Dissertation

Three Essays in Policy Analysis Among Vulnerable Populations

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Abstract

This dissertation focuses on three distinct issues among vulnerable populations using three different methodologies. All three essays make contributions to their respective literature but taken together, the dissertation also provides a blueprint for an approach that uses innovative methodologies to engage with complex issues while also working intimately with and in the communities of interest.

The first essay uses a randomized trial to study religion and caste-based discrimination in healthcare delivery in Bihar, India. Using the novel standardized patient method, I measure the impact of caste and religion on the technical and interpersonal quality of care. By randomly varying how patients present themselves to a provider (which signals their religious or caste identity), I estimate the causal impact of these attributes on the outcomes of interest. I find that Muslims that present with religious indicators (traditional garb, a beard, and eyeliner) report receiving significantly worse technical and interpersonal quality of care. Further, while patients of minority identities do get better care among minority providers, the disparity in care is larger among minority providers when compared to upper-caste Hindu providers. Apart from being the first study to rigorously document this discrimination as a potential cause of population-level disparities, these findings suggest that interventions such as implicit bias training are more likely to reduce disparities as opposed to interventions that encourage patients of minority identities to get care only at minority providers.

The second essay uses a game-theoretic approach to better understand the reasons for non-disclosure by victims of sexual misconduct and how policymakers may be able to improve truth-telling among victims. I do so by developing a theoretical model (and then implementing a computational model) to study social movements

such as the #MeToo movement and the ensuing dynamics. This kind of approach allows for a more holistic understanding of the issue and all the social incentives and disincentives at play as opposed to the more traditional lens of individual psychology. I find that a truth-telling equilibrium can be achieved but is sensitive to factors such as stigma costs and social support. Further, I find that level of initial stigma is less important than the rate at which stigma decreases in engendering truth-telling in the long-run. A virtuous cycle of truth-telling can be started once stigma is lowered to a certain threshold and a second inflection point is achieved when social support reaches a high enough level. Taken together, these results point to prioritizing the reduction of stigma using interventions such as information campaigns to find misconceptions about sexual misconduct like its rarity or the ubiquity of false accusations.

The last essay uses a qualitative approach to engage with an issue that has eluded an effective solution despite decades of study. Using semi-structured interviews with private providers in the states of Karnataka and Bihar in India, we try to better understand the reasons for under-prescription of ORS for child diarrhea. We find that the decision process of prescribing ORS may be a lot more complicated than previously understood. While providers are aware of the importance of ORS in treating diarrhea, they still harbor misconceptions about when the best time to use it is and other misconceptions. Despite being inexpensive, the cost of ORS is also a factor since patients are often poor and prefer to not purchase ORS because they consider antibiotics to be more effective. Financial incentives also play a role in prescription behavior but the exact mechanisms vary. Interventions that are likely to work in improving ORS prescribing will have to involve both the provider and the patient. These could include informational campaigns in the form of short films and posters.

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I believe the primary purpose of the pursuit of knowledge should be to move us ever closer to kindness. I hope that this dissertation is a small step in that direction and for that opportunity, I have only the deepest of gratitude to the universe, the greatest teacher of them all.

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Introduction

In the realm of policy analysis, the term "vulnerable populations" often refers to groups of individuals who are disproportionately at risk due to a variety of socioeconomic and demographic factors. These populations include individuals who are marginalized due to race, religion, socioeconomic status, or health status, among other factors [1]. However, vulnerability extends beyond these factors to include elements such as the availability of social support, access to resources, and the capacity to advocate for oneself [2].

Conducting policy analysis among these populations presents unique challenges. Data availability and quality are often significant issues [3]. Vulnerable populations are frequently underrepresented in data collection efforts, leading to a lack of reliable data to inform policy decisions. Furthermore, these populations may face barriers to participation in research, such as language barriers, mistrust of authorities, or logistical challenges. These barriers can lead to a lack of understanding of the unique needs and experiences of these populations, further exacerbating their vulnerability [4].

The dominant methods used in policy analysis often fail to adequately address these challenges. Traditional policy analysis methods often rely on quantitative data and statistical models that may not capture the complex realities faced by vulnerable populations [5]. These methods can overlook important contextual factors and fail to account for the lived experiences of individuals within these populations. This can lead to a "black box" approach to policy analysis, where the mechanisms linking social factors to outcomes (especially health outcomes) are not adequately explored or understood [6].

Moreover, the failure to address these challenges effectively is not just a method-

ological issue but also a matter of social justice. As argued by Amartya Sen, policies that fail to adequately consider the needs and experiences of vulnerable populations can exacerbate existing inequalities and lead to further marginalization [7]. This is echoed elsewhere too, where researchers argue that health inequalities are not only unfair but also avoidable and that addressing these inequalities requires a focus on the social determinants of health [8].

Given these challenges, it is crucial to adopt a multifaceted approach to tackling problems among vulnerable populations. This approach should include a combination of quantitative and qualitative methods, as well as a focus on participatory research methods that involve members of vulnerable populations in the research process [9]. This approach can help to ensure that the perspectives and experiences of these populations are adequately represented in the policy analysis process. Further, a multifaceted approach can help to identify and address the complex, interrelated factors that contribute to vulnerability. Addressing problems among vulnerable populations often requires interventions at multiple levels, from individual behaviors to social structures and policies [10]. This approach recognizes that health and well-being are influenced by a wide range of factors, from the availability of healthcare services to the conditions in which people are born, grow, live, work, and age.

In this dissertation, I present three papers that attempt to engage with issues among three different populations using three different methods. The first is a randomized trial using the novel standardized patient method to understand the impact of caste and religious identity on healthcare delivery in Bihar, India. This is the first study to document the impact of religion and caste and identity on healthcare delivery using a rigorous causal framework. Moreover, this methodology uses patient actors from within the communities of interest to interact with providers in order to understand the impact of their identities on the kind of healthcare they receive.

These patient actors are involved closely in the development of standardized roles as well. This study is the first to document evidence of discrimination among a vulnerable and historically underserved community in a robust manner while working closely with members of the community.

The second paper uses a game-theoretic approach to understanding the dynamics of the #MeToo movement. Specifically, it tries to understand why victims of sexual misconduct may not come forward and make an accusation and what policy mechanisms can be leveraged to better enable this. The prevailing view takes an almost entirely psychological perspective on understanding reasons for non-disclosure. In contrast, this study tries to situate the victim in the context of a much broader social phenomenon that includes factors such as stigma, societal support, and the process of justice. This study attempts to understand the broader contextual considerations at play to better address the needs of a vulnerable population rather than taking a siloed approach to engage with this important issue.

The third paper in this dissertation attempts to understand the reasons for the under-prescription of oral rehydration salts (ORS) in the treatment of childhood diarrhea in rural India. Diarrhea is one of the leading causes of under-five child mortality [11]. The World Health Organization has tried to improve ORS use for the last three decades with little to moderate success. Despite this effort, ORS continues to be prescribed at lower levels than expected. Moreover, the exact reasons for under-prescription have been difficult to pin down despite years of effort and a recent large-scale randomized trial to understand the same. In this study, we return to the providers that serve the communities of interest to better understand the reasons for under-prescription and what interventions might be able to improve ORS prescription and use. In some senses, it is an attempt to go back to the drawing board via the community after attempts to address this problem using the more conventional toolkit of policy analysis have yielded mixed results for many years.

Chapter 1

Caste And Religion Based Discrimination In Healthcare Delivery: Evidence From India

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Abstract

Despite overall improvements in population health in India, there remain significant differences in health outcomes along caste and religious lines. Due to the lack of rigorous evidence, it is unclear if these differences stem from a lack of access to healthcare or discrimination at the point of care. I use a randomized controlled trial to measure the discrimination faced by patients at the point of care by private healthcare providers in Bihar, India. I use standardized patients (SPs) seeking care for asthma and randomly vary their religious and caste presentation to measure the causal effect of caste and religion on technical and interpersonal quality of care. SPs presenting as Muslims with religious indicators (such as eyeliner, a beard, and skullcap) received technical quality of care scores that were 0.29 standard deviations lower than upper-caste Hindu SPs and interpersonal quality of care scores that were 0.19 standard deviations lower than Hindu SPs. SPs presenting as Muslims without any religious indicators (only a Muslim name) or as Dalit (individuals of a lower-caste or without a caste) also received lower technical quality of care scores than upper-caste Hindu SPs but did not experience significantly worse interpersonal quality of care. I also find that, although minority providers provide better care to all patient types compared to Hindu providers, the disparity in healthcare quality experienced by minority patients was larger among minority providers. These findings suggest that differences in health outcomes among under-served minorities such as Muslims and Dalits are driven, in part, by discrimination at the point of care – often by providers of the same religious or caste identity and interventions such as implicit-bias training could help improve outcomes for these groups.

Introduction

Despite overall improvements in population health, there remain dire inequities along social, cultural, gender, and economic lines in India [12, 13, 14, 15, 16]. A salient axis along which these inequities exist is that of caste and religious identity. They have defined the social structure for centuries and the so-called "lower" castes have been, historically and in the present, socially and economically deprived [17, 18]. Over the last few decades, the state has tried to uplift these sections of society through targeted attempts at affirmative action as well as attempting to build public infrastructure and services catered towards their betterment. Despite these imperfect attempts, the inequities and behaviors that perpetuate them continue to exist.

The macro-level health disparities are well recorded in the Indian context. For instance, official data shows that the infant mortality rate among scheduled castes (SCs), scheduled tribes (STs), and other backward classes (OBCs) are significantly higher than among the general category (GC). Similarly, the neonatal mortality rate, infant mortality rate, and child mortality rate among SCs, STs, and OBCs are also substantially higher than those among the GC [19]. This same trend in outcomes is also evident in access to healthcare. For instance, the percentage that seeks treatment for diarrhea in a health facility is 54.3% in STs and 65% in the GC. While this macro-level data was collected as part of a national standardized survey, similar evidence can also be found in smaller, more targeted studies where respondents report on their own health. A study in the south Indian state of Kerala found that SC/ST women self-reported much higher rates of poor self-perceived health status than those of the GC across age groups[20]. Self-perceived health status is consistently correlated with mortality and morbidity.

While disparities in health based on caste and religion are well documented,

there exists little evidence of the exact drivers that drive these disparities. While these disparities can be driven by differential access to healthcare, another driver of these disparities may also be the discrimination faced by patients at the hands of providers while seeking care. There is a gap in robust quantitative evidence in the literature for discrimination faced directly by individuals from these disenfranchised castes and minority religions and this is the gap that we hope to address in this study. The only such available evidence seems to come from a recent Oxfam survey where respondents self-reported facing discrimination based on their caste or religious identity[21]. In the survey, a third of Muslim respondents reported that they felt discriminated against on the grounds of their religion in a hospital or by a healthcare professional. 22%, 21%, and 15% of respondents belonging to the STs, SCs, and OBCs reported the same. Another qualitative study in Mumbai found that Muslim women reported facing discrimination based on their identity – including denial of treatment, derogatory remarks about being married to Muslim men, and derisive comments on their religious attire (burqa or purdah)[22]. Apart from these two studies, there is a large amount of anecdotal evidence and grey literature on the discrimination faced by individuals of these castes and religions which came to the forefront during both - the coronavirus epidemic [23] and the Spanish flu pandemic of 1918[24]. Nonetheless, there seems to be a paucity of high-quality evidence in the academic literature of the kind of discrimination faced by patients based on their religious and caste identity at the point of care.

In order to study possible discrimination in healthcare delivery, we randomize anonymous standardized patients or SPs (actors pretending to be patients seeking care) with the exact same case to providers while only changing their name and attire. This helps isolate the effect of identity in the procurement of healthcare by patients. Since the evidence for recent years shows a high dependence (80%) on the private sector for outpatient care [25, 26], our sample only consists of private

providers. The SP method has been used extensively in the last few years in the development setting particularly to measure practitioner performance. It has been found to be a valid method since it presents a well-defined incognito case in a clinically accurate and consistent manner to all practitioners[27, 28, 29]. This method has several benefits. First, it ensures that the cases presented in all provider-practitioner interactions are as similar as possible i.e. standardized - which ensures that the parameter of interest can be well-isolated. Second, since we know the exact nature of the illness being presented, we can accurately assess the quality of treatment provided. Finally, there are no concerns about Hawthorne effects because providers are unaware that the visit is being studied.

We find that Muslim SPs with religious indicators reported worse technical quality of care outcomes when compared to the upper-caste Hindu SPs. They were 8.2 percentage points (50%) less likely to receive the correct diagnosis compared to upper-caste Hindu SPs. They were also asked 1.27 ($p<0.01$) fewer key questions about their illness. They also had a consolidated technical quality of care index that was 0.205 standard deviations below the group mean for upper-caste Hindu SPs. Further, they also reported a consolidated interpersonal quality of care index that was 0.188 standard deviations below the index score for upper-caste Hindu SPs. Muslim SPs with religious indicators also reported receiving significantly worse care on some components of the interpersonal quality of care metrics such as "You are given enough time for questions" and "The doctor listens carefully to what you have to say" when compared to Muslim SPs without religious indicators. This disparity in care experienced by minority SPs (SPs other than upper-caste Hindus) compared to upper-caste Hindu SPs is larger during interactions with minority providers. This is the case despite the fact that all SP types receive better care from minority providers.

The extant literature has a few studies that attempt to identify the sources of health inequity in the Indian and global context. In the Indian context, a recent

study found that the disparity in access to a government maternal health benefits scheme is primarily explained by endowment variables and the unexplained portion may be attributed to caste discrimination [30]. But again, the relationship between caste identity and disparities is not established in a causal framework which is what this study attempts to do. Another study in Pakistan finds that marital status and parity seem to influence provider decisions to offer services or counsel on modern methods of contraception[31]. While these are important sources of inequity in the healthcare system, it is unclear if they qualify as "discrimination", and certainly not on the basis of religion or caste. While trying to study the effect of concordance in patients and providers on health disparities, one study in the United States suggests that black doctors could reduce the black-white male gap in cardiovascular mortality by 19% in the United States [32]. Contrary to this, in Bihar, we find the opposite to be the case - while SPs of minority identities do get better care when visiting minority providers, the disparities are larger. While these studies do provide an important understanding of the sources of inequity in healthcare, they are either not in the Indian context or the evidence is not experimental in nature. Assessing the presence of caste and religion-based discrimination in healthcare delivery is an important first step in understanding what policy levers can be used in improving healthcare outcomes for underserved minorities. This study, which is inspired by a study that assessed the discrimination faced by Muslims and Dalits in the rental housing market [33], presents, to the best of my knowledge, the first experimental evidence of discrimination faced by patients on the basis of their caste and religion at the point of care in the Indian context. This discrimination is a possible driver of the health disparities recorded in population health data and the evidence presented in this paper allows us to design effective interventions (such as implicit bias training) to effectively address these inequities.

Setting and Sample

This study takes place in the Indian state of Bihar. Bihar is one of the poorest states in India and is mostly rural. More than half of households (53%) in Bihar have household heads who belong to another backward class (OBC) and nearly one-quarter (24%) belong to a scheduled caste (SC). 4% of household heads belong to a scheduled tribe (ST). About one-fifth (18%) of Bihar's household heads do not belong to a scheduled caste, a scheduled tribe, or another backward class (i.e. are of the upper/general caste). Further, 86% of households in Bihar have a head of household who is Hindu and 14% have a head of household who is Muslim [34]. A population as varied as the one in Bihar tends to have similarly varied healthcare outcomes. For instance, after adjusting for age, gender, and distance to visceral leishmaniasis treatment facility, Mushars (the lowest caste in Bihar) had twice the odds to be 'late presenters' of visceral leishmaniasis (patients who reported having an onset of symptoms $\geq$ 8 weeks before admission) compared to the rest of the castes (OR 2.05, 95% CI: 1.24–2.38). A study also found that SC women in Bihar may be inequitably served by maternal health services, and in some cases may face specific discrimination [35]. I chose the second most populous state in the country and one which is known for its poor health outcomes. Moreover, it is one that is notorious for being plagued by caste and religion-based discrimination in everyday life.

Sampling and recruitment

Our study encompasses three distinct categories of medical facilities where patients in Bihar usually seek care - private clinics, private hospitals, and registered medical practitioners (RMPs). Practitioners who work in private clinics and hospitals

possess a recognized medical degree and are trained in allopathic, homeopathic, or naturopathic medicine. RMPs is a catch-all term for a "disparate group of medical practitioners who have not received formal training in allopathic medicine [36]." Though the majority of RMPs do not have a medical degree, they may possess a degree in another discipline such as Biology or Ayurveda (often earned via correspondence courses). Apprenticeships are a typical way for RMPs to gain experience before establishing their own practice.

I sampled providers from all towns with a population larger than 10,000 but smaller than 150,000. Within a particular town, the survey team identified all eligible private healthcare providers for this study (pharmacies and most specialty clinics were excluded). I then enrolled and surveyed all consenting providers[1]. The team spent 2-3 days in each town ensuring that all possible eligible providers were enrolled in our study resulting in a sample that approximates a census of private providers and RMPs in each town. Of these providers, I sampled 604 across 22 districts to receive a standardized patient visit. The study team was able to complete 594 successful visits.

Table 1 shows the characteristics of the providers in our sample. Most providers were male, 12% had an MBBS (an Indian medical degree), and had 21 years of experience on average. 59% sell medication directly to patients. Providers saw an average of 13 patients per day and charged an average of INR 88.2 ($1 USD) per consultation. 18% of the providers were Muslim and 7% were Dalit.

Study Design

The primary aim of this study is to identify the discrimination faced by individuals based on their caste and religion. In India, caste and religion are usually gleaned

[1]Providers were originally recruited for a different study on diarrhea care

by one's name and when applicable, by the way in which one presents oneself. As such, we designed an intervention that induces random variation in these attributes. We randomly vary SP roles across providers to estimate the effect of the caste and religion of the patient on the healthcare they receive. Table 2 describes the four different SP roles and we describe them in detail below.

Standardized patient design

Each provider received a visit from one of four different SP types. Each SP type introduced themselves by name before the visit begins in order to signal their religion or caste. SPs presenting as *Upper-caste Hindus* had an upper-caste Hindu name and were dressed in a well-ironed shirt and trousers. They introduced themselves by saying *Namaste* (the Hindi salutation most commonly used by Hindus in India). SPs presenting as *Muslims* had a Muslim name and were also dressed in a well-ironed shirt and trousers. SPs presenting as *Muslims with garb* also had a Muslim name (the same as *Muslim* SPs) but in addition, they presented with certain religious indicators such as a skull cap, a beard, and were wearing a *kurta-pyjama*. Both Muslim SPs introduced themselves by saying *Salaam* (the Urdu salutation most commonly used by Muslims in India). SPs presenting as Dalits had a Dalit name and were dressed in a more unkempt manner than the other SPs. This was only because, in the Indian context, caste is often (but not always) very closely correlated with class. Dalit SPs also introduce themselves by saying *Namaste*.

Ten unique enumerators were selected from a larger pool of 16 actors to play the SP roles. Of the ten enumerators, five were Muslims and five were Hindu. The Muslim enumerators played both Muslim roles while the Hindu enumerators played both Hindu roles but the Muslim enumerators did not play either Hindu role and vice versa. This was done to ensure the safety of the enumerators since religion and caste are very sensitive issues in India and if an enumerator was caught

pretending to be someone of a different caste or religion, they may be mistreated. All the SPs presented with an identical case of asthma. This case of asthma was adapted from the cases developed by ISERDD in New Delhi (Institute for Socio-Economic Research on Development and Democracy) for the Quality of Tuberculosis Care (Qutub) Project [37, 38]. They were trained extensively over the week-long training period so that each role was portrayed consistently across actors. This included memorizing answers to common questions (e.g., "when did you last feel breathless?", "how long does an episode of breathlessness last?", or "what were you doing when you last felt breathless?") so that each actor responds similarly for the respective role. **Type-1** randomly assigned the SP role the providers receive (stratified by town) and further, randomly assigned the actors to play each role (within the Muslim and Hindu pools of enumerators). All SPs completed the visit and pay any fees required by the doctor. The standardized nature of the cases presented to the providers helps isolate the effect of caste and religion (and visibility of religion) on healthcare delivery.

Using upper-caste Hindu SPs as the reference, I am able to estimate the causal effect of caste and religion on healthcare outcomes described in the next section. Comparing outcomes of Muslim and Muslim with garb SPs to upper-caste Hindu SPs measures the effect of being Muslim on healthcare outcomes (relative to an upper-caste Hindu patient). Similarly, comparing the outcomes of Dalit SPs to upper-caste Hindu SPs measures the effect of being Dalit on healthcare outcomes (relative to an upper-caste Hindu patient). Finally, comparing outcomes of Muslim with garb SPs to Muslim SPs will measure the effect that is attributable purely to how Muslim patients presents themselves.

Data Collection and Outcomes

Provider Survey

The provider survey was conducted when providers were recruited and enrolled into the study. This survey collected information on provider characteristics (e.g. religion, age, degree, experience) and about the clinic (how many patients visit, whether the facility is rented or owned). Data collected in the provider survey helps us understand our provider population better, allows to control for providers' characteristics in our regression models, and allows us to assess heterogeneity by provider type.

Standardized patient survey

SPs were trained extensively on what to be mindful of during each visit and how to record data about the visit. Within an hour of making the visit, SPs filled out a detailed form administered by a supervisor that documented several aspects of their interaction with the provider. This included the questions asked, physical tests performed, diagnosis given, provider's interpersonal behavior, and prescribed treatment. Within a few hours of the SP visit, a member of the study team returned to the provider to ask them if they "suspected having received a visit from a member of the study team." None of the providers reported receiving any visits from the SPs.

Outcomes

The key outcomes are broadly categorized as technical quality of care and interpersonal quality of care. SPs are surveyed on their interaction with a provider and key outcomes are recorded. I created a technical and interpersonal quality of care in-

dices based on the set of outcomes included in each category. The technical quality of care outcomes include correct diagnosis, number of key questions asked, number of clinical tests performed, and correct treatment. *Correct diagnosis* is coded as 1 if the provider diagnoses the condition as asthma and 0 if the provider diagnoses it as something else or fails to provide a diagnosis. *Number of key questions asked* is a count of the number of questions asked from a list of fourteen questions that are important for the diagnosis and treatment of asthma. These include questions about symptoms, medical history, and ongoing treatment. Similarly, *Number of clinical tests performed* is a count of the number of physical tests asked from a list of six physical tests that are important for the diagnosis and treatment of asthma. These include tests such as auscultation, throat exam, and temperature. *Correct treatment* is coded as 1 if the provider prescribes asthalin (Indian generic medicine with salbutamol as an active ingredient) in any form (tablet, syrup, or inhaler) and 0 if it is not prescribed. In order to construct the index, we implement the mean effects approach [39] which uses the mean of the variables within each outcome after they have been standardized to the control group (upper-caste Hindu SPs).

The interpersonal quality of care outcomes are part of a standardized scale developed to measure patient perceptions of quality in India [40]. SPs respond to eight different statements about their interaction with the provider. The response options vary from "Strongly Agree" to "Strongly Disagree." The questions are "The doctors gave you advice about ways to avoid illness and stay healthy", "The doctor gave you complete information about your illness", "The doctor gave you complete information about your treatment", "The doctor talks politely", "Hospital workers are helpful to you", "The doctor gave you adequate time", "You are given enough time to ask the doctor questions", and "Doctors listen carefully to what you have to say." Just like the technical quality of care outcomes, the interpersonal quality of care outcomes are also standardized and then collapsed into a consolidated scale.

Throughout the paper, we present results for the aggregated scales as well as their individual components.

Empirical Framework

To examine the effect of patient type on the various technical and interpersonal quality of care outcomes, I compare the outcomes between SPs who presented as the different SP types in the study. I estimate the following equation:

$$y_i = \beta_0 + \beta_1 Muslim_i + \beta_2 MuslimGarb_i + \beta_3 Dalit_i + \epsilon_i \quad (1)$$

The unit of observation here is a provider-SP visit. Here, y_i is any of the outcomes described in the previous section. For instance, it could be the number of key questions asked by the provider i to the SP. $Muslim1$ indicates if the SP presented as a Muslim but without religious indicators, $MuslimGarb$ indicates if the SP presented with a Muslim name along with religious indicators, and $Dalit$ indicates if the SP presents as a Dalit. The β terms represent the impact of the respective patient-identity on the outcome relative to upper caste Hindu. I estimate Huber-White robust standard errors. Errors are not clustered as the SP roles are assigned at the provider level with only one visit per provider. The main results are presented in the appendix with errors clustered at the town-level. I also estimate a version of the above equation with a set of control variables including age, sex, work experience, weekly hours worked, and facility ownership.

Next, I hypothesize that the possible discrimination faced by patients might be attenuated when they are treated by a provider of the same caste/religious identity. This hypothesis follows from research in the United States showing how patients being assigned to black doctors could reduce the black-white male gap in cardio-

vascular mortality by 19% in the United States [32]. I try to estimate the effect of a matching provider and SP type on the outcomes of interest. In this case, I collapse the previously mentioned religious identities into a *Minority* identity - if the provider is either a Muslim or Dalit (captured as belonging to the Scheduled Caste or Scheduled Tribes in the provider survey), they are considered to belong to the *Minority* category. Both Muslim type SPs and Dalit SPs are considered to be in the *Minority* category. I estimate the following equation:

$$y_i = \beta_0 + \beta_1 MinoritySP_i + \beta_2 MinorityProvider_i + \beta_3 MinoritySPXMinorityProvider_i + \epsilon_i \quad (2)$$

Here again, the unit of observation here is a provider-SP visit. $MinoritySP$ indicates if the SP was of the *Minority* type and $MinorityProvider$ indicates if the provider was of the *Minority* type. $MinoritySPXMinorityProvider$ is the interaction of these two types. The reference group is a visit by a *non-Minority* SP to a *non-Minority* provider. The β_1 term estimates the disparity in care faced by minority SPs, relative to Hindu SPs, when seeing a Hindu provider. The β_3 term is the difference in the disparity faced by minority SPs when seeing a minority provider rather than a Hindu provider. The β_2 term represents the difference in care outcomes when a Hindu SP visits a minority provider compared to a Hindu provider. I hypothesize that β_1 will be negative and β_3 will be positive, which would imply that minorities face less discrimination when they see a minority provider rather than a Hindu provider. Lastly, I performed subgroup analyses of the above two estimations by provider types.

Results

Effect of caste and religion on technical quality of care

Table 4 shows that when SPs presented as Muslims with garb, they reported worse technical quality of care outcomes compared to upper-caste Hindu SPs. Muslim with garb SPs reported a consolidated technical quality of care metric that was 0.205 standard deviations below upper-caste Hindu SPs. The effect on the index was mostly driven by less correct diagnosis and fewer key questions asked. Muslims with garb SPs were 8.2 percentage points (50%) less likely to receive the correct diagnosis when compared to the upper-caste Hindu SPs (mean=0.16). They were also asked 1.27 fewer key questions about their illness than upper-caste Hindu SPs (mean=7.57). Similarly, Muslim SPs were also asked 1.049 fewer key questions about their illness compared to upper-caste Hindu SPs. The differences in care reported between Muslim and Muslim with garb SPs were not significantly different. Even though Dalit SPs did not have significantly worse outcomes than the upper-caste Hindu SPs, they tended to be directionally worse than those for upper-caste Hindu SPs. Results are similar when I include selected covariates (Table A3).

Effect of caste and religion on interpersonal quality of care

Table 5 shows that when SPs presented as the Muslim with garb type, they reported worse interpersonal quality of care outcomes when compared to the comparison group of upper-caste Hindu SPs (upper-caste Hindus). Muslim with garb SPs rated providers 0.438 standard deviations lower than upper-caste Hindu SPs when answering the question “You are given enough time for questions”, 0.227 standard deviations lower when answering the question “The doctor listens carefully to what

you have to say" (p=0.067), and 0.328 standard deviations lower when answering the question "You are given adequate time with the provider". The difference between Muslim and Muslim with garb SPs' ratings was also significant for the questions "The doctor listens carefully to what you have to say" and "You are given adequate time with the provider". Finally, Muslim with garb SPs also reported a consolidated interpersonal quality of care metric that was 0.188 standard deviations below the group mean for upper-caste Hindu SPs. Results trend in the same direction for Dalit SPs but were not significant. Results are similar when I include selected covariates in table A4 of the appendix.

Effect of concordance between the identity of providers and patients on quality of care

For this part of the analysis, all SPs other than upper-caste Hindus were categorized as "minority" type. Similarly, all non upper-caste Hindu providers were categorized as "minority" types. 20.4% (121) of the interactions in our sample were between minority SPs and minority providers, 55% (327) between minority SPs and Hindu providers, 6.2% between Hindu SPs and minority providers, 18.4% were between Hindu SPs and Hindu providers. Figures 1 and 2 summarize the disparity in care experience by minorities when visiting a minority provider and a Hindu provider as estimated in equation 2. Both show that the disparity in care experienced by minority SPs is larger among minority providers compared to Hindu providers. While this difference in disparity is only suggestive for the technical quality of care index, it is significant for the interpersonal quality of care index. Both minority and Hindu providers get better care at minority providers but the gap is larger among minority providers. These results are also presented in table form in tables A9 and A10 in the appendix.

Subgroup analyses by provider type

For the subgroup analysis, we consider three different types of providers - those with an MBBS (n=80), RMPs (n=285), and AYUSH practitioners(n=229). We find that the results are primarily driven by RMPs and (to a lesser extent) for AYUSH practitioners. While these two categories are not mutually exclusive, RMPs who were AYUSH practitioners were categorized as AYUSH practitioners for this analysis. We reran models 1 and 2 by each provider type. These findings are summarized in figures 3 and 4 respectively. Among RMPs, Muslim with garb SPs received the correct diagnosis 16 percentage points (100%) below the mean of Hindu SPs. They were also asked 1.44 fewer key questions about their illness. Muslim with garb SPs also reported a consolidated technical quality of care index that was 0.210 standard deviations below the group mean for upper-caste Hindu SPs - this is comparable to the results where all provider types were included. Results for AYUSH practitioners and MBBS doctors were directionally the same but comparatively muted in magnitude and significance. Muslim with garb SPs also reported a consolidated interpersonal quality of care metric that was 0.303 standard deviations below the group mean for upper-caste Hindu SPs. They rated providers 0.644 standard deviations lower than upper-caste Hindu SPs when answering the question "You are given enough time with the doctor", and 0.836 standard deviations lower when answering the question "You are given adequate time to ask the provider questions". Interpersonal quality of care outcomes were similarly impacted by SP-type for AYUSH practitioners as well.

Threats to validity

As mentioned in section , in order to ensure the safety of the enumerators, the enumerators were only assigned to play roles of their own religious identity (i.e. Muslim enumerators played the Muslim roles and Hindu actors played the Hindu roles). This means that it is possible that the effects of religion and caste on healthcare outcomes could be driven, at least in part, by the Muslim enumerators playing the role differently than Hindu enumerators in a way that was unrelated to caste or religion since these can't be controlled for because of the study design. To test this, I rerun my models with actor fixed-effects. Ideally, I would have been able to run all the models with actor fixed-effects on the entire dataset but this was not possible since the Muslim roles were played exclusively by Muslim enumerators and the Hindu and Dalit roles were played exclusively by Hindu and Dalit enumerators. Instead, I first subset the data to include only the Muslim roles and run the model with and without actor-fixed effects which allows me to test whether the differences in outcomes between the Muslim roles are being driven by the fixed characteristics of actors (unrelated to their caste or religious identity). I then repeat the process for the Hindu roles. Results are presented in tables A1 and A2 of the appendix. I find that in these models, the effect sizes do not change much when actor-fixed effects are included. Additionally, the R^2 is nearly identical. Therefore, we can be reasonably confident that the effects presented in this study are not driven by confounding introduced by actors presenting the cases differently.

Another possible threat to validity is that the results are driven by perceived class differences rather than caste or religious identity. More specifically, there is a possibility that providers are not discriminating against Muslim with garb SPs based on their identity but, instead, that the religious indicators they present with are a signal of the class status especially since they do report getting the correct

treatment at similar rates. Providers could just be assuming (usually incorrectly) that these SPs are poorer and therefore less educated and consequently get asked fewer key questions or given fewer diagnoses. This is unlikely to be the case because if this were true, we would expect to see a similar level of outcomes among Dalit SPs as well since the incidence of poverty is similar among both communities. A study in Uttar Pradesh (the state adjoining Bihar with which it shares a lot of socioeconomic characteristics) reported that the rural poverty rates for Hindu Dalits and Muslim Dalits was 51.9 and 52.5 respectively [41].

Finally, due to the design of the study, SPs were aware of the fact that they were reporting on discrimination and the Muslim SPs could have been over-reporting discrimination because they were primed to notice it. While this is possible, it is unlikely to be the case. As part of the SP Debrief, SPs were also directly asked if they felt like they were discriminated against on the basis of their caste or religious identity. SPs responded "yes" to this answer after only 11 visits(1.85%). Of these visits, 7 (1.2%) were conducted by minority SPs. Thus, although I find evidence of discrimination in the data, it does not appear that the SPs themselves felt like they were being discriminated against.

Discussion

Religion and caste-based discrimination in India is a social reality faced by millions of her citizens in different facets of their lives. While government healthcare surveys document the disparities in health outcomes across these different minority groups, little work has been done to understand the exact source of these disparities other than a lack of access to healthcare. To my knowledge, this is the first experimental studies to measure discrimination in the provision of healthcare on the basis of religion and caste in the Indian context. Given the standardized patient method

and the developed case [37, 38], we can be confident in the similarity of the cases presented to different providers, and consequently in the reliability and validity of the results.

This study builds on other work that has been done in India to shed light on discrimination in other circumstances [19, 33] and the use of the novel standardized patient method in the healthcare setting [27]. The results clearly show that providers discriminate against Muslim patients on important technical and interpersonal quality of care metrics. Further, results indicate that the discrimination faced by Muslim patients who present with religious indicators is greater which has implications for a country like India where religion occupies a very public space.

Further, our results also indicate that while patients of minority identities do get better care when they are treated by a provider of the same identity, the disparity in care increases significantly since upper-caste Hindus also receive far better care. Finally, we find that the discrimination in technical quality of care is driven primarily by RMPs and AYUSH practitioners. Conversely, we find that the discrimination in interpersonal quality of care is driven by RMPs and MBBS practitioners. This set of results implies that while MBBS practitioners are able to treat patients well by virtue of their education, they may still treat patients poorly in interpersonal terms.

Our study has important limitations as well. First, the study was conducted only in the state of Bihar which means that results may not be generalizable to the rest of the country. Bihar presents a unique landscape in some ways - it is the second most populous state in the country, one of the least developed, and also one where caste and religion are very salient in everyday life. Consequently, given the lack of development and large population, it is an important area of the country to study but because of its unique caste and religious character, results may not be easily generalizable to the rest of the country.

Secondly, due to the sensitive nature of the study, certain measures had to be

taken which compromised the fidelity of the study design. In an ideal setting, we would have had every patient actor play every role in order to eliminate the possibility of actor-specific effects. Unfortunately, due to concerns for safety in case actors were identified while visiting providers and were found to be playing a character of a religious identity different from their own, we had to limit the possible crossovers in roles. Therefore, we cannot completely eliminate the possibility of actor-specific effects in our results. Lastly, the signaling of caste or religious identity in some of the design arms using a salutation and introducing by name are stylized versions of patient-provider interactions. In reality, providers may be less likely to immediately identify the caste or religion of the patient. Consequently, the effects seen can be thought of as close to the largest possible discrimination effects.

Despite these limitations, our results raise relevant policy issues. First, the identification of discrimination in a rigorous way in benign and low-contact time interactions indicates the need for further investigation on this subject. Second, the prevailing reasoning for the disparities in health outcomes is primarily class-based lack of access. Our results indicate that this is an ostensibly insufficient reason for these disparities and religion and caste-based discrimination may play a significant role in explaining disparities even when access to healthcare is available. Finally, our second set of results points to a set of policy recommendations. Since we find significant differences between how Muslim patients with religious indicators are treated from those without, some sort of implicit bias training may help to allay some of these effects. Next, taken together, our results suggest that while the disparity in outcomes does increase when patients are treated by minority providers, minority patients still get better care. This means that minority patients could benefit from receiving care from minority providers. This could be implemented through different means but the easiest could be for the government to set up incentives (cash transfers, rent subsidies, etc.) for minority providers to set up their practice in

minority communities since these communities are usually very segregated in the Indian context.

Tables and figures

Table 1: Provider characteristics

Variables	Providers Interviewed (N=594)
Age	46.9
Male	1.02
Provider has MBBS[1]	0.12
Patients per day	13.4
Years of experience	21.2
Works at other facility	0.09
Beds	1.63
Dispenses medications	0.59
Has electricity	0.98
Consultation Fee[2]	88.2
Provider is Muslim	0.18
Provider is Dalit	0.07

[1]MBBS is a Bachelor of Medicine, Bachelor of Science degree is the medical degree awarded to undergraduates in Indian medical schools

[2]Consultation Fee typically includes any fees paid for medicine for a registered medical practitioner (RMP)

Source: Baseline provider survey

Table 2: Description of Standardized Patient Roles

SP Type	Identity	Presentation	Opening Statement
Upper-caste Hindu (Type-1)	Upper-caste Hindu male	Dressed in a well-ironed shirt and trousers	Namaste doctor. My name is Manoj Sharma. I had some trouble breathing last night
Muslim (Type-2)	Muslim male	Dressed in a well-ironed shirt and trousers	Salaam doctor. My name is Mohammed Salim. I had some trouble breathing last night
Muslim with garb (Type-3)	Muslim male	Dressed in a kurta-pajama, wearing a skull-cap, surma in eyes, and has a beard	Salaam doctor. My name is Mohammed Salim. I had some trouble breathing last night
Dalit (Type-4)	Dalit male	Dressed shabbily in old clothes and with a stubble	Namaste doctor. My name is Vikas Paswan. I had some trouble breathing last night

Table 3: Main outcomes of interactions with standardized patients

Variables	Pooled (N=594)	Upper-caste Hindu (N=158)	Muslim (N=144)	Muslim with garb (N=145)	Dalit (N=147)
Time with provider (minutes)	6.79	7.01	6.85	6.87	6.42
Number of key questions asked[1]	10.2	11.2	9.67	9.23	10.8
Cost of consultation[2]	154.	166.	163.	135.	151.
Number of clinical exams performed[3]	2.48	2.70	2.49	2.34	2.38
Correct diagnosis[4]	0.12	0.16	0.12	0.08	0.13
Number of medicines prescribed	2.55	2.70	2.63	2.48	2.37
Antibiotics prescribed	0.34	0.37	0.35	0.29	0.35
Steroid prescribed	0.16	0.12	0.19	0.19	0.13
Average interpersonal quality of care score (1-5)[5]	3.67	3.75	3.68	3.58	3.67

[1] *Number of key questions asked* is a count of the number of questions asked from a list of fourteen questions that are important for the diagnosis and treatment of asthma.

[2] *Cost of consultation* includes doctor's fees and typically includes any fees paid for medicine for a registered medical practitioner (RMP)

[3] *Number of clinical exams performed* is a count of the number of physical tests asked from a list of six physical tests that are important for the diagnosis and treatment of asthma.

[4] *Correct diagnosis* is coded as 1 if the provider diagnoses the condition as asthma and 0 if the provider diagnoses it as something else or fails to provide a diagnosis.

[5] *Average interpersonal quality of care score* is the average rating of the SP to eight questions about the interpersonal quality of care where 1 is *Strongly disagree* and 5 is *Strongly agree*

Source: Standardized patient debrief survey

Table 4: Effect of caste and religion on technical quality of care

	Consolidated Index	Index components			
	(1)	(2)	(3)	(4)	(5)
	Technical quality of care (std.)	Correct Diagnosis	Key questions asked	Clinical exams conducted	Correct treatment
Muslim	-0.110	-0.033	-1.049***	-0.203	0.036
	(0.072)	(0.040)	(0.337)	(0.234)	(0.044)
Muslim with garb	-0.205***	-0.082**	-1.266***	-0.351	0.000
	(0.072)	(0.037)	(0.352)	(0.228)	(0.042)
Dalit	-0.036	-0.029	-0.270	-0.315	0.066
	(0.072)	(0.040)	(0.330)	(0.227)	(0.045)
Observations	594.00	594.00	594.00	594.00	594.00
R-squared	0.02	0.01	0.03	0.00	0.01
Hindu SP (mean)	.05	.16	7.57	2.7	.16
Muslim-Muslim with garb	0.096	0.049	0.217	0.148	0.036

*** p<0.01, ** p<0.05, * p<0.10

Index components are presented without standardization. Technical Quality of Care Index is an average of the index components after standardization. Reported estimates are unadjusted. Adjusted estimates can be found in the appendix. *Hindu SP (mean)* represents the mean of the standardized patient (SP) comparison group. Muslim-Muslim with garb tests the difference between the two Muslim standardized patient types.

Source: Standardized patient debrief survey

Table 5: Effect of caste and religion on interpersonal quality of care

	Consolidated Index	Index Components							
	(1) Interpersonal quality of care (std.)	(2) Avoid illness and stay healthy (std.)	(3) Info about illness (std.)	(4) Info about treatment (std.)	(5) Talks politely (std.)	(6) Helpful staff (std.)	(7) Enough time for questions (std.)	(8) Listens carefully (std.)	(9) Adequate visit time (std.)
Muslim	-0.054	-0.130	-0.208*	-0.048	0.153	0.122	-0.183	0.011	-0.148
	(0.072)	(0.115)	(0.114)	(0.113)	(0.108)	(0.120)	(0.127)	(0.113)	(0.131)
Muslim with garb	-0.188**	-0.091	-0.155	-0.141	0.119	-0.113	-0.438***	-0.227*	-0.461***
	(0.080)	(0.115)	(0.114)	(0.112)	(0.106)	(0.125)	(0.146)	(0.123)	(0.153)
Dalit	-0.096	-0.108	0.001	-0.042	0.001	-0.067	-0.238*	-0.168	-0.146
	(0.074)	(0.116)	(0.119)	(0.118)	(0.108)	(0.120)	(0.123)	(0.122)	(0.125)
Observations	594.00	594.00	594.00	594.00	594.00	594.00	594.00	594.00	594.00
R-squared	0.01	0.00	0.01	0.00	0.01	0.01	0.02	0.01	0.02
Hindu SP (mean)	0	0	0	0	0	0	0	0	0
Muslim-Muslim with garb	0.134	-0.038	-0.052	0.093	0.034	0.234*	0.255	0.238*	0.312*

*** p<0.01, ** p<0.05, * p<0.10

Index components are standardized from a scale with scores ranging from 1-5. The Interpersonal Quality of Care Index is an average of the standardized index components. Reported estimates are unadjusted. Adjusted estimates can be found in the appendix. *Hindu SP (mean)* represents the mean of the standardized patient (SP) comparison group. Muslim-Muslim with garb tests the difference between the two Muslim standardized patient types.

Source: Standardized patient debrief survey

Figure 1: Disparity in technical quality of care received by Hindu and Minority SPs (Minority SP-Hindu SP) by provider identity

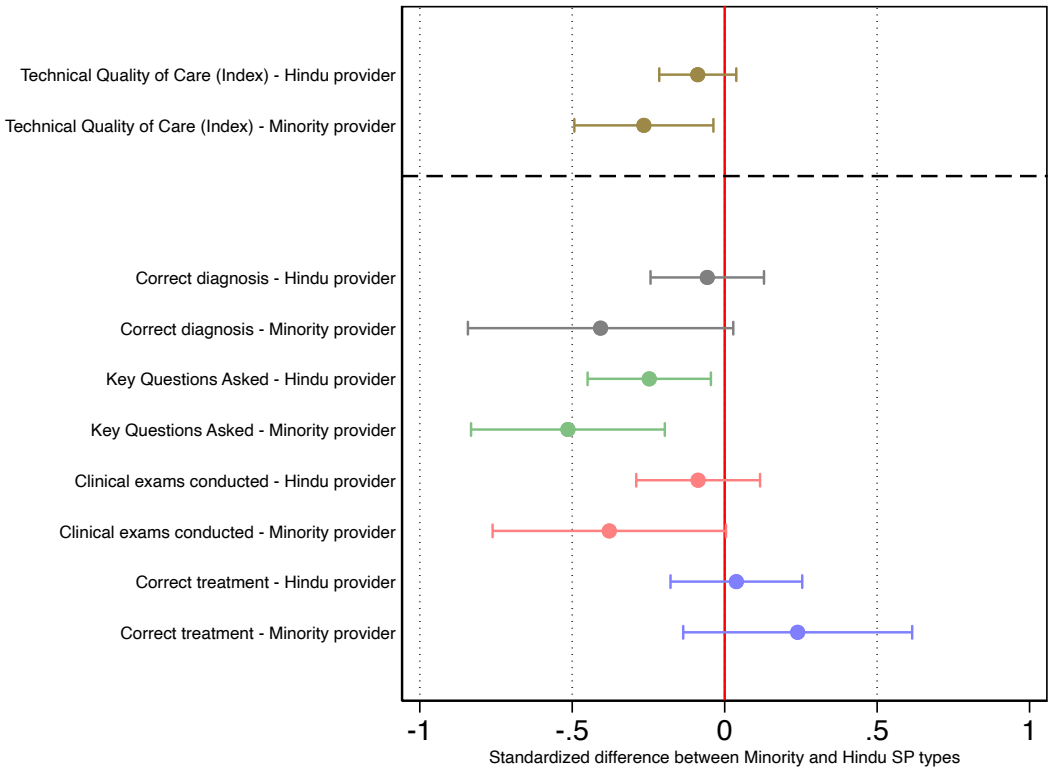


Figure 2: Disparity in interpersonal quality of care received by Hindu and Minority SPs (Minority SP-Hindu SP) by provider identity

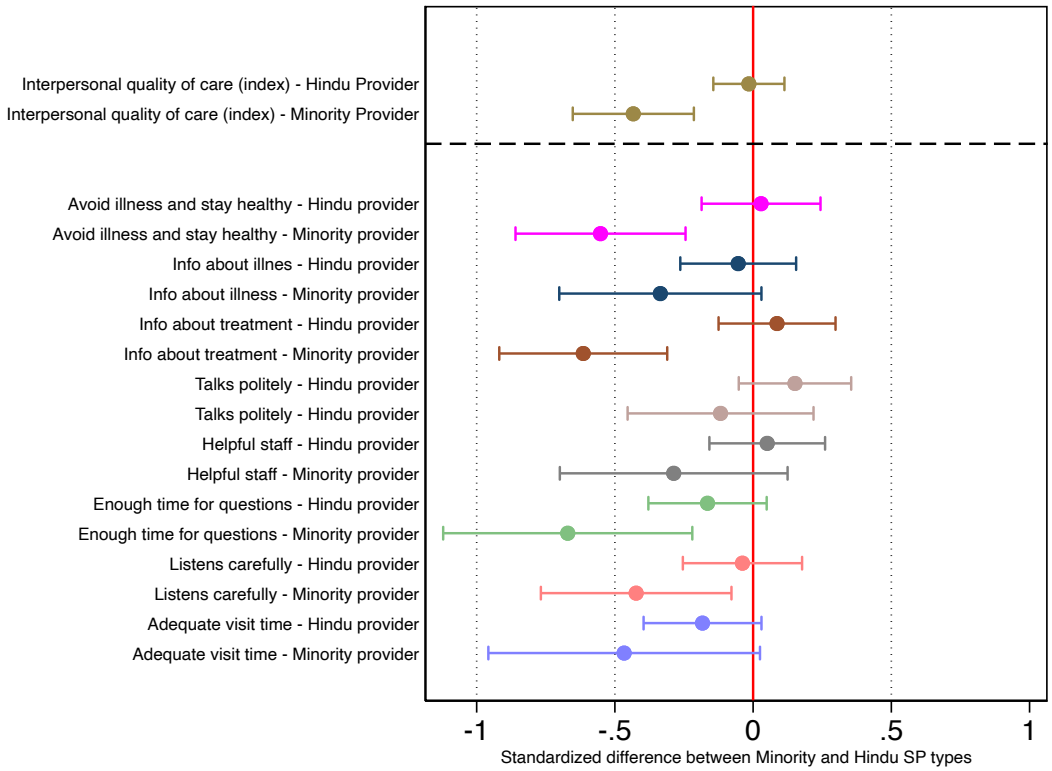


Figure 3: Effect of caste and religion (Muslims with garb) on technical quality of care by provider type

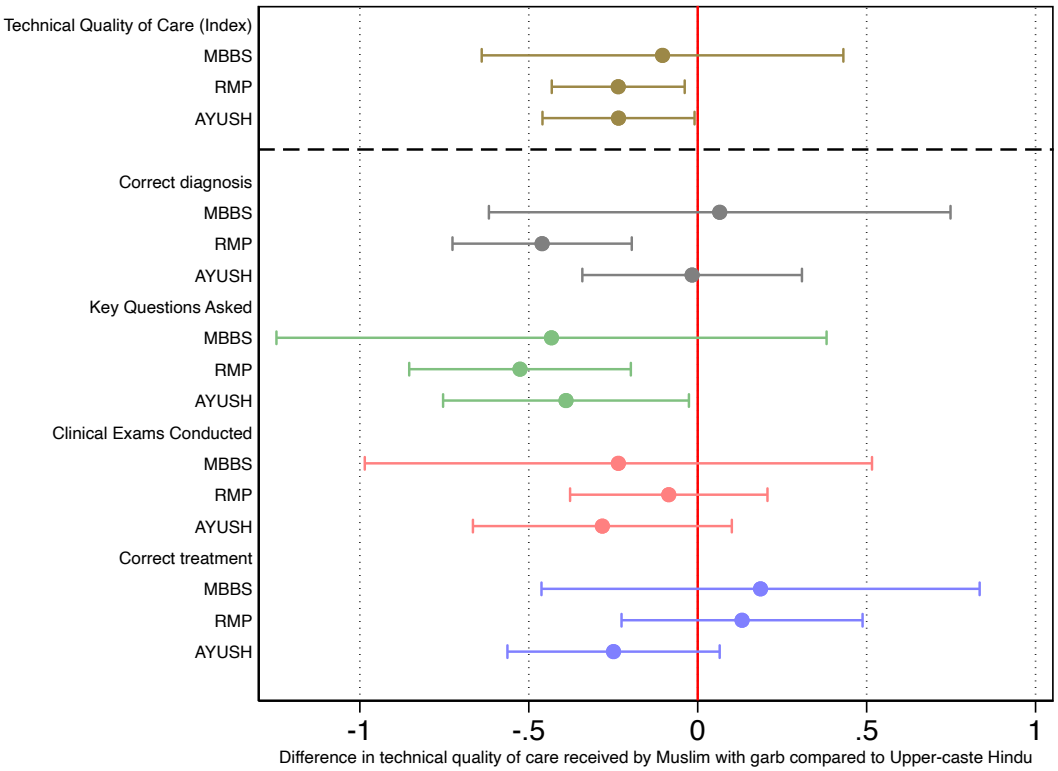
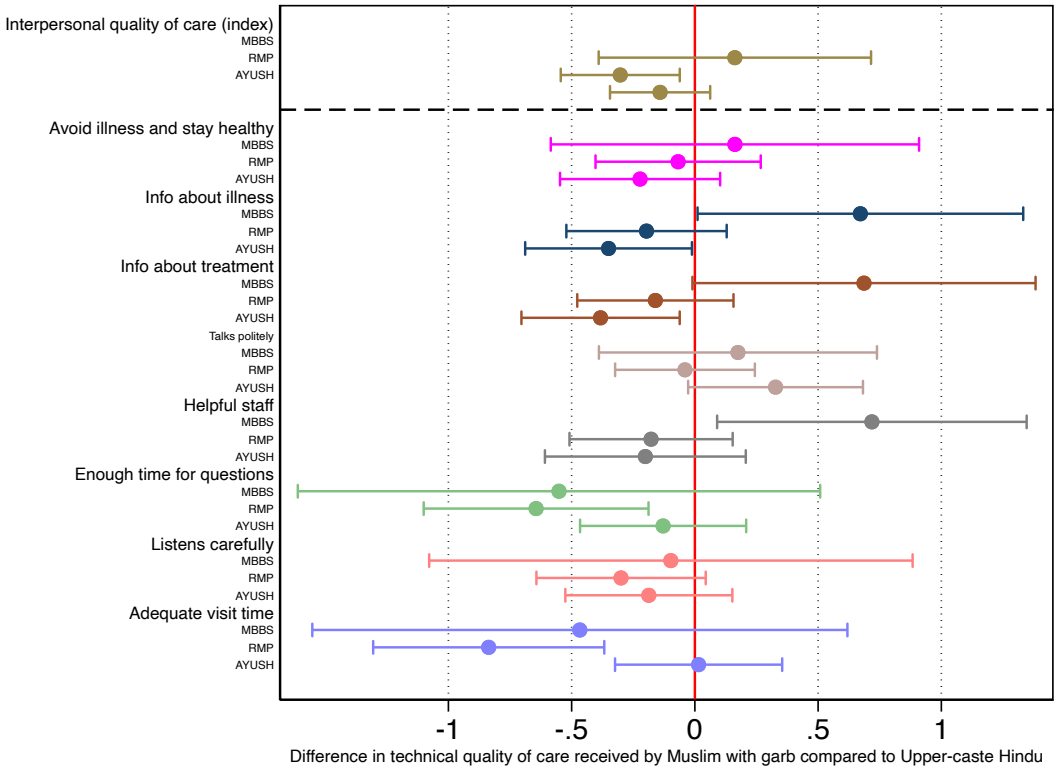


Figure 4: Effect of caste and religion (Muslims with garb) on interpersonal quality of care by provider type



Appendix

Table A1: Impact of caste and religion on technical quality of care with fixed effects

	(1) Technical quality of care(Std.)	(2) Technical quality of care(Std.)	(3) Technical quality of care(Std.)	(4) Technical quality of care(Std.)
Muslim with garb	-0.096	-0.117**		
	(0.076)	(0.032)		
Dalit			-0.036	-0.008
			(0.072)	(0.053)
Observations	289	289	305	305
R-squared	0.01	0.01	0.00	0.00
Muslim SP (mean)	-.06			
Hindu SP (mean)			1	
SP fixed-effects	No	Yes	No	Yes

Note:*** p<0.01, ** p<0.05, * p<0.10

Table A2: Impact of caste and religion on interpersonal quality of care with fixed effects

	(1) Interpersonal quality of care(Std.)	(2) Interpersonal quality of care(Std.)	(3) Interpersonal quality of care(Std.)	(4) Interpersonal quality of care(Std.)
Muslim with garb	-0.134	-0.134*		
	(0.085)	(0.064)		
Dalit			-0.096	-0.072*
			(0.074)	(0.031)
Observations	289	289	305	305
R-squared	0.01	0.01	0.01	0.00
Muslim SP (mean)	-.05			
Hindu SP (mean)			1	
SP fixed-effects	No	Yes	No	Yes

Note:*** p<0.01, ** p<0.05, * p<0.10

Table A3: Impact of caste and religion on technical quality of care (with controls)

	Technical quality of care (Index)		Correct diagnosis (std.)		Key questions asked (std.)		Clinical exams conducted (std.)		Correct treatment (std.)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Muslim	-0.110	-0.119*	-0.092	-0.103	-0.345***	-0.347***	-0.102	-0.143	0.101	0.117
	(0.072)	(0.071)	(0.112)	(0.112)	(0.111)	(0.111)	(0.117)	(0.114)	(0.123)	(0.124)
Muslim with garb	-0.205***	-0.211***	-0.229**	-0.239**	-0.417***	-0.420***	-0.176	-0.187	0.001	-0.000
	(0.072)	(0.072)	(0.102)	(0.102)	(0.116)	(0.116)	(0.114)	(0.113)	(0.117)	(0.119)
Dalit	-0.036	-0.032	-0.081	-0.087	-0.089	-0.086	-0.158	-0.148	0.184	0.191
	(0.072)	(0.072)	(0.112)	(0.112)	(0.109)	(0.109)	(0.114)	(0.112)	(0.126)	(0.126)
Observations	594	594	594	594	594	594	594	594	594	594
R-squared	0.02	0.03	0.01	0.02	0.03	0.04	0.00	0.07	0.01	0.02
Muslim-Muslim with garb	0.096	0.092	0.137	0.135	0.072	0.074	0.074	0.043	0.100	0.118
Selected covariates	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Note:*** p<0.01, ** p<0.05, * p<0.10

Table A4: Impact of caste and religion on interpersonal quality of care (with controls)

	Interpersonal quality of care (Index)		Avoid illness and stay healthy (std.)		Info about illness (std.)		Info about treatment (std.)		Talks politely (std.)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Muslim	-0.054	-0.067	-0.130	-0.113	-0.208*	-0.198*	-0.048	-0.047	0.153	0.129
	(0.072)	(0.072)	(0.115)	(0.116)	(0.114)	(0.113)	(0.113)	(0.113)	(0.108)	(0.106)
Muslim with religious indicators	-0.188**	-0.193**	-0.091	-0.102	-0.155	-0.165	-0.141	-0.156	0.119	0.122
	(0.080)	(0.079)	(0.115)	(0.114)	(0.114)	(0.113)	(0.112)	(0.113)	(0.106)	(0.103)
Dalit	-0.096	-0.097	-0.108	-0.108	0.001	-0.004	-0.042	-0.044	0.001	-0.004
	(0.074)	(0.073)	(0.116)	(0.114)	(0.119)	(0.117)	(0.118)	(0.117)	(0.108)	(0.109)
Observations	594	594	594	594	594	594	594	594	594	594
R-squared	0.01	0.03	0.00	0.02	0.01	0.04	0.00	0.01	0.01	0.04
Muslim-Muslim with religious indicators	0.134	0.127	-0.038	-0.010	-0.052	-0.033	0.093	0.110	0.034	0.007
SP fixed-effects	No	No	No	No	No	No	No	No	No	No
Selected covariates	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

	Helpful staff (std.)		Enough time for questions (std.)		Listens carefully (std.)		Adequate visit time (std.)	
	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Muslim	0.122	0.087	-0.183	-0.218*	0.011	-0.001	-0.148	-0.174
	(0.120)	(0.118)	(0.127)	(0.125)	(0.113)	(0.113)	(0.131)	(0.130)
Muslim with religious indicators	-0.113	-0.084	-0.438***	-0.441***	-0.227*	-0.257**	-0.461***	-0.465***
	(0.125)	(0.122)	(0.146)	(0.145)	(0.123)	(0.123)	(0.153)	(0.151)
Dalit	-0.067	-0.060	-0.238*	-0.245**	-0.168	-0.167	-0.146	-0.144
	(0.120)	(0.119)	(0.123)	(0.121)	(0.122)	(0.121)	(0.125)	(0.123)
Observations	594	594	594	594	594	594	594	594
R-squared	0.01	0.06	0.02	0.04	0.01	0.03	0.02	0.04
Muslim-Muslim with religious indicators	0.234*	0.171	0.255	0.224	0.238*	0.256**	0.312*	0.291*
SP fixed-effects	No	No	No	No	No	No	No	No
Selected covariates	No	Yes	No	Yes	No	Yes	No	Yes

Note:*** p<0.01, ** p<0.05, * p<0.10

Table A5: Impact of caste and religion on technical quality of care (standard errors clustered at town level)

	Technical quality of care(std.)	Correct diagnosis	Key questions asked	Clinical exams conducted	Correct treatment
	(1)	(2)	(3)	(4)	(5)
Muslim	-0.110	-0.033	-1.049***	-0.203	0.036
	(0.073)	(0.039)	(0.333)	(0.207)	(0.045)
Muslim with garb	-0.205***	-0.082**	-1.266***	-0.351*	0.000
	(0.072)	(0.041)	(0.334)	(0.206)	(0.039)
Dalit	-0.036	-0.029	-0.270	-0.315	0.066
	(0.066)	(0.029)	(0.307)	(0.190)	(0.043)
Observations	594.00	594.00	594.00	594.00	594.00
R-squared	0.02	0.01	0.03	0.00	0.01
Hindu SP (mean)	.05	.16	7.57	2.7	.16
Muslim-Muslim with garb	0.096	0.049	0.217	0.148	0.036

Note:*** p<0.01, ** p<0.05, * p<0.10

Table A6: Impact of caste and religion on interpersonal quality of care (standard errors clustered at town level)

	Consolidated Index	Index Components							
	(1) Interpersonal quality of care (std.)	(2) Avoid illness and stay healthy (std.)	(3) Info about illness (std.)	(4) Info about treatment (std.)	(5) Talks politely (std.)	(6) Helpful staff (std.)	(7) Enough time for questions (std.)	(8) Listens carefully (std.)	(9) Adequate visit time (std.)
Muslim	-0.054	-0.130	-0.208**	-0.048	0.153	0.122	-0.183	0.011	-0.148
	(0.074)	(0.113)	(0.100)	(0.106)	(0.104)	(0.100)	(0.119)	(0.116)	(0.135)
Muslim with garb	-0.188**	-0.091	-0.155	-0.141	0.119	-0.113	-0.438***	-0.227*	-0.461***
	(0.080)	(0.102)	(0.098)	(0.113)	(0.105)	(0.119)	(0.141)	(0.119)	(0.155)
Dalit	-0.096	-0.108	0.001	-0.042	0.001	-0.067	-0.238**	-0.168	-0.146
	(0.075)	(0.108)	(0.109)	(0.104)	(0.089)	(0.114)	(0.114)	(0.125)	(0.125)
Observations	594.00	594.00	594.00	594.00	594.00	594.00	594.00	594.00	594.00
R-squared	0.01	0.00	0.01	0.00	0.01	0.01	0.02	0.01	0.02
Hindu SP (mean)	0	0	0	0	0	0	0	0	0
Muslim-Muslim with garb	0.134*	-0.038	-0.052	0.093	0.034	0.234**	0.255*	0.238**	0.312**

Table A7: Impact of caste and religion on technical quality of care (alternate specification of SP-types)

	Technical quality of care (Index)		Correct diagnosis (std.)		Key questions asked (std.)		Clinical exams conducted (std.)		Correct treatment (std.)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Minority	-0.117**	-0.119**	-0.134	-0.142	-0.283***	-0.281***	-0.146	-0.159*	0.096	0.104
	(0.057)	(0.057)	(0.091)	(0.091)	(0.086)	(0.086)	(0.092)	(0.091)	(0.096)	(0.098)
Observations	594	594	594	594	594	594	594	594	594	594
R-squared	0.01	0.02	0.00	0.02	0.02	0.03	0.00	0.07	0.00	0.01
Selected covariates	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Note:***p<0.01, ** p<0.05, * p<0.10

Table A8: Impact of caste and religion on interpersonal quality of care (alternate specification of SP-types)

	Interpersonal quality of care (Index)		Avoid illness and stay healthy (std.)		Info about illness (std.)		Info about treatment (std.)		Talks politely (std.)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Minority	-0.113*	-0.118**	-0.109	-0.108	-0.120	-0.120	-0.077	-0.081	0.090	0.081
	(0.058)	(0.057)	(0.093)	(0.092)	(0.093)	(0.092)	(0.093)	(0.092)	(0.090)	(0.089)
Observations	594	594	594	594	594	594	594	594	594	594
R-squared	0.01	0.02	0.00	0.02	0.00	0.03	0.00	0.01	0.00	0.04
Selected covariates	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

	Helpful staff (std.)		Enough time for questions (std.)		Listens carefully (std.)		Adequate visit time (std.)	
	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Minority	-0.020	-0.019	-0.286***	-0.300***	-0.128	-0.141	-0.251**	-0.258**
	(0.096)	(0.095)	(0.100)	(0.098)	(0.095)	(0.094)	(0.102)	(0.100)
Observations	594	594	594	594	594	594	594	594
R-squared	0.00	0.06	0.01	0.04	0.00	0.02	0.01	0.03
Selected covariates	No	Yes	No	Yes	No	Yes	No	Yes

Note:***p<0.01, ** p<0.05, * p<0.10

Table A9: Impact of matching provider and SP-types on technical quality of care

	Consolidated Index	Index components			
	(1) Technical quality of care (std.)	(2) Correct Diagnosis	(3) Key questions asked	(4) Clinical exams conducted	(5) Correct treatment
Minority SP	-0.085	-0.020	-0.724**	-0.177	0.015
	(0.064)	(0.035)	(0.308)	(0.207)	(0.040)
Minority Provider	0.222**	0.146*	0.844*	0.573	-0.030
	(0.110)	(0.079)	(0.455)	(0.381)	(0.066)
Minority SP × Minority Provider	-0.140	-0.122	-0.594	-0.491	0.079
	(0.132)	(0.087)	(0.572)	(0.441)	(0.080)
Observations	594	594	594	594	594
R-squared	0.01	0.01	0.02	0.01	0.00

Note:***p<0.01, ** p<0.05, * p<0.10

Table A10: Impact of matching provider and SP-types on interpersonal quality of care

	Consolidated Index	Index Components							
	(1) Interpersonal quality of care (std.)	(2) Avoid illness and stay healthy (std.)	(3) Info about illness (std.)	(4) Info about treatment (std.)	(5) Talks politely (std.)	(6) Helpful staff (std.)	(7) Enough time for questions (std.)	(8) Listens carefully (std.)	(9) Adequate visit time (std.)
Muslim Minority SP	-0.013	0.029	-0.053	0.089	0.153	0.063	-0.164	-0.038	-0.182*
	(0.066)	(0.110)	(0.107)	(0.108)	(0.104)	(0.106)	(0.109)	(0.110)	(0.109)
Minority Provider	0.337***	0.424***	0.224	0.598***	0.314*	0.326*	0.296	0.394**	0.117
	(0.095)	(0.154)	(0.182)	(0.149)	(0.169)	(0.197)	(0.197)	(0.163)	(0.215)
Minority SP × Minority Provider	-0.420***	-0.581***	-0.283	-0.704***	-0.271	-0.350	-0.507**	-0.385*	-0.284
	(0.129)	(0.191)	(0.215)	(0.189)	(0.200)	(0.235)	(0.254)	(0.207)	(0.273)
Observations	594	594	594	594	594	594	594	594	594
R-squared	0.02	0.01	0.01	0.02	0.01	0.00	0.02	0.01	0.01

Table A11: Impact of caste and religion on technical quality of care for MBBS doctors

	Technical quality of care(std.)	Correct diagnosis	Key questions asked	Clinical exams conducted	Correct treatment
	(1)	(2)	(3)	(4)	(5)
Muslim	0.258	-0.011	0.023	0.996*	0.201*
	(0.182)	(0.102)	(0.731)	(0.507)	(0.114)
Muslim with religious indicators	-0.158	0.017	-1.650	-0.622	0.063
	(0.270)	(0.127)	(1.224)	(0.756)	(0.120)
Dalit	0.028	-0.041	0.273	-0.545	0.147
	(0.167)	(0.100)	(0.778)	(0.503)	(0.114)
Observations	80	80	80	80	80
R-squared	0.05	0.00	0.05	0.12	0.04
Muslim-Muslim with religious indicators	0.416	-0.029	1.673	1.619**	0.138
Hindu mean	.05	.16	7.57	2.7	.16

Note:*** p<0.01, ** p<0.05, * p<0.10

Table A12: Impact of caste and religion on interpersonal quality of care for MBBS doctors

	Consolidated Index	Index Components							
	(1) Interpersonal quality of care (std.)	(2) Avoid illness and stay healthy (std.)	(3) Info about illness (std.)	(4) Info about treatment (std.)	(5) Talks politely (std.)	(6) Helpful staff (std.)	(7) Enough time for questions (std.)	(8) Listens carefully (std.)	(9) Adequate visit time (std.)
Muslim	0.254	0.381	0.081	0.693**	0.276	0.587**	-0.181	0.304	-0.106
	(0.179)	(0.294)	(0.288)	(0.302)	(0.274)	(0.276)	(0.279)	(0.322)	(0.380)
Muslim with religious indicators	0.162	0.163	0.672**	0.686*	0.175	0.718**	-0.551	-0.097	-0.467
	(0.282)	(0.381)	(0.337)	(0.355)	(0.288)	(0.320)	(0.541)	(0.501)	(0.554)
Dalit	-0.065	-0.201	0.107	0.409	-0.390	0.493	-0.567	-0.199	-0.173
	(0.218)	(0.337)	(0.326)	(0.348)	(0.387)	(0.303)	(0.383)	(0.427)	(0.423)
Observations	80	80	80	80	80	80	80	80	80
R-squared	0.04	0.05	0.05	0.08	0.07	0.08	0.04	0.03	0.01
Muslim-Muslim with religious indicators	0.092	0.219	-0.591*	0.007	0.101	-0.132	0.370	0.401	0.360

Table A13: Impact of caste and religion on technical quality of care for RMPs

	Technical quality of care(std.)	Correct diagnosis	Key questions asked	Clinical exams conducted	Correct treatment
	(1)	(2)	(3)	(4)	(5)
Muslim	-0.192*	-0.097*	-1.604***	-0.445	0.090
	(0.104)	(0.058)	(0.514)	(0.301)	(0.071)
Muslim with religious indicators	-0.210**	-0.165***	-1.439***	-0.110	0.053
	(0.100)	(0.049)	(0.504)	(0.298)	(0.066)
Dalit	-0.062	-0.066	-0.214	-0.243	0.046
	(0.101)	(0.060)	(0.485)	(0.303)	(0.066)
Observations	285	285	285	285	285
R-squared	0.02	0.04	0.05	0.01	0.01
Muslim-Muslim with religious indicators	0.017	0.068	-0.165	-0.335	0.037
Hindu mean	.05	.16	7.57	2.7	.16

Note:*** p<0.01, ** p<0.05, * p<0.10

Table A14: Impact of caste and religion on interpersonal quality of care for RMPs

	Consolidated Index	Index Components							
	(1) Interpersonal quality of care (std.)	(2) Avoid illness and stay healthy (std.)	(3) Info about illness (std.)	(4) Info about treatment (std.)	(5) Talks politely (std.)	(6) Helpful staff (std.)	(7) Enough time for questions (std.)	(8) Listens carefully (std.)	(9) Adequate visit time (std.)
Muslim	-0.170	-0.258	-0.353**	-0.242	-0.036	-0.015	-0.205	-0.022	-0.232
	(0.109)	(0.175)	(0.164)	(0.169)	(0.164)	(0.169)	(0.203)	(0.174)	(0.210)
Muslim with religious indicators	-0.303**	-0.068	-0.196	-0.160	-0.040	-0.178	-0.644***	-0.299*	-0.836***
	(0.123)	(0.171)	(0.166)	(0.162)	(0.145)	(0.169)	(0.233)	(0.175)	(0.239)
Dalit	-0.050	0.003	0.182	-0.036	-0.119	-0.100	-0.193	-0.063	-0.076
	(0.100)	(0.170)	(0.172)	(0.168)	(0.135)	(0.152)	(0.184)	(0.172)	(0.172)
Observations	285	285	285	285	285	285	285	285	285
R-squared	0.03	0.01	0.04	0.01	0.00	0.01	0.03	0.01	0.06
Muslim-Muslim with religious indicators	0.132	-0.190	-0.157	-0.082	0.004	0.162	0.439*	0.278	0.605**

Table A15: Impact of caste and religion on technical quality of care for AYUSH practitioners

	Technical quality of care(std.)	Correct diagnosis	Key questions asked	Clinical exams conducted	Correct treatment
	(1)	(2)	(3)	(4)	(5)
Muslim	-0.179	0.037	-0.934*	-0.548	-0.085
	(0.112)	(0.065)	(0.541)	(0.396)	(0.059)
Muslim with religious indicators	-0.202*	-0.002	-0.962*	-0.488	-0.087
	(0.114)	(0.061)	(0.551)	(0.393)	(0.058)
Dalit	-0.028	0.025	-0.560	-0.339	0.063
	(0.126)	(0.065)	(0.552)	(0.416)	(0.074)
Observations	229	229	229	229	229
R-squared	0.02	0.00	0.02	0.01	0.04
Muslim-Muslim with religious indicators	0.024	0.039	0.027	-0.060	0.002
Hindu mean	.05	.16	7.57	2.7	.16

Note:*** p<0.01, ** p<0.05, * p<0.10

Table A16: Impact of caste and religion on interpersonal quality of care for AYUSH practitioners

	Consolidated Index	Index Components							
	(1) Interpersonal quality of care (std.)	(2) Avoid illness and stay healthy (std.)	(3) Info about illness (std.)	(4) Info about treatment (std.)	(5) Talks politely (std.)	(6) Helpful staff (std.)	(7) Enough time for questions (std.)	(8) Listens carefully (std.)	(9) Adequate visit time (std.)
Muslim	-0.065	-0.215	-0.164	-0.146	0.328*	0.042	-0.188	-0.088	-0.090
	(0.112)	(0.174)	(0.183)	(0.166)	(0.174)	(0.201)	(0.194)	(0.166)	(0.177)
Muslim with religious indicators	-0.141	-0.222	-0.350**	-0.383**	0.327*	-0.201	-0.129	-0.187	0.015
	(0.104)	(0.166)	(0.173)	(0.164)	(0.181)	(0.208)	(0.172)	(0.173)	(0.173)
Dalit	-0.169	-0.219	-0.275	-0.226	0.310*	-0.244	-0.174	-0.294*	-0.228
	(0.124)	(0.172)	(0.186)	(0.180)	(0.176)	(0.217)	(0.173)	(0.178)	(0.193)
Observations	229	229	229	229	229	229	229	229	229
R-squared	0.01	0.01	0.02	0.02	0.03	0.01	0.01	0.01	0.01
Muslim-Muslim with religious indicators	0.076	0.008	0.186	0.237	0.001	0.242	-0.059	0.098	-0.105

Table A17: Impact of matching provider and SP-types on technical quality of care (MBBS Providers)

	Technical quality of care(std.)	Correct diagnosis	Key questions asked	Clinical exams conducted	Correct treatment
	(1)	(2)	(3)	(4)	(5)
Minority SP=1	0.121	0.006	-0.031	0.325	0.113
	(0.143)	(0.066)	(0.705)	(0.497)	(0.098)
Minority Provider=1	0.443	0.444*	1.250	0.861	-0.111
	(0.314)	(0.262)	(0.859)	(0.856)	(0.076)
Minority SP=1 × Minority Provider=1	-0.178	-0.061	-1.275	-1.464	0.220
	(0.463)	(0.315)	(1.515)	(1.034)	(0.188)
Observations	80	80	80	80	80
R-squared	0.04	0.20	0.01	0.02	0.04

Note:***p<0.01, ** p<0.05, * p<0.10

Table A18: Impact of matching provider and SP-types on interpersonal quality of care (MBBS Providers)

	Consolidated Index	Index Components							
	(1) Interpersonal quality of care (std.)	(2) Avoid illness and stay healthy (std.)	(3) Info about illness (std.)	(4) Info about treatment (std.)	(5) Talks politely (std.)	(6) Helpful staff (std.)	(7) Enough time for questions (std.)	(8) Listens carefully (std.)	(9) Adequate visit time (std.)
Minority SP=1	0.305*	0.319	0.266	0.880***	0.039	0.597**	-0.187	0.365	0.162
	(0.179)	(0.306)	(0.286)	(0.296)	(0.224)	(0.272)	(0.299)	(0.356)	(0.354)
Minority Provider=1	0.495**	0.646**	0.317	1.409***	-0.604	0.395	0.352	0.862**	0.585
	(0.210)	(0.310)	(0.479)	(0.311)	(0.986)	(0.419)	(0.407)	(0.405)	(0.447)
Minority SP=1 × Minority Provider=1	-1.122**	-1.160**	-0.227	-1.636***	-0.281	-0.026	-1.338	-2.001**	-2.309**
	(0.444)	(0.511)	(0.630)	(0.529)	(1.146)	(0.475)	(0.838)	(0.790)	(0.909)
Observations	80	80	80	80	80	80	80	80	80
R-squared	0.10	0.04	0.01	0.14	0.09	0.09	0.08	0.10	0.16

Note:***p<0.01, ** p<0.05, * p<0.10

Table A19: Impact of matching provider and SP-types on technical quality of care (RMP Providers)

	Technical quality of care(std.)	Correct diagnosis	Key questions asked	Clinical exams conducted	Correct treatment
	(1)	(2)	(3)	(4)	(5)
Minority SP=1	-0.133	-0.069	-0.919**	-0.270	0.036
	(0.093)	(0.050)	(0.457)	(0.287)	(0.062)
Minority Provider=1	0.162	0.212*	0.609	-0.064	-0.040
	(0.153)	(0.117)	(0.662)	(0.468)	(0.096)
Minority SP=1 × Minority Provider=1	-0.093	-0.166	-0.586	0.051	0.092
	(0.182)	(0.125)	(0.829)	(0.544)	(0.117)
Observations	285	285	285	285	285
R-squared	0.02	0.05	0.02	0.00	0.01

Note:***p<0.01, ** p<0.05, * p<0.10

Table A20: Impact of matching provider and SP-types on interpersonal quality of care (RMP Providers)

	Consolidated Index	Index Components							
	(1) Interpersonal quality of care (std.)	(2) Avoid illness and stay healthy (std.)	(3) Info about illness (std.)	(4) Info about treatment (std.)	(5) Talks politely (std.)	(6) Helpful staff (std.)	(7) Enough time for questions (std.)	(8) Listens carefully (std.)	(9) Adequate visit time (std.)
Minority SP=1	-0.085	0.091	0.037	0.015	0.008	-0.047	-0.258	-0.077	-0.451***
	(0.096)	(0.168)	(0.158)	(0.158)	(0.142)	(0.149)	(0.171)	(0.163)	(0.160)
Minority Provider=1	0.247*	0.433**	0.490**	0.427**	0.422**	0.087	0.150	0.266	-0.298
	(0.136)	(0.216)	(0.242)	(0.215)	(0.163)	(0.243)	(0.322)	(0.258)	(0.340)
Minority SP=1 × Minority Provider=1	-0.340*	-0.711***	-0.577**	-0.589**	-0.307	-0.196	-0.351	-0.226	0.240
	(0.187)	(0.270)	(0.291)	(0.270)	(0.223)	(0.294)	(0.403)	(0.311)	(0.420)
Observations	285	285	285	285	285	285	285	285	285
R-squared	0.02	0.02	0.02	0.02	0.02	0.00	0.02	0.01	0.02

Note:***p<0.01, ** p<0.05, * p<0.10

Table A21: Impact of matching provider and SP-types on technical quality of care (AYUSH Providers)

	Technical quality of care(std.)	Correct diagnosis	Key questions asked	Clinical exams conducted	Correct treatment
	(1)	(2)	(3)	(4)	(5)
Minority SP=1	-0.109	0.026	-0.784	-0.263	-0.042
	(0.111)	(0.060)	(0.520)	(0.350)	(0.061)
Minority Provider=1	0.250	-0.056	1.126	1.578**	-0.002
	(0.181)	(0.090)	(0.753)	(0.661)	(0.115)
Minority SP=1 × Minority Provider=1	-0.134	-0.026	-0.190	-0.891	0.016
	(0.213)	(0.105)	(0.908)	(0.775)	(0.130)
Observations	229	229	229	229	229
R-squared	0.02	0.01	0.03	0.05	0.00

Note:***p<0.01, ** p<0.05, * p<0.10

Table A22: Impact of matching provider and SP-types on interpersonal quality of care (AYUSH Providers)

	Consolidated Index	Index Components							
	(1) Interpersonal quality of care (std.)	(2) Avoid illness and stay healthy (std.)	(3) Info about illness (std.)	(4) Info about treatment (std.)	(5) Talks politely (std.)	(6) Helpful staff (std.)	(7) Enough time for questions (std.)	(8) Listens carefully (std.)	(9) Adequate visit time (std.)
Minority SP=1	-0.061	-0.173	-0.303*	-0.147	0.374**	-0.022	-0.054	-0.157	-0.002
	(0.104)	(0.158)	(0.162)	(0.158)	(0.189)	(0.177)	(0.155)	(0.154)	(0.157)
Minority Provider=1	0.427***	0.344	-0.220	0.569***	0.440*	0.705*	0.537**	0.445**	0.598***
	(0.145)	(0.268)	(0.318)	(0.216)	(0.260)	(0.370)	(0.216)	(0.189)	(0.218)
Minority SP=1 × Minority Provider=1	-0.289	-0.206	0.175	-0.475*	-0.234	-0.505	-0.487*	-0.145	-0.430
	(0.177)	(0.312)	(0.366)	(0.274)	(0.282)	(0.428)	(0.276)	(0.247)	(0.279)
Observations	229	229	229	229	229	229	229	229	229
R-squared	0.04	0.02	0.02	0.03	0.04	0.02	0.02	0.03	0.02

Note:***p<0.01, ** p<0.05, * p<0.10

Chapter 2

#MeToo - Why Now?

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Abstract

In this paper, I model the rise of the #MeToo movement using a stylized game theory model to better understand the reasons why victims of sexual misconduct may choose not to make an accusation and what policy levers are at our disposal to enable them to come forward. First, I build a static model where individuals make a decision to report a case of sexual assault under the uncertain support of society and the perpetrator's decision to challenge the accusation or plead guilty. I find that a truth-telling equilibrium does exist (an equilibrium where victims of an assault make an accusation while non-victims do not) but is sensitive to stigma costs as Ill as the ability of a player to convert effort into success. I then extend our static model to be played multiple times with parameters of interest being updated in a Markovian fashion. I find that the initial level of stigma against victims (costs against victims because of lack of societal support which makes it more difficult to make an accusation) is less important than the rate at which it decreases in determining the long-run evolution of the truth-telling equilibrium. The computational model also provides an account of how a social movement may evolve through a virtuous cycle of victims making accusations after an inflection point is hit once the stigma against victims is low enough. These findings can help policymakers direct resources toward the appropriate levers strategically to enable truth-telling in an effective manner.

Introduction

The #MeToo movement has played an instrumental role in engendering the conversation about sexual violence in the national and global discourse. The movement has mobilized thousands of sexual abuse victims to speak up against perpetrators – both in personal and professional settings [42]. Many victims have made allegations against powerful individuals in public service, the tech and entertainment industry, and academia, and such allegations have resulted in the careers of the accused coming under public scrutiny. The #MeToo movement has revealed the prevalence and extent of under-reporting of sexual misconduct in both private settings as well as the workplace. Many organizations such as Google and the American Economics Association have been under pressure by stakeholders to improve their current procedures. While following procedures can possibly deter further cases of misconduct, data suggests that not reporting is rampant [43]. More than 90% of US government workers who had experienced sexual harassment did not take formal action [44]. While this movement has been timely and necessary, there have been many detractors that have questioned the veracity and timing of the claims of victims but in reality, sexual misconduct remains severely under-reported[45, 46].

Current psychological understanding of this phenomenon posits that victims under-report for reasons that include fear of negative social reactions, lack of perceived available support, minimization and repression of the abuse, and retaliation against the victim among others [47, 48, 49]. While this line of inquiry is important in establishing the reasons for non-disclosure that are most salient from a victim's perspective, it does little to situate them together in the context of a social movement to better understand their interplay and consequently, what policy levers are available to enable the disclosure of misconduct. Many argue that the most strategic approach to social movements was in the advent of resource mobilization theory

where these movements were not studied as isolated events but in a contextual backdrop of conflict[50]. This framework allowed researchers to better study the interaction between insurgents and their opponents – especially more insidious processes like polarization. Eventually, the study of these dynamic processes gave way to a more structural study such as those considering state capacities[51], different players on the inside and outside of the polity, indigenous resources, and political opportunity structures[52]. Three of the major architects of that tradition, which still dominates the study of social movements in the United States, have highlighted defects – a focus on the static rather than the dynamic relationships being the most salient - and called for a more rigorous approach[53]. A properly strategic approach would address each of these lacunae. This paper attempts to fill that gap.

Specifically, this paper seeks to answer the following questions. First, whether it is possible for a truth-telling equilibrium to even exist (an equilibrium where victims make an accusation but non-victims do not) and what factors it is sensitive to using a static model which incorporates factors such as social support and associated stigma costs and the relative ability of a player to convert effort into a win after an accusation is challenged. Next, I try to understand how this equilibrium evolves in the context of a social movement and finally, how such an equilibrium can be achieved in the most effective way. I do this by extending the static model into a Markovian model played over a long time horizon where the parameters of interest evolve based on past outcomes of the static game.

I find that a truth-telling equilibrium can exist but it is sensitive to the probability of societal support and the associated stigma costs and the victim's relative ability to convert effort into a win in court. The computational model shows that the rate at which stigma costs decrease is more important than the level of the stigma in determining how quickly the long-run truth-telling equilibrium is reached. Further, it also provides an understanding of the ontology of this evolution. The

long-run equilibrium is reached through two inflection points. The first is when stigma against the victim falls below a threshold which starts a virtuous cycle of the victim making an accusation whenever there is an assault. The next inflection occurs when the probability of societal support is above a certain threshold. After this point, the victim's ability to convert effort into a win improves, and consequently, almost every time an assault occurs, an accusation is made. Taken together, these results show how policy should tackle the stigma against victims first and then direct resources toward improving their ability to fight accusations in court.

I draw from various facets of the literature to model different aspects of the game. While components of the model used in this paper are developed and analyzed piecemeal in other papers, I attempt to put them together to study the #MeToo movement. To model and solve the information disclosure aspect of the game, I draw on Crawford and Sobel's seminal work on strategic information transmission[54]. Then, to add a layer of temporal complexity, I draw from the literature on endogenous timing games where players choose to make a move in temporally distinct ways – which then gives rise to a leader-follower dynamic[55, 56, 57]. Social movements have also often been studied as behaviors spreading on social networks where it has been shown that the behavior (modeled as a contagion) spreads only if agents have a degree of certainty (above a threshold that depends on how connected the social network is) about the actions of other agents – a dynamic that can be observed in the case of the #MeToo movement as well[58]. Similarly, in our model we find that a virtuous cycle of accusations only start when stigma falls below a certain threshold. The only other game-theoretic attempt at modeling the #MeToo movement available in the literature finds that strategic uncertainty about whether other players report sexual misconduct is a driver of under-reporting [59]. This paper looks at sexual misconduct in the workplace and how agents make a decision to disclose a case of misconduct. It also looks at the effect that disclosure has on manager mentors'

decision to work closely with female colleagues. In contrast, this model abstracts away from the site of the misconduct and instead, focuses on the social aspects at play and the evolution of the movement itself. The game that is outlined in the "Model" section is similar to a kind of two-player asymmetric game with ratio-form success functions - a kind of game where the probability of winning is determined by the ratio of efforts of the two players. I adapt the backward induction method to solve these games to as they pertain to our specific model [60].

This analysis sheds light on under what circumstances some victims may "rationally" choose to remain silent and thus allay some of the potentially unjustified criticism. Further, it identifies key policy levers and the strategy that can be adapted to engender truth-telling writ large. For instance, the comparative statics reveal the importance of a supportive society and the existence of a "goldilocks zone" for this probability of support in determining a victim's decision to remain silent or make an accusation. Further, the computational model shows how it is important to first reduce stigma against the victim below a certain threshold and then improve their ability to convert effort into a win in court. The results not only provide a more rigorous and nuanced understanding of the process and the constraints that a victim considers in their decision-making process but also an alternative lens to view this important public issue, which has traditionally been rather fragmented.

Model

In this section, we present a narrative overview of the model followed by the full technical specification. The model overview suffices for understanding the key components of the model and the results. The model specification describes the more technical details of the modeling process in detail.

Model Overview

To capture the dynamic unfolding of potential assaults and subsequent accusations, we consider two players, the potential accuser (player 1) and a potential accused (player 2). At the start of the game, a random variable determines whether player 2 has assaulted player 1. Player 1 must then decide whether or not to accuse player 2 of assault. This captures both states of the world - where player 1 may choose to be truthful or lie.[2] For the sake of simplicity, we abstract away from the decision of player 2 to commit the assault and instead model it as a random process. If player 1 remains silent, the game ends. However, if player 1 chooses to accuse, then a sequence of events occurs that ultimately determines whether the accuser receives a judgment in their favor. After player 1 chooses to make an accusation, society may either be supportive of player 1 or unsupportive. In general, the probability that society is supportive can depend on whether player 1 is truthful. For example, the case where society always supports a truthful accuser and never supports an untruthful accuser captures the phenomenon where a benevolent society can accurately determine which accusers are truthful and then support them. Another interesting case is when the probability that society supports the truthful type is the same as the probability that they support the untruthful type. This captures the cases where society is completely ignorant of the underlying state of the world. From player 1's perspective, whether society is supportive determines the stigma associated with accusing. When society is supportive, player 1 receives a positive reward for accusing. On the other hand, if society is unsupportive then the accuser incurs a cost due to the negative stigma of accusing. Crucially, player 1 doesn't know whether society will be supportive or not before they accuse and thus must reason under uncertainty about society. Years of research on sexual harassment have shown how

[2]Rape allegations made to police or campus authority are estimated to be false approximately 2% to 10% of the time[61]

the experience itself is varied and complex and consequently, the decision to make an accusation is determined by many factors [62, 63]. We choose to focus on the twin mechanisms of stigma and societal support for two reasons. First, the literature suggests that anticipatory stigma as well as negative social reactions in response to a survivor's disclosure are major factors in determining their help-seeking and attainment process and their consequent likelihood of re-victimization (especially true for female survivors of child sexual abuse) [64]. Conversely, social support (especially through movements such as the #MeToo movement) has been understood to improve reflection on biases among the mass public which can make disclosure easier [65]. Secondly, while we refer to these as stigma and societal support, they can represent any other costs or more specific social settings like the workplace and the management's support for victims of misconduct and the consequent costs accrued to raise a complaint or the impact that disclosure might have on a victim's career. For instance, surveys show that low complaint filing rates for sexual harassment in the workplace can be attributed to the organizational structure. 20% of the victims indicate that they did not report because they did not think anything would be done and 17% thought it would affect their career adversely [66]. The abstraction used in this model allows for adapting these factors to other such contexts.

After an accusation and the realization of society's support, player 2 can choose to either admit guilt or dedicate resources to fighting the accusation. If player 2 admits guilt, the game ends with player 2 receiving a negative reward due to both stigma effects and financial payments. Player 1 receives a positive reward due to achieving a favorable judgment. If player 2 doesn't admit guilt, they must choose how many resources it devotes to fighting the accusation. These resources can represent anything from legal fees to public relations consultants to personal time spent fighting the accusation. From a strategic perspective, these resources shape the probability that the accuser receives justice. That is, the more resources player

2 allocates to fighting the accusation, the less likely player 2 is to achieve justice. However, these resources are costly for player 2 and therefore, they prefer to dedicate fewer resources. The last stage of the game is the determination of justice. Given the amount of resources player 2 allocates to fighting the accusation, a random variable determines whether a "court of justice" (this may be an actual court of justice, the court of public perception, or even an employer firing an accused) rules in favor of the accuser or the accused. This ruling then results in a positive reward for the party receiving the favorable ruling and a cost for the party on the other side. In total, this means that player 1's utility is determined by the support it receives from society and whether it receives justice. Player 2's utility is determined by the result of the ruling and the resources it puts into countering an accusation. Of course, since the model is one of imperfect information, the players will maximize their expected utility and take the expectation over the type of player 1, whether society is supportive and the outcome of the trial.

Model Specification

Player 1

At the start of the game $\omega \in \Omega = \{\omega_1, \omega_2\}$ is drawn and determines whether an assault was commited by player 2. In each branch, player 1 has two strategy options denoted by $a \in A = \{a_1, a_2\}$ which represents player 1's choice to either remain silent or make an accusation. The game ends if player 1 chooses to be silent but if player 1 chooses to accuse, the game continues.

Society

After player 1 chooses to accuse, society reacts by supporting or not supporting them. This is denoted by $s \in S = \{s_1, s_2\}$. Support is conditional on whether the assault has occurred and is denoted by $Pr(s_1|\omega_i)$. Note that this parameter can be tweaked in a way to represent support based on society's beliefs. For instance, in a world where society's belief represents reality, $Pr(s_1|w_1)$=1 and $Pr(s_1|w_2)$=0. What this would mean is that society is more likely to be supportive when it believes that an assault has actually occurred. In a more material sense, society's support consequently determines the stigma that both players are subjected to - which, can be thought of as a relative cost c which is applied to the player that is not supported and can take on a value $c \in C = \{c_1, c_2\}$.

Player 2

Once player 1 makes an accusation, player 2 decides to either choose to admit guilt or dedicate resources to fighting the accusation. As mentioned above, if player 2 admits guilt, the game is over. But if player two does not admit guilt, both players may choose to invest resources x_1 and x_2 into fighting the accusation.

Courts

After the above decisions, the "courts" make a decision $j \in J = \{j_1, j_2\}$ in favor of player 1 or player 2. The probability of a player winning is determined by their relative efforts ($\theta = x_1/x_2$) using a pair of contest success functions. The form of these functions is of the type, $f(\theta) = \sigma\theta/(\sigma\theta + 1)$ where $\sigma > 0$. σ represents player 1's ability to convert effort into the probability of winning relative to player 2. σ is in turn determined by whether the assault has occurred or not.

After the above decisions, the "courts" rule in favor of player 1 or otherwise. This decision is influenced by multiple factors - the effort put in by the accused, societal support (since these decisions can often be influenced by public perception), and whether the assault actually occurred. Consequently, each of these scenarios leads to a different payoff or each player. When the assault occurs (ω_1) and player 1 chooses to not accuse, the payoffs are (a, b) but if the assault does not occur (ω_2), then the payoffs from player 1 not accusing are (c, b) such that $a < c$. If player 1 makes an accusation and player 2 pleads guilty, the payoff is (d, e). This is the case irrespective of whether the assault actually occurs or if society supports the victim. Finally, if society supports player 1 and player 1 wins, the payoff is $(d, e - c_2)$ but if player 2 wins, the payoff is $(a, b - c_2)$. If society does not support player 1 and player 1 wins, the payoff is $(d - c_1, e)$ but if player 2 wins, the payoff is $(a - c_1, b)$ - notice that in this situation, the only difference is that the stigma cost is accrued by player 1 instead of player 2. This configuration of payoffs is independent of whether the assault occurs or not. It is represented in the game tree in figure 1.

Player 1 accuses and player 2 fights if the expected value of profit for player 2 from fighting the accusation is greater than the payoff from pleading guilty and the expected value of profit for player 1 from fighting the accusation is greater than the payoff from not accusing Player 1 accuses and player 2 pleads guilty if the expected value of profit for them from fighting is smaller than the payoff from pleading guilty and the payoff for player 1 from accusing and player 2 pleading guilty is smaller than the payoff from player 1 not accusing There is a symmetric and opposite condition for when an assault does not occur. We characterize the desirable equilibrium as a truth-telling equilibrium where player 1 makes an accusation if there has been an assault and does not make an accusation if there has not been an assault.

Results

Proposition 1: With all parameters other than $\bar{V}_1(\bar{V}_2)$ fixed, there exists a $\bar{V}_1^L < \bar{V}_1{}^H$ ($\bar{V}_2^L < \bar{V}_2{}^H$) such that truth telling equilibrium exists if and only if $\bar{V}_1^L < \bar{V}_1 < \bar{V}_1{}^H$ ($\bar{V}_2^L < \bar{V}_2 < \bar{V}_2{}^H$). The truth-telling equilibrium is defined as one where conditional on an assault occurring, player 1 makes an accusation and conditional on an assault not occurring, player 1 does not make an accusation.

This result is perfect bayesian equilibrium which is found by an application of the method outlined in [60]. The proof is provided in the appendix. The main insight is that the expected payoffs from accusing cannot be either too high nor too low. In other words, the payoffs from coming forward must be high enough that an assaulted player is incentivized to accuse but not so high that a non-assaulted player is deterred from accusing. Specifically, Lemma 1 in the appendix outlines the region where it is optimal to accuse (conditional on an assault occurring). This region must satisfy one of two conditions. The first possible condition is that player 2's expected payoff ($\pi_{\overline{2A}}$) from fighting the accusation [3] is greater than the payoff from pleading guilty and player 1's expected payoff ($\pi_{\overline{1A}}$) from making the accusation is greater than the payoff from not accusing. The other condition is that player 2's expected payoff from fighting the accusation is smaller than the payoff from pleading guilty but player 1's payoff from accusing and player 2 pleading guilty, is smaller than their payoff from not accusing (the latter is considered to be trivially true).

Lemma 2 in the appendix outlines the region where it is optimal to not accuse conditional on an assault not occurring. This region must satisfy one of two conditions - either player 2's expected payoff ($\pi_{\overline{2A}}$) from fighting the accusation is

[3] A player's expected payoff from fighting is their expected winnings minus the effort (cost) that they expend to fight the accusation. The probability of success is a function of σ and effort

greater than the payoff from pleading guilty and player 1's expected payoff ($\pi_{\overline{1A}}$) from making the accusation is smaller than the payoff from not accusing *or* player 2's expected payoff from fighting the accusation is smaller than the payoff from pleading guilty but player 1's payoff from not accusing and player 2 pleading guilty, is smaller than their payoff from not accusing (the latter of which we consider to be true by assumption).

From Lemma 1 and 2, we find that this truth-telling region exists and is bounded. This region is visualized in fig 2. The blue ($\pi_{2A} = e$) and red ($\pi_{1A} = a$) lines represent the bounds of the regions where player 1 makes an accusation and player 2 fights (to the left of the zero of $\pi_{2A} = e$) or pleads guilty (to the right of the zero of $\pi_{2A} = e$). These represent the ways in which player 1 might make an accusation conditional on an assault occurring. When no assault occurs, player 1's choice to make an accusation is mapped by the green line (to the left of the zero of $\pi_{\overline{1A}} = c$ player 1 chooses to not make an accusation) and player 2's decision to fight is mapped by the brown line (to the left of the zero of $\pi_{\overline{2A}} = e$). The light blue region on the x-axis is the region of expected payoffs for player 1 ($\overline{V_1}$) that represent the truth-telling equilibrium. In this region, the equilibrium is defined as one where, conditional on assault, Player 1 makes an accusation and Player 2 fights and conditional on an assault not occurring, Player 1 does not make an accusation and Player 2's sub-game perfect Nash equilibrium strategy specifies that they fight.

Proposition 2: There exists a $\bar{p_s}$ and $\bar{c_2}$ such that for any probability of social support and stigma against player 2 below $\bar{p_s}$ and $\bar{c_2}$, the derivative of $\bar{V}_1^H - \bar{V}_1^L$ with respect to p_s and c_2 is positive while above $\bar{p_s}$ and $\bar{c_2}$, it is negative.

The above proposition implies that while the truth-telling equilibrium does exist, it is sensitive to stigma costs against player 2 and the probability of societal support

for the victim. The region in which truth-telling can occur is a narrow zone - to the left and right of this area, there is either no incentive to make an accusation or an incentive to make an accusation independent of whether an assault has actually occurred. When stigma costs against a potential perpetrator are too low, there is less of an incentive for a victim of sexual misconduct to make an accusation since they still accrue costs and some stigma while going through the process. An increase in these stigma costs (like in the wake of the #MeToo movement), creates an increased incentive for a victim to make an accusation but if the stigma costs were to increase beyond a certain point, it could lead to individuals making wrongful accusations, especially since an alleged perpetrator would often just plead guilty due to these increased stigma costs. The probability of societal support has a similar effect on the likelihood of truth-telling as well but because victims are more likely to be able to incur the costs of a court battle since stigma costs are lower.

More specifically, in this model, as the probability of societal support and the stigma cost to player 2 approach zero, the equilibrium region shrinks and finally disappears. The equilibrium can disappear again even at the other extreme indicating a "goldilocks-zone" where the truth-telling equilibrium is preserved (but, by no means does that mean status quo is there yet). Further, not only is the stigma cost to player 2 an important factor, but its impact on the existence of the equilibrium region varies based on player 2's payoff (between winning and losing). A large payoff can disrupt the equilibrium and stigma costs have to move in tandem to maintain the equilibrium. The dissolution of the truth-telling equilibrium is represented in figure 3 where stigma costs to player 2 are too high. This results in there not being a region of overlap because player 2's expected value of profit from fighting the accusation is no longer greater than the payoff from pleading guilty and therefore is no longer sub-game perfect. In this model, we assume that $\sigma_A > \sigma_{\overline{A}}$ (i.e. player 1's ability to convert effort into probability of success is higher when an assault occurs

than when it does not occur). We assume this to be true since it is usually easier to prove that an assault occurred when it did rather than when it did not. As σ_A increases, $\bar{V}_1^L$ decreases which, in turn, broadens the equilibrium region. This is because an increase in σ_A denotes an increase in the probability of converting effort into a favorable judgment in court for player 1 relative to player 2 when an assault has occurred. Consequently, since it is easier to "win" a case, player 1 is willing to make an accusation for an even lower expected payoff. Finally, the equilibrium widens when player 2's expected payoff from fighting in the no-assault case is large. This is because it disincentivizes an untruthful accusation in the case of no assault.

Computational Model - Description

We extend our results further by adapting the previously described static-model into a Markovian model played over a long time horizon (5,000 time-steps) where the parameters of interest evolve conditional on past realizations. The results allow us to tell a more detailed story of how the long-run equilibrium of interest (truth-telling) equilibrium evolves. Further, it also allows for a more robust understanding of which policy levers matter most in achieving a truth-telling equilibrium in the long-run.

The parameters that evolve over time include *stigma against player 1 (c_1)*, *stigma against player 2 (c_2)*, *Probability of support for player 1(p_s)*, and *player 1's ability to convert effort into the probability of success* (σ). These parameters update as a function of four different outcomes - whether an Assault occurred, whether Player 1 made an accusation, whether Player 2 fought the accusation (or pleaded guilty), whether Player 1 received justice (the court ruling in their favor) when Player 2 chooses to fight the accusation. Table 1 summarizes these parameter updates in terms of the four key outcomes. When all four outcomes are "true" (row 1), in the next time period, the stigma against player 1 is decreased, the stigma against player

2 is increased, and the probability of societal support for player 1 increases, and σ also increases. When a victim is able to make an accusation and publicly get justice for themselves in court, it leads to a reduction in stigma for victims and it is more likely for society to support the victim. This view is supported by the literature - specifically, the literature finds that receiving a positive response after disclosure is a facilitator of future reporting - often through channels of support from friends and family [67]. σ increases too as it usually may also be easier for victims to win a case in the future (as a consequence of reduced uncertainty around the process of going to court) [68]. In addition, the stigma against perpetrators also tends to be higher going forward (as was seen in the wake of the #MeToo movement and ensuing protests) [57]. Conversely, if player 2 wins the fight in court (row 2), the parameters update in the opposite direction from the previous case. Player 2 may also plead guilty (row 3), and then the parameters update in the same way as when Player 1 wins the fight in court (row 1) - we assume there to be no difference if player 2 pleads guilty or chooses to fight the accusation and then loses. If there is an assault and player 1 does not make an accusation (row 4), only σ decreases whereas other parameters remain the same. This is because stigma and probability of societal support would only be updated if the case were to come into the public eye (i.e. an accusation is made) but a lack of reporting can still harm the ability of victims in the future to win a case. When no assault occurs (rows 4-8), we assume that the parameters update in the same way as when the assaults occur since the "truth" of the assault is assumed to be unknowable. The only exception is when there is no assault and no accusation occurs. In this case, none of the parameters are updated. Since the game is repeated with different players, we also sample the winning payoffs for both players (b, d) from a Normal distribution in every time step to capture the heterogeneity of the players. Further, players do not observe results of the previous rounds.

For all of our results, we consider three separate equilibrium types. The first is the truth-telling as previously defined. The second is the "Always accuse" equilibrium where player 1 always makes an accusation and the last is the "Never accuse" when player 1 never makes an accusation. In order to classify each time-step into one of these equilibrium types, we first simulate a time-step where a random draw determines whether an assault occurs and record the outcomes of interest. The parameters updated based on these outcomes. Then, we also record the outcomes as if the opposite of the random draw were true. While these second set of outcomes are not used to update the parameters, they are used to establish the equilibrium type for that particular time-step. Finally, we map the probability of each of these equilibrium types using a rolling average over twenty time-steps. We also run each set of simulations 100 times to eliminate any Monte Carlo noise.

Computational Model - Results

The rate at which societal stigma towards player 1 decreases is an important predictor of how quickly the truth-telling equilibrium evolves - more so than the initial level of societal stigma

In a societal setup where the truth-telling equilibrium occurs with low probability, c_1 is important in determining how the truth-telling equilibrium evolves over time. In general, while the level of stigma matters, the rate at which it decreases is a bigger determinant of whether we can reach a long-run truth-telling equilibrium for most cases. In simple terms, even if a society has a high level of social stigma, a high probability of truth-telling can be achieved as long as the rate at which c_1 decreases is relatively high. Figure 4 exhibits three different scenarios of the evolution of c_1. The top left panel shows a low initial level of c_1 that evolves quickly, the top right panel shows a high initial level of c_1 that evolves quickly and the bottom panel

shows a high initial level of c_1 that evolves slowly. Figure 5 shows the corresponding evolutions of the truth-telling equilibrium. The evolution of the truth-telling equilibrium is largely unaffected by the initial level c_1. The probability of the truth-telling equilibrium reaches a steady state value of around 0.6 by the 3000th time-step. It also begins to increase monotonically around the 500th timestep.

Conversely, when we decrease the rate by which c_1 reduces, two things happen. First, c_1 decreases with much more uncertainty over time (the Monte Carlo spread is much larger). This is because the higher c_1 is, the less likely it is for truth-telling to occur which in turn has an impact on the evolution of c_1. Secondly, not only does the truth-telling equilibrium not reach a steady-state until a much later time-step, but the steady-state probability of the truth-telling equilibrium is also lower - a probability of around 0.4. Taken together, we can say that a society with a high level of c_1 can reach a higher steady-state probability of the truth-telling equilibrium so long as the rate of decrease of stigma is sufficiently high.

A long-run equilibrium where truth-telling occurs more frequently is achieved when the society reaches a certain inflection point which achieves a virtuous cycle of victims making accusations when an assault occurs

The results of the computational model also shine some light on the ontology of the evolution of the truth-telling equilibrium. We find that, typically, there is an inflection point at which the probability of the truth-telling equilibrium begins to increase. There is a second more subtle point at which the rate of change also increases. Both of these inflection points are a consequence of the c_1 and p_s. Initially, while c_1 is high (until about the 2,500th-time step), player 1 only makes an accusation if they expect player 2 to plead guilty and not challenge the accusation. But after this, once c_1 is sufficiently low, they begin to make an accusation even when if they expect player 2 to fight it. This kicks off a virtuous cycle where player

1 continues to make accusations when there is an assault. This inflection point can be clearly seen in panel 3 of figure 7 and the first panel of figure 6 shows the corresponding evolution of c_1. The inflection point can also be seen in panel 1 of figure 7 which is a cumulative count of accusations made when an assault has occurred. There is a second less pronounced inflection point as well which occurs once p_s is above a certain threshold (around the 6,500th-time step). After this point, almost every time an assault occurs, an accusation is made. This in turn has the effect of improving σ. This can be seen in the second panel in figure 7 where the cumulative count of an accusation *not* made after an assault flattens. The second and third panels of 6 show the corresponding evolution of p_s and σ. There is a slight increase in the number of false accusations as well but the number is low overall (false accusations only make up 5% of the cases) since player 1 is still strategically deterred from making a false accusation. These two mechanisms provide an account of the evolution of the probability of the truth-telling equilibrium becoming the dominant equilibrium in the long term.

Discussion

This paper set out to investigate a few things - if it is even possible for a truth-telling equilibrium to exist, what the existence of the truth-telling equilibrium is most sensitive to, and what policy levers we can use to engender such an equilibrium in the long-run. The first two were studied using the static model and the computational model provided insights into the long-run evolution of the truth-telling equilibrium and the consequent policy levers at our disposal.

While a truth-telling equilibrium can exist, we find that its existence is quite sensitive to the stigma against player 2 and the probability of societal support. Moreover, the model suggests that there is a Goldilocks in which the equilibrium

exists - if stigma against player 2 is too low or too high, it leads to a dissolution of the equilibrium. In the real world, the absence of the truth-telling equilibrium can probably be attributed to a low stigma cost against player 2. The public-facing nature of the #MeToo movement created a situation in which this stigma was higher than it usually is under status-quo which led to more victims making accusations against perpetrators of sexual misconduct. We also find that increasing the ability of player 1 to convert effort into the probability of winning a case relative to player 2 broadens the region of the truth-telling equilibrium. This is a policy lever that can be used in many different ways. Apart from being affected indirectly as a consequence of a more supportive society, it can also be improved through interventions like funds raised through non-profits that support victims of sexual misconduct.

The computational model provides us with a more holistic story of how the truth-telling equilibrium evolves in the long-run. Our first result shows how the rate at which stigma against victims reduces is a bigger factor than the initial level of the stigma in ensuring truth-telling. This finding can help us direct resources in the most effective lever. Indeed, the model further finds that the first big inflection point which kick-starts a virtuous cycle occurs when stigma against player 1 falls below a certain threshold. The model also predicts that truth-telling can be further bolstered by improving the ability of player 1 to convert effort to a probability of winning. It is important to note that while using either lever could result in a desirable status quo, reducing stigma against victims before improving their ability to fight in court, could be more cost-effective.

We can also think about comparing this long-run evolution to where we might be in the process of improving truth-telling in our society as well. Recent evidence shows that reporting of sexual misconduct improved by 10% during the first six months of the #MeToo movement [42]. This effect was also persistent even a year after the movement started. The primary mechanism through which the increase is

explained is the increased benefit of reporting (through an understanding that this problem was widespread and a consequent reduction in stigma as well). Given this evidence, it can be argued that social movements such as the #MeToo movement are the kind of watershed movements that can cause a large decrease in stigma against victims and kick-start a virtuous cycle of truth-telling as described by the computational model results. It is also important to note that such a process is not necessarily linear in reality outside of the model. There can be gains made to enable truth-telling for some amount of time before other events may cause society to revert to a less desirable state. While the #MeToo movement seems to have started a virtuous cycle, only time will tell the extent to which it enables truth-telling in the long-run. Based on the results of this model, a few policy levers can be leveraged to further bolster truth-telling in the real world in the wake of the #MeToo movement. In order to further reduce stigma, information awareness campaigns can be used by the government and workplaces to fight some of the common misconceptions about sexual misconduct. Some of these might include misconceptions that it is a rare happening or that false accusations are common when the opposite is true. At the same time, some amount of care must be taken to ensure that we do not create a system of incentives that allows non-victims to make accusations easily as well since this can end up harming real victims in the long-run and make it more difficult for them to get justice. Given where we are in the evolution of truth-telling, this is unlikely to be an imminent threat but still worth considering. One way to ensure this would be to protect even the identity of the accused until due process has occurred so that they are not faced with additional social costs (especially in the case where they are not found to be guilty).

While the results of this model offer us important insights about the policy levers at our disposal and a strategy that can be used to deploy them, it also abstracts away from certain nuances that may be germane to the decision-making process of

an individual such as their immediate social networks. Currently, the ratio-form success function that is used is only dependent on the ratio of efforts put in by each player. This can also be extended to be a function of other things that are exogenous to effort such as historical success rates for victims of assault. Future research should further explore such nuances that underlie a complex and sensitive decision such as this. Another direction that future research could take would be to relax the Markovian assumption of the computational model and instead allow agents to have longer (albeit discounted) memory of past events. This would allow for a more realistic model for how victims choose to make a decision to accuse. In addition, further research could also attempt to model specific interventions while using this model to understand their effects on truth-telling.

Tables and figures

Table 1: Summary of parameter updates

Assault, Accuse, Fight, Justice	Stigma against Player 1 (c_1)	Stigma against Player 2 (c_2)	Probability of Support (p_s)	Sigma(σ)
T, T, T, T	$\downarrow$	$\uparrow$	$\uparrow$	$\uparrow$
T, T, T, F	$\uparrow$	$\downarrow$	$\downarrow$	$\downarrow$
T, T, F, N/A	$\downarrow$	$\uparrow$	$\uparrow$	$\uparrow$
T, F, N/A, N/A	$-$	$-$	$-$	$\downarrow$
F, T, T, T	$\downarrow$	$\uparrow$	$\uparrow$	$\uparrow$
F, T, T, F	$\uparrow$	$\downarrow$	$\downarrow$	$\downarrow$
F, T, F, N/A	$\downarrow$	$\uparrow$	$\uparrow$	$\uparrow$
F, F, N/A, N/A	$-$	$-$	$-$	$-$

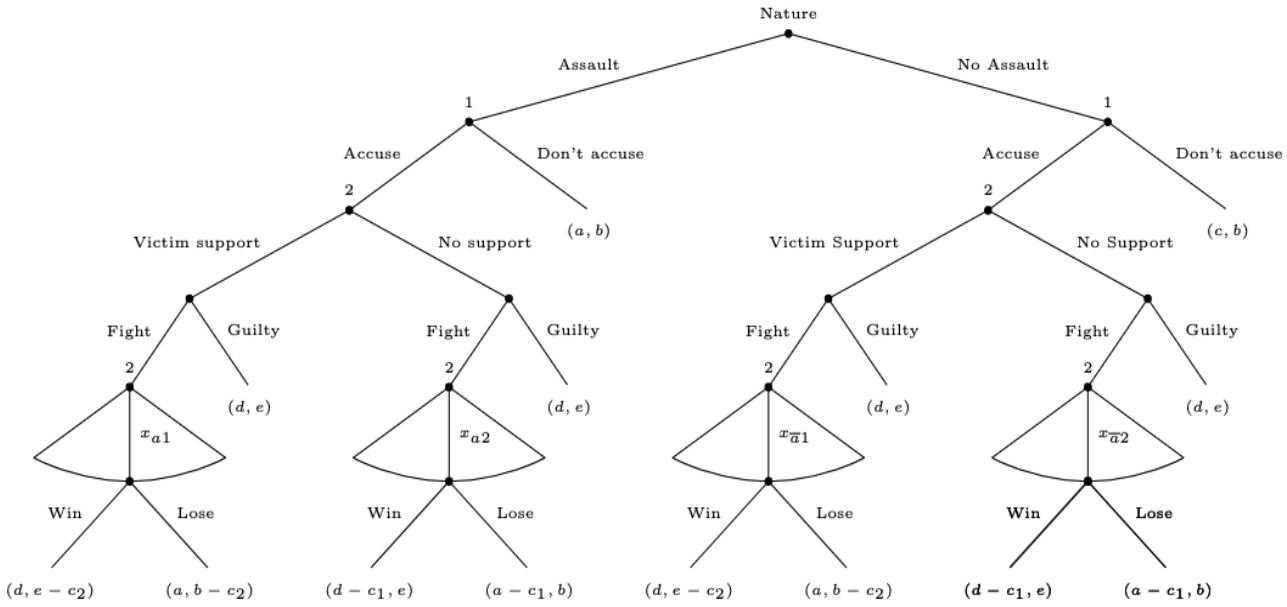

Figure 1: Game tree

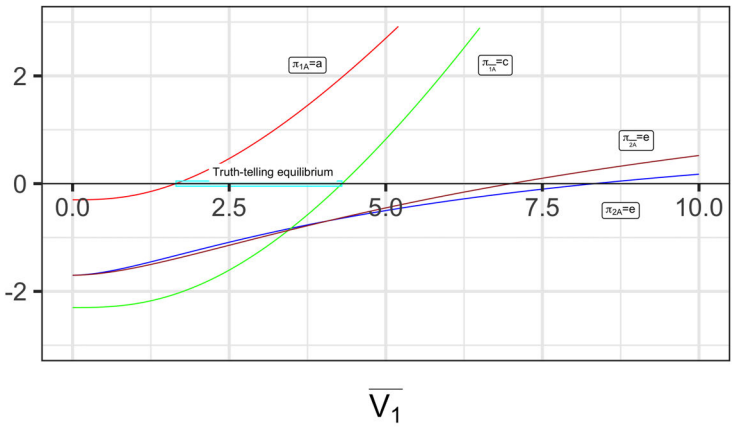

Figure 2: Region (in blue) where truth telling is preserved

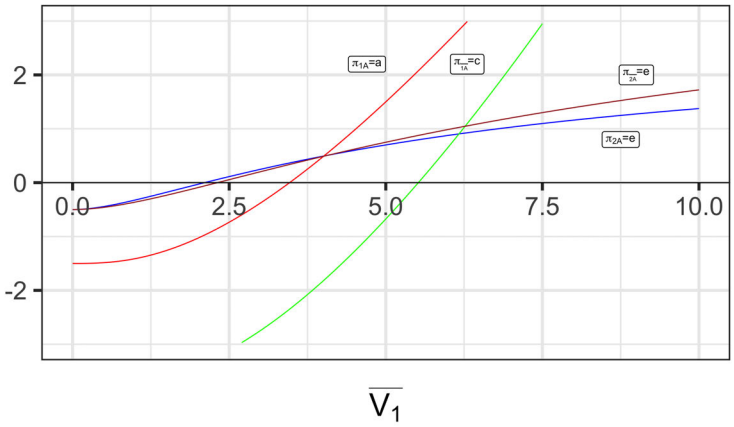

Figure 3: Truth telling region does not exist when stigma costs are high

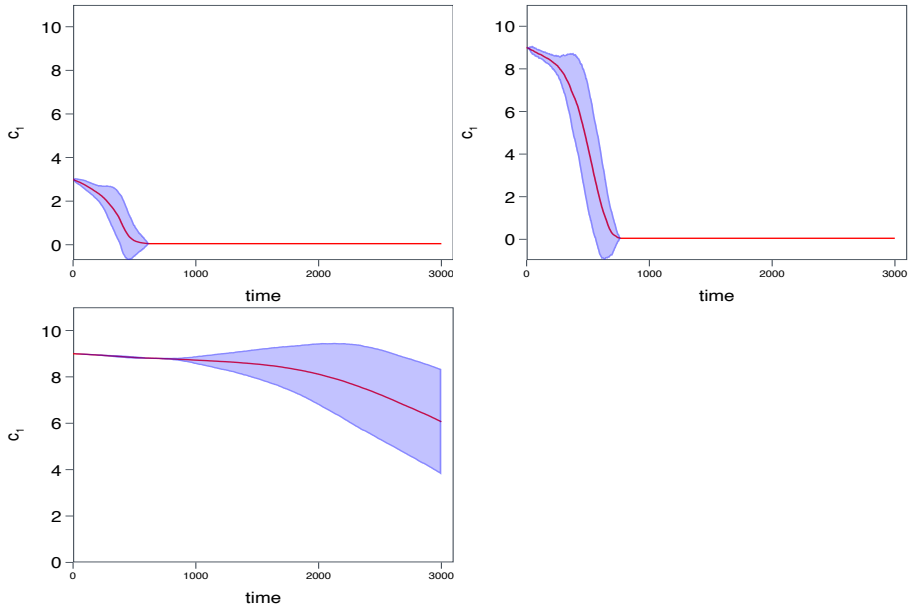

Figure 4: Evolution of stigma against player 1

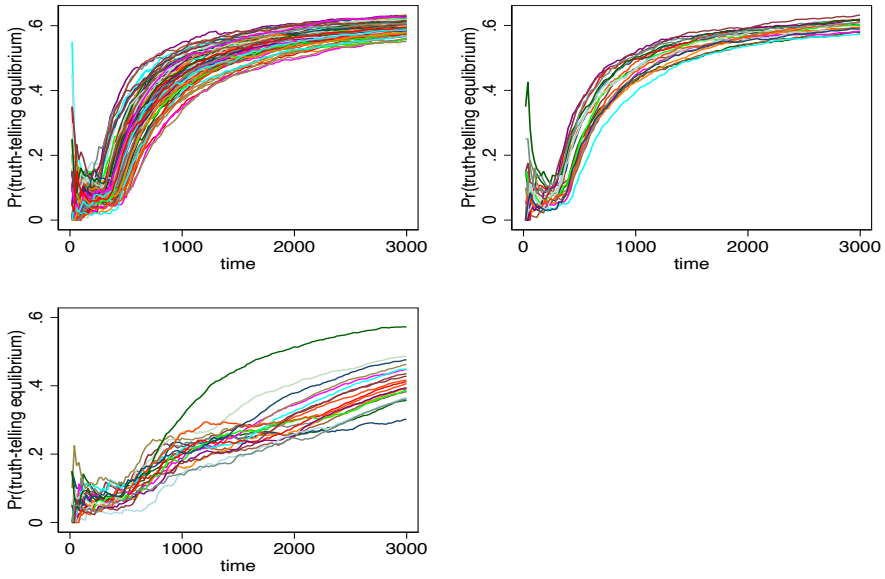

Figure 5: Evolution of truth-telling equilibrium

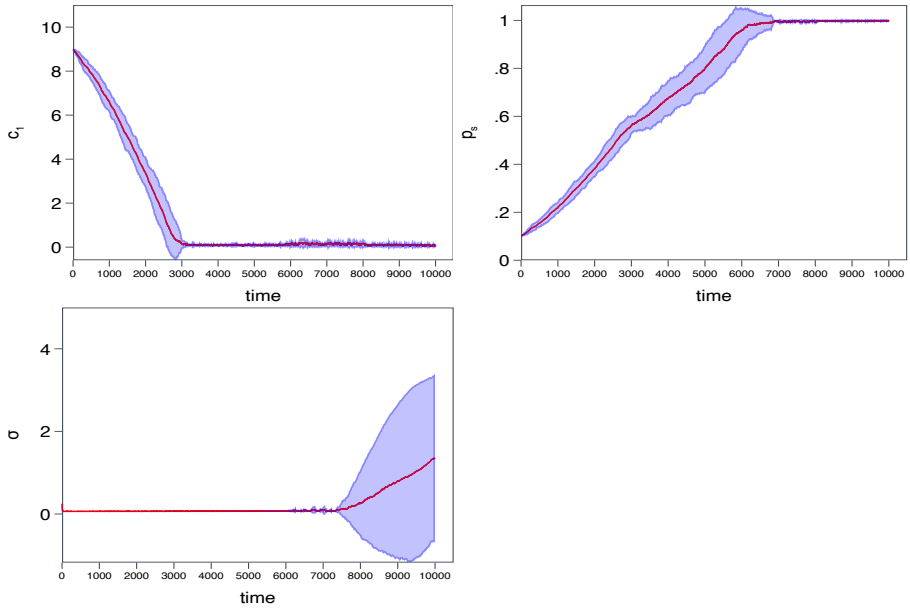

Figure 6: Inflection points of key parameters

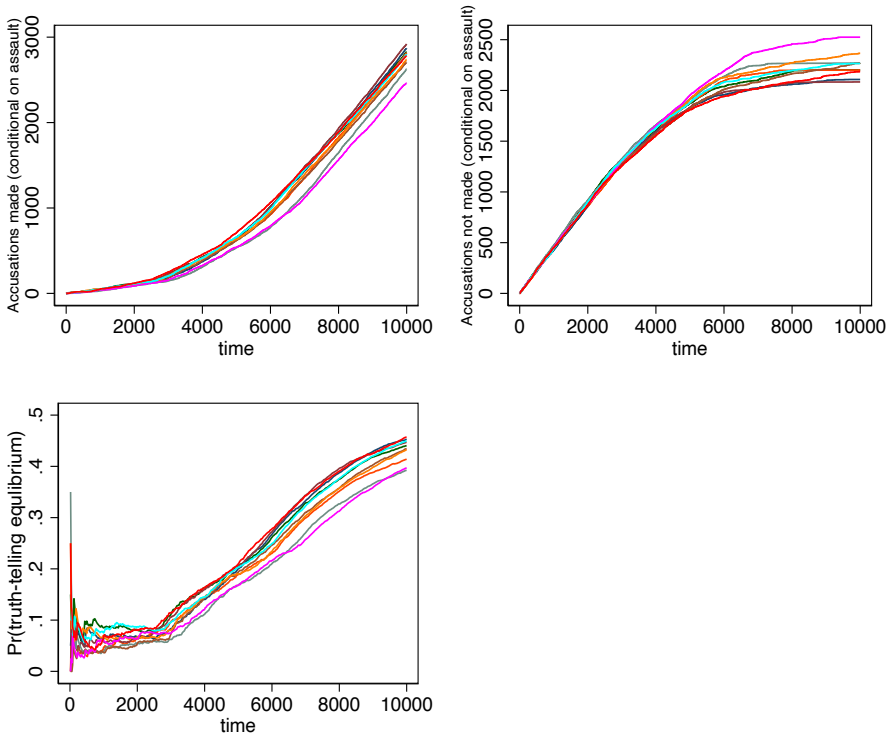

Figure 7: Evolution of virtuous cycle of truth-telling

Appendix

Proof of Proposition 1

We can find this space by considering both possibilities after an accusation - one where player 2 fight the accusation and the other where they plead guilty.

Lemma 1

The region where it is optimal to make an accusation conditional on assault occurring is defined by the region:

$$\pi_2* = p_s c_2 + \frac{\sigma_1^2 \overline{V}_1^2 \overline{V}_2}{(\sigma_1 \overline{V}_1^* + \overline{V}_2^*)^2} < \overline{V}_2$$

The necessary conditions to find such a condition are defined as:

$$(\pi_2* > e \& \pi_1* > a) | (\pi_2* < e \& d > a) \tag{3}$$

Player 1 accuses and Player 2 fights if:

$\pi_2* > e$: The expected value of profit for player 2 from fighting the accusation is greater than the payoff from pleading guilty

$\pi_1* > a$: The expected value of profit for player 1 from fighting the accusation is greater than the payoff from not accusing

Player 1 accuses and Player 2 pleads guilty if:

$\pi_2* < e$: The expected value of profit for player 2 from fighting the accusation is smaller than the payoff from pleading guilty

$d > a$: The payoff from accusing and player 2 pleading guilty is greater than the payoff from player 1 not accusing

Let's take a look at the first of these four statements

$\pi_2* > e$

$$\begin{aligned} \pi_2* &= (1 - f^*(\theta))V_{2W} + f^*(\theta)V_{2L} - X_2^* \\ \pi_2* &= V_{2W} - f^*(\theta)\overline{V}_2 - X_2^* \end{aligned} \tag{4}$$

where,

$$\begin{aligned} V_{2L} &= p_s(e - c_2) + (1 - p_s)e = e - p_s c_2 \\ V_{2W} &= p_s(b - c_2) + (1 - p_s)b = b - p_s c_2 \\ \overline{V}_2 &= b - e \\ f^*(\theta) &= \frac{\sigma_1 X_1^*}{\sigma_1 X_1^* + X_2^*} \\ X_1^* &= \frac{\sigma_1 \overline{V}_1^2 \overline{V}_2}{(\sigma_1 \overline{V}_1^* + \overline{V}_2^*)^2} \\ X_2^* &= \frac{\sigma_1 \overline{V}_1 \overline{V}_2^2}{(\sigma_1 \overline{V}_1^* + \overline{V}_2^*)^2} \end{aligned} \tag{5}$$

Note that X_1^* and X_2^* have the same denominator which we can call D. Then we have:

$$\begin{aligned} f^*(\theta) &= \frac{\sigma_1 X_1^*}{\sigma_1 X_1^* + X_2^*} \\ f^*(\theta) &= \frac{\sigma_1 \dfrac{\sigma_1 \overline{V}_1^2 \overline{V}_2}{D}}{\sigma_1 \dfrac{\sigma_1 \overline{V}_1^2 \overline{V}_2}{D} + \dfrac{\sigma_1 \overline{V}_1 \overline{V}_2^2}{D}} \end{aligned} \tag{6}$$

$$f^*(\theta) = \frac{\sigma_1 \overline{V}_1 \overline{V}_2 (\sigma_1 \overline{V}_1)}{\sigma_1 \overline{V}_1 \overline{V}_2 (\sigma_1 \overline{V}_1 + \overline{V}_2)} \tag{7}$$

but now the $\sigma_1 \overline{V}_1 \overline{V}_2$ terms cancel and you are left with

$$f^*(\theta) = \frac{\sigma_1 \overline{V}_1}{\sigma_1 \overline{V}_1 + \overline{V}_2} \tag{8}$$

$$\implies (1 - f^*(\theta)) = \frac{\overline{V}_2}{\sigma_1 \overline{V}_1 + \overline{V}_2} \tag{9}$$

We can write this in a more general form as well. σ is the ability parameter that determines the relationship between effort and the probability of winning. If both players were to put in the same effort, $p_1 = \sigma p_2$ for this form of the success function. We would ultimately like this parameter to take on different values depending on whether an assault occurs or not (i.e. the ability of each player to convert their effort into the probability of winning changes depending on whether there was an assault).

So,

$$f^*(\theta) = \frac{\sigma_1 \overline{V}_1 (\sigma_1 \overline{V}_1 + \overline{V}_2)}{\overline{V}_2 (1 + \sigma_1 \overline{V}_1) + \sigma_1^2 \overline{V}_1^2} \tag{10}$$

Substituting in 6, we get:

$$
\begin{aligned}
\pi_2* = V_{2W} - \frac{\sigma_1 \overline{V}_1 \overline{V}_2}{(\sigma_1 \overline{V}_1 + \overline{V}_2)} - \frac{\sigma_1 \overline{V}_1 \overline{V}_2^2}{(\sigma_1 \overline{V}_1^* + \overline{V}_2^*)^2} > e \\
\implies \pi_2* = b - p_s c_2 - \frac{\sigma_1 \overline{V}_1 \overline{V}_2 (\sigma_1 \overline{V}_1 + \overline{V}_2) - \sigma_1 \overline{V}_1 \overline{V}_2^2}{(\sigma_1 \overline{V}_1^* + \overline{V}_2^*)^2} > e \\
\implies \pi_2* = p_s c_2 + \frac{\sigma_1^2 \overline{V}_1^2 \overline{V}_2}{(\sigma_1 \overline{V}_1^* + \overline{V}_2^*)^2} < b - e \\
\implies \pi_2* = p_s c_2 + \frac{\sigma_1^2 \overline{V}_1^2 \overline{V}_2}{(\sigma_1 \overline{V}_1^* + \overline{V}_2^*)^2} < \overline{V}_2
\end{aligned}
\tag{11}
$$

In order for there to be just one root in this equation, we must prove that it is zero crossing only once (i.e. has only one root). We first use Descarte's rule of signs on the derivative of this function to narrow down the maximum number of roots and then further eliminate the possibility of multiple by checking that the function is zero crossing just once by checking its limits. In this case, after finding that the function has at most two roots, we check the limit.

$$
\begin{aligned}
\lim_{\overline{V}_1 \to 0} f(\overline{V}_1, \overline{V}_2) = 0 \\
\lim_{\overline{V}_1 \to \infty} f(\overline{V}_1, \overline{V}_2) = \infty
\end{aligned}
\tag{12}
$$

This defines one end of the boundary of the region discussed in Lemma 1.

Let's take a look at the second of these four statements: $\pi_1* > a$

$$
\begin{aligned}
\pi_1* = f^*(\theta) V_{1W} + (1 - f^*(\theta)) V_{1L} - X_1^* \\
\pi_1* = f^*(\theta) \overline{V}_1 + V_{1L} + -X_1^*
\end{aligned}
\tag{13}
$$

where,

$$
\begin{aligned}
V_{1L} = p_s(a) + (1-p_s)(a-c_1) = a - c_1(1-p_s) \\
\overline{V}_1 = d - a \\
f^*(\theta) = \frac{\sigma_1 \overline{V}_1}{\sigma_1 \overline{V}_1 + \overline{V}_2} \\
X_1^* = \frac{\sigma_1 \overline{V}_1^2 \overline{V}_2}{(\sigma_1 \overline{V}_1^* + \overline{V}_2^*)^2}
\end{aligned}
\tag{14}
$$

Substituting in 10, we get:

$$
\begin{aligned}
\pi_1* = V_{1L} + \frac{\sigma_1 \overline{V}_1^2}{(\sigma_1 \overline{V}_1^* + \overline{V}_2^*)} - \frac{\sigma_1 \overline{V}_1^2 \overline{V}_2}{(\sigma_1 \overline{V}_1^* + \overline{V}_2^*)^2} > a \\
\implies \pi_1* = a - c_1(1-p_s) + \frac{\sigma_1 \overline{V}_1^2 (\sigma_1 \overline{V}_1 + \overline{V}_2) - \sigma_1 \overline{V}_1^2 \overline{V}_2}{(\sigma_1 \overline{V}_1^* + \overline{V}_2^*)^2} > a \\
\implies \pi_1* = p_s c_1 + \frac{\sigma_1 \overline{V}_1^3}{(\sigma_1 \overline{V}_1^* + \overline{V}_2^*)^2} > c_1
\end{aligned}
\tag{15}
$$

We repeat the earlier process to eliminate multiple roots. This function has only one root at $\overline{V_1}$=0. This is the lower boundary of the region described in lemma 1

Lemma 2

The region where it is optimal to ***not*** *make an accusation conditional on assault* ***not*** *occurring is defined by the region:*

$$
\pi_1* = a + p_s c_1 + \frac{\sigma_1 \overline{V}_1^3}{(\sigma_1 \overline{V}_1^* + \overline{V}_2^*)^2} < c + c_1
$$

Conditional on an assault NOT occurring, for the equilibrium to be one where

player 1 (victim) does not make an accusation, the condition that needs to be met is as follows:

$$(\pi_2* > e \& \pi_1* < c) | (\pi_2* < e \& d < c) \tag{16}$$

Player 1 does not accuse and Player 2 fights if:

$\pi_2* > e$: The expected value of profit for player 2 from fighting the accusation is greater than the payoff from pleading guilty

$\pi_1* < c$: The expected value of profit for player 1 from making the accusation and fighting is smaller than the payoff from not accusing

Player 1 does not accuse and Player 2 pleads guilty if:

$\pi_2* < e$: The expected value of profit for player 2 from fighting the accusation is smaller than the payoff from pleading guilty

$d < c$: The payoff for player 1 from accusing and player 2 pleading guilty is smaller than the payoff from player 1 not accusing

Following the same logic as in Lemma 1, we get:

$$\begin{aligned} \pi_1* &= V_{1L} + \frac{\sigma_1 \overline{V}_1^2}{(\sigma_1 \overline{V}_1^* + \overline{V}_2^*)} - \frac{\sigma_1 \overline{V}_1^2 \overline{V}_2}{(\sigma_1 \overline{V}_1^* + \overline{V}_2^*)^2} < c \\ \implies \pi_1* &= a - c_1(1 - p_s) + \frac{\sigma_1 \overline{V}_1^2 (\sigma_1 \overline{V}_1 + \overline{V}_2) - \sigma_1 \overline{V}_1^2 \overline{V}_2}{(\sigma_1 \overline{V}_1^* + \overline{V}_2^*)^2} < c \\ \implies \pi_1* &= a + p_s c_1 + \frac{\sigma_1 \overline{V}_1^3}{(\sigma_1 \overline{V}_1^* + \overline{V}_2^*)^2} < c + c_1 \end{aligned} \tag{17}$$

Taken together, the root of the expression for Lemma 1 gives the upper bound of the truth-telling equilibrium ($\bar{V}_1^H$), and the root of the expression for Lemma 2 gives the lower bound of the truth-telling equilibrium ($\bar{V}_1^L$). The space enclosed by $\bar{V}_1^H$ and $\bar{V}_1^L$ is the truth-telling equilibrium described in proposition 1.

Proof of Proposition 2

The region of the truth-telling equilibrium is defined by the expression $\bar{V}_1^H$ and $\bar{V}_1^L$. The expression for $\bar{V}_1^H$ is derived from Lemma 1 from the proof of proposition 1:

$$\pi_2* = p_s c_2 + \frac{\sigma_1^2 \overline{V}_1^2 \overline{V}_2}{(\sigma_1 \overline{V}_1 + \overline{V}_2)^2} < \overline{V}_2$$

And the expression for $\bar{V}_1^L$ is derived from Lemma 2 from the proof of proposition 1:

$$\pi_1* = a + p_s c_1 + \frac{\sigma_1 \overline{V}_1^3}{(\sigma_1 \overline{V}_1 + \overline{V}_2)^2} < c + c_1$$

Substituting $D = (\sigma_1 \overline{V}_1 + \overline{V}_2)^2$, we find that the region of the truth-telling equilibrium is:

$$\bar{V}_1^H - \bar{V}_1^L = \sqrt{\frac{DV_2 - Dp_s c_2}{\sigma V_2}} - \sqrt[3]{\frac{D(c + c_1) - D(a + p_s c_1)}{\sigma_1}} \tag{18}$$

In order to understand how this region changes in p_s and c_2, we find the partial derivatives with respect to the term $p_s c_2$ since they always appear as a product in the expression. For simplicity, let's say $x = p_s c_2$. This derivative has one root (i.e. they are zero crossing once). This tells us that the derivative is first negative and then positive or first positive and then negative. Consequently, the region of the truth-telling equilibrium first contracts and then expands or first expands and then contracts. This can be confirmed by investigating the limits of the derivatives at both extremes (approaching the limit at zero from the right):

$$\lim_{x \to 0^+} \frac{\partial(\bar{V}_1^H - \bar{V}_1^L)}{\partial x} > 0 \tag{19}$$

$$\lim_{x \to \infty} \frac{\partial(\bar{V}_1^H - \bar{V}_1^L)}{\partial x} = -\infty \tag{20}$$

Since the derivative has one root, and is positive to the left of it and $-\infty$ at the limit to the right, the derivative is first positive and then negative. Consequently, the truth-telling equilibrium $(\bar{V}_1^H - \bar{V}_1^L)$ first widens and then shrinks as $x = p_s c_2$ increases (proposition 2).

Corollary: By symmetry, proposition 2 is also true when the truth-telling region is defined in $\bar{V}_2^H - \bar{V}_2^L$ when $\bar{V}_1$ is held constant.

Chapter 3

Under Prescription Of ORS For The Treatment Of Child Diarrhea In India - A Qualitative Study

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Abstract

Diarrhea is one of the leading causes of under-5 child mortality in the world. Almost 500,000 children die from it every year despite the availability of a very affordable and effective treatment in the form of oral rehydration salts (ORS). Despite decades of attempts to improve ORS prescription and use, in India, 45% of caretakers that seek care for child diarrhea do not receive ORS. Moreover, the reasons for this under-prescription are unclear which makes it even more difficult to design interventions to improve ORS prescription. In this qualitative study, we conduct 20 semi-structured interviews with private providers in the Indian states of Karnataka and Bihar who were recruited as part of a larger randomized trial to document the reasons for under-prescription. Interviews were transcribed verbatim and translated from Kannada and Hindi into English before being analyzed. The transcripts are analyzed to better understand the results of the randomized trial and to document previously unexamined reasons for under-prescription of ORS. We find that providers are well aware of the importance of using ORS to treat diarrhea but still have misconceptions about the best time to do so and other best practices. Financial incentives can also contribute to the issue of under-prescription, although the specific mechanisms involved can differ significantly. Additionally, healthcare providers expressed concerns about how patients perceive their prescribing practices but stated that their treatment decisions were not influenced by patient preferences. Potential interventions could include information campaigns, such as creating short films and posters targeting both healthcare providers and patients.

Introduction

Diarrhea is the second leading cause of under-five child mortality in low and middle-income countries (LMICs)[11]. Worldwide deaths continue to total about half a million per year. Oral rehydration salts (ORS) are considered to be an extremely effective and inexpensive medicine in the treatment of diarrhea. Since 1978, the World Health Organization has pushed ORS for global diarrheal control and considers it one of the most important medical advances of the 20th century. Despite this, ORS has been under-prescribed for decades – only somewhere between a third to half the diarrhea cases in LMICs receive ORS [69, 70]. This lack of ORS coverage leads to a significant public health threat and undue loss of life.

Many efforts have been made to improve ORS prescription and use rates with varying degrees of success – especially in India. From 2011 to 2014, Diarrhea Alleviation through Zinc Therapy (DAZT) was a multi-pronged pilot program in the Indian states of Gujarat and Uttar Pradesh which tried to improve Zinc and ORS prescription (the WHO now recommends a combination of ORS and Zinc to treat diarrhea). It involved training public sector providers, making educational visits to private providers, and also supplying ORS and Zinc to communities. In Gujarat, ORS prescription increased from 15% to 40% but in Uttar Pradesh, it remained at only 20% [71]. From 2012 to 2016, The Clinton Health Access Initiative (CHAI) improved and scaled up the DAZT program to more districts by adding a mass media campaign through multiple channels which targeted caregivers. ORS use improved in Uttar Pradesh to 44% - a comparable success but far lower than optimal levels of prescription[72].

A complete account of the exact reasons for this trend of severe under-prescription of ORS has been rather elusive. Lack of access explains only some portion of this behavior. However, studies show that most caretakers of children with diarrhea

seek treatment at a healthcare provider and are often still not prescribed ORS. For instance, in India over three-quarters of caretakers seek care from private providers and only about half of them receive ORS [73]. Lack of knowledge is unlikely to be a primary driver of under-prescription. Prior work shows that most private providers fail to prescribe ORS even when they know that ORS is the appropriate treatment for diarrhea [74]. There are other competing explanations for the under-prescription of ORS.

Some of these explanations were tested in a recent study (yet to be published) conducted among 2,282 providers in the Indian states of Karnataka and Bihar. The hypotheses tested were threefold. First, patients may exhibit a preference for other treatments or develop a disliking for ORS due to its unpleasant taste, limited observable relief from symptoms (as it primarily addresses dehydration rather than alleviating diarrhea symptoms), and the perception that ORS is not a genuine medicine (given its powdered form that requires mixing with water, as opposed to a pill or injection). Private providers could be driven by financial incentives to promote alternative treatments that are more profitable than ORS. While ORS is an affordable option, antibiotics generate a higher profit for the provider. Existing evidence suggests that such financial incentives contribute to the inappropriate prescription of antibiotics in various contexts [75, 76]. Finally, there is evidence indicating that private providers in India frequently face shortages of ORS, leading to the unavailability of the product in their stock [77]. All three of these hypotheses were tested using a standardized patient methodology in a large-scale randomized trial. Results suggest that providers were very responsive to a patient's preference for ORS if the preference was exhibited. Providers who sell medicines were only slightly more likely to prescribe ORS when provided with a supply of ORS (indicating that stock-outs are not a big driver of under-prescription). Finally, removing financial incentives only had a modest effect on prescriptions among pharmacies and

not among clinics. Taken together, these estimates explain about 60% of ORS under prescription while the remaining 40% remains unexplained.

Given the findings, this qualitative study had two goals – to better understand the results of the trial and to generate previously untested explanations for the under-prescription of ORS in the Indian context. Other qualitative studies have primarily focused on the community and caretakers and found many different norms and beliefs that influence ORS use. The earliest of these studies from 1988 found that, in India, 81% of mothers who previously used ORS but do not plan on using it again were not satisfied since 'it did not stop diarrhea.' There is also a lack of awareness regarding the benefits of ORS, resulting in low usage of ORS during diarrhea episodes[78]. In Indonesia, most mothers associated the importance of food hygiene with disease prevention, contaminating agents, and health[79]. A study from Kenya found that inconsistent recommendations from health workers regarding the use of ORS caused confusion about when it is appropriate and whether it requires a medical prescription [80]. In the rural community, beliefs in herbal remedies, cost, and distance to health facilities presented additional barriers to ORS use. In contrast to these studies, our study focuses on providers and their perceptions of ORS and the patients that they serve in order to better understand the reasons for under-prescription. We return to a subset of the providers recruited in our trial and conduct semi-structured interviews about their treatment behavior, perception of ORS, patients' behavior, preferences and perceptions, and financial incentives. The results of this study can help policymakers and researchers alike to study the reasons more effectively for ORS under prescription that has been plaguing LMICs for decades.

Methods

Study Context

This study was conducted as a follow-up study to a large-scale randomized trial that tested different hypotheses for the reasons for ORS under prescription in Bihar and Karnataka. In this study, 2,210 providers received an unannounced visit from one of four standardized patient types. Each standardized patient case was designed to either express a preference for ORS, antibiotics, or no preference at all. Half the no-preference type SPs let the provider know that they would be purchasing medicine from elsewhere, thus measuring the effect of financial incentives. Providers were also randomized to receive six weeks' worth of ORS supply to estimate the effect of stock-outs on ORS prescription. Results from this study show that expressing a preference for ORS increased ORS prescribing by 27 percentage points (96%) and reduced antibiotics prescribing by 10 percentage points (14%). Expressing a preference for antibiotics increased inappropriate antibiotic prescribing by 7.5 percentage points (10%) but had no effect on ORS prescribing. Removing financial incentives increased ORS prescribing at pharmacies by 10 percentage points (58%), but did not affect prescribing at clinics. Increasing supply of ORS increased ORS dispensing by about 3 percentage points among all clinics and by 8 percentage points at clinics that sell medicines. Taken together, the study estimates that these mechanisms explain about 61% of under-prescription while 39% can be attributed to other factors. Despite controlling for many different factors, a large part of ORS under prescription remains unexplained. This study attempts to better understand the results of the large-scale trial (such as reasons for why removing financial incentives only increased ORS use in clinics and not pharmacies), generate new hypotheses for ORS under prescription, and understand what kind of interventions might work to improve ORS prescription.

Study Setting

This study was split evenly between two different states in India – Karnataka and Bihar in the districts of Mysuru and Patna respectively. Apart from being culturally dissimilar, the states are very different from each other in terms of socio-economic indicators, health outcomes as well as diarrhea treatment practices. Bihar is the poorest state in India while Karnataka is one of the richest [81]. The types of practitioners that operate in both states are also different. Karnataka has a higher density of providers that have a medical degree like an MBBS (Indian equivalent of a medical degree) while Bihar has a higher degree of Registered Medical Practitioners (RMPs)[4]. Both districts are important population centers of the states and see a large footfall of patients seeking care. The metro area of Mysuru has a population of approximately 1.3 million and the metro area of Patna has a population of approximately 2.6 million. Agriculture is the main occupation in both places. The sample was split between three different towns within each of the districts.

Study Sample

Providers in this study were chosen from those recruited for the larger trial mentioned previously. Providers had already consented to a possible follow-up visit for additional information. We chose the towns based on accessibility by road from the main city center. All providers were private practitioners who treat cases of child diarrhea. The sample itself was chosen purposively to include a mix of different provider types (clinics, RMPs, and pharmacies) as well as providers that have prescribed and failed to prescribe ORS for a case of child diarrhea in the larger trial. Providers were contacted by the study team a day or two in advance to find a time

[4]RMPs is a catch-all term for a "disparate group of medical practitioners who have not received formal training in allopathic medicine"

for the interview. Providers were compensated for their time after the interview if they agreed to participate. Characteristics of the study sample are presented in Table 1.

Data Collection

Based on our results from the larger trial, we developed discussion guides for semi-structured interviews that were used for data collection. These guides were also translated into the local languages (Kannada in Mysuru and Hindi in Patna). Data collection was subcontracted out to an experienced data-collection agency in India that we had worked with for the larger trial. Data collection was performed by three members of this study team with extensive qualitative research experience collecting healthcare data in these regions. They were already a part of the large-scale trial and consequently, well-versed with the context and subject matter. They were also joined by a final-year doctoral student (co-author RZ) who led an extensive three-day session to train the interviewers. The interview guide (Appendix 3) focused on understanding providers' treatment practices for childhood diarrhea, their perceptions about ORS (including reasons for underuse), their perceptions of patient behavior and preferences, and the financial incentive structures at play. Before going into the field, the team piloted the guide among themselves to ensure that appropriate language was used including local turns of phrase and context cues. The team was also instructed on using specific probes such as 'How?', 'Why?' and, 'What?' to get more detailed themes. They were also directed to not ask more sensitive questions (such as those regarding financial incentives) about the providers they were interviewing directly but rather to ask them about "other providers in the area."

All interviews were conducted in the local language, audio recorded, transcribed verbatim, and translated from the respective local language into English. It took

three days in each state to conduct ten interviews which usually lasted 45-60 minutes. Of the twenty interviews, one had to be conducted telephonically since the provider was unavailable for an extended period of time. To ensure confidentiality, the providers were picked using their software-generated unique ID (and corresponding provider characteristics data). All other sensitive information including things like name and address were separated and only available to the data collection team. After the data was collected, personal identification information was removed from the response data, and providers were identified only using their unique IDs. Once the transcripts were securely transferred, they were entered into Dedoose software [82].

Data Analysis

Our primary aim for this analysis was to better understand possible reasons for ORS underuse and a secondary aim was to better understand the results from the large-scale trial. From previous work in the field, we narrowed down possible areas of investigation – namely providers' perceptions of ORS as a medicine, providers' perceptions of patient preferences and behavior, and the role of financial incentives. With these broad areas in mind, we developed a coding framework that encapsulated these themes, as well as specific descriptors for each code, inclusion criteria, and sample quotes. Codes were also classified into main categories and subcategories. We then read the 20 transcripts multiple times in Dedoose and coded the data based on the created themes. We also created new codes to capture recurring key issues that were not captured by the pre-existing themes. All themes were coded by a single coder (co-author RZ) and discussed in weekly meetings with other co-authors to discuss any other emerging themes, questions, or concerns. Finally, we analyzed all themes by site to better understand any differences across them.

Results

This study had 20 participants – 10 from each state. There was a mix of providers from clinics, RMPs, AYUSH[5] practitioners, and pharmacies. The generated themes can be broadly categorized into three categories – Diarrhea Treatment and ORS Underuse, ORS Perception, and Patient Behavior. Differences in themes by site are also noted.

1. Diarrhea Treatment and ORS Underuse

1.1 *Providers have adequate knowledge about using ORS to treat diarrhea*

Providers in both states were knowledgeable about the use of ORS to treat childhood diarrhea. There was little doubt in the mind of most providers that ORS is the recommended treatment for childhood diarrhea. One provider in Karnataka said:

> *"ORS is the first treatment given to any patient [of diarrhea]. When we think about treatments for diarrhea, ORS comes to mind first."*

Providers were also often able to note that it works by addressing the dehydration that results from diarrhea. A provider in Bihar said:

> *"Sir, if the body becomes dehydrated, it must be given an ORS as it makes up for the lack of water. If there is a lack of water in the body, it should be replenished first."*

[5] AYUSH is an acronym for Ayurveda, Yoga and Naturopathy, Unani, Siddha, and Homeopathy and are the six Indian systems of medicine

This corroborates previous research [74] and rules out any large knowledge gaps as a primary reason for the under prescription of ORS.

1.2 *Providers believe that ORS should only be given when dehydration symptoms are noticeable*

While providers were aware that diarrhea should be treated with ORS, they often thought that it should be given only when symptoms of dehydration (such as sunken eyes and skin turgidity) are noticeable:

> *"If the loose motions are excessive and a lot of fluid has been lost from the body, that is when it is necessary to give the child ORS."*

This opinion runs counter to the prevailing understanding of how diarrhea must be treated. It is recommended to provide ORS for all cases of diarrhea, and it often acts in a preventative manner before dehydration occurs. This theme was observed in both states but was more prevalent in Bihar. It was even observed among providers with an MBBS degree. One such provider said:

> *"In the first stage, if there is no dehydration we suggest that they take 'home fluids', but in the second stage everyone must compulsorily be given ORS."*

1.3 *Cost of medicine may lead to under-prescription of ORS*

Providers said that cost may be a reason for ORS underuse. Even though ORS is not very expensive (approx. USD 0.25 per packet), patients may ask for it to be removed from a prescription since they think it is less effective than antibiotics

(discussed in theme 3.1) and additionally, it can be substituted with a solution of salt, sugar, and water that is prepared at home. One provider said:

> *"There are some people from poorer families who take them less frequently. But we still advise them to go to the government hospital and take ORS, as it is available free of cost there. Moreover, if they don't have time or are unable to go for some reason, then they can give a solution of salt and sugar at home without any problem. We try to educate them on the importance of using ORS for diarrhea treatment, but for them, Rs. 20 or Rs. 30 (USD 0.25 - 0.35) for ORS may still be costly."*

While this theme was primarily observed in Bihar and especially among pharmacies, it was also observed in a few instances in Karnataka and among other provider types.

1.4 *Financial incentives play a key role in under-prescription of ORS but exact mechanisms vary*

Providers in both states acknowledged that financial incentives for medicines other than ORS, in one form or another, do play into providers' prescription decisions. Although providers in both states did acknowledge it, fewer providers in Karnataka were aware of (or willing to share) details about the specific mechanisms through which the financial incentives worked. Providers were clear that there are usually no incentives for ORS:

> *"Look, I don't prescribe medicines based on a percentage (commission) that I get from the pharmaceutical companies. Nowadays, we are supplied ORS from well-established companies – there aren't any up-and-coming companies manufacturing it. Since these brands have already made their*

name in the market, they don't provide us any additional incentive, they just say - you just prescribe them we will supply them."

Providers were also forthcoming about the prevalence of financial incentives for other types of medicine – often only when probed about the behavior of other patients and not their own. When talking about the practice of other providers, an RMP in Bihar said:

"It happens [for other medicines]; he [the medical representative] would say something like, 'Give this medicine twice or thrice. If it is not beneficial, then you can offer saline, and you can make a higher profit.' Many people have the mentality that their only aim is to earn money. Very few people work with a spirit to serve. Many people keep the child in observation for a long time; they wait until the evening and when the child's health does not improve, they say that the patient needs to be given saline. The patient obviously agrees. They give saline and cheat thousands of rupees in this way. We are in the same market, sir, there are all kinds of people here. There are very few people with a spirit of service. I also have the same job, I also must earn money, but I do not do this. A man should not do so much that he sacrifices his morals."

There was less agreement on the kind of mechanism through which financial incentives work. The first and most obvious one was through the profit margins of different medications – antibiotics have a higher profit margin than ORS. The other mechanism seemed to be by writing a prescription which is tracked by a medical representative of a pharmaceutical company that pushed a certain drug. This happens by tracking the stock if a provider dispenses medication directly but

also by tracking prescriptions since providers usually have a go-to pharmacy that they prescribe from (either attached or separate). This is how a provider explained it:

> *"He [the medical representative] keeps track of the product. The provider is usually given many different medicines. For example, he is given 10 medicines - one medicine is for fever, one for diarrhea, one is for an ulcer and so on. In addition to tracking this stock, when the prescription goes to the pharmacy, the sale is also counted from that distributor."*

Some providers also alluded to the formation of a kind of monopoly where certain prescribed medicines may only be available from one pharmacy in the area which makes it easier to track. One provider in Bihar said:

> *"Yes, there is an incentive even if the doctor does not stock of medicine, as all the big doctors have a tie-up with the distributor (pharmacy). You will get that medicine only from that distributor. You will not get the medicine if you look anywhere else. After searching all other medical stores, you will have to come back to the same one for medicine."*

1.5 *Providers think that giving a child ORS if they already have a cold or fever can worsen their condition*

Providers in Bihar think that it might not be prudent to treat child diarrhea with ORS if the child also has a cold or fever from another illness. This is possibly because of cultural beliefs which often associate respiratory tract infections with

fluid intake (often colder fluids). This kind of belief was alluded to directly by one provider:

> *"If you are saying that ORS should be given in every case, then it is wrong. When vomiting and diarrhea are due to a cold, ORS will not stop it but harm the child a little. In this situation, an antibiotic injection must be given, only then will it stop. Moreover, due to the cold, a child may have loose motion. Loose motion and vomiting start when a child feels hot. Vomiting also starts when a child has a fever, and in that situation, ORS will not work."*

Another provider helpfully pointed out that this was a misconception held by many in the area – providers and patients alike:

> *"Many people think that in cold weather, they should not give ORS to the child with diarrhea; instead, they give multivitamins, zinc, etc. Due to cold exposure, they think that if they give the child ORS, then it may cause a cold and cough. Because of this, many people do not give ORS in cold weather. However, this is a misconception. When there is a lack of water in the body, it does not matter if it is winter, summer, or rain. The body needs water, and the food we eat needs water, whatever the season. It is not as if when it is winter, we do not drink water."*

This theme was only observed in Bihar which further bolsters the likelihood of it being a consequence of local cultural beliefs.

1.6 *Providers are concerned with how patients would perceive them if they only prescribed ORS*

One of the hypotheses tested in the larger trial was if providers were sensitive to patient preferences. Since these are private providers, there is a possible market incentive in place to give a patient the medicine that they want so that the patient is satisfied with the treatment (even if it may not be the appropriate treatment) and return to the same provider the next time that they need to consult with one. We find that providers in Karnataka often feel that if the patient is only prescribed ORS for diarrhea, they may perceive the provider as being inadequate or lacking in knowledge and might not return to the provider:

> *"[If we only prescribe ORS] they will change the doctor. They might say that we don't have adequate knowledge. [Some providers] prescribe multivitamin drops or a tonic (antibiotic) or something expensive so that they think he is prescribing good medicines and come back next time."*

One possible reason that this theme was only observed in Karnataka is that since patients in Bihar tend to be less educated, they are more likely to defer to the doctor for medical advice but in Karnataka, there is a possibility that patients have their own preconceived notions of the kind of treatment they expect from providers. Therefore, providers are able to prescribe treatment without having to worry too much about how patients will receive it.

2. Perception of ORS

2.1 *Providers believe that not giving a child ORS can put the child at risk of death*

To better understand if providers recognize the importance of ORS in treating

child diarrhea, they were explicitly asked if they thought not giving ORS put the child's life at risk. Interestingly, this was one of the only themes with near unanimous consensus across both states. Providers agreed that not giving the child ORS could jeopardize the child's life. One provider in Bihar said:

> *"Yes, exactly sir. If there is a lack of fluids in the child's body, it can lead to serious conditions. Even if the child may not be weak in the present condition. If a healthcare provider has diagnosed the child and found that a high percentage of fluid has come out of the child's body and still does not give an ORS, then the risk [of death] increases, doesn't it sir?"*

This further supports the idea that ORS underuse is likely not driven by large gaps in provider knowledge about using ORS to treat diarrhea but rather, about when it should be used and best practices. Not only do providers know that diarrhea should be treated with ORS(theme 1.1), but they also realize that a failure to do so could result in the child's death.

2.2 *Some providers see ORS as comparable to other medicines, but others only see it as a supplement*

Apart from how important providers thought ORS was, they were also asked about how they perceived ORS relative to other medicines. Since providers frequently prescribe antibiotics in lieu of ORS, there might be reason to believe that ORS simply does not occupy the same position in local beliefs about medicines as antibiotics do. Indeed, consensus was split on the type of medicine that ORS is. Some providers saw it as compared to other medicine:

> *"It's comparable to other medicines. When I say it is given to correct*

electrolyte imbalances, I think of it as any other medicine only. We also prescribe ORS for muscle cramps which happen due to electrolyte imbalance as well."

Others only thought of it as a supplement or something that is given in addition to another medicine (like an antibiotic):

"It is not a medicine; it is only for body maintenance and cannot be categorized as a medicine. It is used to replenish the level of water in the body. It is not really medicine – more like supporting therapy."

The perception of ORS as important but a supplement could be one reason that it is under prescribed especially when coupled with other reasons such as cost. For instance, if the patient is short on money, providers may end up removing ORS from the prescription even though it is cheaper since it is only seen as a supplement medicine while an antibiotic may be seen as "real medicine" and still prescribed. This lack of consensus about the nature of ORS was true for both states.

Patient Behavior

3.1 *Patients often administer treatment before they come to the provider*

Providers in Bihar almost unanimously believed that patients usually administer treatment before they visit a provider. This was less so the case in Karnataka although there were instances of it there as well. A provider in Bihar said:

"[Parents administer treatment] before coming to us. Most people only come after giving the medicine they get from the shop a couple of times. People give the medicine a couple of times and wait to see if it cures the problem; otherwise, they take the child to a doctor."

Often, the treatment administered is a solution of sugar and salt as a home remedy substitute for ORS. One provider said:

"Yes, in the village, people do domestic treatment. They often give the child salt and sugar mixed in water."

If this is true, it is likely to be a more common practice in Bihar since it is a poorer state when compared to Karnataka. Consequently, patients may try to remedy an ailment themselves before consulting with a provider to save money.

3.2 *Patients often want medicine that they consider to be "stronger" than ORS*

Providers in both states agreed that patients often ask for medicines that are considered to be "stronger" than ORS such as antibiotics and anti-diarrheal. This corresponds with the earlier theme that patients may perceive a provider as inadequate if they are only prescribed ORS.

"Yes, many times they ask for medicines like Normet syrup, O to Z (antibiotic syrups), etc. They tell us that companies claim that the medicine will control their condition. Many people think that if the work is done (diarrhea is cured) for less money, then it's preferable."

Taken together, the previous theme and this theme might have important implications for ORS underuse. Since providers believed that patients administer treatment at home before coming to the doctor, they may be inclined to believe that the patient wants something "stronger" since they have chosen to meet with a provider. In some instances, this may be further corroborated by patients explicitly asking for something stronger. Consequently, it could entrench the belief that when patients come to a provider, they are only looking for something other than ORS and the provider prescribes according to that belief.

3.3 *Providers claim that patients' preferences do not change their prescription behavior*

Interestingly, providers claim that patients exhibiting their preferences do not change their prescription behavior. This runs counter to our findings in the large-scale study where patients were more likely to get ORS if they showed a preference for it. Providers in both states said that the patients' preferences are not a factor in deciding what they are prescribed. One provider said:

> *"No, we do not prescribe based on their demand but ask them to bring the child first, and we will give medicine when we see the child. We tell them that the child needs to be given medicine on time, and the child will be fine if he is kept hydrated."*

Not only did the large-scale study find that providers respond to patient preferences, but providers are unaware that they do (or at least claim not to be). If providers are indeed unaware of their behavior, it further supports the need for a

twin-pronged intervention where, apart from targeting communities to get patients to ask for ORS, it is necessary to also target providers and clear any misconceptions about patient preferences (since it may be leading to them prescribing antibiotics without them being completely aware of it).

Discussion

Many themes, some unexpected, related to the under-prescription and eventual underuse of ORS emerged during this study. We find that providers understand well that diarrhea is the recommended treatment for diarrhea and its importance in ensuring that there is no risk to the child's health. But there are still misconceptions about the timing of use. Specifically, providers believe that ORS should only be administered after symptoms of dehydration show as opposed to earlier in order to prevent dehydration. Apart from this, the reasons for under-prescription vary contextually. The cost of medicine may lead to the under-prescription of ORS – especially because patients, and often providers, think that antibiotics are more effective (especially in Bihar). This may also be further exacerbated since providers in Bihar noted that patients often tried to administer treatment (often a solution of salt and sugar) at home before approaching them. Financial incentives for selling other treatments (either as a higher profit margin or separate benefit/commission) may also play a role in under-prescription but the exact mechanisms vary. Providers were also concerned with how they were perceived by patients if they only prescribed ORS but also said that they were not influenced by the preferences of their patients.

Results from the large-scale trial show that providers do, in fact, respond to patient preferences. This study indicates that they might not be aware of the change in their behavior. Further, the large-scale study found only a small effect of financial incentives and even then, only in pharmacies. This study documents that the mech-

anisms through which financial incentives work can be quite varied and complicated. It is likely that these were not all controlled for in the large-scale trial and consequentially, the results probably underestimate the effect of financial incentives. It is possible that providers only prescribing ORS when the disease is in the 'goldilocks zone' could have been another factor at play in the study. Study participants in the trial were consulting for a case of diarrhea for their child but without a child present. This could have signaled that the child was either not too serious since the child was not brought along or that the child was so serious that they were too weak to accompany the caretaker. In either case, it complicates a provider's decision to prescribe ORS.

Usually, policymakers see a failure to prescribe ORS for child diarrhea as clearly incorrect because of its effectiveness and affordability. This behavior is usually thought of being a consequence of knowledge gaps and financial incentives. While this is true to an extent, our findings suggest that the story might be a little bit more complicated than that. Taken together, our results suggest that the decision to prescribe ORS or otherwise is a rather complex decision where a provider is trying to parse multiple different signals about the interaction before arriving at a decision. Some of these are based on certain misconceptions about ORS appropriateness (like waiting until signs of dehydration start to show) while others are constraints external to the diagnostic and treatment process (like the budget constraint of the customer). Abstracting away from the multitude of considerations that may be at play could also be a clue as to why it has been difficult to design interventions that are able to improve ORS use. Often, these considerations could be working together. For instance, patients may say they are short on money (theme 1.3) and even though ORS is cheap, it may be removed from the prescription since it is considered by many providers to be a supplement (theme 2.2) and because they think that the patient has probably tried to administer a home-made solution before approaching them

(theme 3.1). Further, due to habit formation over several such instances, providers could be implicitly judging the budget constraint of a patient without an explicit conversation about it and accordingly modifying their prescription behavior.

Another example of why it has been difficult to understand the reasons for under-prescription could be the complicated and seemingly contradictory nature of the knowledge that providers possess about when ORS should be used. Previous work has shown that a knowledge gap does not play a big role in the under-prescription of ORS. This is corroborated by two of our themes as well – providers adequately understand the need to prescribe ORS for diarrhea (theme 1.1) and also think not doing so can put the child at risk of death (theme 2.1). But, at the same time, when probed further if there was any case for which ORS would not be given, providers often said that it is not required unless dehydration is symptomatically noticeable (theme 1.2). Taken together, this could mean that while providers do know that ORS should be prescribed, they think that there is a 'goldilocks zone' – after dehydration symptoms but before the child's life is at risk – when ORS should be prescribed. If this is the case, this adds another dimension of complexity to the decision to prescribe ORS since providers are also trying to make an additional judgment about when the patient has chosen to consult a provider during the current episode of diarrhea.

This study has highlighted the existence of multiple factors that could be driving the underuse of ORS. Consequently, it could also be why it has been a difficult problem to successfully intervene even after decades of trying. Providers also shed some light on what possible interventions might work. An information intervention for providers in the form of a short film could help clear some of the misconceptions. Providers were quick to note that such an intervention would be most effective if it were shown in person – possibly as part of a training event led by a trusted community doctor. Providers were also open to having posters put up in their

clinics that inform patients about the importance of ORS and urge them to ask the provider for ORS. While providers thought that offering a financial incentive to dispense ORS instead of antibiotics might work, it would create a moral hazard and lead to it being prescribed for illnesses that did not require it. The findings of this study are preliminary and require careful investigation using more robust methods. A clearer understanding of the relevance of the themes discussed in this paper could allow us to use them as policy levers and intervene in a more effective manner.

Tables

Table 1: Provider characteristics

Variables	Pooled (N=20)	Karnataka (N=10)	Bihar (N=10)
Demographics			
Age	43.6	42.5	44.8
Male	0.80	0.60	1.00
Knowledge/Experience			
Years of experience	18.2	16.6	19.9
Knows ORS is Correct treatment[1]	0.90	0.95	0.85
Provider type			
MBBS[2]	0.35	0.60	0.10
RMP	0.30	0.00	0.60
AYUSH	0.10	0.20	0.00
Pharmacy	0.25	0.20	0.30
Patient volume			
Patients per day	37.3	48.0	26.7
Diarrhea case per week	5.75	6.90	4.60
Facility characteristics			
Number of beds	3.13	4.75	1.29
Consultation Fee[3]	76.6	102.	47.1
Dispenses medications	0.60	0.30	0.90
ORS available at baseline	0.65	0.40	0.90

Notes: Data was collected prior to the standardized patient visit during the baseline provider survey

[1] *Knows ORS is Correct treatment* is the average of two dummy variables which record whether the provider correctly prescribed ORS when asked to treat a case of diarrhea during the vignette section of the provider survey

[2] MBBS is a Bachelor of Medicine, Bachelor of Science degree is the medical degree awarded to undergraduates in Indian medical schools

[3] *Consultation Fee* typically includes any fees paid for medicine for a registered medical practitioner (RMP)

Appendix

Protocol/Guide for Semi-Structured Interviews

Study Description

In this section, we will tell providers that we are here to understand about child diarrhea care more generally and how it can be improved – not mentioning explicitly that this is a follow-on study.

Introduction

[For interviewers: In this section, we are just trying to build rapport with the doctor so we open with a few easy questions before presenting a vignette of a case with diarrhea. Take a moment to lay out the case carefully and clarify any questions that they might have since it provides the springboard for the next set of questions about their treatment behavior.]

1. We would like to start with some information about your background
    a. How long have you been practicing medicine and working at this facility?
    b. Tell us a little bit about your training in medicine
    c. How often do you see a case of child diarrhea?
2. [Insert Vignette]
    a. Assuming that this is all the information that you have, how would you treat this case?
    b. Is this like a pretty typical case of diarrhea that you see (perhaps prompt something about the child being absent)? What more information would you ideally need and why?

ORS under-use and Financial Incentives

[For interviewers: In this section, we want to better understand the reasons/circumstances under which providers do not prescribe ORS. This includes investigating possibilities like a "lack of prestige" associated with ORS (Q4), stock-outs, their perception of patient preferences, and incentives to prescribe something other than ORS. We also try to understand the structure of the financial incentives at play a bit more]

3. You mentioned that you would use ORS to treat this case – would you always suggest using ORS?
    a. *If ORS not mentioned as treatment in vignette:* You did not mention using ORS in the treatment options – why is that?
    b. Under what circumstances would you recommend using ORS?
4. What kind of a treatment do you consider ORS to be? [Prompt: Do you consider it similar to other medicines that you use?]
5. How are you usually supplied with ORS?
6. Do you often find yourself running out of ORS?
7. Has anyone ever tried offering you incentives to sell ORS?
8. What kind of treatments do you think patients presenting with a case of diarrhea expect to be given?

9. Do patients' parents ever administer some treatment at home before they come to you for treatment? How often is this case and what kind of treatments do they tend to administer at home? [Enumerators: Also try and understand how they know this]
10. Do you ever encounter patients who exhibit a preference for a particular kind of medicine? Would it change your treatment advice to them at all?
11. Can you think of any situation(/in what situation) in which you or other providers might not choose to prescribe ORS?
    a. If provider insists that they would always dispense ORS, prompt them by focusing on why other providers might not or if they are a provider who has not prescribed ORS in SP visit, tell them about their own prescription behavior. [Prompt: We asked other providers]
    b. [Insert follow-up questions based on answer to 11] Prime the te
12. Earlier, you mentioned that you have/not been offered any incentives to sell ORS. Have you been offered incentives to sell any other medicines for child diarrhea?
    What kind of incentives have you been offered for _____?
    How does the incentive system work? How do they keep a track of your prescription behavior and then compensate you?

Intervention Design

[For interviewers: In this section, we want to better understand the challenges with the interventions that we are considering. These interventions are either on the patient side or provider side. On the patient side, we are trying to intervene by getting patients to ask for ORS through an informational campaign like putting up a large poster in providers' clinics. On the provider side, we either pay them directly to prescribe ORS or instead, get them to provide more ORS using informational campaigns. These campaigns may take the form of visual media like a short film which provides information about the efficacy/benefits of ORS along with information about patient preferences. Pay careful attention to XYZ]

13. Is there any medicine that you would suggest should be given regularly to cases of child diarrhea other than ORS?
14. The WHO suggests providing ORS as treatment for all cases of diarrhea and we want to understand what kind of interventions would help increase the prescription rate of ORS. Do you think you would be willing to prescribe ORS more regularly for child diarrhea if you were paid to do so?
15. What kind of information would you/other providers require to prescribe ORS at a higher rate/for all cases of child diarrhea?
16. If information is about effectiveness – what kind of information would be the most effective in conveying the efficacy of ORS?
17. If information is about patient preferences – what specific statistics would help? Would it be information about what patients said they want in our survey? What patients typically use when no provider is available? What other providers usually give patients?

18. Would this be effective as information provided once or would it need to be provided multiple times?
19. What would be the best way to provide this information? Text, audio, video?
20. As a provider, would you be interested in helping make patients more aware of their treatment options by putting up a poster in your office?
21. What kind of issues do you think might crop up when we try to give other providers information about ORS effectiveness/patient preferences?
22. Under what circumstances do you think just paying providers to prescribe ORS would be more effective then getting them to increase ORS prescription by making them aware of the efficacy of ORS (or vice versa)?
23. If there were one thing that could increase ORS prescription relative to anything else, what do you think that would be?

Policy Implications

The goal of this dissertation was to highlight the need to study vulnerable populations with a nontraditional approach that intimately involves members of the community of interest. The three papers in this dissertation present examples of how such an approach can be implemented. The first paper uses an innovative method to study an important social interaction that is otherwise difficult to observe and throws light on a previously understudied form of discrimination among some of the most vulnerable populations of India. I worked closely with members of these communities throughout the process and in fact, this study would be impossible to conduct without their participation. Similarly, the second paper also uses an innovative approach to study the problem of sexual misconduct under-reporting from a more holistic perspective. Finally, the last paper returns to the community to better understand the reasons for the under-prescription of ORS for child diarrhea after decades of attempts to address this issue have only resulted in limited improvements.

The first essay sought to understand the impact that caste and religious identity have on healthcare delivery in Bihar, India. This is particularly important to understand for two reasons - first, in a society like India where caste and religion play an ever-present role in social interactions, especially those of a discriminatory nature, there has been little rigorously documented evidence of discrimination in healthcare delivery. Second, even though disparities in health outcomes are clearly observed in population-level data, it is unclear if some portion of these disparities are driven by discrimination or solely by differential access. This study is the first to rigorously document caste and religion-based discrimination in healthcare delivery. This is an important finding because it allows policy-makers to choose the right levers

to combat health disparities. While continued improvement in access to healthcare will certainly narrow the gap, policymakers will also have to engage with the discrimination faced by minority communities in India to finally close it. Implicit bias training can be an effective way of combating some of these. Often, providers from minority communities can be placed in minority communities to better serve them but the results show that even though minority patients do get better care overall, the disparities widen. Policymakers will have to be careful of how to design such an intervention if they choose to do so. One option may be to have minority providers exclusively serve minority communities. Nonetheless, while tackling the issue of caste and religion-based discrimination, it must be remembered that this is a complex systemic issue with historical origins. Consequently, it might require bold or radical policy interventions to completely stymie.

The second essay attempts to take a more systemic approach to a previously individualized phenomenon: non-disclosure by victims of sexual assault. In the aftermath of the #MeToo movement, society has witnessed a larger number of victims reporting on cases of sexual misconduct. Simultaneously, there have also been many detractors that have questioned the veracity and/or timing of the claims. The prevailing understanding of non-disclosure has focused primarily on the psychological aspects of a victim. The results of this study provide a more holistic narrative of how policymakers can engender truth-telling at the societal level. The big takeaways of this study are that the level of stigma is less important than the rate at which stigma decreases in improving truth-telling. Further, reducing stigma is an important first step to improving truth-telling because it kick-starts a virtuous cycle of accusations being made. A second inflection point in the evolution of the long-term equilibrium occurs when social support reaches a certain level and there is an improvement in the ability of victims to convert effort into receiving justice. From a policy perspective, this has a few different implications. First, it is important

for policymakers to focus initial efforts on reducing stigma. This can be done in many ways. For instance, using information campaigns that focus on the ubiquitous nature of sexual misconduct. This has the twin effect of reducing stigma while also making individuals aware of the extent of the problem. These have been found to be major reasons for disclosure in the wake of the #MeToo movement [42]. Secondly, the results also show that truth-telling occurs in a 'goldilocks zone'. This means that policymakers must also take care to not create a set of incentives that encourage those who have not experienced sexual misconduct to make an accusation (though we currently don't run this risk as a society). This can be ensured, to a certain degree, by limiting stigma against the accused before the court has made a judgment since such stigma costs can lead to innocent individuals choosing to plead guilty to avoid being in the public eye. Consequently, reactions to such an equilibrium might create a situation that makes it even more difficult for true victims to make an accusation.

The third essay returns to the community to try and better understand why ORS remains under-prescribed for cases of child diarrhea despite being an inexpensive effective treatment. This is an issue that has been addressed with limited success despite decades of work. A recent large-scale trial conducted by the same study team found that patients exhibiting a preference for ORS improves prescription. Further, in some facilities such as pharmacies, removing financial incentives also improves prescription. Nonetheless, 39% of under-prescription still remains unexplained. In this study, the study team performed semi-structured interviews with providers from the large-scale study to better understand the potential reasons for ORS under-prescription, perceptions about ORS, and patient behavior. Our results show that providers are well aware of the importance of using ORS in treating diarrhea but there are misconceptions about the timing of use and best practices. Often, providers are considering a variety of factors in making this decision, some of

which may not be obvious to those studying the problem. For instance, even though ORS is inexpensive, it might often not be prescribed by providers if the patient says that they are short on money. Even though antibiotics are more expensive, they are perceived to be more effective and "real" medicine while ORS is often considered to be a supplement, and a home-administered solution of sugar and salt is thought to be a reasonable substitute. Consequently, ORS is dropped from the treatment. Financial incentives also play a role in the under-prescription of ORS but the exact mechanisms vary. The large-scale trial only controlled for one such mechanism and was therefore probably underestimating its effect. Providers said that a patient's preference for certain medicines did not change treatment behavior which is the opposite of what was found in the large-scale trial. This indicates that providers may perhaps be unaware of how patient preferences do indeed change their prescription behavior. Interventions that might be likely to work must be multi-pronged and target the provider and community simultaneously. Policymakers can partner with community doctors and leaders to show short films aimed at clearing the aforementioned misconceptions about ORS use. These films can also present suggestions for how providers can engage with trickier situations and still prescribe ORS. On the community side, policymakers can improve awareness about ORS and encourage patients to ask for ORS as this is found to improve ORS prescription. This can be done using informational posters which can be put up in the clinics of frequently visited providers as well community healthcare worker clinics. All providers that we spoke to were open to putting up such posters and even encouraged it.

In some sense, in reverse, the methods used in this dissertation provide the blueprint of an approach to tackle complex problems among vulnerable populations. First, start with engaging the community to understand the community and its problem more deeply. Then, build a holistic theoretical model which accounts for how the most important factors outlined by the community interact with the

problem at hand and generate hypotheses about the problem or how to intervene. After this, collect empirical data to test our hypotheses about the problem or how to solve it. Finally, return to the community with these findings to better engage with them in finding a solution to the problem.

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