Sit it Out or Dance: Representative Bureaucracy Contagion Effects in Health Care

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Abstract: The study of representative bureaucracy traces out multiple organizational and individual-level pathways through which identity-based representation contributes to improvements in bureaucratic processes, outcomes, and legitimacy. Leveraging a multi-level dataset of Florida emergency room visits, we simultaneously model aggregate (indirect) and individual (direct) forms of representation to shed light on what we term "contagion effects" in representative bureaucracy. Our theory of contagion argues that the presence of under-represented bureaucrats (in the aggregate) can change the behavior of other existing bureaucrats. An empirical test of physician-patient sex matching in heart attack outcomes finds that male physicians get better results for female patients when they work alongside more female physicians in their unit, that contagion effects are indicative of men changing their behavior to be more receptive to women's symptoms, and that the quality of medical school is related to men's susceptibility to contagion influences.

The literature on representative bureaucracy has found relationships between the social identities of bureaucrats and outcomes that benefit represented clientele in education (Keiser et al. 2002), health care (Zhu and Walker 2013), corrections (Wade-Olson 2019), employment counseling (Guul 2018), agriculture loans (Selden 1997) and law enforcement (Meier and Nicholson-Crotty 2006; Schuck 2018) among others. The identities examined include race and ethnicity (Meier 1984), sex (Keiser et al. 2002), socioeconomic status (Gilad and Alon-Barkat 2018), sexual orientation (Theobald and Haider-Markel 2009), veterans' status (Gade and Wilkins 2012) and other lived experiences (Park 2020). Although the literature is dominated by studies of the US and western Europe, it has recently expanded to numerous other countries such as Ghana (Agyapong 2018), South Korea (Song 2018), China (Zhang 2019), South Asia (Baniamin and Jamil 2021), India (Dhillon and Meier 2022), and Brazil (Dantas Cabral, Peci, and Van Ryzin 2021).

The initial literature on representative bureaucracy focused on aggregate level representation and thus aggregate level data, but recent work has used individual level data to probe the precise microbehavior of bureaucratic representation (Guul 2018; McCrea 2021; Nicholson Crotty et al. 2016; Xu and Meier 2021). Of the various ways that bureaucratic representation can influence organizational outputs and outcomes, the study of contagion effects—whereby underrepresented bureaucrats interact with other bureaucrats and change the behavior of those bureaucrats—has been generally ignored (but see Atkins and Wilkins 2013; Li 2021; Meier and Nicholson-Crotty 2006). This study seeks to address this gap in the literature by examining whether male bureaucrats who interact with female colleagues change behaviors to better serve female clients.

The specific case will use a unique data set of hospital emergency room visit outcomes

that matches the sex of the physician and patient in the context of the sex composition of the ER physicians. Specifically, we focus on heart attack mortality due to existing research noting that this is an area ripe for gender bias (McCrea 2021, 2022). A crucial micro-foundation to this bias is the fact that women are more likely to present atypical heart attack symptoms which are harder to detect and diagnose (McSweeney et al. 2003; Then, Rankin, and Fofonoff 2001). Since many physicians, especially male physicians, perceive women as overreactive and dismiss their symptoms (Fasler 2015; Fetters 2018), higher mortality rates for women may be driven in part by an unwillingness for male physicians to consider these symptoms when diagnosing and treating women. As such, contagion may be a mechanism through which male physicians better serve the needs of female patients.

Even in a country that relies heavily on the private sector for the provision of medical care such as the US, emergency departments are a suitable *public* context given the regulatory structure of the 1986 Emergency Medical Treatment and Labor Act (EMTALA) which requires universal, public emergency department access to all regardless of race, sex, citizenship, or ability to pay (Bitterman 2002; Wanerman 2002). While ER care is administered across public, private, and nonprofit hospitals, EMTALA imposes a high degree of "publicness" on organizational functions via regulation (see Bozeman 1987). Violations of EMTALA subject hospitals to harsh penalties such as fines, civil liability, and a loss of the provider's Medicare or Medicaid funding. Moreover, federal, state, and local governments fund approximately 52% of hospital care costs in the US (CMS 2021). Since all emergency departments are required by law to dispense an important social safety net program, ER care is an essential and understudied context ripe for studying questions of equity and access in public administration.

The paper will begin by sketching out the theory of representative bureaucracy and the

various paths that link the identities of bureaucrats to outcomes that benefit the represented clientele. Because contagion effects have generally been ignored in the literature, the theoretical reasons why and under what conditions contagion effects might exist will be specified. We then introduce the substantive study to discuss why hospital emergency rooms provide a promising area to observe contagion effects. Using individual level data for all emergency room visits for 12 years for the state of Florida, we present analysis that shows that heart attack outcomes of female patients with male physicians are better when the male physicians work in units with more female physicians. We further demonstrate that, as our theoretical arguments predict, this representation impact is enhanced under conditions where learning is possible and male physicians have characteristics associated with a willingness to learn. Finally, the implications of our findings for the broader understanding of representative bureaucracy and administrative behavior are addressed.

The Theory of Representative Bureaucracy

Donald Kingsley (1944) first proposed that a bureaucracy representative of the social origins of the public could contribute to an effective democracy. The underlying logic for the theory is that bureaucrats exercise discretion when making decisions and that discretion is likely to be influenced by the values of the bureaucrats (Long 1952; Mosher 1968). Bureaucratic values in turn are influenced by socialization processes that reflect the bureaucrats' social origins such as socioeconomic status, education, race, sex, and other factors as they are tempered by the lived experiences of the bureaucrat (see Bishu and Kennedy 2020; Kennedy 2014; Meier 1975; Riccucci and Van Ryzin 2017; Park 2020). These linkages imply, as Mosher (1968) contends, that a passively representative bureaucracy in terms of social origins should generate outcomes that are generally responsive to the needs and desires of the general public.

The empirical literature on representative bureaucracy contends that when identities such as race, sex or other factors become salient, and bureaucrats can exercise discretion, that bureaucratic outcomes are likely to benefit the clients who are passively represented (Keiser et al. 2002). This relationship between passive representation and outcomes can occur in two ways. The original work focused on active representation, the idea that a bureaucrat would take specific actions seeking to benefit the representative clientele. Later empirical work returned to an idea briefly sketched by Mosher (1968) of symbolic representation where the benefits occur because the client/citizen responds to this passive representation rather than any action taken by the bureaucrat. The micro theory under both processes merit discussion.

Mosher's seminal work, brief as it was, stressed symbolic representation as the primary benefit of passive representation. "The importance of passive representativeness often resides less in the behaviors of public employees than in the fact that the employees who are there are there at all" (Mosher 1968: 14). Passive representation in Mosher's mind serves as a symbol to the public that the civil service is open to "most people, whatever their station in life" and generates a feeling of legitimacy and acceptance for the public. More recent work suggests that symbolic representation is not just symbolic, but may encourage clients to change their behavior, be more cooperative, or engage in coproduction (Guul 2018; Riccucci, Van Ryzin and Li 2016; Riccucci, Van Ryzin and Lavena 2014; Theobald and Haider-Markel 2009; Vinopal 2017).

Active representation by bureaucrats can occur by any of three processes that operate separately or in combination. First, individual bureaucrats who interact with a client who looks like them might be willing to take actions to benefit the individual; a teacher might be more likely to recommend a student for a gifted class (Nicholson-Crotty et al. 2016) or a job counselor might spend more time with a client (Guul 2018). Second, representative bureaucrats might

collectively pressure the organization to change policies that currently result in disparate outcomes; teachers and administrators might seek to change disciplinary policies that punish some groups of students disproportionately (Roch, Pitts and Navarro 2010). Third, the presence of bureaucrats who passively represent disadvantaged clientele might affect other bureaucrats to change their behaviors, what are termed "contagion effects" (Meier and Capers 2012).[1] As an example, white male teachers appear to take cues from black female teachers on issues of teen pregnancy in Georgia schools (Atkins and Wilkins 2013; in law enforcement see also Li 2021; Meier and Nicholson-Crotty 2006).

Contagion Effects in Representative Bureaucracy

Unlike the many discussions on active and symbolic representation (Bishu and Kennedy 2020; Keiser et al. 2002; Kennedy 2014; Riccucci and Van Ryzin 2017), the theoretical logic behind contagion effects has not been developed even though there is some evidence of contagion effects (in education see Atkins and Wilkins 2013; Meier and Xu 2022; in the judiciary see Kastellec 2011; in law enforcement see Li 2021) and the processes has long been noted (see Meier, Wrinkle and Polinard 1999; Meier and Nicholson-Crotty 2006; Meier and Capers 2012). Empirically, there is also evidence in the literature that nonminority bureaucrats can adopt the role of acting as a minority representative (see Bradbury and Kellough 2008; Selden 1997), and the diversity management literature appears to describe a similar process of influence (Groeneveld and Meier 2022). The contact thesis in psychology (Amik 1969) provides the basic logic for contagion effects and holds that contact between racial groups breaks down

[1] Contagion effects might be considered symbolic representation in that bureaucrats from underrepresented populations do not need to take specific action, but rather other bureaucrats simply respond differently when they are present.

stereotypes and, in the process, facilitates better inter-racial relationships and communication. Essentially the contact thesis argues that behavior (contact between unlike individuals) will change attitudes (inter group relations) and could have a subsequent impact on behaviors that might benefit the organization. The logic is similar to an extensive literature in decision making that contends greater diversity of inputs can improve decisions and thus more diversity can shape the actions of both individuals and organizations (Ashikali and Groeneveld 2015; Lorbiecki and Jack 2000).

Translated to representative bureaucracy, the parallel logic is that increases in passive representation of an underrepresented group will result in greater inter-group contact which should change the values of the bureaucrats involved or result in some of the other bureaucrats adopting representative behaviors. Li (2021), for example, examines what she terms "spillover" effects in law enforcement and finds that white officers working in units with nonwhite officers engage in less discriminatory action in four of eight cases. Meier and Nicholson-Crotty (2006) hypothesize that this could occur in sexual assault cases but do not have the data necessary to a test.

Although the contact thesis was originally designed to study prejudice (Allport 1954) and is subject to a set of favorable conditions (Pettigrew et al. 2011), the logic behind contact is similar to the process of learning where bureaucrats, through interactions with each other, learn about different values, perceptions, and approaches to the job. Virtually all theories of organizational behavior expect new bureaucrats to learn from existing, more experienced bureaucrats; and existing bureaucrats might learn new technical skills from new hires with more recent training. Representative bureaucracy contagion effects might be considered just a special case of how individual bureaucrats learn from each other. The learning process resulting from

contact, in fact, might be different from the value change process theorized by Allport in that behavior changes might not require changes in existing attitudes. A bureaucrat might observe another who gets better results by acting in a different way and adopt that behavior out of self-interest (the desire to perform better or get better results) without changing any underlying prejudicial attitudes. Such a learning process, particularly in organizations composed of science-based professions such as medicine, is likely to be reinforced by organizational socialization (Wilkins and Williams 2008).

Similar to any learning process, greater contact among different groups whether racial, sexual or other characteristics, however, is likely a necessary but not a sufficient condition for contagion effects. What incentives might induce a bureaucrat to learn via contagion effects? First, some bureaucrats might have insight into why some clients respond in dysfunctional ways to interactions with the bureaucracy or how interactions lead to dysfunctional outcomes. A white police officer might observe how a Latinx police officer interacts with a Latinx motorist during a traffic stop in a way that reduces potential conflict (Li 2021). A male bureaucrat might see how a female bureaucrat uses emotional labor to diffuse a tense situation with a client (Guy, Newman and Mastracci 2014). An Anglo teacher might notice that a Latino teacher gets more class participation from Latino students and tries a new approach.

Second, more representative bureaucrats might have better skills in specific areas as the result of more recent training. Minority police officers might have better contacts in minority areas of a city and thus be able to acquire more information to solve crimes. Calderon's (2018) study of immigration enforcement indicates that Latinx officers make fewer arrests of individuals overall but more arrests of individuals with serious criminal records; Li (2021) finds similar results in traffic stops. Health care workers from underserved populations might have common

lived experiences with clients that permit them to provide treatment more effectively (Park 2020). Both factors might demonstrate to bureaucratic colleagues that outcome disparities in terms of race, sex or other factors might be lessened by learning from the behavior of the representative bureaucrat and adopting similar behaviors.

The incentives to learn from other employees to improve one's own performance is reinforced both by the organization and the bureaucrat's personal values. One of the clear growth areas of public administration is the rise of performance management systems that seek to link individual employees to specific outcomes and in the process produce an evaluation of the employee's contribution to the organization (Moynihan 2008). Such systems create an incentive for bureaucrats to improve the numbers that the organization cares about and thus should facilitate learning. Government bureaucrats also have high levels of intrinsic motivation and thus should be interested in learning how to do their jobs better (Langbein 2010). Such incentives to learn from fellow employees are likely then enhanced to the degree that the bureaucrats have more frequent interactions; contagion effects should be more likely for example when police officers patrol in teams rather than as individuals. Regardless of the incentives to learn, an individual bureaucrat needs to decide whether to be open to learning, to "sit it out or dance."

Methods Implications of Contagion Effects

The theoretical arguments above that active representation might result from contagion effects in addition to direct active representation and policy change not only has implication for the theoretical study of representative bureaucracy, but it also suggests a methodological limit in the current literature. If contagion effects exist, they make the estimation of representation effects at the individual level more difficult to discern. The common individual level

comparison, for example, involves examining outputs for female clients who are served by female bureaucrats compared to the outcomes for female clients with male bureaucrats (see Guul 2018; Xu and Meier 2021). In this case, if male bureaucrats represent as the result of contagion effects, it reduces the difference between male and female bureaucrats relative to female client outcomes, and a false negative is possible. Given this potential threat to validity, incorporating contagion effects is extremely important for a full view of representative bureaucracy.

The methodological problem of omitting contagion effects is not fully solved by examining aggregate level data where total outputs or outcomes are related to levels of passive representation.[2] Such analysis will include contagion effects but will not be able to separate them out from active representation by the underrepresented bureaucrats and outcome changes as the result of policy change by the entire organization. To observe if contagion effects exist in representative bureaucracy, one needs to examine the actions of individual bureaucrats not from underrepresented populations as they interact with clientele from underrepresented populations and how that is affected by their contact with passively representative bureaucrats.

Contagion Effects and Hospital Emergency Rooms

Examining contagion effects in representative bureaucracy requires a data set with specific characteristics and a context where theory would suggest that contagion effects would be likely. In terms of data, the study needs data at the *individual level* to match the client with the bureaucrat as well as *aggregate* data to assess the degree of exposure to bureaucrats with a

[2] A small, recent literature seeks to combine both individual and aggregate level measures to assess representation effects that are not the result of a specific underrepresented bureaucrat interacting with a demographically matched client. These indirect effects have been examined in schools for assignments to gifted classes (Nicholson-Crotty, et al. 2016), parent participation in the schools (Vinopal 2018) and test scores (Favero and Molina 2018).

different identity. Confidence in the results would be enhanced if the match-up between bureaucrat and client were not based on pre-selection by the client and thus prior expectations of symbolic representation. Match-up processes that approach random would be ideal (see Guul 2018). In terms of context, theory indicates that representative bureaucracy is more likely to occur in cases where the identity in question is salient and the bureaucrat has the discretion or the ability to influence outcomes (Selden 1997; Keiser et al. 2002).

Based on these methodological and theoretical criteria, hospital emergency rooms and sex differences in heart attack outcomes are a promising public setting for examining contagion effects in representative bureaucracy. Contextually, heart attack outcomes present an interesting case given the fact that heart attacks are the leading cause of death in the United States across all populations (e.g., sex, race, ethnicity), but are more fatal for women than men. One explanation for these disparities is how symptoms manifest differently across the sexes. Chest pain is considered the standard symptom of a heart attack; however, a growing body of literature documents that women experience higher rates of atypical symptoms such as fatigue, abdominal discomfort, cold sweats, or pain in other parts of the body such as the jaw, back, shoulders, or legs (McSweeney et al. 2003; Then, Rankin, and Fofonoff 2001). These symptoms are harder to detect and diagnose than chest pain, meaning that the tendency for hospital systems to discount women and their symptoms may carry over into how these women are treated and contribute to poor outcomes (see Bernstein and Kane 1981; Fassler 2015; Fetters 2018; Greenwood, Carnahan, and Huang 2018; Kent, Patel, and Varela 2012).

Recent evidence suggests that female representation can lower heart attack mortality for women and produce other health benefits such as greater satisfaction and improved process-of-care (e.g., Greenwood, Carnahan, and Huang 2018; McCrea 2021; Roter and Hall 2001). As a

classic example of street-level bureaucrats (Lipsky, pg. 4, 73, 85-86, 138), physicians experience a great deal of discretion over treatment and diagnosis decisions (Harrison 2015; Harrison and McDonald 2008; Hupe and Hill 2007; Lipsky 1980). As such, female physicians have been shown to adopt behavior congruent with a representative role such as longer visits with women, providing more information, recommending gender salient procedures, and showing more attentiveness to women (Flocke and Gilchrist 2005; Franks and Bertakis 2003; Roter and Hall 2001; Roter, Hall, and Aoki 2002).

Unlike many organizational contexts where representation may be jointly determined by bureaucratic (active representation) and client (symbolic representation) factors, the quasi-random assignment between provider and patient in the ER context means that a client's prior-selection, and by consequence, symbolic representation, does not directly drive outcomes (see Greenwood, Carnahan, and Huang 2018; Chang and Obermeyer 2020). Given the information asymmetries that exist in medicine and the technical expertise required to practice it, physician-driven effects should be especially pronounced in this context. As a result, the randomization process may heighten the salience of a sex (mis)match more than other contexts such as education or social welfare where greater selection effects are at-play (e.g., Guul 2018; Nicholson-Crotty et al. 2016). When an administrative system is designed to eliminate identity-congruent matches, it means that 1) representation is a process of chance and 2) mismatched clientele may be treated by bureaucrats that behave in a manner that is, at best, naïve about the unique needs or challenges facing that group or, at worst, biased against them. In other words, *representation only matters if one is exposed to it*. Due to these features of ER care, the sex-matched cases are arguably less interesting theoretically than the mismatched cases due to their potential exposure to bias. As such, representation through contagion effects may provide a

mechanism that socializes men on better and more effective practices in their interactions with women.

Guidance from the healthcare administration literature points to the possibility of contagion effects. Literature suggests that physician learning most commonly occurs when they need to remove uncertainty in their work, resolve specific problems in patient care, or address gaps in knowledge/skill (Slotnick 1999). Consistent with the contagion argument, physicians regularly consult colleagues on ways to better serve their patients and frequently seek out advice (Hoffman and Donaldson 2004; Slotnick 1999; Stok-Koch et al. 2007; Teunissen et al. 2007; Van de Wiel et al. 2011). These learning processes can occur either because a physician actively seeks out information from colleagues or passively observes it while working alongside other physicians. While this work is done independent of any gender considerations, the argument still provides a rationale for contagion because if male physicians regularly interact with female physicians, a larger percentage of female physicians within their unit increases the odds of exposure to gendered ideas of diagnosis and treatment than if they were in more isolated or homogenous units. Relevant to this context is the potential exposure, understanding, and acceptance of sex specific symptoms in heart attacks.

The hospital emergency room and the case of heart attacks also creates strong incentives for physicians to learn and adopt behaviors of other more successful physicians. All hospitals now have performance systems imposed by government regulation, insurance companies, and their own organization. The financial consequences of negative events create significant incentives for the organization and the individual physician to adopt behaviors that minimize such outcomes. These extrinsic incentives should reinforce the basic intrinsic incentives that

physicians have to improve the health outcomes of their patients.[3]

Data and Methods

Data for this study come from the Florida Agency for Healthcare Administration which provides a census of all emergency department visits to Florida ERs between the years 2005-2016. This dataset is a rich source that reports patient outcomes and an extensive array of organizational, patient, physician, and comorbidity-related information. As such, this dataset provides leverage on institutional-level questions, micro-level questions, and of particular importance for an analysis of contagion, interactions across levels of analysis. Descriptive statistics for all individual and organizational-level variables are reported in Table 1.

[Table 1 about here]

Dependent Variable: Heart Attack Mortality

The main patient-level outcome of interest is heart attack mortality. Each case reports an International Classification of Diseases (ICD) diagnosis code which represents the diagnosis chiefly responsible for the services performed during the visit. From 2005-2015 Q3 (i.e. quarter 3), the coding was based off ICD-9, with a heart attack taking the value of 410.XX. The X's represent specific values corresponding to different heart attack classifications. From 2015 Q4-2016, the data switched to the ICD-10 classification system and is based off cases taking the value of I21.XX and I22.XX. Each individual case also reports if a patient survived (e.g., routine discharge, transferred) or expired while receiving treatment. Each case coded as "expired" in the dataset receives a value of 1, other outcomes are coded as 0. A total of 37,186 cases are included in the analysis.

[3] Hospital emergency rooms might also be a case where the incentives to the organization (from fewer patient deaths) are such that organizational socialization reinforces the case for representative bureaucracy rather than mitigates it (Wilkins and Williams 2008).

Table 2 provides information on the yearly number of heart attacks, total mortality rates, and mortality rates disaggregated by sex. From 2005 to 2016, mortality rates decreased in the aggregate and for both women and men. However, the mortality gender gap has remained persistent over the sampling frame, lending credence to the arguments about systematic gender bias in heart attack treatments and outcomes.

[Table 2 about here]

Independent Variables

Corresponding to each individual case in the dataset is a unique physician ID code which provides detailed information on the physician. We also gathered data from the Florida Department of Health's practitioner profile masterfile which provides the name of every current and formerly licensed physician in the state of Florida. The physician names were then matched with the physician IDs in our dataset. In the first round of coding, we focused on cases where there was a clearly gendered English name. Female physicians were coded as 1 and male physicians were coded as 0. Next, we focused on cases where the name was gender ambiguous or non-traditional to the English language. We performed individual internet searches for these physicians and searched medical networking sites, general information sites on healthcare providers such as doximity.com, healthcare4ppl.com, vitals.com, and other comparable sites which allowed us to determine gender pronouns.[4] We include a measure of physician quality to tap into the willingness for a physician to learn. After obtaining information on where the physician received their medical degree, we matched this information with the U.S. News and

[4] The websites will contain language such as "Dr. X earned her (his) medical degree from X university." We were unable to verify gender pronouns for one of these ambiguous cases. We acknowledge that this method of coding is imperfect since it relies on the assumption that one's name is a reflection of their expressed gender identity and that the reporting on these websites is factual and accurate.

World Report Best Global Universities for Clinical Medicine which ranks the quality on over 700 medical schools around the world.[5] The ranking measure is based primarily on research-related factors, and greater exposure to the research side of medicine should provide a pathway for learning and receptivity to new information and research. We also control for two physician factors related to experience. First, we measure each physician's experience with women by counting the cumulative number of female patients treated by the physician up to quarter-year *t-1*.[6] Second, the physician profile on the Florida Department of Health provides information on the year they received their license. We subtracted the year in which the physician received their license from the year of each individual case as a proxy for experience. This measure is logarithmically transformed to adjust for a right skew.

Several important patient characteristics are extracted from the data. First, the sex of every patient is reported. The dataset also provides detail on the type of insurance the patient provided, e.g., private insurance, public insurance (e.g., Medicare and Medicaid), and uninsured. We construct two dummy variables for the analysis. First, is a dummy variable for all patients covered under public insurance options (Medicare and Medicaid). Previous literature suggests that both forms of public insurance can contribute to worse outcomes (Han et al. 2015). The other dummy variable is for uninsured patients. This leaves the omitted category as those insured under private insurance. The data also report the age of each patient (mean age 63). The race of every patient is also reported. A dummy variable is created for all non-white patients. Based on

[5] Appendix 1 provides more detail on the construction of this measure.

[6] One limitation of this measure is that confidentiality provisions prevent determining the temporal ordering of cases within quarter. If a physician treated three patients in one quarter (e.g., two women and one male), we cannot determine the order in which these cases were treated or gauge the time gap between cases.

the categories available, these include Black, Asian, and Indian. Finally, we include a cluster of heart attack comorbidities. These variables allow us to identify the most common comorbidities of a heart attack while simultaneously accounting for the patient's health quality. These include hypertension, tobacco use, diabetes, high cholesterol, a prior heart attack, and obesity.

We gauge representation effects by specifying three different matching dummy variables. For contagion effects, we are most interested in the male physician-female patient match, but we also control for a male physician-male patient match, and a female physician-male patient match. This allows for a direct comparison between the male physician-female patient match, and the omitted category, a female physician-female patient match. Contagion effects are hypothesized to occur when individuals from different groups interact with each other. The main theoretical variable of interest at the organization level, therefore, is the percentage of female attending physicians in each ER for the specific time period—which indicates potential contact between male and female physicians. We assume that male ER physicians who work in units with more female ER physicians will have greater contact with female physicians and, thus, more opportunities to observe differences in treatment. This assumption is likely given that the average hospital has 18 ER physicians; the average ER shift would have three to five physicians who generally work 8-12 hour shifts spread over 4 or 5 time periods (working 3-4 shifts per week). With rotating shifts and scheduling conflicts, this means a given ER physician will work with many different ER physicians over several weeks.

Both our individual-level and aggregate measures of representation are comprised of actors drawn from the same profession and peer group. A professionalism and normative isomorphism logic would suggest that these individuals conform to dominant behaviors in their professional community, observe common ethical principles and norms, provide similar

knowledge-based services, and participate in licensing and accreditation overseen by their professional associations, among other isomorphic pressures (see DiMaggio and Powell 1983; Teodoro 2014). These factors mean that attending physicians communicate in the same professional language which provides an anchor for contagion. If our measure included operating physicians, nurses, and other actors as potential sources of contagion, it would likely be more challenging to detect empirically due to differences in status, professional philosophy, and role (see Groeneveld and Meier 2021; Jones et al. 2018). This measure is constructed by aggregating the number of female ER physicians by hospital quarter-year and dividing by the total number of physicians by quarter-year.

The models also include several hospital-level controls. First, each emergency department within the dataset reports a county FIPS code which was matched with data from the Florida Department of Health which designates whether the county is "rural." Rural context is an important predictor for quality of care, timeliness of care, and rates of utilization (Bennett et al. 2019; Kindermann et al. 2013; Middleton and Burt 2006). Rural status also accounts for variation in human capital between hospitals since rural areas tend to suffer from a "brain drain" and struggle to retain and develop quality personnel (see Groth, House, and Overton 2013; House, Young, and DeRoo 2009). Second, we generate a measure of workload due to unpredictable and volatile ER workflows (Greenwood, Carnahan, and Huang 2019; Levin et al. 2006). Physicians working during times of high workload, for example, may have fewer slack resources, less time for individual clients, and limited discretion which make representation more challenging and costly (McCrea 2022). We construct two dummy variables for whether workload was greater than one standard deviation *above* average for that quarter year and whether workload was greater than one standard deviation *below* average. Third, we capture

institutional access to specialists and expertise through a dummy variable representing teaching hospital affiliation. Fourth, hospital ownership is defined through three dummy variables representing public, private for-profit, and private nonprofit hospitals. Ownership structure is identified as an important factor which shapes managerial priorities, organizational performance, and the availability of specialized or unprofitable services (Horwitz 2005; Johansen and Zhu 2014). Finally, we construct a measure of utilization to capture dynamics of hospital size and scale. This is measured as the logged number of total visits to the ER.

Findings

For our modeling strategy we estimate a series of logistic regression models since heart attack mortality is a limited dependent variable. Because the coefficients of logit models are not directly interpretable, we express all quantities of interest in the manuscript as average marginal effects which provide a straightforward and intuitive interpretation of the effect size. For dichotomous indicators, a unit change in the independent variable predicts a percentage point change in heart attack mortality.

Baseline Effects of Male Physician-Female Patient Matching and Contagion

Model 1 provides a baseline estimate on the effect of a male physician-female patient match. When matched with a male physician, female mortality is 1.5 percentage points higher than if they were matched with a female physician. In other words, the model predicts that the mortality rate for these cases is roughly 20% higher than the sample baseline of 7.5%. The other variable of interest is the percentage of female physicians. The coefficient is statistically insignificant, suggesting there is no direct effect of sex representation on mortality outcomes separate from the sex match of physicians and patients.

[Table 3 about here]

Model 2 tests for contagion effects by specifying an interaction term between the male physician-female patient match and percentage of female physicians. The interaction term indicates that as the percentage of female physicians increases, male physicians improve in their treatment of female patients. The marginal effects plot in Figure 1 provides a graphical representation of this relationship. Once a hospital exceeds ~30% female representation, the substantive effect of a male physician-female patient match is indistinguishable from zero. Since a female physician-female patient match is the omitted category, this suggests that the performance of both male and female physicians converges. In other words, the change in outcomes is consistent with the notion that men's behavior is changing as a function of contagion effects and that sex differences in outcomes are no longer statistically different when the female ER percentage exceeds 30%. An alternative specification with fixed effects for physicians is reported in the appendix.[7]

[Table 4 about here]

The Influence of Contagion on Outcomes for Women with Atypical Symptoms

To better ground these assertations on learning behavior from male physicians, we present an additional model which includes factors indicative of a behavioral change. We do this by including two measures for the patient's primary symptom upon arrival to the ER. If the manifestation of symptoms varies by sex (e.g., McSweeney et al. 2003), then women should

[7] As a robustness check, we estimated an alternative model in the appendix limited to male physicians only so that we can include a fixed effect of each male doctor and control for unmeasured physician characteristics. That model also reports a significant contagion effect that is somewhat smaller than in Table 3 and Figure 1. The fixed effect model, however, makes the unrealistic assumption that male doctors revert to failing to appropriately treat female patients if they move to an ER team with fewer female physicians. Such a pattern would be inconsistent with learning and better fit a prejudice model and as such is not consistent with the actual data generating process.

report different symptoms than men when they arrive at the emergency room. The dataset provides a rare opportunity to measure not only the specific diagnosis the patient received services for (recorded by the hospital post hoc), but also what the patient described as their reason for seeking care. With this latter measure, we can observe patients' most commonly *perceived* symptoms and test if there are any differences in reporting by sex. If male physicians are learning from association with female physicians, then we would expect the improvements in outcomes to be concentrated on patients with atypical symptoms.

[Table 5 about here]

Perhaps unsurprisingly, the most common reason for a visit is some form of chest pain with roughly 56% of the sample reporting that as their primary reason for seeking care (see Table 1). Table 4 reports a difference of means tests for mortality rates. Those that report chest pain as their primary reason for seeking care have a 3% baseline mortality rate, whereas those who do not report chest pain have a baseline mortality rate of 12%. Reporting chest pains generally starts an immediate focus on heart attacks and thus lowers mortality rates via prompt diagnosis and treatment. While reported at a much lower rate, we can also identify sex differences in atypical symptoms such as fatigue, sleep disturbances, shortness of breath, and weakness (McSweeney et al. 2003). The baseline mortality rate for individuals presenting these specified atypical symptoms is 11.4% compared to 7.2% for the reference group. Examining differences in reporting chest pain by sex of the patient in Table 5, we find that men are approximately 9 percentage points more likely to report chest pain than women. For the atypical symptoms, 7% of women report these symptoms compared to 4.7% of men. *If contagion effects produce behavioral changes in men and they learn to respond similarly to their female colleagues, this*

should result in better performance for patients who present these atypical symptoms (as is the case when a female physician provides treatment).

Model 3 specifies a three-way interaction between the male physician-female patient match, percentage of female physicians, and chest pain symptom variable. The model also accounts for those explicitly coded as a heart attack upon arrival, leaving the omitted category as those expressing atypical symptoms. This allows for a direct comparison between chest pain and atypical symptoms. Due to the complexity of a three-way interaction, we rely on Figure 2 which plots how the male physician-female patient match is moderated by the percentage of female physicians in the ER. The plots are separated by symptom type with chest pain reported in the left panel and atypical symptoms in the right panel. In general, greater female representation leads to improvements across both symptom types as predicted by the negative and statistically insignificant coefficient on the three-way interaction term. While there may be negligible differences between symptom types, the physician-patient match within atypical cases matters. Up until female representation exceeds ~20%, there is a statistically significant and positive effect. This indicates that, relative to a *female physician-female patient* match, a *male physician-female patient* match predicts a roughly 3-5 percentage point higher mortality rate. When more than 20% of the male physician's ER colleagues are female, the point estimate is indistinguishable from zero which provides more concrete evidence on the behavioral changes male physicians make contingent on the symptoms presented.

[Table 5 about here]

Who is Susceptible to Contagion Effects? An Exploration of Physician Quality

The second part of the analysis identifies the physicians who are most susceptible to contagion effects. Based on the theoretical expectations derived earlier in the manuscript, we

argue that contagion effects are more likely when a physician is open to learning. One such dimension that could facilitate learning is the quality of training. We operationalize this dimension of learning through a three-way interaction between the physician-patient match, percentage of female MDs, and medical school rank in Model 4. While substantively small, the three-way interaction term is statistically significant and positive, suggesting that physicians from lower ranked medical schools are less receptive to contagion effects.

[Figure 2 about here]

Figure 4 simplifies the complexity of this model specification by plotting how contagion effects moderate the *male physician-female patient* match across different cut points in the physician ranking. Specifically, we plot the marginal effect of a male physician-female patient match across different ranks (25^{th}, 50^{th}, 100^{th}, 250^{th}, 500^{th}) and unranked programs. While the confidence intervals slightly overlap zero in these cases ($p < .1$), we observe a non-trivial positive effect on mortality rates at low levels of contagion regardless of the physician's educational background. These effects still hold substantive importance, with the confidence intervals suggesting that women treated by male physicians may be prone to mortality rates anywhere from 0 to 5 percentage points higher than if they were matched with a female physician. Interestingly, once we move to physicians from the 500^{th} ranked program the negative relationship with contagion begins to disappear. Contagion effects that reduce female mortality occur only for physicians graduating from higher ranked medical schools. These findings provide evidence on the relationship between training quality and contagion effects.

[Figure 3 about here]

Conclusions

Recent years have seen several studies highlight the specific pathways that a representative bureaucracy improves administrative processes and outcomes, perceptions of legitimacy amongst vulnerable populations, and social equity within administrative systems. Among the various direct and indirect pathways, few studies have explored what we call "contagion effects," whereby exposure to bureaucrats from underrepresented populations changes the behavior of other bureaucrats (see Atkins and Wilkins 2013; Li 2021; Gade and Wilkins 2013; Meier and Xu 2022).

Using an analysis of physician-patient sex matching within Florida emergency departments, we make three contributions to the study of contagion effects within representative bureaucracy. First, we demonstrate that male physicians get better results for female patients when they work alongside more female physicians in their unit. According to 2019 national-level estimates from the Association of American Medical Colleges, 28.3% of emergency department physicians are women. Our sample average is 18% women's representation, indicating that the state of Florida lags behind the national average. Interestingly, the benefits of contagion occur within Florida hospitals as they approach the national average of female representation. However, our estimates reveal that only 37 (~17%) hospitals in Florida met or exceeded the national average. At the individual-level, this means that only 8,755 (~25%) patients were treated within hospitals which possessed the capacities where contagion effects would be likely. These trends, combined with the empirical results, should encourage hospital managers to pursue greater gender diversity for several reasons. First, administrators in lagging hospitals should view more representative ERs as a social aspiration of real consequences and that efforts towards diversification are not merely "cheap talk." While recruitment and retention are not explicitly addressed within this research, we believe that the clear performance implications of contagion

reflect its importance across all emergency departments. Due to the random nature of assignment between physician and patient, who one is assigned to can be an important driver of outcomes. Contagion focuses on the mismatched cases and can provide a way for peer-to-peer socialization and training that can complement existing programs on cultural competency and diversity management. As such, looking towards more representative organizations and adopting their practices towards recruiting female physicians is rooted in clear performance and social equity logics.

Second, we find that these contagion effects change the behavior of men as evidenced by their greater propensity to identify and detect atypical symptoms of a heart attack within women. These findings are consistent with a behavioral change due to the extra time, attention, and effort required to diagnose and treat these specific cases; such changes could be independent of any attitude or values changes. Our third contribution is that we identify the type of men susceptible to these contagion influences. Specifically, educational quality may signal a receptiveness to learning necessary for improving outcomes in such a highly demanding and technical area of public service delivery.

Discussion

Public administrators work across organizations with varying levels of client contact. As such, the question of generalizability for this research is important. Returning to the contact thesis, Allport (1954) suggested that positive results were more likely if 1) the two groups were of equal status, 2) they had common goals, 3) cooperative behavior was an advantage, and 4) the results had the support of authorities, law, or custom. The empirical literature is generally supportive of these contentions although not universally (Pettigrew et al. 2011). Although Allport was concerned with prejudice and the change in values rather than learning, the ER case

matches these theoretical characteristics; male and female doctors have generally equal status, both seek to help patients, cooperation is necessary in an ER situation and happens repeatedly over time among ER physicians, and the hospital provides strong incentives for physicians to reduce ER deaths.

Other ER characteristics reinforce the incentives to also alter behavior. The outcomes of the process are highly visible, unlike events with outcomes that might be ambiguous (e.g., interactions in routine services such as employment counseling, welfare checks, or traffic stops). The behavior involved accesses a technical skill, the ability to diagnose from atypical symptoms, not just an attitude (e.g., client deservingness). Organizational incentives to reduce deaths from heart attacks suggest that organizational socialization and other methods of reinforcement will encourage adoption of these contagion effects rather than discourage them (Wilkins and Williams 2008). The average Florida ER has a rotating staff of 18 physicians which means that contact among doctors will be extensive (versus police who often patrol alone or with a single partner).[8] At the same time, the time pressures of an emergency room do not permit time for thoughtful consideration of all alternatives (e.g., in contrast to a decision on providing government grants), but rather place a premium of fast action which mitigates against behavior change. Using the logic of a most similar systems design (King, Keohane, and Verba 1994), representative bureaucracy contagion effects are more likely in organizations where contact is frequent and among equals, the behavior in question is linked to organizational goals that will affect outcomes that the organization will reward or at least not discourage, and outcomes that are highly visible.

[8] In depth case studies of ERs or other organizations could be used to verify the actual degree of contact among bureaucrats to assess the validity of this assumption.

Additional work, however, is needed to determine if these are either necessary or sufficient conditions for contagion effects. Several bureaucratic contexts might serve as cases to determine the context for contagion effects and what the boundary conditions for the behavior might be. First, Li's (2021) innovative study of policing indicates it is a promising context; she found contagion effects in four of her eight cases despite the limited contact among officers spread over multicounty areas of a state and the less consensus around outcomes related to racial profiling. Second, Atkins and Wilkins' (2013) qualitative assessment of teen pregnancy outcomes indicate contagion effects in public schools outside primary educational outcomes; a recent study by Meier and Xu (2022) involving math tests in China also indicates some potential contagion effects. With the rise of performance appraisal systems in education and the generally collegial nature of teaching within a school, we might expect to find representative bureaucracy contagion effects in student performance, student evaluations, and class assignments.

Third, group decision making processes in public organizations such as the determination of contracts, grants, or provision of services appear very similar to US court of appeals decisions where composition of the panel changes judges' behavior (Kastellec 2011). Fourth, network delivery of services where cooperation is needed to generate positive outcomes (e.g., economic development, mental health services, etc.) should also be receptive to contagion effects (Park 2020). Finally, theory suggests that contagion effects are not likely in public programs where the status of groups is unequal (managers v. street level employees), the groups do not have common goals (that is, a zero sum competitive situation where one group benefits if another does not), cooperative behavior is not needed (the bureaucrat can act alone), or the behavior is not supported by the organization, law or custom (organizational socialization supports biased treatment, service delivery is segregated, etc.). Contagion effects might also be less likely in

situations where the outcomes are not as clear cut as in the ER context or the outcomes do not materialize until further into the future. Contagion effects could also have individual level correlates; work could address the types of employees most likely to respond to the presence of underrepresented colleagues in the organization.

An interesting area for further exploration concerns the mechanism of contagion across different bureaucratic identities. Many bureaucracies implement programs across an array of actors with different credentials, roles, and organizational identities, meaning that the potential for contagion could, in theory, extend beyond a single professional category. In our case, what role do nurses play in influencing physician behavior? Despite the reality that the nursing profession is dominated by women and nurses frequently work alongside physicians, there are significant status differences between physician and nurses which likely prevents these types of contagion effects (see Casanova et al. 2007; Greenfield 1999; Mahboube et al. 2019; Matziou et al. 2014). Nonetheless, other public contexts where the actors involved in implementation exhibit less status difference between professional categories may be suitable for not only analyzing contagion within a single professional group, but across them as well.

Future work may also explore if some identities are more effective in facilitating contagion effects than others. Our analysis focuses on sex as a salient characteristic, but questions of representation can theoretically extend to any population which is salient in the political process and faces some form of disadvantage vis-à-vis the status quo. The most prominent identity in this regard is race and ethnicity. In comparison to sex, levels of racial and ethnic representation tend to be lower on average, and lower levels of representation mean intergroup contact is lower and thus the possibility of contagion effects is lower. Actions taken by a bureaucrat who is a racial minority may be less observable if the identity is rare within an

organization. If marginalized bureaucrats are in organizations with few who look like them, this may discourage them from engaging in any advocacy. This reluctance to engage in contacts that permit contagion may be further amplified due to the emotional labor required to shoulder the burden of educating colleagues (Guy, Newman and Mastracci 2014). As individuals often expected to handle a disproportionate share of issues related to diversity, equity, and inclusion, bureaucrats from underrepresented populations in these settings may have the time and resources to tend to *their* cases, but not the cases of their colleagues.

An intersectional approach to race and gender may further illuminate the relationship between contagion effects and equity in organizational outcomes. Intersectional approaches to identity are a growing concern within public administration (Fay et al, 2021; Diggs 2022), with empirical literature documenting how race and gender exhibit distinct, but multiplicative burdens on client processes and outcomes. Black women in particular, face some of the highest levels of discrimination within healthcare and public service delivery more broadly (Mouton et al. 2020). However, Black women comprise only 3% of the physician workforce within the United States (Association of American Medical Colleges n.d.). This reality calls contagion into question as a mechanism to facilitate positive changes in Black women's experiences with healthcare. Despite this lack of representation, two possibilities are relevant for future research. First, does gender representation, particularly amongst white women, spillover onto processes for Black female patients? Second, does racial representation, particularly amongst Black men, provide any type of contagion effect? In both cases, the main issue is if representation on one dimension is enough to offset the bias caused by the other.

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Tables

Table 1: Descriptive Statistics

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Number of Female Patients	37,186	4.683	6.275	0	71
Uninsured Patient	37,186	0.135	0.342	0	1
Patient Mortality	37,186	0.0751	0.263	0	1
Patient Age	37,186	63.68	14.63	11	113
Non-White Patient	37,186	0.159	0.366	0	1
Hypertension	37,186	0.433	0.495	0	1
Tobacco Use	37,186	0.194	0.396	0	1
Heart Disease	37,186	0.136	0.342	0	1
High Cholesterol	37,186	0.132	0.339	0	1
Diabetes	37,186	0.184	0.387	0	1
Heart Failure	37,186	0.0742	0.262	0	1
Prior Heart Attack	37,186	0.0388	0.193	0	1
Obesity	37,186	0.0242	0.154	0	1
Female MD, Male Patient	37,186	0.119	0.323	0	1
Male MD, Female Patient	37,186	0.278	0.448	0	1
Experience (log)	37,156	2.278	0.823	0	3.970
Male MD, Male Patient	37,186	0.538	0.499	0	1
High Workload	37,186	0.166	0.372	0	1
Low Workload	37,186	0.242	0.428	0	1
Chest Pain Symptom	37,186	0.563	0.496	0	1
% Female MD	37,183	18.39	16.95	0	100
Teaching Hospital	37,186	0.287	0.452	0	1
Heart Attack Symptom	37,186	0.231	0.421	0	1
Rural Hospital	37,186	0.368	0.482	0	1
Public Insurance	37,186	0.535	0.499	0	1
Medical School Rank	35,148	463.8	269.5	1	750
Total ER Visits (logged)	37,186	17.26	1.048	10.44	18.32

Table 2: Distribution of Heart Attacks and Mortality Rates by Year and Sex

Year	Total Heart Attacks/ Mortality Rate	Female Heart Attacks/ Female Mortality Rate	Male Heart Attacks/ Male Mortality
2005	2,963 (7.8%)	948 (11.0%)	2,015 (6.4%)
2006	3,028 (7.7%)	953 (11.0%)	2,075 (6.1%)
2007	2,847 (7.2%)	906 (9.4%)	1,941 (6.1%)
2008	2,929 (6.9%)	922 (9.2%)	2,007 (6.0%)
2009	2,626 (8.6%)	903 (11.4%)	1,723 (7.2%)
2010	2,802 (7.6%)	946 (9.4%)	1,856 (6.6%)
2011	2,732 (9.0%)	884 (11.4%)	1,848 (8.0%)
2012	2,820 (8.6%)	1,015 (9.3%)	1,805 (8.1%)
2013	3,055 (8.8%)	1,096 (12.0%)	1,959 (7.1%)
2014	3,358 (7.8%)	1,229 (8.5%)	2,129 (7.4%)
2015	3,894 (6.2%)	1,385 (6.7%)	2,509 (6.0%)
2016	4,132 (5.1%)	1,554 (6.4%)	2,578 (4.3%)

Table 3: Modeling the Impact of a Male Physician-Female Patient Match on Heart Attack Mortality (1) and How it is Moderated by Contagion Effects (2).

VARIABLES	(1) Baseline	(2) Contagion
Male MD, Female Patient	0.243**	0.392***
	(0.106)	(0.125)
% Female MDs	-0.00252	-0.000312
	(0.00187)	(0.00215)
Male MD, Female Patient × Percent of Female MDs		-0.00698**
		(0.00325)
Female MD, Male Patient	0.0120	0.0156
	(0.107)	(0.107)
Male MD, Male Patient	0.0771	0.121
	(0.106)	(0.107)
Med School Rank	-0.000213*	-0.000214*
	(0.000114)	(0.000114)
High ER Intake	0.0124	0.0149
	(0.0579)	(0.0579)
Low ER Intake	-0.0251	-0.0236
	(0.0504)	(0.0503)
Number of Female Patients Treated	-0.0813***	-0.0813***
	(0.0121)	(0.0121)
Public Insurance	0.188***	0.189***
	(0.0650)	(0.0650)
Uninsured	0.665***	0.666***
	(0.0777)	(0.0778)
Years since License (log)	0.120***	0.120***
	(0.0361)	(0.0361)
Patient Age	0.0457***	0.0457***
	(0.00211)	(0.00211)
Non-White	0.186***	0.184***
	(0.0619)	(0.0619)
Hypertension	-0.521***	-0.519***
	(0.0483)	(0.0484)
Tobacco Use	-0.813***	-0.813***
	(0.0844)	(0.0844)
Heart Disease	-0.207***	-0.207***
	(0.0724)	(0.0725)
Cholesterol	-0.898***	-0.898***
	(0.0937)	(0.0937)
Diabetes	-0.00868	-0.00844
	(0.0576)	(0.0576)
Heart Failure	0.155**	0.153**
	(0.0730)	(0.0731)
Prior Heart Attack	-0.0817	-0.0794

	(0.117)	(0.117)
Obesity	-0.284	-0.285
	(0.212)	(0.212)
Nonprofit	0.159**	0.161**
	(0.0660)	(0.0661)
Public	-0.448***	-0.447***
	(0.104)	(0.104)
Rural Hospital	-0.513***	-0.513***
	(0.0699)	(0.0699)
Teaching Hospital	0.506***	0.507***
	(0.0652)	(0.0653)
Total ER Visits (log)	-0.0744	-0.0752
	(0.0940)	(0.0942)
Constant	-4.583***	-4.651***
	(1.372)	(1.374)

Notes: N=35,121; DV= Heart Attack Mortality (0, 1); Logistic Regression; Controls Included; Standard Errors Clustered by Physician; Quarter-Year FE.

Table 4: Differences in Mortality Rate by Chest Pain (1) and Atypical Heart Attack Symptoms (2)

		(1) Chest Pain		(2) Atypical Symptom		
Symptom Type	N	Mean	Difference/CI	N	Mean	Difference/CI
Mortality (0)	16,247	0.14*	.11	33,142	0.07*	-.02
Mortality (1)	20,939	0.03	[.11- .12]	3,372	0.10	[-.03- -.01]

*Statistically significant; two-tailed test; $p < .05$.

Table 5: Sex Differences in Heart Attack Symptom

		(3)		(4)	
		Chest Pain		Atypical Symptoms	
	N	Mean	Difference/ CI	Mean	Difference/ CI
Men	24,445	0.59	.09*	0.08	-.04*
Women	12,741	0.50	[.08- .10]	0.012	[-.05- -.03]

*Statistically significant; two-tailed test; $p < .05$.

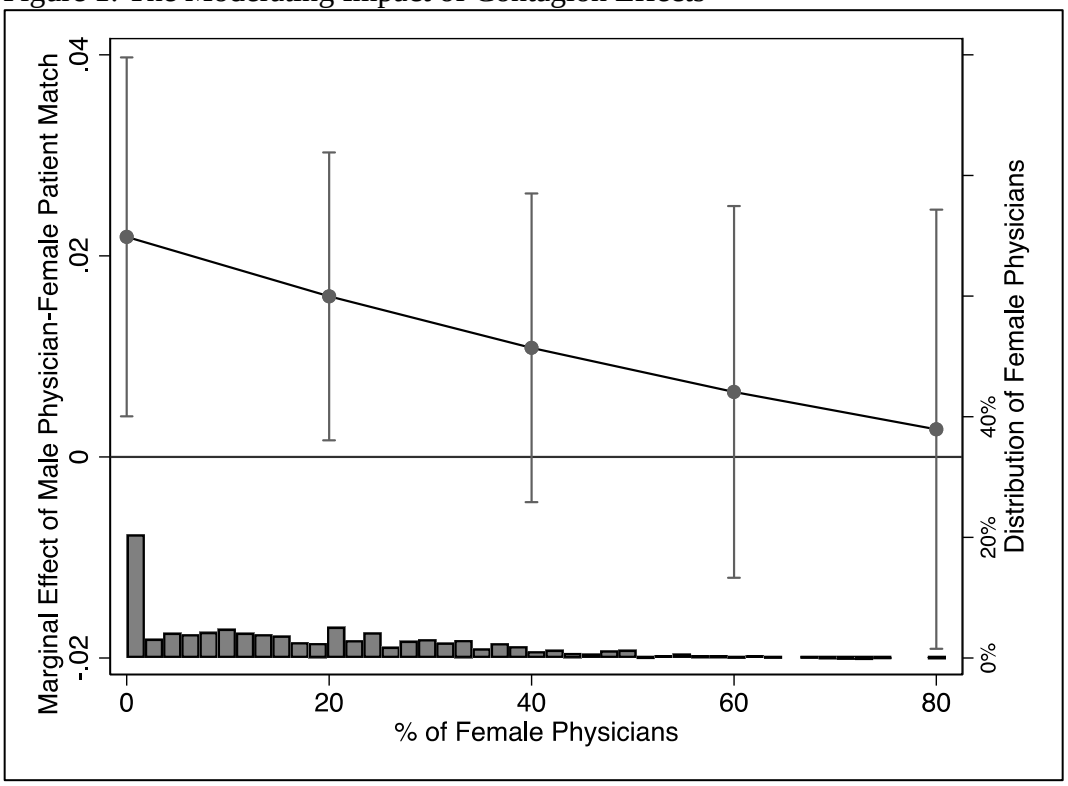
Table 6: How Contagion Effects vary by Symptom (3) and Physician Education Quality (4)

VARIABLES	(3) Symptom	(4) Education
Male MD, Female Patient	0.365***	0.318*
	(0.132)	(0.176)
% Female MDs	-0.000826	-0.00129
	(0.00228)	(0.00391)
Male MD, Female Patient × Percent of Female MDs	-0.00579	-0.0104*
	(0.00372)	(0.00630)
Chest Pain (Symptom)	-1.344***	-1.292***
	(0.112)	(0.0640)
Male MD, Female Patient × Chest Pain	-0.0140	
	(0.163)	
Chest Pain × Percent of Female MDs	0.00356	
	(0.00409)	
Male MD, Female Patient × Percent of Female MDs × Chest Pain	-0.00105	
	(0.00709)	
Male MD, Female Patient × Med School Rank		-0.000108
		(0.000256)
Percent of Female MDs × Med School Rank		-0.00000
		(0.00000)
Male MD, Female Patient × Percent of Female MDs × Med School Rank		0.00002*
		(0.00001)
Heart Attack (Symptom)	0.486***	0.498***
	(0.0629)	(0.0635)
Constant	-5.213***	-5.208***
	(0.271)	(0.278)

Notes: N=35,121; DV= Heart Attack Mortality (0, 1); Logistic Regression; Standard Errors Clustered by Physician; Quarter-Year FE; Controls reported in Appendix 3.

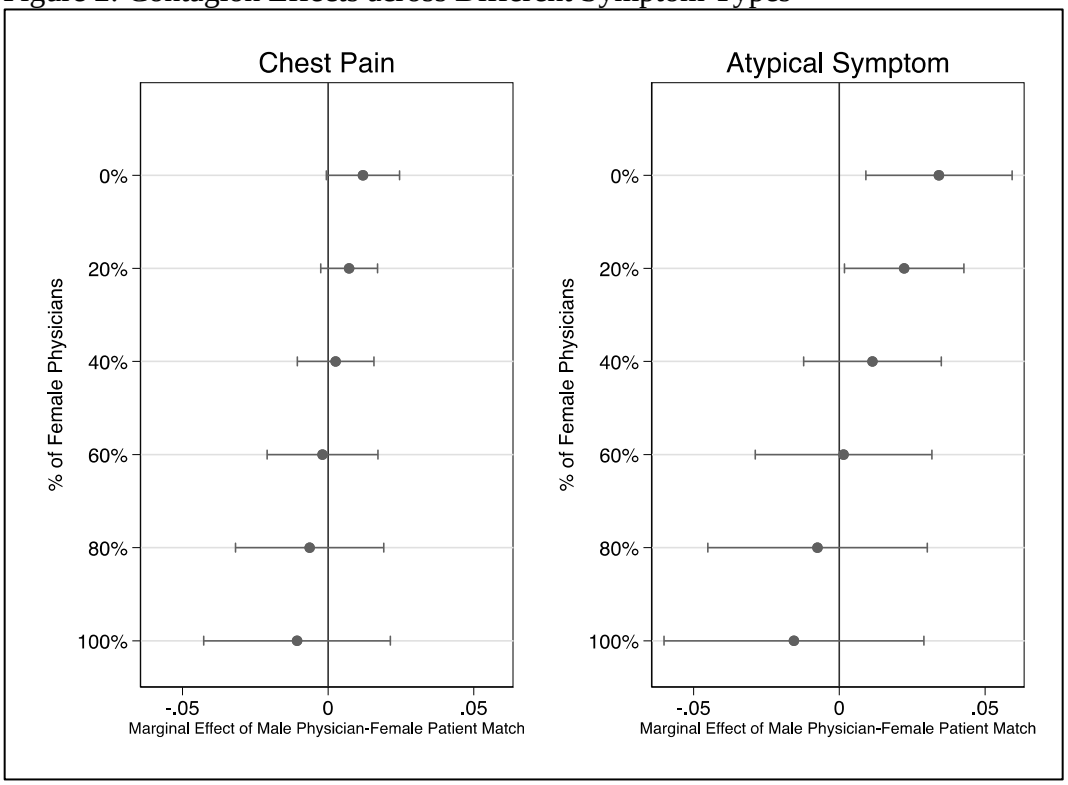
Figures

Figure 1: The Moderating Impact of Contagion Effects



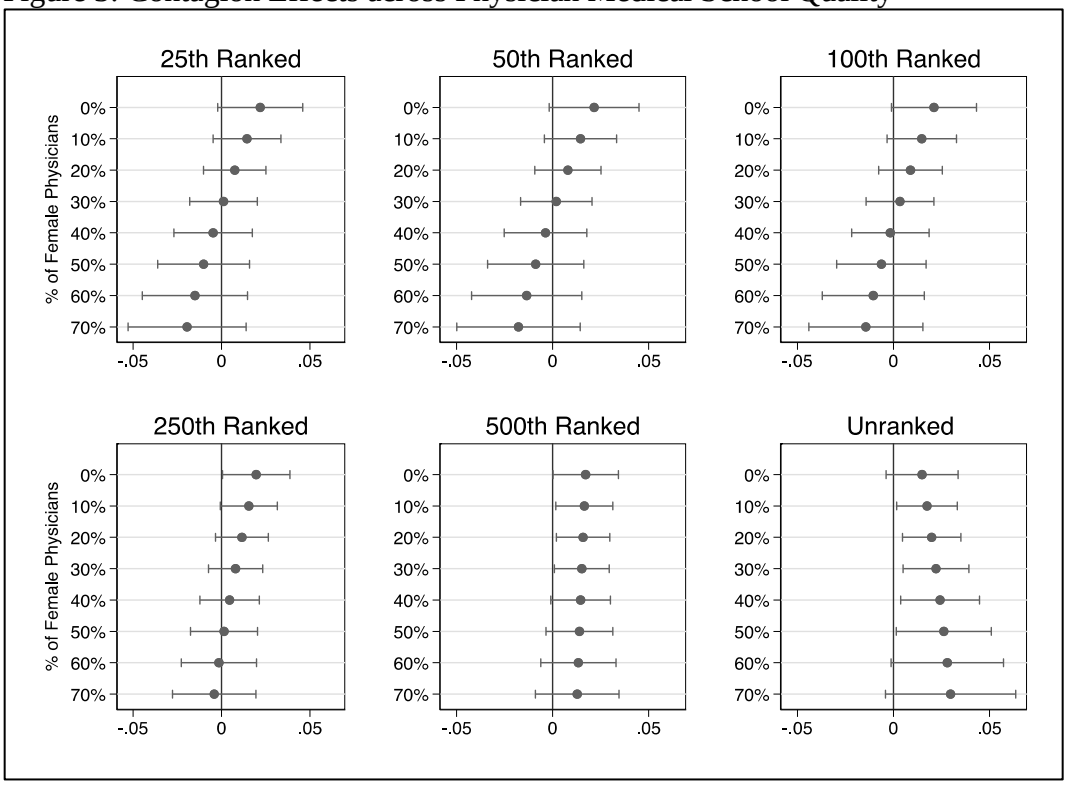
Notes: Reference Category is Female Physician-Male Patient Match; 95% Confidence Intervals; Estimates from Model 2.

Figure 2: Contagion Effects across Different Symptom Types



Notes: 95% Confidence Intervals; Estimates from Model 3.

Figure 3: Contagion Effects across Physician Medical School Quality



Notes: 95% Confidence Intervals; Estimates from Model 4.