

Price Transparency's Impact on Hospital Prices: pg. 17





Contents

The Vanderbilt Undergraduate Research Journal Staff	ii
A Letter From the Editors	1
 North, South, East, West, and Briley: What the 1958 and 1962 Metro Nashville Consolidation Reveals about Suburban and Urban Voters	 3
 On the Immorality of Mandatory Reporting for Suicide on College Campuses	 11
 Price Transparency's Impact on Hospital Prices: An Analysis of the 2021 Hospital Transparency Final Rule	 17
 Shaping the Past: Architecture as a Carrier of Meaning in the Restorations of Pantokrator Monastery	 35
 The Medicalization of Grief	 38
 The surreal in Julio Cortázar's Cosmopolitan Works and Gabriel García Márquez's Provincial World	 43
 Variability in the Daily Activity of the Nine-banded Armadillo across the Americas	 49





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Letter from the Editors

Dear Vanderbilt Community,

We are excited to announce the 16th volume of The Vanderbilt Undergraduate Research Journal (VURJ). VURJ is a student-run research journal, which publishes across all 7 disciplines at Vanderbilt University: Natural Science, Social Science, Economics/Political Science, Education and Human Development, Humanities, Math/Physics, and Engineering.

In this edition, we are honored to announce seven manuscripts which went through a strict review and revision process by our reviewer and copy-editing team. Three of our manuscripts were recognized by the Immersion Office, earning cash awards. The first winner earning \$250 was Jacqueline Huang, who wrote “Price Transparency’s Impact on Hospital Prices: An Analysis of the 2021 Hospital Transparency Final Rule.” Our two runners-up, earning \$150 each, were Camille Brice, who wrote, “The Surreal in Julio Cortazar’s Cosmopolitan Works and Gabriel Garcia Marquez’s Provincial World,” and Colin Wilson, who wrote “Variability in the Daily Activity of the Nine-banded Armadillo across the Americas.”

We are grateful for the support of Carolyn Floyd, J.D., Senior Director of the Office of Experiential Learning and Immersion Vanderbilt. She has been extremely supportive throughout this process, and we are honored to be able to work under such an incredible mentor.

We also want to recognize Dr. John Bradley, Ph.D., Director of the Vanderbilt Writing Studio and Tutoring Services, who led our 6th Writing Studio Training Session. His training sessions have been influential to the Editorial Review Board and Copy-Editing Team as they reviewed papers thoroughly and critically.

Additionally, we want to thank our supportive team of faculty and graduate student mentors for their commitment to training our Editorial team and evaluating papers for our Manuscript competition.

Lastly, we want to thank our supportive Executive Board, Managing Editor Team, Editorial Review Board, Copyeditors, and committee members for their support throughout the year. Research is an important part of Vanderbilt’s community, and we strive to create an open community where everyone can share their ideas and collaborate with each other to expand the sphere of research.

Happy reading!

Alexis Mowrer- *editor-in-chief*





VURJ





North, South, East, West, and Briley: What the 1958 and 1962 Metro Nashville Consolidation Reveals about Suburban and Urban Voters

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Abstract

The consolidation of the Metropolitan Government of Nashville and Davidson County is often framed as a story of administrative reform intended to modernize government, eliminate duplication, and improve efficiency. This paper argues that Nashville's path to consolidation reveals far more than bureaucratic reorganization. The failure of the 1958 consolidation proposal and the success of a nearly identical plan in 1962 expose the political, economic, and social divisions between suburban and urban voters in a mid-sized southern city during the midtwentieth century. By examining voting patterns, public discourse, and policy developments, this study asks why the 1958 proposal failed and why it succeeded just four years later. Drawing on newspaper coverage, planning commission reports, voting data, and oral history interviews, the paper traces how consolidation shifted from a city-driven initiative to a negotiated settlement shaped by suburban concerns. It argues that suburban opposition stemmed from fears of increased taxation, loss of local control, and domination by urban officials, particularly in areas such as education and public services. Consolidation succeeded only after political leaders

"It may be a safe prediction that within the space of two years many in this community who undoubtedly fell victim to irresponsible claims patently intended to spread confusion and doubt will wish for another shot at the opportunity they have allowed to slip by,"

warned *The Nashville Tennessean* on June 18, 1958, the day after Nashville voters rejected a proposal to consolidate the city and county governments. ("Opportunity missed; a challenge ahead," 1958) Four years later, almost to the day, that prediction proved true. In 1962, after years of political maneuvering, strategic compromise, and vicious campaigning, the residents of Nashville and Davidson County voted to merge into a single metropolitan government.

The story of the Metropolitan Government of Nashville and Davidson County (Metro for short) consolidation appears to be one of purely administrative reform. A story of an attempt to modernize local government, eliminate duplication, and bring efficiency to public services. However, Nashville's path to consolidation reveals more than a bureaucratic reorganization. The consolidation debate became a battleground for competing visions of governance, taxation, and social control. The failure of the 1958 proposal and the eventual success of the 1962 plan depict the political, economic, and social differences between suburban and urban residents

in a mid-sized southern city in the middle of the 20th century. The changing ballot box in these elections reveals the intensely competing motivations and ideals between the residents of the old city and the old county, despite living merely miles apart.

This paper asks: Why did the 1958 consolidation proposal fail, and why did a nearly identical proposal pass just four years later? What changed in the political landscape, and what can this shift tell us about the broader dynamics between urban cores and suburban peripheries? By exploring the evolution of public sentiment, political strategy, and economic pressure, this paper traces how Nashville's consolidation moved from city-driven ambition to a carefully negotiated settlement, revealing the underlying differences between urbanites and suburbanites.

Prior scholarship frames Nashville's city-county consolidation as both administrative reform and negotiated political compromise (Booth, 1963; Hawkins, 1966; Deng et al., 2022; Raymond & Meinfeld, 2011). Early studies emphasize efficiency and institutional structure, while later work highlights suburban resistance and the role of safeguards such as service districts. Comparative research suggests consolidation often succeeds not by integrating urban and suburban interests, but by preserving suburban autonomy within metropolitan systems. This paper





builds on that scholarship by examining how the political shift between 1958 and 1962 transformed consolidation from a city-driven initiative into a negotiated settlement shaped by suburban priorities.

While previous scholarship has extensively analyzed the structure and efficiency of Nashville's consolidation, this paper focuses on the political shifts between 1958 and 1962 and the specific mechanisms that secured suburban buy-in. The failure of the 1958 proposal and the passage of the 1962 plan proved more than just administrative events but also occurred as a result of years of political maneuvering, economic coercion through annexation policies, and a suburban realization of the inevitability of consolidation. This paper builds upon existing studies but emphasizes what the change between 1958 and 1962 reveals about suburban and urban interests as well as how suburban and urban competing interests shape governance structures.

The failure of the 1958 consolidation proposal and the success of the 1962 plan reveal the fundamental divide between urban and suburban interests in governance, taxation, public services, and political power. While Nashville's city leaders pursued consolidation to expand its tax base, centralize administration, and modernize infrastructure, suburban voters feared losing control over local governance, school districts, and taxation policies. Only after city leaders restructured the proposal to preserve suburban autonomy did consolidation gain the necessary support to pass. The transformation of consolidation from a city-driven initiative into a negotiated settlement highlights how suburban interests shaped metropolitan governance, addressing long-term disparities in service allocation, economic development, and political influence.

Between 1940 and 1960, the population of suburbs in Davidson County grew from under 90,000 residents to nearly 230,000 residents. In contrast, the central city of Nashville grew by merely 3,000 residents over those same years, hovering around 170,000 by 1960 (Hawkins, 1966, p. 17). Middle-class families left the city in increasing numbers in search of new housing, better schools, and greater autonomy in the suburbs. As subdivisions spread, local infrastructure lagged. Suburban residents paid nearly double the

water rates of their urban counterparts, subscribed to private garbage collection, and faced limited access to public services. A report authored by the Nashville City Planning Commission and the Davidson County Planning Commission, published in *The Nashville Tennessean* in 1956, outlined these growing inequalities. It noted that most suburban services either operated on a subscription basis, cost more than in the city, or failed to meet basic urban standards. ("Plan of metropolitan government for Nashville and Davidson County", 1956). At the same time, the fractured structure of local governance left no single entity capable of addressing area-wide challenges.

This fragmentation led to a "dispersion and dissipation" of residents' control in the government ("Plan of metropolitan government for Nashville and Davidson County", 1956, p. 17). As the public received fewer effective services, residents lacked a clear, singular path to addressing inefficiencies. These inefficiencies, combined with the mounting service demands of a growing population, led local leaders and planners to call for the "elimination of duplicated services," a point Charles Galbreath, a former judge, echoed decades later in a 1995 interview (Galbreath, 1995).

In the context of these growing tensions, city and county planners introduced the 1958 consolidation proposal. The plan outlined a comprehensive governmental merger that would immediately eliminate the separate city and county administrations. The new metropolitan charter aimed to consolidate all primary services, including police, sanitation, road maintenance, and fire protection, under a single centralized authority. The Planning Commission focused on "equitable and sound financing" of services, meaning taxpayers did not pay for more services than they received. ("Plan of metropolitan government for Nashville and Davidson County", 1956, p. 29) To ensure equity, the Charter created a "general services district" for the entire county and an "urban services district," providing more services for the urban area. Notably, the Charter subjected those living within the "urban services districts" to a higher tax rate. The Planning Commission defended the two-district idea as the best approach against the issue of ensuring that they receive fair taxes based on services. The report argues that the





separated service districts provided taxpayers to only pay for the level of services needed. The success of the proposal rested on the suburban voters' understanding of the fairness of a tiered system and that the proposal minimized tax increases.

The proposal promised clear lines of responsibility, expanded services, and a governing structure with the capacity to manage Nashville's metropolitan growth. The charter called for the elimination of overlapping boards, streamlined budgeting, and representation for suburban residents within the new metro council. On June 13, 1958, a few days before the vote, an editorial in the *Tennessean* pleaded with residents to vote for the proposal. The *Tennessean* argued that consolidation would afford residents working in the city but living in fast-growing suburbs like Donelson representation in the city. ("To those without a voice", 1958)

Still, the proponents failed to quell all the residents' fears. Many rural voters feared the cost of change, suspecting a shift in the tax burden while not delivering equal services. Though the tiered service system meant a lesser increase in taxes, the county residents feared any tax increase. Also, the 1958 proposal signaled to county residents a loss of autonomy, a threat to localized control, and a potential overtaking of suburban priorities by urban officials. The groundwork for the 1958 vote had been laid, and the lines between city and suburb had already hardened.

On June 17, 1958, the county residents utilized their voice, voting against the proposal, ending any hopes for consolidation. The referendum saw opposite results between the county and city votes, as nearly 60% of county residents voted against the proposal, as opposed to the slightly over 60% of city residents in favor of the charter (Booth, 1963, p. 21). Importantly, residents of the contiguous suburban areas voted 52% in favor, greatly contrasting the barely 20% pro-vote among other, more rural, county residents. This clear pattern between the votes of voters living miles apart demonstrates an increasing fear of the city as the distance from the city increases. Rural county residents feared the city's heavy taxes and the more direct control that followed the higher taxes.

County residents viewed, as a former city official explained in a 1994 interview, the proposal as a "city takeover." (Deep, 1994) A study conducted in November 1958, interviewing residents of the anti-consolidation Berry Hill and pro-consolidation Belle Meade, two similar "pseudo-municipalities" within Nashville, corroborated this geographically-influenced divide. (Booth, 1963, p. 38) The study found that those identifying their backgrounds as "rural" voted against Metro more than those identified as "urban." (Booth, 1963, p. 48) The study also revealed that a fear of higher taxes and a satisfaction with the status quo proved the most significant influences for a vote against the measure. (Booth, 1963, p. 41) Suburban residents feared higher taxes and a loss of control to the city if Metro passed.

A *Tennessean* article released the day following the 1958 referendum described the results of the previous day's tragic irony ("Opportunity missed; a challenge ahead", 1958) The tragic irony being the alternative solution for Nashville's goals of expanding the tax base resulting in a less efficient, more infelicitous option.

Shortly following the failure of the 1958 proposal, Nashville and Mayor Ben West started pursuing alternative solutions to the tax base issue. The two primary solutions included the "Green Sticker Tax," a tax intended to target county residents using city streets, and annexation, which extends the city's boundaries and tax base to incorporate more urban areas without a referendum. Both solutions, however, faced much opposition. (Hawkins, 1966, p. 60)

By 1960, Ben West had implemented a new taxation policy to target county residents working in the city. The "Green Sticker Tax," named after the green stickers placed on cars, taxed those who used Nashville's streets, unfairly targeting county residents. Drivers paid ten dollars to register their vehicles if they lived outside city limits. The tax policy was soon very unpopular. As city councilman Charles Bramwell argued in 1960, the tax was "the most unpopular tax ever levied on people." ("Council refuses to kill car tax", 1962) One letter to the editor described it as Mayor West's "way of reprimanding" county residents. ("Two types of planned annexation", 1961) Many residents labeled the tax as a form of "taxation without





representation.” Critics saw the policy not as fair cost-sharing but as a form of punishment for rejecting consolidation.

Like the “Green Sticker” tax, the Ben West-led city government pursued the annexation of the suburban areas of the county, angering many county residents. City planners were aware of the issues with annexation before 1960, and their attempts to address these issues influenced the 1958 consolidation proposal. Traditionally, cities had expanded through annexation, but the 1956 Planning Commission’s report argued that annexation lacked a growth-oriented structure and perpetuated inequality, as cities might annex only the industrial or “wealthy suburban” areas. (“Plan of metropolitan government for Nashville and Davidson County”, 1956) Initially, annexation threatened the suburban areas near Nashville, such as Donelson. Eventually, though, as Nashville grew, the annexation would spread throughout Davidson County as West planned on eventually targeting “all areas on city water.” (“Annexation or Charter”, 1962)

By January 1961, Nashville had annexed, without a referendum, nearly 42 square miles of county land and more than 80,000 county residents. (“Two types of planned annexation”, 1961) Many of the annexed residents felt West had “denied” them “a voice” by annexing without a vote. This anger towards annexation led many previously opposed to Metro to begin supporting the city-county consolidation plan directly “in the face of the city’s annexation drive.” (“Annex drive spurs Metro”, 1960) Rather than settle the issue, annexation and the sticker tax reignited the county’s interest in forming a consolidated metropolitan government.

As public frustration intensified after the Green Sticker Tax and the city’s annexation policies, momentum for consolidation began to build again. But the political terrain had shifted since 1958. Former supporters of consolidation fractured. Nashville Mayor Ben West, once a key advocate, now opposed the new charter. Rather than pursue regional government, West doubled down on annexation. He argued, in a speech regarding the future of Nashville, that Nashville could absorb growing suburbs and unify services and avoid “the many mistakes, drawbacks and legal clouds of the 1962 Charter.” (“Mayor Says School Systems Can

Unite without Metro”, 1962) The Nashville Banner, which previously supported consolidation in 1958, joined West in opposing the 1962 proposal. In a June editorial, the paper warned that the new charter would lead to too much government and spark uncontrolled spending. (“Mayor Says School Systems Can Unite without Metro”, 1962) The editorial criticized the plan’s complexity, claiming the plan would entrench bureaucracy rather than simplify it.

Together, West and the Banner framed consolidation as an overreach, arguing that annexation could achieve the same goals without disrupting local control or raising taxes. West positioned annexation as a more efficient, less invasive solution that avoided the disadvantages of consolidation. (“Mayor Says School Systems Can Unite without Metro”, 1962) This narrative resonated with voters who remained skeptical of centralized government. While consolidation advocates continued to push for efficiency and equitable service delivery, the opposition painted the new charter as both excessive and unnecessary. These diverging visions reignited the public debate, now defined less by whether reform should happen and more by who should control the government.

As Mayor West and the Nashville Banner campaigned against consolidation, a new coalition stepped in to lead the pro-Metro effort. County Judge Beverly Briley became the face of the movement, pushing a message of reform, unity, and shared responsibility. The Nashville Tennessean also emerged as a powerful voice in favor of consolidation. The paper argued that the goal of West’s “unplanned” expansion was to “fatten those city coffers and broaden that tax base.” (“Annexation or Charter”, 1962) In an editorial on the eve of the vote, the paper framed the choice as one between “progress” and continued division, warning that maintaining two overlapping governments wasted tax dollars, created legal confusion, and stalled necessary services. (“What a Vote Today FOR Consolidation Means for Your Community’s Future”, 1962) According to this article in the Tennessean, fragmentation produced delays, duplicated authority, and weakened public trust. The editorial argued that annexation would only shift boundaries, not solve systemic failures. Briley echoed this messaging throughout the campaign, emphasizing that





consolidation allowed the entire county to share costs fairly while streamlining governance. Together, Briley and the Tennessean refocused the debate away from abstract ideas of efficiency and towards the consequences of the status quo.

With the stage set by the two campaigns, Nashville and Davidson County residents headed to the polls on June 28, 1962, to decide the fate of the consolidation proposal. On June 29, 1962, the Tennessean headline read: "Metro Scores Easy Win." ("Metro scores easy win", 1962) The results marked a dramatic reversal from four years earlier. In 1958, over 60 percent of county voters had rejected the merger, while nearly 60 percent of city voters had supported it. This time, the county passed the proposal with 56% of those outside the city in favor. Notably, within rural areas, the proposal garnered just 37% of the vote, but the proposal passed in the county due to the support by those living in areas threatened by annexation (62% in favor). (Hawkins, 1966, p. 121) In the city, the merger passed with 57% of the vote, a slight decrease from 1958. When excluding the newly annexed areas, however, which overwhelmingly supported reorganization by over 70%, only 45% of the city voted in favor of the restructuring. These results demonstrate a massive flip in support from the 1958 referendum.

The reversal in the 1962 election results did not signal a sudden embrace of regional unity. Instead, the reversal revealed how suburban voters reframed consolidation as a defense of their autonomy. By 1962, the plan represented a structured compromise that promised to halt annexation, stabilize taxes, and give suburban residents a say in the future of the county. This shift revealed that consolidation succeeded not because it united Nashville and Davidson County under shared values, but because the plan ensured suburban voters a voice.

Metropolitan governance in mid-20th-century America often exposed sharp divides between central cities and their surrounding suburbs. In many regions, fiscal pressures pushed suburban residents to resist integration and protect their autonomy. Suburban residents often sought to avoid "high taxes, inadequate public schools and other government services, racial tensions, crime, and poor city amenities." (National Research Council, 1999) Nashville in 1958 reflected

this trend. Suburban voters rejected consolidation to preserve local control and avoid the perceived costs of city life, even though many depended on the city's infrastructure and economy. By 1962, however, Nashville's suburbs broke with national patterns. Similarly to Nashville suburbanites in 1962, most suburbanites nationally rejected annexation due to a "desire of the periphery for political autonomy from the core," however, instead of continuing to distance themselves from the city, Nashville suburban voters embraced consolidation to protect themselves from further annexation and unequal taxation. (Danielson, 1976) Rather than retreating, suburban residents chose to enter the consolidated government on their terms. Nashville's suburban voters accepted the merger to formalize representation and check unilateral city power. Their choice reflected not shared identity with city residents, but a tactical acceptance that consolidation offered more predictability and protection than continued piecemeal absorption.

However, after Ben West's annexations, suburban voters feared the same loss of freedom that they had tried to avoid by voting against the merger in 1958; this time, the city did not offer a choice to remain separate. By 1962, many saw Metro as key to gaining influence and protecting their interests through formal representation and institutional safeguards. At the same time, some urban voters grew skeptical, questioning whether the new structure would dilute their power or redirect resources. By 1962, annexation appeared to many "old city" voters, who previously supported the 1958 consolidation effort, as an acceptable, if not preferred, form of growth. Bank president Edward Potter, though always an opponent of consolidation, argued that annexation best maintained the city's "established form of government" without increasing taxes. ("Potter for Annexation Instead of Metro Plan", 1961) This reversal in support reflects a change in political stance by urban and suburban voters to uphold their values.

The new Metro structure preserved these safeguards through the creation of separate service districts. Suburban areas remained in the General Services District, where lower taxes matched fewer services. Urban neighborhoods entered the Urban Services District, which funded broader infrastructure



and public programs. Educational governance followed a similar pattern. City and county school systems combined slowly over two years while ensuring no immediate “drastic changes” to the schools. (“Metro scores easy win”, 1962) This decision provided suburban residents with continued influence over school funding, boundaries, and leadership.

The shift from rejection in 1958 to approval in 1962 reveals more than a policy change. The vote captured a negotiation between the city’s push for centralized control and the suburbs’ determination to protect local authority. City leaders sought expanded jurisdiction, a broader tax base, and modernized administration. Suburban voters feared a loss of control over zoning, schooling, and public spending. Resistance followed the first proposal. Four years later, suburban voters returned with new incentives. Annexation pressures and unfair taxes like the Green Sticker policy created a sense of urgency. Consolidation gained support only after the revised charter offered institutional safeguards for suburban interests such as education and public services.

Notably, West’s annexation policies proved increasingly detrimental to Nashville’s growth in the early 1960s. However, a 2011 study comparing the effectiveness of Nashville’s consolidation to the annexation policies pursued by a similarly sized Tennessee city, Memphis, reveals the deeper issues with annexation. In Memphis, decades of aggressive annexation pushed city boundaries outward but failed to preserve the tax base. The strategy triggered what the study calls “white migration,” draining both residents and revenue from the urban core. (Raymond & Meinfeld, 2011). As tax demands grew, services deteriorated, and fiscal pressure mounted. In contrast, Nashville’s consolidation preserved regional stability. By merging city and county governments, Nashville avoided the piecemeal expansion that ultimately weakened Memphis. The study concludes that consolidation better retains a “viable tax base” and improves long-term economic health. (Raymond & Meinfeld, 2011, p. 430)

Nashville’s charter did not create a seamless merger. The final document established a political structure that allowed participation while maintaining division. Tax policy, school oversight, and service

distribution reflected the goals of suburban negotiators more than the vision of city planners. Researchers like Deng, Feng, and Partridge describe similar patterns in other consolidated governments, where suburban areas collect most long-term benefits. (Deng et al., 2022) In Nashville, suburban priorities shaped the outcome of reform and set limits on how far integration would extend.

Similar struggles continue across metropolitan America. Many suburban communities seek access to urban economies without accepting the costs of full regional integration. The Nashville case shows how governance reform depends on compromise, not consensus. The Metro government succeeded in stabilizing Nashville’s growth, but that stability came through careful protection of local power. Consolidation did not eliminate inequality. The charter formalized separation within a shared system. Future cities looking to restructure regional governance will face the same questions that defined Nashville’s turning point: Who decides? Who pays? And whose vision shapes the rules?

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About The Author

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On the Immorality of Mandatory Reporting for Suicide on College Campuses

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Introduction

In this paper, I argue for the immorality of suicide-related mandatory reporting for students attending institutions of higher education in the United States. I will begin by defining mandatory reporting for suicide within the context of higher education. I will then detail policies commonly put in place by institutions of higher education, as well as explain how these policies translate into practice. I will present an argument against mandatory reporting on the grounds that it deprives the student in crisis of agency. Next, I will share a personal narrative regarding my experience with mandatory reporting, as well as lessons learned from volunteering as a support worker on a mental health crisis lifeline. Finally, I will propose some practical suggestions for mental health crisis response before addressing a few counterarguments in conclusion.

Section I: Mandatory reporting is immoral

Suicide has become a growing problem among college-aged individuals in the United States. For students of this population who attend institutions of higher education, the stressors and demands of college can quickly become overwhelming. Due to the effects of academic stress and because many students in four-year institutions live and work on-campus, it is the responsibility of the institution to ensure student health and safety. One policy that schools have implemented in response to the prevalence of student suicide—and therefore the threat of a suicide-related lawsuit—is to designate faculty and student staff members as mandatory reporters for suicide and other mental health issues. This means that if a student expresses some form of suicidal ideation or behavior to someone who is a mandatory reporter, the reporter must file a report to be reviewed by the university. Upon review and assessment, the university may forcibly withdraw the student from their courses if it is deemed that the

student poses a risk to themselves (Cramer, 2020; Penven & Janosik, 2012).

In practice, these policies create a paradox in which those tasked with helping students are, in the end, deemed untrustworthy by the very population they intend to serve due to their positioning as a mandatory reporter. I will, due to my personal experience and training as a student serving in the role, focus mainly on resident advisors as mandatory reporters. Occasionally, a struggling student will approach a resident advisor or faculty member for help regarding a situation related to suicide, not knowing about their status as a mandatory reporter. In these cases, faculty and resident advisors are trained to preface conversations of that nature with a phrase along the lines of, “I’m a mandatory reporter, so if you tell me anything related to suicide or sexual assault, I’m required to report it.” This disclaimer is given in an effort to respect the person’s agency by ensuring they have the appropriate knowledge of the situation and the ways in which it could progress. The hope from universities is that students will, in a sense, “sign off” on this caveat and share their struggles while conceding that their information may not be kept private. It should be considered, however, that there is a subset of students that—upon hearing this disclaimer—will choose to withhold this self-disclosure and instead struggle alone (Francis, 2003).

Section II: The role of agency

Although the disclaimer above is often used by university faculty and staff to preserve the agency and dignity of the affected student, I argue that current mandatory reporting policies are immoral because they deny agency to individuals experiencing mental health challenges.



When a student is considering suicide, it is often because they feel an overwhelming lack of control and hopelessness towards their current situation and the direction of their future. Knowing that suicide is an option can, therefore, be comforting to students who feel their life is out of their control. It remains an option—one that will relieve their current pain and suffering—and even if one doesn't act on these thoughts, it can be reassuring to know that such an escape is possible.

Because choice and agency are empowering, many clinical interventions for mental illness are focused on restoring agency to the individual by approaching treatment as a partnership between client and psychologist and encouraging the former to play an active role in their own recovery (Graham, 2010). This allows for a tailored approach, rather than a generic one, in which the person positioned to help (resident advisor, clinician, etc.) works together with the person seeking help to find the most beneficial solution for both parties (Brown, 2017). This idea is more formally known as coproduction, defined as “the art and practice of sharing risk and responsibility together to make things that solve problems” (Brown, 2017). For these reasons, agency—and trust that one will retain their agency when they seek help—is an important part of treatment and recovery for mental illness and disorder (Heney, 2024).

Agency, however, is something we often assume the mentally disordered do not or should not have. They may lack the ability to make certain rational decisions and act in ways that are destructive to themselves or others. In his book “The Disordered Mind,” George Graham argues for the importance of using a person-respecting approach to the treatment of mental disorders (2010). His view states that the mentally disordered should still be treated as agents capable of participating in their own recovery and posits that having a mental disorder does not mean that one undergoes a complete loss of rationality. He suggests that clinicians work with the rationality that clients do have and refrain from treating them as problems to solve or manage (Graham, 2010). By framing the mentally disordered in this way, Graham's

view provides support for the argument that preserving agency—as opposed to removing it—is necessary for mental health treatment and recovery.

Section III: The dangers of mandatory reporting

The consequences for which students put themselves at risk when they admit having mental health challenges are plentiful. In response to hearing a student express suicidal ideation, the mandatory reporter is required to submit a report of concern. At first pass, such a report may seem relatively harmless; however, this form asks for personal details regarding the person and their situation that is then automatically shared with several university staff members. This is problematic, as students are rarely informed of who their personal mental health information is being sent to, who might access it in the future, and whether or not it could affect internal employment opportunities at the university. Given these risks, it is no wonder that students refrain from sharing their suicidal thoughts and instead suffer in silence, even if—or perhaps especially if—their suicidal thoughts are only thoughts with no intent to act. These thoughts, however, when kept to oneself, may further isolate students, which in turn further increases the risk for suicide.

Another consequence of mandatory reporting is that it can put students at risk for involuntary institutionalization. In a personal narrative, novelist Esmé Weijun Wang reflects on the advice she received from classmates during her time at Yale. She remembers being told, “They'll put you in YPI [Yale Psychiatric Institute] for anything...Never tell them you've thought about killing yourself,” and in response, she writes, “I think about that advice now...this was sound advice, in the end, if I wanted to stay [in school]” (Wang, 2019). Involuntary psychiatric institutionalization is morally fraught for several reasons. Firstly, it is often forced on the receivers of care, once again denying agency to the affected individual in a situation when regaining control over one's life is crucial. Furthermore, institutions have historically been hot spots for neglect and abuse. In a personal narrative recounting her lived experience with severe mental illness, Wilma Boevink says the following:





One of the consequences of serious psychiatric suffering is that you will find yourself as a patient in a psychiatric hospital...It is a place where traumas are likely to be experienced, and where even abuse may be undergone or witnessed...My stay in the institution damaged me in several ways...When I look back at how undignified it was to be a psychiatric patient, the self-respect for which I fought through the years feels shaky (Boevink, 2012).

Boevink also describes the sedation policy used in a psychiatric in-patient hospital that she observed (2012). The psychiatrists were not at the hospital on the weekends, and the first line of response for all newly admitted psychiatric patients was heavy sedation, even if they were not demonstrating concerning behavior at the time (Boevink, 2012). Given the lack of respect and autonomy combined with the potential for neglect and abuse, it is apparent why students want to avoid institutionalization, a potential next step after being mandatory reported, let alone being admitted without their consent and against their will. We should, therefore, understand and respect students' desires to avoid such places and the potential risk for harm. Students should not be forced into situations of harm, especially those who have already experienced harm in the past and who are at a heightened risk for abuse and other bad outcomes due to their condition (Heney, 2024).

Section IV: Personal narrative

I will now give an account of my personal experience, both as someone who was mandatory reported by a resident advisor in the past, as well as someone who is now in a resident advisor position and a mandatory reporter myself.

In the fall of 2023, I was in constant conflict with my roommate, mostly as a result of my Obsessive-Compulsive Disorder and need for cleanliness. My roommate eventually requested a room change, which sent me into a spiral of guilt, shame, and hopelessness that I could ever exist in successful relationships with others due to my condition. I started to feel as if I did

not want to live anymore, although I also did not want to die. I mentioned this in one of the last conversations I had with this roommate, who informed our resident advisor. The resident advisor came to my room, banging on the door, and insisted that I call the suicide crisis line, even though I was not having active thoughts of killing myself. I vehemently declined, knowing the potential consequences, and begged her not to submit a report for the same reason. She told me that she had no choice, or she would risk losing her job as a resident advisor. My mind started racing. Who would the report be sent to? Would I have to talk to someone? I felt scared, and this only exacerbated my feelings of wanting to disappear. I felt out of control and hopeless, like I needed to do something. I could not understand why people who were not in any sort of caretaking role—professors, administrators, etc.—had a right to my private information, and I felt violated that my deepest secret was sitting in the inboxes of people who I have never met. After being reported against my will, I knew that anytime I said the wrong thing was a time when I put my future autonomy at risk, so I lied on the risk assessments and told the university staff members who reached out to me over the next week that I was feeling much better when I was not

A year later, I am serving in the resident advisor role, and I face a constant ethical dilemma in which I feel that it is immoral to report someone against their will as a result of my personal experience and the way in which it affected the trust I had in my friends and community. However, I am also bound by the protocols of the position and risk legal liability if I were to choose not to mandatory report. This dilemma is not unique to me, and it forces good-meaning people to make an impossible choice between their job (and livelihood) and their morals.

I am also a volunteer on a mental health crisis lifeline, and the suicide-related training I received before working on the lifeline is very different than the training I received at my university as a resident advisor. It is not only our policy not to engage in mandatory reporting, but we cannot even if we wanted to, as all the lifeline users are kept anonymous, allowing for unconditional trust and confidentiality.





Instead, we hold a nonjudgemental space for the users to talk about topics that would normally be shut down or involuntarily referred out, as in cases of mandatory reporting. Many users simply want to talk about suicide or convey their feelings of wanting to disappear without risking a threat to mental and bodily autonomy. If a situation escalates, we are trained to inform the user that we will hang up so that they can call emergency services. Universities could likely benefit from a similar model in which the goal is to listen and support, rather than report.

Section V: Practical suggestions

I will now introduce practical suggestions that I argue could be the first step to a better, more person-respecting approach to suicide. Firstly, all resident advisors—and all other mandatory suicide reporters for that matter—should be required to undergo extensive, autonomy-respecting training on suicide response. This training would take less than a day and would mainly entail learning how to triage mental health concerns. Resident advisors could implement the suicide protocol that the crisis lifeline uses in which volunteers assess the severity of the issue by asking if users have had thoughts of killing themselves, if they have a plan, if they have the means to carry out the plan, etc. In severe cases, instead of reporting the individual, the resident advisor should empower the student to call for help. If a student simply wants a safe space to talk with a peer mentor about mental health concerns, this would also be a possible option.

I, additionally, suggest that we reframe the way in which we think of students who reach out to discuss suicidal thoughts or ideation. There is a common misconception that people who experience suicidal ideation want to end their lives, and while this is sometimes true, it is often the case that the desire is to end the suffering, not the life itself. However, they may believe that ending their life is the only way to end their suffering. These situations are paradoxical, as while the person may convey they want to end their life, they are also actively asking for help by seeking out resources in a time of need. Reminding students of this can be an empowering way to commend the student for taking care of themselves and acknowledge that

they still have hope that things will get better

When someone reaches out for help, this is often a critical period in which they are weighing their options and testing their resources, but they may still be at high risk for suicidal behavior. It is, therefore, important to connect with the individual, and mandatory reporting (referring out) has the potential to push people further away. Ultimately, if a student's only goal is to kill themselves, it would be strange for them to seek out help, so given that the student has reached out to someone they think could help them in some way, we should be willing, prepared, and able to talk openly with students about their concerns, especially if they are related to suicide.

Section VI: Addressing counterarguments

One counterargument I anticipate receiving is from the perspective of someone who had a positive experience with being forcibly reported. They may view this policy as having saved their life. However, a change in mandatory reporting policy would not mean that students cannot get help when they need it; rather, it means that students and students/staff in positions of power are not automatically required to report a student if a student resists for any of the variety of reasons detailed above. If a student is in crisis and consents to being referred, this is still an option available to them.

Another perspective of interest to consider is that of the university, or institution. With the growing prevalence of mental health concerns among college-aged individuals, universities have felt an increased need to safeguard themselves from legal liability in cases of student suicide (Penven & Janosik, 2012). While this concern is understandable, it is the duty of the institution to treat students with respect and care, providing an environment and community in which they can flourish. Furthermore, the easiest way to avoid wrongful death lawsuits is to decrease the amount of student death by suicide, and while more empirical evidence is needed, I speculate that implementing person-respecting policies will lead to greater mental health awareness and ultimately, the prevention of student suicide. This is ultimately in the best interest of





the university.

Finally, I wish to emphasize that this paper is a mere step in reconceptualizing mental health crisis response. I argue for the immorality of mandatory reporting, but I recognize that there are many questions left to be answered. It is not yet clear just how far we should go in preserving student agency, and there may be important distinctions to be made when students are experiencing delusions or are under the influence of drugs. There are also important questions to be asked regarding the morality of suicide itself and whether respect for agency extends as far as knowingly permitting students to die by suicide if consent is given ahead of time. These considerations are not within the scope of this paper. My goal is instead to shed light on issues with current mandatory reporting policies and to contribute to the conversation on how to improve our approach to mental health crisis response in institutions of higher education.

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**Psychology &
Philosophy**





Price Transparency's Impact on Hospital Prices: An Analysis of the 2021 Hospital Transparency Final Rule

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Health care expenditures in the United States have risen steadily for decades, imposing a growing financial burden on patients. In response, President Trump signed an executive order in 2019 requiring hospitals to publicly post the prices of 300 common procedures on their websites that was implemented in 2021. Prior research suggests that price transparency can either increase or decrease prices. This study employs ordinary least squares (OLS) and a difference-in-difference (DiD) framework to evaluate whether the executive order reduced service prices between 2018 and 2022. I hypothesize that prices decline in highly competitive hospital markets but rise in less competitive markets following the transparency mandate. Results indicate no statistically significant change in prices across varying levels of market competition as hospitals became more transparent. The results may be attributed to low

Introduction

Health expenditures in the United States have been rising steadily for decades, placing a financial burden on patients and contributing to medical debt (American Medical Association, 2025). In response, President Trump signed an executive order in 2019, effective in 2021, requiring hospitals to publicly disclose prices for common services. This federal hospital price transparency policy was intended to help patients make informed choices and lower hospital prices nationwide.

In this paper, I examine the effect of the hospital price transparency (HPT) executive order on hospital prices. Prior literature finds mixed effects of price transparency, with prices decreasing in some settings and increasing in others. These differing outcomes may reflect differences in regional hospital market competition across the United States. I test the hypothesis that the impact of price transparency varies by market concentration: hospitals operating in highly competitive markets may respond to transparency by lowering prices, while hospitals in less competitive markets may increase prices. To evaluate this hypothesis, I employ both ordinary least squares and difference-in-differences models to estimate how increases in price transparency affect hospital markups and to assess how prior state-level transparency laws influenced markups relative to states without such laws.

While previous research has primarily focused on the effects of state-level price transparency, no

studies have examined its impact nationally, despite the policy impacting hospitals nationally. By using cross-sectional and panel data from 2018–2022, this study provides a national assessment of the policy's effect on hospital pricing. I begin by reviewing the policy details, the theoretical framework of hospital pricing and price transparency, and the existing literature. I describe the data sources and empirical models, present the results, and discuss the findings, which indicate that hospital price transparency did not significantly alter markups during this period. These findings shed light on the limitations of transparency policies as a tool for controlling healthcare costs and highlight the decision making that hospitals face in response to public pricing information.

Background

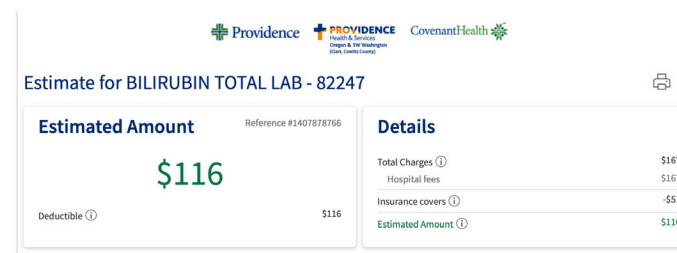
Details of the Policy

Healthcare expenditures in the United States have risen steadily for decades (Adjei et al., 2024). A contributor to this increase is rising service prices, the overall payment that the hospital charges patients and insurers. Between 2015 and 2019, health spending increased by 21.8%, with about two-thirds of the increase attributable to higher service prices (2019 HEALTH CARE COST and UTILIZATION REPORT, 2021).

To address rising medical expenditures, President Trump signed Executive Order 13877, "Improving Price and Quality Transparency in American Healthcare to Put Patients First", in 2019. The executive order required hospitals to make clear,



accessible pricing information publicly available through a machine-readable file and a consumer-friendly display covering at least 300 shoppable services. The idea of price transparency in healthcare is not new. Before 2019, 27 states had price transparency laws; the laws ranged from requiring a good-faith estimate upon request to requiring hospitals to disclose the out-of-pocket price to uninsured patients. The 2019 executive order created a federal blanket price transparency policy that was more expansive, mandating hospitals to publicize prices for both uninsured and insured patients. In response to the 2019 executive order, CMS Administrator Seema Verma said, “Thanks to President Trump’s vision and leadership, we are throwing open the shutters and bringing to light the price of care for American consumers. Kept secret, these prices are simply dollar amounts on a ledger; disclosed, they deliver fuel to the engines of competition among hospitals and insurers. This final rule and the proposed rule will bring the transparency we need to finally begin reducing overall healthcare costs. Today’s rules usher in a new era that upends the status quo to empower patients and put them first.” (Centers for Medicare and Medicaid Services, 2019).



Estimate for BILIRUBIN TOTAL LAB - 82247	
Estimated Amount	Reference #1407878766
\$116	
Deductible ①	\$116
Details	
Total Charges ①	\$167
Hospital fees	\$167
Insurance covers ①	-\$51
Estimated Amount ①	\$116

Figure 1: Sample price estimate a patient will see on a hospital website under the HPT

This policy would allow patients to input their health insurance status and plan information on a hospital’s website to receive an estimated price for the service they plan to receive. Figure 1 above shows a sample of the price information available to patients. In this example, a patient with an Anthem Blue Cross Blue Shield insurance plan who received a bilirubin lab, a test that accesses liver function, at Providence Hospital in Fullerton, California, would see that the total charges, or “service price,” are \$167. The service price is the overall price that the hospital charges. In

this example, the insurance provider will cover \$51 of the service price, which is an estimated “copay” or “coinsurance payment” for cost-sharing plans, leaving the patient to pay \$116 out-of-pocket. For an uninsured patient, they will only see the service price (Providence Health and Services Oregon and California, 2026).

The price transparency rule, signed in 2019, was implemented on January 1, 2021. If hospitals did not comply with this policy by the start of 2021, they would be penalized \$300/day for noncompliance. In 2022, this penalty was increased to \$10/bed/day with a minimum of \$300/day and a maximum of \$5,500/day (Koos, 2025). In his second presidency, Trump issued another executive order, Executive Order 14221, “Making America Healthy Again by Empowering Patients,” to expand the list of shoppable services reported from 300 to 500 in February 2025. In the press release following the signing of the executive order, President Trump stated, “It is the policy of the United States to put patients first and ensure they have the information they need to make well-informed healthcare decisions.” He then justified the expansion of reported services by reporting the success of the HPT rule implemented in 2021. President Trump, in the press release of the 2025 HPT executive order, says, “One economic analysis from 2023 estimated the impact of these regulations, if fully implemented, could result in as much as \$80 billion in healthcare savings for consumers, employers, and insurers by 2025. Another report from 2024 suggested healthcare price transparency could help employers reduce healthcare costs by 27 percent across 500 common healthcare services. Recent data has found that the top 25 percent of the most expensive healthcare service prices have dropped by 6.3 percent per year following the initial implementation of price transparency during my first term.” (The White House, 2025). However, the citations for the studies supporting these results were not included in the White House press release.

According to the U.S. Bureau of Labor Statistics, in 2025, “[Overall] Medical care prices rose 2.8 percent in 2024, following an increase of 0.5 percent in 2023. From December 2023 to December 2024, prices for hospital and related services rose 4.0 percent, and physicians’ services increased 2.6 percent.” The increase in healthcare spending, including physician



and clinical services, raises questions about whether the HPT lowered service prices at the current moment as President Trump stated.

Although there are penalties for noncompliance, the number of hospitals audited is low. In a 2024 report, the Office of the Inspector General estimated that 5,879 hospitals have been audited, representing about 46% (Not All Selected Hospitals Complied with the Hospital Price Transparency Rule 2024). Between 2021 and 2025, 28 hospitals were penalized for noncompliance (Hospital Price Transparency Enforcement Updates | CMS, 2026). Trump has signaled that he will increase the number of audits on hospitals, stating, “Unfortunately, progress on price transparency at the Federal level has stalled since the end of my first term. Hospitals and health plans were not adequately held to account when their price transparency data was incomplete or not even posted at all.” (The White House). A lack of enforcement may cause hospitals to be slow to become compliant, leading to prices not changing in the short run.

Hospital Pricing

Generally speaking, insurer service price is set when insurers and hospitals negotiate. These negotiations are private. Insurers use their market power to negotiate lower prices and hospitals use their market power to negotiate higher prices. Previous studies have shown that the most attractive hospitals to patients, in terms of hospital characteristics, tend to have more negotiating power relative to insurers, leading to higher prices (Wang et al., 2023 A). Other studies have shown that when there is more competition amongst insurance companies in a market, hospital prices decrease. For the uninsured, a study found that service prices for uninsured patients are less than or equal to the median negotiated rates for insured patients 47% of the time for the same general acute care hospitals in the United States. Wang et.al. attributes this finding to the fact that uninsured patients have a “lower willingness to pay and ability to pay for hospital care, and they may be more sensitive to higher hospital prices than patients with insurance coverage. Therefore, offering lower service prices might be a way that hospitals respond to the greater price sensitivity from the uninsured and underinsured

patients”. The study also suggests that prices for the uninsured are likely lower than negotiated rates in regions with stronger hospital market power and weaker insurer market power because offering lower uninsured service prices will attract price-sensitive patients who chose to forgo insurance coverage due to high costs (Wang et al. 2023 B). This finding was consistent for both private insurance and government plans such as Medicare and Medicaid, with 60% of negotiated rates being higher than the service price for the uninsured for the same service (Ruiz Sánchez, 2022). This study looked at only the service price for brain MRIs whereas Wang, Meiselbach, Cox, et al. looked at the aggregate cost-to-charge ratio reported from the CMS’s Hospital Provider Cost Report, which can explain the difference in the percentages in both of the findings.

Theory of Price Transparency

The Intuition underlying HPT is that increased transparency enables buyers to compare prices across providers and select lower priced options. In turn, suppliers are incentivized to lower prices to attract buyers (Bernstein & Crowe, 2024).

However, because patients pay for healthcare in various ways, they may not have incentives to price shop. Almost a year after the price transparency rules were released, a survey was conducted to assess people’s response to these new policies. Between December 15, 2021, and January 5, 2022, 1,539 Americans took an online survey. In the survey, the majority of respondents ranked price as the most important factor when choosing a healthcare provider, ahead of quality, convenience, and provider relationship for primary care services, knee MRIs, and newborn delivery. This would indicate that patients are sensitive to price and have incentives to price shop. However, only 24% of respondents were aware that hospitals must disclose prices for tests and treatments. When asked whether comparing prices could help them save a significant amount of money, 40% agreed; however, only 32% of respondents knew how to find prices for tests or treatments. The study also found that 40% of respondents said that they do not need to compare prices because they have insurance (Triana et al. 2022).



The reasons for unequal incentives to price shop are differences among healthcare plans. For uninsured patients, there is an incentive to price shop because they bear the full burden of the service price and will seek out hospitals with lower service prices, which is the total amount a hospital expects to be paid for a given service from the individual and/or the insurance company. Insured patients with high-deductible plans or plans with a high percentage of cost-sharing that is a function of service prices, such as the coinsurance rate, have incentives to seek hospitals with lower service prices to reduce their out-of-pocket payments. Other insured patients may have cost-sharing caps, such as copays². In that case, patients have no incentive to price shop or choose hospitals based on service prices.

Data

In this study, I use publicly available data from the Centers for Medicare and Medicaid Services (CMS), the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS), CareJourney, and the Kaiser Family Foundation to examine how price transparency affects hospital service prices.

The CMS Hospital Provider Cost Report is submitted annually by Medicare certified hospitals. Data from 2011 to 2023 are publicly available for hospitals across the United States. This dataset contains two primary types of information: (1) hospital financial data, including assets, liabilities, costs, and charges, and (2) hospital characteristics, such as the number of beds, interns, and employees. These cost reports are used for Medicare reimbursement, regulatory oversight, and hospital financial analysis. The question used to find the proportion of patients who would recommend a given hospital is in Appendix B.

Hospital reputation is a primary factor influencing patients' hospital choice. In a survey of 4,672 randomly selected adults, 61.9% of respondents reported that hospital reputation was the most important factor when choosing a hospital. Prior research supports the importance of reputation in shaping patient perceptions (Ellis et al., 2020). Mira et al. (2014) find that greater patient confidence in hospital professionals is associated with more positive perceptions of hospital safety; specifically, each additional point of confidence corresponds to

a 15% increase in perceived hospital safety. Hospital reputation also affects hospital pricing. Beauvais et al. (2020) find that hospitals with stronger reputations tend to charge slightly lower prices. To account for hospital reputation, I use HCAHPS survey data. HCAHPS is a standardized questionnaire administered to randomly selected adult patients nationwide between 48 hours and six weeks after hospital discharge. The survey includes nineteen questions related to quality of care, such as cleanliness, quietness, communication with doctors and nurses, and medication communication. These data are used both to help patients compare hospitals and to allow hospitals to monitor and improve quality. To measure hospital compliance with the HPT rule, I use data from CareJourney, published in 2022. The CareJourney dataset combines Turquoise Health's hospital transparency data with hospital-level Herfindahl-Hirschman Index (HHI) data compiled by Dr. Zack Cooper (Cooper et al., 2022). Turquoise Health's hospital transparency data provide an ordinal compliance score ranging from 1 to 5, where 5 indicates full compliance with HPT requirements and 1 indicates complete noncompliance. A score of 4 indicates that a hospital has met most HPT requirements, with largely complete pricing information and well-formatted price disclosures. A score of 3 reflects partial compliance, characterized by missing service price data or poorly formatted disclosures that limit price clarity for patients. A score of 2 indicates minimal compliance, with most pricing data missing or presented in an unclear format (Hospital Price Transparency Research Datasets | Turquoise Health, n.d.). The Turquoise Health hospital transparency dataset was initiated in March 2022. The CareJourney dataset also includes hospital-level HHI data, created by Dr. Zack Cooper in March 2022, which measures hospital market competitiveness. The HHI is calculated as the sum of the squared market shares of hospitals within a regional market. An HHI below 1,500 indicates a competitive market, an HHI between 1,500 and 2,500 indicates moderate concentration, and an HHI above 2,500 indicates a highly concentrated market. To measure insurance market concentration, I use the Large Group Insurance Market Competition dataset from the Kaiser Family Foundation, which reports the HHI scores and the market share for the largest

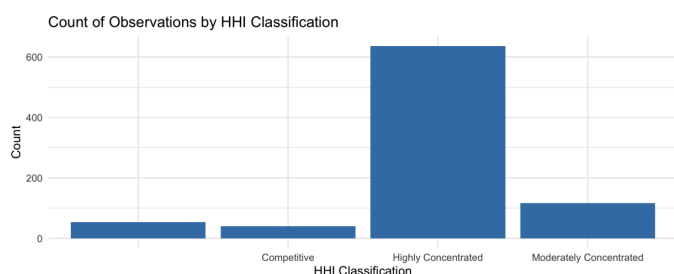




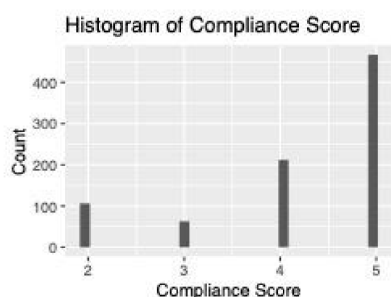
insurer in every state. The data is from 2022, aimed at capturing the market concentration of large group insurance companies for every state. An HHI score under 1,500 indicates a competitive market, 1,500 to 2,500 a moderate concentration, and above 2,500 a highly concentrated market.

Summary Statistics

Most hospitals are in the highly concentrated HHI category and are fully compliant in the dataset. There are significantly fewer hospitals in the competitive and moderately concentrated category than in the highly concentrated category



There are no hospitals in complete non-compliance; most are fully compliant or on their way to becoming fully compliant.



In 2018, the average charge-to-cost ratio was 3.87; in 2019, 3.87; in 2020, 3.80; in 2021, 3.88; and in 2022, 5.10.

2018 summary statistics

HHI Classification	Mean charge-to-cost ratio	Standard deviation	n
Competitive	4.39	2.15	37
Highly Competitive	4.87	2.38	569
Moderately Concentrated	6.00	3.01	105
Overall	3.87	2.59	2121

2019 summary statistics

HHI Classification	Mean charge-to-cost ratio	Standard deviation	n
Competitive	4.19	2.05	46
Highly Competitive	4.88	2.45	573
Moderately Concentrated	6.04	3.17	102
Overall	3.87	2.67	2092

2020 summary statistics

HHI Classification	Mean charge-to-cost ratio	Standard deviation	n
Competitive	4.11	2.12	37
Highly Competitive	4.79	2.48	571
Moderately Concentrated	5.88	3.27	105
overall	3.80	2.73	2050

2021 summary statistics

HHI Classification	Mean charge-to-cost ratio	Standard deviation	n
Competitive	4.26	2.20	38
Highly Competitive	4.93	2.53	581
Moderately Concentrated	6.18	3.50	109
Overall	3.88	2.69	2008

2022 summary statistics

HHI Classification	Mean charge-to-cost ratio	Standard deviation	n
Competitive	4.20	2.61	40
Highly Competitive	5.00	2.28	637
Moderately Concentrated	6.24	2.78	117
Overall	5.10	2.93	848



Empirical Method

Two empirical models are employed. In the first model, I will use a cross sectional dataset from the year 2022 to estimate an OLS model that shows how hospital markup, or charge-to-cost ratio, changes when hospitals become more compliant with HPT to the executive order. In the second model, I will use a panel dataset from the years 2018 to 2022 to estimate a difference-in-difference model to compare hospital markup changes between states with price transparency laws, prior to HPT and states without.

For both models, only hospitals that offer general health services are included to ensure a pool of homogenous hospitals. That is, I exclude hospitals affiliated with the U.S. Department of Veterans Affairs, specialty hospitals, rehabilitation hospitals, hospitals that only provide psychiatric care, hospitals located in the U.S. Indian reservations that exclusively cater to the Native American population, and charitable hospitals who offer services for free or at a significantly reduced rate due to charitable contributions from third party donors or other funding sources. These hospitals either have access to a consistent pool of external funding or offer only specialized services most hospitals do not provide.

Dependent Variable

I will use the charge-to-cost ratio as my dependent variable. certified hospitals have to disclose the total cost and charges where total costs are the costs that the hospital incur to provide services including unreimbursed care, charity care, and operating costs and total charges also known as service price is the service price that hospitals set for a service. The charge-to-cost ratio is a measurement of the mark up for services. If the charge-to-cost ratio is greater than 1, then the price charged to patients is greater than the costs the hospital incurs. If the charge-to-cost ratio is 3, then a given hospital charges three times more than it costs for a service. The charge-to-cost ratio is typically used by CMS to determine reimbursement rates but has been used in a measurement of price for studies examining the relationship between hospital features and pricing (Beauvais et al., 2020, Hilsenrath et al., 2015).

Independent Variable

In both models, I include controls for the number of interns, number of hospital beds, number of employees, hospital recommendation ratings, urban versus rural status, state fixed effects, and hospital and insurance market concentration as measured by HHI category.

To account for hospital types, such as community hospitals, research hospitals, or general service hospitals, I use the number of interns, employees, and hospital beds as proxies which I accessed from the CMS Hospital Provider Cost Report. Hospitals with fewer beds, employees, and interns are more likely to be community hospitals, while hospitals with larger bed counts and higher numbers of interns are more likely to be teaching or research hospitals. I also use an urban versus rural indicator from the CMS Hospital Provider Cost dataset that includes a dummy variable indicating whether a hospital is located in an urban or rural area to account for higher service prices in areas with limited provider availability (Lin et al., 2020).

To address hospital reputation, I will use the percentage of people who respond “definitely yes” when asked if they would recommend the hospital to someone else from the HCAPS dataset³.

State fixed effects, based on hospital addresses reported in the CMS Hospital Provider Cost Report, are included to account for variation in state-level policies that affect hospital pricing. States differ to the extent to which they regulate hospital charges through pricing caps and patient protection laws. For example, California’s Hospital Fair Pricing Act of 2006 limits the amount hospitals can charge underinsured or uninsured residents with incomes below 3.5 times the Federal Poverty Level (Place a Limit on Gross Charges for Patient Care Services or Items Set by Certain Private Hospitals [Ballot], 2015), whereas Missouri imposes no comparable limits on hospital charges (Bram Sable-Smith, 2023).

Finally, I include HHI categories to measure market competitiveness for both hospitals and insurance companies. These controls account for pricing variation arising from differences in local market competition. The hospital HHI accounts for the differing service prices hospitals



charge. Hospitals operating in highly competitive markets face greater pressure to offer lower service prices, while hospitals in less competitive markets may exercise greater market power and set higher service prices. The insurance HHI accounts for the prices that insured patients pay. In areas with limited competition among insurance companies, negotiated prices between hospitals and insurers tend to be higher than in markets with more competitive insurance markets. By accounting for HHI scores as a measurement of market competition for both hospitals and insurers, some of the variation in prices across the United States is captured. The Herfindahl–Hirschman Index (HHI) is calculated as the sum of the squared market shares of all firms in a given market and serves as a standard measure of market concentration. An HHI below 1,500 indicates a highly competitive market, an HHI between 1,500 and 2,500 reflects moderate concentration, and an HHI above 2,500 indicates a highly concentrated market with limited competition.

OLS regression model

The following is the cross sectional linear regression model using 2022 data.

$$Y_{js} = \beta_0 + X_j'\beta + \gamma_s + \mu_{js}$$

Where $Y_{js} : \frac{\text{charge}}{\text{cost}}$ for hospital j in state s and X_j are hospital characteristics (price transparency score*HHI category, indicator variable for if a hospital is an urban or rural area, number of hospital beds, number of hospital employees excluding interns and residents, number of interns and residents, percentage of patients that respond “definitely yes” when asked if they would recommend the hospital)

γ_s : state fixed effects

μ_{js} = unobservables

I use the year 2022 since it is the only year where the CMS, HCAPS, and CareJourney dataset are all publicly available. It is possible that price transparency impacts hospital behavior beyond 2022. As hospitals observe competitor’s service prices, they may alter their service prices past the year 2022. Patients might also start shopping

more as they become more aware of the ability to price shop. There may be a time lag in the policy, as patients may be unaware that they can price-shop or lack an incentive to do so, therefore the charge-to-cost ratio may change more in the future than what is being captured in 2022.

Difference-in-Difference model

To measure how price transparency affects prices over time, I will use a difference-in-differences model for the years 2018-2022. Before the federal transparency law was enacted in 2021, 27 states already had their own transparency laws. Because no state had a policy exactly like the executive order, I chose states for my treatment group that share similar aspects of the policy. I chose states where hospitals were required to report the procedure price for a given insurance plan to the patient upon request. I did not include states with “good faith estimate” price transparency laws, only prescription medicine transparency laws, or states where hospitals were only required to inform uninsured patients upon request, given that most patients have insurance coverage. The states that met the criteria were New Hampshire, Florida, and Montana, all of which had state transparency laws implemented before 2018. Hospitals in these three states are the control group in the difference-in-difference model. The hospitals in the control group should not notice a significant change in prices after the federal law’s implementation, since they were already required to have some degree of price transparency prior to the executive order. The treatment group are states without price transparency policies prior to the 2021 when the HPT was implemented and states with only pharmaceutical transparency laws or weak hospital transparency laws.

The degree of price transparency will not be included in the difference-in-differences model because data on how compliant hospitals were with price transparency laws were collected starting in 2022. The model will assume that hospitals in Montana, Florida, and New Hampshire were compliant with their state transparency laws before the federal law, and that hospitals in all states were compliant after the 2021 federal law. Given that no hospitals were in complete noncompliance in 2022 and the majority were fully compliant, the federal policy was integrated



by varying degrees across all hospitals observed.

Difference-in-difference model for years 2018-2022

$$y_{jst} = \alpha_j + \lambda_t + \beta (Prior_t \times Treat_s) + X'_{jt} \gamma + \epsilon_{jst}$$

Where:

y_{jst} : charge – to – cost ratio for hospital j in state s during year t

X'_{jt} : time varying hospital covariates(number of interns, recommend hospital, number of employees, HHI categories)

$Post_t$: equals 1 if $t \geq 2021$, 0 otherwise

$Treat_s$: equals 0 if state s had prior price transparency laws, 1 otherwise

α_j : hospital fixed effects

λ_t : year fixed effects

β : difference – in – difference estimate

Results

OLS Results

$$\frac{\text{charge}}{\text{cost}} = \beta_0 + \beta_1 \text{compliance score}$$

	Coefficient	Standard error
Intercept	0.285***	0.02
Compliance score	-0.008+	0.005
Number of reservations	791	
R-squared	0.003	

+ 10% significance, *5% significance, **1% significance, ***0.1% significance

$$\frac{\text{charge}}{\text{cost}} = \beta_0 + \beta_1 \text{compliance score} + \beta_2 \text{HHI Category} + \beta_3 \text{urban vs. rural} + \beta_4 \text{number of beds}$$

$$\beta_5 \text{number of employees} + \beta_6 \text{number of interns} + \beta_7 \text{recommend hospital} + \beta_8 \text{insurance HHI}$$

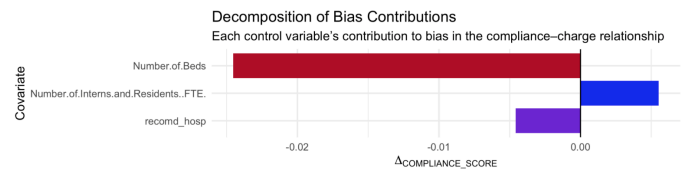
	Coefficient	Standard error	95% Confidence Interval	Actual coefficient for independent variable	95% Confidence Interval
Intercept	4.637*	1.938	(0.8322,8.4421)		
Compliance	-0.396	0.355	(-1.0933,0.3007)		
Compliance*Highly Concentrated (competitive is baseline)	0.510	0.371	(-0.2187,1.2392)	0.114	(-0.0953,0.3232)
Compliance*Moderately Concentrated (competitive is baseline)	0.505	0.417	(-0.3133,1.3227)	0.109	(-0.3289,0.5467)
Number of observations	791				
R-squared	0.330				
Adjusted R-squared	0.279				

Endogeneity

Oster bounds

beta*	0.0601
(beta*-beta controlled)^2	0.000305
Alternative Solution 1	83.7
(beta[AS1]-beta controlled)^2	6989
Uncontrolled coefficient	0.107
Controlled coefficient	0.0776
Uncontrolled R-square	0.00140
Controlled R-square	0.328
Max R-square	0.48

Gelbach Decomposition Results



	Delta compliance score
Number of beds	-0.0245
Number of interns and residents	0.00552
Recommend hospital	-0.00457
total	-0.0236

There are concerns about endogeneity with the OLS results, since hospitals with higher prices may not want to reveal their prices by publishing them all.

The results from the Oster bounds analysis show, in Table 4, without controlling for any other factors, a one-degree increase in price transparency is associated with a 0.107 increase in markup. After including observed controls, the estimated effect decreases to 0.0776, though it remains positive, suggesting that greater price transparency is still associated with a slight increase in markup.

The Gelbach decomposition, displayed in Table 5, provides more insight into which control variables drove down the coefficient change from 0.107 to 0.0776. It shows that the number of beds, a proxy for hospital size, is the largest contributor to the reduction in the coefficient from the uncontrolled to the controlled model, accounting for a decrease of approximately -0.0245. Other factors, including the number of interns and residents (0.00552) and the hospital recommendation score (-0.00457), also contribute, but to a smaller extent. Collectively, these



observed covariates explain nearly all of the change in the coefficient.

The analysis from the Oster bounds shows that unobserved factors would need to be 83.7 times stronger than the observed variables to reduce the effect to zero, and the potential bias from unobservable variables is very small at 0.000305. With a maximum R-squared of 0.48, the model explains a moderate portion of the variation in markup. These results suggest that while observed controls largely account for the change in the coefficient, the association between price transparency and markup is robust and unlikely to be driven by unobserved confounding variables.

	Coefficient	Standard error	95% confidence interval	Actual coefficient for independent variable	95% confidence interval
(Prior * Treat) for highly concentrated	-0.08237	0.3233	(-0.7162, 0.5515)	-0.2943	(-0.8552, 0.2667)
(Prior * Treat) for moderately concentrated	-0.1058	-0.3736	(-0.9393, 0.6267)	-0.3177	(-0.9871, 0.3516)
Multiple R-squared(full model)	0.6473				
Adjusted multiple R-squared(full model)	0.563				
F-statistic(full model)	7.676				
F-statistic(proj model)	17.686				

Analysis OLS

From Table 1, the results from the baseline OLS regression indicate that in 2022 there is a statistically significant linear relationship between price transparency and hospital markup. The average charge to cost ratio in 2022 was 5.10, with a standard deviation of 2.93. Specifically, a one unit increase in price transparency is associated with a 0.008 decrease in hospital markup.

After adding control variables in Table 2, including state fixed effects, urban versus rural status, number of beds, insurance HHI, hospital HHI, number of interns and residents, and the percentage of patients who recommend the hospital, the estimated coefficient increases in magnitude, implying that a one unit increase in price transparency is associated with a 0.078 decrease in hospital markup. However, this estimate is no longer statistically significant. The 95% confidence interval ranges from -0.1065 to 0.2613, indicating uncertainty around the estimate and allowing for either a decrease or an increase in hospital markup.

To test the hypothesis that price transparency increases prices in markets with few hospitals but decreases prices in markets with many hospitals, I estimated a separate OLS specification that interacted with hospital market concentration with price transparency. This interaction term captures whether the effect of price transparency on hospital markup

Difference-in-difference 2018-2022

$$\frac{\text{charge}}{\text{cost}} = \beta_0 + \beta_1(\text{Prior}_s \times \text{Treat}_s) + \beta_2 \text{ number of interns} + \beta_3 \text{ number of employees} + \beta_4 \text{ recommend hospital} + \beta_5 \text{ HHI category}$$

	Coefficient	Standard error	95% confidence interval
Difference-in-difference	-0.2924	0.2845	(-0.8503, 0.2654)
Highly concentrated(competitive is base)	1.402***	0.02513	(0.9090, 1.8946)
Moderately concentrated(competitive is base)	1.727***	0.02665	(1.2047, 2.2499)
Multiple R-squared(full model)	0.6473		
Adjusted multiple R-squared(full model)	0.5633		
F-statistic(full model)	7.704		
F-statistic(proj model)	23.57		

$$\frac{\text{charge}}{\text{cost}} = \beta_0 + \beta_1(\text{Prior}_s \times \text{Treat}_s) * \text{HHI Category} + \beta_2 \text{ number of interns} + \beta_3 \text{ number of employees} + \beta_4 \text{ recommend hospital} + \beta_5 \text{ HHI category}$$



varies by the level of market competition. The results, shown in Table 3, indicate that, relative to competitive markets, a one unit increase in price transparency is associated with a 0.114 increase in hospital markup in highly concentrated markets and a 0.109 increase in moderately concentrated markets. However, neither of these estimates is statistically significant. Both coefficients are small, within one-tenth of a standard deviation, and suggest a positive relationship between price transparency and markup in more concentrated markets, though the estimates are imprecisely measured.

Difference-in-difference

The difference-in-difference model assumes that hospitals in Florida, New Hampshire, and Montana are fully compliant with the state transparency law. The parallel assumption does hold as shown in the graph in Appendix D. In the first difference-in-difference model, displayed in Table 6, the estimated coefficient indicates a -0.2924 change in hospital markup for hospitals subject to price transparency relative to hospitals without price transparency prior to 2021. However, this estimate is not statistically significant. The confidence interval $(-0.8503, 0.2654)$ shows substantial uncertainty, indicating that price transparency could be associated with a large decrease in or a modest increase in markup.

When interacting the difference-in-difference estimator with hospital market concentration in Table 7, the estimated coefficients are -0.2943 for highly concentrated markets and -0.3177 for moderately concentrated markets, relative to competitive markets. Both estimates are not statistically significant. These results suggest that, prior to 2021, hospitals in highly and moderately concentrated markets did not experience statistically significant differences in pricing between states with price transparency laws and states without such laws.

Conclusion

In general, the 2021 price transparency law did not have a significant impact on hospital prices as anticipated. Across market concentrations, hospital service markups remained largely unchanged as hospitals became more transparent. While many

patients consider price an important factor in their healthcare decisions, some may lack the incentives or ability to price-shop. Even when patients do not compare prices or choose the lowest-price hospital, hospitals may still benefit from transparency through the form of increased information. Requiring all hospitals to publish prices provides them with more information during negotiations with insurance companies, potentially increasing their bargaining power and enabling them to secure higher prices. Conversely, hospitals may lower prices to avoid being perceived as high-priced providers, particularly in highly competitive markets. The combination of price increases in some markets and decreases in others may explain why the OLS results covering hospitals nationwide show no significant change in hospital markup. This may be a short-run result, as hospitals are still getting into compliance and may change their prices once more hospitals in a given area increase their compliance with HPT.

The results may also be attributed to the low enforcement rate between 2021 and 2022. Limited enforcement by the Centers of Medicare and Medicaid likely reduced hospitals' incentives to prioritize compliance with the HPT, which may explain the lack of change in service prices as hospitals are not incentivized to change their behavior. However, the Trump administration has signaled an increase in hospital audits for compliance, which may lead to a greater number of hospitals moving toward full compliance in the future. In the long run, prices may move as hospitals become increasingly compliant.

The difference-in-differences results also indicate no significant change in hospital markup. This suggests that state level price transparency laws may have had little effect on markups relative to states without such laws. The lack of observed impact could reflect incomplete compliance among hospitals in Montana, Florida, and New Hampshire, and the limited sample size from these three states reduces the statistical power to detect meaningful effects. There is also no way to measure how compliant hospitals in Montana, Florida, and New Hampshire were to the state law, so it is possible that the markup for hospitals in the three states did not change with state transparency laws.



In future research, examining insurance negotiated rates as a measure of price could provide a more comprehensive understanding of hospital pricing behavior after the implementation of the HPT. Because negotiated rates directly reflect the outcomes of negotiations between insurers and hospitals, increased information symmetry resulting from price transparency policies may change negotiation dynamics, affecting prices. Furthermore, the majority of Americans are insured and do not pay the service price rate. Analyzing these negotiated rates would therefore help clarify whether transparency influences pricing through changes in bargaining power rather than through posted service prices alone. 2019 HEALTH

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Shaping the Past: Architecture as a Carrier of Meaning in the Restorations of Pantokrator Monastery

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Introduction

The Monastery of Christ Pantokrator (now Zeyrek Camii) was founded in Constantinople (now Istanbul) the early twelfth century by John II Komnenos (r. 1118-1143) and his wife Irene. Following the Ottoman conquest, the complex was converted into a madrasa and then a mosque, which was accompanied by alterations characterized by the addition of Islamic and Ottoman architectural features, including a minaret, mihrab, altered rooflines, filled windows, the enclosure of the south bay to form the Sultan's tribune, and other modifications reinforcing the building's changed cultural context and religious function (Van Millingen, 1912).

The modern restoration history of the complex also reveals a deliberate series of architectural choices. In the mid-20th century, two restorations occurred, the first in 1953 and the second beginning in 1960. At some point during this period, a campaign reinstalled some scalloped, Byzantine-style eaves, reversing earlier Ottoman interventions. The 1997-98 restoration was largely focused on structural stabilization, and replacing the dilapidated Ottoman-era roofing with a replica in the Ottoman style. The 2001-2005 continuation prioritized Ottoman adaptations primarily through choices of reconstruction rather than the removal of earlier Byzantine elements. This philosophy foreshadowed the major 2006-2018 campaign, which enacted sweeping alterations to produce a nearly "like new" version of the monument's nineteenth-century Ottoman appearance, with many reversals and additions. The most architecturally prominent changes include the removal of the scalloped eaves and the construction of the flat Ottoman roofline on the western portion of the structure, the reconstruction of a walled 19th-century courtyard, and the addition of a new wooden Sultan's pavilion with a lead roof attached

to the Southwest wall of Pantokrator Monastery.

These architectural decisions reveal the broader prioritization of Ottoman-era identifiers at the expense of recognizing the monument's Byzantine heritage, in furtherance of the narrative that the building's historical and artistic import are fundamentally Ottoman and Muslim. By examining the Pantokrator/Zeyrek restorations in this context, I will argue that recent architectural interventions result from, and actively contribute to, this modern political agenda by selectively elevating Ottoman solutions while minimizing and obscuring Byzantine elements.

History of the Pantokrator/Zeyrek Complex

The Monastery of Christ Pantokrator was founded in the early twelfth century on the fourth hill of Constantinople as the second-largest Byzantine imperial construction after Justinian's Hagia Sophia. Construction began around 1118 under Empress Eirene, wife of John II Komnenos, with the South Church dedicated to Christ Pantokrator. After this came the North Church, dedicated to the Theotokos Eleousa, and a funerary chapel dedicated to the Archangel Michael that linked the two churches. During the Byzantine period, the complex remained a major religious, charitable, and ideological center (Berger, 2004).

This structure was a manifestation of Byzantine political authority, and no other Byzantine church housed so many imperial burials, including John II and Eirene, Manuel I and his wife Bertha of Sulzbach, and later Palaiologan emperors Manuel II and John VIII. The monastery also held unique religious significance, housing famous relics related to the life of Christ and a revered icon of the Theotokos Hodegetria (Berger, 2004).





During the Latin occupation of Constantinople (1204–1261), the Pantokrator served as Venetian headquarters, and valuable objects were taken, including some later identified at St Mark's Basilica in Venice (Ousterhout et al, 2009). After the Byzantine reconquest in 1261, the monastery was restored to Orthodox use and remained a stronghold of the Orthodox resistance to Roman Catholic unification during religious debates that preceded the fall of the city in 1453. Following the Ottoman conquest, the complex was converted first into a madrasa, and then into Zeyrek Mosque, named for the most prominent teacher at the madrasa (Van Millingen, 1912).

Significant architectural modifications accompanied this transformation. To facilitate Muslim worship, a mihrab was added, reorienting the building towards Mecca. A mimbar was constructed out of spoliated elements from the church's iconostasis, marble from a nearby Church of St Polyuktos, and other Byzantine elements. Triple windows in the apses of all churches, as well as windows in other locations, were infilled. Interior surfaces were plastered, sometimes in keeping with the Islamic prohibition on depictions of animate beings, but also to remove Byzantine vegetal and geometric motifs to accommodate Ottoman-style wall paintings. Many repairs were also initiated, which over time resulted in an entirely Ottoman roof, where scalloped Byzantine eaves found on domes and rooflines were adapted in the Ottoman style, forming a more angular silhouette. In several places, characteristic Byzantine dogtooth brickwork was replaced by flat parapets or greenstone cornices, though elements of original dogtooth remained into the 21st century (Ousterhout, 2000). A walled outdoor courtyard was implemented during this period (Nar, 2018). On the exterior, a protective plaster, which may have also served decorative and symbolic roles when functioning as a church, gradually wore away, entirely revealing the facade's brickwork by the 20th century. On the southwest wall of the church, a wooden Sultan's lodge was erected, which connected to the Byzantine roofline and was accessible via an outdoor staircase (Nar, 2018). On the interior, a raised wooden platform with an enclosure was constructed for the Sultan to attend worship in the North Church. Most interior Byzantine carved Corinthian columns were encased

or replaced by Ottoman piers (Van Millingen, 1912).

20th Century Restorations

By the early 20th century, the structure was crumbling (Van Millingen, 1912). It continued to languish until the mid-20th century, when excavations and restorations were made in the building. Though these restorations provided immediate remedy, some of these alterations proved structurally threatening long term, especially in roof areas that were subjected to concrete solutions (Ousterhout, 2000). In the 1960s, the Dumbarton Oaks-sponsored restoration unveiled an ornate opus sectile floor in the South Church. They also recovered a significant amount of Byzantine stained glass. This glass is a rare example of figural window fixtures in Byzantium. These findings were substantial and allowed experts to create hypothetical reconstructions of their appearance using these shards (Megaw, 1963)

During this time, Dumbarton Oaks extended some of the lost areas of dogtooth brickwork on the western wall. In the pastophoria of the South Church, the original Byzantine dogtooth cornice remained unaltered (Ousterhout, 2000) The western wall was subject to more extensive architectural modifications around this time. The Ottoman roof in this area was replaced completely, and scalloped Byzantine eaves were reinstated (Figure 1) (Ousterhout, 2000).

Significance of the 20th-Century Restorations

This total reconstruction of the Byzantine roofline reflected the restorer's emphasis on the Byzantine origins of the building. It was contemporaneous with the discovery of significant Byzantine features, like the opus sectile floor and the rare stained glass. It may be assumed that, from the perspective of those involved, once a new roof was required, the replacement would reflect what they saw as the more authentic version of the building. This choice reveals that restorers did not consider, or perhaps fundamentally objected to, the meaning behind the Ottoman adaptations to the roofline. The flattened appearance, which gave the structure an altogether more Turkish architectural character, represented a physical manifestation of the structure's





role as an Islamic structure serving a Turkish population. The Ottoman roofline was a particularly visible exterior element, making the 20th-century Byzantine-style alterations a deliberate and uniquely public contestation of this identity, achieved through the partial reintroduction of Byzantine eaves in an otherwise Ottoman-style roofline.

1997-1998 Restoration

In 1998, another Dumbarton Oaks restoration project took place under the leadership of Dr. Robert Ousterhout, Dr. Zeynep Ahunbay, and Dr. Metin Ahunbay. The primary focus of this phase of the project was the stabilization of the structure and the replacement of the roof (Ousterhout, 2000). The team claimed that, with this project, they aimed to “treat the building as the sum of its history, and this means respecting the modifications effected during the Ottoman period” (Ousterhout, 2000, p. 265).

Ottoman features were represented in the replacement of nearly the entire roof, which had been badly damaged over time, with a structurally sound replica, also in the Ottoman style. During the replacement, some Ottoman-era greenstone cornices were found in situ (Ousterhout, 2000). These were repaired. Most areas without surviving cornices were fabricated and carved using a mortar mixture composed of greenstone, cement, and epoxy resin to replicate the Ottoman motif. The Byzantine elements restored constituted “several minor areas of cornice [that] have been replaced in dogtooth” (Ousterhout, 2000, p. 267).

Significance of the 1997-1998 Restoration

The decision to retain the Ottoman roof silhouette rather than reconstruct a Byzantine roof undeniably maintains an Ottoman appearance, but this approach is in keeping with their attempt to treat the building as the “sum of its history”. From a conservation standpoint, this choice is expected, as reconstructing a Byzantine roof would have substantially altered the existing fabric. A total reconstruction would have represented a level of revisionism that denies architectural significance to the Ottoman construction. Such a project would also reject the claims of this architecture, which was intentionally utilized to reflect and project Ottoman

aesthetic sensibilities and presence in the monument.

The treatment of the cornices is more complicated. The restoration team elected to repair surviving Ottoman greenstone cornices. In the missing sections, however, they also fabricated most cornices in the Ottoman style. Restoring dogtooth brickwork would have represented one way to highlight the significance of this building as a Byzantine foundation, yet the element was reintroduced only in “several minor areas”. This selective reconstruction subtly indicates a preference for Ottoman elements and acknowledges the Byzantine history as present, but secondary.

2001-2005 Restoration

The 1997 project was halted due to bureaucratic issues, but was resumed under the same leadership. This project completed the replacement of the old roof, along with exclusively by Ottoman cornices (Ousterhout et al., 2009). It also stabilized gallery vaults and windows throughout. The project also instituted a program of marble, Ottoman-style window fixtures to replace modern solutions, including tarp, that were universally used in the building before restoration (Ousterhout et al., 2009). They removed Ottoman plaster from marble-carved Byzantine cornices in the interior.

The team also unblocked several windows filled in the Ottoman era (Ousterhout et al., 2009). Significantly, they unblocked the central light of the North Church’s triple window in the apse, as well as the central light of the Middle Church’s triple window in the apse. They could not unblock the lateral lights of the North Church due to structural concerns indicated by visible cracks in mullions (Ousterhout et al., 2009). The lateral lights in the South Church apse were simply “not included in the program,” though in the future, they “may be possible to open” (Ousterhout et al., 2009, p. 243). Some unblocked windows unveiled vine-pattern mosaics and geometric frescos in the window reveals, which were conserved for display. On the facade, they also “decided to leave the brick surfaces exposed in the restoration,” justifying that they had “become quite familiar to visitors over the years and they are also important for representing the history of the building” (Ousterhout et al., 2009, p. 239).



Significance of the 2001-2005 Restoration

This iteration imposes on Pantokrator Monastery an exterior that reads as almost entirely Ottoman. The preservation and display of a few mosaics and frescoes on the interior window arches, while not erased, is vastly overshadowed by the effect of the Ottoman fixtures applied to them. The restoration's handling of these windows comes at the expense of historical accuracy. The presence of Byzantine decorations in the reveals of the unblocked windows indicates that they were probably only in use during the Byzantine era, and thus never would have had Ottoman coverings. Although at that time the only surviving historical window fixtures are Byzantine examples documented by Megaw, exclusively Ottoman-style marble frames were fabricated and applied uniformly across the building. This choice presents a unified Ottoman exterior regardless of the chronology of individual spaces.

The selective reopening of only the central lights of the triple apse windows distances the building from its identity as a church. Triple apse windows carry a uniquely Christian meaning, as they reference the Holy Trinity (Patricios, 2014). In the South Church, the decision to reopen a single light while excluding the lateral lights for reasons unrelated to structural necessity constitutes a superficial acknowledgment of Byzantine architecture, achieved by the unblocking of this light, but severs these elements from their Christian meaning. The practical result is a mosque with improved lighting rather than an acknowledgement of the building's Christian identity.

The choice of window fixtures is particularly troubling in this context. Megaw's sketches (Figure 2) approximate the original Byzantine window fittings for the South Church triple windows, which are both unique and art-historically significant. Like others in the building, these windows were blocked during the Ottoman period and thus were never fitted with the nineteenth-century marble frames now imposed upon them. The decision to reopen only one light of each triple window and then mark that opening with an ahistorical Ottoman fixture, distorts the historicity and coherence of the space. In the South Church, where the only known historical window treatment is Byzantine

stained glass, the possibility of restoring this feature was never considered.

Finally, the decision to leave the exterior building without plaster represents a further disassociation from its Byzantine past. Plaster was a necessary component of Byzantine construction in the area because of the humid climate and was present when the complex functioned as a church. Its omission is contrary to modern conservation ethics, given its importance for ensuring the longevity of the structure. The puzzling explanation offered by the restoration team may be motivated by other concerns. A possibility reveals itself when considering that the 2008-2017 restoration team chose to replaster the building at the conclusion of their project. This final restoration made alterations that may have impacted the plaster, or have been made more difficult to accomplish, if it was preemptively applied, such as when building additional structures connected to Pantokrator and adding, removing, and reshaping parts of the walls. Whether intentional or not, the absence of plaster at the conclusion of the 2001-2005 restoration allowed for a more seamless integration of Ottoman architectural elements during the final restoration campaign.

2009-2017 Restoration

This restoration was undertaken by the Turkish Government's Directorate of Pious Foundations. The individuals working on this restoration cannot be easily identified. A restoration report for this iteration was issued by an architect named Nuran Nar for her presentation of the project in the 10th Seminar on Restoration and Conservation in Masonry Structures in 2018 (Nar, 2018).

This project effected numerous changes to Pantokrator/Zeyrek, so this paper will limit the discussion to four aspects of this program. First, the Western wall's Byzantine-style elements reintroduced in the 1960s are addressed as follows: "West and North fronts soffits on the outer narthex of South building were seen as flush in the photographs from 19th century and beginning of 20th century. They were dismantled in the 1960s and converted into wavy form. Dogtooth freezes made out of cement mortar and bricks are removed in compliance with the approved project and rebonded with khrosan mortar and flat bricks



as forming parapet.” (Nar, 2018, pg. 204). Though not explicit, photographs reveal that the Byzantine scalloped roof was raised completely. It was rebuilt with several levels of brickwork and finished with a flat, sloping, Ottoman-style roofline. (Figure 1) The reference to the removal of the dogtooth brickwork does not appear to be limited to the modern dogtooth on the western wall. After 2017, dogtooth brickwork cannot be identified anywhere on the building.

Another significant construction was directly adjacent to this Western wall. Here, the report states: “East part of South Wall which was bonded by incongruous perforated bricks is dismantled. Under the surveillance of Istanbul archaeological museums the area excavated in order to find possible foundation of the wall. Based on data obtained from excavations... courtyard walls are completed with original-sized bricks and khrosan mortar” (Nar, 2018, p. 206). It seems that the area was excavated in search of the foundations for this wall, upon which a wall of entirely modern construction was erected atop the 19th-century foundation to replicate the Ottoman courtyard (Figure 3).

Another addition to the exterior is implied in the report: “Scrutinizing 19th century photographs an approved restoration project is applied. This project suggested a wood staircase leaning on the middle building’s West wall and providing ascend towards portico level from mosque’s interior and a wooden lodge under the sultan’s lodge on South building’s West wall” (Nar, 2018, p. 215) Photographs posted on social media after 2017 reveal that an elevated, large rectangular wooden structure capped with a lead roof is joined to the South Church (Figure 3).

A 19th-century Rococo decorative scheme was also implemented throughout the interior, which required plastering over Byzantine frescos and mosaics. The work on the interior of the Sultan’s dome is particularly notable. The term Sultan’s dome likely refers to the South Church’s gallery dome, but this is unclear. The painting on this dome is unique in that it displays several decorative schemes (Figure 4). The earliest style is the 19th-century theme reproduced throughout the space, and on the majority of the dome. Two other Ottoman phases of wall painting were revealed during restoration on the cone of the

dome, which were not painted over, and instead were given spot-retouches and displayed so that “samples of various periods are left untouched” (Nar, 2018, p. 211). These Ottoman paintings, like many other Ottoman elements uncovered during this phase of renovations are described in the restoration report as the “original... decorations” (Nar, 2018, p. 211).

The United Nations Educational, Scientific, and Cultural Organization (UNESCO) State of Conservation Report from 2019 remarks favorably on this decision, noting that “the opportunity is also taken to display evidence of the evolution of the structure.” (UNESCO, 2019, p. 24). Unlike the restoration report, they add that “Christian traces are behind obscured glass which can be removed when inspection is needed.” (UNESCO, 2019, p. 24). If the Sultan’s dome is indeed the South Church gallery dome, the Christian traces referenced by UNESCO constitute a non-figural motif in a window reveal.

Significance of the 2009–2017 Restoration

The 2009–2017 restoration undertaken by the Directorate of Pious Foundations represents the most sweeping visual program in the monument’s modern history, which fabricated replicas of long-lost Ottoman features while covering and sometimes demolishing the few remaining Byzantine features of the building.

The Byzantine-style roof introduced in the 1960s is represented in the restoration report as an ahistorical distortion of the Ottoman norm and thus something that required correction. Even the UN parroted this valuation when they described the procedure as follows: “the wall head was brought level to a cornice, and other details reinstated, as had existed before the 1960s” (UNESCO, 2019, p. 21). Like Nar’s report, there is no recognition that the 1960s version was a reconstruction of the earlier Byzantine version, nor does UNESCO acknowledge that any non Ottoman roofing style had ever existed on the building. This denial of the monument’s Byzantine history was extended even to the original dog-tooth, which was removed in keeping with the narrative that the structure is fundamentally Ottoman. By contrast, photographs of long gone nineteenth-century Ottoman architectural adaptations are treated as essential to the monument, and are thus reinstated through extensive new construction. Paradoxically, Byzantine





replicas built anew are considered ahistorical, yet it is appropriate to reinstate Ottoman features.

The reconstruction of the pavilion wall, and especially the addition of the Sultan's lodge, constitute new constructions rather than repairs or restorations. These interventions visibly alter the exterior of the complex in ways that strongly reinforce an already dominant Ottoman program. The Sultan's lodge has no surviving original fabric and relies on nineteenth-century photographs for the construction of an approximate replica. A paucity of documentation regarding this structure's historical presence raises questions about the nature of this structure's role and artistic value that apparently demanded its reintroduction in a 21st-century restoration project.

The courtyard wall constructed adjacent to the western facade further illustrates the restoration team's insincere approach to historicity. Although excavations were conducted in search of foundations, the resulting wall appears to be a modern construction erected atop the nineteenth-century base, with little clear archaeological evidence dictating its final form. Here, historical accuracy is subordinate to the primary goal of instituting a reconstruction that visually imposes an exclusively Ottoman identity on the Pantokrator Complex.

The interior treatment of the "Sultan's dome", likely the gallery dome of the South Church, reveals the revisionist goals of this restoration. The two Ottoman decorative schemes uncovered during the project were restored and displayed as "original" decoration. At the same time, Byzantine elements present in the same space, likely non-figural motifs in the window reveals, were covered with opaque glass. This decision cannot be explained by concerns for visual coherence, as the dome's surface is already deliberately fragmented by the display of multiple Ottoman schemes. The dome thus creates the illusion of representing the layers of the building's history while excluding evidence of the building's original identity. Because this dome purports to represent the historical phases of the building, the concealment of Byzantine elements here is especially troubling.

Taken together, the 2009–2017 restoration reveals a highly selective program aimed at articulating

almost entirely Ottoman elements. The result is not a mosque adapted from a former church, but instead a monument altered to present Ottoman Turkish culture as having the exclusive claim on the building's essence.

Conclusion

The modern restoration history of the Pantokrator/Zeyrek complex demonstrates how formal architectural changes can impact how meaning is communicated. Their cumulative effect has been the increasingly dominant presentation of the building as an Ottoman mosque, with its Byzantine origins obscured. This was validated at an international level. The UNESCO State of Conservation Report characterized the most recent restoration as successful, concluding that "as completed, internally the Byzantine structure and its Ottoman overlay combine to form coherent, impressive and functional architectural spaces," and that "the overall balance seems right" (UNESCO, 2019, p. 25).

This coherence is achieved through a selective articulation of history. A tourist seeking directions to the monument on Apple Maps is led to a destination identified as a "12th-century mosque" (Figure 5). This description is incorrect and further obscures the monument's Byzantine imperial foundation and Christian origins. Such a characterization is not the result of any single architectural intervention, but these rewritings are enabled in part by the restoration programs applied to the building, which are themselves products of the same desire to reshape the past. Berger,

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The Medicalization of Grief

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Abstract

Determining where normal human emotion ends and mental disorder begins remains one of psychiatry's most contested challenges. Grief, a universal yet deeply individualized response to loss, sits at the center of this debate. As medicalization increasingly frames everyday suffering as pathology, the boundaries of mental illness have expanded, running the risk of transforming ordinary emotional experiences into diagnosable conditions. While this process can legitimize distress and improve access to care, it also risks reducing complex, socially embedded experiences to clinical symptoms. The shifting classification of grief within the Diagnostic and Statistical Manual of Mental Disorders illustrates this tension. The removal of the bereavement exclusion in DSM-5 and the subsequent introduction of Prolonged Grief Disorder in DSM-5-TR reflect evolving and socially negotiated diagnostic criteria. These changes blur distinctions between natural mourning and more severe mental disorders, raising concerns about overdiagnosis and the imposition of rigid temporal and functional standards on an experience shaped by culture, relationship, and meaning. Grief varies widely in expression, duration, and intensity across individuals and societies. Pathologizing it risks reinforcing Western ideals of productivity, emotional restraint, and rapid recovery while neglecting communal, moral, and existential dimensions of loss. Although some individuals experience debilitating grief that warrants clinical intervention, most mourning is not a disorder to be cured but a meaningful process to be lived. A cautious, context-sensitive, and culturally attuned approach is essential to preserve the integrity of grief while still supporting

Where to draw the line between normal human emotion and mental disorder remains one of the most contested debates in psychiatry and modern culture, especially when some individuals' emotions are situated as excessive while others' emotions are not. Historically, Western society has struggled to define when clinical intervention becomes necessary, often blurring the distinction between natural human suffering and pathological disorder. Medicalization, the "process by which a mental or physical condition comes to be seen as a medical condition deserving medical attention," has increasingly expanded the boundaries of what counts as illness (Gosselin, 2019; Conrad, 2013). While this process can help some individuals access needed care for severe, persistent symptoms of mental dysfunction, it can also transform ordinary human experiences into pathologies. Grief exemplifies this tension: as a universal, existential, and socially mediated experience, it resists clear diagnostic categorization. Conceptualizing grief primarily as a pathology risks overdiagnosis, unnecessary treatment, and the imposition of unrealistic expectations for how individuals should process loss. Therefore, a more cautious, context-driven, and individualized understanding of grief, one that preserves the authenticity of human emotion while still supporting those whose suffering becomes debilitating, is essential.

Medicalization, though conceptually neutral, has become a pervasive lens through which psychiatry

interprets emotional distress, as it is the practice of interpreting "everyday emotional suffering and behavior as a medical condition that can be treated with a particular drug" (Aho, 2008). As Gosselin (2019) notes, medicalization can provide legitimacy and resources to those in need, enabling access to treatment, insurance coverage, and social support. Yet it also has the potential to obscure the social, relational, and environmental factors that contribute to mental distress. Therefore, medicalization is also multi-dimensional; it acts on a continuum, as some disorders, illnesses, or conditions are more medicalized than others (Conrad, 2013). This further intensifies the difficulties in medicalizing mental difficulties, as it is challenging to determine which symptoms deserve treatment, and if treatment is necessary, to what degree. In addition, medicalization is not without bias, as it is a social process (Conrad, 2013). Physicians, pharmaceutical companies, consumer advocacy groups, and insurers all have vested interests in expanding diagnostic categories, often for profit rather than care (Conrad, 2013). Thus, medicalization reflects not only medical progress but also sociopolitical priorities, many of which privilege efficiency and pharmacological solutions over understanding human suffering in its broader context.

Before the codification of mental illness through the Diagnostic and Statistical Manual of Mental Disorders (DSM), Western conceptions of





mental health were inconsistent and largely moralistic. With the DSM's first publication in 1952, psychiatry gained a formalized diagnostic framework that became, as Conrad (2013) writes, the "official 'bible' for designating mental disorders in the United States." However, even these formalized categories are socially constructed rather than purely objective. Mental illnesses are not fixed biological entities but negotiated interpretations shaped by cultural and political values (Conrad, 2013). Granek (2011) similarly argues that psychiatry's reliance on the DSM has led to the pathologizing of reactions that were once considered normal, such as sadness or grief. Moreover, the DSM's continual revisions reflect the instability of diagnostic boundaries, as definitions change as societal norms and professional ideologies evolve. Nowhere is this more evident than in the shifting classification of grief.

Prior to the DSM-5, major depressive disorder (MDD) included a "bereavement exclusion," which prevented clinicians from diagnosing depression within the first months following the death of a loved one. This exclusion recognized grief as a normal, if painful, human experience rather than a psychiatric disorder. However, when DSM-5 was published, the bereavement exclusion was excluded (Kofod, 2015). Criticisms of this change rose quickly, as researchers subsequently warned that one-third to one-half of bereaved individuals might meet criteria for MDD within the first month of loss due to the natural intensity of grief symptoms (Kofod, 2015). This change blurred the line between normal grief and clinical depression, opening the door to overdiagnosis and overmedicalization (Brinkmann, 2017). Later, DSM-5-TR, an edit to DSM-5, introduced Prolonged Grief Disorder to distinguish between ordinary and pathological mourning. Prolonged grief disorder is described as "intense and persistent grief symptoms which are not only distressing in themselves but also associated with problems in functioning." Prolonged Grief Disorder requires that symptoms persist for at least one year in adults and cause significant impairment in functioning, however functioning itself is inherently difficult to classify (APA, 2025). While this temporal criterion acknowledges grief's natural duration, it still risks imposing rigid timeframes and normative expectations on an experience that varies

widely across individuals and cultures.

An experience as nuanced and individual as grief is extremely difficult to pathologize, as it manifests differently in terms of symptoms, duration, and severity. Kofod (2015) describes grief as a "border diagnosis," a condition located at the margins of psychiatry, constantly negotiated between medical and nonmedical understandings. Pathologizing grief ignores its complexity and diversity, reducing an existential experience to a checklist of symptoms. While some individuals do develop severe or prolonged distress that warrants intervention, a universal diagnostic model cannot capture the moral, spiritual, and communal dimensions of mourning. In medicalizing grief, psychiatry risks oversimplifying a deeply human process that defies linear recovery or uniform expression.

Western psychiatry's tendency to treat grief as a disorder reflects broader cultural assumptions about normality, productivity, and emotional control. As Aho (2008) argues, experiences like grief must be understood as embedded within "the sociohistorical situation in which we grow." Symptoms of distress are not always indicators of illness; they may instead express culturally learned ways of processing loss. For example, in many non-Western cultures, extended mourning periods, public displays of sorrow, or continued relationships with the deceased are understood as natural and even necessary components of healing, rather than symptoms of pathology. Grief exists "in a gray area between an objective state of loss and social 'feeling rules' that dictate how emotion should be expressed" (Brinkmann, 2017). Western societies, in particular, often privilege quick recovery and emotional restraint, treating prolonged sadness as dysfunction rather than depth. Medicalizing grief under these assumptions risks imposing Western ideals of efficiency and self-control onto global and diverse mourning practices, erasing cultural variation and moral meaning.

While medicalization can sometimes facilitate healing by legitimizing suffering and connecting individuals to resources, its expansion into the realm of grief represents a troubling overreach. Pathologizing experiences like grief risks "trying to medicalize not only psychiatry but the human condition itself"





(Chodoff, 2002). This blurs the lines between disorder and life experience, as grief is simply part of being human. Grief, though painful, is neither abnormal nor pathological. By labeling it as such, psychiatry discourages emotional vulnerability and casts natural sorrow as something to be cured. This pathologization not only undermines personal meaning-making but also diminishes the moral and relational dimensions of love and loss (Kofod, 2015; Cacciatore, 2022). When grief becomes a diagnosis rather than a dialogue, in which individuals are given the time and space to grieve in the way that feels best for them, the focus shifts from understanding to correction. This effectively undermines the relationships that cause the painful experience of grief in the first place.

The impacts of this pathologization are profound. By imposing normative expectations about how individuals should grieve, medicalization implicitly suggests that recovery must be quick, linear, and measurable (Granek, 2011). Those unable to meet these expectations may feel shame or inadequacy, internalizing a sense of failure for not “healing correctly.” This can drive individuals toward medical treatment, such as antidepressants, anti-anxiety medications, or sleep aids, that may not address the relational and existential dimensions of their suffering. As Granek (2011) notes, grief often requires time, presence, and community rather than pharmacological suppression. When natural sorrow is miscast as dysfunction, the process of mourning is reduced to a clinical problem rather than recognized as a vital aspect of human experience.

Additionally, the lines between normal grief and grief that requires medicalization, diagnosis, and treatment are quite blurred. In fact, evidence suggests that boundaries between healthy and pathological grief are culturally constructed. Granek (2011) argues that the growing tendency in Western psychology and psychiatry to pathologize grief reflects an individualistic, efficiency-driven cultural paradigm, which privileges rapid recovery and emotional control over communal or ritualized expressions of mourning. Aho (2008) supports this critique philosophically, noting that experiences such as grief must be understood as embedded in sociohistorical and relational contexts rather than

reducible to neurochemical dysfunction. Together, these perspectives show that efforts to medicalize grief often reflect Western cultural values, particularly individualism, productivity, and emotional restraint, rather than universal features of human psychology. Recognizing the cultural and historical variability of grief underscores the need for caution when defining it as a medical disorder and reinforces the argument that grief should remain understood as a socially and existentially meaningful experience, not merely a pathology.

Ultimately, the challenge lies in supporting those whose grief becomes disabling without pathologizing ordinary human sorrow. For some, grief may overlap with depressive or anxiety disorders, and compassionate clinical intervention can be lifesaving. Yet for most, grief is not a symptom to be treated but a process to be lived through. Clinicians should therefore adopt a cautious, individualized approach that recognizes grief as both a psychological and moral experience. As Brinkmann (2017) writes, grief itself “is not a pathology, but rather an existential condition that may lead to mental disorder.” A humane approach must honor this distinction by acknowledging grief as potentially painful and destabilizing, yet simultaneously profoundly meaningful and necessary.

Recognizing the variability and cultural embeddedness of grief calls for a broader social response. Societal investment should not be limited to pharmaceutical or psychotherapeutic interventions but extended to community-based supports, public rituals of mourning, and compassionate acknowledgment of loss. Research should explore how social connection, ritual, and collective care influence healing compared to strictly medical interventions. Arguably, this is further complicated at this point in human history, as the community environment and social framework becomes increasingly fragmented and unstable. However, reintegrating grief into the social fabric affirms its role as a shared moral and existential experience rather than a pathology to be cured.

Grief, though undesirable and often agonizing, is a central feature of human life, as it is an expression of love, attachment, and the meaning we ascribe to others. To medicalize it indiscriminately is to deny part of what makes us human. The task for psychiatry,



then, is not to eliminate grief but to understand it, by distinguishing suffering that requires intervention from the suffering that simply requires witness. In striking this balance, society can preserve the integrity of grief as both a deeply personal and profoundly communal experience.

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The surreal in Julio Cortázar's Cosmopolitan Works and Gabriel García Márquez's Provincial World

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Many factors must be considered when analyzing a story, notably the context in which it was written. The setting of a story can also be used as a segue to understand the deeper meaning and the potential commentary being made by the author. When studying the Colombian 1982 Nobel Literature Prize winner, novelist, and journalist Gabriel García Márquez (1927-2014) or Argentinean novelist and short-story writer Julio Cortázar (1914-1984), the context of the Latin American boom is essential.

The experimental and modernist works produced during the 1960s and 1970s reached global- most notably European- prominence and explored societal commentary and criticism, with a novel approach to the description and qualification of reality. Following the inhuman atrocities of World War II, emerging literary styles that confronted the banality and absurdity of society and daily life such as surrealism, fiction, existentialism, magical realism started to emerge.

Gabriel García Márquez is most attributed with the concretization of magical realism, taking impossible and fantastical events and seamlessly incorporating them into truth-like writing without questioning the absurdity of the situation or treating it as "magical." García Márquez wrote within the context of small towns and villages, with an emphasis on closed-off local worlds where deeply rooted Latin-American traditions and ways of life were kept untouched. His stories serve as societal commentaries and criticisms, bringing to light the small life, violence, and hypocrisy in rural and local Colombian towns. On the other hand, Cortázar's writing is more frequently associated with surrealism, studied more within the context of cosmopolitan literature because of his recurring Parisian setting or his reflection of Buenos

Aires, precipitated by his move to France in 1951. Both García Márquez and Cortázar exemplify the Latin American boom's search for reality through

fiction, with the former using magical realism as a medium to study provincial and more closed-off Latin American communities, and the latter's works adopt a broader surrealism of the cosmopolitan reality of the 20th century.

Gabriel García Márquez centers many of his stories around magical realism to examine communities more generally, using fantastic elements to highlight his commentary. Seamlessly incorporating magical elements into his stories, without characters blinking at the improbability of the mythical elements of the story, is the essence of magical realism. García Márquez's life was parallel to the many political upheavals of the 20th century, notably the Cuban and Mexican revolutions, with which he was strongly associated. The use of magical realism in his numerous works such as the short story "A Very Old Man with Enormous Wings" (1955) and novel *Chronicle of a Death Foretold* (1981) serves as a medium for his own political commentary.

In her paper "Of Hybrids and Other Fusions," Rodríguez-Vivaldi (2016) examines the creation of new ways of expression in Latin America during the Latin American boom, looking at the two different reactions to the political and social commotion of the time. The first manifested in "A cosmopolitan trend toward taking artistic innovation and experimentation that became the avant-garde," which "paralleled some international (mostly European) styles in vogue" (Rodríguez-Vivaldi, 2016, p.150). This description could be used to characterize popular styles of the time such as modernism, existentialism, absurdism, and surrealism, which is why Rodríguez-Vivaldi refers to this reaction as the collective "isms," popular in Europe with writers including Sartre, Ionesco, Camus, Kafka, and Proust. This trend was also prominent in the Latin American boom with writers such as Cortázar, whose writing exemplifies this movement owing to the time he spent in France under the influence of 20th century European literature styles.





Meanwhile, García Márquez's writing better fits the second description offered by Rodríguez-Vivaldi, which is the "search for Panamerican or national identity as the true alternative for Latin American art that evolved into a social, ideological, and nativist art." (Rodríguez-Vivaldi, 2016, p. 150). This corresponds to a style less influenced by Europe's modernism but instead delves into authentic Latin American stories focusing on the continent's culture and history. Gabriel García Márquez is more strongly associated with magical realism because it is a literary style that was not derived from the prominent styles of Europe at the time, and he focused more on cultural and provincial aspects of his culture rather than a cosmopolitan one.

Magical realism can be found in the vast majority of García Márquez's work, notably in "A Very Old Man with Enormous Wings," published as a short children's in the journal *Casa de las Américas*. This story recounts the tale of a couple, Pelayo and Elisenda, who find what appears to be a fallen angel in their backyard and proceed to exploit its presence by having inhabitants of their small coastal town visit him for divine guidance. They charge for admission and progressively treat the angel like an animal in their yard, especially as he loses popularity when a "spider-woman" becomes the town's biggest attraction. The angel, often described like an old man, regains strength to fly away at the end of the story, to Pelayo and Elisenda's satisfaction. This short story differs from García Márquez's other works because of the sheer amount of magical realism incorporated in it, surpassing the subtlety of the style in his other writings. The presence of an angel falling in the backyard of a provincial town is a first mystical event, however, the author counters the improbability of this with the characters' reactions, initially of stupor but quickly "overcame their surprise and in the end found him familiar" ("Very Old Man," García Márquez, 2005, p. 218). The absurdity of the angel is continued with his description, which counters what one would expect an angel to look like. Rather than a majestic arrival, the angel is found "lying face down in the mud [...] who, in spite of tremendous efforts, couldn't get up" (p. 217). By countering what is expected even from a magical being, there is an element of reality that is entailed when the true nature of something is more disappointing or less magical than one would expect.

Instead of the angel being gracious and beautiful, the rough, "old man" description brings it closer to reality. García Márquez uses precise descriptions and details, further making the magical seem real when a divine creature so closely resembles a "human", especially an unattractive, parasite-covered, and filthy one ("Very Old Man" 219). García Márquez uses this as a platform for his commentary of a society that takes advantage of the weak. When the old man was advantageous and lucrative to the impoverished couple, they exploited it and treated it like a circus animal. However, as soon as the interest in the angel waned, it became a burden to them and was more severely mistreated. "A Very Old Man with Enormous Wings" is exemplary of García Márquez's use of magical realism and his focus on smaller Latin American communities, by tying to the divine or mystical to draw a reflection of provincial character's interactions with it.

Magical realism is a commentary on society; García Márquez's choice of confining this story to a small coastal town, similarly to his novel *Chronicles of a Death Foretold* (1981), is what allows the commentary to strike. In *Chronicles*, Santiago Nasar is murdered by the Vicario twins, the brothers of Angela Vicario, who claims Nasar took her virginity, costing her an advantageous marriage. As the title suggests, Nasar's death is predicted, everyone living in the small Colombian town knew about the young man's impending murder, but no one chose to act on it or prevent it from happening, underscoring the absurdity of the situation and a lack of sense of responsibility. The public knowledge that the Vicario brothers are waiting to slaughter Nasar travels quickly across the town, yet he is still killed. As in "A Very Old Man with Enormous Wings," the society that this behavior is allowed in is closely analyzed and criticized by García Márquez; *Chronicles* outlines the dangers of "machismo," lack of proactiveness and involvement to help another, especially one who is revealed as an innocent and well-doing citizen. Meanwhile, the exploitation of the old man in the short story is only able to happen because of how small the community is. In the context of a big city, the themes of taking advantage of the vulnerable and the role of divine presence would take quite different forms. García Márquez studies the individual within society, using "petri-dish" communities of the





worlds he creates that allow him to push through his commentary.

Julio Cortázar also uses certain mythical aspects in his stories. However, the surrealist style of his work resides in the absurdity of his storytelling to explore human nature and the purpose of existence. This aligns with the surrealism or absurdism, “isms” identified by Ana María Rodríguez-Vivaldi in reaction to the Latin American Boom, especially within cosmopolitan settings (150). Julio Cortázar’s used more cosmopolitan approaches to his stories, especially during his time spent in Paris and Buenos Aires, where some of his works such as *Rayuela* (1963) and “Casa Tomada” are set. In his book *En Busca Del Unicornio: Los Cuentos de Julio Cortázar*, Jaime Alazraki explores the definition of the mythical and fantastical aspects of Cortázar’s writing and quotes the author explaining that “Casi todos los cuentos que he escrito pertenecen al género llamado fantástico por falta de mejor nombre” (“Almost all of the stories that I have written belong to the fantastic genre” (Cortázar, as cited in Alazraki, 1983, p. 27). Cortázar self-categorizes in this genre, explaining that “me lanza a escribir como la única manera de cruzar ciertos límites, de instalarme en el territorio de lo otro” (it launches to write as the only way to cross certain limits, to settle in the territory of the other” 27). This otro is often mentioned by the author, and gives context to his intentions when writing a story. By writing about an absurd situation and crossing a certain threshold of reality or logic, Cortázar was able to reflect on human behavior and the curious nature of life within a larger and higher society. Alazraki defines this otro as “una nueva postulación de la realidad, de una nueva percepción del mundo” (“A new postulate of reality, of a new perception of the world” 28). Cortázar, like García Márquez, used a new lens to comment on the world and man within society.

Julio Cortázar’s intentions of finding a deeper meaning to life are manifested in his 1963 innovative novel *Rayuela*. The novel recounts the story of Horacio Oliveira, a writer living in Paris with his Uruguayan mistress La Maga and his club of ex-pats called The Serpent Club. After complications with his mistress’ son Rocamadour, Oliveira sets back off to Buenos Aires where he works odd jobs, including keeper of a circus cat and attendant at an insane asylum.

The structure of the novel’s chapters was groundbreaking- they could be read in sequence or at random- a reflection of Cortázar philosophical and reflective commentary. The novel contained much less of a mystical aspect, but when taking a closer look at each character’s behavior, the absurdity of the mundane is made abundantly clear. Oliveira’s character narrates certain parts of the story, one where he explains that “this whole A B C of my life was a painful bit of stupidity, because it was based solely on a dialectical pattern, on the choice of what could be called nonconduct rather than conduct, on faddish indecency instead of social decency” (Cortázar, 1966, p.12). This character’s narration bridges the author’s thoughts on society, which is riddled with questions about how one should behave but does not impact the world. Oliveira spends the whole story seeking bigger meaning to his life, moving continents, looking for love in La Maga and then confusing his affection for his mistress with that of his friend’s wife. Living in the bustling cities of Paris and Buenos Aires further this insignificance of life, as they belittle the character and accentuate how small the consequences of his decisions are.

In addition, Cortázar searched for the meaning in existence within everyday routine. As Ilan Stavans explains in his journal article “Justice to Julio Cortázar,” the short-story writer plunges into how to tie in “the surreal into daily life”, which would help him with finding “the peculiar and bizarre in the routine - to intertwine dreams and reality.” (Stavans, 1996, p.11). Emphasizing this repetitive aspect of life highlights the absurdity of existence and even adds slight humor to Cortázar’s works that countered the dark meaning behind his writing. Oliveira’s character describes how “La Maga was putting up her hair, taking it down, putting it up again.” (Cortázar, 1966, p. 12) as part of the description of his surroundings, a common description in this novel, that highlights the absurdity of everyday life. La Maga’s fixation on her looks becomes part of her routine, but something that seems so important to her is merely an absurd and repetitive aspect of reality. By combining the mundane with the surreal narration of his stories, Cortázar questions the logic behind human behavior within society and reflects on the absurdity of the importance that each individual attaches to their insignificant life.





Rayuela, despite its complex storyline, recollects the story of a man seeking philosophical meaning. However, in either order of reading, the reader is left with a sense of ambiguity with the ending. There is no true closure for Horacio Oliveira, and therefore no true progression in finding purpose. Using a cosmopolitan backdrop to this helps accentuate the sense of deception and loneliness of human reality, as even though Oliveira is constantly surrounded and accompanied, he still feels the need to seek something greater than himself or question his insignificant reality.

Iris Pearson states clearly in her article comparing the use of Paris in 20th century works that Cortázar responds “to an ongoing disillusionment with the promised land of Paris by reconfiguring the city as a site of continued search, and they do so through discontinuous, fragmented forms, promoting episodic narratives whose pieces must be carefully navigated by the reader.” (Pearson, 2021, p.89) The city of Paris is yet another component of the story used to confuse and highlight the absurdity of our reality. Putting characters in a setting where their story truly has no impact on the lives of others is most easily done in a city, where everyone lives their lives in parallel without necessarily knowing what their neighbor is doing, a stark contrast to García Márquez’s small Latin American towns. Cortázar’s centers his characters on their thoughts to extract a greater meaning out of his stories, whereas García Márquez studies his characters within the context of a smaller society.

In summary, Julio Cortázar and Gabriel García Márquez both seek a greater human reality in their works and do so by using surreal and fantastical literary styles. However, the authors differ in how they incorporate the surreal or absurd in their work, and the context in which they do so. García Márquez focuses on smaller closed-off Latin American communities in works such as *Chronicles of a Death Foretold* and “A Very Old Man with Enormous Wings,” in which he highlights interactions of mystical or divine beings with provincial societies. The seamless incorporation of the mystical is magical realism, strongly associated with this author, can be attributed to his 1982 Nobel Prize win. The defined Latin American identity García Márquez created echoed across the world and caught

European attention. By contrast, while Latin American, Julio Cortázar contributed to the popular European movements of absurdism and surrealism, with a focus on the individual and their inner thoughts. Set in large cosmopolitan cities like Paris and Buenos Aires, Cortázar showed the insignificance of individual decisions, and how each of his characters have little to no impact on their surroundings relative to the bustling environment in which they live.

Considering Cortázar’s proximity to many recognized 20th century writers, it would be expected that he be eligible for the Nobel Literature Prize, especially with the Nobel Academy’s eurocentrism. Perhaps his “loss” can be attributed to the fact that he mainly wrote short stories, and novels are preferred. Both Julio Cortázar and Gabriel García Márquez shaped the Latin American Boom, as well as the literary styles who became the voice of the second half of the 20th century. But for the time, García Márquez had a more distinct take on a defining unique Latin American style, one that was less cosmopolitan and, in effect, less European.

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Variability in the Daily Activity of the Nine-banded Armadillo across the Americas

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Introduction

The nine-banded armadillo (*Dasypus novemcinctus*, Cingulata, Dasypodidae) is one of the most unique mammalian species of the Western hemisphere. Though sometimes mistaken for a reptile, these placental mammals have bony plates across their back for protection against predators. They produce their offspring in an interesting manner; despite mating season being in mid-summer, the zygote doesn't implant itself until early winter. It is also one of the only mammals to regularly produce identical offspring consistently, with each zygote splitting into genetically indistinguishable quadruplets (Loughry et al. 1988). They also differ from certain trends most mammalian species follow. They have a low metabolic rate for their size and have a high thermal conductance as well (Boily 2002). They are deemed imperfect homeotherms as their ability to thermally regulate is so poor, and their body temperature depends much more on environmental factors than other endotherms (Boily 2002).

They play an important role in the ecosystem as well. They are primarily insectivores, but also eat plant matter, and thus can serve to control insect and pest populations while promoting seed dispersal (Rodrigues et al. 2019). Another major impact they have on the environment is their establishment of burrows, which are used by a number of other species as well. They offer shelter and warmth for species like opossums, squirrels, foxes, bobcats, and even some birds (DeGregorio, Veon, & Massey 2022). In addition, their actions can also negatively impact human development. They are often declared a nuisance in the United States due to their ability to cause tunnelling in lawns and gardens as well as destroying agricultural landscapes.

Although the main topic of this paper is not on the geographic range of the nine-banded armadillo, it

is an important point to discuss. At its simplest, it is the locales in which a species resides. It depends on the interplay between numerous variables. Abiotic factors, like climate, temperature, and altitude, can provide obstacles for a species' occupation (Holt 2003; Sexton et al. 2009). Biotic factors also play an important role; the presence or absence of food sources, predator threats, and competitors can limit the locations of specific species (Holt 2003; Sexton et al. 2009). Geographic availability is the final consideration, as a species must be able to reach and establish themselves in a location in order for them to occupy it. Ranges are not static concepts; as the above variables change, species' ranges can contract or expand (Sexton et al. 2009). Furthermore, the evolution of a species can change its range, despite the external variables remaining constant. The changes in a species range can, in turn, further alter those abiotic factors and create new symbiotic relationships between species. Helping identify species' ranges can be important in predicting ecological interactions, changes to the environment, and species at risk of endangerment (Gaston and Fuller 2009).

The nine-banded armadillo is unique as it has had massive geographic expansion. It originates in the northern parts of South America but has spread its occupation substantially further north than south. They have not colonized the southern reaches of South America but continue to push into the United States of America. McNab (1980) posits that this may be due to interspecific competition in the south that is absent in the north. This expansion demonstrates a remarkable plasticity on the nine-banded armadillo's part, as the Northern and Southern Temperature regions have a much different climate than their tropical origin (McNab 1980). There is some evidence that their northern expansion is slowing down, due to colder





temperatures and frozen precipitation, which provides a thermal stress and hinders foraging (DeGregorio & Deshwal 2025). In addition, their western range in the US has already shown some contraction, possibly due to increasing levels of aridity (Humphrey 1974).

The primary subject of this paper is temporal niches. Similar to spatial niches, temporal niches play a role in a species' fitness. Most higher order vertebrate species operate on a 24-hour circadian clock and are active at regular select intervals in a day. Typically, there are three categories of temporal niches: diurnal, nocturnal, or crepuscular. There are varying degrees of flexibility to which a species can change their temporal activity (Levy 2019). For example, Levy points out that some rattlesnake species are active at certain times depending on heat levels, regardless of the light levels at the time. However, many species are limited in their ability to change their niche by internal biological constraints, like retinal sensitivity (Levy 2019). The ability of a species to change the time of day in which they are active can provide a valuable ability to improve fitness. It can help to reduce interspecific competition or increase resource availability.

The large expansion in the nine-banded armadillo's range has introduced a number of different variables from their origin in the tropics. Temperature, land cover, and seasonal differences occur across their distribution. In the South American tropics, research typically describes them as nocturns. However, in the northernmost parts of their range, some research describes them as exhibiting more diurnal activity (DeGregorio 2021; Green 2016; McDonough). This is especially true in the wintertime, which is much more pronounced in the Temperate zones than in the Tropics. This is likely to avoid the frigid temperatures of the winter nights. Armadillos are well known to have very poor thermal regulation compared to other mammals, so their activity is highly temperature-dependent. This seems to be the most prominent variable in determining the temporal distribution of their daily activity. Another strong factor is human activity; developed areas tend to cause more nocturnal activity, most likely as an avoidance mechanism since mortality rates are high in these areas due to dog attacks and car accidents (DeGregorio 2023).

The plasticity of the nine-banded armadillo's temporal activity greatly determines the extent of its range and how it can respond to different factors. This study aims to investigate potential changes in armadillo activity across the latitudes of its range and relate those to variables that could be affecting them, such as temperature, land cover, or seasonality. As distance from the equator increases, a corresponding increase in diurnality is expected to occur due to the higher frequency of colder temperatures. When separated by season, this effect in the extratropical latitudes should be most pronounced in the winter and least pronounced in the summer. The seasonal differences in the tropics should be minimal, as temperature fluctuations are very small between seasons. Prior research has shown that temperature is the primary determinant of activity, so seasonal differences accounting for temperature should not be strong. Temperature should be the strongest determinant of activity and the differences between temperature groups should be prominent. In addition, the armadillo has been shown to prefer tree-covered areas, partially because it provides shade and thermal regulation on hot days. Accounting for temperature, it might be possible to see a slight increase in diurnality in treeoccupied areas relative to artificial surfaces or grassland when temperatures exceed a certain point.

Methods

Data Collection

The primary data for this study was sourced from Wildlife Insights, a public database of camera trap data from researchers and labs across the globe. Camera traps are a common tool used in ecology to determine location and timing of organismal activity. They are near-identical to hunting cameras and are often attached to trees or vertical surfaces to gain a view of a specific habitat or area. An organism's movement activates either the taking of one image, multiple images (a sequence), or a video.

Wildlife Insights was filtered such that only *Dasypus novemcinctus* (nine-banded armadillo) images and sequences were retrieved. All of the data was merged into a single dataset, and data cleaning and analysis was done in R; camera trap sequences were given a timestamp the same as the first image present in each sequence (i.e., a sequence with multiple images





ranging from 1:04:54-1:07:32, the time stamp for the observation would be 1:04:54). These images were then filtered to remove images within an hour of the previous observation from the same camera trap, to ensure each image was an independent observation; this is a common practice in the field of ecology, though the time difference may vary depending on the species and study site (Sollman 2018).

Each image was associated with the country and location (latitude/longitude) of its respective camera trap. Seasonality of each image was determined using meteorological season, which denotes each season as starting the first day of the month containing the respective solstice/equinox. The landcover of the camera trap was obtained using the FAO map of the dominant land cover type (2014). The location of each camera trap was mapped onto the landcover map in QGIS (Image 1). Using the Vector Geoprocessing tool Buffer, an area of radius 187.12 meters was drawn around each camera trap. This area is meant to approximate the home range of nine-banded armadillos (estimates vary depending on the study, so a roughly median value of 11 hectares was chosen) (Gammons, Mengak, & Conner 2009). Raster zonal statistics were then used to calculate the predominant

landcover type around each camera trap.

Temperature was gathered using the “ERA5 post-processed daily statistics on single levels from 1940 to present.” This dataset provides a raster file with values for each day in a year, at a resolution of 0.25° longitude and latitude. Each photo was related to the closest point in the ERA5 raster and the temperature was extracted for the given day of the photo.

Statistical Methods

For latitudinal analysis, the range of locations were split into seven slices. Each one is a range of 11.75°, except for the northernmost and southernmost slices, which extend to the most distant observation in their group (45° to 35.25°, 35.25° to 23.5°, 11.75° to 0°, 0° to -11.75°, -23.5° to -11.75°, -30° to -23.5°). The total number of latitudinal slices in the tropics are four, and there are three extratropical groups. These allowed for latitude to become a categorical variable to make statistical analysis more manageable. Kernel density estimates (R package overlap) were used in order to visualize the daily temporal activity of *Dasypus novemcinctus*. Watson-Williams tests of homogeneity of means were used to determine if distributions were significantly different (R package circular).

Results and Discussions

The data represented almost all of the North and South American countries [Image 1], except for those with insufficient observations to be included (Honduras, El Salvador, Nicaragua, Venezuela, Argentina, Chile, and Uruguay) as well as island nations without the species present. The number of camera traps and images per latitude group vary. For example, the group from 11.75° to 23.5° had the smallest sampling (n=258) while the other latitudes had an order of magnitude greater (n=1188-5786).

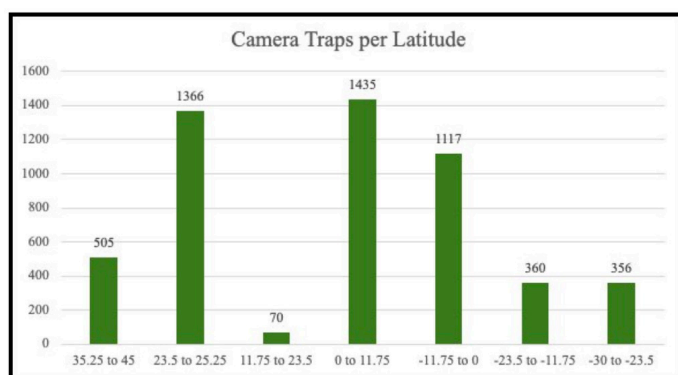


Figure 1. Number of Camera Traps per Latitude

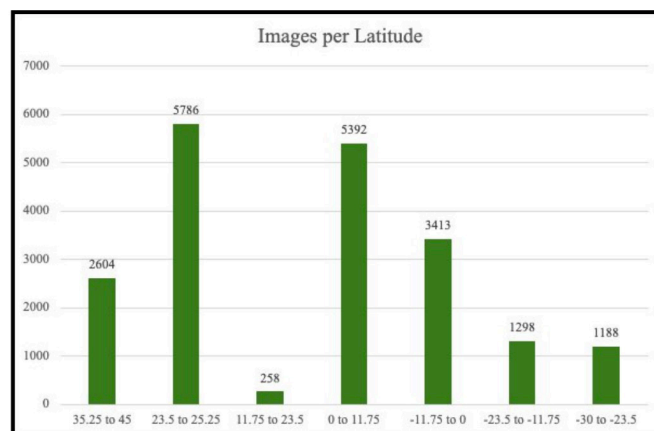


Figure 2. Number of Independent Images per Latitude



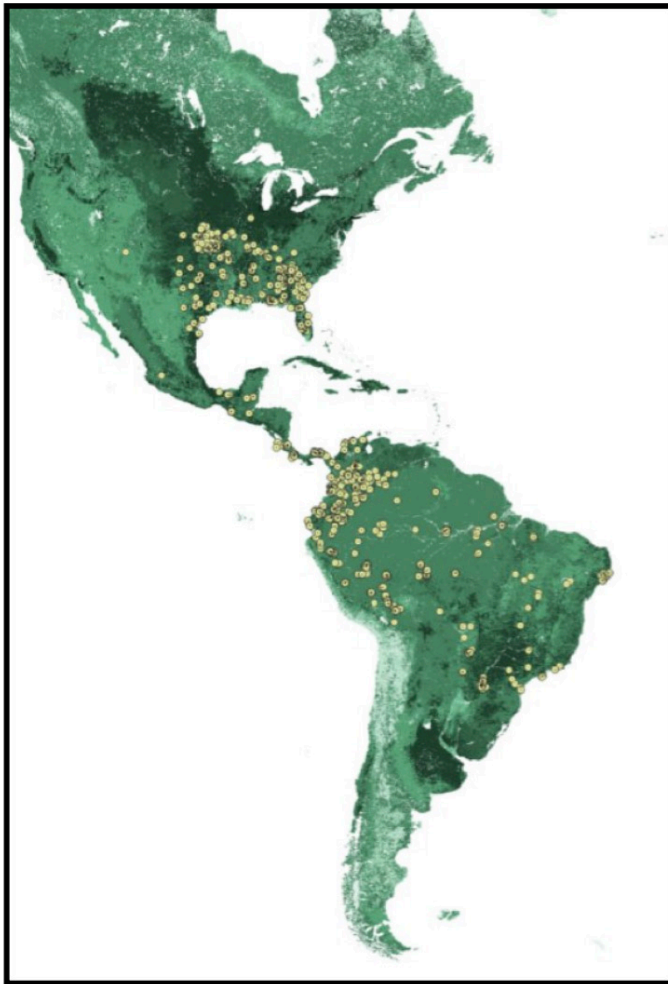


Image 1 Spatial Distribution of Camera Trap Deployments

The distribution of seasons in this dataset is not even across the latitudes [Figure 3]. The proportions within and between the latitudes differ, especially in regards to winter and fall. The two northernmost latitudinal groups have an abundance of fall sampling compared to the other seasons. This can be a limitation in comparing latitudes, especially in the extratropics where distributions vary significantly between seasons and oversampling can shift distributions.

All of the latitudes are predominantly tree-covered areas, with none being less than half of the sample [Figure 4]. The proportions of the others vary significantly. The most prominent across groups besides tree-covered were cropland, artificial surfaces, and grassland. For certain latitudes, these groups did not have sufficient sampling to produce a density plot,

and thus were left out. Others were included, but their samples were quite small such that random variation produces an unusual plot. Other categories, like waterbodies or shrubland, were left out of analysis entirely due to their consistent lack of sampling and inability to produce significant results.

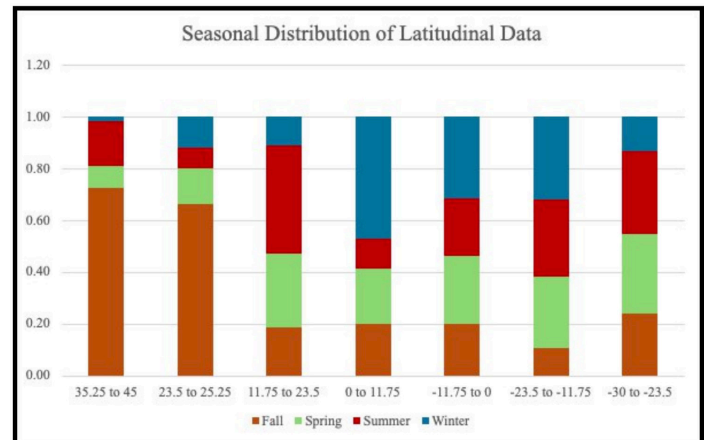


Figure 3. Seasonal Proportions in Each Latitude's Dataset

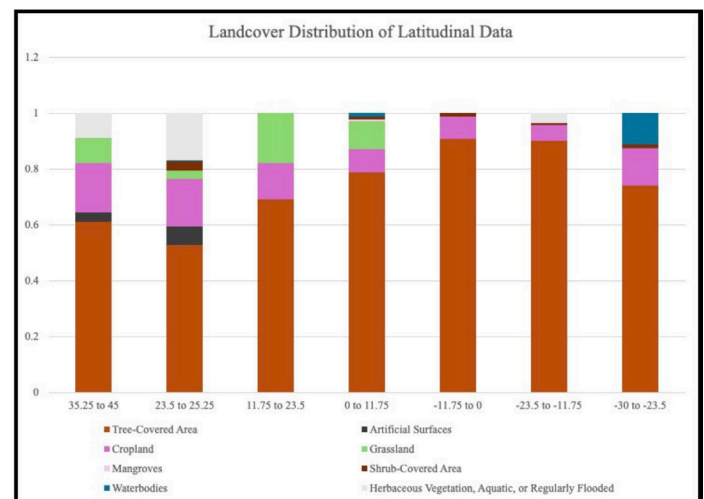


Figure 4. Landcover Proportions in Each Latitude's Dataset





Latitudinal Differences in Daily Activity

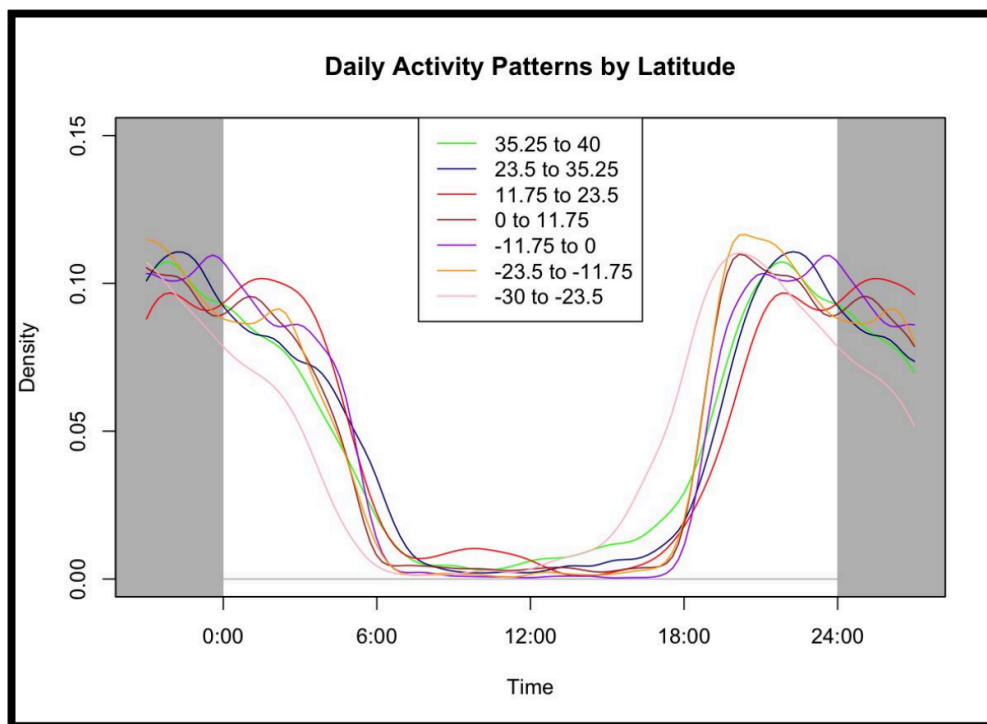
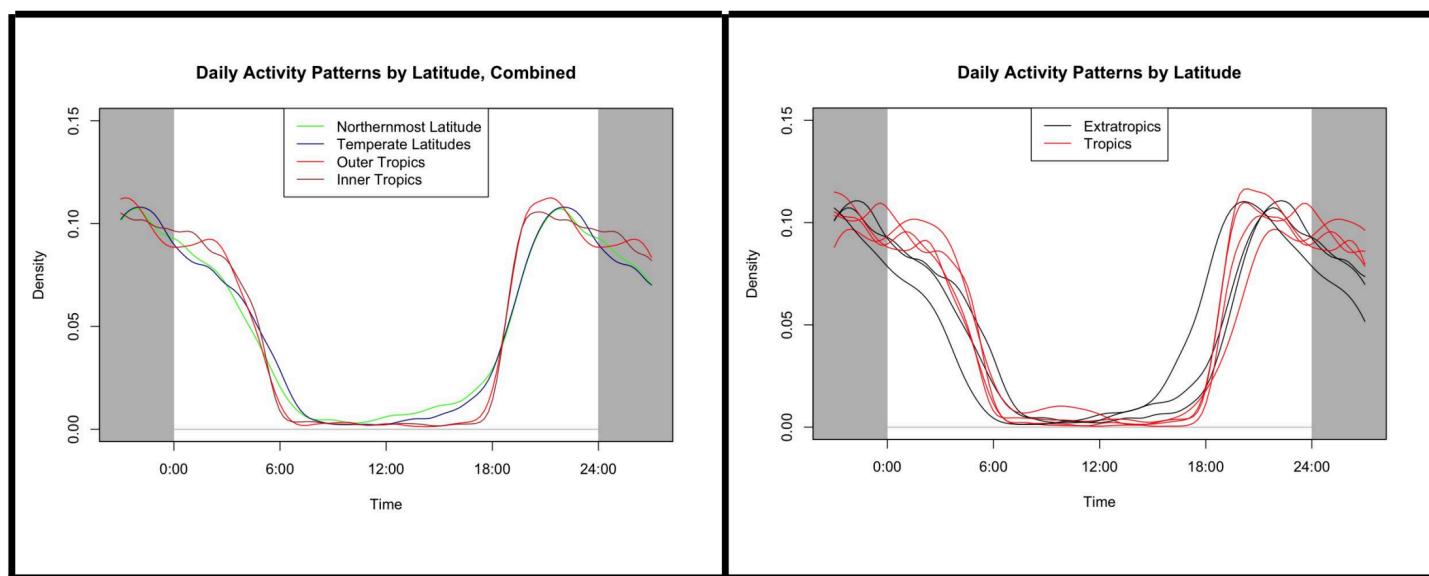


Figure 5. Daily Activity Patterns By Latitude



Figures 6 & 7. Daily Activity Patterns By Latitude Altered for Clarity





In general, the daily activity patterns of the nine-banded armadillo are the same across latitudes. They exhibit a nocturnal activity pattern with maximum activity between ~19:00 to ~22:00. Activity drops consistently from ~6:00 to ~7:00. During the day, activity is low, but between ~16:00 and ~18:00 activity begins to rise again until its peak. Variations between latitudes are small, with the Watson-Williams Test showing no consistent pattern in significant differences between density curves of extratropics vs. tropics (Appendix, [Table 1]).

The southernmost latitude shows the greatest difference from the others, reducing activity in the morning and increasing it in the evening before the others. There are other armadillos in this area, so it could be possible that the combination of extratropical seasonal differences combined with competition and niche partitioning could result in the effect seen, though I think this to be unlikely.

One qualitative observation is that the extratropical latitudes tend to drop from the peak of their activity earlier than do the tropics, but take longer to reach their low daily activity. This results in the trend observed above where in the early morning tropical activity exceeds extratropical activity, but they cross over due to the more rapid decrease of tropical activity in the morning. This is most visible in [Figure 7], due to the contrast.

One limitation is that the makeup of this data is not uniform; as can be seen in [Figure 3] in the next section, the distribution of the seasons is not even across each latitude due to some being oversampled. In addition, seasonality means different things in the tropics than it does in the extratropics; therefore, the northernmost latitude's density distribution is an average across all seasons, while the tropics is technically the same, but the seasonal differences are minute

Temperature and Seasonal Effects on Daily Activity

Seasonality seems to play a role in the daily activity of the nine-banded armadillo in the extratropics, but this difference disappears in the tropics (for significance, see Appendix, [Table 2]). The extratropics north of the equator (45° to 23.5°) showed more diurnal activity during the winters as well as a spring peak in the evening substantially higher than the other seasons. For example, in the northernmost latitude group, winter had a probability density of 0.34 compared to values of 0.13, 0.02, and 0.07 for fall, spring, and summer, respectively from 6:00 to 18:00. For the spring season, the increased activity in the evening compared to the morning was an unexpected find, but this could be due to precipitation generally occurring in the evening more than the morning. Rain could lower temperatures compared to the morning, and also simultaneously encourage insect activity in the soil while making foraging easier. These effects could account for the heightened evening activity in the spring.

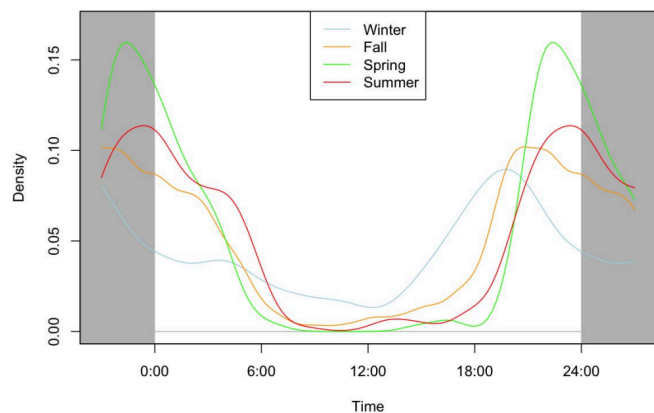
There was an observed seasonal difference in the latitudinal range from 23.5° to 11.75° , which was unexpected due to it being in the tropics, but the smaller sample size ($n=258$) may contribute to the differences seen. The rest of the tropical latitudes had very little difference between the seasons, as expected. Since the primary factor in armadillo activity has been shown to be temperature, the little seasonal difference in tropical areas is likely due to the slim temperature differences throughout the seasons.

Some mammals have seasonal variation due to factors other than temperature, including light levels and breeding seasons. To further determine if there is a seasonal effect separate from temperature, the extratropical latitudes were combined and separated by seasons. Each season only included the temperatures between 20° and 30°C , in order to ensure temperature's effect on the distribution was reduced. The plot is shown in [Figure 9].

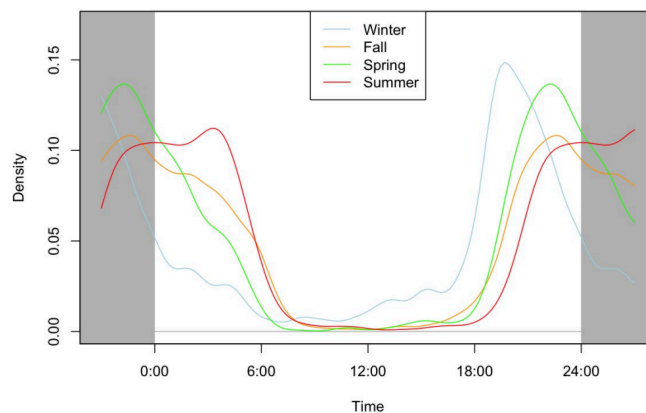




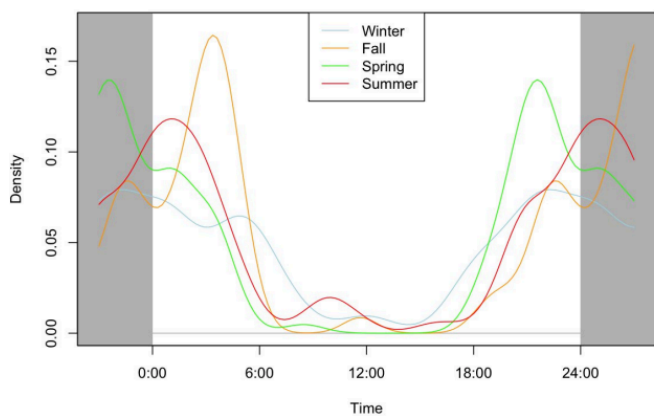
Daily Activity Patterns by Season, 35.25 to 45



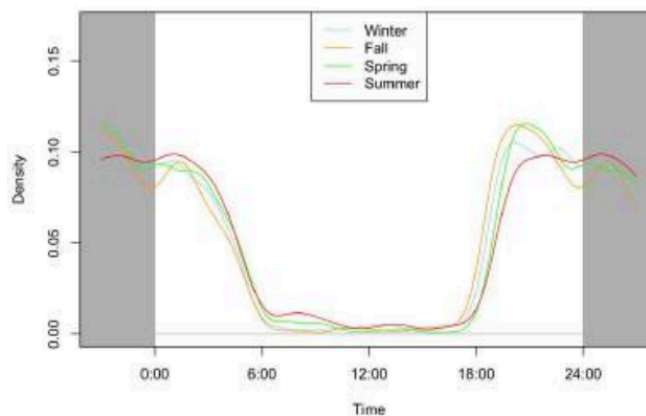
Daily Activity Patterns by Season, 23.5 to 35.25



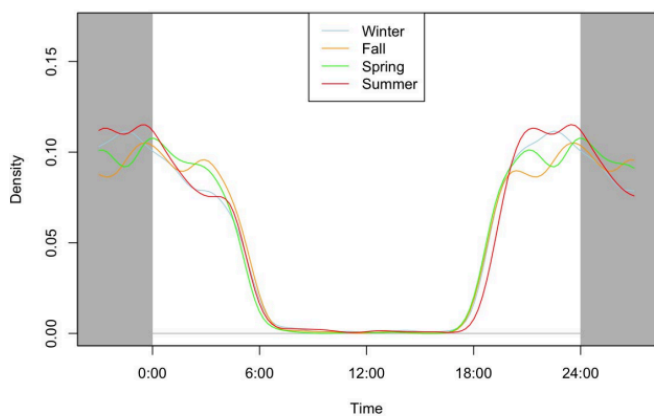
Daily Activity Patterns by Season, 11.75 to 23.5



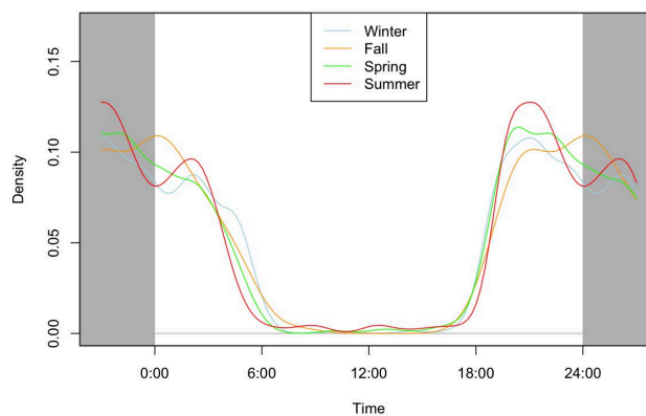
Daily Activity Patterns by Season, 0 to 11.75



Daily Activity Patterns by Season, -11.75 to 0



Daily Activity Patterns by Season, -23.5 to -11.75



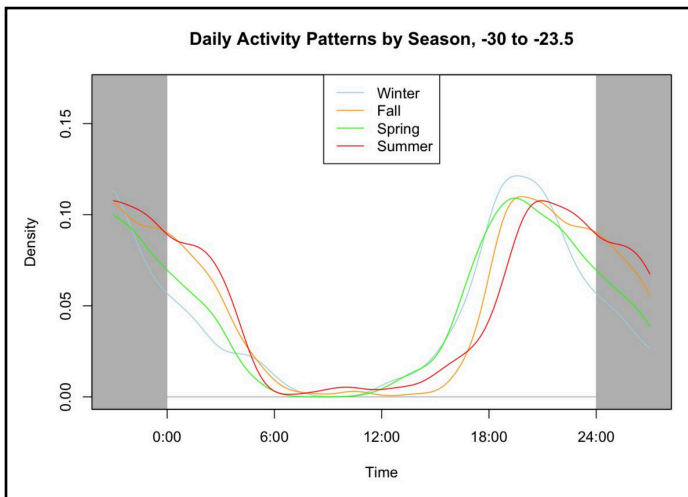


Figure 8 Seasonal Differences in Temporal Activity by Latitudinal Section

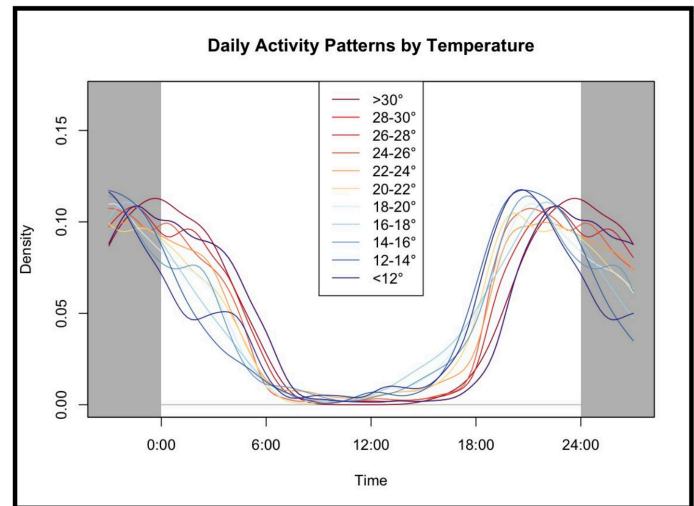


Figure 10 Temperature Differences on Temporal Activity

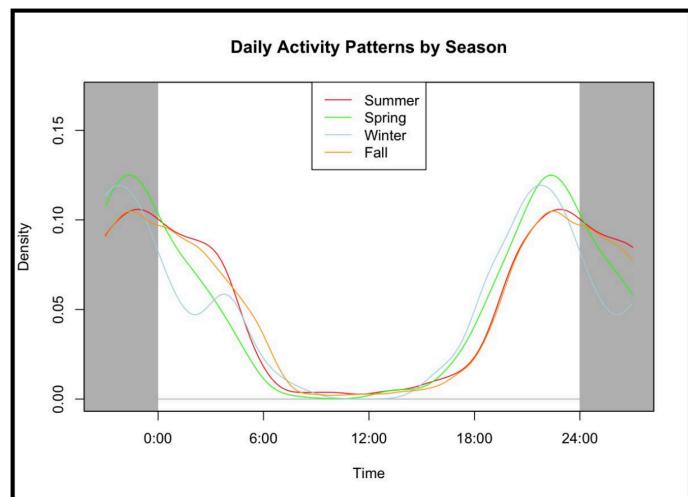


Figure 9 Seasonal Differences on Temporal Activity in the Extratropics, Accounting for Temperature

The variation seen previously in the extratropics mostly disappears in [Figure 6]. There remains some significant difference in the plots, variations in the temperature distributions between the seasons and smaller sample sizes that likely account for the small differences seen. [Figure 9] indicates that the majority of the seasonal differences in activity are due to temperature differences.

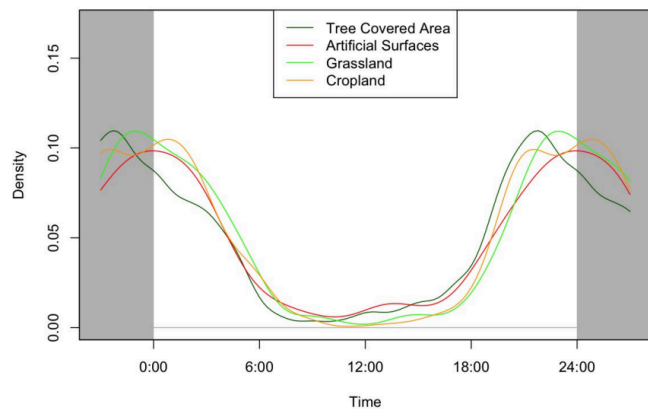
[Figure 10] seeks to establish how temperature differences affect activity patterns. It takes from a smaller sample, only the years 2018-2023. Due to the lack of an appropriate regression model in order, temperature was converted into a categorical variable; each line represents a range of 2°C , except for the warmest and coolest categories, which extend from 30° to 33.94° and 1.86° to 12° , respectively. The darkest red corresponds to the warmest temperature, and the darkest blue the coolest. [Figure 10] shows that warmer temperatures decrease activity in the morning and increase activity in the evening later than the cooler ones. The delayed activity in the evening is almost assuredly to avoid the hotter temperatures of the afternoon. In order to account for the delay in the evening, it is possible the armadillos prefer to stay active a little later in the morning. Thermal inertia means that the morning temperatures are relatively cooler than the evening ones of the same day, causing the shift in activity seen in [Figure 10].

The coolest temperatures match the winter observations from above, indicating higher diurnality. The diurnality exhibited is not a constant higher rate of activity from 6:00 to 18:00, but instead a minimum around 6:00 like the warmer temperature, and then a steady climb in activity until the peak around 20:00. This results in increased daytime activity in the afternoon, and an insignificant difference in the morning when compared to the warmer temperatures. The trend in [Figure 10] is consistent, with decreasing temperature categories shifting the plot steadily to the left.

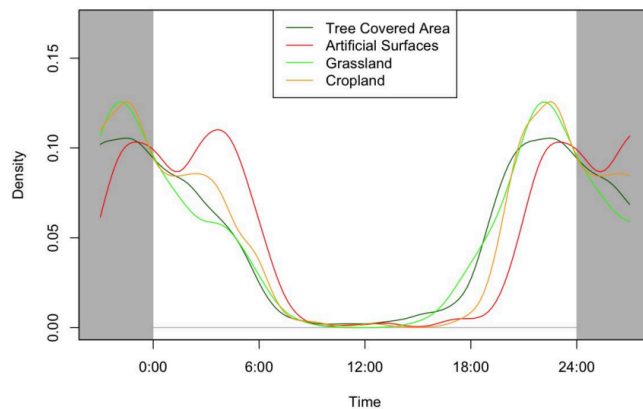


Landcover

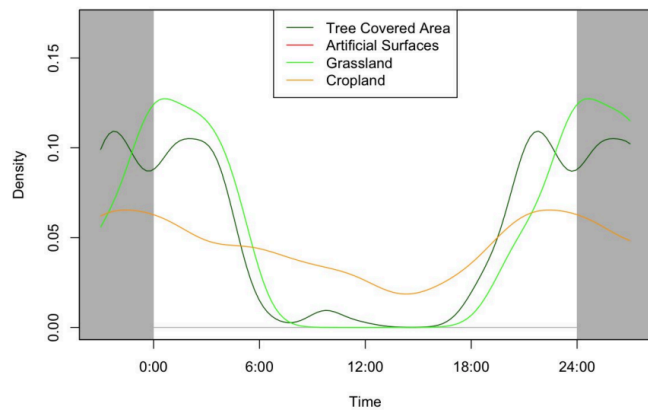
Daily Activity Patterns by Landcover, 35.25 to 45



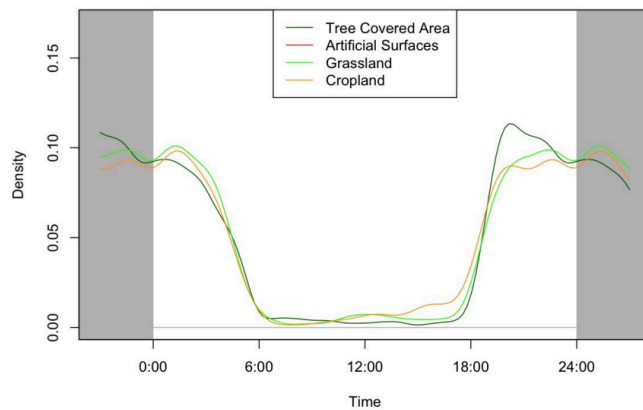
Daily Activity Patterns by Landcover, 23.5 to 35.25



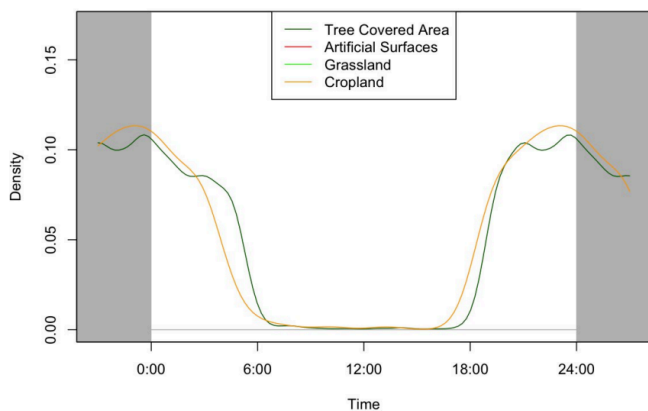
Daily Activity Patterns by Landcover, 11.75 to 23.5



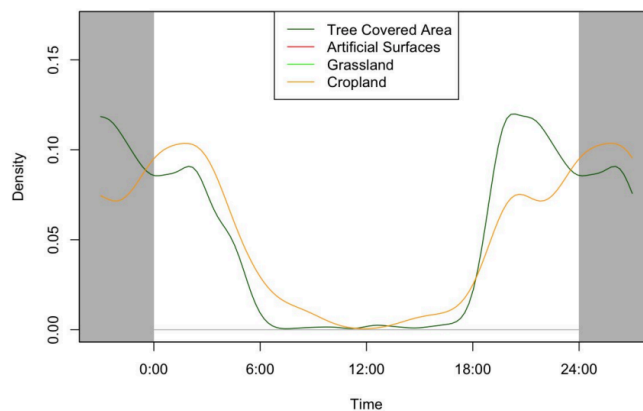
Daily Activity Patterns by Landcover, 0 to 11.75



Daily Activity Patterns by Landcover, -11.75 to 0



Daily Activity Patterns by Landcover, -23.5 to -11.75



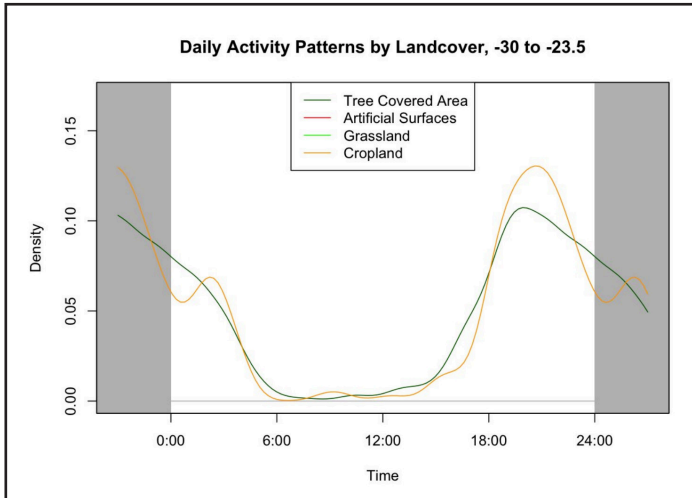


Figure 11 Landcover Differences in Temporal Activity by Latitudinal Section

Landcover does not seem to provide a great impact on the activity patterns of the ninebanded armadillo. The hypothesis that tree-covered areas have different distributions than the uncovered areas, like grasslands, was not supported. The shape of the distributions match consistently across landcover types. The variation seen in some of the plots, like from 11.75° to 23.5°, is most likely due to their small sample sizes rather than any significant difference occurring. The Appendix, [Table 3] shows the significance values for each latitude. To account for temperature variations between latitudes, another plot was generated with only temperatures between 26 ° and 30° were included.

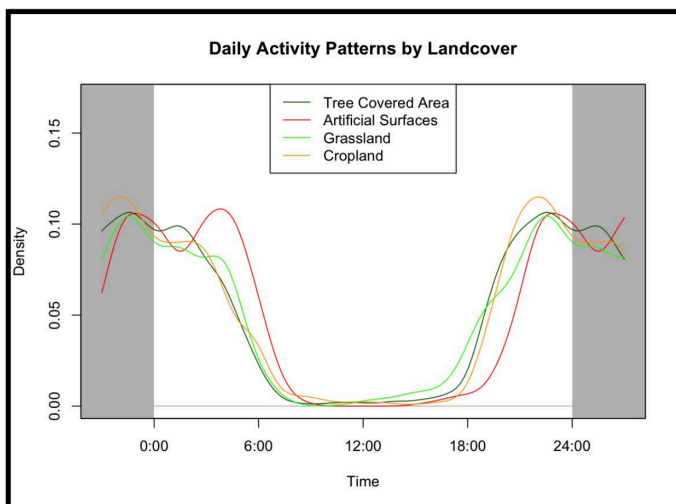


Figure 12 Landcover Differences on Temporal Activity, Accounting for Temperature

In [Figure 12], the tree-covered areas, grassland, and cropland all have near identical distributions. Artificial surfaces have the same shift as hotter temperatures did in [Figure 10]: a later decrease in activity in the morning and a later increase in the evening when compared to the other landcovers. Additionally, it was the only plot significantly different from any of the others ($p = 0.0005755$, 0.06591 , 0.0002631 , for tree-covered, grassland, and cropland, respectively). Since artificial surfaces typically have hotter temperatures than do the natural habitat or croplands in a given setting due to their darker material and higher absorptivity, this shift makes sense.

Conclusion

This study found that of the variables tested, temperature had the most significant effect on armadillo activity. As temperatures increase, the decrease in activity in the morning (~6:00) occurs later; furthermore, the increase in activity that happens in the evening also occurs later with hotter temperatures. This is likely due to a preference for the relatively cooler mornings than the evenings, due to the thermal inertia throughout the day. Cooler temperatures also had relatively more activity during the day, occurring after the drop in the morning and a steady increase during the day. This results in their diurnal activity happening more in the afternoon than in the late morning and midday.

Seasonal differences in activity did occur, but it was almost entirely due to temperature differences. Wintertime had the same shift that the cooler temperatures had compared to warmer seasons like summer. One unexpected find was that springtime in the extratropics tended to have relatively more activity in the evening than morning. It is possible that this is due to more precipitation occurring in the evening than the morning, creating better foraging environments and more reasonable temperatures.

Different landcover types did not cause significant variations in the activity patterns, with the exception of artificial surfaces. The heat island effect, well noted in urban areas, is the most likely cause for the shift, as the difference from the other landcover types was the same as that of hotter temperatures from the colder temperatures.



As the nine-banded armadillo migrates further northward, seasonal differences are expected to become more profound. The encountered temperatures will become increasingly colder, eventually reaching a point where no shift in activity patterns can offset fitness costs. The species may eventually become more completely diurnal in the wintertime if physiologically possible, but this research nor any others published have indicated this as a possibility. Their ability to counteract the frigid temperatures and precipitation of the northern United States will ultimately determine the upper limit of their range.

Acknowledgements

I would like to thank Dr. Malu Jorge of Vanderbilt University for her assistance in this project. Without her help and support as head of the laboratory, this would not have been possible.

Conflicts of Interest

The authors declare no conflicts of interest that would influence or appear to influence the results of this work.

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Colin Wilson is an undergraduate majoring in Ecology, Evolution, and Organismal Biology from Louisville, KY. He is a member of the Jorge Lab, which specializes in Neotropical mammalian ecology. His research interests focus on the interactions between animals, plants, and fungi. Following graduation, he will be pursuing a Master's degree in Ecology and Conservation Biology at Texas A&M University. Outside of the lab, he enjoys reading, playing soccer, and spending time outdoors.



Colin Wilson

Majors:
**Ecology, Evolution and
Organismal Biology**





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