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**Selling Health: Investigating the Role of Religion and Innovation in Healthcare**

**By**

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**Sociology**

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# Selling Health: The Role of Religion and Innovation in Healthcare

**By**

**Allison Roberts**
**Master of Arts**

**Advisor: Ellen Idler**

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**An abstract of**
**A dissertation submitted to the Faculty of the James T. Laney School of Graduate Studies of Emory University in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Sociology**
**2020**

# Abstract

Selling Health: The Role of Religion and Innovation in Healthcare

by Allison Roberts

This dissertation seeks to explain two central ideas: how innovations spread across hospitals, and how the religious ownership of hospitals continues to impact their behavior. It is divided into three sections. The first section utilizes theories of organizational behavior and the diffusion of innovations to explain the diffusion of bariatric (weight loss) surgery, robotic surgery, and electronic medical records. It leverages heterogeneous diffusion modeling to predict the spread of each innovation. The second section explores how the two surgical innovations are advertised on the web, to evaluate whether hospital organizations employ frames to diversify their adoption of these procedures. Diversity in frames was measured using structural topic modeling and network analysis. The third section looks directly at religion, investigating whether the use of religious language in hospital mission statements predicts their charitable behavior. Indicators of religious and secular language were combined with linear regression to evaluate whether the use of religious language was associated with higher uncompensated care spending. All three sections use the American Hospital Association Annual Reports, linked with the Centers for Medicaid and Medicare Healthcare Cost Reporting Information System Cost Reports. The latter two sections also utilize scraped text from hospital websites, procured using an automated web scraper designed in Python. There were a few key findings. The pattern of innovation diffusion exacerbates healthcare access inequality, and may contribute to the medicalization of obesity. Defying expectations of isomorphism, all three sections find that hospital ownership type continues to predict differences in hospital behavior. Religious ownership was found to be particularly important. When Catholic hospitals adopt an innovation, they tend to cause other hospitals to adopt it. Church-owned hospitals use measurably different language than secular hospitals when advertising procedures. Religious language in a hospital mission statement predicts higher uncompensated care spending, while secular terms associated with charity (mission, giving, donations) do not.

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I want to thank my grandmother, who doesn't really get graduate school, but constantly asks me about it anyway. Her constant, loving support (and excellent cooking) is a gift.

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This dissertation is dedicated to my parents.

# 1 Introduction

My first real introduction to the world of healthcare came when I was seven or eight years old. My mother worked at a local Catholic hospital as a laboratory technician, and she signed me up to attend a daily summer camp that picked up children from the hospital. I would ride with her to work, and then sit in the lobby of the hospital, waiting for the bus driver to arrive an hour later. The lobby featured a huge mural detailing the history of the hospital, decorated with grainy black and white photos of nuns. I remember that my mother's work badge had a mission statement printed on the back, which she was required to memorize, that detailed the hospital's commitment to Christ. I thought of the hospital as a huge charity, a place of healing and peace run by modern versions of the black-and-white nuns in the photos.

Over the next twenty years, I had many more encounters with that hospital. I took my father to chemotherapy treatments there for years, sitting in the beautiful chemotherapy room with wide windows and cheerful decorations. Later, my family and I sat with him in a smaller room with smaller windows, where he passed away. A few years after that, my mother passed away in that same hospital, although she was in a windowless ICU room with glass walls and lights that never turned off, even at night. Through all of those encounters, a nun always came to visit us. She would not be dressed like the nuns from old photographs, in a flowing and dramatic habit. Instead, she would be dressed in a knee-length skirt and long-sleeve top, with thick hose, sensible shoes, and a small hood covering her hair. The first time I met one of these nuns, my mother had to tell me what she was. My family was not Catholic, or even particularly religious, nor did we ask the nuns to come. But one would be there, sitting in the waiting room and offering silent comfort. When my mother was in the hospital, my grandmother began asking the nun for advice and comfort before she would ask the physician. So, throughout all of those negative experiences, I still saw the place itself as I had when I was a child: a place of healing and peace run by nuns.

At the same time, however, I was beginning to learn a lot more about sociology, organizations, and the healthcare system itself. I will never forget the first time I read T.R. Reid's

*The Healing of America,* a short book detailing the problems with the American healthcare system and comparing our outcomes to other countries. I had always thought we had the best outcomes in the world, but we do not (Wang et al. 2016). I had always thought we had the best medical care, the most bang-for-your-buck, but we do not (KFF 2020). The more I read, the more disillusioned I became. Hospitals were not just charities, they were booming businesses making millions of dollars a year. Non-profit hospitals still made plenty of profit. My obsession was solidified when I read Paul Starr's always-cited magnum opus, *The Social Transformation of American Medicine.* I could not believe the way that our strange and awkward history of healthcare reform had led us to our current state of compromises, high uninsurance rates, and inflated prices.

I cannot help but believe that the pursuit of health is fundamentally and irrevocably at odds with the pursuit of profit. Hospitals that are seeking to compete and make money cannot and will not be able to only focus on the health of the people that they care for. Economic principles cannot apply, because people cannot choose when and how to demand healthcare. No one wakes up and says, "I'd love an appendectomy today!" We can choose to pursue preventative services, but these small doctor visits do not make up the lion's share of a hospital's profit or our interactions with the system. Patients suffer from "provider induced demand"–we know that we need a service because our provider tells us we need it. If our provider stands to gain financially from our decision to consume additional services, that provider is faced with a conflict of interest. It was this problem that most concerned me. If our hospitals stand to gain from the over-consumption of medical services, they have an incentive to encourage consumption of care.

Every experience I have ever had with the medical world has been a vulnerable one. My parents and I were asked to make decisions for which we could never really be equipped–do we keep pursuing chemotherapy? Do we accept dialysis treatment? In those moments, I relied fully on the professionals in the room to tell me what was right. I looked for cues in their words, in their eyes, to tell me what was the "right" medical decision. To believe

that those physicians, and the huge bureaucracies that helped shape their decisions and their billing practices, could have anything other than the health of the patient at the top of their agendas bothered me to the core. No one in those medical rooms was a consumer. They were patients, afraid of death and unnecessary pain. A system that assumes rational decision-making in those moments is making the wrong assumption.

Steven Brill writes about this problem poignantly in his book *America's Bitter Pill.* We feel that shadow of fear in every visit to the physician, not just the truly critical ones. We do not know if getting an invasive scan is wasteful, or an important way to avoid dying of brain cancer. If the system is oriented towards "more treatment is always better," and the economics support that assertion, it is likely we will default to more treatment than is needed, ad it is unlikely that we will "shop" for the best deals. More treatment, however, is not always better. Aggressive chemotherapy can yield shorter, lower quality lifespans to patients with certain types of cancer (Harrington and Smith 2008), all drugs have side effects, and surgeries can leave us with lasting complications.

As I learned more about these problems, my mind kept returning to the Catholic hospital of my childhood. These books and articles rarely mentioned religious ownership of hospitals, beyond the fact that early facilities were often owned by charities. Other papers simply asserted that there was no difference–that Catholic hospitals were now run by secular MBAs, not nuns, and had primarily secular boards of directors. That was certainly true at my childhood hospital. My mother had even begun complaining about the shift to more business-oriented management over the last few years of her employment there. But I kept wondering, or perhaps hoping, if there was something distinctive about hospitals that were owned and operated by religious organizations. Surely they would pursue charity and avoid profit for profit's sake. One night, however, an ad for my Catholic hospital showed up on the television. It was a short commercial, only 20 seconds or so. It showed a thin, older man standing silently in the center of the screen. He unfolded and held up a pair of extremely large blue jeans to his waist, clearly implying that they once fit him. He faded into the background,

and the words "Nothing *shall* be impossible," (a Bible verse) were projected in front of him. It was an advertisement for weight-loss surgery.

The idea for this dissertation really started with that single advertisement. It was such a clear example of a hospital selling a product, trying to convince consumers to spend their dollars. Except that "product" was a life-altering dangerous surgery, with severe side effects and permanent physical implications. Further, the hospital was using a Bible verse as a slogan to sell that product. It felt like the most capitalist thing that our healthcare system could do, proving all of my worst fears about over-treatment. I was surprised that I couldn't find more literature researching the rise of specialty services like weight-loss surgery. I was even more surprised that I could not find more in-depth research on religious hospitals. I also learned about the general lack of public health research around religion. It turned out that it wasn't just healthcare organizational researchers that were ignoring religion as a determinant of health–it was almost everyone. I decided that, while my dissertation could not address the whole of my problems and interests with the healthcare system, it could begin to address two key components: the role of religion in hospitals and the role of specialty surgeries.

My most basic goals for the proceeding three papers were to establish two ideas: that religion is an important hospital characteristic that needs to be included in healthcare research, and that the spread of specialty services is fast, unequal, and problematic. I wanted to investigate these questions using innovative quantitative methods, incorporating both hospital and text data. I wanted the hospitals to be able to "speak for themselves," and not just rely on external measurements. Finally, I wanted anything I did to be fully reproducible. I believe in the importance of reproducible scientific research–where anyone could take the raw data and my code and exactly replicate my results–and thought this dissertation would be a great place to start practicing that philosophy. For now, the code is not actually available online, because I need to wait until the papers are published, but I intend to publish it concurrently with the papers themselves.

As a final note, I decided to focus on hospitals–not physicians–for all parts of this analysis.

While physicians play an obvious and undeniable role in the provision of these services, they do not operate in a vacuum. Physicians are being increasingly employed directly by hospitals, and are often given financial and professional incentives to adopt new hospital policies and innovations (Cutler and Morton 2013). Further, a hospital interested in offering a potentially profitable service may be more likely to decide to offer it, and then hire as needed, than to simply wait for a physician to volunteer. The decision to offer and advertise a new procedure must occur at the hospital level, and is likely to be most influenced by hospital decision-makers, not physicians.

I think the proceeding three papers successfully accomplish my goals. They are not a perfect fit, as external factors (the coronavirus epidemic) forced me to abandon a few key aspects of the original plan, but they come close. The first paper details the spread of weight loss surgery, robotic surgery, and electronic medical records, incorporating measures of hospital type and religiosity. The second paper looks at the nature of weight-loss surgery and robotic surgery advertising online, again incorporating measures of hospital type and religiosity. The final paper looks at how hospitals express (or fail to express) their religiosity in mission statements, and what impact that has on their provision of charitable care.

# 2 Unequal Innovation: How the Spread of Healthcare Innovations Can Exacerbate Inequality

## 2.1 Introduction

There is no question that health, measured as mortality, morbidity, or self-rated health, is unequally distributed in the population. Many of these disparities are due to things other than healthcare, such as neighborhoods, stress, and other social determinants, and fall along both racial and socioeconomic lines. Socioeconomic health inequality is often attributed to a lack of resources (food deserts, poor housing), a lack of education, and even the presence of inequality itself (Phelan et al. 2004; Kawachi et al. 1997; Meyer, Castro-Schilo, and Aguilar-Gaxiola 2014). Researchers have also found persistent racial inequality in care. One study found that clinicians made biased decisions around conditions with racial stereotypes—diabetes, hypertension, and depression (Balsa, McGuire, and Meredith 2005). Black individuals are also more likely to be hospitalized for preventable conditions, suggesting that they did not get adequate primary care (Pappas et al. 1997). Matthew (2015) provides a compelling overview of the myriad ways that segregation and discrimination have persisted, both in the healthcare system at large and in individual physician/patient encounters. She argues that legal structures have entrenched unequal treatment in healthcare, though Title VI proved an "effective weapon against the segregation and discrimination" until the mid-nineties (Matthew 2015:19). Racial differences persisted despite controlling for socioeconomic factors, but black individuals also have a higher likelihood of living in poverty and facing the additional burdens of economic inequality.

These health inequalities are exacerbated by unequal access to healthcare innovations and services. New innovations in healthcare are happening all the time, but not all groups gain access to these advances. While a great deal of work has been done to explain unequal access to critical services, less has been done to investigate the role of diffusion–how and when new innovations begin to be adopted by these institutions. Inequality is a central part of health

research, but it remains understudied in the organizational diffusion and neoinstitutionalism literature, where the focus remains on explaining the pattern of the spread, not the resulting inequality. This paper seeks to fill this gap in the literature by explaining the unequal spread of three innovations: bariatric surgery, robotic surgery, and electronic medical records. Further, I incorporate detailed measures of hospital type, including religious affiliation, to demonstrate how expectations of diffusion and organizational similarity are moderated by hospital characteristics. Finally, I utilize longitudinal, nationally representative hospital organizational data to test these claims. I find that these innovations do spread unequally, and that hospital religious status is a key predictor of innovation adoption.

## 2.2 Background

### 2.2.1 Seeking Legitimacy or Seeking Profit? The Case of the Healthcare "Market"

The American healthcare system has some similarities to a free market. Hospitals, physicians, insurance companies, and drug providers compete for consumer dollars. In some ways, traditional economic theories can be applied to health: economists like to talk about health as a "stock" that can be invested in or frittered away by lifestyle choices and healthcare consumption. There is a danger, referred to as a "moral hazard" that patients with extremely good health insurance will drive up health spending by over-consuming care (Chernomas and Hudson 2016). On the employment side, hospitals must worry about supply and demand constantly—encouraging physicians to choose underrepresented tracks (like primary care), trying to recruit more nurses—and are in constant economic competition with other hospitals. Embracing the idea that they must behave more like traditional businesses, hospitals have begun hiring more MBAs and adopting efficiency protocols from the larger business world (Jost 2010; Potter and Dowd 2003). Some authors propose healthcare reform around these ideas, by forcing consumers to spend more on their care and view it more like a traditional marketplace (Goldhill 2013).

Most economists, however, argue that the healthcare field does not operate as a free market, and cannot be explained by traditional economic theory (Bodenheimer and Grumbach 2009; Rice 1998). First, patients cannot operate as consumers. They are not informed of the cost of a procedure before it occurs, making it impossible for them to do a cost-benefit analysis, and are then insulated from this full price by their insurer. Even if they were aware of the full cost, they do not know the cost of getting the procedure done anywhere else (and may be restricted by which providers are in network). Going one step further, even if the patient had the theoretical ability to look up costs from all hospitals and find out what share their insurer would expect them to pay, they would still not be able to behave as regular consumers. They are subject to "supplier-induced demand," where the seller of healthcare, the provider, is also the one telling consumers what they need (Chernomas and Hudson 2016; Arrow 1963). Most patients lack the knowledge and skillset to determine what healthcare is necessary, and what is "snake oil," (Rice 1998). The "utility" derived from an investment is also never clear, because the consumer does not generally know if the treatment provided healing or if the body healed itself (Greenberg 1978). They are also often extremely sick or even unconscious, unable to make difficult economic decisions.

A second layer of complexity comes from health insurers. Goldhill argues that, ""the notices and bills sent to us are unreadable because we are not their intended readers. The health care system does not consider us real customers..." (p.41). The intended readers, of course, are the health insurers. They make the financial deals with hospitals, even as they have limited control over what is consumed. Hospitals face two types of consumers: the patients that consume care, and the health insurance bureaucracies that pay (or refuse to pay) for it. Hospitals thus do not know how much they will make from a procedure in a given day, as they must offer different rates to different insurers. Further, they must accept ever-changing reimbursement rates from Medicare with little negotiation (beyond lobbying). Thus, they cannot set prices based on cost and desired profit—they cannot set prices at all.

Both insurance companies and hospitals are subject to federal legislation, which can alter

rules surrounding both insurance protocols and hospital ones. The ACA, for example, required insurance companies to cover individuals with preexisting conditions and to reimburse all preventative care in full. The Medicare Access and Chip Reauthorization Act (MACRA) of 2015 was aimed at forcing hospitals to adopt new quality metrics in exchange for continued critical Medicare funding (Walsh 2017).

Neoinstitutional theory provides a better explanation of hospital behavior in a changing marketplace. Neoinstitutional theory asserts that institutions do not, and cannot, behave rationally (Powell and DiMaggio 1991). In many cases, organizational actors do not possess enough information about their broader context and fellow actors, termed the "field," to decide on the best rational course of action. In addition, other organizational actors do not have enough information to decide on the success or the legitimacy of an organization using purely rational means. Instead, organizational actors resort to non-rational behavior in order to not just attain economic success, but to signal legitimacy. Isomorphism, or the increasing similarity among organizations, is often the result. Companies may practice mimetic isomorphism, where they mimic other successful companies, as they want to achieve similar success and are unable to verify which aspect of the successful company led to its success. In addition, outside regulations, consumer expectations, and other factors may act as a form of coercive isomorphism, forcing companies to adopt similar models. Neoinstitutional theory tries to explain how institutions gain legitimacy, their behavior once legitimacy has been established, and how these two processes tend to encourage similarity across organizations.

Theorists and historians generally agree that hospitals achieved legitimacy as important medical institutions in the early 1900's (Potter and Dowd 2003; Scott et al. 2000; Starr 1982). When hospitals first gained their institutional legitimacy, they were primarily regarded as locations for physicians to work as independent contractors, typically outside of the control of the hospital. The passage of the Social Security Amendments of 1965, which established Medicare and Medicaid, allowed for unprecedented profit, as hospitals were able to get more patients whose care could be reimbursed by insurance. Hospitals were then able to assume

that their largest "customer base" (older patients) would be able to pay for procedures and were usually able to charge almost arbitrary amounts for treatment, allowing for easy profiteering and the conception of a hospital as a corporation (Potter and Dowd 2003). Administrators began to gain importance, but doctors were still fully independent.

Since the advent of PPOs and HMOs, the healthcare industry has faced a fluctuating and difficult to control market. The government has attempted to change regulations and insurance companies have increasingly controlled the amounts they will reimburse for procedures through various mechanisms (Starr 2006). Most hospitals now need to demonstrate profitability and success, both for the stakeholders who control their future and insurance companies who decide whether or not to invest in the institution (Flood and Fennell 1995). The best strategies for economic success are unclear because hospitals have difficulty calculating the actual profit garnered from each procedure, or even the benefits from more aggressive efficiency measures (Flood and Fennell 1995; Potter 2001). They are therefore more likely to practice mimetic isomorphism, demonstrating success by doing what other successful institutions do (Anthony, Appari, and Johnson 2014; Powell and DiMaggio 1991; Flood and Fennell 1995). Previous research has suggested that hospitals make changes in leadership or organization when the "field" (policy and insurance payouts) changes, in order to demonstrate to stakeholders that the hospital will continue to succeed despite the changes (Flood and Fennell 1995; Potter and Dowd 2003). The very nature of these changes, since they represent unprecedented situations, makes strategies for success unclear. Hospitals therefore feel pressure to pursue any new innovations present in their field as they are faced with more ambiguous settings, making them even more likely to practice mimetic isomorphism. In addition, insurance payout changes cause coercive isomorphism, limiting the options of the institution by changing what seems profitable.

The perspective outlined above has been used successfully in several longitudinal analyses of hospital change over time. One of the most influential studies of hospital institutional change utilized this perspective (Scott et al. 2000). The authors did an in-depth analysis

of hospitals in the Bay Area and found support for neoinstitutional perspectives. They particularly focused on the issue of "field," integrating it into theories of community ecology, which argue that external forces determine institutional behavior more than institutional choices.

### 2.2.2 Diffusion as a Mechanism for Isomorphism

Neoinstitutional theory provides a helpful framework for hospital action, but it does not provide a good explanation of how isomorphism unfolds over time, particularly in regard to innovations. The diffusion literature, however, has long been involved in the process of explaining how innovations diffuse through a population or a set of organizations (Rogers 2003). Studies of diffusion tend to focus on the adoption of innovations, focusing on either characteristics of innovations themselves or on the characteristics of the organizations that adopt them (Rogers 2003). When looking at organizations, the goal is often to determine what makes an organization "contagious" (causing others to innovate) or "susceptible" (willing to adopt) (Greve, Strang, and Tuma 1995; Rogers 2003). Further, it attempts to discern whether endogenous (organization specific) or exogenous (policy and environmental factors) are more important for the diffusion of ideas and innovations (Rossman 2014).

Many of these studies utilize retrospective organizational surveys, where researchers ask organizations why they chose to adopt an innovation. Rogers (2003) points out that these techniques tend to bias diffusion research, emphasizing on innovative success, rather than failed or abandoned innovations. In addition, retrospective research suffers from cross-sectional research bias, where a respondent's explanation may be colored by the impacts of the innovation. In addition, adoption does not always translate directly to implementation—something that has been discussed by organizational researchers since Meyer and Rowan's influential paper on formal myths and ceremonies. In a recent study of healthcare innovation, researchers called for a longitudinal analysis of adoption and implementation to better determine how innovations spread and fail (Kennedy and Fiss 2009; Wejnert 2002).

Many diffusion studies that combine neoinstitutional perspectives with diffusion are arbitrating motivation. For example, Kennedy and Fiss (2009) look at managers' reported reasons for being either early or late adopters of a major healthcare innovation They categorized motivations as being either "economic" or "social" in origin—so, whether they used traditional economic weighting or sought legitimacy. The test was designed to see whether the traditional "two-stage" model of diffusion explanation applied in a healthcare case. The two-stage model assumes that early adopters innovate for economic reasons, while later adopters innovate for social ones. Kennedy and Fiss (2009) found that this model did not hold for healthcare—signaling social competence was equally important for all adopters, perhaps suggesting that fully economic motivations were not possible.

Diffusion does not have to include an actor's stated motivation. Researchers looking at the spread of Manhattan hotels found that external factors, like the geographic environment, are also extremely important in explaining the rate of innovation diffusion (Baum and Haveman 1997). Building a complete picture of an institution's environment—its nearby competitors, the socioeconomic status of its potential clientele, the local governmental policy—helps explain how innovations diffuse, and cases where imitating a neighbor may be helpful. Studies of diffusion also do not have to look at solely adoption. They can also look at decisions to end innovation, implementation of said innovation, and organizational failure following adoption (Baum and Mezias 1992; Strang and Macy 2001; Wejnert 2002). Strang and Macy (2001), for example, found that innovation adoptions are rarely permanent. Instead, businesses quietly abandon ideas all the time, whenever they become socially undesirable or are proven non-profitable. These decisions are less highly publicized than adoptions and may reflect individual institutional preferences more than adoption.

### 2.2.3 Why Hospitals Innovate

At the most basic, hospitals innovate for two reasons: to improve patient outcomes and to survive in the business of healthcare. These two goals often coincide, but not always. While

saving more lives seems transparently good for business, hospitals often benefit the most from innovations that provide limited benefits to their patients.

On the business side, there have been a wide variety of innovations aimed at reducing bottom lines and improving the competitiveness of hospitals. Researchers have looked at the hiring of MBA's, improving efficiency scores, and the formation of large healthcare systems as ways that hospitals have adapted to survive (and profit) (Cutler and Scott Morton 2013; Potter 2001; Potter and Dowd 2003). Most of these innovations are medically neutral—changing the way the hospitals are managed and financed, but not changing the way patients are treated. However, health policy researchers have suggested that both physicians and the hospitals that house them tend to diagnose and treat with an eye to the bottom line, as well (Goldhill 2013; Rosenthal 2017). Innovations to provide more out-patient procedures, for example, (avoiding less well-reimbursed in-patient care) have changed treatment for reasons other than better care.

Specialty procedures, which are voluntary surgeries generally emphasizing improved quality of life, tend to be very desirable for hospitals (Carey, Burgess, and Young 2009; Reilly and Broyles 1992). In addition the services I will be outlining below, examples often include things like elective knee replacements. Because specialty services are voluntary, hospitals offering these procedures do not run the risk of uncompensated care. In addition, these procedures are often not covered by Medicare, Medicaid, or all private insurance companies. While this restricts the possible buyer market, it also means that those who buy the procedure have little negotiating power. They are more likely to pay high rates, both for the in-patient beds and for the procedure itself. The actual profitability of these strategies is unclear, but they signal that a hospital is embracing competition and has as much capability for innovation as its peers.

Hospitals, therefore, have an incentive to invest in specialty elective service innovation. While researchers have mentioned this tendency, I am not aware of any research on the diffusion of these innovations. Specialty procedures represent active, generally invasive

treatments on patients. The United States tends to have higher rates of invasive procedures than other countries (Bradley and Taylor 2013). The diffusion of these specialty procedures provides an important window into how our rates of invasive procedures increase, and how both exogenous features of health policy and environment and endogenous features of the healthcare systems contribute to (or resist) this diffusion.

**2.2.3.1 Determinants of Diffusion: Endogenous Effects** One key potential predictor of diffusion is a hospital's type. Acute hospitals can be for-profit, non-profit, or owned by the government. For-profit hospitals, as the name implies, can make a profit and are generally owned by investors hoping to do just that. non-profit facilities are owned by private organizations, sometimes religious and sometimes secular. They are required to prove that they provide substantial charity care in order to secure this status and receive block grants and tax-exemption in return. What "charity care" means is not well defined, can vary widely by state, and sometimes includes research and education (King 2016). Government-owned hospitals vary the most widely. They consist of Veteran's Affairs hospitals (which, notably, have the additional funding from government-run insurance for veterans), community hospitals, and some university hospitals (Fishman 1997). These hospitals are considered "safety-net" hospitals and often form formal agreements with their states to provide any needed care, regardless of ability to pay. While private non-profits are also considered safety-net hospitals, Fishman (1997) found that they provide less uncompensated care than government-owned facilities, and they are less contractually obligated to do so. All hospitals are required to accept any patient that is in a state of emergency, regardless of ability to pay, due to the federal law Emergency Medical Treatment and Labor Act (EMTALA). So, if a patient arrives in the middle of cardiac arrest, any hospital will provide uncompensated care.

Hospital-focused analyses have a tendency to focus on hospitals as a whole, or on the distinction between non-profit and for-profit facilities (Ginn, Shen, and Moseley 2009; Potter 2001). Many publicly available datasets only provide these classifications. However, these

broad distinctions ignore the hospitals that remain closest to the original goal of healthcare: those founded on the principle of philanthropy and religion. A substantial portion of hospitals are owned by religious organizations, and explicitly pursue charity care as a part of their religious affiliations. Catholic hospitals are the predominant group, representing more than two-thirds of religious hospitals in the AHA. According to the Catholic Healthcare Association website, one-sixth of all hospital beds in America are Catholic (www.chausa.org). The Catholic hospital system is highly integrated and organized (Leaman 2002). Non-Catholic hospitals can be much more difficult to determine, as no central database exists, and many previously religious hospitals have been purchased by secular organizations (but maintain their religious names). All other religious hospitals identified in the database as church-owned were Protestant, primarily Adventist. One researcher estimates that there may only be seven Jewish hospitals left in the United States, and they may not be categorized as 'church-owned" in the AHA database (Halperin 2012). Due to their high level of integration, financial success, and national-level organization, Catholic hospitals may be able to successfully implement innovations and influence additional hospitals to follow suit. Their decisions could be considered "contagious."

Community hospitals provide an important counterpart to religious hospitals in the United States. King's (2016) book, A Spirit of Charity, provides a complete history of public community hospitals in the United States. Like religious hospitals, these facilities were generally founded for philanthropic reasons, and many were either established by or run by religious groups—often nuns. Community hospitals generally face a confusing mix of funding, where governments provide some support, tax breaks, and land, but hospitals must raise the rest of funds from fee-for-service care and donations. Medicaid often represents "the single largest source of revenue," (King 2016:34). They are also often the sole providers of high-quality trauma care, earning the highest designations ("Level One") and receiving the most critical cases. Trauma is generally seen as a low-profit enterprise, which is why private facilities generally invest less in this specialty. Community hospitals are also often in the

poorest parts of town, providing free care to those who truly need it most—something that many religious charitable hospitals can no longer claim (Wall 2011). Community hospitals are often in disrepair, however, and face constant threats of closing. The second-oldest community hospital in the United States, Mercy Hospital in New Orleans, closed in 2005 due to budget problems in the wake of Hurricane Katrina. Grady Hospital in Atlanta, one of the largest and most successful community hospitals in the U.S., has almost shut down numerous times, and faces an increasingly difficult financial picture as Georgia refuses to expand Medicaid—its primary source of revenue. Smaller, rural community hospitals are exceptionally likely to close, as they cannot garner private donations as easily and serve an extremely impoverished community (Nelson 2017). Federally owned government hospitals, which are primarily Veteran's Affairs hospitals, are excluded from this analysis due to their general lack of comparability to other facilities.

Distinct from ownership status, a hospital can also be classified as a teaching facility. Teaching hospitals, which are often affiliated with universities, conduct more research and experimental treatment than other hospitals (Ayanian and Weissman 2002). Many innovations in clinical care originate with these organizations, and their findings generally hold more prestige. Further, they regularly train physicians and send them out into the world, which means they have a greater influence on the broader medical community. When it comes to clinical innovations, then, they are expected to be early and influential adopters, causing other hospitals to adopt the innovations as well.

Considering all hospital types is particularly key in the context of neoinstitutional theory and diffusion. If hospital type, after controlling for other hospital characteristics, persists in predicting different diffusion patterns across facilities, it may indicate that isomorphism is limited by an organization's "formal myth and ceremony," defying expectations that all facilities will begin to look alike. This distinction is most salient when comparing non-profit and religious hospitals. These two hospital types have the same tax, reporting, and income structure. Their only difference is religious ownership and affiliated religious behavior. If there

are significant differences between these two groups, it demonstrates that an institution's guiding ethos, even as Catholic hospitals are increasingly run by secular individuals, can result in different behavior. This distinction may be increasingly important for specialty procedures, for reasons that I will discuss in detail in the specialty procedure section. Diffusion theory, by focusing on the "how" and "when" of these adoptions, allows us to see more granular variation in isomorphism.

Beyond ownership, an obvious determinant of innovation is size. Larger hospitals have more capital to spend on new ventures, making it easier for them to innovate. Cross-sectional research has shown that larger hospitals provide more innovative services than smaller hospitals, but these studies do not have information at the individual hospital level or how adoptions changed over time (Livingston 2010; Saba, Ravipati, and Voigt 2009). However, large hospitals also have enough capital to weather storms, and may have less need for cost-saving innovations, waiting instead for smaller enterprises to "vet" a procedure before they invest. Some research has found that they may adopt risky or untested business ventures later than smaller facilities (Kennedy and Fiss 2009). In diffusion terms, they have been found to be "susceptible" to innovations, adopting them after other nearby and influential locations choose to adopt.

A hospital's costs and income are key predictors of their interest in, and ability to, innovate. Gross revenue can provide insight into the total income entering a hospital and scale of operations. This number is highly variable, however, and does not take into account hospital costs. A better measure is the assets to liabilities ratio, or debt ratio, which standardizes revenue and indicates how well an organization is balancing revenue and cost (Wertheim and Lynn 1993). Hospitals are also required to report revenue from ambulatory procedures, outpatient care, and other categories to the Centers for Medicaid and Medicare. All of these measures will be considered in the analyses. Hospitals with higher income have been previously found to be adopters of innovation (Angst et al. 2010). Because organizations like to copy successful institutions, we could expect that higher income hospitals may influence

those around them, and so their adoptions would be considered "contagious" as they increase the likelihood that other hospitals adopt.

Another key metric is a hospital's uncompensated care. This measure directly indicates how many of a hospital's bills go unpaid, and can provide a proxy indicator for the amount of charity care a hospital provides (Mitias 2007). Hospitals that provide the most charitable services may be against profiteering, but they may also be more desperate for additional funds than less charitable facilities. Other research has operationalized "charity care" as emergency department usage, because emergency departments often let in the highest amount of uncompensated care, but I do not have access to that information in this dataset (Reilly and Broyles 1992). If hospitals with higher amounts of uncompensated care do not adopt profit-making innovations as quickly as other facilities (after controlling for income and other institutional factors), this may represent a choice based on institutional beliefs rather than a rational economic decision–supporting the idea that institutions do not always make economic rational choices. As a hospital's uncompensated care rises, it may become more susceptible to innovation, however, as it becomes more desperate to recoup lost income.

Finally, a hospital's system membership is important. Hospitals have been increasingly members of larger networks and systems (Cutler and Scott Morton 2013). A "network" is defined as a cooperative group of hospitals that agree to work together, share information and patients, and often form group purchasing arrangements. A "system" is comprised of several hospitals that are financially joined–usually, one company owns many hospitals, or one large hospital owns several subsidiaries. While both forms of organization are important, this paper will focus on system membership. System membership has led to extremely high rates of consolidation in the healthcare marketplace (Cutler and Scott Morton 2013). Further, systems can exert influence on members, coercing them to adopt particular billing protocols, websites, procedures, and more (Xu, Wu, and Makary 2015). It could be expected that two hospitals in the same system would be more likely to behave similarly, adopting similar innovations.

**2.2.3.2 Determinants of Diffusion: Exogenous Effects** A great deal of research on organizational competition and the diffusion of innovations emphasizes the importance of location. Organizations that are near each other compete for clientele by either differentiating, combining, or by directly competing with similar services (Lomi and Pallotti 2012). This has been demonstrated compellingly in the hotel industry (Baum and Haveman 1997; Baum and Mezias 1992), but hospitals also follow this trend (Kitts et al. 2017). Nearby hospitals can either directly compete, by offering the same services as their competitors, or they can choose to coordinate and offer different services, thereby hoping to attract a different audience. The complex findings from previous studies suggest a mixed effect of geography on healthcare innovation. In this study, I incorporate a direct measure of distance between all hospitals, to see if proximity impacts hospital adoption.

A hospital's geographic region is a key external influence on their behavior. Their nearby area affects their patient mix, which influences the types of services they can offer. There are many ways to measure geography, but this analysis will consider the "local" region of a hospital to be its zip code. There are known problems with this assumption (Grubesic and Matisziw 2006), but this choice was restricted by available data. The uninsurance rate, median income, racial distribution, educational distribution, and population density of a hospital's region are all known to be important factors in the provision of health services (Horev, Pesis-Katz, and Mukamel 2004). As with uncompensated care, a hospital in a highly uninsured region may be more susceptible to new innovations, as it looks to attract a better patient base.

The actions of external actors can be very influential in organizational decisions to innovate (Briscoe, Gupta, and Anner 2015). Previous research in the railroad industry demonstrated how government action significantly impacted the diffusion of railroads and corporations within the United States (Dobbin and Dowd 1997). The authors illustrate the importance of considering complex changes in the organizational "field," such as government policy, in explaining organizational behavior (Schneiberg and Clemens 2006). This dataset allows me

to capture a large amount of policy variation, as it captures time both before and after the passage and implementation of the ACA. In addition, the data allows me to link to geographic policy variation, as different states have very different Medicaid reimbursement rates.

The Affordable Care Act (ACA), passed in 2010, was our most significant healthcare reform since the passage of Medicare and Medicaid. My timeline of analysis will capture approximately 6 years of hospital behavior from before the ACA, and approximately 7 years after. The ACA aimed to significantly alter the provision of health insurance. When it passed, it included a provision to expand Medicaid, making anyone under 138% of the federal poverty level eligible for coverage. It also included a soft individual mandate, requiring everyone to buy insurance or pay an increasing penalty. Finally, it developed a government-run insurance marketplace, the "exchange", where individuals could buy health insurance and receive government subsidies to defray excessive cost. Since the bill's passage, however, things have not gone to plan. The Supreme Court ruled that states could not be required to expand Medicaid, and so not all states expanded access to the service. According to Kaiser, 34 states have currently decided to expand Medicaid (www.kff.org). While this decision was an unfortunate one for the success of the policy, it provides needed variation for analysis–I can compare states who accepted the expansion to those who did not, to measure the effect of ACA policy changes. It is important to note that the ACA reduced block grants for safety-net facilities with uncompensated care rates, under the justification that they would no longer have an uninsured population, and required more stringent evidence of their community support (Crossley, Tobin Tyler, and Herbst 2016). Because the uninsured still exist despite the removal of other parts of the bill, safety-net hospitals are now facing even leaner times. The analysis in this paper will include a measure of state-level Medicaid reimbursement rates, and an indicator of whether a hospital's state chose to expand Medicaid. These measures will help indicate the importance of external policy on diffusion decisions.

### 2.2.4 Using Test Cases to Evaluate Theoretical Expectations

Specialty services are wide-ranging: in complexity, price of implementation, and ease of advertising. It is not feasible for a single paper to evaluate the implementation of innovative specialty services as a whole, and so I have chosen three test cases. This paper will track the implementation of bariatric (weight-loss) surgery, Da Vinci robotic surgery, and electronic medical records (EMR) over the past twenty years. All three of these innovations have become mainstream since 2000, but each represent a very different form of specialty innovation.

**2.2.4.1 Bariatric Surgery** Bariatric surgery is an entirely new procedure category, which embraces the idea of obesity as a disease and encourages extreme measures to cure it. Its efficacy is still under debate, despite its widespread popularity. It is a (relatively) low-cost innovation, as existing surgeons can conduct the surgery and the materials are not expensive (Ashrafian, Darzi, and Athanasiou 2011). However, it has a perception of profitability—fitting the criteria of a voluntary specialty procedure. Bariatric surgery certainly became a popular procedure very quickly, going from almost no procedures in 1995 to over 120,000 in 2002 (Livingston 2010). The quick increase of bariatric surgery cannot be explained by its demonstrated clinical effectiveness and necessity alone. In order to understand why it has become such a popular and accepted treatment, it is important to look at the organizations providing and promoting the procedure: hospitals.

Bariatric surgery is a particularly important innovation to consider, because it may conflict with the ideals of some hospitals. Bariatric surgery is sometimes considered a profit-driven procedure, developed to make money in uncertain times (Schoenthal and Getzen 2005). By adopting it, hospitals could be seen as profiteering, wasting facility space and physician time on procedures without life-saving community benefit. non-profit hospitals, and especially Catholic hospitals, may resist this form of isomorphism because they face a different set of pressures than the for-profit facilities—they are not expected to immediately pursue profit. One study of bariatric surgery adoption in hospitals between 1995 (when the procedure was

invented) and 2000 found that non-profit hospitals were significantly less likely to adopt the procedure, suggesting that legal status was an important predictor for this case (Tian, Hurley, and Clement 2010). However, the study was conducted over a brief time period and could not distinguish between secular and Catholic hospitals. Evaluating whether adoption of bariatric surgery can be predicted by hospital type will illuminate whether the potential conflict between profiteering and a hospital's mission can lead to a lower adoption rate.

**2.2.4.2 Robotic Surgery** Da Vinci robotic surgery is a new methodology for not-so-new procedures (primarily prostate surgeries). While versions of robotic surgery have existed for decades, Da Vinci robotic surgery represents a significant advancement. It was patented for use in 2000, but adoption was slow in the first few years (Kalan et al. 2010). Though the surgeries are touted as being safer and faster, patients (or, in some cases, their insurance companies) are asked to pay more for these options. The robot has a high up-front cost: between $1 and $2.5 million dollars (Attaluri and Mclemore 2016; Turchetti et al. 2012). The machines are expensive to purchase, making the decision to adopt robotic surgery a more resource-intensive decision. Once it has been purchased, however, robotic surgery can be profitable, fitting the same criteria as bariatric surgery, though its precise profitability is still under debate (Turchetti et al. 2012). These machines do not have the same linkage to profiteering that bariatric surgery does, instead representing a high-tech innovation demonstrating that the hospital is on the "cutting edge," (Turchetti et al. 2012). Hospitals may tend to use the robot in more cases than it is strictly recommended (charging extra), in order to recoup the high costs of purchasing the machine. Turchetti et al. (2012) outlined an ever-growing list of procedures that hospitals and physicians are attempting to complete using robotic methods. Robotic surgery provides a "neutral" test case–a medical innovation that is highly expensive, but does not treat a stigmatized condition. It would require cooperation between physicians and hospital administration to purchase one of these machines. This innovation allows us to model how a highly expensive, highly-specialized medical innovation spreads. Due its slow

initial spread, my analysis is able to capture the majority of the diffusion of this innovation.

**2.2.4.3 Electronic Medical Records** Electronic medical records (EMRs) represent a markedly different test case. Electronic medical records are a digital patient record that can be maintained by hospital staff and physicians, as well as accessed by the patient (AHRQ, n.d.). These systems are driven almost entirely by administrative decisions, and represent a more "business side" innovation. Electronic medical records were not quickly adopted by hospitals, due to the difficulty in certifying their compliance with the Healthcare Insurance Portability and Accountability Act (HIPAA), and general distrust among physicians (Ben-Assuli 2015). External funding mechanisms from the federal government, as well as improving technology, finally made it profitable for hospitals to adopt the EMR model. In 2009, CMS announced a funding mechanism dubbed "HITECH" that would pay providers for the adoption and meaningful use of these services and hospitals responded positively, though adoption was not as high as the program hoped (Mirani and Harpalani 2014). To date, physicians still report low satisfaction and engagement with the EMR system, often feeling that adds to their administrative burden without providing improved clinical care (Guo, Chen, and Mehta 2017). Research has shown, however, that effective use of EMRs can improve patient outcomes (Ben-Assuli 2015).

EMRs thus represent a case of medical innovation that was explicitly driven by non-medical professionals–a more typical case for a hospital diffusion study. Unlike the other two innovations, where some demand for these services must come from the physicians themselves (as they must agree to prescribe and perform the procedures), this innovation cannot be attributed to physician behavior. By comparing the diffusion of this service to the other two innovations, we can see if there are meaningfully different patterns for diffusion. Previous early research utilizing heterogenous diffusion modeling on their spread found that external policy was influential in their adoption, overriding hospital characteristics like network affiliation (Miller and Tucker 2009). Another study found that U.S. financial incentives encouraged

diffusion among EMRs, causing a better adoption rate than in Germany (Esdar et al. 2019). EMRs are the only case here directly impacted by a government financing decision, and so may be more sensitive to the exogeneous factors.

These three innovations together represent a strong test of the diffusion and neoinstitutional theory literature. All three represent medical innovations that are now widely adopted. They are all perceived as profitable, though actual evidence is mixed. However, they vary in key ways: EMRs and robotic surgery are much more expensive to implement, while bariatric surgery is fairly cheap. Bariatric surgery is more clearly linked to profiteering, with limited medical benefits. EMRs are the only innovation that do not involve the patient's body or physical consent, and are instead a business decision aimed at helping the hospital improve patient coordination of care and lower costs. Comparing all three will help illuminate how the characteristics of an innovation mix with the characteristics of an organization to affect diffusion. Hospital ownership, for example, is much more salient for bariatric surgery than for EMRs. If ownership is important, we would expect it to predict adoption of these three procedures differently.

- **Hypothesis 1**: Patterns of adoption for the three innovations will vary by hospital ownership, after controlling for other hospital characteristics.

### 2.2.5 Unequal Diffusion

An important, but understudied, consequence of diffusion is inequality. If decisions to innovate can be predicted by geographic and hospital characteristics, it is likely that certain areas will experience unequal access to a given innovation. Identifying inequality in access to specialty services will provide a new lens on the impacts of healthcare diffusion. When it comes to the provision of specialty services, healthcare inequality can fall into two major categories: access and treatment. Due to the fact that I only have institutional data, I cannot assess treatment inequality, and instead must focus on access.

Access is the most straightforward type of inequality to measure. If patients who want

to get a treatment are physically incapable of accessing it because it is not available in their geographical area, they are experiencing unequal access. Insurance coverage is also sometimes included in this category, as inadequate health insurance can make an individual just as unable to access a treatment as physical distance. The diffusion of new services can often exacerbate inequality, as they spread to the wealthiest and most privileged areas first (Rogers 2003: 130). A recent exploratory model of diffusion through geographic space has suggested that diffusion directed by anything other than random chance makes it likely that the innovation will not be equally distributed through the population, exacerbating unequal access to healthcare (Dunn and Gallego 2010). More research is needed, however, to determine whether unequal distribution can be explained by the socioeconomic features of a geographic region, or if the racial composition is particularly important. Discrepancies here could indicate whether hospitals with predominantly white, low-income populations still perceive their patients as more likely specialty consumers than hospitals with predominantly black, poor populations. Finally, it is possible that hospitals in low-income areas may be more likely to adopt bariatric surgery, in an attempt to attract wealthier clients. If this is the case, we would expect hospitals in poor areas that are reasonably near richer areas, such as urban hospitals, to be more likely to adopt procedures than poor hospitals with no wealthy areas in a reasonable, drivable distance.

Racial differences in treatment, as discussed above, are well documented. The case of obesity and bariatric surgery, however, is more complex. Black and Hispanic individuals are more likely to be obese, but obesity is also less stigmatized among both of these groups (Goel et al. 2004; Milkie 1999; Ng et al. 2014; Trigwell et al. 2014). Black individuals are also less likely to trust physicians and follow medical advice (Schnittker 2004). Finally, healthcare providers tend to view minority patients as less compliant (Lerner 1997). Minority patients may thus experience less access, as hospitals may not choose to expand to areas that are primarily minority areas, but they may also be less likely to be prescribed or seek innovative procedures when they are available, which can lead to a widening racial access gap after the

introduction of a new medical innovation (Levine et al. 2010).

Problems of inequality in access could theoretically be ameliorated by the nature of the three innovations in this paper. The first two are designed to be profitable to the hospital. Bariatric surgery, in particular, costs little to implement and could potentially attract individuals from other regions. Hospitals in poor areas could use the procedure to attract wealthy individuals from drivable distances, thus shoring up their revenue. Robotic surgery requires a significant up-front investment, making it the hardest for poor hospitals to adopt, but can again yield massive savings in the long run. EMRs have been funded by the federal government, in part because of the belief that they will yield cost savings and better outcomes, making it easier for poorer hospitals to implement them, though Levine et al. (2010) found that government-sponsored innovations tended to exacerbate inequality. I do not expect that the potential profitability of these procedures will overcome the larger barriers that hospitals in disadvantaged regions face.

- **Hypothesis 2**: Geographic factors, like race and income, will predict whether a hospital chooses to adopt an innovation, regardless of innovation. Lower income and high minority areas will have a lower likelihood of adoption.

This study hopes to fill the gaps in the literature defined above by evaluating how the diffusion of innovations has been unequal along hospital and geographic lines. By explicitly incorporating a measure of hospital religiosity, as well as a focus on unequal population outcomes, I will add to our understanding of how diffusion and subsequent isomorphism vary in the healthcare landscape, leading to unequal results. Finally, by utilizing longitudinal prospective data, I am able to avoid problems of confirmation bias that are present in other diffusion studies (Kennedy and Fiss 2009; Wejnert 2002).

## 2.3 Methods

### 2.3.1 Data

This paper utilizes several data sources. The primary data source is the 2005-2018 waves of the American Hospital Association Annual Survey (AHA), which I accessed through the Wharton Research Data Services (WRDS). This data source represents over 95% of hospitals in the United States. For my analyses, I kept all hospitals that were over 50 beds, were classified as general acute facilities, and were open and in the database for the entire time period. My final sample contains 2397 hospital records for 12 years, leading to 32466 total observations in my full sample. The entire AHA dataset contains over 800 variables, spanning a wide variety of topics.

The second primary dataset for this analysis comes from the Centers for Medicaid and Medicare Healthcare Cost Reporting Information System (HCRIS). This data provides detailed financial records for all hospitals that accept Medicare patients from 2005-2018. Hospitals are required by law to provide this information in order to receive Medicare patients. Because I chose large, acute hospitals, almost all of my facilities are included in this dataset. For all years until 2015, there are less than 10 missing observations for any financial category. For 2015-2018, unfortunately, the data is lower quality. The final number of hospitals with complete records for all years is 1903. For most of the analyses presented here, however, I utilized financial data from 2005, so the N is higher:2397 . The records were merged using the Medicare Provider ID, a distinctive ID assigned to all facilities that accept CMS patients.

Finally, I include several geographic measures. I utilized the 2011-2013 wave of the American Community Survey (ACS) to add zipcode-level geographic data to my analyses (U.S. Census Bureau 2011). Because annual data at the zip code level does not exist, I could not create a geographic measure that varied over time. Instead, I chose an ACS wave that sits in the middle of my time frame, and treat it as a non-time-varying variable. This dataset allows me to model the local patient mix of each hospital, key determinants in identifying

motivations for adopting (or failing to adopt) a procedure. All geographic data was merged with my dataset using the AHA reported zip code for each hospital in 2011. There were 78 missing cases that could not be resolved and were removed from analysis. There did not appear to be any pattern to their missingness.

I also included state-level variables. I merged in CMS state-level National Health Expenditure reports on annual spending per Medicaid and per Medicare enrollee, and the Medicaid and Medicare enrollment levels for each year in my time period (CMS.gov 2014). These reports provide a rough approximation of the generosity of government programs towards hospitals, though of course they can also reflect variations in enrollee medical needs. These data are only reported through 2014. For the remaining years, I used each state's annual growth rate to extrapolate the potential annual spending per enrollee for 2015-2018. These numbers should be interpreted with caution. I also utilized Kaiser Health Data, a prominent online resource for up-to-date healthcare data, to obtain current statistics on whether or not each state had accepted the ACA expansion of Medicaid by 2020 (Kaiser Family Foundation 2020).

### 2.3.2 Analysis

The majority of the data cleaning and analyses in this paper were done using R. A fully reproducible version of this paper, which will include all data cleaning and analysis code, will be available on GitHub and my personal website, though I cannot make all of the source data freely accessible. AHA strictly prohibits the publication of their raw data.

I first look at all data descriptively, analyzing patterns in adoption over time across hospital types, and variations in other demographic characteristics. It should be noted that while the sample size for this analysis is sufficiently large to justify analysis, several key variables were right-skewed: gross income, ambulatory surgery, and uncompensated care costs. A few cases were identified as having implausibly high incomes or costs and those cases were removed from analysis, but many hospitals were just very large. Even after removing

missing and implausible observations, however, this dataset comes close to representing the full population of acute hospitals over 50 beds that accept Medicare (less than 100 hospitals were removed from the original AHA database after all cleaning procedures). I also utilized AHA control codes to classify hospitals into five categories: non-profit, for profit, Catholic owned, other religious organization, and state owned. Federal hospitals, which are mostly Veteran's Administration hospitals, were excluded from this dataset, as they do not report their costs to CMS and have a different organizational structure. While it was possible to directly identify Catholic-owned hospitals, as they are specifically reported, all other religious hospitals were only classified as "Church owned" and could not be further specified. Hospitals were classified as "teaching" hospitals if they reported as a member of the Council of Teaching Hospitals. While many other hospitals may engage in teaching activities, these facilities are actively affiliated with a medical school and conduct university-level training and research.

In order to create more comparable geographic measures, as zip codes vary widely in size and population density, I calculated percentage measures for race and education groups. These were calculated by dividing the reported number of a given race by the reported total population for each zip code. Due to extremely variable numbers, it was not possible to look at smaller racial categories, and so I had to group races into "white", "black," and "other" from the original more robust categories available in the ACS. I also utilized median income for each zip code, and the percent of the population that remained uninsured.

The final, full model used in this analysis is a Heterogeneous Diffusion Model (HDM). This analysis operates like a discrete time event history analysis, but it allows me to evaluate how the adoption of one hospital affects the likelihood of another hospital to adopt, and allows these influences to change over time. This analysis also includes a measure of distance, which measures how the proximity of two hospitals impact their likelihood of adopting the innovation. The analysis for this model was done in Stata 16 SE, utilizing a slightly tweaked version of the `hdiff` program written by Forrest Briscoe and David Strang, two experts in HDM (Briscoe 2016). My analysis was identical to their original package, except I had to

change how distance data was stored and utilized by the model, in order to incorporate my unusually large dataset (which exceeded the maximum allowed observations in the original package). My version is available on the GitHub repository. While specifying this model is theoretically possible in R, there are no well-tested algorithms for its implementation.

This model allows the specification of the role of variables. The default is "propensity," which models how the variable changes an organization's overall willingness to adopt an innovation. However, one can also specify a variable as "contagious," which asserts that organizations with this characteristic who adopt the innovation are more likely to cause other organizations to adopt, or "susceptible," which asserts that this characteristic makes an organization more likely to be influenced by the adoption of other organizations. Distance between facilities is modeled as a proximity effect–it estimates the impact of increasing distance. Due to the complexity of the HDM model, it is important to select what characteristics will be considered susceptibility or contagiousness measures based on theoretical expectations, and to include variables in all of the roles where they could reasonably be expected to matter (Greve, Strang, and Tuma 1995). For this reason, all susceptibility and contagiousness variables are also included as propensity measures. As explained in the preceding literature review, I utilized beds, uncompensated cost, and uninsurance rates as susceptibility measures. I used for-profit, Catholic owned, gross income, and accredited teaching hospital as measures of contagiousness.

I used the HDM model on all three of the outcomes. Robotic surgery and bariatric surgery were each reported in every year of the survey. The first year that the hospital reported either service was tagged as their "adoption" year. Due to the structure of the survey, some hospitals that did not offer either surgery or anything comparable did not answer that section at all, resulting in missing values. All missing values were presumed to be non-adoptions of the innovation. While this assumption may undercount the actual number of adoptions, this is unlikely. Further, all analyses were repeated without this assumption (dropping the cases instead), and similar results were found. For the EMR adoption date, I

used a different method. EMR data was not collected in the survey until 2011. However, the survey addendum included a question about the year of adoption, though it stopped asking that question in 2014. This measure is self-reported, so more likely to have errors, but does include information about adoption for a longer period of time. The earliest adoption year was 1978, and the latest was 2014. I truncated the time period to 1990-2014, as there were only 9 hospitals that adopted it earlier. This allowed me to see a longer period of adoption.

For all analyses, hospital demographic factors were time-lagged and set at 2005–the beginning of the period. This ensures that there cannot be reverse causality for the two surgical adoptions, as the observations about income and uncompensated care preceded the adoption of the procedures. In an ideal circumstance, I would have incorporated time-varying measures, as I have annual observations for most of the key variables. However, computing power limitations made it impossible to complete that model. For the EMR data, some observations do precede the demographic data, making causality a bit harder to assert. However, associations were in the same direction when I truncated adoption years to 2005-2014 (though there was less significance, as there were fewer observations). Not including time-varying measures also made the EMR model more comparable to the other two models, as it was not possible to include time-varying observations for the EMR model for years earlier than 2005.

Finally, I incorporated two measures of "distance" into the HDM model. I calculated the Euclidean distance between each two hospitals utilizing the `raster` package in R. While this gives a rough approximation of distance, it is "as the crow flies," and does not take into account actual travel time. This data is then included in the HDM as a large matrix. I also measured whether hospitals reported being in the same larger healthcare system, using the system ID. In other adoption research, such as research into the adoption of the ACO model, system membership has been found to be an important predictor of adoption (Colla et al. 2016).

## 2.4 Results

### 2.4.1 Descriptive Results

Figure 15 presents the full geographic distribution of hospitals in this analysis. As this sample represents the majority of all large acute hospitals in the United States, the distribution of my hospitals closely matches the population distribution.

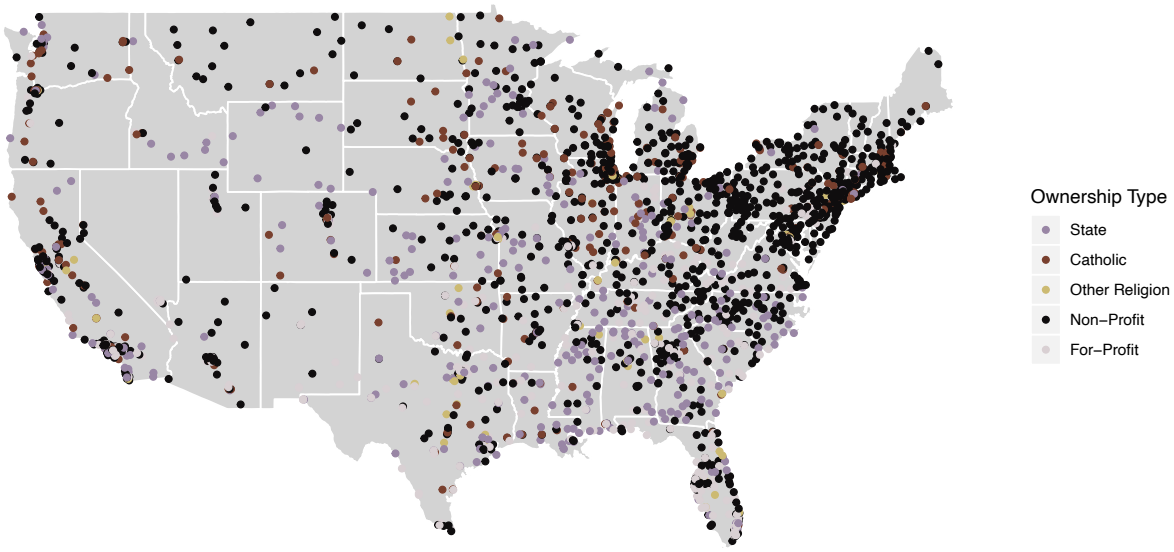



Figure 1: Distribution of Hospitals by Type

First, I present selected descriptive statistics from my dataset. Table 1 summarizes key time-varying variables in my model. For readability, I present the averages from three years, rather than the full set.

Table 1: Key Time-Varying Variables

| | 2005 | 2010 | 2015 |
|---|---|---|---|
| N | 2319 | 2319 | 2319 |
| Prop with Robotic Surgery (SD) | 0.09 (0.29) | 0.29 (0.45) | 0.46 (0.50) |
| Prop. with Bariatric Surgery (SD) | 0.30 (0.46) | 0.35 (0.48) | 0.39 (0.49) |
| **Hospital Ownership** | | | |
| *State (%)* | *355 (15.3)* | *352 (15.2)* | *325 (14.0)* |
| *Catholic (%)* | *261 (11.3)* | *250 (10.8)* | *239 (10.3)* |
| *Other Religion (%)* | *67 (2.9)* | *64 (2.8)* | *63 (2.7)* |
| *Non-Profit (%)* | *1279 (55.2)* | *1267 (54.6)* | *1261 (54.4)* |
| *For Profit (%)* | *357 (15.4)* | *386 (16.6)* | *431 (18.6)* |
| Prop. Catholic Affiliated (SD) | 0.16 (0.36) | 0.16 (0.36) | 0.16 (0.37) |
| In a Hospital System | 0.59 (0.49) | 0.63 (0.48) | 0.72 (0.45) |
| Accredited Teaching Hospital (SD) | 1.90 (0.29) | 1.90 (0.30) | 1.91 (0.28) |
| In-Patient Rev., millions (SD) | 100.52 (266.56) | 139.48 (196.60) | 138.82 (206.59) |
| Uncompensated Costs, millions (SD) | 20.49 (47.68) | 16.21 (18.03) | 14.07 (15.30) |
| # of Beds (SD) | 250.28 (193.89) | 257.69 (204.34) | 255.00 (214.87) |
| Occupancy Rate* (SD) | 436.29 (151.74) | 461.45 (182.47) | 505.54 (220.79) |
| Ratio of Assets to Liabilities (SD) | 2.65 (3.88) | 3.28 (37.61) | 4.97 (93.46) |
| Ambulatory Rev., thousands (SD) | 515.44 (12240.32) | 406.59 (12511.89) | 1045.00 (23268.52) |
| Critical Access Hospital (SD) | 0.06 (0.24) | 0.06 (0.25) | 0.07 (0.25) |
| Medicaid Per Cap Spending** (SD) | 6550.80 (2040.49) | 6954.16 (1727.66) | 6981.26 (1565.50) |
| Medicare Per Cap Spending** (SD) | 7764.45 (877.86) | 10380.85 (1141.70) | 10892.63 (1039.98) |

*Note:*
*The number of patient days in a year divided by the number of beds
**Numbers for 2015-2018 extrapolated using average annual growth rate

Readers may notice that the distribution of hospital type shifts slightly over this period. The hospitals in this sample do not change over time–they are identified by their reporting ID, not by their name or other characteristics. However, some facilities changed ownership over the time period. State hospitals, for example, have been increasingly sold to for-profit and other companies, as state governments struggle to maintain these facilities. Other hospitals may have been purchased by a for-profit system (forcing them to become for profit), may have gone bankrupt and sold to another company, or decided to secularize. However, hospital type remains an extremely stable indicator, with only a small minority of hospitals shifting

categories over time.

It is notable in this table that bariatric surgery has a higher starting percentage than robotic surgery. This is because bariatric surgery was authorized for wide-spread use in 2001, which is outside the scope of my data. Robotic surgery, on the other hand, was only authorized in 2004. While this slightly reduces the comparability of the two surgeries, this model does still capture a significant amount of spread within each category. It is also important to note that there are more hospitals that are Catholic-affiliated than there are owned by the Catholic church. This is because some secular hospitals are owned by a Catholic system, and some state-owned hospitals are run by a church. We can see that, while the beds have remained fairly stable over time, the occupancy rate has increased over time. This reflects a preference in the market for reducing the amount of time a patient stays in the hospital. More patients, on average, enter the hospital each day than there are beds. Because of the distribution of EMR records was so different, it is not included in this table. It captures, however, the full arc of EMR implementation–from the first adoption to the last adoption observed in 2014.

We can also see that, over time, hospital profits are growing. The average in-patient revenue is growing slowly and inconsistently, but the ratio of assets to liabilities is increasing much more rapidly. By 2015, hospitals had 4 times more assets than liabilities, likely reflecting a reduction of overhead and non-essential costs, given the slower growth in revenue. The increasing consolidation of hospital ownership into large systems is a large part of that shift.

Due to the difference in type, I present the key static variables separately, in Table 2. These are variables that, due to data limitations or the nature of the variable, do not vary over the time period.

Table 2: Key Static Variables

| | Overall |
|---|---|
| N | 32466 |
| Has Adopted Bariatric Surgery | 0.57 (0.50) |
| Has Adopted Robotic Surgery | 0.58 (0.49) |
| Time to Adopt Bariatric | 3.67 (3.76) |
| Time to Adopt Robotic | 6.29 (3.87) |
| Has Electronic Medical Records | 0.92 (0.27) |
| Average Adoption Year of EMR | 2006.17 (5.68) |
| **Zipcode-Level Variables** | |
| Median Income (thousands) | 49.83 (19.60) |
| Proportion Black | 0.14 (0.19) |
| Proportion White | 0.75 (0.21) |
| Proportion Asian | 0.04 (0.07) |
| Proportion Other | 0.04 (0.07) |
| Proportion No High School | 0.14 (0.09) |
| Proportion High School | 0.28 (0.09) |
| Proportion Some College | 0.29 (0.06) |
| Proportion College and beyond | 0.29 (0.16) |
| **State-Level Variables** | |
| Medicaid Average Annual Growth | 0.03 (0.01) |
| Medicare Average Annual Growth | 0.05 (0.01) |
| Accepted ACA Expansion | 0.65 (0.48) |

We can see that approximately the same percent of hospitals have adopted bariatric surgery and robotic surgery. Robotic surgery had a slower adoption period, which matches its newer introduction to the field. This section also introduces a few geographic demographic variables. Among these, we can see that the proportion of white individuals in the hospital zip codes is higher than the national average, as is the average income. The distribution of college education level is fairly even, and both Medicaid and Medicare have experienced steady growth. I also included a static measure of whether the hospital's state accepted the Medicaid expansion–a key decision that would likely increase the state's pool of eligible enrolled individuals. A very low proportion of hospitals in this dataset are designated as teaching hospitals.

Before moving onto the analytic results, I present the overall trend in adoptions by each innovation over the entire potential time frame in Figure 2. The Y axis is presented as the proportion of overall hospitals that have adopted the innovation by the given year (not just the percent of hospitals that adopted the innovation in each year). A steeper slope indicates a faster adoption of a given procedure, while a flatter slope indicates slower adoption.

Note that the EMR trend line has a different start and end date than the other two–as mentioned before, the data source for the adoption of EMRs was slightly different. Though I had to truncate EMR adoptions at 2014, as data collection stopped at that time, other research indicates that almost every hospital had some version of EMR by 2018 (Adler-Milstein et al. 2017). This suggests that my observation window does miss a crucial EMR adoption period that occurred after 2014. As expected, all three innovations have strong increases in adoption over time. Bariatric surgery has a slightly flatter line, as the time period possible for this analysis slightly misses the initial adoption year of bariatric surgery (2001). The beginning of robotic surgery was much closer (2004), and so this analysis captures the vast majority of early adoptions. As predicted by Roger (2002), all three of the trends seem to be beginning to taper by the end of the period, suggesting a plateau of adoptions.

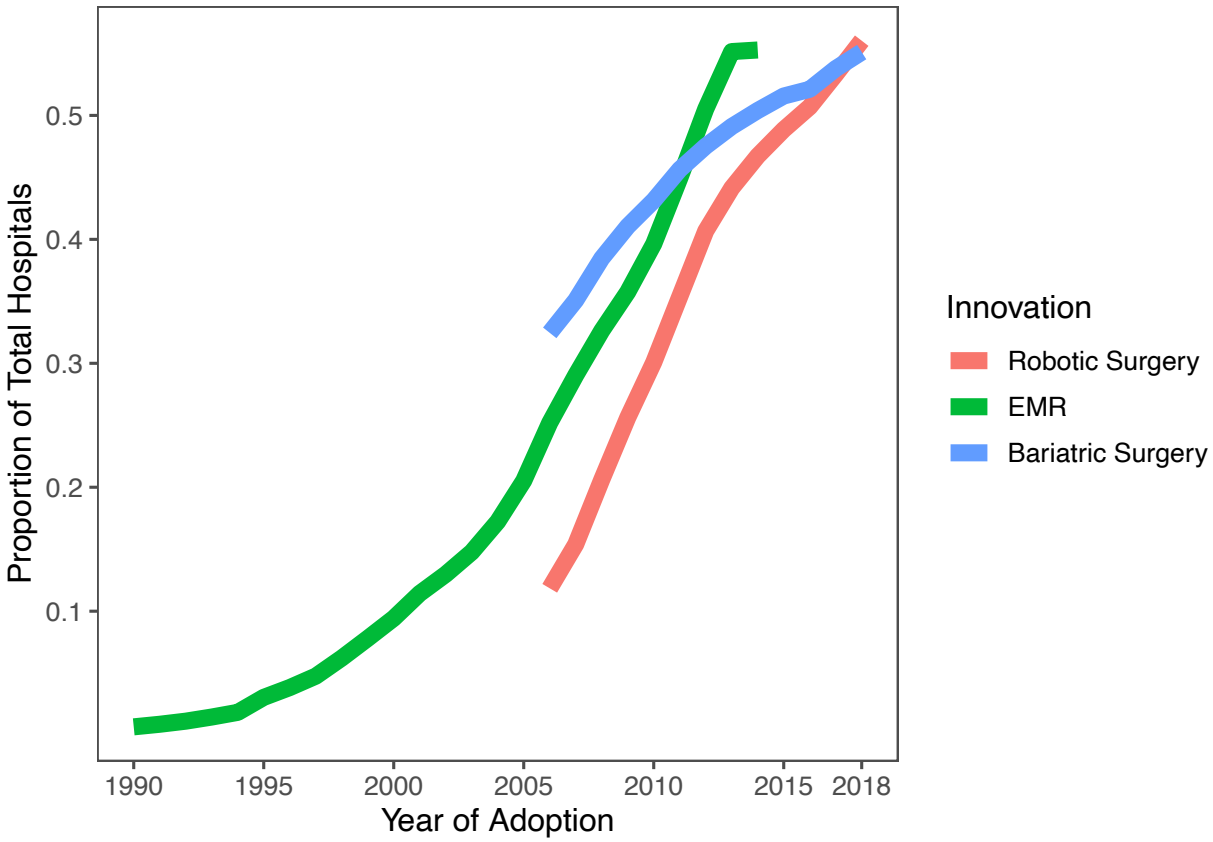



Figure 2: Proportion of Hospitals Adopting Each Innovation over Time

### 2.4.2 Heterogenous Diffusion Model Results

Finally, I present the three full diffusion models in Table 3. The models are identical in predictors and sample size, only varying the outcome variable. They present hazard ratios, rather than raw coefficients. Hazard ratios can be interpreted as "increasing risk of adoption" when they are >1, and "decreasing risk of adoption" when they are less than 1. Because I have a discrete outcome variable, the hazard ratios are reflecting the likelihood of not just adopting, but also how quickly the organization will adopt. Appendix A provides iterative versions of all three models, to demonstrate the impact of adding each additional set of variables.

Table 3: Results from Heterogenous Diffusion Model on Three Innovations

| | Bariatric | | Robotic | | EMR | |
|---|---|---|---|---|---|---|
| | HR | | HR | | HR | |
| **Hospital Characteristics** | | | | | | |
| *Ownership (ref=Non-Profit)* | | | | | | |
| For-Profit Hospital | 0.9091 | | 0.7363 | *** | 0.3194 | *** |
| Catholic-Owned Hospital | 0.9985 | | 0.9479 | | 0.7386 | *** |
| Other Religious Hospital | 1.1058 | | 1.1832 | | 1.0843 | |
| State Hospital | 0.8233 | * | 0.6912 | *** | 1.0788 | |
| # of Beds | 1.0012 | *** | 1.0018 | *** | 1.0006 | |
| Gross Revenue, millions | 1.0002 | | 1.0004 | *** | 1.0003 | * |
| Occupancy Rate | 0.9993 | ** | 0.9992 | ** | 0.9997 | |
| Accredited Teaching Hospital | 0.7808 | * | 0.5405 | *** | 0.9042 | |
| Uncompensated Costs, millions | 0.9989 | | 0.9992 | | 0.9996 | |
| Ratio of Assets to Liabilities | 1.0012 | | 1.0108 | | 1.0048 | |
| Ambulatory Revenue | 1.0000 | | 1.0000 | | 1.0000 | |
| In System | 1.0155 | | 1.0584 | | 1.1068 | |
| **Geographic Characteristics** | | | | | | |
| Median Income | 1.0000 | | 1.0000 | | 1.0000 | |
| Proportion Black | 0.8305 | | 1.0950 | | 0.5324 | *** |
| Proportion Other | 0.6979 | | 0.7856 | | 0.3687 | |
| Proportion with College Degree | 4.3947 | *** | 9.2607 | *** | 1.2172 | |
| Total Population Size | 1.0055 | ** | 1.0059 | ** | 1.0026 | |
| Proportion Uninsured | 1.0232 | *** | 1.0195 | * | 0.9999 | |
| Medicaid Enrollment | 1.0000 | | 0.9999 | *** | 1.0000 | |
| Medicaid Per Cap Spending (thousands) | 1.0600 | *** | 0.9457 | ** | 1.0296 | |
| Expanded Medicaid | 1.0699 | | 1.0232 | | 1.0367 | |
| **Susceptibility Measures** | | | | | | |
| Intercept | 1.0036 | | 0.9469 | *** | 1.0771 | * |
| Uninsured Percent | 1.0000 | | 1.0000 | | 1.0000 | |
| Beds | 1.0000 | *** | 1.0000 | ** | 1.0000 | |
| Uncompensated Costs, millions | 1.0000 | | 1.0000 | * | 1.0000 | |
| **Contagiousness Measures** | | | | | | |
| For-Profit | 1.0375 | | 0.9995 | | 0.9896 | |
| Catholic-Owned | 0.9875 | | 1.0295 | ** | 0.9355 | *** |
| Gross Income | 1.0000 | | 1.0000 | ** | 1.0000 | ** |
| Accredited Teaching Hospital | 0.9962 | | 1.0242 | *** | 0.9649 | * |
| **Closeness Measures** | | | | | | |
| In Same System | 1.0001 | | 0.9994 | | 0.9999 | |
| Geographic Distance | 1.0000 | | 1.0000 | | 1.0000 | *** |
| Chi-Squared | 1713.7477 | | 989.7785 | | 1232.1163 | |
| **Model Statistics** | | | | | | |
| *Log Likelihood* | *-2829* | | *-2459* | | *-1675* | |

In the propensity measures, which model basic likelihood of adopting the three innovations, patterns are primarily the same across all three categories. For-profit hospitals are less likely than non-profit hospitals to adopt all three of these innovations, but were particularly less likely to adopt EMRs: their hazard for adopting was 70% lower than non-profits. This indicates that their overall likelihood to adopt is low. For all significant relationships, state hospitals are also less likely to adopt than non-profits. Catholic ownership reduces overall propensity to adopt, but is only significant for EMRs. Although never significant, other religious hospitals were consistently more likely to adopt all three procedures. Increasing the number of beds in a hospital increases the hazard of adopting for all three models (but only significantly for robotic and bariatric surgery). Accredited teaching hospitals, surprisingly, also have lower hazards for adopting all three, and are particularly less likely to adopt robotic surgery–being a teaching institution reduces hazard by 46% as compared to a non-teaching hospital. Among the geographic variables, highly educated, densely populated regions were significantly more likely to receive robotic or bariatric surgery, though this positive relationship was not significant for EMRs. The proportion of black individuals in a zip code was only significant for EMRs, but demonstrated a clear trend–an increase in the proportion of black individuals reduced the overall propensity of a hospital to adopt EMRs by 47%. Other than the proportion of black individuals, however, no geographic variable was significant for EMRs, even though many of the variables were significant for the other two. Notably, Medicaid per capita spending (a rough proxy for Medicaid generosity by state) was the only variable whose direction of association had reversed significance for different innovations. It was positively associated with bariatric surgery, but was negatively associated with robotic surgery.

The measures of susceptibility were mostly non-significant. The few relationships that were significant were very small (a significant 1.0000 connotes an increased hazard that was too small to capture in 4 decimals). The intercept indicates the overall susceptibility of hospitals in the sample. It is interpretable as similar to a constant. For robotic surgery, hospitals were

overall slightly less susceptible, while for EMR, they were slightly more susceptible. Beyond this, we find that increasing beds increase susceptibility slightly, as expected.

Among the contagiousness measures, Catholic ownership was consistently important. For robotic surgery, Catholic hospitals that adopted increased the hazard that other facilities would adopt by 3%. In EMRs, however, it decreased the likelihood that other facilities would adopt by 6.4%. Accredited teaching hospitals follow a similar pattern. They are influential in the adoption of robotic surgery, increasing the hazard that others adopt by 2.4%, but decrease the likelihood that other facilities will adopt EMRs.

The closeness measures, surprisingly, were not significant. Geographic distance was significant for EMRs, but it was not a large enough effect to be practically significant. Being in the same system did not influence any of the outcomes. Including these measures, however, did change the impact of other variables. This indicates that they are still important to include, and may capture unmeasured variation.

## 2.5 Conclusion and Discussion

Overall, the findings from this paper demonstrated a complex relationship between endogenous hospital features, exogeneous features, and the nature of an innovation itself. Hypothesis 1, which predicted that different innovations would have different patterns of diffusion by hospital type, was partially supported. Certain differences, particularly among the contagiousness measures, were clearly seen. Catholic and teaching hospitals played very different roles in the expansion of EMRs and robotic surgery. Among the propensity measures, differences in strength of association were seen, but the direction of association was generally consistent. Non-profits were generally the most likely to adopt an innovation, though non-Catholic religious hospitals demonstrated a consistent (but not statistically significant) early adoption pattern. These findings did strongly show, however, that type of hospital is an important predictor for adoption. In particular, the finding that Catholic hospitals behave significantly differently from non-profit hospitals demonstrates that their religious mission and organization

causes them to behave separately from other facilities.

Hypothesis 2, which predicted that innovations would spread unequally, was also partially supported. It is clear that areas with high education are consistently benefitting from new innovations, as this was the strongest predictor of adoption of anything in the model. Areas with a high proportion of black individuals, however, are at a disadvantage. They were significantly less likely to receive EMR adoptions. Median income was not significant, though some of its effect was mediated by education. More densely populated areas were more likely to receive both surgical interventions than more rural areas. Governmental spending on Medicaid also increased adoption of bariatric surgery, but decreased adoption of robotic surgery. Robotic surgery was also slightly less likely to spread to high-Medicaid areas. These patterns suggest that diffusion is not happening equally, and that rural areas with high minority populations may be less likely to receive innovation, both surgical and non-surgical. Race was particularly important for EMRs, but not for the surgical interventions.

Some variables were less significant than expected. However, two things should be considered. First, these models incorporated many control variables, at both the hospital and geographic level. Certain variables, like uncompensated care costs, are known to be associated with the uninsurance rates and income of a region (Mitias 2007). The Appendix tables demonstrate how the addition of some these variables affected significance. Further, the organizational impacts have associated factors, like size and income, held constant. However, organizational characteristics impact income, uncompensated care costs, and other measures. Organizational effects, therefore, may be underestimated in this model.

There are several limitations to this study. First, organizational characteristics were set at 2005 due to computing power limitations. Future research should incorporate more complex, multi-spell models to fully investigate the importance of changing income over time. Second, this research relied on the self-reporting of hospitals. It is likely that some facilities either failed to report adopting these innovations, or incorrectly reported adoption. An analysis of the relationship between hospital report and actual behavior, by looking at patient records

and counting the number of procedures actually completed by the hospital, is needed to verify the actual nature of hospital adoption. Finally, I integrated four separate data sources in order to complete the analyses presented. While this gave a greater depth to the final model, and allowed me to control for a wide variety of hospital characteristics, it is likely that additional error was introduced with each of the new data sources. Further research utilizing other data sources should be conducted, to verify trends.

Despite these limitations, the model presented here demonstrates that hospitals continue to behave in diverse ways, despite the expectations by neoinstitutional theory and previous findings that all hospitals are beginning to look the same. In particular, it shows that patterns of diffusion can vary widely by hospital type and region, and that characteristics of the innovation itself are important to consider when predicting adoption patterns. The fact that these patterns exist for all three innovations is particularly important because this paper included medical innovations. These inventions, while sometimes contentious, are often expected to lie outside of the realm of "business." In a hospital world purely motivated by the desire to improve health, we would not expect the spread of medical innovations to be predicted by a hospital's legal status or ownership type. This paper, however, finds that even hospital provision of medical services is fundamentally shaped by its business strategy. While the patterns of adoption varied, the two surgical intervention patterns were just as related to hospital ownership characteristics as electronic medical records. Future research should consider what this blurring of boundaries means for healthcare provision. Inequality is clearly driven by diffusion, as certain areas are denied early access to these innovations because of business considerations. Future research should consider how the blurring of these boundaries impacts the provision of other medical services, and how these impacts may change patient quality of care and outcomes.

These findings also speak to the larger diffusion literature. They seem to cement the idea that we cannot consider "adoption of innovation" as a monolithic idea, even within a single industry. The varying characteristics of these three innovations–in terms of cost, perceived

profitability, and implications for the organization–demonstrably impacted the speed and style of their adoption. This emphasizes Wejnert (2002), who argued that classification of the innovation itself is an important part of diffusion modeling, and illustrates a statistical way to model variation in innovation. While other diffusion researchers have highlighted the potential importance of innovation characteristics (Wejnert 2002), most diffusion research still focuses on a single innovation or idea. The findings from this paper indicate that researchers interested in explaining the impact of organizational factors on innovation need to carefully consider their "test case" innovation, and expand to multiple cases when possible. The choice of innovation can have a major impact on the findings of a study.

Finally, the findings from this paper clearly demonstrate that it is critical to include a measure of hospital religiosity in organizational research. While religious hospitals have traditionally been ignored in institutional research, they were highly influential in this paper. Catholic hospitals, in particular, were influential in the future adoption of bariatric surgery, often paving the way for the adoption by other facilities. Perhaps a religious organization adopting a procedure legitimizes it, making it easier for other hospitals to adopt as well. Or perhaps the mere fact that Catholic hospitals are highly organized and hierarchically structured makes their decisions more influential, as they can quickly adopt a procedure in multiple geographic regions at once, changing a large portion of the market structure. Much more research needs to be done to fully understand how Catholic hospitals and other religiously-affiliated hospitals operate and influence the market, but this paper demonstrates that additional research is warranted and needed.

# Appendix

Table 4: Results from Heterogenous Diffusion Model on Adoption of Bariatric Surgery

| | Mod. 1 | | Mod. 2 | | Mod. 3 | | Mod. 4 | |
|---|---|---|---|---|---|---|---|---|
| | b | | b | | b | | b | |
| **Hospital Characteristics** | | | | | | | | |
| *Ownership (ref=Non-Profit)* | | | | | | | | |
| For-Profit Hospital | 0.7919 | ** | 0.8804 | | 0.9075 | | 0.9091 | |
| Catholic-Owned Hospital | 1.0832 | | 0.9611 | | 1.0005 | | 0.9985 | |
| Other Religious Hospital | 1.2272 | | 1.1047 | | 1.1084 | | 1.1058 | |
| State Hospital | 0.6222 | *** | 0.8007 | * | 0.8222 | * | 0.8233 | * |
| # of Beds | | | 1.0022 | *** | 1.0012 | *** | 1.0012 | *** |
| Gross Revenue, millions | | | 1.0003 | * | 1.0002 | | 1.0002 | |
| Occupancy Rate | | | 0.9991 | *** | 0.9993 | ** | 0.9993 | ** |
| Accredited Teaching Hospital | | | 0.6165 | *** | 0.7726 | * | 0.7808 | * |
| Uncompensated Costs, millions | | | 0.9976 | *** | 0.9990 | | 0.9989 | |
| Ratio of Assets to Liabilities | | | 0.9984 | | 1.0004 | | 1.0012 | |
| Ambulatory Revenue | | | 1.0000 | | 1.0000 | | 1.0000 | |
| In System | | | 0.9827 | | 0.9875 | | 1.0155 | |
| **Geographic Characteristics** | | | | | | | | |
| Median Income | | | 1.0000 | | 1.0000 | | 1.0000 | |
| Proportion Black | | | 0.7882 | | 0.8543 | | 0.8305 | |
| Proportion Other | | | 0.5879 | | 0.6661 | | 0.6979 | |
| Proportion with College Degree | | | 7.0151 | *** | 4.3362 | *** | 4.3947 | *** |
| Total Population Size | | | 1.0061 | ** | 1.0055 | ** | 1.0055 | ** |
| Proportion Uninsured | | | 1.0273 | *** | 1.0226 | ** | 1.0232 | *** |
| Medicaid Enrollment | | | 1.0000 | | 1.0000 | | 1.0000 | |
| Medicaid Per Cap Spending (thousands) | | | 1.0907 | *** | 1.0594 | *** | 1.0600 | *** |
| Expanded Medicaid | | | 1.0265 | | 1.0394 | | 1.0699 | |
| **Susceptibility Measures** | | | | | | | | |
| Intercept | | | | | 1.0036 | | 1.0036 | |
| Uninsured Percent | | | | | 1.0000 | | 1.0000 | |
| Beds | | | | | 1.0000 | *** | 1.0000 | *** |
| Uncompensated Costs, millions | | | | | 1.0000 | | 1.0000 | |
| **Contagiousness Measures** | | | | | | | | |
| For-Profit | | | | | 1.0377 | | 1.0375 | |
| Catholic-Owned | | | | | 0.9875 | | 0.9875 | |
| Gross Income | | | | | 1.0000 | | 1.0000 | |
| Accredited Teaching Hospital | | | | | 0.9961 | | 0.9962 | |
| **Closeness Measures** | | | | | | | | |
| In Same System | | | | | | | 1.0001 | |
| Geographic Distance | | | | | | | 1.0000 | |
| Chi-Squared | 47.9279 | | 742.8984 | | 1710.8014 | | 1713.7477 | |
| **Model Statistics** | | | | | | | | |
| *Log Likelihood* | *-3955* | | *-3314* | | *-2830* | | *-2829* | |

Table 5: Results from Heterogenous Diffusion Model on Adoption of Robotic Surgery

| | Mod. 1 | | Mod. 2 | | Mod. 3 | | Mod. 4 | |
|---|---|---|---|---|---|---|---|---|
| | b | | b | | b | | b | |
| **Hospital Characteristics** | | | | | | | | |
| *Ownership (ref=Non-Profit)* | | | | | | | | |
| For-Profit Hospital | 0.8650 | | 0.7654 | ** | 0.7352 | *** | 0.7363 | *** |
| Catholic-Owned Hospital | 1.2091 | ** | 0.9869 | | 0.9509 | | 0.9479 | |
| Other Religious Hospital | 1.3985 | * | 1.1936 | | 1.1786 | | 1.1832 | |
| State Hospital | 0.6287 | *** | 0.7162 | *** | 0.6927 | *** | 0.6912 | *** |
| # of Beds | | | 1.0021 | *** | 1.0018 | *** | 1.0018 | *** |
| Gross Revenue, millions | | | 1.0003 | *** | 1.0004 | *** | 1.0004 | *** |
| Occupancy Rate | | | 0.9992 | ** | 0.9992 | ** | 0.9992 | ** |
| Accredited Teaching Hospital | | | 0.5904 | *** | 0.5395 | *** | 0.5405 | *** |
| Uncompensated Costs, millions | | | 0.9980 | ** | 0.9992 | | 0.9992 | |
| Ratio of Assets to Liabilities | | | 1.0115 | | 1.0108 | | 1.0108 | |
| Ambulatory Revenue | | | 1.0000 | | 1.0000 | | 1.0000 | |
| In System | | | 1.1789 | * | 1.2012 | ** | 1.0584 | |
| **Geographic Characteristics** | | | | | | | | |
| Median Income | | | 1.0000 | | 1.0000 | | 1.0000 | |
| Proportion Black | | | 1.1475 | | 1.0891 | | 1.0950 | |
| Proportion Other | | | 0.7737 | | 0.8008 | | 0.7856 | |
| Proportion with College Degree | | | 8.8779 | *** | 9.3142 | *** | 9.2607 | *** |
| Total Population Size | | | 1.0067 | *** | 1.0059 | ** | 1.0059 | ** |
| Proportion Uninsured | | | 1.0212 | *** | 1.0194 | * | 1.0195 | * |
| Medicaid Enrollment | | | 0.9999 | *** | 0.9999 | *** | 0.9999 | *** |
| Medicaid Per Cap Spending (thousands) | | | 0.9513 | ** | 0.9458 | ** | 0.9457 | ** |
| Expanded Medicaid | | | 1.0226 | | 1.0282 | | 1.0232 | |
| **Susceptibility Measures** | | | | | | | | |
| Intercept | | | | | 0.9468 | *** | 0.9469 | *** |
| Uninsured Percent | | | | | 1.0000 | | 1.0000 | |
| Beds | | | | | 1.0000 | ** | 1.0000 | ** |
| Uncompensated Costs, millions | | | | | 1.0000 | * | 1.0000 | * |
| **Contagiousness Measures** | | | | | | | | |
| For-Profit | | | | | 0.9995 | | 0.9995 | |
| Catholic-Owned | | | | | 1.0295 | ** | 1.0295 | ** |
| Gross Income | | | | | 1.0000 | ** | 1.0000 | ** |
| Accredited Teaching Hospital | | | | | 1.0242 | *** | 1.0242 | *** |
| **Closeness Measures** | | | | | | | | |
| In Same System | | | | | | | 0.9994 | |
| Geographic Distance | | | | | | | 1.0000 | |
| Chi-Squared | 55.8276 | | 873.4008 | | 987.9335 | | 989.7785 | |
| **Model Statistics** | | | | | | | | |
| *Log Likelihood* | *-3177* | | *-2518* | | *-2460* | | *-2459* | |

Table 6: Results from Heterogenous Diffusion Model on Electronic Medical Records

| | Mod. 1 | | Mod. 2 | | Mod. 3 | | Mod. 4 | |
|---|---|---|---|---|---|---|---|---|
| | b | | b | | b | | b | |
| **Hospital Characteristics** | | | | | | | | |
| *Ownership (ref=Non-Profit)* | | | | | | | | |
| For-Profit Hospital | 0.3844 | *** | 0.3829 | *** | 0.3200 | *** | 0.3194 | *** |
| Catholic-Owned Hospital | 0.7979 | ** | 0.7766 | ** | 0.7278 | *** | 0.7386 | *** |
| Other Religious Hospital | 1.0546 | | 1.0444 | | 1.1025 | | 1.0843 | |
| State Hospital | 1.0245 | | 1.0691 | | 1.0689 | | 1.0788 | |
| # of Beds | | | 1.0003 | | 1.0006 | * | 1.0006 | |
| Gross Revenue, millions | | | 1.0002 | | 1.0003 | | 1.0003 | * |
| Occupancy Rate | | | 0.9998 | | 0.9997 | | 0.9997 | |
| Accredited Teaching Hospital | | | 0.9149 | | 0.8879 | | 0.9042 | |
| Uncompensated Costs, millions | | | 1.0000 | | 0.9998 | | 0.9996 | |
| Ratio of Assets to Liabilities | | | 1.0035 | | 1.0041 | | 1.0048 | |
| Ambulatory Revenue | | | 1.0000 | | 1.0000 | | 1.0000 | |
| In System | | | 1.0852 | | 1.1162 | | 1.1068 | |
| **Geographic Characteristics** | | | | | | | | |
| Median Income | | | 1.0000 | | 1.0000 | | 1.0000 | |
| Proportion Black | | | 0.6615 | * | 0.5868 | ** | 0.5324 | *** |
| Proportion Other | | | 0.3824 | | 0.3195 | | 0.3687 | |
| Proportion with College Degree | | | 1.0573 | | 1.0925 | | 1.2172 | |
| Total Population Size | | | 1.0015 | | 1.0025 | | 1.0026 | |
| Proportion Uninsured | | | 0.9994 | | 0.9953 | | 0.9999 | |
| Medicaid Enrollment | | | 1.0000 | | 1.0000 | | 1.0000 | |
| Medicaid Per Cap Spending (thousands) | | | 1.0207 | | 1.0262 | | 1.0296 | |
| Expanded Medicaid | | | 0.9781 | | 0.9506 | | 1.0367 | |
| **Susceptibility Measures** | | | | | | | | |
| Intercept | | | | | 1.0765 | * | 1.0771 | * |
| Uninsured Percent | | | | | 1.0000 | | 1.0000 | |
| Beds | | | | | 1.0000 | | 1.0000 | |
| Uncompensated Costs, millions | | | | | 1.0000 | | 1.0000 | |
| **Contagiousness Measures** | | | | | | | | |
| For-Profit | | | | | 0.9893 | | 0.9896 | |
| Catholic-Owned | | | | | 0.9353 | *** | 0.9355 | *** |
| Gross Income | | | | | 1.0000 | ** | 1.0000 | ** |
| Accredited Teaching Hospital | | | | | 0.9649 | * | 0.9649 | * |
| **Closeness Measures** | | | | | | | | |
| In Same System | | | | | | | 0.9999 | |
| Geographic Distance | | | | | | | 1.0000 | *** |
| Chi-Squared | 116.1142 | | 139.3886 | | 1214.2571 | | 1232.1163 | |
| **Model Statistics** | | | | | | | | |
| *Log Likelihood* | *-2410* | | *-2221* | | *-1684* | | *-1675* | |

# 3 Selling Health: Exploring Lexical Isomorphism in Hospital Websites

## 3.1 Introduction

As the use of the internet as a source of information, advertising, and communication has grown, the importance of an organization's website has also grown. The content must be designed and presented in a way that conveys what the designer wants—something that improving technology has made easier than ever. Websites are often the first way that a consumer interacts with a business, as they find its address, read about its services, and even meet workers. Hospitals are not exempt from this trend, as they must compete to be included in Google search results, attract consumers, and keep ratings high. The current Vice President of marketing at Emory University Healthcare describes their website as the "new front door" of the facility, as patients are increasingly likely to be introduced to Emory Healthcare through its website long before they physically visit any buildings (2018: personal communication).

With the rising importance of web pages, studies of organizations must begin to include studies of "digital sociology," which focuses on how sociological concepts occur in the digital space (Gregory 2016). Gregory et al. (2016) highlights the numerous ways that sociologists can begin to investigate the digital interaction of people and organizations: through social media, curated blogs, wearable technology, and other mediums. In this case, I am interested in how the hospital frames and advertises its surgical offerings to consumers, and the natural medium for this analysis is the hospital website, which is designed and controlled by the marketing team of each hospital to convey precise information to patients. These choices have powerful implications for how American patients think about and consume medical care.

This paper will leverage sociological theories of framing with theories of how institutions diffuse, copy, and present their innovations to explain patterns in hospital websites. It will test whether hospitals differ in their provision of information in important ways. It finds that

hospital ownership is a key predictor in framing decisions.

## 3.2 Background

### 3.2.1 Framing Health

In this analysis, I will be using the concept of framing most commonly employed in studies of media, rather than a social psychological perspective. This emphasizes how content is consciously presented, not on how individuals filter and understand the world. The general concept of framing implies that actors can make choices about how to present a cultural object, and in doing so, can change its meaning. The media can frame Muslims as dangerous terrorists or a misunderstood religious group, for example (Bail 2012). Cultural studies of framing are primarily interested in how actors determine frames, how these frames affect the presentation of content, and how these frames impact consumers (and, in turn, how consumers may impact frames). The consideration of frames in advertising has particularly deep roots—Goffman's Gender Advertisements focused on the way that advertisers frame male and female bodies, and he offered some of the earliest considerations of frame analysis (Goffman 1974). He believed that media frames could influence perception by telling consumers what is worth their attention; it could determine what is "relevant" in the larger cultural world. Other studies have problematized the idea of the consumer as a dupe, passively accepting the versions of reality that media may present. Instead, they suggest that consumers evaluate the media that they encounter and adapt it to their personal tastes and beliefs (Griswold and Wright 2004; Lu 2013). The debate on the passivity of the consumer has not yet been resolved, but some argue that attention is key: we passively consume some products, while others encourage more careful deliberation.

Many current studies attempt to adjudicate between these elements of framing by incorporating measures of frames, organizations, and audience reactions. Bail (2012) provides a particularly good example of this approach. His work analyzed the similarity of press releases and news reports about the Muslim community to track what types of Muslim frames

garnered the most media attention. He found that fringe, highly inflammatory claims were more effective. He also covers the concept of "unsettled times," a term which refers to the Swidler (1986) argument that active attempts for cultural change occur in times of great social change. The healthcare industry in the United States is facing almost constant reforms (either planned or enacted), as the government and other entities try to develop better ways to regulate the provision and cost of care. These reforms often change the rules that define what makes a "good" hospital or profitable behavior. Thus, most of healthcare's history could be considered "unsettled times," suggesting that hospitals may be particularly motivated to create cultural narratives about themselves and their care. Other researchers have looked more explicitly at the relationship between frames and business. Mears (2010) looks at how decision-makers in high-end fashion houses frame a lack of model diversity as an inevitable outcome, and Mezias and Boyle (2005) analyze the impact of the New York Times framing of the film industry on organizational success and failure. All of these studies find that organizations can and do employ framing as a way to alter the behavior of consumers and competitors, particularly in highly competitive fields. Frames can help encourage consumers to purchase services, develop brand loyalty, or change the existing narrative about a facility. As hospitals occupy a contested and competitive space, it is reasonable to expect that they will utilize frames to change potential patient behavior.

### 3.2.2 Framing as Differentiated Diffusion

Framing can add needed depth to theories of diffusion. The theory of organizational diffusion, which seeks to explain when and why organizations choose to adopt an innovation, tends to treat adoption as a binary event, without considering the character of the adoption (Colyvas and Jonsson 2011). However, once an institution chooses to adopt an innovation, it must choose *how* to adopt it–how to fit it into the existing structure of the organization. When organizations adopt a new innovation, they are often doing it in response to a pressure to appear legitimate, not because it is the best technical and economic decision (DiMaggio and

Powell 1991). Therefore, there is an expectation that all organizations will begin to look the same, as they respond to pressures and tend to adopt an innovation, regardless of need. This tendency to all look the same is called "isomorphism."

Recent research has pointed out that the style of adoption–whether the organization adapts an innovation to fit its needs, or adopts it without modification–can give much needed insight into whether the diffusion of an innovation is truly isomorphic (Ansari, Fiss, and Zajac 2010). Ansari et al. (2010) argues that a critical form of this variation may stem from how a practice is framed. They argue that adoptions can be classified in terms of "fidelity" and "extensiveness." Fidelity refers to how similar their implementation of a innovation is to other adoptions. Extensiveness, in contrast, is how much they commit to and integrate the adoption into their corporation. In the context of framing, organizations can adopt an innovation but never advertise/adopt a frame (high fidelity, low extensiveness), they can adopt the innovation and copy the frame that other organizations utilized (high fidelity, high extensiveness), or they can fully take on the adoption and adopt a new frame that fits the needs of their organization (low fidelity, high extensiveness). They argue that early adopters will be more likely to adopt but not develop a frame, while late adopters are more likely to develop a customized frame. Under this theory, we should see the most variation in the framing of an innovation late in its cycle. Bariatric surgery and robotic surgery have both been diffusing for two decades, giving adopters plenty of time to develop alternative frames. If this is true, it suggests that frames offer a mechanism for organizations to resist isomorphism, and that these frames may tend to be more diverse over time. What matters for these arguments is not necessarily the content of the frames being utilized, but rather whether or not the frames vary across organizations.

### 3.2.3 Framing and Medicalization

In the medical world, framing is a key mechanism of medicalization. At its core, medicalization is a form of framing, as various groups attempt to attach a particular perspective to an

underlying condition. Medicalization is the process through which conditions, previously considered natural, become defined as diseases (Conrad 2007). The medical community largely drives this social construction of new illness through diagnosis and treatment (Brown 1995). Researchers have found that the use of persuasive frames in medical centers around treatments like prostate examinations can drive changes in patient behavior (Schneider et al. 2001; Cherubini et al. 2005). This suggests that once a hospital has medicalized a procedure or condition, they can utilize framing to change patient perceptions toward that medicalized item.

Of course, all diseases that we currently recognize have been "medicalized"–they have been named, quantified, and treated, despite once being considered natural–and the nature of that social construction depends on the lingual, cultural, and medical traditions of society (Conrad and Barker 2010). Medicalization is thus not inherently bad, though it is generally employed in a critical sense. It is the mechanism through which we identify and treat diseases. Research emphasizing medicalization, however, focuses on more recent and contested diseases. Medicalization can improve well-being for people with certain conditions, but many argue that the excessive medicalization can lead to rising costs, excessive treatment, and even unnecessary harm to patients (Clarke et al. 2003; Goodman and Goodman 1987).

Researchers have been studying this phenomenon from a variety of angles. The most common approach, especially with journalists, considers the role of "Big Pharma," where multi-billion dollar pharmaceutical industries push unnecessary drugs for profit (Brill 2015; Conrad 2005; Whitaker 2010). In recent years, however, hospitals have become an important part of the trend towards increasing medicalization, as they can profit from the increased utilization of healthcare, and offer elective surgeries (Jost 2010). In particular, certain medicalized conditions are especially amenable to hospital interventions, such as surgery, rather than pharmaceutical intervention. This key difference places patients in a different market. Hospital approaches are also often more invasive and permanent, which require a more complete acceptance of medicalization. Finally, while both pharmaceutical companies

and hospitals generally advertise their services, hospitals are able to bring their legitimacy as healthcare providers to bear, and subsequently create the perception that their products are legitimate and necessary (Salant and Santry 2006). Pharmaceutical companies, particularly in the United States, have long been recognized as marketing agents, and so consumers may be less likely to assume that their marketing material is objective.

One of the most evocative recent examples of medicalization is the case of obesity (Saguy 2013; Sobal 1995). Obesity was once considered a natural state, with fluctuating attributions of desirability, until the public health field began to attach a variety of health risks to the condition, alternating between considering it a disease, an epidemic, and a risk factor (Fontaine and Barofsky 2001; Nestle and Jacobson 2000; Poulain et al. 2006). As the research was conducted, obesity quickly garnered a variety of clinical diagnostic measures, including Body Mass Index measurements, skin fold tests, and total body fat measures (Burkhauser and Cawley 2008). The medical community responded to these new studies by developing treatments for obesity, which did include some pharmaceuticals, but were primarily centered around weight loss, or bariatric, surgery (Sobal 1995; Throsby 2009). The set of procedures that are considered bariatric surgeries are invasive, some involving the removal of the stomach, and all cause permanent changes in a patient's body and lifestyle (Drew 2011). Since the implementation of the first FDA-approved bariatric procedure in 1995, rates of the surgery have skyrocketed, as many major hospitals begin offer the service (Livingston 2010; Tian, Hurley, and Clement 2010).

On the surface, the above trend appears to be a smooth transition: the medical community discovered a risky medical condition and took steps to correct it. Other authors, however, have argued that the rise of obesity as disease and epidemic is a problematic example of medicalization. Saguy (2013) argues that the evidence for obesity as a risk factor for various poor health outcomes (like heart disease and diabetes) is circumstantial at best, and certainly not strong enough to warrant a public health war. She claims that this transition has strengthened the stigma against obesity, making life substantially harder for overweight

individuals. Other studies have agreed with Saguy's perspective, particularly mentioning the role of bariatric surgery as a force of medicalization (Throsby 2009). A review of the efficacy of the procedure found that most studies proving its success are limited in scope (less than three years), and the only long-term study (10 years) found limited support for long-term weight loss benefits (Picot et al. 2009). It was found to be fairly safe, though complications do occur. While a case can be made for obesity as a disease and bariatric surgery as a solution, the case is not as clear-cut as much medical literature makes it appear.

Bariatric surgery certainly became a popular procedure very quickly, going from almost no procedures in 1995 to over 120,000 in 2002 (Livingston 2010). The quick increase of bariatric surgery cannot be explained by its demonstrated clinical effectiveness and necessity alone. In order to understand why it has become such a popular and accepted treatment, it is important to look at the organizations providing and promoting the procedure: hospitals. If their content routinely emphasizes the social benefits of weight-loss surgery, like looking thin and feeling happier, it indicates that they are not just implementing bariatric surgery, but trying to sell it.

The example of bariatric surgery highlights how profitability (real or perceived) can push medicalization forward. When more human conditions fall under the "medical" umbrella, the hospital has more potential consumers. When a hospital adopts bariatric surgery, it is suddenly in its best interest for obesity to be a disease treatable by surgery. Diffusion theory alone can help us understand which hospitals choose to adopt bariatric surgery, but it cannot help us understand how they communicate that adoption to the consumer. We need to analyze the way that they frame these adoptions to the outside world.

Bariatric surgery represents a pure test case of an innovation that benefits from, and contributes to, medicalization. Other procedures, however, represent a different issue. Some innovations have proven benefits, but are extremely expensive to adopt. Hospitals must spend millions of dollars to purchase the equipment, hoping that they will get enough use out of the machines to justify their cost. They have an incentive, therefore, to use the equipment

beyond the surgeries for which they were originally designed, in order to more quickly recoup the loss.

A recent example is Da Vinci robotic surgery, a new methodology for not-so-new procedures (primarily prostate surgeries). While versions of robotic surgery have existed for decades, Da Vinci robotic surgery represents a significant advancement. It was patented for use in 2000, but adoption was slow in the first few years (Kalan et al. 2010). Though the surgeries are touted as being safer and faster, patients (or, in some cases, their insurance companies) are asked to pay more for these options. The technology has a high up-front cost: between $1 and $2.5 million dollars (Attaluri and Mclemore 2016; Turchetti et al. 2012). The machines are expensive to purchase, making the decision to adopt robotic surgery a more resource-intensive decision. Once it has been purchased, however, robotic surgery can be profitable, fitting the same criteria as bariatric surgery, though its precise profitability is still under debate (Turchetti et al. 2012). These machines do not have the same linkage to profiteering that bariatric surgery does, instead representing a high-tech innovation demonstrating that the hospital is on the "cutting edge," (Turchetti et al. 2012). Hospitals may tend to use the robot in more cases than it is strictly recommended (charging extra), in order to recoup the high costs of purchasing the machine. Turchetti et al. (2012) outlined an ever-growing list of procedures that hospitals and physicians are attempting to complete using robotic methods.

Bariatric surgery has a much clearer reliance on advertising, as people must believe that weight loss is important and that surgery is the answer. Da Vinci robotic surgery serves as a status symbol, indicating that the hospital is cutting edge. While a hospital may have an incentive to encourage current surgery patients to pay extra to have their procedure performed by the robot, it is unlikely that a website advertisement will induce a person to get emergency surgery. If advertising and promoting medicalization are primary motivations to carefully frame a new innovation, we would expect bariatric surgery to have more extensive and varied framing than robotic surgery.

- **Hypothesis 1:** Frames surrounding bariatric surgery will be more coherent than

frames surrounding robotic surgery.

### 3.2.4 Websites as Frames

In order to evaluate how hospital adoptions of these two procedures vary, I will look at website presentations of each procedure. Hospitals who choose to adopt either innovation are not required to announce or advertise the service on their website. Choosing to do so indicates that they have decided to advertise the procedure. Further, it gives them a chance to frame their adoption. They can explain the medical merits of the procedure, highlight why their center is the best, educate patients on risks, and connect patients with hospital doctors performing the procedure. They can also choose to copy and paste the description of the surgery from a separate website, avoiding the work of crafting their own description. Website presentation of surgery innovations, therefore, presents an opportunity to evaluate whether hospitals choose to adopt diverse or isomorphic frames.

Colyvas and Jonsson (2011) argue that the process of framing and implementing a given innovation represents a form of institutionalism. Patterns of diversity seen in this institutionalism may be attributed to higher organizational factors, reflecting a conflict between the innovation and cultural/formal beliefs held by the organization. Thus, if variation occurs, it should occur along patterned lines. In hospitals, one of the most salient organizational characteristics is ownership type, as a hospital can be owned by a for-profit company, non-profit company, religious institution, or state agency. Innovations with connotations for medicalization and profitability, like bariatric surgery and robotic surgery, may require different framings to comply with an organization's stated beliefs. Previous research by the author has demonstrated that these hospitals adopt robotic and bariatric surgery at different rates.

- **Hypothesis 2** Framing variation around bariatric surgery and robotic surgery will be predicted by hospital ownership type.

This question is particularly important as preliminary evidence has revealed that the

quality of health information available online is poor. Corcelles et al. (2015) found that most websites discussing sleeve gastrectomy (a form of weight-loss surgery) failed to fully explain its risks and the importance of trying other methods first—even those sites owned by universities. These findings echoed results from a decade older, more general study of bariatric surgery sites (Salant and Santry 2006). Similarly, Hajdenberg and Landau (2010) found that sites discussing robotic surgery seriously overstated its efficacy and importance for common procedures. On pharmaceutical websites, only 5 percent of websites were found to have clear and accurate information about the side effects of the drugs advertised (Davis 2012). These studies, however, do not include healthcare provider websites. If hospitals are coalescing around one narrative for these procedures, that they are something worth buying, that may reduce a patient's access to critical alternative information.

## 3.3 Methods

### 3.3.1 Data Acquisition and Preparation

The primary dataset used for this analysis is the 2018 wave of the American Hospital Association Annual Survey (AHA). which I accessed through the Wharton Research Data Services (WRDS). This data source represents over 95% of hospitals in the United States, and contains records for hospitals regardless of their membership in the American Hospital Association. For my analyses, I kept all hospitals that were over 50 beds and were classified as general acute, non-Federal facilities.The entire AHA dataset contains over 800 variables, spanning a wide variety of topics.

Financial information about the hospitals comes from the Centers for Medicaid and Medicare Healthcare Cost Report System (HCRIS). This data provides detailed financial records for all hospitals that accept Medicare patients. Hospitals are required by law to provide this information in order to receive Medicare patients. Because I chose large, acute hospitals, almost all of my facilities are included in this dataset. For all years until 2015, there are less than 10 missing observations for any financial category. For 2015-2018, unfortunately,

the data is lower quality, and approximately 500 hospitals did not have records for 2018. Reasons for a failure to report can include incorrect original submissions, disputed claims, or simple reporting delays. The records were merged using the Medicare Provider ID, a distinctive ID assigned to all facilities that accept CMS patients.

Finally, I include several geographic measures. I utilized the 2011-2013 wave of the American Community Survey (ACS) to add zipcode-level geographic data to my analyses (U.S. Census Bureau 2011). This represents the most recent, complete data from the ACS. All geographic data were merged with my dataset using the AHA reported zip code for each hospital in 2011. There were 78 missing cases that could not be resolved and were removed from analysis. There did not appear to be any pattern to their missingness.

Once I had acquired and merged all of the demographic data, I used it to identify complete test cases. Only hospitals with complete financial, demographic, and geographic measures were included. The final list included 1,908 facilities. Unfortunately, none of my data sources included a website link (URL) for the hospitals. I identified an online directory, called American Hospital Directory (AHD), that has extremely current records, including URLs, for every hospital currently open in the United States. I obtained a license to use their data through an educational agreement with Emory University. Their website, however, does not allow for automated scraping, and does not provide a mechanism for downloading all URLs automatically. Instead, I had to manually copy and paste the URLs from each hospital's AHD Profile into a spreadsheet, and then link the spreadsheet to my original dataset. Each hospital was identified using its name. When there was not an exact name match, I used the CMS identifier to detect whether a hospital with a similar name was the same facility. This method is not ideal, and likely resulted in a higher error rate than an automated method. Because my dataset was from 2018, and the AHD data was updated in 2020, some facilities from my dataset had either closed, merged with another facility, or otherwise become impossible to identify. I was able to identify 1,703 hospital URLs. Beyond this point, I used only algorithm-based cleaning and analysis. This research is designed to

be fully reproducible, with no bias introduced by individual decisions that can be hard to document and justify. The code needed to perform all steps is available on my GitHub, though I cannot provide the source data.

After compiling the URLs, I ran each one through a custom-built Python web scraping algorithm. My program accessed each website and scraped targeted content using the `BeautifulSoup` package. It took any text tagged as "paragraphs" (descriptive, long-form text) from each home page, as well as the full list of navigation menu items from the main page. It then searched through all menu items and links to identify sub-pages about either bariatric or robotic surgery. It then navigated to those additional pages and scraped all "paragraph" style text from those sites. Overall, it was able to obtain a response and at least basic information from 1692 URLs. The hospitals who were not included were similar to the facilities who were–with a similar distribution of sizes, ownership types, and income.

Designing a web-scraper that can consistently capture similar content from a wide variety of websites is challenging. HTML, the language used to write and present websites, can vary widely across sites. While there are theoretical regularities in the way HTML is written and tagged, many websites do not produce clean or consistent code. My web scraping algorithm was designed and tested on an increasing number of websites, and refined each time to reduce incorrect scrapes. In each iteration, I drew a random sample of 30 websites and compared their scraped data to the actual website. If a problem was identified (such as incorrect descriptions being drawn for surgeries), I refined the scraper to correct the problem for a single site, and then ran it over increasing samples to see if it corrected similar problems in other sites. The scraper also contains several testing mechanisms, where it will flag captured text if it does not contain expected key words. In the final version of the scraper, it had a 100 percent accuracy rate.

Even though the scraper is fairly accurate, the information it gathered was by necessity basic and messy. Due to the complexity and variation of sites, it was unable to consistently identify other features of interest (such as photos, banners, or videos), and the captured text

often included phrases and information that are not of interest. For example, the final run of this webscraper occurred after the worldwide coronavirus pandemic had become widespread in the United States. Many hospitals had quickly added coronavirus announcements to every page of their website, and the webscraper was unable to avoid those announcements. Many scrapes also included addresses, phone numbers, lists of doctor names, and special characters used in HTML. In order to improve the usability of the scraped text, I used Python's Natural Language Tool Kit (`nltk`) package, as well as regular expressions (regex) to parse and clean each block of code (Bird, Loper, and Klien 2009). I identified and removed all street addresses, phone numbers, lists of names, non-English words, and special characters. I was careful not to remove names that occurred in context, such as "Dr. Reilly is our premier robotic surgeon", because this indicates an important organizational choice to feature specific physicians. The resulting text contains much less repeated language and other non-valuable information, but is also often not as readable and cohesive as it may have appeared on the website. While I tried to be as parsimonious in the the cleaning procedures as I could, punctuation and sentence structure often suffered from both the scraping and the cleaning procedures.

### 3.3.2 Analysis

My plan for analyzing the scraped web text and its associated metadata had three stages. All analysis was conducted in R. First, I analyzed descriptive elements of the text, such as frequently occurring words, readability, and length, to see if any clear patterns between type of hospital and descriptive patterns emerged. For these descriptive statistics, I utilized the `stringr`, `tidytext`, and `quanteda` packages (Silge and Robinson 2016; Wickham 2019; Benoit et al. 2018).

Before moving onto a description of my analytic approach, I want to clarify a few terms. When conducting text analysis, a "corpus" is the full body of texts that is utilized for analysis–for example, the entire set of bariatric surgery texts represents a single corpus. Each corpus is comprised of many documents. In our case, each "document" is a single website's

bariatric surgery text. Though I tested multiple specifications for the data in this paper, the structure utilized in all final models was a set of two corpuses (one for bariatric surgery, and one for robotic surgery). Each analysis was done twice, once per corpus. Other analytic strategies, where I combined these texts, seemed to compress important between-corpus variation.

I then fit a structural topic model (STM) to the bariatric text, the robotic text, and the home text. STMs are a relatively new form of topic model, and provide significant advantages over more classic versions like Latent Dirichlet Allocation (LDA) and correlation topic models (CTMs) (Roberts, Stewart, and Tingley, n.d.). Like other topic models, STMs function by treating a corpus like a "bag of words," ignoring the relationship between individual terms within a document. They search over every document in the corpus, looking for words that frequently co-occur. Each set of frequently co-occurring words is considered a "topic." Topics are non-exclusive–a word can belong to multiple topics, particularly if it is an extremely common word. After the topics have been assigned, each document is given a weighted score indicating how many of a given topic's words occur within the document (again, with no attention to the order in which the words appear).Unlike other topic models, STMs allow the researcher to include metadata in the fitting of topics. This means that the model can take things like the source of each document into account when fitting topics. This can vastly improve the specification of topics that actually reflect meaningful patterns in the underlying corpus (Roberts, Stewart, and Tingley, n.d.). The inclusion of these criteria make them ideal for social science research (Lindstedt 2019). Much like including an interaction term in a linear regression, this specification allows text to vary along specific parameters. I will discuss the specifics of the final STM models, as well as alternative specifications that were tried, in the results section.

It should be noted that topic models are often criticized in the text analysis literature, and represent a fairly basic form of text analysis. Other methods of text analysis, such as using a document's structure to identify and predict parts of speech, using relational matrices (like

`word2vec`), sentiment analysis, and machine learning techniques can all yield more detailed information and accurate predictions for a corpus. However, the corpus for this analysis, which consists of short and messy documents on a very specific topic, is not appropriate for more complex text analyses. Parts-of-speech tagging, for example, only works correctly if there are primarily full sentences with correct punctuation. STM allows me to identify latent topics in the websites–key ideas that tend to arise naturally. This information fits the research questions. For the purposes of understanding divergent diffusion, it is most important to know if the hospitals are using a diverse set of concepts, or if they tend to remain the same. Bail (2016) used structural topic models for a similar question as a part of a larger project.

The final component of this analysis is a network exponentiated random graph model (ERGM) predicting website similarity between hospitals, using the `ergm` function in the `statnet` package in R (Handcock et al. 2019). Network analysis is fundamental to the study of innovation diffusion (Strang and Meyer 1993). This analysis predicts the likelihood that two hospitals, each considered a "node," will have a highly similar website (a "tie"), while incorporating controls and the broader network structure (Hunter et al. 2008). In order to fully test my hypotheses about the divergence of hospital websites, I constructed and analyzed three separate hospital similarity networks. The first two utilized a text similarity function in `quanteda`, a text analysis package in R (Benoit et al. 2018). This function calculated the cosine distance between each set of texts, which calculates the angular distance in words between two texts–taking into account both words and order. Two texts that are entirely dissimilar are scored as a "0", and those that are identical are scored as a "1." I calculated the similarity between each set of texts in the bariatric corpus and the robotic corpus, and scored hospitals as "similar" if their similarity was greater than 0.5, as this was higher than one standard deviation above the mean similarity within both matrices. These two network models gave me a baseline estimation of similarity based on word prevalence.

I compared these two models with a final model leveraging the topic model results. For the final estimation, I created a weighted network. I obtained each hospital's top topics (the

topic most prevalent in their robotic surgery and bariatric surgery texts). If two hospitals had one top topic in common, they were scored a "1." If they had two in common, they were scored a "2." I then utilized a weighted ERGM to predict the likelihood of increasingly strong ties.

All three models included several control variables. The geographic proximity between the two hospitals was calculated using Euclidean distances, and included as a separate predictive matrix. Other controls included gross revenue, uncompensated care costs, charge to cost ratios, if they were in the same system, and zip code demographics. This will provide a deeper analysis of the similarities and divergences between adoptions of bariatric surgery. Hospital type was identified through the AHA database. The AHA data classifies all religiously-owned hospitals as "Church" facilities, and so I will use that same terminology here, even though some facilities may not be technically owned by a church.

## 3.4 Results

### 3.4.1 Descriptive Results

Surgery descriptions varied widely in the corpus. Some were extremely long and detailed, explaining all parts of the surgical process. After scraping and cleaning, these descriptions remain fairly readable. Below, I provide an example of what a long bariatric surgery website looks like after initial cleaning to remove hyperlinks, HTML, numbers, and addresses. The full page was very long, so ellipses denote excluded text. All typos were in the original text, but could have been a result of the scraping process.

> Weight loss is a journey , and at Regional Medical Center , we are here to help you every step of the way . trained and board - certified general surgeon , Steven , M . D ., an independent member of the medical staff , performs a variety of minimally invasive weight loss procedures which may provide the life - changing results you ' re seeking. You may be a candidate for weight loss surgery if you are... If

> you meet any of the requirements above or would like additional information , contact us . Well review your health history and personal goals , and provide in - depth information on weight loss surgery options , including the benefits , risks and expected results of each. . . We recommend that you verify coverage with your insurance company for surgery. . . .Very good safety results are achieved by carefully preparing patients for surgery . A happier and you is more than just physical transformation . Studies have shown that self - confidence and well - being are improved . Many people have improvement in physical mobility allowing them to enjoy their lives in a way that they had lost . Weight loss truly gives people a new lease on life . All operations carry some risk. . .

These longer descriptions varied in content, with some focusing on the health benefits, and a very few offering detailed descriptions of the surgery itself (which usually involves removing 95% of the stomach, and/or attaching the intestine to the esophagus, to reduce the ability of the body to absorb food). Shorter pages often offered a small description and a phone number or link to get more information:

> If youre struggling with your weight , discover how surgery at Health in North San Diego County can help . benefit from the compassion , skill and of a team thats helped thousands of people reach their goals and improve their quality of life. . . metabolic surgery , is a procedure that promotes weight loss. Call () - for more information

Robotic surgery pages were on average significantly shorter than the bariatric surgery pages. The content on these pages often emphasized the newness of robotic surgery–in many cases, the hospital mentions that it is the first facility in its region to offer the procedure. Longer descriptions tend to build more on the innovative nature and safe nature of robotic surgery. I present one of the longer descriptions here, as it provides a good example of much of the language used in robotic surgery sites.

> If you or a loved one is preparing to undergo surgery , you owe it to yourself to learn about all of your medical options . Lake City Medical Center is proud to offer some of the most effective , least invasive surgical treatments available . Lake City Medical Center utilizes the da Vinci Surgical System , which provides surgeons with an alternative to both traditional open surgery and conventional laparoscopy , putting a surgeons hands at the controls of a state - of - the - art robotic platform. . . our surgeons are able to perform some of the most complex and delicate procedures through very small incisions . Using high - definition vision and a magnified view , the surgeon controls the da Vinci System , which translates his or her hand movements into smaller , more precise movements of tiny instruments inside the body. Robotic - assisted surgery is like other minimally invasive surgery , in that instruments and cameras are inserted through small incisions . What is different is that the surgeon sits at a console next to the patient . Though it is often called a robot , the da System cannot act on its own surgery is performed % by our talented physicians . The surgeon looks into a at the three - dimensional , high - quality image sent back by the cameras and works the surgical arms . The quality of the images and precise movement of the surgical arms essentially puts the surgeon right next to the area in which he or she is operating There are many potential benefits for patient when comparing da Vinci Surgery to traditional open surgery , including. . .

Reading through these descriptions gives an impression that hospitals can choose to emphasize technical details, physical benefits, their distinctiveness in the field, or simply the presence of the innovation. Rather than looking at the qualitative side, however, I turn to quantitative text processing to evaluate whether different themes can be identified through the patterned use of specific words.

Table 9 presents the basic descriptive statistics for this sample. This presents all of the hospitals that had active URLs and were searched for robotic and bariatric content.

Table 7: Descriptive Variables

| | State | Catholic | Other Religion | Non-Profit | For-Profit |
|---|---|---|---|---|---|
| *N* | *189* | *175* | *55* | *942* | *331* |
| Offers Robotic Surgery (%) | 88 (46.6) | 120 (68.6) | 37 (67.3) | 558 (59.2) | 143 (43.2) |
| Offers Bariatric Surgery (%) | 72 (38.1) | 84 (48.0) | 16 (29.1) | 444 (47.1) | 102 (30.8) |
| Bariatric on Website (%) | 28 (14.8) | 32 (18.3) | 4 (7.3) | 190 (20.2) | 58 (17.5) |
| Robotic on Website (%) | 13 (6.9) | 9 (5.1) | 1 (1.8) | 63 (6.7) | 33 (10.0) |
| In System (%) | 73 (38.6) | 162 (92.6) | 49 (89.1) | 702 (74.5) | 317 (95.8) |
| Gross Income (millions) | 127.38 (224.40) | 163.29 (218.40) | 158.94 (218.71) | 163.78 (223.03) | 178.57 (240.56) |
| Uncompensated Cost (millions) | 20.81 (19.89) | 20.68 (16.49) | 19.00 (17.99) | 20.60 (19.16) | 14.30 (13.83) |
| Beds | 282.76 (267.72) | 272.36 (161.19) | 221.07 (139.39) | 285.63 (252.62) | 215.84 (147.52) |
| Occupancy Rate | 548.84 (177.84) | 480.59 (169.09) | 453.48 (136.71) | 538.88 (185.54) | 388.07 (132.18) |
| Charge to Cost Ratio | 2.63 (2.24) | 2.12 (2.04) | 2.47 (2.20) | 1.91 (6.04) | 1.46 (3.13) |
| **Geographic Characteristics** | | | | | |
| Median Income (thousands) | 44.08 (15.79) | 50.85 (19.21) | 55.84 (24.05) | 51.32 (21.53) | 47.17 (16.90) |
| Percent Black | 0.20 (0.21) | 0.14 (0.19) | 0.13 (0.20) | 0.14 (0.19) | 0.15 (0.18) |
| Percent Completed College | 0.25 (0.14) | 0.32 (0.15) | 0.33 (0.19) | 0.31 (0.17) | 0.26 (0.14) |

The distribution of hospital types is as expected, with a majority of hospitals classified as "non-profit." Hospitals that were religious, but not Catholic, were the least common category. It is notable that, while robotic surgery was the adopted by over 50% of hospitals in most categories, less than 20% of facilities in any category advertised the service on their website. Catholic and for-profit hospitals were the most likely to be in a system, and other religious hospitals had the highest charge to cost ratio. State hospitals tended to be in the poorest and least educated zip codes, while other religious hospitals were in the richest.

Due to the fact that very few non-Catholic religious hospitals had surgical content on their sites, all of the remaining analyses combine the two religious hospital groups. For most models, the use of covariates had to be limited, due to the relatively small number of texts available for analysis.

Figure 3 presents the distribution of word counts for robotic surgery, bariatric surgery, and the home text of each site (for comparison). This analysis, and all future analyses, removed the terms "surgery," "weight," "robotic," and "loss." These terms occurred in every single website, in part because they were part of the scraping process, and so did not contribute to deviation.

Overall, it is clear that bariatric pages had the longest descriptions for every group but church. Robotic pages had, on average, very short descriptions. Home pages are provided as a comparison, to get a sense of the base "wordiness" of each website. All pages had home pages that hovered around 200-300 words. Overall, non-profits had the wordiest descriptions of bariatric surgery, while for-profit hospitals had the longest robotic surgery descriptions.

Figure 4 presents the most common words in the robotic and bariatric surgery corpuses, with a minimum of 200 appearances.

From this graph, the disparity in overall word counts between the two categories is again visible. Most of the high-occurring words are in the bariatric surgery corpus. Many words also only appear in one corpus–"minimally" and "invasive" are never used to describe bariatric surgery. "Surgeon" and "system" also never appear. It is also striking that among all of the

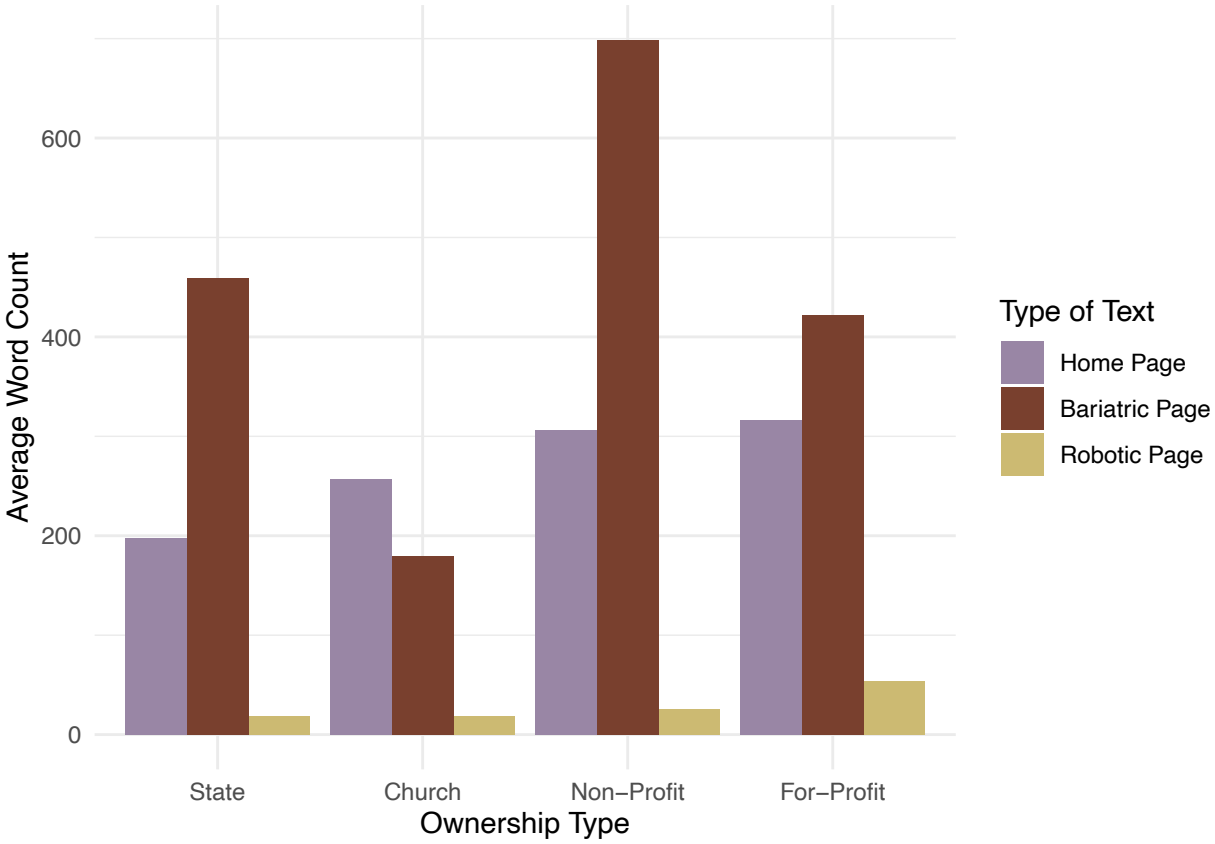



Figure 3: Length of Texts by Type

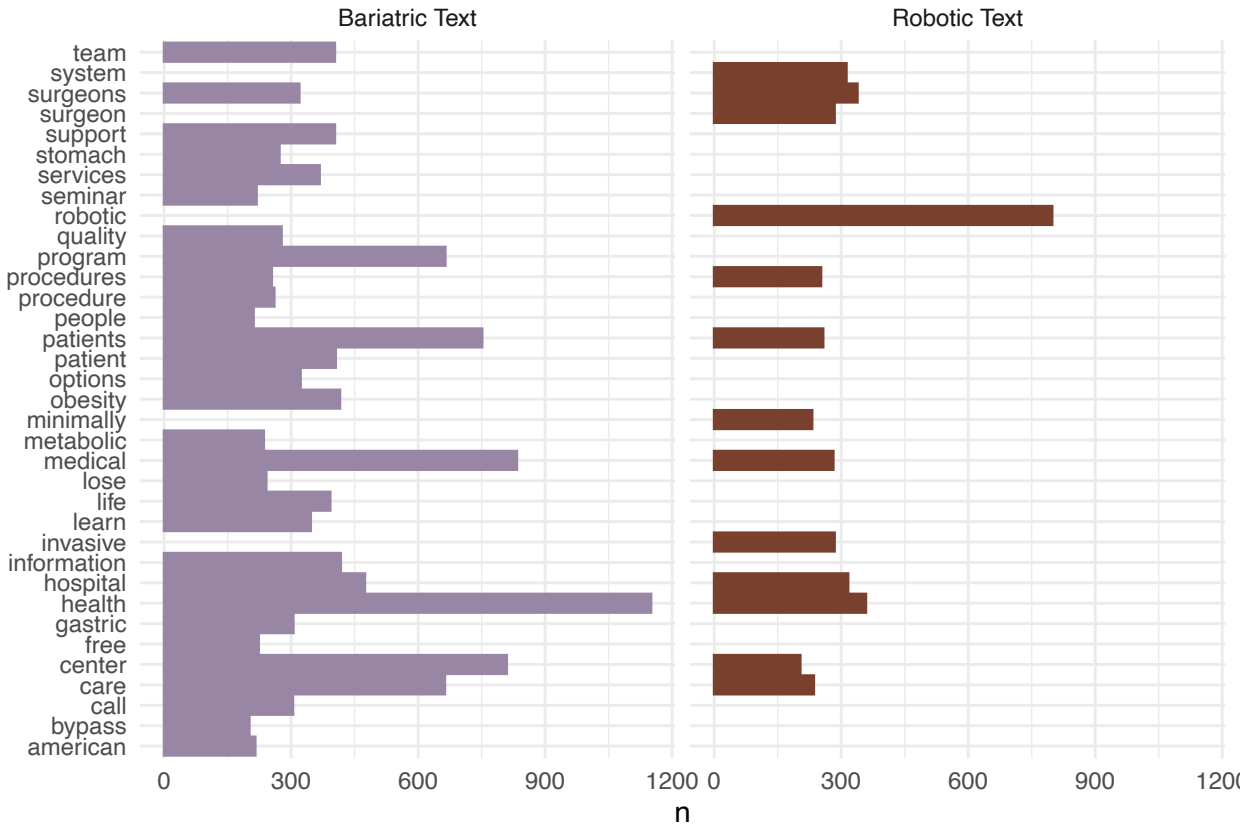



Figure 4: Word Frequency by Group

top words, terms that would be used to describe the intricacies of either procedure ("staples", "band", "laproscopic") are missing. Most of the terms focus on teams, patients, quality, even "Americans." In the next section, I delve more into these two sets of terms using the structural topic model.

### 3.4.2 Structural Topic Model Results

In order to fit the structural topic model, I tried a variety of specifications. The topic model requires that the user specify the number of topics to fit, but there are no hard guidelines on the correct number of topics (Hunter et al. 2008). The ideal model will have high exclusivity (words are only in one topic) and high coherence (topic terms are all talking about the same thing). In general, as the number of topics increase, exclusivity increases and coherence decreases. In order to evaluate the ideal number of topics, I first ran 45 models (between 5 and 50) on each corpus, and graphed their exclusivity and coherence. For each corpus, the ideal balance between exclusivity and coherence appeared to be between 5 and 15. After that point, coherence dropped to almost nothing. I then inspected the topics generated within each corpus, looking for logical word groups. For both corpuses, approximately 7 topics seemed to capture variation, without generating random topics with no clear logic.

As mentioned in the methods section, the STM allows me to specify document-level characteristics that may affect topics. I included the hospital size and ownership type in the creation of the STM. Including these metrics improved coherence and exclusivity, and generated topics with similar words.

After specifying the models, I ran a series of regressions to evaluate whether hospital type predicted a significant difference in the distribution of topics for each document. Figure 5 presents the estimated mean prevalence of each topic for each hospital type, after controlling for hospital demographics, for bariatric surgery. A graph of the relationships is much easier to interpret than a table.

Before delving into the different predicted probabilities, we should first look at the topics

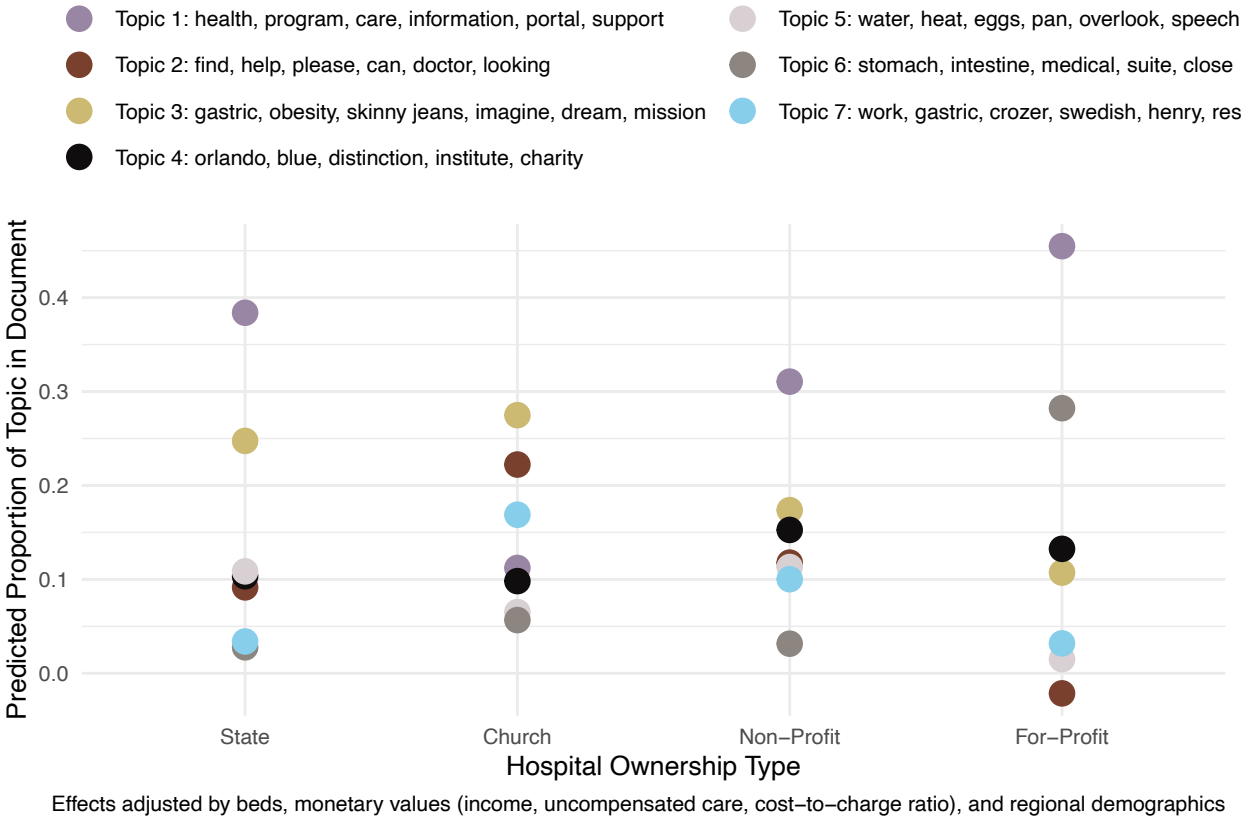



Figure 5: Predicted Topic Prevalence by Type: Bariatric Surgery

themselves. Instead of giving the topics labels, like “Surgery Topic”, I chose to present key words that were associated with each one. It is notable that Topic 3 deals specifically with “skinny jeans,” as well as “imagine” and “dream.” This is the type of language that glamorizes and sells weight loss. Topic 6 consists of technical words, like “stomach” and “intestine.” It is the only topic that addresses the physical body parts involved in bariatric surgery. Topic 5 includes terms like “eggs,” and links to websites that had recipes for surgery patients. Topic 1 deals with procedural words, like “program,” “information,” and “support.” Topic 7 looks strange, because it deals with names, but it is likely capturing the names of physicians that were mentioned in each document, indicating that the names occur in similar places across the corpus. Similarly, Topic 4 appears to be capturing words that communicate location. Quotes illustrating each topic are available in the Appendix.

The pattern of topic prevalence varied widely across the ownership type. Topic 1 was the most prevalent for every ownership type except church-owned. Among church-owned hospitals, the topic dealing with aesthetics (like skinny jeans) was the most prevalent. For-profits had the highest usage of Topic 6, terms relating to the nature of the surgery. Non-profit facilities almost never used those terms. Topic 2, which dealt with terms associated with seeking treatment (“help”,“looking”), was highly prevalent among church facilities, but virtually non-existent among for-profit hospitals.

Figure 6 presents the results from the STM conducted on the robotic surgery corpus. The estimation process, including covariates, was identical to the first model.

The topics in robotic surgery appear a bit less cohesive than the bariatric surgery topics. The terms in each topic are not as clearly related. Topic 7 was the most prevalent in most categories, and deals with key components of the surgery itself. Instead of using hands, the surgeon uses a machine, which can be described as “delicate,” “powerful,” or “modern.” Topic 4 highlights another key aspect of the surgery–that it is minimally invasive–but is not as prevalent among the four ownership types, and is particularly uncommon among state-owned hospitals. Topic 2 deals with the ramifications of surgery: recover time, incisions,

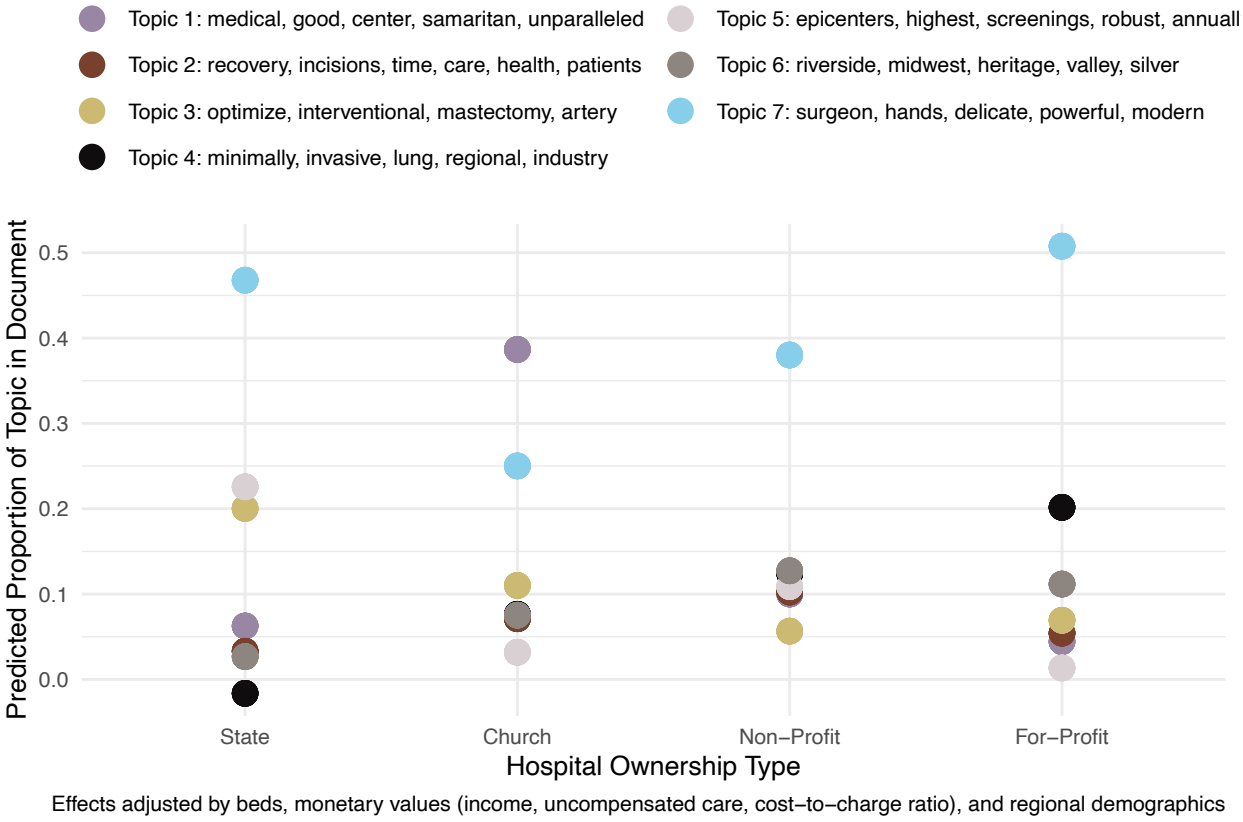



Figure 6: Topic Prevalence by Type: Robotic Surgery

and the patients. Topic 6, like Topic 4 in the bariatric surgery corpus, deals with the hospital location, and is not predicted as highly prevalent for any group. Topic 3 contains examples of procedures that can be completed using robotic surgery, and is predicted to be slightly more prevalent among non-profits than other groups. Topic 5 was prevalent among the state pages, but is hard to interpret from its top words. Like with bariatric surgery, the prevalence of topics appears to vary widely by ownership type.

### 3.4.3 ERGM Results

The final component of my analysis was the use of network models to predict similarity between pairs of hospitals. This methodology tests whether the similarity in text between two hospitals can be predicted by their ownership type, other characteristics, or physical distance. The similarity between facilities was modeled in two ways. First, I calculated the overall similarity in words between each pair of hospital's surgery texts using the `rSimil` package in R. This program evaluates the similarity between all words in each text, but does not consider order. It is flexible, and scores similar words ("cat" and "catty") as more similar than words with no stem in common. Hospitals with a greater than 50% similarity in text were scored as "highly similar." Each set of hospitals that were highly similar were considered to have a tie.

Figures 7 and 8 illustrates the structure of the networks that were formed using similarity ties. Each hospital is represented by a round circle. The size of the circle corresponds to the relative size of the hospital. Each set of hospitals that were scored as highly similar are connected by a thin line–the "tie." The graph model clusters together hospitals with denser connections.

It can be seen that these networks are highly connected, with many hospitals sharing similarity ties. The robotic surgery texts were more closely linked, with very few hospitals having no ties, but both groups had a few very large clusters. Cluster analysis revealed that the bariatric surgery group had two 26-hospital clusters, where they all connected to each

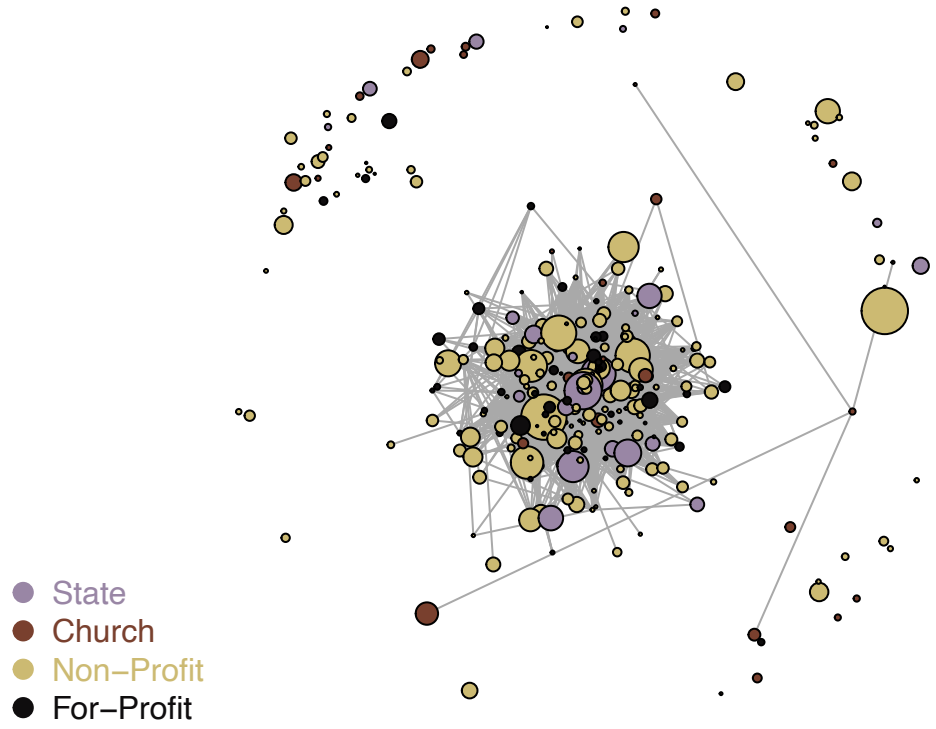



Figure 7: Network Model Using Bariatric Similarity

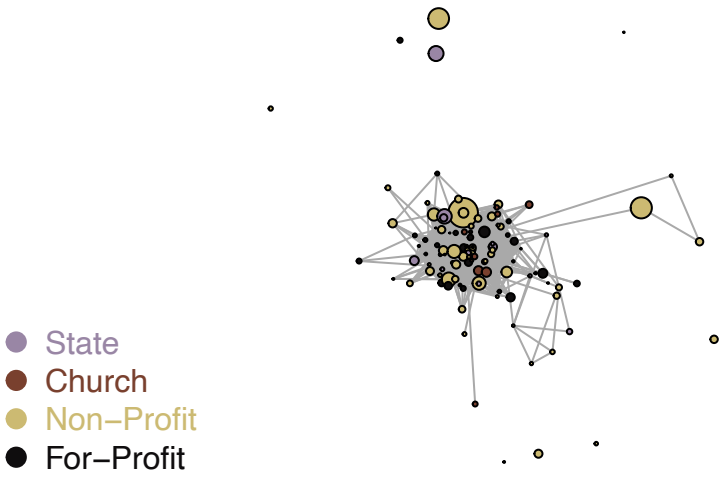



Figure 8: Network Model Using Robotic Similarity

other. It was relatively uncommon for a hospital's discussion of a surgery to be similar to only one other facility. Instead, a few dominant patterns of similarity emerged.

Figure 9 presents the network model constructed using the results of the topic models. This network leverages both topic models to create a weighted network. The most prevalent topic for each hospital from the topic models was identified. Any two hospitals that shared the same top topic were given a similarity score of 1. If they shared two top topics, they were given a score of 2. Because every hospital in this corpus shared a top topic with at least one other facility, the visual representation of the full network is very hard to read. Instead, I only graph the strongest ties, between hospitals that shared two top topics.

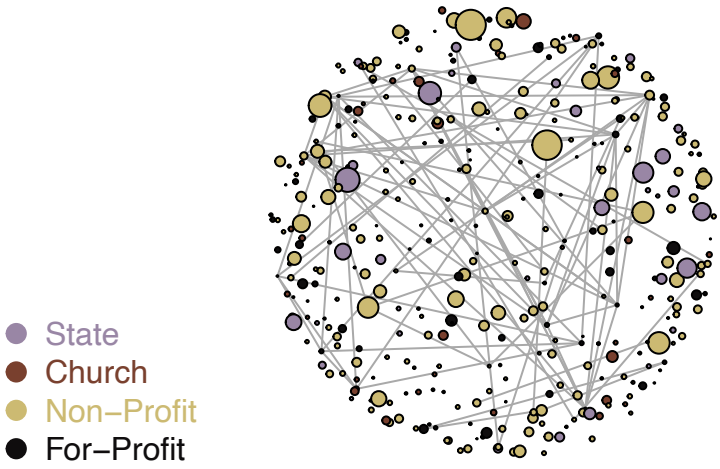



Figure 9: Network Model Using Topic Models

There were significantly fewer hospitals that had strong ties via topic model across both topics. There appears to be less of a pattern, as well. Hospitals with one tie were not automatically more likely to have additional ties. Though the diagram may make the topic

models network appear less connected, it should be recalled that every hospital had at least one tie in the full model–the diagram just does not display weaker ties.

All three models had fairly similar density–overall bariatric surgery similarity had the highest density of 0.16, indicating that 16 percent of all possible observable ties occurred. Bariatric surgery also had the highest centrality score (0.42), indicating that a few key hospitals were highly similar to many other websites. Transitivity scores for these networks were unusually high, ranging from 60-90 percent. Transitivity can be interpreted as the proportion of total possible triangles (where A connects to B, B connects to C, and C connects to A) that were observed in the model. The topic model-based network has the highest transitivity with a score of 91.

Table 8 presents the ERGM results from all three models. The coefficients predict the likelihood of a tie. The regular covariates indicate the likelihood that the hospital will have more or less total ties, while node matches calculate whether two hospitals sharing the same characteristic (such as ownership type) increases their likelihood of a tie to each other. Negative values indicate that a given characteristic lowers the likelihood of a tie, while a positive value indicates that it increases the likelihood of a tie. Finally, the models include a measure of geographic distance. Due to the small sample size, the measure of distance was dichotomized as "1" if the hospitals are less than 100 miles apart, and 0 otherwise. This models the relative importance of distance–hospitals further apart than 100 miles are likely no longer competing for the same patients.

Overall, the three models captured similar patterns. It should be noted, however, that the weighted topic model did not converge, and so the final estimates are suspect. Running the model as an unweighted network resolved the convergence problems and yielded similar results, but less of the relationships were significant, and the Akaike Inference Criterion (AIC) was extremely high. Because the topic model network has such high transitivity when weights are excluded, I chose to present the weighted model here, as it better fits the data.

When looking at hospital type, it appears that for-profit hospitals are less likely than

Table 8: ERGM Analysis Results

| | *Dependent variable:* | | |
|---|---|---|---|
| | net | | |
| | Bariatric | Robotic | Topic Model |
| Ownership Type (ref=State) | | | |
| *For Profit* | $-0.125^{*}$ | $0.152^{***}$ | $-0.950^{***}$ |
| *State* | $-0.176^{**}$ | $0.494^{***}$ | $2.512^{***}$ |
| *Church* | $-0.673^{***}$ | $-0.405^{***}$ | $-0.670^{***}$ |
| Beds | $-0.001^{***}$ | $-0.0001^{***}$ | $-0.001^{***}$ |
| Uncompensated cost (millions) | 0.002 | $0.006^{***}$ | $-0.007^{***}$ |
| Gross income (millions) | 0.000 | $-0.000^{***}$ | $-0.00000^{***}$ |
| Charge to Cost Ratio | $-2.256^{***}$ | $0.677^{***}$ | $-1.406^{***}$ |
| Uninsured Percent Black in Zip | $-0.598^{***}$ | $-0.726^{***}$ | $0.068^{***}$ |
| Percent College Educated in Zip | 0.193 | $0.173^{*}$ | $-0.836^{***}$ |
| Median income in Zip | $-0.00002^{***}$ | $-0.00001^{***}$ | $-0.00001^{***}$ |
| Node match: Ownership type | 0.017 | $-0.027$ | $0.363^{***}$ |
| Node match: Hospital System | 0.055 | 0.141 | $-0.577^{***}$ |
| Edges | $2.345^{***}$ | $-0.904^{***}$ | $-0.122^{***}$ |
| Hospitals <100 miles apart | 0.014 | $-0.053$ | $0.231^{***}$ |
| Akaike Inf. Crit. | 6,080.464 | 35,381.890 | -15,468.710 |
| Bayesian Inf. Crit. | 6,183.313 | 35,513.730 | -15,331.420 |

*Note:* $^{*}$p<0.1; $^{**}$p<0.05; $^{***}$p<0.01

non-profit hospitals to have similarity ties on their bariatric surgery pages, and are less likely to have the same top topics. State hospitals have the same pattern. Church-owned hospitals are the only ownership type predicted to have less similarity ties to their robotic surgery pages than non-profit hospitals.

Among the control variables, there are a few interesting findings. Hospitals with higher charge to cost ratios (indicating that they are making a larger profit on every dollar spent) are also less likely to have similar websites or common top topics. This indicates that hospitals who maximize profits spend more effort on diversifying their websites. Distance was only important for the topic model network. The coefficient indicates that hospitals in the same 100 mile radius are 63% less likely to have a similar websites.

The model also included two matching terms. First, it measured whether hospitals having the same ownership type made them more likely to have similar websites. This assertion was only true within the topic model network, suggesting that key groups of words do tend to cluster with similar websites. I also tested whether two hospitals being in the same system predicted that they would have a similarity tie. I noticed during data collection that healthcare system corporations often develop website shells for their hospitals to use, and sometimes even keep the hospital's site as a subsidiary of their page. It seemed likely that hospitals owned by the same system, then, may be given specific text content to post, and thus have more similar sites. I included this measure to ensure that similarities seen between hospitals could not be attributed to the hospital's membership in a system, as the Church-owned hospitals were particularly likely to be in a system. However, this measure was only significant for the topic models network.

## 3.5 Conclusions and Discussion

The results from my analysis fully supported both hypotheses. First, the frames surrounding bariatric surgery seemed to be more coherent and diverse than those surrounding robotic surgery. The descriptions on these sites were longer, and the topic models had more cohesive

language. For the second, and larger hypothesis, hospitals clearly framed these surgeries in diverse ways, and the types of frames could be predicted by looking at hospital ownership type. After the procedure diffused to these facilities, they used careful framing to modify the way that these procedures were institutionalized within their organization.

Further, though it was not explicitly hypothesized, there was a clear indication that hospitals were actively utilizing persuasive language to sell the surgery (using words like "skinny jeans" and "dream")–further normalizing the idea that surgery is an acceptable solution to obesity. There was a noticeable absence of medical terms surrounding bariatric surgery–while "stomach" appeared in the list of top words used in bariatric surgery websites, almost no other explicitly medical language was present. Robotic surgery had, in general, higher observed similarity between hospitals. The sites were shorter, and topics appeared to focus more on the innovative and less invasive nature of the procedure. Robotic surgery, as expected, was a signal that a hospital was cutting edge, while bariatric surgery was more of a commodity that was being sold. These findings indicate that hospitals are indeed playing an active role in medicalization, particularly of obesity. They are endorsing the narrative that it is undesirable to be overweight: so undesirable, in fact, that extreme solutions are warranted. The most problematic part of this endorsement is its reliance on aesthetics–like the ability to confidently wear skinny jeans–not just potential medical risks like heart attacks. When hospitals stand to gain financially from the successful medicalization of a disease, they may sacrifice the quality of the information they provide. This matches concerns from other researchers (Corcelles et al. 2015, @conrad_medicalization_2004) .

The findings from this paper also demonstrated that religious ownership is a key predictor of hospital behavior. Church-owned hospitals had notably different topics than other facilities. Surprisingly, they were the most likely to use the topic that included terms like "skinny jeans" and "dreams," implying that they may have actually had the most persuasive and least medical language on their websites. Their descriptions tended to be shorter and more diverse than the other groups, suggesting that they may have put more effort into differentiating

their presentations of bariatric and weight loss surgery than secular facilities. These findings suggest that religious hospitals may not see a conflict between their religious ownership and advertising. Instead, tney seem just as willing as their peers to advertise, and even less likely to make sure that their advertisements are not devoid of medical content. An outward to commitment to charity and religion does not seem to reduce profit-seeking in our extremely competitive healthcare market. Combining church-owned hospitals with secular non-profits would have suppressed key variations present in this corpus.

This research lays an interesting groundwork for future study. It tests the limits of what can be achieved with fully automated webscraping of hospital websites, and provides needed depth to the diffusion literature. It is clear from these findings that, while all of the hospitals studied *adopted* each procedure, their approach to implementing and advertising them varied widely by hospital characteristics. It is clear that simply looking at adoption alone would fail to capture these differences. These differences were further predicted by the surgical procedure of interest. Bariatric surgery, which has existed longer and may rely more on advertising, had a much larger presence online. Further, there were a wider array of clear topics surrounding it. Robotic surgery was less commonly advertised by all hospitals, and its topics seemed to center on its novelty, not necessarily on selling it. This supports the expectation that organizations will diversify their adoptions of older innovations more, because they will have more time to test, tweak, and apply modifications in advertising.

If hospitals adopt more diverse frames as innovations age, this suggests a second wave of diffusion. First, organizations mimic each other by all adopting the same innovation–a type of isomorphic diffusion that we commonly track and analyze. But after the initial wave of adoptions is over, they may adopt different *frames* of that innovation, leading to a second diffusion of diversity. Identifying and tracking the spread of frames across already established institutional ideas and innovations could be a fascinating approach to diffusion research. The topic models identified in this paper suggest that defined frames may exist, and may vary in patterned ways. Predicting which frame an organization may adopt, and how long it may

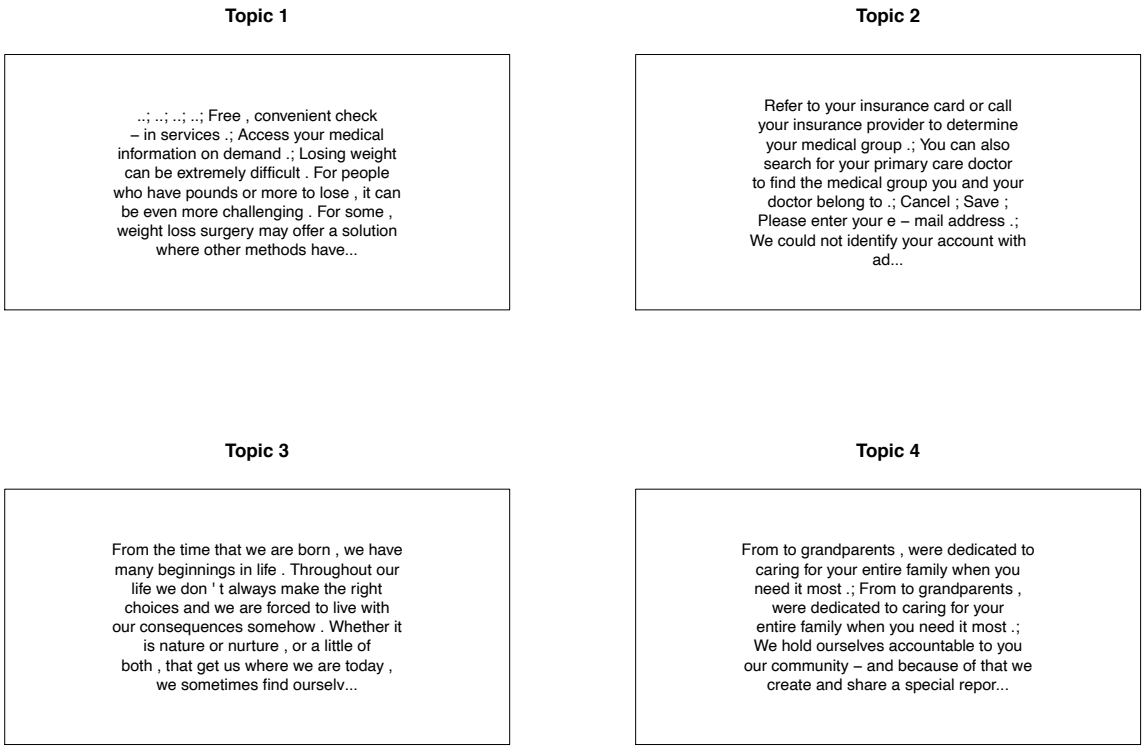
take it to adopt that frame, would help explain persisting diversity in organizations.

Future analyses, utilizing a mixture of qualitative and quantitative techniques (such as individually reading and coding hospital websites, in addition to scraping text) could provide richer context to the results presented here. Further, analyses of other media–such as in-hospital pamphlets, advertisements, and television commercials–could illustrate how framing of innovation varies across mediums. Finally, it would be interesting to look at actual patient experiences of these conditions–identifying the role of the physician-patient interaction in patient decisions to follow through on procedures.

# Appendix

Note that topics are presented with less clean text than was used for the topic modeling. In the final model, "weight loss," "surgery," and all punctuation was removed. They were kept here to preserve readability, and to give you a better sense of the messiness of the underlying data. These texts have undergone processing to remove addresses, numbers, and non-English words. The exemplar texts presented here were selected by the STM program, for having the highest proportion of each topic.

### 3.5.1 Bariatric surgery topics



**Topic 5**

Surgery is a tool that aids in weight loss , resolution of co – morbid conditions and increased quality of life for patients . In order to achieve and maintain success following surgery , proper diet , vitamin supplementation and daily exercise are essential . Our staff have designed a nutrition bin...

**Topic 6**

Find A Doctor ; Patients & Visitors ; Services ; Community Resources ; Medical Professionals ; About Us ; Select a department to call .; Find A Doctor ; Patients & Visitors ; Services ; Community Resources ; Medical Professionals ; About Us ; Has managing your weight felt like a losing battle ? If s...

**Topic 7**

How to lose weight fast . Maybe a search for that phrase brought you here . Weight loss surgery ' t a simple quick fix solution to losing weight . However , it is a legitimate fact that individuals that fall into the obese weight classification are at higher risk of developing many serious , life – ...

### 3.5.2 Robotic Surgery Topics

**Topic 1**

PRESS ROOM Journal News : Exciting Times in Robotic Surgery : Good Samaritan Doctor Responds Good Samaritan Hospital Holds Robot Day at Palisades Center Mall Contact Us at .. ROBOT or .. Our center is comprised of the lower Valleys leading Robotic Surgeons with in Urologic , Gynecologic , Colorectal...

**Topic 2**

. ER Wait Times About Us Contact Us Patients and Visitors More from Healthcare . ER Wait Times About Us Contact Us Patients and Visitors More from Healthcare Healthcare Tomball has one of the most advanced robotic surgery programs in the greater area . Our hospitals highly skilled surgical team is a...

**Topic 3**

offers a wide variety of surgical services and state – of – the – art technology to ensure our patient ' s surgical needs are covered in and . Our highly skilled team of surgeons remains on the cutting edge of technology and procedures . Traditional , or open , surgery involves an incision that is m...

**Topic 4**

. Ann Peters , an intensively trained surgeon , diagnoses and treats GYN patients in The Gynecology Center at Mercy Medical Center in Baltimore , Maryland . Knee replacement surgery is offered at Mercy Medical Center in Baltimore . The orthopedic team at Orthopedics and Joint Replacement at Mercy of...

**Topic 5**

Robotic surgery at Health brings high tech and human health to a new level of cooperation . With the da robotic surgery system , our surgeons can perform relatively complex operations with greater precision , better range of motion and increased visibility . How can we help you today ? Robotic Surge...

**Topic 6**

Heritage Valley Health System recently acquired the da Xi Surgical System . The da Xi Surgical System is an innovative tool that utilizes advanced robotic computer and optical technologies to assist surgeons in a variety of procedures . This state – of – the – art da Xi system is a sophisticated sur...

**Topic 7**

Infirmary Health was the first healthcare system in the region to acquire the da Surgical System one of the most precise and least invasive surgical treatments available . Mobile Infirmary and Thomas Hospital ' s surgical services programs collectively offer the most comprehensive robotic program al...

# 4 Christianity and the Corporation

## 4.1 Introduction

Religion played a fundamental role in the creation of American hospitals, and continues to be a prominent feature of those facilities today. 1 in 7 hospital beds in the United States are owned and operated by the Roman Catholic Church (cha.org), and many more bear the names of religious groups or orders: "Baptist Hospital," for example, is one of the most common hospital names. And yet, the religious ownership of hospitals is rarely discussed in healthcare services research (Bromley and Meyer 2017). At most, researchers tend to focus on the restrictions that the Catholic church may impose, such as the limited provision of contraceptive and abortion services (Leaman 2002; Rubin, Grumet, and Prine 2006). The origins of religious healthcare, however, do not come from restrictions or a desire to deny service. Instead, they lie in charity: in providing care to those too poor to receive care through any other means (Wall 2011; Levin 2011). Not enough is known, however, about whether that commitment to charity has persisted through the expansion and formalization of the hospital industry. Today's hospitals face a highly competitive and profit-driven landscape, where they must constantly compete for insurance contracts and government funds. Do religious hospitals, who face these pressures just as much as other facilities, succeed in also providing additional charity care to those who need it?

In order to answer that question, this paper tests existing Weberian and organizational theories around the rationalization of healthcare which posit that religious affiliation will likely not impact hospital behavior. It looks at hospital mission statements to identify institutions that remain committed to religious beliefs, and tests whether the content of those mission statements predicts a hospital's provision of charitable services. It finds that hospital use of religious terms, not religious ownership, predicts increased provision of uncompensated care.

## 4.2 Background

### 4.2.1 A Brief History of Religion in Hospitals

Before delving into the theoretical expectations surrounding religion in hospitals today, it is necessary to consider the history of its involvement. Many religious denominations have had their hand in healthcare delivery in the United States, though the nature and length of that involvement varied widely by group. This section provides an extremely brief overview of the changing involvement of the most commonly healthcare-affiliated religious groups in the United States. It does not pretend to be a full history, and overlooks single hospitals that may have been founded by other religious groups (such as Islamic or Hindu facilities) due to the fact that very few (possibly none) exist, and little has been published about them. This history also only focuses on involvement with large, acute-care facilities designed to treat and discharge patients. Religious organizations are also frequently involved in long-term healthcare facilities, and some think that these institutions better reflect religious missions (White 2013). These institutions are entirely different from acute hospitals, however, and should be the focus of a separate paper.

The most well-known example of a religious institution being involved in healthcare is the Catholic Church. Religious members of the Catholic church have been involved in healthcare since the very beginning (Levin 2011). Nuns were the original nurses, offering needed support to patients and, later, physicians. They owned their hospitals and remained on the boards as the hospitals expanded and changed. Wall (2011) provides a compelling and detailed history of Catholic hospitals in the United States. Her history describes the constant struggle between the Catholic mission of providing charity care and the need to stay financially solvent. As healthcare grew more expensive, this challenge grew more difficult. At the same time, radical changes in the Catholic church, wrought by the Vatican II, reduced the available number of nuns and brothers to staff the hospitals and run the boards. Hospitals had to increasingly allow lay-people into management and affiliated nursing schools. By the eighties,

some Catholic hospitals were being forced to close by financial insolvency. Service to the poor, however, remained central. By 1982, Wall writes, "bishops questioned the very existence of Catholic hospitals if they could not extend service to the poor and elderly. Hospital chief executives concurred. All agreed that commitment to the poor was the key to Catholic identity," (2011:18).

Despite this emphasis, many Catholic hospitals began to embrace the market and experience financial success. As the broader healthcare market changed, it became advantageous for hospitals to coordinate in "systems," where one company owns or coordinates the management of many facilities, often across state lines (Alexander, Kaluzny, and Middleton, n.d.; Cutler and Morton 2013; Reilly and Broyles 1992) Catholic hospitals were well-prepared to form systems, as they had already been in religious networks for years (often owned by the same branch of nuns), and so benefited immediately from coordination of services that other hospitals took years to develop. Catholic hospitals still have a substantial share of the market: the official Catholic Health Association website claims that one out of every six patients is cared for by a Catholic hospital each day (www.chausa.org).

Current Catholic hospitals still must agree to a Catholic code of conduct, and generally have at least a few modern nuns on staff (www.chausa.org). Research, however, has found mixed evidence for a continued distinction between Catholic hospitals and their secular counterparts. Catholic hospitals are not distinct in their prevention of infant mortality, and do not seem to receive distinct satisfaction rankings from secular facilities (Garrido et al. 2012; Kutney-Lee et al. 2014). In keeping with stated Catholic missions, however, they are significantly less likely to provide emergency contraceptives, and patient surveys also rate them as providing more compassionate care (Rubin, Grumet, and Prine 2006; White and Begun 1998). Researchers in this sector tend to emphasize that Catholic hospitals do not succeed in differentiating themselves enough from other non-profits, which may hurt their ability to draw unique religious consumers (in those limited cases were patients can select their preferred hospital) and draw additional donations (Swetz, Crowley, and Maines 2013).

Some researchers argue that current Catholic hospitals face a continuous battle between "mission and margin," and cannot succeed as a Catholic organization without sacrificing mission (White 2013).

The Jewish story echoes the Catholic one in many ways. The Jewish people have also always had a hand in the care of the sick, though their work was hampered by a belief that religious individuals should never touch a dead or dying body (Cheshire 2003; Halperin 2012). In the United States, they at first continued a mission of helping the unfortunate and ill, just like the Catholics, though they were less numerous and less active (Kraut and Kraut 2007).

As hospitals were modernizing and becoming more central to medical care, Jews were immigrating in large numbers to America, especially large cities. They began to face increasing anti-Semitism from many institutions, including hospitals. Like the Catholics, they feared deathbed conversion, but their problems with healthcare institutions went deeper than that. Non-Jewish doctors would often misdiagnose Jews as mentally ill when they could not speak English, disrespected requests for kosher meals, and denied the individuality of Jewish patients—"[merging them] into the hazy background of the average Jew," (Kraut and Kraut 2007; Starr 1982). Jewish physicians were excluded from working in hospitals and gaining the prestigious experience. As Starr (1982) points out, this onslaught of discrimination pushed Jewish people to abandon their principles of helping every man and begin focusing on helping only the Jewish people.

The wealthier Jewish citizens established several Jewish hospitals. They provided Jewish foods and religious traditions, employed only Jewish physicians, and generally served as a protective enclave for their people (Kraut and Kraut 2007). For many years, these facilities thrived on donations from wealthy Jewish families. As American anti-Semitism began to dissipate in the wake of World War II, they relaxed boundaries and became more secularized. Hospitals were combined with other, non-Jewish institutions, or simply moved away from Jewish affiliation, as the Jewish elite began to branch out and spend fewer resources on hospitals. Today, less than twenty hospitals still affiliate as Jewish (Halperin 2012; Kraut

and Kraut 2007).

The Protestant story is the least-discussed aspect of American healthcare. Starr (1982) discusses the Protestant issue briefly, and Rosenberg (1987) mentions the role of early Protestant clergymen, but neither provide a cohesive account of Protestant hospitals. In 1842, in Germany, deaconesses became the first female Protestant priests to also provide healthcare. They spread to the United States, working in hospitals and almshouses, but providing much less care than their Catholic counterparts. Several early hospitals were owned by Episcopalians. In addition, many early physicians were Protestant Christian and saw the hospital as an opportunity to "[fulfill] their responsibility as Christians," (Rosenberg 1987:21).

Protestantism has an uneasy relationship with health: some perspectives argue that it promotes it, while others argue that it is antithetical to traditional healing (Klassen 2011). When Protestant hospitals were built, they were generally not fully Protestant—they might be founded on Protestant principles, but board members, doctors, and other powerful decision makers were often not religious. Because of their weaker commitment to religion, they often did not stay religious, being either secularized or bought out by secular institutions. When these conversions occurred, their names often remained. Thus, we are left with many institutions with religious names and indistinguishably secular missions.

The remaining Protestant hospitals are not a cohesive group, and some denominations have had significantly more success than others. Seventh-Day Adventists control most of the current Protestant hospitals, and certainly have the most visibly cohesive presence. When searching for information online about Protestant healthcare, only the Adventists provide a central website detailing access to their hospitals (www.adventisthealthsystem.com). The website argues that Adventists have provided quality healthcare since their first Michigan hospital in 1866. This connection makes natural sense, as Adventists emphasize health promotion as a part of their religion.

### 4.2.2 Rationalization and Secularization

In many ways, the above story of hospital change–as hospitals expanded from small individual institutions with charitable missions into large, heavily structured organizations with high profit margins–matches Weber's expectations about the rationalization of religion into capitalism (Weber 1905). He argued that religion would fade as rationalization rose, leaving only hints of the original religious intent of individuals and organizations. Hospitals with names like "Baptist Hospital," that are owned by secular groups and do not affiliate with a Baptist church, are examples–the religious roots are left in the name, but not the actions, of the organization.

Weber's works have a wide variety of claims about rationalization scattered throughout, but he did not provide a single, cohesive definition. It is generally understood that Weberian rationalization took on different forms, and so should not be considered a single concept (Ritzer 2001). For this paper, I will utilize two types of rationality outlined in (Kalberg 1980): substantive and formal. Though other interpretations of Weber's work exist, these forms clearly relate to organization-level rationalization.

Substantive rationalization is a form of value-rationality (Kalberg 1980). Values in the Weberian sense are complete world-views that determine what behavior is ethical, what a subject should want, and how the realities of the world should be interpreted. Values, then, can determine both the means and the ends of a society. Religion is often an example of this case. In many cases, a religion requires a complete acceptance of a particular interpretation of the world. It asserts what behavior (asceticism, for example) is acceptable, and what ends should be sought (charity, for example). The actor then behaves rationally within these confines. Under this interpretation, a hospital that has substantively rationalized may hold onto ethical obligations, and use those to guide business decisions like the provision of free care. This substantive guidance can still be explicitly religious, or it can be secularized versions of religious ethics. For example, a hospital that has embraced substantive rationalization could be "caring for the poor in Christ's name" or simply "caring for the poor."

Formal rationalization, on the other hand, is characterized by the rise of bureaucracy (Ritzer 2001). This form emphasizes the creation of general rules that specify the means to achieve ends—laws, policies, etc.—and provides much less information about the determination of means. In this case, actors are emphasizing efficiency and predictability, trying to externally control actors in pursuit of a particular end. Bureaucracies in pursuit of profit are the best example of this case, where everything about the organization is rationally designed to reduce unpredictably and increase output. In this case, the religious ethos of an organization is mere myth and ceremony, not a set of guiding principles.

Substantive and formal rationalization are often seen as opposing forces, where the formalization of an organization is either impeded by a commitment to values, or simply causes those values to fade (Ritzer 2001). Weber argued that systems rationalized through capitalism will eventually become fundamentally incompatible with ethical and charitable concerns (Kalberg 1980). Through this theory, we would expect that organizations shaped by capitalist forces should have a low commitment to charity, regardless of other characteristics. It has been found that hospital success may be fundamentally incompatible with the goals of the Catholic Church, for example (White and Dandi 2009).

Organizational theory provides insight into the rationalization and secularization of institutions, specifically. Neoinstitutional theory posits that organizations, in order to achieve legitimacy and success, will mimic each other and increasingly look alike (DiMaggio and Powell 1991). These isomorphic tendencies will drive a particular form of rationalization, and make it increasingly difficult for hospitals to distinguish themselves along religious or ethical lines (Bromley and Meyer 2017). Thus, we would expect that religious ownership would cease to be a point of distinction as the hospitals become increasingly rationalized and similar.

This questions becomes more complex, however, when we consider organizations that have kept religion as a formal part of their identity. Weber's theories were formulated around Protestantism, which is characteristically individualistic and fragmented. The Roman Catholic Church, however, is highly organized and integrated, exerting considerable power on

its member institutions. Hospitals that are formally affiliated with, and owned by, the Catholic Church are being continually reminded of their religious commitments. These commitments could be seen as "formal myth and ceremony," where they are publicly embraced by the corporation but do not affect its daily operations (Meyer and Rowan 1971). Meyer and Rowan (1971) demonstrated that this type of behavior is common to large bureaucratic organizations. But some authors argue that the relationship between a hospital and a large organized religious group represents a unique sticking point, allowing organizations to resist the trend towards rationalization and secularization (Seidler 1986). Under this theory, we would expect that hospitals affiliated with highly organized branches–such as the Roman Catholic Church or even the 7th Day Adventists–may remain more actively religious than other hospitals without a strong religious organizational affiliation. If this is the case, rationalization may not be necessarily synonymous with secularization. Further research is needed to tease out the continuing role of religion in highly secularized hospitals.

### 4.2.3 A Test Case: Website Mission Statements and Charity Care

Hospital descriptions of themselves, as presented on hospital websites, offer a unique window into the underlying religiosity of an organization. A hospital is not required to have an "About Us" or mission statement page, but many choose to adopt one. Mission statements provide an opportunity for an organization to define its goals and values, and have been found to correlate with organizational behavior (Blair-Loy, Wharton, and Goodstein 2011). Other studies interested in identifying religious institutions in a variety of fields (such as adoption agencies and worker placement programs) found that analyzing mission statements was one of the best ways to identify faith-based groups: better than looking at organization names or ownership (O'Rourke and O.p. 2001; Ferguson et al. 2007). These findings indicate that a hospital's mission statement may better reflect its actual commitment to charity or religion than its name or ownership category.

When writing a mission statement, religious institutions are trying to establish their

purpose and organizational character. Research into art worlds has found that groups with high coherence (a single, clear identity that everyone understands) can generally produce shorter and more abstract works than groups with low coherence (Bergesen 1984). This expectation, called the semantic equation, can be directly translated to websites. We would expect that Catholic hospitals, who are already under a national mission and have a clear and coherent organizational structure, would have shorter mission statement pages than other religious hospitals, who may need to define what "religion" means in their context, and how they are choosing to enact that faith.

- *Hypothesis 1:* Catholic hospitals will have shorter mission statements than non-Catholic religious hospitals.

Mission statements are not required to be religious. Any hospital may express an overall commitment to providing charity care to the poor, to providing innovative services, to great customer service, or anything else. Hospitals that express a commitment to charity care and service to the poor, but do not mention religion, may represent cases of substantive rationalization. Thus, mission statements could be classified as religious or secularly committed to charitable goals. It is unclear, however, whether secular commitments to charity are as binding as religious commitments. At the individual level, it has been found that individuals with higher levels of "religious capital," who speak about and engage in a variety of religious activities, are more likely to perform volunteer work than those that claim religious beliefs, but have low religious capital (Park and Smith 2000). This suggests that institutions with more religious language would be more likely to enact their beliefs–even more than religious hospitals with no religious mission statements.

- *Hypothesis 2:* Religious mission statements will have a greater relationship with hospital behavior than secular mission statements.

### 4.2.4 Defining Charity

In order to evaluate the impact of mission statements and religiosity on hospital behavior, we need an appropriate measure of behavior. As the original hospitals were founded to provide care for those too poor and disadvantaged to receive care through other means, tracking current hospital charity care seems like the most appropriate metric of whether the hospitals are behaving in a way that matches their original intent.

The American healthcare system, unfortunately, provides ample opportunity for the provision of charitable services. We do not have universal health insurance coverage, meaning that many individuals go without insurance. Currently, an estimated 27.9 million Americans are without health insurance, a number that has been increasing despite recent reforms designed to address the problem (Tolbert et al. 2019). Even those that are insured often have inadequate plans to cover the cost of care, and may lose their coverage when employment or income changes occur (Quadagno 2004). Further, the uninsured often pay the highest prices for healthcare, as they cannot bargain for discounted prices like the government and private insurers (Melnick and Fonkych 2008). Hospitalizations in the uninsured are associated with an increased risk of bankruptcy and financial hardship (Dobkin et al. 2018). Hospitals that want to help alleviate patient burdens can choose to provide care for free or discount prices to qualified individuals This is the most common form of charitable care, and is easily measurable–hospitals must report this quantity to the Internal Revenue Service and the Centers for Medicaid and Medicare Services (though the way they calculate this charity can vary) (Gaskin et al., n.d.). This is called "uncompensated care," and can be separated from "bad debt", which represents services that the hospital billed for, but never received payment.

It should be noted that hospitals that claim a non-profit 503(C) status are required to provide a certain amount of charity care in order to qualify for tax exemption (Crossley, Tobin Tyler, and Herbst 2016). All hospitals that are explicitly owned by religious institutions, as well as those that are secular non-profits, fall under this status. Uncompensated care counts as one form of charity care, and so hospitals have an incentive to report as much

uncompensated care as possible. However, hospitals can also utilize other services–like offering free mammograms–as charity care. These other services have been criticized as schemes to advertise the hospital and drive additional revenue (Mitias 2007). Thus, while all hospitals may be over-reporting their true provision of uncompensated care, hospitals with no interest in charity would likely find other services to fulfill the requirements. Variation in uncompensated care remains a good measure of a hospital's commitment to charity–not just a commitment to tax exemption.

- *Hypothesis 3:* A hospital's religious orientation, measured by mission statements, will be related to its provision of uncompensated care.

## 4.3 Methods

### 4.3.1 Data

The original list of hospitals used in this analysis, as well as demographic characteristics, was obtained from the American Hospital Association Annual Survey (AHA), accessed through an institutional license to the Wharton Research Database Service (WRDS). This survey provided 2018 data on hospital ownership, size, geographic location, and other key characteristics. Over 96% percent of acute hospitals in the United States are represented by this survey, regardless of their affiliation to the American Hospital Association. For this project, I selected all acute, non-federal hospitals over 50 beds. There were 2392 hospitals that met this criteria in the list.

I paired the institutional data from the AHA with financial data from the Center for Medicaid and Medicare Services (CMS) Healthcare Cost Reporting and Information System (HCRIS), again access through the WRDS. This database contains detailed financial records for every hospital that accepts Medicare patients–which is essentially every large, acute hospital. This database is used for a great deal of research, and is used to determine how Medicare will reimburse hospitals for certain procedures. From this data, I was able to pull

the hospital's patient revenue, gross revenue, charge to cost ratio, and uncompensated care costs. The quality of recent data is poor, however, as many hospitals take a great deal of time to send in and amend their cost reports. While less than 10 hospitals were missing data from 2015, there were over 400 hospitals that were missing data from 2018. I restricted my cases to those that had complete 2018 financial records by March 2020. This lead to a final set of 1902 eligible hospitals for analysis. The reasons for not having complete financial records are varied, including incorrect original submissions, billing issues, and other problems (HCRIS). The reasons are not, as far as the author is aware, related to the outcome of interest.

After establishing complete hospital profiles, I linked the hospital data to external geographic data at the zip code level. I used the 2011-2013 waves of the American Community Survey to estimate the percent of uninsured individuals, median income, racial demographics, and educational demographics in the hospital's zip code. These factors allow me to control for external features that may drive a hospital's provision of uncompensated care. If it is the only hospital in a poor area, it may have no choice but to provide more uncompensated care. Some researchers have pointed out, in addition, that Catholic hospitals may be moving out of poorer zip codes and into wealthier suburbs in order to survive (Wall 2011). I also linked the hospitals to the CMS reported per-capita Medicaid spending and enrollment in their state. Hospitals in areas with more generous Medicaid spending may have more additional funds to spend on uncompensated care, while hospitals with parsimonious Medicaid spending may face larger losses from their insured patients and be less able to provide uncompensated care. I also investigated whether or not each hospital's state had expanded Medicaid, but that relationship was not significant.

The AHA does not provide information on a hospital's website. The only place with a centralized list of all hospital websites is the American Hospital Directory (AHD), which has current profiles on almost every hospital that is open and operating in the United States. I obtained permission to use their data through an education and research agreement, but their site does not provide a way to download all of the hospital URLs at once. Instead, I

had to manually match the hospital name to my list, go to the hospital's profile page on the AHD, and manually copy and paste its URL. I matched each hospital by name when possible, but names were not always a perfect match. In cases where I found a similar name, I would verify that the CMS certification number for the facility was an exact match to my record. From the original list, I was able to obtain and connect to 1692 URLs. Missing hospitals had either no identifiable record in the AHD, or the link available on the AHD was no longer functional.

In order to gather mission statement and other information from each hospital's website, I built a custom webscraper in Python using the `BeautifulSoup` package (Richardson 2007). This scraper scanned over every hospital's main page, pulling in any text tagged "paragraph." It then looked for any tabs or links within the page that mentioned "Mission," "Vision and Values," "About Us," or any combination of those terms. If found, it navigated to that page and again pulled in any text tagged "paragraph." After inspecting the results of these text pulls, I found that hospitals which included a lot of text on their home page often put their mission there, if they did not have a separate tab or page for it. 1422 hospitals had matching text on their home page, and 954 hospitals had specific mission statement tabs.

Because this webscraper was designed to find similar information on extremely different websites–all of which had different layouts, coding styles, and more–the text it scraped was unavoidably messy and imperfect. Random words, incomplete sentences, and unneeded information (like addresses and phone numbers) were often included in the raw text that was collected. I used the `nltk` package and `regex` in Python to perform basic cleaning, including the removal of addresses, phone numbers, names, and symbols. The final, cleaned texts are readable, but often break the rules of English grammar.

### 4.3.2 Analysis

I first analyze the text descriptively, looking at the most common words to occur overall and across hospital types. I analyzed the length of the texts, as well. I then used a "dictionary"

of religious and secular charity words to identify mission statements that used either religious language or secular words that relate to charity. I looked at the use of these two languages across hospital type, correlation between terms, and the geographic distribution of the language. I also use the dictionary method to identify all religious denominations mentioned by the hospital site. Finally, I utilize a linear regression to see if the use of religious language or secular charity language predicts the amount of charity care that a hospital provided. The regression includes a variety of hospital and demographic controls, as well as a measure of the hospital's ownership type.

The religious and secular dictionaries were developed using multiple sources, as no existing appropriate dictionary could be identified. To establish a list of religious denominations, I used Pew's list of religious groups in America, as they conduct frequent religious research in the United States (Pew 2015). To establish a list of words that are religious, I used reversedictionary.org, a non-profit website that provides words commonly associated with a given word. My search terms included "religion," "church," and each denomination from the denominations list. Words that were not explicitly religious (like "charity" or "mission") were excluded. A full list of the words included in the final dictionary is available in the appendix. When identifying religious language in a given hospital's mission statement, I removed any mention of the hospital's name from the document. This prevents hospitals with lingering religious names, like "Covenant Hospital," from being classified as religious language users.

The secular dictionary was a bit harder to define, because the idea of "charity-related" terms is more nebulous than religion. I used the same website, and used "charity," "philanthropy," and "mission" as my initial search terms. All terms that came up and were not explicitly religious were included. These were words like "philanthropy," "donation," "poverty," and others. The final dictionary included 30 terms, and is available in the appendix.

Hospital ownership in the AHA is divided into non-profit, for profit, Catholic, other religious ownership, and state ownership. While I used the terms in the websites to provide context on the diversity of religious organizations involved in these hospitals, it is impossible

to determine with certainty what non-Catholic religious organizations either owned or were affiliated with the hospitals. Because of the low number of non-Catholic religious owned hospitals, it would have been impossible to include sub-groups (such as Jewish hospitals) in the final logistic regression anyway.

Charity care provision was measured using the total uncompensated care, excluding unreimbursed care, reported by each facility on the HCRIS, divided by the gross revenue reported by the facility. This is the standard measure used to calculate charity care, as it reflects the costs of all services provided to patients that the hospital expected to be uncompensated (Gaskin et al., n.d.). This measure likely over-estimates the total charity care that a hospital provides, because hospitals have an incentive to report as much charity care as possible to meet federal requirements (Crossley, Tobin Tyler, and Herbst 2016). It should be noted that hospitals cannot always differentiate between "bad debt" (patient bills that they expected to be paid, but never were) and the intentional provision of free services (AHA). They are required to report two separate numbers on the HCRIS forms, however, and so I am using the number that they estimate relates to the intentional provision of free services.

## 4.4 Results

### 4.4.1 Descriptive Results

The types of mission statements in the hospitals were diverse, both in length and content. Some of the longest ones included descriptions of the hospital's most advanced technology, best physicians, and even dinner menus. The majority of the mission statements were secular in nature. Many of these were short, and looked something like the below examples. The name of the hospital is removed, to preserve anonymity. These two examples give examples of a mission statement that does not provide promises for charity care, and one that does.

> It is our mission at Hospital to provide each patient with the exceptional quality

> care, service, and compassion we want for our loved ones.
>
> As a part of our mission, we will provide care to all persons seeking care without regard to race, color, disablilty, religion, creed, or financial ability to pay for services if we possess the ability to provide the care or services requested.

Longer secular mission statements often focused on the context and style of care more than on specific donation or charity provisions. Below, I include an example of a secular mission statement from a hospital with an overtly religious name. The name is common, so I preserved it, but the location name has been removed.

> Baptist Health is the largest healthcare system serving central STATE, providing comprehensive hospital-based and outpatient services to residents in Central ,STATE>. Our commitment to providing compassionate care and advanced technology offerings is relevant today and in the future for each and every patient we serve. We recognize the importance of meeting patients where they are at and helping them plan for healthy futures, and we look forward to serving you. Baptist Health has placed a strong emphasis on teaching our community members to reduce their risks of illness and disease while encouraging them to live healthier lives. Our providers know that wellness conversations are not the wave of the future, but instead, life-changing conversations for today. The Baptist Health focus on preventive care began well ahead of its time, and continues today because your best life is our primary goal. Baptist Health remains at the forefront of cutting edge advances in medical technology, always redefining possibilities in healthcare. We are proud to be one of the most technologically advanced health systems in STATE , delivering high-tech care to Central . Our patients also want to know that they are receiving excellent medical services with their financial health in mind, also. Baptist Health is deeply committed to keeping costs down as we expand our services to meet the needs of central BLANK. We care about

what matters to you. In short, your health is our mission.

When religious language was used, it was often subtle. Short religious missions statements sometimes looked like:

> Dedicated to spiritually-centered, holistic care that sustains and improves the health of individuals and communities Our Mission, Vision and Values guide everything we do at HOSPITAL. They are foundational to our work to transform healthcare and express our priorities when providing care and services, particularly to those most in need.

Sometimes, however, the religious language was much more overt. Longer, more intensely religious mission statements often looked like the below:

> The Mission of HOSPITAL and Catholic Health Initiatives is to nurture the healing ministry of the Church, supported by education and research. Fidelity to the Gospel urges us to emphasize human dignity and social justice as we create healthier communities. As a ministry of the Catholic Church, we will lead the transformation of health care to achieve optimal health and well-being for the individuals and communities we serve, especially those who are poor and vulnerable. We track our progress in achieving our plan. . . Living Our Mission Measures. These are commonly definitions of success for our system and the centerpiece for monitoring and managing performance throughout Catholic Health Initiatives. Our commitment is tied to the distinctive culture of Catholic Health Initiatives. Learn more, including about our values and ethics at work. The core values define and serve as our guiding principles. They are the roots, or anchors, from which all of our activities, decisions and behaviors follow. To ensure a healthy future for those we serve, our strategy is to excel in system performance while we advance personal and community health beyond our traditional acute

> care focus. We are focused on four strategic objectives that are shared across our system...

In Table 9, I provide a table breaking down the demographics of the hospitals included in the final sample, and the word count of their explicit mission statement pages (if they existed).

Table 9: Descriptive Variables

| | State | Catholic | Other Religion | Non-Profit | For-Profit |
|---|---|---|---|---|---|
| *N* | *189* | *175* | *55* | *942* | *331* |
| Mission Statement on Web (%) | 101 (53.4) | 128 (73.1) | 24 (43.6) | 473 (50.2) | 228 (68.9) |
| Words in Mission | 246.99 (246.37) | 290.52 (211.34) | 390.42 (348.04) | 370.58 (421.00) | 347.56 (235.12) |
| In System (%) | 73 (38.6) | 162 (92.6) | 49 (89.1) | 702 (74.5) | 317 (95.8) |
| Total Patient Revenue (millions) | 30.68 (21.84) | 39.90 (24.87) | 42.61 (26.93) | 35.67 (24.50) | 35.49 (23.72) |
| Uncompensated Cost (millions) | 20.81 (19.89) | 20.68 (16.49) | 19.00 (17.99) | 20.60 (19.16) | 14.30 (13.83) |
| Ratio of Uncompensated Cost to Revenue | 0.68 (0.74) | 0.52 (0.59) | 0.39 (0.37) | 0.48 (0.62) | 0.37 (0.45) |
| Beds | 282.76 (267.72) | 272.36 (161.19) | 221.07 (139.39) | 285.63 (252.62) | 215.84 (147.52) |
| Occupancy Rate | 548.84 (177.84) | 480.59 (169.09) | 453.48 (136.71) | 538.88 (185.54) | 388.07 (132.18) |
| Assets to Liabilities Ratio | 2.63 (2.24) | 2.12 (2.04) | 2.47 (2.20) | 1.91 (6.04) | 1.46 (3.13) |
| **Geographic Characteristics** | | | | | |
| Medicaid Revenue (millions) | 35.01 (24.21) | 36.58 (26.05) | 40.21 (28.24) | 39.30 (25.66) | 39.07 (25.00) |
| Median Income (thousands) | 44.08 (15.79) | 50.85 (19.21) | 55.84 (24.05) | 51.32 (21.53) | 47.17 (16.90) |
| Uninsured Percent | 16.38 (6.62) | 13.00 (6.35) | 13.73 (7.39) | 12.97 (6.63) | 17.44 (7.61) |
| Percent Black | 0.20 (0.21) | 0.14 (0.19) | 0.13 (0.20) | 0.14 (0.19) | 0.15 (0.18) |
| Percent Completed College | 0.25 (0.14) | 0.32 (0.15) | 0.33 (0.19) | 0.31 (0.17) | 0.26 (0.14) |

Non-profit hospitals were the most common in this sample, as is true in the underlying population. Other religious hospitals were the least common, with only 55 facilities making it into the final sample. There were only 80 in the full AHA database, however, so this is a good representation. As expected, Catholic hospitals were extremely likely to be in systems, as were for-profit hospitals. State hospitals were the least likely to have a system membership. The initial results in uncompensated care spending are surprising. Catholic hospitals did not provide the most uncompensated care–by either total spending or ratio–and other religious hospitals provided the lowest amount of uncompensated care per dollar of gross revenue. Other religious hospitals had the longest mission statements of any hospital type, but Catholic hospitals were the most likely to have a mission statement on their website. Other religious hospitals also had the highest revenue per patient.

Figure 10 presents the most common words among all mission statements, color coded by hospital ownership types. These word counts include text in both the explicit mission statement pages, and in the home text of websites that had mission statements on their home pages. In this graph, and all proceeding analyses, stop words (like "is," "a," "and") were removed, as they are extremely common but do not add value. I did not remove hospital names from this analysis, as they were not common enough to appear in the top words. In order to improve readability, only words that appeared at least 200 times are presented.

As expected, the most common words are "health" and "care." "Mission" also appears on the list of top words. Almost every word in this top list appeared in every ownership type. Non-profits account for a large percentage of each word's appearance because non-profits are disproportionately represented in this sample. It is notable that almost no religious terms appear in the list–only "St.", which is likely from a name. It also appears that hospitals emphasize their surgical and research programs, their staff, and physicians. The patient was obviously a central part of the mission statements as well, as they were very high on the list of common words. Hospitals also emphasized "community." Overall, these common terms give a picture of a patient-centered mission statement, with an emphasis on the hospital's

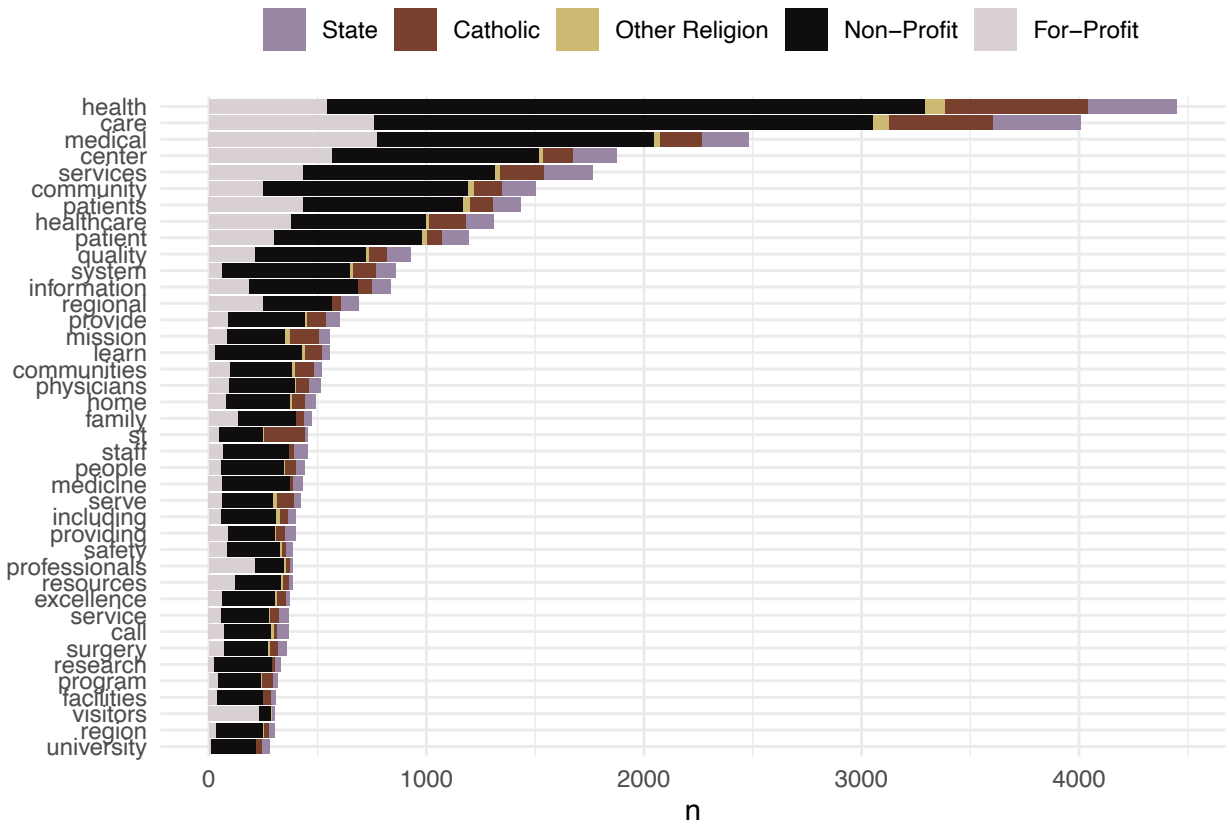



Figure 10: Most Common Terms

ability to provide quality and cutting edge care. While many of the mission statements did include statements about caring for the poor or religion, those terms are not common enough to make it into this list.

Figure 11 presents the distribution of denomination words that were included in the mission statements. These may reflect the religious affiliations of the hospitals, though this count cannot distinguish the difference between "We are a Protestant ministry," and "To get to us, turn left after the Protestant church." While the first scenario is more common than the second, this count cannot be considered a perfect proxy for denominational affiliation. Still, before delving into the religious language of the hospitals, it seems useful to get a sense of what type of religions are represented.

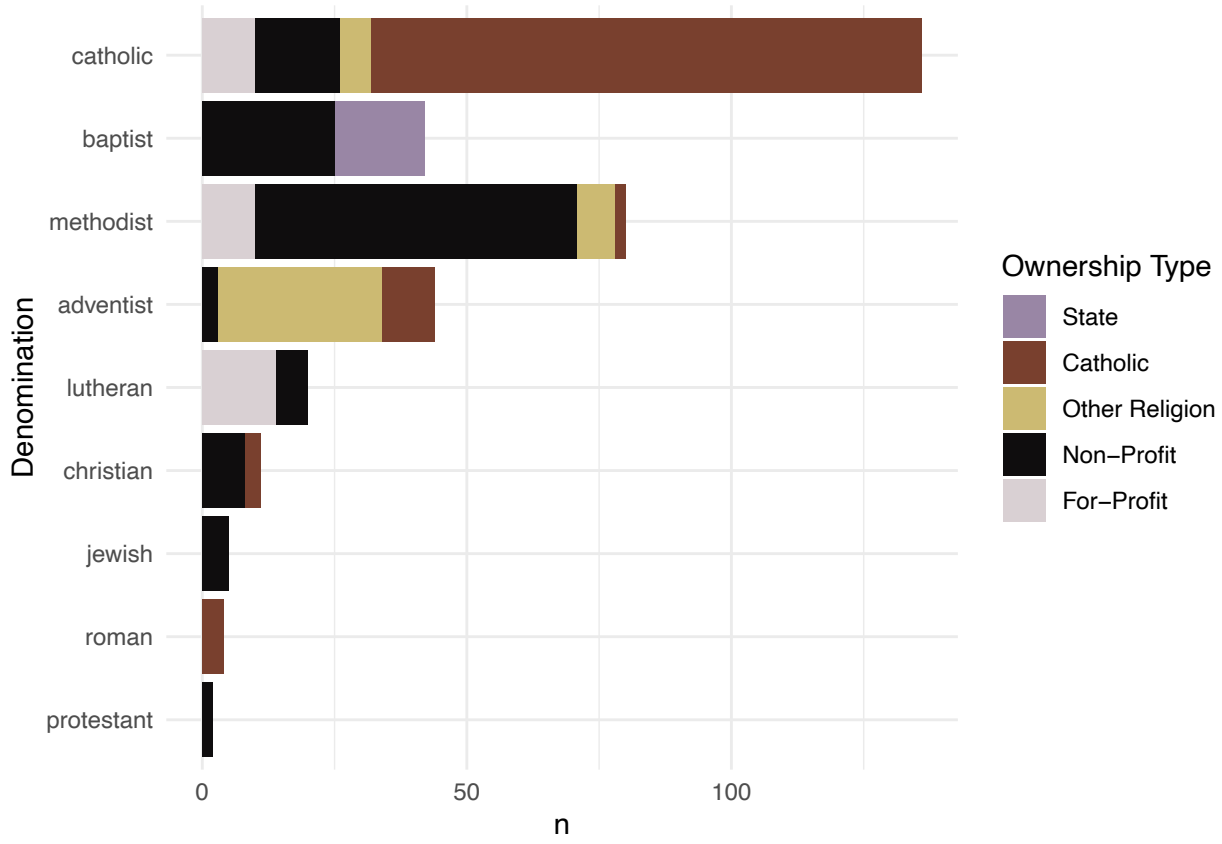



Figure 11: Denominations Mentioned

The most striking thing about this figure is the fact that many hospitals which are not owned by religious groups have religious denominations mentioned on their website. Lutheran,

Christian, Jewish, and Protestant are all only mentioned on formally secular websites, and Lutheran is well-represented among a few for-profit hospitals. It appears that most non-Catholic religious hospitals are Adventist or Baptist, but also that a few may actually be Catholic (despite not being officially listed that way). It should also be noted that the list of denominations was much longer than this, and included many non-Christian religious groups, but none of those terms appeared in the sample. As has been found in other studies, most of the large acute-care facilities in the United States appear to be Christian, with a select few that may be Jewish. However, when looking at the hospitals where the term "Jewish" appears, some of the facilities are simply describing their past as a place for Jewish physicians to practice, and others only have "Jewish" in the name of their system or affiliated hospitals (the names of each hospital were removed prior to this analysis, to avoid simply capturing hospitals with religious names, but the names of systems and other hospitals that may have been mentioned could not be reliably removed). None of the hospitals using the term could be reliably confirmed as currently Jewish-owned or operated from the information on their websites.

Figures 12 and 13 present the word counts of the religious and secular terms that occurred more than 5 times in the hospital mission statements, again color-coded by type. Very few of the terms from the dictionaries were included in the mission statements. For this count, I looked at home page text and mission statement page text, to avoid missing facilities that may have stated their religious mission on the home page. The terms are ordered by the number of occurrences within a single type. So, for example, "covenant" occurs more within non-profit facilities than any other term appears within any group, while "saint" appears the most among Catholic hospitals.

The above figures demonstrate that religious terms were by no means only present within religious hospitals. In fact, some terms–Christian, Church, sacred, pray, prayer, covenant, and meditation–only occurred in secular non-profit websites. Grace only occurred in a for-profit hospital site. Other terms, like Jesus, Christ, God, and religious, only occurred in

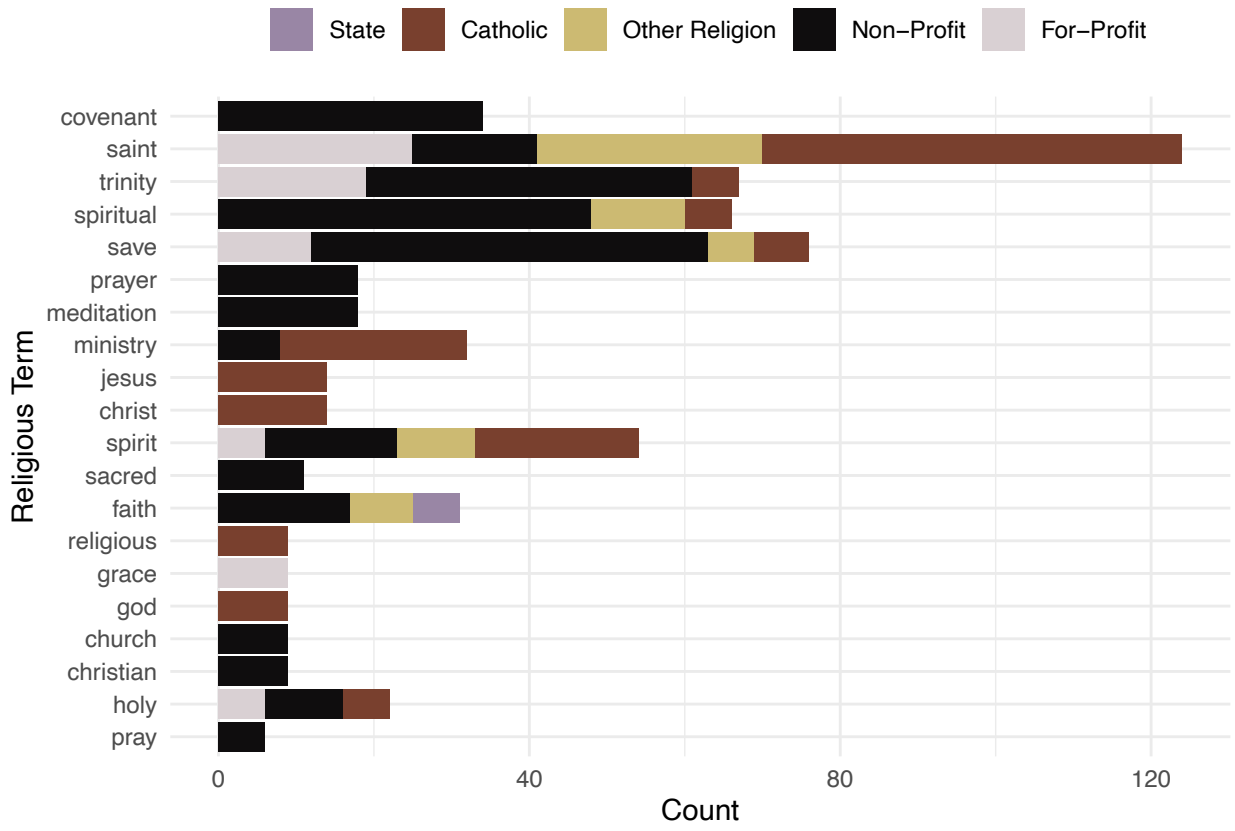



Figure 12: Religious Key Terms

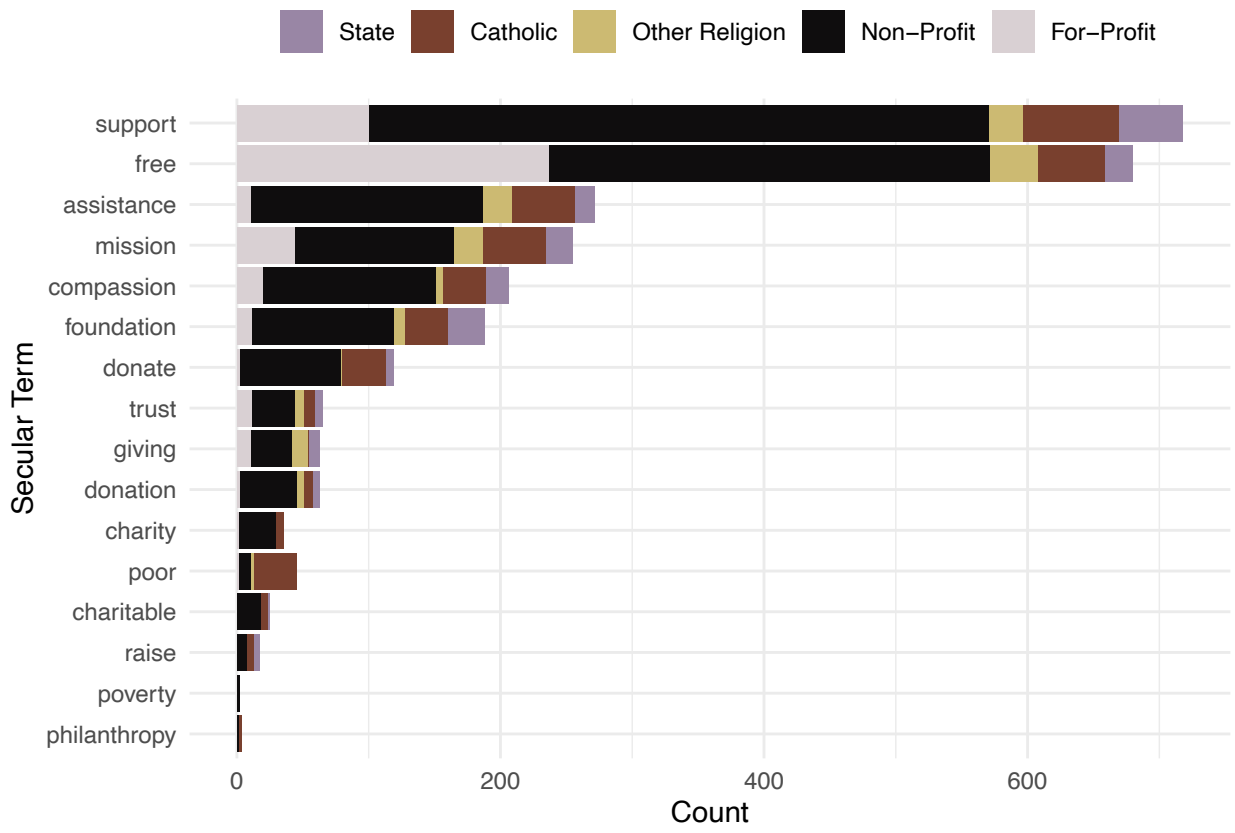



Figure 13: Secular Key Words

Catholic-owned hospital sites. Other religious hospitals were not well-represented anywhere on this list, only using the terms saint, spiritual, save, spirit, and faith. These findings echo the findings from the denomination graph. Looking at what type of organization owns a hospital clearly does not determine whether or not the facility is religiously affiliated.

The secular terms were much more evenly distributed, with all hospitals using most of the key terms. Free was particularly common, but may be capturing cases where the hospital is trying to drive business (offering a "free consultation", for example) in addition to cases where they are offering charitable free services. Terms like "poverty" and "philanthropy" were the least common. Unlike the religious terms, however, not a single term on this list was only used by one type of hospital organization, suggesting that these terms are less related to hospital type than the religious terms.

Figure 14 presents the religious and secular terms in another way, to help illustrate again which terms were more common within the mission statements.

Figure 15 presents the geographical distribution of religious language, as the percentage of observed hospitals in each state that used religious terms. Note that the distribution is only utilizing hospitals from this sample, so some states may have very few observations.

Unsurprisingly, Utah has the highest percentage of religious language. Parts of the southeast have high concentrations as well, but Alabama and Georgia have lower concentrations of religious language than we might expect. California also has surprisingly high concentrations of religious language. Overall, there is clear geographic variation in the use of these terms, but the pattern does not precisely follow religious or political divides across the states. The distribution of secular words is not shown, because there was no great variation or pattern–all states used similar amounts of secular language.

Figure 16 presents the relationships between words in my religious and secular texts. A correlation was calculated between all of the words from the dictionaries that were present in the text. This correlation is measured as the likelihood that two words will occur together in the same mission statement. Each tie between nodes represents a correlation that is higher


Figure 14: Religious and Secular Terms Word Cloud

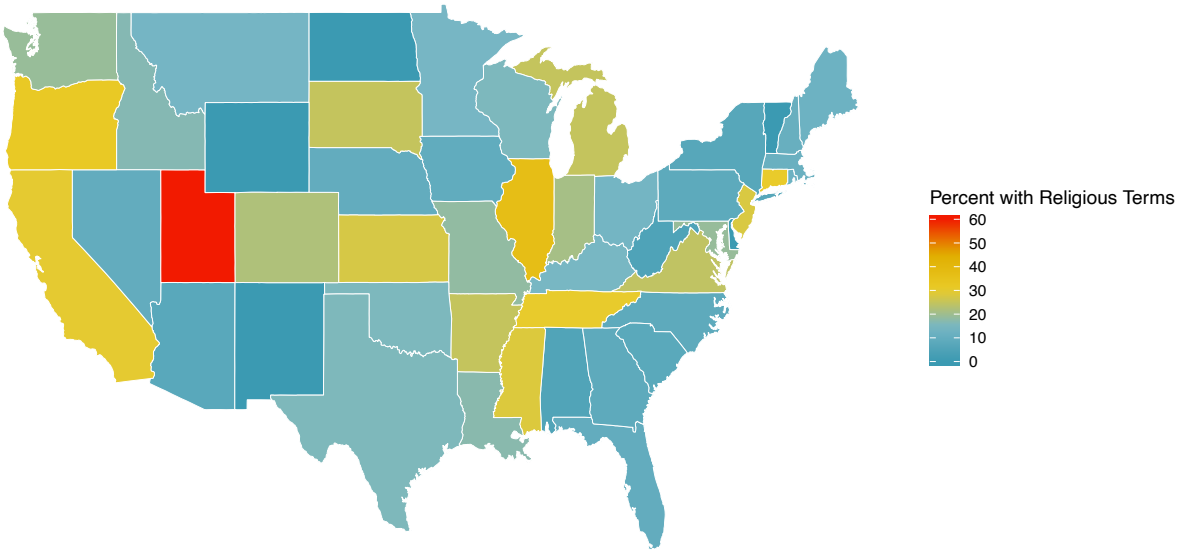



Figure 15: Distribution of Religious Language

0.2, with darker lines indicating stronger correlations. This figure can help visualize the relationship between secular and religious terms, and which ones might be measuring the same underlying concept. Only words that were correlated with at least one other word are graphed.

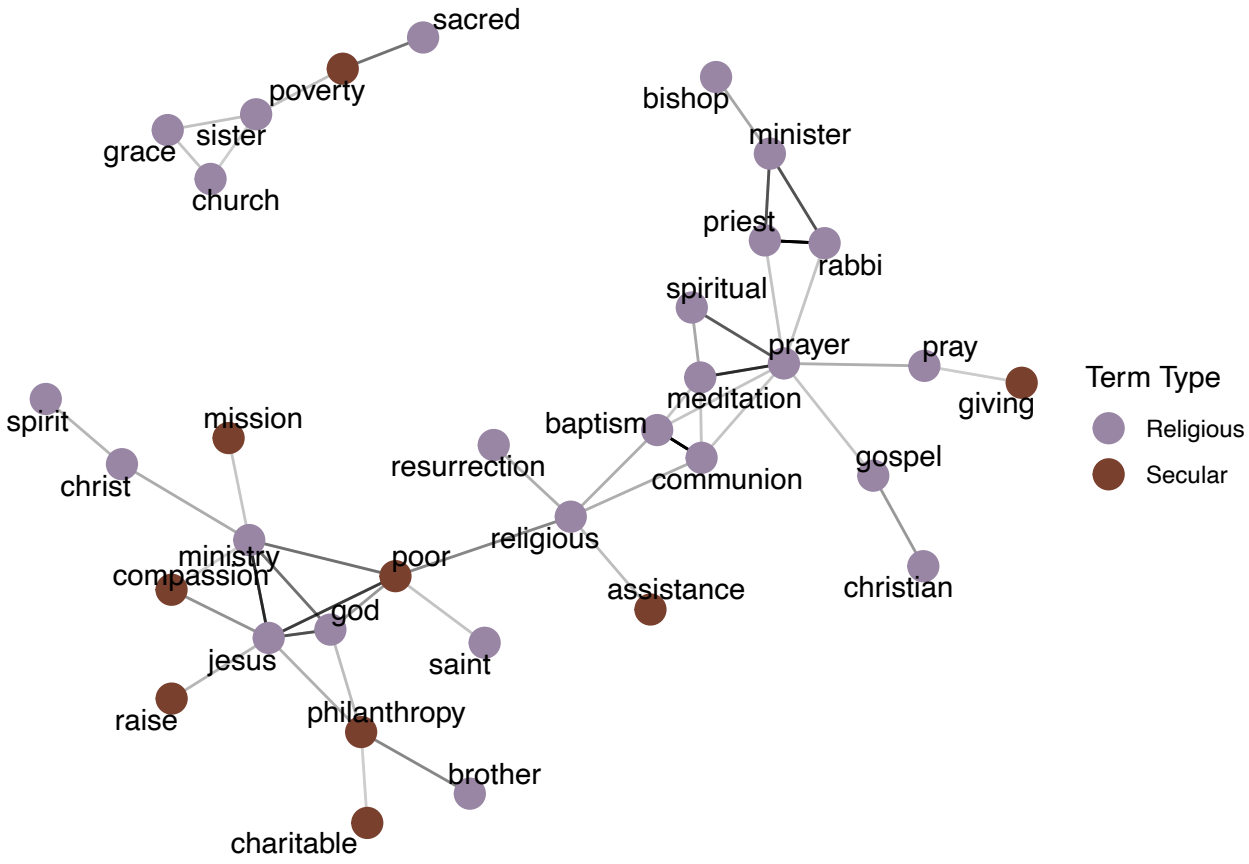



Figure 16: Correlations among Religious and Secular Terms

It is immediately clear that the religious terms were more related than the secular ones. Almost every religious term was correlated with other religious words, while only a few secular terms had correlations high enough to be presented in the graph. We can see from this graph that "giving" appears to be related to the religious ideas of prayer, which are related to meditation and spiritual. Several secular terms are clustered with the religious ideas of Jesus, God, ministry, and brotherhood–secular words like compassion, poor, philanthropy, and charitable seem to be talking about similar concepts. Poverty is linked to sacred and sister. Overall, this graph gives the idea that some of the secular terms are more closely

related to religious ideology than others.

### 4.4.2 Regression Results

Table 10 presents the results from the full linear regression. It includes a base model and a model with covariates, to illustrate the importance of context on the measured relationships. The outcome measure was the total uncompensated care provided by each hospital divided by its gross revenue. This provides a standardized measure of a hospital's generosity that is not inflated by overall revenue–a score of 0.25 would mean, for example, that a hospital spends 25 cents of every dollar earned on uncompensated care. It should be noted that this metric was right-skewed, with a few hospitals reporting much more uncompensated care than gross revenue. The skew could be corrected by taking transforming the ratio by the logarithmic scale. I tested both versions of this model, and found that the transformation did not change the results. The model below presents the un-transformed outcome, because this is much easier to interpret.

Overall, religious-owned hospitals were not significantly more likely to provide more uncompensated care per dollar of gross revenue than secular non-profit hospitals. State hospitals were significantly more likely to provide more, which makes sense–state facilities are often established in under-served areas that cannot sustain a private hospital. For-profit hospitals offered significantly less, which again makes sense–they are established to make a profit, and are not required to provide any charity care. Religious text being on a hospital website predicted a significant increase in the amount of charity care a hospital provided. It was measured dichotomously, so the coefficient indicates that a hospital adding any religious text to its site increases its uncompensated care spending by 6 cents per dollar of gross revenue. As gross revenue can often be in the hundreds of millions, this is a significant increase. Secular language was not associated with a difference in uncompensated care spending.

The controls in this model had relationships that were mostly in the expected directions. Areas with high uninsurance percentages and minority populations had more uncompensated

Table 10: Linear Regression Predicting Percent of Gross Income Spent on Uncompensated Care

| | *Dependent variable:* | |
|---|---|---|
| | Uncompensated Care Ratio | |
| Ownership Type (ref=Non-Profit) | | |
| *State* | 0.208*** | 0.173*** |
| *Catholic* | 0.017 | 0.035 |
| *Other Religion* | −0.112 | −0.061 |
| *For-Profit* | −0.099*** | −0.110*** |
| Religious Text on Site | 0.095** | 0.066* |
| Secular Philanthropy on Site | 0.001 | 0.001 |
| Gross income (millions) | | 0.0005*** |
| Charge to Cost Ratio | | −0.00002 |
| Beds | | 0.001*** |
| Median income in Zip | | −0.00000 |
| Uninsured Percent in Zip | | 0.019*** |
| Percent Black in Zip | | 0.213*** |
| Percent Other in Zip | | 0.426* |
| Percent College Educated in Zip | | 0.561*** |
| State Medicaid Spending | | 0.00000 |
| State Medicaid Enrollment | | −0.00002*** |
| Constant | 0.460*** | −0.250** |
| Observations | 1,672 | 1,670 |
| Log Likelihood | -1,500.211 | -1,246.922 |
| Akaike Inf. Crit. | 3,014.422 | 2,527.844 |
| *Note:* | | *p<0.1; **p<0.05; ***p<0.01 |

care spending. Hospitals with a higher overall gross income and more beds were more likely to provide a bit more uncompensated care, even though the outcome did control for size. Hospitals in states with higher Medicaid enrollment (and thus less total uninsured individuals) provided slightly less uncompensated care. All of these controls weakened the relationship between religious text and uncompensated care spending, but not enough to drop the relationship out of significance.

I also tested an interaction effect in this model, looking at the interaction between hospital ownership and language usage. This interaction was not significant for any group, and led to a lower overall model fit. It was thus excluded from this final presentation.

## 4.5 Conclusion and Discussion

The results from my analysis supported the hypotheses proposed in the beginning of this paper. Catholic hospitals had shorter mission statements overall, indicating a greater cohesiveness within their hospitals than other hospital groups. Other hospitals appeared to need to do more work to define their mission and values. When hospitals chose to use religious language, this resulted in measurably higher rates of uncompensated care spending. This indicates that the use of religious language was specifically important, and that uncompensated care is a good measure of religious behavior. This relationship was more important than the religious ownership of the hospital. Hospitals with secular philanthropy language on their sites were not more likely to provide uncompensated care.

Though the focus of this paper was more on the overall relationship between language and behavior, I also discovered telling relationships between certain secular and religious terms. Words like “philanthropy” and “compassion” were more commonly used in conjunction with religious language, while words like “support” and “foundation” almost never were. These co-occurrences may speak to the underlying religiosity in those terms. Secularization is a spectrum, not a dichotomy, and analyses like these can help us determine the religious roots of particular ideas and phrases. Further analyses in other corpora utilizing the dictionaries

developed here could help elucidate whether these relationships persist in other linguistic contexts (like news sites, social media posts, or non-healthcare mission statements).

These findings demonstrate that the use of religious language is not merely "myth and ceremony." It continues to relate to actual organizational behavior, even in such a competitive and rationalized institutional field. Further, it demonstrates that secular versions of religious commitments to philanthropy are not as binding. These terms did not predict hospital behavior in the same way as their religious counterparts, despite being closely related. Finally, this demonstrates that ownership alone is not sufficient to measure a hospital's religiosity. Without investigating the actual use of religious language on a hospital's website, I would have missed a key source of variation in uncompensated care spending. These results suggest that there is something intrinsically different about religious language. It seems to relate to actual organizational behavior more directly than legal status or secular claims. It is possible that only hospitals with a true commitment to a religious mission and philanthropy are willing to put religious language on their websites. But it is also possible that hospitals who have put religious language on their websites feel a subsequent pressure to behave more charitably. Because the data and analysis for this paper was cross-sectional, it is impossible to adjudicate between these two possibilities.

It should also be noted that this paper failed to identify substantial religious diversity in American hospitals. The majority were Catholic or Seventh Day Adventists, with a small number of other denominations mentioned. This finding suggests that non-Christian patients who are seeking care that aligns with their religious beliefs may be unable to do so. Further, people living in rural areas with only one reachable hospital may have no choice but to get care from a religious hospitals. Further research should consider the impact to individuals with non-Christian beliefs who are required to go to Christian hospitals, especially since this paper has demonstrated that those hospitals may advertise their religiosity online and alter behavior accordingly.

All of these findings indicate that there is an enduring importance of religion. It demon-

strably impacts a hospital's behavior. Future hospital studies should be careful to include measures of a hospital's religiosity in order to fully explain hospital behavior. It further suggests that substantive rationalization–where an organization removes the religious but maintains the ethical commitments–does not drive ethical organizational behavior. Our expectation that different forms of rationalization lead to different outcomes may not be accurate (Ritzer 2001). The Weberian idea that the ghosts of religion remain, guiding our actions even without the religious motivation, may not apply to charitable organizational behavior. Instead, the imprint of religion in secularized, rationalized institutions may be only in the rhetoric. This rule appears to apply even to hospitals owned by religious organizations that choose not to express their religiosity online.

On the more practical side, this paper demonstrates flaws in the AHA's classification of hospitals that future researchers should consider. The distribution of denominations did not match the AHA database, and further research should be done to investigate why these distributions varied so widely. This paper provides a helpful starting point for beginning that investigation. Qualitative and historical research may be needed to fully flush out the nature of religious hospitals, but the findings from this study emphasize that there is enough diversity and conflict within the hospitals to warrant additional research.

# Appendix

**Religious Terms:** christ, jesus, ministry, pray, prayer, christian, spirit, spiritual, spiritualism, god, religious, church, bible, divinity, brother, sister, sisterhood, congregation, congregationist, save, saint, covenant, idolatry, canon, preach, holy, holiness, theology, faith, worship, scripture, anoint, antichrist, baptism, consecrate, crucifix, crucifixion, devotional, eucharist, gospel, grace, hell, nazarene, messiah, testament, rapture, resurrection, sacrament, salvation, sanctification, sacred, sin, commandment, trinity, minister, priest, nun, bishop, pope, communion, sacralized, verse, messiah, meditation, sabbath, blasphemy, jihad, prophet, halal, imam, heaven, temple, mosque, kosher, shiva, seder, rabbi, hasidic, torah, messianic, pulpit, pagan, golem, yarmulke, hebrew,

**Secular Terms:** charity, donation, endowment, philanthropy, assistance, beneficence, mission, dole, almshouse, virtue, trust, cause, good, distribute, charitable, poor, needy, morality, giving, alms, handout, free, compassion, support, poverty, raise, giver, fundraise, donate, foundation,

# 5 Conclusions from this Dissertation

If the three preceding papers demonstrated anything conclusively, it was that the religiosity of a hospital is important. Catholic hospitals lead the charge in the adoption of weight-loss surgery, influencing other facilities to follow their lead and adopt the surgery as well. When religious hospitals choose to adopt a specialty procedure, they advertise it in a measurably different way from other types of hospitals, using different terminologies. Finally, hospitals with religious missions are more likely to provide charity care than their secular counterparts– even those secular facilities that profess to have a mission to help the poor. The relationship between religion and organizational behavior is complex. Non-Catholic religious hospitals often had different relationships with the outcome variables than their Catholic counterparts, and the expression of religion on their websites varied widely.

This work also illustrated the diverse spread of specialty services. This spread was shown to exacerbate inequality, as poorer areas were less likely to receive the services. Hospitals that chose to advertise tended to highlight the benefits of the procedures, not the risks. Further, these findings demonstrated that the diffusion of specialty services cannot be explained without considering the nature of the service itself, and that diffusion is affected by hospital ownership type. Finally, the adoption of a service was shown to not be isomorphic. Hospitals advertised the services in diverse ways, that again varied along ownership lines.

This dissertation highlights opportunities for additional research. As religion has been demonstrated to be a key part of hospital behavior, more work needs to be done to incorporate it into health services research and analysis. Qualitative analyses, of both religious statements and hospital surgery advertising, could add additional depth to our understanding of how hospitals present themselves online. Finally, interviews with key stakeholders at hospitals on these issues is warranted, to get a sense of how hospital leaders make decisions about specialty surgery, advertising, and mission statements. Finally, analysis on how many procedures a hospital actually performs, using discharge data, would provide much needed insight into how the adoption of an innovation may differ from its utilization.

I hope that I will be able to conduct much of this research, utilizing the huge amount of data I collected in the process of working on this dissertation. The works presented here barely scratch the surface of the opportunities that the data provides, and I look forward to continuing to work on this research.

# 6 Works Cited


Adler-Milstein, Julia, A. Jay Holmgren, Peter Kralovec, Chantal Worzala, Talisha Searcy, and Vaishali Patel. 2017. "Electronic Health Record Adoption in US Hospitals: The Emergence of a Digital "Advanced Use" Divide." *Journal of the American Medical Informatics Association: JAMIA* 24 (6): 1142–8. https://doi.org/10.1093/jamia/ocx080.

AHRQ. n.d. "Electronic Medical Record Systems." *Digital Healthcare Research Archive*. https://digital.ahrq.gov/key-topics/electronic-medical-record-systems.

Alexander, Jeffrey A., Arnold D. Kaluzny, and Suann C. Middleton. n.d. "Organizational Growth, Survival and Death in the U.S. Hospital Industry: A Population Ecology Perspective." *Social Science & Medicine* 22 (3): 303–8. https://doi.org/http://dx.doi.org/10.1016/0277-9536(86)90126-7.

Angst, Corey M., Ritu Agarwal, V. Sambamurthy, and Ken Kelley. 2010. "Social Contagion and Information Technology Diffusion: The Adoption of Electronic Medical Records in U.S. Hospitals." *Management Science* 56 (8): 1219–41.

Ansari, Shahzad M., Peer C. Fiss, and Edward J. Zajac. 2010. "Made to Fit: How Practices Vary as They Diffuse." *The Academy of Management Review* 35 (1): 67–92.

Anthony, Denise L., Ajit Appari, and M. Eric Johnson. 2014. "Institutionalizing HIPAA Compliance: Organizations and Competing Logics in U.S. Health Care." *Journal of Health and Social Behavior* 55 (1): 108–24. https://doi.org/10.1177/0022146513520431.

Arrow, Kenneth J. 1963. "Uncertainty and the Welfare Economics of Medical Care." *The American Economic Review* 53 (5): 941–73.

Ashrafian, Hutan, Ara Darzi, and Thanos Athanasiou. 2011. "Bariatric Surgery - Can We Afford to Do It or Deny Doing It?" *Frontline Gastroenterology* 2: 82–89. https://doi.org/10.1136/fg.2010.002618.

Attaluri, Vikram, and Elisabeth C. Mclemore. 2016. "The Cost of Robotic Surgery." *Seminars in Colon and Rectal Surgery* 27 (3): 134–35. https://doi.org/10.1053/j.scrs.2016.04.004.

Ayanian, John Z, and Joel S Weissman. 2002. "Teaching Hospitals and Quality of Care: A Review of the Literature." *The Milbank Quarterly* 80 (3): 569–93. https://doi.org/10.1111/1468-0009.00023.

Bail, Christopher A. 2012. "The Fringe Effect: Civil Society Organizations and the Evolution of Media Discourse About Islam Since the September 11th Attacks." *American Sociological Review* 77: 855–79.

———. 2016. "Cultural Carrying Capacity: Organ Donation Advocacy, Discursive Framing, and Social Media Engagement." *Social Science & Medicine* 165 (September): 280–88. https://doi.org/10.1016/j.socscimed.2016.01.049.

Balsa, Ana I., Thomas G. McGuire, and Lisa S. Meredith. 2005. "Testing for Statistical Discrimination in Health Care." *Health Services Research* 40 (1): 227–52. https://doi.org/10.1111/j.1475-6773.2005.00351.x.

Baum, Joel A. C., and Heather A. Haveman. 1997. "Love Thy Neighbor? Differentiation and Agglomeration in the Manhattan Hotel Industry, 1898-1990." *Administrative Science Quarterly; Thousand Oaks* 42 (2): 304–38.

Baum, Joel A. C., and Stephen J. Mezias. 1992. "Localized Competition and Organizational Failure in the Manhattan Hotel Industry, 1898-1990." *Administrative Science Quarterly; Thousand Oaks* 37 (4): 580–604.

Ben-Assuli, Ofir. 2015. "Electronic Health Records, Adoption, Quality of Care, Legal and Privacy Issues and Their Implementation in Emergency Departments." *Health Policy (Amsterdam, Netherlands)* 119 (3): 287–97. https://doi.org/10.1016/j.healthpol.2014.11.014.

Benoit, Kenneth, Kohei Watanabe, Haiyan Wang, Paul Nulty, Adam Obeng, Stefan Müller, and Akitaka Matsuo. 2018. "Quanteda: An R Package for the Quantitative Analysis of Textual Data." *Journal of Open Source Software* 3 (30): 774. https://doi.org/10.21105/joss.00774.

Bergesen, Albert. 1984. "The Semantic Equation: A Theory of the Social Origins of Art Styles." *Sociological Theory* 2: 187–221. https://doi.org/10.2307/223348.

Bird, Steven, Edward Loper, and Ewan Klien. 2009. *Natural Language Processing with Python*. O'Reilly Media Inc.

Blair-Loy, Mary, Amy S. Wharton, and Jerry Goodstein. 2011. "Exploring the Relationship Between Mission Statements and Work-Life Practices in Organizations." *Organization Studies* 32 (3): 427–50. https://doi.org/10.1177/0170840610397480.

Bodenheimer, Thomas, and Kevin Grumbach. 2009. *Understanding Health Policy: A Clinical Approach*. Sixth. The McGraw-Hill Companies.

Bradley, Elizabeth, and Lauren Taylor. 2013. *The American Health Care Paradox: Why Spending More Is Getting Us Less*. New York: PublicAffairs.

Brill, Steven. 2015. *America's Bitter Pill: Money, Politics, Backroom Deals, and the Fight to Fix Our Broken Healthcare System*. New York: Random House.

Briscoe, Forrest. 2016. "Heterogeneous Diffusion Software." https://sites.psu.edu/forrest/heterogeneous-diffusion/.

Briscoe, Forrest, Abhinav Gupta, and Mark S. Anner. 2015. "Social Activism and Practice Diffusion: How Activist Tactics Affect Non-Targeted Organizations." *Administrative Science Quarterly* 60 (2): 300–332. https://doi.org/10.1177/0001839215579235.

Bromley, Patricia, and John W. Meyer. 2017. "'They Are All Organizations': The Cultural Roots of Blurring Between the Nonprofit, Business, and Government Sectors." *Adminis-*

*tration & Society* 49 (7): 939–66. https://doi.org/10.1177/0095399714548268.

Brown, Phil. 1995. "Naming and Framing: The Social Construction of Diagnosis and Illness." *Journal of Health and Social Behavior*, 34–52. https://doi.org/10.2307/2626956.

Burkhauser, R. V., and J. Cawley. 2008. "Beyond BMI: The Value of More Accurate Measures of Fatness and Obesity in Social Science Research." *J Health Econ* 27 (March): 519–29. https://doi.org/10.1016/j.jhealeco.2007.05.005.

Carey, Kathleen, James F. Burgess, and Gary J. Young. 2009. "Single Specialty Hospitals and Service Competition." *Inquiry* 46: 162–71. https://doi.org/http://www.inquiryjournalonline.org/loi/inqr.

Chernomas, Robert, and Ian Hudson. 2016. "Health, Healthcare, and the Individual." In *Economics in the Twenty-First Century: A Critical Perspective*, 79–105. Toronto: University of Toronto Press.

Cherubini, Paolo, Rino Rumiati, Daniela Rossi, Fllippo Nigro, and Antonio Calabrò. 2005. "Improving Attitudes Toward Prostate Examinations by Loss-Framed Appeals." *Journal of Applied Social Psychology* 35 (4): 732–42. https://doi.org/10.1111/j.1559-1816.2005.tb02144.x.

Cheshire, William P. 2003. "Twigs of Terebinth: The Ethical Origins of the Hospital in the Judeo-Christian Tradition." *Ethics & Medicine* 19: 143–53.

Clarke, Adele E., Laura Mamo, Jennifer R. Fishman, Janet K. Shim, and Jennifer Ruth Fosket Fosket. 2003. "Biomedicalization: Technoscientific Transformations of Health, Illness and U.S. Biomedicine." *American Sociological Review* 68: 161–94.

CMS.gov. 2014. "Health Expenditures by State of Residence (1991-2014)." *National Health Expenditure Data*. https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/ NationalHealthAccountsStateHealthAccountsResidence.

Colla, Carrie H., Valerie A. Lewis, Emily Tierney, and David B. Muhlestein. 2016. "Hospitals Participating in ACOs Tend to Be Large and Urban, Allowing Access to Capital and Data." *Health Affairs (Project Hope)* 35 (3): 431–39. https://doi.org/10.1377/hlthaff.2015.0919.

Colyvas, Jeannette A., and Stefan Jonsson. 2011. "Ubiquity and Legitimacy: Disentangling Diffusion and Institutionalization*." *Sociological Theory* 29 (1): 27–53. https://doi.org/10.1111/j.1467-9558.2010.01386.x.

Conrad, Peter. 2005. "The Shifting Engines of Medicalization." *Journal of Health and Social Behavior* 46: 3–14. https://doi.org/10.2307/4147650.

———. 2007. *The Medicalization of Society*.

Conrad, Peter, and Kristin K. Barker. 2010. "The Social Construction of Illness: Key Insights and Policy Implications." *Journal of Health and Social Behavior* 51: S67–S79.

Conrad, Peter, and Valerie Leiter. n.d. "Medicalization, Markets and Consumers." *Journal*

*of Health and Social Behavior* 45 (extra issue): 158–76.

Corcelles, Ricard, Christopher R. Daigle, Hector Romero Talamas, Stacy A. Brethauer, and Philip R. Schauer. 2015. "Assessment of the Quality of Internet Information on Sleeve Gastrectomy." *Surgery for Obesity and Related Diseases* 11 (May): 539–44. https://doi.org/10.1016/j.soard.2014.08.014.

Crossley, Mary, Elizabeth Tobin Tyler, and Jennifer L. Herbst. 2016. "Tax-Exempt Hospitals and Community Health Under the Affordable Care Act: Identifying and Addressing Unmet Legal Needs as Social Determinants of Health." *Public Health Reports* 131 (1): 195–99.

Cutler, David M., and Fiona Scott Morton. 2013. "Hospitals, Market Share, and Consolidation." *JAMA* 310 (18): 1964–70. https://doi.org/10.1001/jama.2013.281675.

Cutler, David M., and Fiona Scott Morton. 2013. "Hospitals, Market Share, and Consolidation." *JAMA* 310 (18): 1964. https://doi.org/10.1001/jama.2013.281675.

Davis, Joel. 2012. "Content Analysis of Efficacy Descriptions on Branded Pharmaceutical Websites." *Journal of Medical Marketing* 12 (4): 211–20. https://doi.org/doi:10.1177/1745790412465425.

DiMaggio, Paul, and Walter Powell. 1991. "The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields." In *The New Institutionalism in Organizational Analysis*, edited by Paul Dimaggio and Walter Powell. Chicago: University of Chicago Press.

Dobbin, Frank, and Timothy J. Dowd. 1997. "How Policy Shapes Competition: Early Railroad Foundings in Massachusetts." *Administrative Science Quarterly; Thousand Oaks* 42 (3): 501–29.

Dobkin, Carlos, Amy Finkelstein, Raymond Kluender, and Matthew J. Notowidigdo. 2018. "The Economic Consequences of Hospital Admissions." *The American Economic Review* 102 (2): 308–52. https://doi.org/10.1257/aer.20161038.

Drew, Patricia. 2011. "'But Then I Learned...': Weight Loss Surgery Patients Negotiate Surgery Discourses." *Social Science & Medicine* 73 (October): 1230–7. https://doi.org/http://dx.doi.org/10.1016/j.socscimed.2011.07.023.

Dunn, Adam G., and Blanca Gallego. 2010. "Diffusion of Competing Innovations: The Effects of Network Structure on the Provision of Healthcare." *Journal of Artificial Societies & Social Simulation* 13 (4): 12–12.

Esdar, Moritz, Jens Hüsers, Jan-Patrick Weiß, Jens Rauch, and Ursula Hübner. 2019. "Diffusion Dynamics of Electronic Health Records: A Longitudinal Observational Study Comparing Data from Hospitals in Germany and the United States." *International Journal of Medical Informatics* 131 (November): 103952. https://doi.org/10.1016/j.ijmedinf.2019.103952.

Ferguson, Kristin M., Qiaobing Wu, Donna Spruijt-Metz, and Grace Dyrness. 2007. "Outcomes Evaluation in Faith-Based Social Services: Are We Evaluating Faith Ac-

curately?" *Research on Social Work Practice* 17 (2): 264–76. https://doi.org/10.1177/1049731505283698.

Fishman, Linda E. 1997. "What Types of Hospitals Form the Safety Net?" *Health Affairs; Chevy Chase* 16 (4): 215–22.

Flood, Ann Barry, and Mary L. Fennell. 1995. "Through the Lenses of Organizational Sociology: The Role of Organizational Theory and Research in Conceptualizing and Examining Our Health Care System." *Journal of Health and Social Behavior* 35: 154–69.

Fontaine, K. R., and I. Barofsky. 2001. "Obesity and Health-Related Quality of Life." *Obesity Reviews* 2: 173–82. https://doi.org/10.1046/j.1467-789x.2001.00032.x.

Garrido, Melissa M., Kirk C. Allison, Mark J. Bergeron, and Bryan Dowd. 2012. "Hospital Religious Affiliation and Outcomes for High-Risk Infants." *Medical Care Research and Review* 69 (June): 316–38. https://doi.org/10.1177/1077558711432156.

Gaskin, Darrell J., Bradley Herring, Hossein Zare, and Gerard Anderson. n.d. "Measuring Nonprofit Hospitals' Provision of Charity Care Using IRS and CMS Data." *Journal of Healthcare Management; Chicago* 64 (5): 293–312. https://doi.org/http://dx.doi.org.proxy.library.emory.edu/10.1097/JHM-D-18-00141.

Ginn, Go, Jj Shen, and Cb Moseley. 2009. "Community Benefit Laws, Hospital Ownership, Community Orientation Activities, and Health Promotion Services." *Health Care Management Review* 34 (2): 109–18. https://doi.org/10.1097/HMR.0b013e31819e90e0.

Goel, Mita Sanghavi, Ellen P. McCarthy, Russell S. Phillips, and Christina C. Wee. 2004. "Obesity Among US Immigrant Subgroups by Duration of Residence." *JAMA: Journal of the American Medical Association* 292: 2860–7.

Goffman, Erving. 1974. *Frame Analysis: An Essay on the Organization of Experience*. Cambridge, MA: Harvard University Press.

Goldhill, David. 2013. *Catastrophic Care : Why Everything We Think We Know About Health Care Is Wrong*. First Vintage Books edition.. Catastrophic Care : How American Health Care Killed My Father – and How We Can Fix It. New York: New York : Vintage Books, a division of Random House LLC.

Goodman, Madeleine J., and Lenn E. Goodman. 1987. "Medicalization and Its Discontents." *Social Science & Medicine* 25: 733–40.

Greenberg, Warren. 1978. *Competition in the Health Care Sector, Past, Present, and Future : Proceedings of a Conference Sponsored by the Bureau of Economics, Federal Trade Commission*. Washington, D.C.: Washington, D.C. : Federal Trade Commission.

Gregory, Karen. 2016. *Digital Sociologies*. Edited by Karen Gregory. Bristol, UK: Policy Press at the University of Bristol.

Greve, Henrich R., David Strang, and Nancy Brandon Tuma. 1995. "Specification and Estimation of Heterogeneous Diffusion Models." *Sociological Methodology* 25 (1): 405–20.

Griswold, Wendy, and Nathan Wright. 2004. "Cowbirds, Locals, and the Dynamic Endurance of Regionalism." *American Journal of Sociology* 109: 1411–51. https://doi.org/10.1086/381773.

Grubesic, Tony H., and Timothy C. Matisziw. 2006. "On the Use of ZIP Codes and ZIP Code Tabulation Areas (ZCTAs) for the Spatial Analysis of Epidemiological Data." *International Journal of Health Geographics* 5 (1): 58. https://doi.org/10.1186/1476-072X-5-58.

Guo, Uta, Lu Chen, and Parag H. Mehta. 2017. "Electronic Health Record Innovations: Helping Physicians - One Less Click at a Time." *Health Information Management: Journal of the Health Information Management Association of Australia* 46 (3): 140–44. https://doi.org/10.1177/1833358316689481.

Hajdenberg, J., and D. Landau. 2010. "Patterns of Robotic Prostatectomy Advertising on the Internet: Quality of the Information Available to U.S. Consumers Through the Use of Google, Yahoo, Bing, and YouTube." *Journal of Clinical Oncology* 28: e16538–e16538. https://doi.org/doi:10.1200/jco.2010.28.15_suppl.e16538.

Halperin, Edward. 2012. "The Rise and Fall of the American Jewish Hospital." *History of Academic Medicine* 85 (5): 610–15.

Handcock, Mark S., David R. Hunter, Carter T. Butts, Steven M. Goodreau, Pavel N. Krivitsky, and Martina Morris. 2019. *Ergm: Fit, Simulate and Diagnose Exponential-Family Models for Networks*. The Statnet Project (https://statnet.org).

Harrington, Sarah Elizabeth, and Thomas J. Smith. 2008. "The Role of Chemotherapy at the End of Life." *JAMA : The Journal of the American Medical Association* 299 (22): 2667–78. https://doi.org/10.1001/jama.299.22.2667.

Horev, Tuvia, Irena Pesis-Katz, and Dana B. Mukamel. 2004. "Trends in Geographic Disparities in Allocation of Health Care Resources in the US." *Health Policy* 68 (2): 223–32. https://doi.org/10.1016/j.healthpol.2003.09.011.

Hunter, David R., Mark S. Handcock, Carter T. Butts, Steven M. Goodreau, and Martina Morris. 2008. "Ergm: A Package to Fit, Simulate and Diagnose Exponential-Family Models for Networks." *Journal of Statistical Software* 24 (3): 1–29.

Jost, Timothy Stoltzfus. 2010. "The Health Care Revolution: From Medical Monopoly to Market Competition" 35: 143–47.

Kaiser Family Foundation. 2020. "Status of State Action on the Medicaid Expansion Decision." *State Health Facts*. https://www.kff.org/health-reform/state-indicator/state-activity-around-expanding-medicaid-under-the-affordable-care-act/.

Kalan, Satyam, Sanket Chauhan, Rafael F. Coelho, Marcelo A. Orvieto, Ignacio R. Camacho, Kenneth J. Palmer, and Vipul R. Patel. 2010. "History of Robotic Surgery." *Journal of Robotic Surgery* 4 (3): 141–47. https://doi.org/10.1007/s11701-010-0202-2.

Kalberg, Stephen. 1980. "Max Weber's Types of Rationality: Cornerstones for the Analysis of Rationalization Processes in History." *The American Journal of Sociology* 85 (5): 1145–79.

Kawachi, Ichiro, Bruce P. Kennedy, Kimberly Lochner, and Deborah Prothrow-Stith. 1997. "Social Capital, Income Inequality, and Mortality." *Am J Public Health* 87: 1491–8.

Kennedy, Mark Thomas, and Peer Christian Fiss. 2009. "Institutionalization, Framing, and Diffusion: The Logic of TQM Adoption and Implementation Decisions Among U.S. Hospitals." *The Academy of Management Journal* 52 (5): 897–918.

KFF. 2020. "How Does the Quality of the U.S. Healthcare System Compare to Other Countries?" *Peterson-KFF Health System Tracker*.

King, Mike. 2016. *A Spirit of Charity: Restoring the Bond Between America and Its Pubic Hospitals*. Salisbury, MD: Secant Publishing.

Kitts, James A., Alessandro Lomi, Daniele Mascia, Francesca Pallotti, and Eric Quintane. 2017. "Investigating the Temporal Dynamics of Interorganizational Exchange: Patient Transfers Among Italian Hospitals." *American Journal of Sociology* 123 (3): 850–910.

Klassen, Pamela. 2011. *Spirits of Protestantism: Medicine, Healing, and Liberal Christianity*. Los Angeles, California: University of California Press.

Kraut, Alan M., and Deborah A. Kraut. 2007. *Covenant of Care*.

Kutney-Lee, Ann, G. J. Melendez-Torres, Matthew D. McHugh, and Barbra Mann Wall. 2014. "Distinct Enough? A National Examination of Catholic Hospital Affiliation and Patient Perceptions of Care." *Health Care Management Review* 39 (June): 134–44. https://doi.org/10.1097/HMR.0b013e31828dc491.

Leaman, Stacey. 2002. "Religion and Reproductive Health Care: Who's the Problem?" *Conscience; Washington* 23 (3): 28.

Levin, PeterJ. 2011. "Bold Vision: Catholic Sisters and the Creation of American Hospitals." *Journal of Community Health* 36 (June): 343–47. https://doi.org/10.1007/s10900-011-9401-7.

Levine, Robert S., George S. Rust, Maria Pisu, Vincent Agboto, Peter A. Baltrus, Nathaniel C. Briggs, Roger Zoorob, et al. 2010. "Increased BlackWhite Disparities in Mortality After the Introduction of Lifesaving Innovations: A Possible Consequence of US Federal Laws." *American Journal of Public Health* 100 (11): 2176–84. https://doi.org/10.2105/AJPH.2009.170795.

Lindstedt, Nathan C. 2019. "Structural Topic Modeling for Social Scientists: A Brief Case Study with Social Movement Studies Literature, 20052017." *Social Currents* 6 (4): 307–18. https://doi.org/10.1177/2329496519846505.

Livingston, E. H. 2010. "The Incidence of Bariatric Surgery Has Plateaued in the U.S." *Am J Surg* 200 (September): 378–85. https://doi.org/10.1016/j.amjsurg.2009.11.007.

Lomi, Alessandro, and Francesca Pallotti. 2012. "Relational Collaboration Among Spatial Multipoint Competitors." *Social Networks* 34 (1): 101–11. https://doi.org/10.1016/j.socnet.2010.10.005.

Lu, Wei-Ting. 2013. "Confucius or Mozart? Community Cultural Wealth and Upward Mobility Among Children of Chinese Immigrants." *Qualitative Sociology* 36: 303–21. https://doi.org/10.1007/s11133-013-9251-y.

Matthew, Dayna Bowen. 2015. *Just Medicine: A Cure for Racial Inequality in American Health Care*. New York: New York University Press.

Mears, Ashley. 2010. "Size Zero High-End Ethnic: Cultural Production and the Reproduction of Culture in Fashion Modeling." *Poetics* 38 (February): 21–46. https://doi.org/http://dx.doi.org/10.1016/j.poetic.2009.10.002.

Melnick, Glenn A., and Katya Fonkych. 2008. "Hospital Pricing and the Uninsured: Do the Uninsured Pay Higher Prices?" *Health Affairs* 27 (Supplement 1): w116–w122. https://doi.org/10.1377/hlthaff.27.2.w116.

Meyer, John, and Brian Rowan. 1971. "Institutional Organizations: Formal Structure as Myth and Ceremony." In *The New Institutionalism in Organizational Analysis*. Chicago: University of Chicago Press.

Meyer, Oanh L., Laura Castro-Schilo, and Sergio Aguilar-Gaxiola. 2014. "Determinants of Mental Health and Self-Rated Health: A Model of Socioeconomic Status, Neighborhood Safety, and Physical Activity." *Am J Public Health* 104: 1734–41. https://doi.org/10.2105/AJPH.2014.302003.

Mezias, Stephen J., and Elizabeth Boyle. 2005. "Blind Trust: Market Control, Legal Environments, and the Dynamics of Competitive Intensity in the Early American Film Industry, 1893-1920." *Administrative Science Quarterly* 50: 1–34.

Milkie, Melissa A. 1999. "Social Comparisons, Reflected Appraisals, and Mass Media: The Impact of Pervasive Beauty Images on Black and White Girls' Self-Concepts." *Social Psychology Quarterly* 62: 190–210. https://doi.org/10.2307/2695857.

Miller, Amalia R., and Catherine Tucker. 2009. "Privacy Protection and Technology Diffusion: The Case of Electronic Medical Records." *Management Science* 55 (7): 1077–93.

Mirani, Rajesh, and Anju Harpalani. 2014. "The Medicare Electronic Health Records (EHR) Incentive Program: First-Year Adoption Response from Inpatient Hospitals." *Journal of Organizational Computing and Electronic Commerce* 24 (4): 388–401. https://doi.org/10.1080/10919392.2014.956601.

Mitias, Marcus Joseph. 2007. "An Analysis of Texas Hospitals: Assessing the Association Between Charity Care, Uncompensated Care, and Community Benefits." M.P.H., United States – Texas: University of North Texas Health Science Center at Fort Worth.

Nelson, Roxanne. 2017. "Will Rural Community Hospitals Survive?" *AJN, American Journal of Nursing* 117 (9): 18–19. https://doi.org/10.1097/01.NAJ.0000524538.11040.7f.

Nestle, Marion, and Michael F. Jacobson. 2000. "Halting the Obesity Epidemic: A Public Health Policy Approach." *Public Health Reports* 115 (February): 12–24.

Ng, M., T. Fleming, M. Robinson, B. Thomson, N. Graetz, C. Margono, E. C. Mullany, et al. 2014. "Global, Regional, and National Prevalence of Overweight and Obesity in Children and Adults During 1980-2013: A Systematic Analysis for the Global Burden of Disease Study 2013." *Lancet* 384 (August): 766–81. https://doi.org/10.1016/s0140-6736(14)60460-8.

O'Rourke, Kevin, and O.p. 2001. "Catholic Hospitals and Catholic Identity." *Christian Bioethics: Non-Ecumenical Studies in Medical Morality* 7 (1): 15–28. https://doi.org/10.1076/chbi.7.1.15.3762.

Pappas, Gregory, Wilbur C. Hadden, Lola Jean Kozak, and Gail F. Fisher. 1997. "Potentially Avoidable Hospitalizations: Inequalities in Rates Between US Socioeconomic Groups." *American Journal of Public Health* 87 (5): 811–11.

Park, Jerry Z., and Christian Smith. 2000. ""To Whom Much Has Been Given...": Religious Capital and Community Voluntarism Among Churchgoing Protestants." *Journal for the Scientific Study of Religion* 39 (3): 272–86.

Pew. 2015. "Appendix B: Classification of Protestant Denominations." *Pew Research Center's Religion & Public Life Project*.

Phelan, Jo C., Bruce G. Link, Ana Diez-Roux, Ichiro Kawachi, and Bruce Levin. 2004. "'Fundamental Causes' of Social Inequalities in Mortality: A Test of the Theory." *Journal of Health and Social Behavior* 45 (3): 265–85. https://doi.org/doi:10.1177/002214650404500303.

Picot, J., J. Jones, J. L. Colquitt, E. Gospodarevskaya, E. Loveman, L. Baxter, and A. J. Clegg. 2009. "The Clinical Effectiveness and Cost-Effectiveness of Bariatric (Weight Loss) Surgery for Obesity: A Systematic Review and Economic Evaluation." *Health Technol Assess* 13 (41): 1–190, 215–357, iii–iv. https://doi.org/10.3310/hta13410.

Potter, Sharyn J. 2001. "A Longitudinal Analysis of the Distinction Between for-Profit and Not-for-Profit Hospitals in America." *Journal of Health & Social Behavior* 42: 17–44.

Potter, SharynJ, and TimothyJ Dowd. 2003. "Executive Turnover and the Legal Environment: The Case of California Hospitals, 19601995." *Sociological Forum* 18 (September): 441–64. https://doi.org/10.1023/A:1025769603135.

Poulain, Magali, Marième Doucet, Geneviève C. Major, Vicky Drapeau, and et al. 2006. "The Effect of Obesity on Chronic Respiratory Diseases: Pathophysiology and Therapeutic Strategies." *Canadian Medical Association. Journal* 174 (April): 1293–9.

Powell, W. W., and P. J. DiMaggio. 1991. *The New Institutionalism in Organizational Analysis*. University of Chicago Press.

Quadagno, Jill. 2004. "Why the United States Has No National Health Insurance: Stakeholder Mobilization Against the Welfare State, 1945–1996." *Journal of Health and Social Behavior* 45 Suppl: 25.

Reilly, Bernard J., and Robert W. Broyles. 1992. "The Priorities of the Health Care System

Vs. Its Financing: Political Realities Vs. Financial Realities." *Journal of Health & Social Policy* 4: 13–25.

Rice, Thomas. 1998. "Can Markets Give Us the Health System We Want?" In *Healthy Markets? The New Competition in Medical Care*, 27–65. Durham: Duke University Press.

Richardson, Leonard. 2007. "Beautiful Soup Documentation." *April*.

Ritzer, George. 2001. "Rationalization and Deprofessionalization of Physicians." In *Exploration in Social Theory: From Metatheorizing to Rationalization*. London: SAGE Publications.

Roberts, Margaret E, Brandon M Stewart, and Dustin Tingley. n.d. "Stm: R Package for Structural Topic Models." *Journal of Statistical Software*, 41.

Rogers, Everett M. 2003. *Diffusion of Innovations*. 5th edition.. New York: New York : Free Press.

Rosenberg, Charles E. 1987. *The Care of Strangers*. Baltimore and London: Johns Hopkins University Press.

Rosenthal, Elisabeth. 2017. *An American Sickness : How Healthcare Became Big Business and How You Can Take It Back*. New York: New York : Penguin Press.

Rossman, Gabriel. 2014. "The Diffusion of the Legitimate and the Diffusion of Legitimacy." *Sociological Science; Stanford* 1 (March): 49–69. https://doi.org/http://dx.doi.org.proxy.library.emory.edu/10.15195/v1.a5.

Rubin, Susan E., Surah Grumet, and Linda Prine. 2006. "Hospital Religious Affiliation and Emergency Contraceptive Prescribing Practices." *Am J Public Health* 96: 1398–1401.

Saba, Samir, Lakshmi Prasad Ravipati, and Andrew Voigt. 2009. "Recent Trends in Utilization of Implantable Cardioverter-Defibrillators in Survivors of Cardiac Arrest in the United States." *Pacing and Clinical Electrophysiology* 32 (11): 1444–9. https://doi.org/10.1111/j.1540-8159.2009.02509.x.

Saguy, Abigail. 2013. *What's Wrong with Fat*. New York: Oxford University Press.

Salant, Talya, and Heena P. Santry. 2006. "Internet Marketing of Bariatric Surgery: Contemporary Trends in the Medicalization of Obesity." *Social Science & Medicine* 62: 2445–57. https://doi.org/http://dx.doi.org/10.1016/j.socscimed.2005.10.021.

Schneiberg, Marc, and Elisabeth S. Clemens. 2006. "The Typical Tools for the Job: Research Strategies in Institutional Analysis." *Sociological Theory* 24: 195–227.

Schneider, Tamera R., Peter Salovey, Unto Pallonen, Norbert Mundorf, Nelson F. Smith, and Wayne T. Steward. 2001. "Visual and Auditory Message Framing Effects on Tobacco Smoking1." *Journal of Applied Social Psychology* 31 (4): 667–82. https://doi.org/10.1111/j.1559-1816.2001.tb01407.x.

Schnittker, Jason. 2004. "Social Distance in the Clinical Encounter: Interactional and

Sociodemographic Foundations for Mistrust in Physicians." *Social Psychology Quarterly* 67: 217–35. https://doi.org/doi:10.1177/019027250406700301.

Schoenthal, Anna R., and Thomas E. Getzen. 2005. "Bariatric Surgery and the Financial Reimbursement Cycle." *Journal of Health Care Finance* 31 (3): 1–9.

Scott, W. R., Martin Ruef, Peter Mendel, and Carol Caronna. 2000. *Institutional Change and Healthcare Organizations: From Professional Dominance to Managed Care*. University of Chicago Press.

Seidler, John. 1986. "Contested Accommodation: The Catholic Church as a Special Case of Social Change." *Social Forces* 64 (4): 847–74. https://doi.org/10.2307/2578784.

Silge, Julia, and David Robinson. 2016. "Tidytext: Text Mining and Analysis Using Tidy Data Principles in R." *JOSS* 1 (3). https://doi.org/10.21105/joss.00037.

Sobal, Jeffery. 1995. "The Medicalization and Demedicalization of Obesity." In *Eating Agendas: Food and Nutrition as Social Problems*, edited by Donna Maurer and Jeffery Sobal. New York: Aldine de Gruyter.

Starr, Paul. 1982. *The Social Transformation of American Medicine*. Harper Collins.

———. 2006. "Remedy and Reaction."

Strang, David, and Michael W. Macy. 2001. "In Search of Excellence: Fads, Success Stories, and Adaptive Emulation." *American Journal of Sociology* 107 (1): 147–82. https://doi.org/10.1086/323039.

Strang, David, and John W. Meyer. 1993. "Institutional Conditions for Diffusion." *Theory and Society* 22 (4): 487–511.

Swetz, KeithM, MaryE Crowley, and T. Dean Maines. 2013. "What Makes a Catholic Hospital 'Catholic' in an Age of Religious-Secular Collaboration? The Case of the Saint Marys Hospital and the Mayo Clinic." *HEC Forum* 25 (June): 95–107. https://doi.org/10.1007/s10730-012-9207-8.

Swidler, Ann. 1986. "Culture in Action: Symbols and Strategies." *American Sociological Review* 51: 273–86. https://doi.org/10.2307/2095521.

Throsby, Karen. 2009. "The War on Obesity as a Moral Project: Weight Loss Drugs, Obesity Surgery and Negotiating Failure." *Science as Culture* 18: 201.

Tian, Wenqiang, Robert E. Hurley, and Dolores G. Clement. 2010. "The Diffusion of Bariatric Surgery Programs Within US Community Hospitals, 1995 to 2000." *International Journal of Public Policy* 5: 204–21. https://doi.org/10.1504/IJPP.2010.030604.

Tolbert, Jennifer, Kendal Orgera, Natalie Singer, and Anthony Damico. 2019. "Key Facts About the Uninsured Population," 19.

Trigwell, J, PM Watson, RC Murphy, G Stratton, and NT Cable. 2014. "Ethnic Differences in Parental Attitudes and Beliefs About Being Overweight in Childhood." *Health Education*

*Journal* 73 (2): 179–91. https://doi.org/10.1177/0017896912471035.

Turchetti, Giuseppe, Ilaria Palla, Francesca Pierotti, and Alfred Cuschieri. 2012. "Economic Evaluation of Da Vinci-Assisted Robotic Surgery: A Systematic Review." *Surgical Endoscopy* 26 (3): 598–606. https://doi.org/10.1007/s00464-011-1936-2.

U.S. Census Bureau. 2011. "American Community Survey 1-Year Estimates." retrieved using American Factfinder.

Wall, Barbra. 2011. *American Catholic Hospitals: A Century of Changing Markets and Missions*. Rutgers University Press.

Walsh, Mary Norine. 2017. "MACRA Is a Law: Practice Transformation Is the Goal." *Journal of the American College of Cardiology* 70 (8): 1096–8. https://doi.org/10.1016/j.jacc.2017.07.720.

Wang, Haidong, Mohsen Naghavi, Christine Allen, Ryan M Barber, Zulfiqar A Bhutta, Austin Carter, Daniel C Casey, et al. 2016. "Global, Regional, and National Life Expectancy, All-Cause Mortality, and Cause-Specific Mortality for 249 Causes of Death, 19802015: A Systematic Analysis for the Global Burden of Disease Study 2015." *The Lancet* 388 (10053): 1459–1544. https://doi.org/10.1016/S0140-6736(16)31012-1.

Weber, Max. 1905. *The Protestant Ethic and the Spirit of Capitalism (1994 Translation)*. Protestant Ethic & the Spirit of Capitalism. Los Angeles, Calif.: Los Angeles, Calif. : Roxbury Pub. Co.

Wejnert, Barbara. 2002. "Integrating Models of Diffusion of Innovations: A Conceptual Framework." *Annual Review of Sociology* 28: 297–326.

Wertheim, Paul, and Monty L. Lynn. 1993. "Development of a Prediction Model for Hospital Closure Using Financial Accounting Data*." *Decision Sciences* 24 (3): 529–46. https://doi.org/10.1111/j.1540-5915.1993.tb01292.x.

Whitaker, Robert. 2010. *Anatomy of an Epidemic: Magic Bullets, Psychiatric Drugs, and the Astonishing Rise of Mental Illness in America*. New York: Crown Publishers.

White, Kenneth R. 2013. "When Institutions Collide: The Competing Forces of Hospitals Sponsored by the Roman Catholic Church." *Religions; Basel* 4 (1): 14–29. https://doi.org/http://dx.doi.org.proxy.library.emory.edu/10.3390/rel4010014.

White, Kenneth R., and James W. Begun. 1998. "How Does Catholic Hospital Sponsorship Affect Services Provided?" *Inquiry - Blue Cross and Blue Shield Association* 35: 398–407.

White, Kenneth R., and Roberto Dandi. 2009. "Intrasectoral Variation in Mission and Values: The Case of the Catholic Health Systems." *Health Care Management Review* 34 (1): 68–79. https://doi.org/10.1097/01.HMR.0000342982.14802.47.

Wickham, Hadley. 2019. *Stringr: Simple, Consistent Wrappers for Common String Operations*.

Xu, Tim, Albert W. Wu, and Martin A. Makary. 2015. "The Potential Hazards of Hospital

Consolidation: Implications for Quality, Access, and Price." *JAMA* 314 (13): 1337–8. https://doi.org/10.1001/jama.2015.7492.