commercial lines of business. Respondents emphasized that Medicare Advantage and commercial lines can apply different criteria to the same service. CMS local coverage determinations may have different requirements, while a commercial policy demands additional verification. Payers also update thresholds at different intervals. The work is less about a single national rulebook and more about tracking fast-moving variations across dozens of payers and products. Another payer-side medical director summarized, *"The guidelines we use for MA versus commercial are slightly different, still evidence-based, but requirements vary."*

Several interviewees highlighted conflicts and incentives embedded in the ecosystem. UnitedHealth Group's 2022 acquisition of Change Healthcare, maker of the widely used InterQual medical-necessity criteria, has increased stakeholder concerns about neutrality in utilization review. As one professor at a prominent university put it, *"InterQual is owned by a national insurer; even if the algorithms are evidence-based, there is a clear conflict of interest."* The respondent went on to state that the U.S. Department of Justice, along with the states of Minnesota and New York, initially sued to block the deal, arguing the combination would give UnitedHealth access to rivals' sensitive claims and pricing information that could advantage its health plan, UnitedHealthcare. After a district court ruling allowed the transaction to proceed, the companies merged in October 2022. Change Healthcare became a part of UnitedHealth's Optum unit. The Department of Justice eventually dismissed its appeal. Payers not affiliated with United Healthcare became skeptical and attempted to move away from InterQual following the acquisition, on one hand, while some United plans continued to use MCG even post-acquisition. According to multiple estimates, however, MCG still owns 65 to 80 percent of the market share.

Respondents acknowledged that internal medical policies and exclusions could be used to raise denial rates just before Medicare eligibility. Most said they had no evidence that their own organizations do this, while noting that other payers, especially smaller plans, might.

5.2.4 MEDICAL POLICY DESIGN IS INFLUENCED BY COST CONTROL

Across interviews, participants said payer medical policies are shaped by more than medical necessity alone. Clinical evidence matters, but it is weighed alongside cost and competition. A Vice-President at a large payer network described the process plainly: *"We review the literature, but we also look at what competitors are doing… and what will cost us."* In

practice, this means a new policy often reflects three inputs simultaneously: what the studies show, what other plans have already limited or allowed, and what the budget can afford this year.

Several respondents walked through how a policy gets made. A clinical team scans the literature and drafts criteria. An actuary models the cost impact under different rules. Compliance and legal check for federal or state constraints. Leaders then compare their draft to peer plans to see if they are looser or tighter. If a new therapy or drug is very expensive, plans lean toward narrower coverage at launch. This is common for high-cost drugs, advanced imaging, and many surgeries that can be performed at lower-cost sites of care. Interviewees emphasized that vendor guidelines (InterQual or MCG) do not settle the matter. Many payers adopt one of these frameworks but layer on their own rules. One medical director on the payer side summed it up: *"evidence provides a floor, not a ceiling. The final policy reflects our risk tolerance and financial goals for that product line."* Several payers were candid that budgets and medical loss ratio targets sit in the background. They described annual trend mitigation cycles where high-growth categories are flagged for action. That action can be a new policy, a tighter policy, or a push to move care to lower-cost settings. As one respondent said, "*Member experiences matter, but product viability is central."* Respondents did not report any policies at their own organizations that explicitly target members nearing Medicare eligibility. However, they agreed that member enrollment patterns can shape decisions by some payers.

5.2.5 CONTRACTUAL AMBIGUITY AND PROPRIETARY INTERPRETATION IS USED AS A FISCAL CONTROL MECHANISM

Clinicians indicated that many policy documents use open phrases, such as "covered when medically necessary." On paper, that sounds clear, but in practice, it leaves a lot of room for the payer to decide what is necessary at any given time. Plans have their own internal rules, prior-

authorization checklists, and clinical policy bulletins. Some of these borrow from InterQual or MCG, but payers often add plan-specific requirements or override the vendor criteria. Because those rules are proprietary and can change, the bar for approval can move without the clinician or patient realizing it. This flexibility acts like a valve on spending. When costs are a concern, a plan can "tighten" by raising documentation demands, narrowing sites of care, or insisting on extra imaging or specialist notes. When pressure eases or when competition for members is the priority, the plan can "loosen" by auto-approving more requests or simplifying steps. The benefit language remains unchanged, but the operational definition of medically necessary does. A senior president at a payer network, who has worked for large payers across different states for over 25 years, admitted that some specialty vendors, such as EviCore, offer a sliding scale in terms of denial rates, which the payer can adjust. The payer can turn the dial up or down. This dial presents a menu of options in terms of cost savings, calibrated to the level of client dissatisfaction that payers are willing to tolerate. The payer can recalibrate the dial whenever they want without ever having to update their members or face any legal consequences.

Clinicians and billing teams feel this as shifting goalposts. A previously approved request may now require additional proof. Appeals can be effective, but they need time, and peer-to-peer calls often divert physicians from patient visits. Patients experience this as delays in care or as denials. None of that is reflected in the phrase "covered when medically necessary," yet it stems from how the plan interprets those words today. Ambiguity also varies by product line. The same service can face different criteria in Medicare Advantage versus commercial plans because payment incentives differ. In fragmented markets, the problem multiplies as each payer uses its own portal and processes. The effect is that discretionary interpretation allows payers to adjust

utilization up or down in near real-time, using the contract's vague terms as the legal cover for operational changes.

Seen through this lens, the denial increases just before Medicare eligibility can emerge without any payer ever writing a policy that targets enrollees about to age into Medicare. When older commercial members request high-cost services, a plan can tighten its proprietary interpretation of medical necessity. These small operational shifts may disproportionately touch near-Medicare adults because they are more likely to require more care compared to their younger counterparts. Interviewees on the billing side described slower approvals and more peer-to-peer calls for older commercially insured patients. Payers emphasized that criteria differ by product line and may be stricter in commercial plans. Discretionary interpretation functions as a fiscal valve that can raise pre-Medicare denials or deferrals even without explicit age-based rules, potentially explaining the pre-eligibility spike I observe in the data.

5.2.6 PROLIFERATION OF VENDORS LEADS TO DIFFUSION OF ACCOUNTABILITY

Across interviews, people described an ecosystem where many hands touch a single claim. Most hospitals and large practices outsource billing and revenue cycle to firms like Ensemble or Med-Matrix. On the payer side, core functions such as utilization management and appeals are often subcontracted to vendors like Telligen or MES. Each handoff adds a new portal, a new checklist, and a new ticket number. That distance makes it harder for clinicians or billing experts to communicate with payers, leading to a diffusion of both accountability and decision-making power.

This layering shows up as friction at every step. Prior authorizations bounce because a vendor's intake screen requires a specific phrase. Claims remain pending because one contractor

wants a code, while another wants a PDF of the same note. Appeals stretch out because the payer's appeals team is a different company from the one that denied the claim in the first place. Peer-to-peer calls get scheduled through yet another service, pulling physicians out of the clinic to re-explain care plans to a stranger with no access to the full chart. With no mandatory data standards, disputes often fall back to manual work and PDFs. One medical billing expert who has spent the last decade with a large hospital network jokingly stated, *"The number of steps involved in filing a claim is probably greater than the number I walk every day."* To add to the complexity, contracts finish abruptly at times, and vendors change without enough notice, requiring rework of complex claims that were already painstakingly submitted.

To add a further layer of complexity, vendors can have their own medical policies. The payer can choose whether to use the vendor's medical policies or request that they use their own internal ones. These decisions vary by product line and often depend on the type of service. For example, most payers opt to use vendor policies for procedures such as high-cost imaging but typically provide their own policies for services related to Oncology. Respondents consistently identified musculoskeletal procedures and durable medical equipment as two service areas that payers now place "under the spotlight" for potential cost savings. To manage these services, many plans contract with specialized vendors such as Vori, Hinge Health, and Turning Point, which apply proprietary adjudication criteria on behalf of insurers. One former medical director at a large payer described Turning Point's role bluntly: *"Turning Point saved them millions. They were very happy."* This outsourcing reflects a strategy to contain costs in categories where clinical complexity and high spending make denials more defensible.

5.2.7 BENEFIT DESIGN OFTEN OVERRIDES MEDICAL NECESSITY

Interviewees suggested that a substantial share of denials is driven not by medical necessity criteria but by plan benefit design. According to one estimate, more than one in five denials, over 20 percent, are denied due to the procedure not being a covered benefit. These denials occur when a requested service is excluded from coverage under the terms of the benefit package, regardless of its clinical appropriateness. Examples include services considered experimental, certain forms of durable medical equipment, or fertility treatments that are excluded under many commercial plans. Respondents noted that these types of denials can be especially frustrating for clinicians and patients because they are not tied to a judgment about whether the service is necessary, but instead to contractual coverage limits.

5.2.8 PRIOR AUTHORIZATION (PA) AUTOMATION IS EXPANDING BUT IMPERFECT

Current prior authorization practices are very costly. Payer side respondents discussed how prior authorization requirements are evaluated through a return-on-investment lens. The administrative cost of processing a single prior authorization was estimated at roughly $200, and payers generally expect a four- to five-fold return on investment for the prior authorization to be worthwhile. Across interviews, respondents saw prior authorization (PA) automation as both inevitable and helpful. The main advantages were speed and clarity. Clinicians can complete a short, policy-based questionnaire in the portal and receive an answer in real-time. Auto approval reduces back-and-forth and lets nurses and physicians focus on patients rather than paperwork. Additionally, when criteria are surfaced upfront, clinicians learn what evidence a plan expects, allowing first-pass submissions to improve over time.

Everyone stressed a key asymmetry in these tools, which is that the software can only approve. If the answers meet the policy threshold, the software issues an instant approval number. If they don't, the case is routed to a human, first to a nurse for record review, and then, if still not meeting the criteria, to a medical director for a possible denial. That design is intentional. A senior manager on the payer side said, *"It keeps denials under clinical oversight and within regulatory due-process rules, while automation handles more straightforward cases."*

Leaders also described how newer systems would connect directly to the EHR to retrieve patient charts, medications, laboratory results, imaging reports, and care summaries. As a clinician orders a service, the PA engine can pre-check requirements in real time and display what's missing. That can reduce rework and help patients schedule sooner. Interviewees flagged three risks, including data quality, variation in coding practices, and exclusion of smaller practices that might not have access to EHR systems. PA automation has the potential to expedite appropriate care, but it still relies on the premise of the availability of high-quality electronic documentation and human review.

Respondents agreed that automated prior authorization is most effective for straightforward cases. As medical complexity rises, the logic breaks down, and human review is required. Since complexity typically increases with age, older members are more likely to trigger exceptions, prolonging approvals despite attempts at automation.

5.2.9 CLAIMS AUTOMATION AND SYSTEMS INTEROPERABILITY: HL7 DA VINCI PROJECT VS AI

Claims automation is spreading across health plans and hospitals, and a lot of the momentum comes from the Da Vinci Project and advances in AI. FHIR is a shared data language for health care software. Da Vinci publishes step-by-step guidelines that demonstrate how payers and electronic health records (EHRs) should utilize this language for practical tasks, such as verifying coverage, applying prior-authorization (PA) rules, submitting the appropriate clinical notes, etc. The goal is a simple one, an executive at a large vendor stated: *"fewer faxes and phone calls, fewer bounced requests, and faster yes/no answers."* In practice, this appears as the EHR asking the health plan, in real-time, "Is this service covered for this patient, and what criteria apply?" The plan returns the policy details and the specific data that must be attached. The EHR can then assemble a clean request using the correct codes or clinic notes and submit it electronically. When done well, that cuts down on back-and-forth and reduces manual rework. Interviewees highlighted the promise of quicker decisions and fewer administrative touchpoints.

On the other hand, some respondents noted that the Da Vinci project is losing momentum due to advances in AI. Since AI has the potential to review and summarize medical records faster than manual reviews, it reduces the value that the Da Vinci project has to offer. A top executive at a medical necessity criteria company noted that their services have three layers: content, workflow tools, and interoperability. *"AI makes it faster to read faxes, making Da Vinci less attractive. We are now more focused on AI to increase the interoperability of our product",* he noted.

People were also realistic about limits. Not every organization codes the same way, so two clinics can describe the same visit with different codes. If the data do not align with what a plan expects, automation will not be of much help. Adoption is uneven, too. Large systems and

national payers tend to move first, while small practices may still rely on paper charts, scanned PDFs, or older EHRs that cannot yet speak FHIR well. That creates an asymmetric world where some requests flow smoothly and others still bog down. Several respondents noted that structural constraints remain, despite automation. Since many clinicians and payers outsource billing, utilization review, or appeals to different vendors, each extra handoff can add complexity that technology alone cannot fix. One respondent said that claim automation might be less likely to work for older commercially insured respondents due to their complex case histories and general higher levels of utilization, *"The more codes we have to chase, the higher the chance something gets missed…and the workflow breaks."*

5.2.10 ENROLLMENT TENURE AND FINANCIAL INCENTIVES IN CLAIMS ADJUDICATION

Several respondents suggested that the average enrollment span of commercially insured members is considered when adjudicating high-cost claims. A former medical director from a large national insurer explained that, on average, *"the member stayed with us for three years. If they were close to the three-year mark, that could potentially influence decision-making for high-cost claims."* Another respondent who has held executive positions across large payers for over 25 years validated this. This highlights how short enrollment horizons can influence corporate incentives to contain costs. Other payer-side participants confirmed that the average tenure typically falls between three and three and a half years. This number highlights the transient nature of coverage in the commercial market. Respondents suggested that this churn environment encourages payers to scrutinize claims that exceed expected spending for the typical enrollment window, primarily when the benefits of treatment may not accrue until years later.

This creates conditions where utilization review is not only about medical necessity but also about whether the insurer will ultimately be responsible for the costs. The interviews highlight how member tenure becomes an embedded metric in high-cost claim adjudication, linking financial incentives to denial rates.

5.2.11 LIMITATIONS

While the expert interviews provided valuable insights into the mechanisms underlying insurance churn and payer behavior, they were also subject to several limitations. Firstly, I relied on snowball sampling to recruit respondents from the health insurance and medical billing industries. Participants were not randomly selected, and the final sample may overrepresent the perspectives of specific geographic regions or organizational types. Secondly, because many interviewees were referred through professional networks or previous participants, there is a possibility of selection bias. Thirdly, discussions about corporate moral hazard or strategic authorization decisions may have been softened or avoided due to concerns about social desirability. Fourthly, all interviews were not equally informative, and the amount of information shared varied depending on the participant's comfort level. Some interviews were more in-depth than others.

Lastly, I conducted a manual thematic analysis, which also introduces the possibility of interpretive bias. Theme construction reflects my own interpretive lens. Although the study included a range of payer types, it did not include direct representation from federal regulatory agencies, such as CMS, or from leadership at national hospital associations. Including such perspectives might have further enriched the understanding of policy-level constraints and physician-side responses to churn. Despite these limitations, the qualitative interviews added

critical depth to the dissertation's quantitative findings and highlighted potential mechanisms that would have otherwise been inaccessible.

6.0 DISCUSSION

Question 1: Around the predictable transition from commercial coverage to Medicare at age 65, do commercial insurers exhibit higher claim denial rates in the years preceding eligibility?

The NH APCD shows a statistically significant correlation between denial rates and Medicare eligibility. My model cannot establish causation, but it hints at a suspicious pattern worth further investigation. While the rate of denial uptick may not be astronomical at the aggregate level, the differences may be more pronounced when examining specific service types or individual payers. For example, musculoskeletal procedures or claims for durable medical equipment have higher denial rates when looked at individually. My quantitative results align with my interview themes, as both types of services are seen to have a higher incidence of denials in the claims data and were also identified by respondents as high-cost services with specialized processing requirements. These service categories are also more likely to get outsourced to third-party claim adjudicators. Similarly, I was unable to distinguish between different payers in our data. Denial rates may vary significantly across insurers, even within the commercial market. Several respondents suggested that plan size, among other factors, may be correlated with variations in denial rates. Specific payers may be less likely to process claims in good faith compared to others, and looking at averages might distort the size of the effect. Having payer-level data could help disentangle this limitation in the future.

I also have limited controls at the patient, clinician, and payer levels. For example, at the patient level, my data does not include information about benefit design, which is one of the top predictors of denials according to experts. I also have limited information about the socio-economic characteristics of beneficiaries, like income and education. At the clinician level, I am

unable to distinguish between individual clinicians and practices. I also do not have information on the ownership of practices, including whether they are for-profit, government-owned, or not-for-profit entities. At the payer level, one of the significant limitations after being unable to identify specific payers is the lack of visibility into the medical policies and medical necessity criteria used by each company.

Lastly, my analysis is geographically limited to one state and denial patterns might vary significantly by geography and state level policies. Despite all the complexities in being able to measure the impact of anticipated insurance transitions on denial variation, my model offers a glimpse in plausible strategic behavior employed by payers to offset costs in the face of imminent policy cancellations.

Question 2: If commercial denial rates rise pre-65, are payer strategies a potential driver for this change?

Definitely attributing payer-side corporate moral hazard as the driver for the correlation between the ramp-up to Medicare eligibility and denial rates is not possible. However, themes identified in the interviews suggest that cost containment is a central priority for payers and manifests in different ways throughout the life cycle of an insurance policy. Denials can be driven by benefit design, exclusions, and carveouts, regardless of medical necessity, even before a claim is filed. They can also be tied to average anticipated churn rates and member tenure. High-cost services may have specialized processes in place for claim adjudication, and industry trends can also inform internal medical policies. Given the different levers available to commercial insurers, and the lack of oversight and laws around claim processing, it is very well possible for payers to deny claims when they are in legal gray areas in order to curb costs.

I chose to focus on the commercial to Medicare transition because it was the most straightforward one to identify, given data limitations. However, payers have a lot more visibility into churn patterns that are not identifiable in research-level claims data. For example, most payer-side interviewees suggested that the average enrollment span for their members was between three and three and a half years. There might be more systematic associations between churn and denial variation that cannot be observed in publicly available files. One of the significant contributions of my research is the acknowledgment of potential corporate moral hazard by industry experts. I cannot quantify or prove the degree of the incentive misalignment. However, by researching an understudied topic that impacts the health and well-being of millions of Americans every day, my research signals that there might be some truth behind the public distrust of one's health insurance company.

7.0 CONCLUSION

Denial rates increase with age leading up to Medicare eligibility, and there are multiple potential drivers for this relationship. My dissertation focuses on payer-side incentives and how misalignment of these incentives can manifest as corporate moral hazard. The interviews I conducted revealed interesting and novel trends, with respondents admitting that denials are often associated with policy enrollment spans, denial rates can arbitrarily change contingent on a private payer's financial strategies, regardless of changes in medical necessity, and that medical policies are grounded in what coverages competitors are offering. While the interviews could not identify the universe of potential adverse behavior, they were able to demonstrate that the principles of *uberrima fides* are not central to claim adjudication, as many might believe. In the absence of legislation and standardization of medical necessity, perverse incentives generated by a fractured health finance system can have profound consequences for healthcare provision. While certain payers may choose not to engage in adverse behaviors, there should be a more thorough investigation into which payers might and what mechanisms they might utilize for the same purpose.

8.0 FUTURE RESEARCH DIRECTIONS

Given the complexity of the system and the lack of centralized data sources, the issue of whether and how health insurance companies in the US may engage in corporate moral hazard needs to be studied at different levels and with different lenses. Within the context of insurance churn, a straightforward approach could be to utilize the Delayed Services Algorithm, which I developed, to replicate this analysis for other States that have APCDs available for researchers to determine if similar trends persist. The flexibility of the algorithm lies in its reproducibility at different levels. It can also be run using hospital EHR's to look at denial variation at a more micro level or across multiple payers for cross state analysis. A simple improvement would be to recreate the NH commercial to Medicare transition analysis after getting payer level identifiers merged to the publicly available analytic files that I used for this dissertation. However, claims-based analysis by itself would be insufficient to robustly prove incentive misalignment. Multiple qualitative study directions can help shed light on mechanisms for denial variation. For example, an interesting direction would be to look at medical policies for specific high-cost services across payers and compare them to see which payers are more aggressive with denials compared to their counterparts. Investigating specific high-cost services, at the same site of care and comparing medical necessity criteria, which are typically available on public websites, could help identify patterns across payers and regions. Also, further exploration into how scientific evidence is converted to medical necessity guidelines could also highlight incentive misalignment across different actors. For example, which entities are funding the research and what is the process for selecting this work to convert into standardized care plans? What are the sample size requirements, and how neutral is guideline formation? Types of carve-outs during benefit design could be another dimension to explore, and denial patterns across different

product lines, even for the same payer. While the complexity in detangling the impact of various drivers of denial variation can be enormous, more research is needed in this direction to help improve access to care in the US. The architecture of complexity inherent to the US health finance system, whether accidental or by design, creates smoke and mirrors that not only reduce transparency but also invite incentive misalignment and potential corporate moral hazard. Research that highlights these opaque processes can help inform future policy decisions.

Appendix A

Alternative Model 1 Singular Cut off

Segment 1 (<65 slope)	0.0038	0.0004	9.12	0	0.0030	0.0047
Segment 2 (65+ slope)	-0.0001	0.0006	-0.11	0.909	-0.0012	0.0011
Level shift at 65	-0.0903	0.0153	-5.91	0	-0.1202	-0.0603
Charlson Comorbidity Index	-0.0003	0.0017	-0.19	0.847	-0.0037	0.0031
Sex						
Male	0.0027	0.0019	1.45	0.146	-0.0009	0.0064
Unknown	-0.0742	0.0517	-1.43	0.152	-0.1756	0.0272
Commercial Insurance Type						
EPO	-0.0376	0.0126	-2.99	0.003	-0.0622	-0.0130
IND	-0.1003	0.0161	-6.25	0	-0.1317	-0.0688
POS	-0.0489	0.0100	-4.89	0	-0.0685	-0.0293
PPO	-0.0806	0.0116	-6.93	0	-0.1034	-0.0578
Constant	-0.0266	0.0267	-1	0.319	-0.0790	0.0257

Table 6: Alternative Model 1 Singular Cut off

Alternative Model 2 All Claims

Segment 1 (<60 slope)	-0.0006	0.0004	-1.65	0.099	-0.0013	0.0001
Segment 2 (60-65)	0.0006	0.0003	1.67	0.096	-0.0001	0.0012
Segment 3 (65+ slope)	-0.0008	0.0002	-3.17	0.002	-0.0012	-0.0003
Level shift at 60	0.0000	0.0013	0	0.998	-0.0025	0.0025
Level shift at 65	-0.0583	0.0115	-5.09	0	-0.0808	-0.0359
Charlson Comorbidity Index	-0.0024	0.0008	-3.05	0.002	-0.0039	-0.0008
Sex						
Male	0.0028	0.0007	4.06	0	0.0015	0.0042
Unknown	0.0613	0.0644	0.95	0.341	-0.0648	0.1875
Commercial Insurance Type						
EPO	-0.0333	0.0059	-5.68	0	-0.0448	-0.0218
IND	-0.0889	0.0085	-10.48	0	-0.1055	-0.0722
POS	-0.0462	0.0052	-8.87	0	-0.0565	-0.0360
PPO	-0.0770	0.0076	-10.15	0	-0.0919	-0.0621
Constant	0.2462	0.0203	12.14	0	0.2065	0.2860

Table 7: Alternative Model 2: All Claims

Alternative Model 3 Logit

Segment 1 (<60 slope)	-0.0012	0.0039	-0.31	0.76	-0.009	0.006
Segment 2 (60-65)	0.0037	0.0032	1.15	0.251	-0.003	0.010
Segment 3 (65+ slope)	0.0015	0.0025	0.6	0.547	-0.003	0.006
Level shift at 60	0.2776	0.0149	18.62	0	0.248	0.307
Level shift at 65	-0.5008	0.0247	-20.28	0	-0.549	-0.452
Charlson Comorbidity Index	-0.0024	0.0008	-3.05	0.002	-0.0039	-0.0008
Sex						
Male	-0.0048	0.0064	-0.76	0.448	-0.017	0.008
Unknown	-0.4760	0.5246	-0.91	0.364	-1.504	0.552
Commercial Insurance Type						
EPO	-0.1987	0.0181	-11.01	0	-0.234	-0.163
IND	-0.9727	0.0527	-18.44	0	-1.076	-0.869
POS	-0.2308	0.0200	-11.54	0	-0.270	-0.192
PPO	-0.6260	0.0189	-33.14	0	-0.663	-0.589
Constant	-1.5408	0.2228	-6.92	0	-1.977	-1.104

Table 8: Alternative Model 3: Logit with No Fixed Effects

Appendix B

Consent Form

Institutional Review Board
1204 Marie Mount Hall ● 7814 Regents Drive ● College Park, MD 20742 ● 301-405-4212 ● irb@umd.edu

CONSENT TO PARTICIPATE

Project Title	*Health Insurance Churn in the US*
Purpose of the Study	*This research is being conducted by **Mah-Afroze Chughtai** at the University of Maryland, College Park. We are inviting you to participate in this research project because you have valuable insights into the health insurance market. The purpose of this research project is to isolate the impact of health insurance churn on payer incentives in the US.*
Procedures	*The procedure involves a virtual unstructured interview approximately 45 mins in duration. If the interviewee permits, the interview will be audio recorded using a personal recorder and the recording will be saved as a password protected file. If the interviewee does not grant permission, only notes will be taken which will later be encrypted and then stored as a password protected file.*
Potential Risks and Discomforts	*There may be some risks from participating in this research study including potential data leaks. To mitigate risk of breach of confidentiality all identifying material will be stored in an encrypted and password protected file. Respondents are also free to skip any question they do not wish to answer.*
Potential Benefits	*There are no direct benefits from participating in this research. However, possible benefits include helping us answer an important health policy question in the US. We hope that, in the future, other people might benefit from this study through improved understanding of health insurance churn.*

Confidentiality	*Any potential loss of confidentiality will be minimized by storing responses in encrypted and password protected files. Only the interviewer will have access to identifiable information which will be stored in a password protected laptop. All personal identifiers will be deleted at the end of the project unless the interviewee chooses to be identified for the purpose of the project.* *If we write a report or article about this research project, your identity will be protected to the maximum extent possible. Your information may be shared with representatives of the University of Maryland, College Park or governmental authorities if you or someone else is in danger or if we are required to do so by law.*
Right to Withdraw and Questions	*Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify.* *If you decide to stop taking part in the study, if you have questions, concerns, or complaints, or if you need to report an injury related to the research, please contact the investigator:* ***Mah-Afroze Chughtai*** ***28 Dixey Dr. Middleton MA, 01949*** ***mafroze@umd.edu*** ***703-447-9734***
Participant Rights	*If you have questions about your rights as a research participant or wish to report a research-related injury, please contact:* University of Maryland College Park Institutional Review Board Office 1204 Marie Mount Hall College Park, Maryland, 20742 E-mail: irb@umd.edu Telephone: 301-405-0678 *For more information regarding participant rights, please visit:* https://research.umd.edu/research-resources/research-compliance/institutional-review-board-irb/research-participants

	This research has been reviewed according to the University of Maryland, College Park IRB procedures for research involving human subjects.
Statement of Consent	*Your oral consent indicates that you are at least 18 years of age; you have read this consent form or have had it read to you; your questions have been answered to your satisfaction and you voluntarily agree to participate in this research study. You may save a copy of this consent form.* *If you agree to participate, please provide oral consent.*

Interview Question Prompts

Last updated: 1st Jan 2024

1. Industry Overview:
    - Can you provide an overview of the current state of health insurance churn in the industry?
    - How has health insurance churn evolved over the past few years, and are there any notable trends?
2. Factors Contributing to Churn:
    - From an industry standpoint, what are the primary factors contributing to health insurance churn?
    - How do changes in employment, eligibility criteria, and market dynamics influence churn rates?
3. Data and Analytics:
    - How does your organization utilize data and analytics to understand and address health insurance churn?
    - Are there specific metrics or indicators that are closely monitored to assess churn patterns?
4. Customer Education and Communication:
    - What strategies does your company employ to educate customers about their health insurance options and minimize confusion?
    - How do you communicate changes in plans or coverage to ensure a smooth transition for policyholders?

5. Policy and Regulation Impact:
    - How do changes in healthcare policies and regulations impact health insurance churn?
    - Are there specific policy reforms that could potentially reduce churn and enhance stability in the industry?
6. Technological Solutions:
    - In what ways is technology leveraged to address health insurance churn?
    - Are there innovations or digital tools that have proven effective in retaining policyholders?
7. Provider Network Management:
    - How does the management of provider networks contribute to or mitigate health insurance churn?
    - What efforts are made to ensure network adequacy and accessibility for policyholders?
8. Customer Retention Strategies:
    - What customer retention strategies has your organization implemented to reduce health insurance churn?
    - Are there specific initiatives aimed at keeping policyholders satisfied and engaged?
9. Collaboration with Healthcare Providers:
    - How does your company collaborate with healthcare providers to improve the overall health insurance experience for policyholders?

- Are there joint initiatives to enhance the coordination of care and reduce disruptions in coverage?

10. Future Industry Outlook:
    - From your perspective, what do you foresee as potential future challenges and opportunities related to health insurance churn?
    - Are there industry-wide initiatives or innovations on the horizon that could impact churn rates?
11. Public Health Initiatives:
    - How does your organization participate in or support public health initiatives that aim to reduce health insurance churn?
    - Are there collaborations with government agencies or non-profit organizations in this regard?

Exemption Letter

UNIVERSITY OF MARYLAND
INSTITUTIONAL REVIEW BOARD

1204 Marie Mount Hall
College Park, MD 20742-5125
TEL 301.405.4212
FAX 301.314.1475
irb@umd.edu
www.umresearch.umd.edu/IRB

DATE:	January 29, 2024
TO:	Mah-Afroze Chughtai
FROM:	University of Maryland College Park (UMCP) IRB
PROJECT TITLE:	[2131405-1] HEALTH INSURANCE CHURN IN THE US
SUBMISSION TYPE:	New Project
ACTION:	DETERMINATION OF EXEMPT STATUS
DECISION DATE:	January 29, 2024
REVIEW CATEGORY:	Exemption category # 45CFR46.104(d)(2ii) & (4i-ii)

Thank you for your submission of New Project materials for this project. The University of Maryland College Park (UMCP) IRB has determined this project is EXEMPT FROM IRB REVIEW according to federal regulations.

We will retain a copy of this correspondence within our records.

If you have any questions, please contact the IRB Office at 301-405-4212 or irb@umd.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within University of Maryland College Park (UMCP) IRB's records.

Appendix C

Delayed Services Algorithm (STATA)

```
**********************************************************
* Delayed Services Identification Algorithm
* Adaptable to any multi-payer dataset like APCDs or Medical Billing Systems with variables listed in the legend below
* Adjust variable names and values as needed
**********************************************************

**********************************************************
* Legend
**********************************************************
* from_year= year the claim is files
* age= age of te patient
* lob= line of business (commercial or Medicare) (maybe different depending on base data)
* sv_stat= claim-line status (D=Deniad, R=Adjusted and P=Paid in our data)(Adjust if different)
* proc= claim line level procedure codes
* claim_id_key= claim number

*-----------------------------------------------------*
* Loop through each year of data available in the claims database
*-----------------------------------------------------*
local years 18 19 20 21 22 23     // last 2 digits of years
foreach y of local years {
    * Load master dataset for year
    use "Master.dta", clear
    keep if from_year == 20`y'

    *-----------------------------------------*
    * STEP 1: Create claim status counts by age and by procedure code
    *-----------------------------------------*
    collapse (count) n_services = claim_id_key, by(age lob sv_stat proc)

    gen denied_count    = cond(sv_stat == "D", n_services, 0)
    gen adjusted_count = cond(sv_stat == "R", n_services, 0)

    collapse (sum) total_claims=n_services ///
             (sum) sum_denied=denied_count ///
             (sum) sum_adjusted=adjusted_count, by(age proc lob)

    gen ratio_denied_adjusted = (sum_denied + sum_adjusted) / total_claims

    *-----------------------------------------*
    * STEP 2: Calculate pre-Medicare Denial Rate for Patients Aged 60–64
```

```
    *-----------------------------------------*
    preserve
        keep if age >= 60 & age < 65 & lob == "COMMERCIAL"
        collapse (sum) total_claims sum_denied sum_adjusted, by(proc)

        gen ratio_denied             = sum_denied / total_claims
        gen ratio_adjusted           = sum_adjusted / total_claims
        gen ratio_denied_adjusted = (sum_denied + sum_adjusted) / total_claims

        save preMed_toplist`y'.dta, replace
    restore
    *-----------------------------------------*
    * STEP 3: Compare rates with the younger cohort aged 55–59 and
    * only retain services with a 10 percentage point or more increase in denials
    *-----------------------------------------*
    preserve
        keep if age >= 55 & age < 60 & lob == "COMMERCIAL"
        collapse (sum) total_claims sum_denied sum_adjusted, by(proc)

        gen ratio_denied             = sum_denied / total_claims
        gen ratio_adjusted           = sum_adjusted / total_claims
        gen ratio_denied_adjusted = (sum_denied + sum_adjusted) / total_claims

        rename ratio* ratio*55
        rename sum* sum*55
        rename total_claims total_claims55

        merge 1:1 proc using preMed_toplist`y'.dta
        keep if _merge == 3
        drop _merge

        keep if ratio_denied >= 1.1 * ratio_denied55

    save delayed_services`y'.dta, replace
}

*-----------------------------------------------------*
* Combine the list of delayed procedure codes across years
*-----------------------------------------------------*
use delayed_services18.dta, clear
foreach y of local years {
    if "`y'" != "18" {
        append using delayed_services`y'.dta
    }
}
save delayed_services_all.dta, replace
```

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