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Information and symptoms assessment in community pharmacies during the COVID-19 pandemic: An audit study in Colombia

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Abstract

We conducted an audit study with 262 community pharmacies from seven municipalities in the Northeast of Colombia. In the study, a simulated client called and described a list of symptoms experienced by her brother and asked the pharmacist for a recommendation. In our "common" condition, the symptoms were headache, sore throat, and fever. In our COVID condition, we added anosmia (i.e., the loss of smell) as a fourth symptom, allowing better discrimination with respect to other diseases. We find that mentioning anosmia induced a more cautious behavior among pharmacists. The probability that pharmacists recommend registering the case in the dedicated emergency line increased from 19.7 to 32.2 percent, whereas the probability that pharmacists make a prescription decreased from 69.7 to 51.5 percent. The seven selected municipalities were drawn from dengue-endemic and non-endemic areas. Although we hypothesized that experience with symptoms from the common condition would make it harder to provide adequate recommendations in endemic areas, we did not find differences in behavior supporting this hypothesis.

JEL Classification: C93; I12; I18

Keywords

anosmia – phone calls – simulated clients – Latin America

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Introduction

Pharmacies are a vital part of the healthcare system as providers of medicines and other health services. In low- and middle-income countries (LMICs hereafter), community pharmacies are often the first line of contact with the health sector (World Health Organization 1997). They seldom serve as medical and pharmaceutical advisors when the costs, in terms of time or money, are perceived to be lower compared to visit a healthcare center (Goel, Ross-Degnan, Berman, and Soumerai 1996, Kamat and Nichter 1998, Mwabu 1989). Facing the COVID-19 pandemic, one might expect that community pharmacies become more relevant due to fears of contagion from visiting a healthcare center and to the expected congestion of dedicated emergency lines.

The WHO guidelines indicate that reports of COVID-19 symptoms must be centralized throughout national or local emergency lines[1] (World Health Organization 2020). Although the *de iure* role of community pharmacies is narrow, the limited capacity of the healthcare system in LMICs and the lack of enforcement of the allowed procedures (e.g., medicine delivery and referral of patients) grant an ampler *de facto* role to these pharmacies. From a policy perspective, understanding the role of pharmacists is determinant to profit from their closeness to the community, while conceiving strategies that allow their diagnoses and referrals to be better integrated with the national healthcare system. We explore the pharmacists' compliance with the WHO guidelines and whether it is affected by relevant COVID-19 information.

We conducted a telephone audit study with 262 community pharmacies located in seven municipalities, accounting for nearly 5% of the Colombian population.[2] In each call, the auditor mentioned that her brother was feeling sick, listed a group of symptoms, and asked the pharmacist "What would she (or he) recommends." We coded whether the pharmacist: (i) recommended to call the emergency line, (ii) recommended to get medical attention, (iii) prescribed any pharmaceutical product, or (iv) recommended to visit the pharmacy.

We randomly assigned each call to one of two treatments. In the *common* treatment, the listed symptoms during the call were headache, sore throat, and fever. These symptoms are

[1] See: who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public.

[2] We located 734 pharmacies in these municipalities, but only 396 registered a phone number. Roughly two-thirds of our calls were answered.

"common" to a flu, to COVID-19, and also to dengue. In the *COVID* treatment, in addition to the symptoms from the *common* treatment, we mentioned anosmia, defined as the loss of smell. Studies have revealed that anosmia is tightly associated with COVID-19, but not to the other diseases mentioned above for individuals without conditions such as asthma or allergic rhinitis. This olfactory dysfunction was present in 79.6% of COVID-19 patients in a European sample, even those otherwise asymptomatic (Lechien, Chiesa-Estomba, De Siati, Horoi, Le Bon, Rodriguez, Dequanter, Blecic, El Afia, Distinguin, et al. 2020).

Mentioning anosmia in roughly half of our calls allows us to check whether novel or "rare" information triggered different pharmacists' responses. Whereas studies measuring behavioral responses to information typically provide it as a direct stimuli (Bhargava, Loewenstein, and Sydnor 2017, Chemin 2018, Kolstad 2013), we rely on the pharmacists' *recent* acquisition of information relating anosmia to COVID-19 or in its "rareness" as a symptom. We emphasize on the recency of information because the first studies relating anosmia to COVID-19, from patients in Iran, Italy and Germany, were published only two weeks before the beginning of our study (Bagheri, Asghari, Farhadi, Shamshiri, Kabir, Kamrava, Jalessi, Mohebbi, Alizadeh, Honarmand, et al. 2020, Giacomelli, Pezzati, Conti, Bernacchia, Siano, Oreni, Rusconi, Gervasoni, Ridolfo, Rizzardini, et al. 2020, Lüers, Klußmann, and Guntinas-Lichius 2020). Hence, reactions to our treatment might shed light on the rapid diffusion of scientific findings into more consumer-friendly sources of information (though not controlled in our study).

It is not obvious that "rare" information enhances diagnosis abilities. Instead, this novel information may enter in conflict with information more easily recalled, falling prey to an availability bias (Dawson and Arkes 1987, Klein 2005). Think, for instance, that pharmacists typically associate headaches, sore throat, and fever with flu or dengue. It could be possible, that the high frequency of these symptoms may lead to neglecting anosmia, a "rare" piece of information.

To explore this possibility, we exploit the regional variation of dengue incidence in Colombia, given that it is an endemic zone (Padilla, Rojas, and Sáenz 2012, Villar, Rojas, Besada-Lombana, and Sarti 2015). More precisely, we study whether pharmacists that are more used to deal with the common symptoms react differently when anosmia is mentioned, compared to pharmacists in non-endemic areas. Sixty-four percent of the pharmacies from our original sample are located in municipalities with at least 390 dengue cases per 100,000 inhabitants during 2019. In contrast, the remaining thirty-six percent of the pharmacies are located in municipalities, in a neighboring *Departamento*, with less than 2.5 dengue cases per 100,000 inhabitants during 2019. By the time this study was conducted, these areas had faced the COVID-19 pandemic and a high number of dengue cases, simultaneously.[3]

We find that, in our baseline, for the call listing the common symptoms 20% of the pharmacists recommend the auditor referring the case to the emergency line. This low compliance increases to 32% when we also mention anosmia. Moreover, the *COVID* treatment yields two additional and positive results. Recommendations to get medical help, either by getting an appointment with a doctor or visiting a healthcare center, increase from 32% to 51% when mentioning anosmia. Moreover, pharmacists' prescriptions, which are not allowed, decrease from 70% to 52% for the same between-treatments comparison. By contrast, we do not find differential effects of our treatment between the dengue-endemic and non-endemic municipalities.

Our primary purpose with this study is to shed light on how community pharmacies handle calls emulating medical consultations during the pandemic. We can locate our contribution on two strands of the literature. First, this study is related to cognitive biases in information processing for medical decision-making. The most common biases in this context are related to the estimation of probabilities and the synthesis of information (Dawson and Arkes 1987, Mamede, van Gog, van den Berge, Rikers, van Saase, van Guldener, and Schmidt 2010, Blumenthal-Barby and Krieger 2015, Lambe, O'Reilly, Kelly, and Curristan 2016). Most of the studies evidencing these biases are conducted with patients (66%) and medical personnel (30%). By contrast, we are aware of only one study with pharmacy directors serving on pharmacy and therapeutic committees, showing a systematic underestimation of risk when displayed in relative terms (Mezzio, Nguyen, Kiselica, and O'Day 2018).

Although our results do not reveal differences between dengue-endemic and non-endemic municipalities, suggesting that the availability bias did not play a role, mentioning anosmia triggered more cautious recommendations from pharmacists. Following Wallsten (1981), we speculate that this result might be associated to the role of regret in overestimating the probabilities of undesired outcomes, which might become more prominent in the middle of a pandemic (Wallsten 1981).

Second, we contribute to the evidence using audit studies, or simulated client studies as they are known in the Public Health domain (Madden, Quick, Ross-Degnan, and Kafle 1997, Watson, Norris, and Granas 2006, Kwan, Daniels, Bergkvist, Das, Pai, and Das 2019), to explore the interplay between norm compliance and information in the health sector. Audits reveal poor compliance with the request of prescriptions, as well as insufficient knowledge of the studied diseases, in particular in LMICs (Smith 2009, Currie, Lin, and Zhang 2011, Wafula, Miriti, and Goodman 2012, Currie, Lin, and Meng 2014, Miller and Goodman 2016). For instance, in South America, 78% of antibiotics are delivered without prescription, with Bogotá (Colombia) displaying even worst numbers (Auta, Hadi, Oga, Adewuyi, Abdu-Aguye, Adeloye, Strickland-Hodge, and Morgan 2019, Vacca, Nino, and Reveiz 2011).

[3] In the first eight weeks of 2020, the number of dengue cases per 100,000 inhabitants reported in the selected *Departamentos*, Santander, Norte de Santander, and Boyacá, were 55.3, 30.6, and 14.7, respectively.

We show low compliance to the WHO and the Colombian Ministry of Health guidelines for reporting COVID-19 symptoms. However, we also show that relevant information for diagnosis substantially improves the handling of calls to pharmacies emulating medical consultations.

Methods

We designed and implemented an audit study to understand pharmacists' behavior upon receiving a call of a client, the auditor hereafter, describing a list of symptoms experienced by the auditor's brother. The nature of audit studies allow us to present a specific medical case to multiple pharmacists in a blinded fashion (Kwan, Daniels, Bergkvist, Das, Pai, and Das 2019). We describe below the protocol employed in the calls, as well as our sampling design.

Ethics clearance

We obtained clearance from the Ethics Committee at Universidad de Los Andes to conduct this study. A full account of the ethical considerations is reported in the Supplementary Material (**SM.1**).

Protocol and implementation

The devised script allows us to code the pharmacists' responses to our call, emulating a medical consultation, while keeping the average duration of the calls below 90 seconds. We randomly assigned each community pharmacy to one of two treatments, differing only in the mentioned symptoms. In the *common* treatment, the auditor says:

> "I am calling because my brother is complaining about a sore throat, headache, and fever. I would like to ask what do you recommend me to do."

In the *COVID* treatment, the script adds anosmia as an additional symptom. It says:

> "I am calling because my brother is complaining about sore throat, headache, fever, and says that he feels as if he had lost the sense of smell. I would like to ask what do you recommend me to do."

The underlined text is the only difference between treatments. We do not provide any other information at the beginning of the call, since pharmacists' questions would give us clues on their reasoning for diagnosis. The responses to potential questions from the pharmacist were identical between treatments. The auditors memorized the main description of the simulated patient: the simulated brother was thirty years old, symptoms started the morning of the previous day, he has not taken any pharmaceutical products yet, and, as far as the auditor knows, her brother is not allergic to any pharmaceutical component. A detailed description of potential questions and answers is reported in the Supplementary Material (**SM.2**).

The auditor makes the call on behalf of her brother for two reasons. First, the auditors' voice would not raise suspicions about the symptoms, especially the sore throat. Second, to reduce the engagement of the pharmacist with the emulated phone medical consultation by being less able to provide further details about symptoms.

Each auditor received a list of community pharmacies. The only information provided for each pharmacy was its name, phone number, and a password to be entered in an online server where all the data coded from the call was registered. The auditor confirmed the pharmacy's phone number after entering the password, and then she was instructed to make the call. We did not voice-recorded the phone calls.

When the call came in, the auditor was assigned to either the *common* or the *COVID* treatment. This last-minute randomization serves two purposes. First, it improves the balance between treatments. Second, auditors are less able to unconsciously control any behavioral differences between treatments during the call. When a call failed, the auditor was instructed to move to the next community pharmacy assigned to herself and attempt the failed calls at the end of the batch of calls again. Failed calls were attempted up to four times.

Sample

We employed web-scraping to collect unique phone numbers of 396 community pharmacies from seven different municipalities in Colombia.[4] Selected municipalities were located in the regions of Santander or Norte de Santander, dengue-endemic areas, or in the neighboring region of Boyacá. The selected municipalities account for nearly 5% of the country's population. For the non-dengue municipalities there was an incidence below 3 cases per one-hundred thousand inhabitants in 2019, while for the dengue-endemic municipalities, the numbers were around 400 to 500 (see Table 2 in the Supplementary Material). We hypothesize that in dengue-endemic municipalities the list of symptoms in the *common* treatment are associated with this disease. Hence, pharmacists in these areas will be more likely to recall the pre-pandemic recommendations given to clients. Therefore there is a higher chance of neglecting the additional information provided in the *COVID* treatment. As a result, we expect lower differences between treatments in dengue-endemic municipalities.

All the selected municipalities have at least 120,000 inhabitants to minimize the chance that calls were interpreted as being made by an "outsider." In smaller municipalities, given the higher social cohesion, outsiders (i.e., non-recognized callers) might be treated differently. An evident reason is that, if the listed symptoms might lead to a COVID-19 case, the pharmacist might become more inquisitive regarding the infected person's identity. Eight auditors were assigned to endemic and non-endemic areas based on their accents, minimizing the outsider effects. Within each area, the pharmacies were randomly assigned to the auditors.

[4] We dropped from our sample pharmacies sharing a phone number, meaning that delivery services are centralized at the chain store level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Pr(Call COVID Line)		Pr(Medical Attention)		Pr(Visit Pharmacy)		Pr(Prescription)	
COVID treatment	0.125**	0.136**	0.187***	0.187***	0.0407*	0.0329	-0.182***	-0.176***
	(0.0536)	(0.0552)	(0.0600)	(0.0612)	(0.0228)	(0.0200)	(0.0595)	(0.0607)
Auditor FE	No	Yes	No	Yes	No	Yes	No	Yes
Municipality FE	No	Yes	No	Yes	No	Yes	No	Yes
Mean of dep. at control	0.197		0.320		0.0160		0.697	
Observations	262	262	262	262	262	262	262	262
R-squared	0.0199	0.0506	0.0359	0.0825	0.0113	0.108	0.0345	0.0757

Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 1. Effect of COVID treatment (i.e., mentioning anosmia) on recommendations made by pharmacists.

Results

General findings

We collected the phone number of 396 pharmacies. The response rate was 66.2%. The reported results correspond to the 262 pharmacies who answered the call.

Table 1 displays the coefficients of a linear probability model for the pharmacist's recommendations as a function of the *COVID* treatment. We coded four behaviors of interest, ordered from the most to the least desirable. The recommendation to call and report the case in the COVID dedicated line is the only behavior aligned with the WHO and the Colombian Ministry of Health guidelines. We observe that in the *common* treatment, this recommendation occurs in 19.7% of the calls. In the *COVID* treatment, adding anosmia as a symptom, increases the probability of being recommended to register the case in the dedicated line in 13.6 pp (percentage points). This effect represents an increase of 69% in the probability of receiving the most desirable recommendation, and it is robust to the introduction of auditor and municipality fixed effects.

The recommendation to seek medical attention, either by visiting a medical center or looking for a physician, occurred in 32% of the calls in the *common* treatment. The *COVID* treatment increased by 18.7 pp (or 58%) the probability of receiving this recommendation. We also find that pharmacists frequently recommended medicines and other pharmaceutical products in the *common* treatment (69.7%). The *COVID* treatment reduced the probability of receiving these prescriptions by 17.6 pp (or 25%).

The recommendation to visit the pharmacy, undesirable for going against confinement policies, rarely occurred in the *common* treatment (1.6%). The effect of the *COVID* treatment, although positive, is only marginally significant (and becomes insignificant once we add fixed effects).

The R-squared in our regression models are relatively low despite the fact that the treatment variable is highly significant for three out of four outcomes. Hence, although the reported effects are large in magnitude, we cannot capture more meaningful determinants of the types of recommendations given by pharmacists.

Differences between dengue-endemic and non-endemic areas

Table 2 reports a similar analysis to the one reported in Table 1. It includes a categorical variable for dengue-endemic areas and its interaction with the *COVID* treatment, which is the coefficient of interest. We do not find evidence of differences between dengue-endemic and non-endemic areas regarding the effects of mentioning anosmia. While the interaction term increases the standard errors, coefficients associated with the treatment remain within the range of those reported in Table 1, for both the dengue and non-dengue areas.[5]

The lack of differences by dengue-endemic and non-endemic areas raises a question on whether our protocol was able to trigger different responses from the pharmacists between these types of municipalities. We thus conduct a third set of linear probability models, in which the dependent variable corresponds to whether a type of pharmaceutical product was recommended. Column (1) in Table 4 (see Supplementary Material) reveals that the probability of recommending products against dehydration is 22.6 pp higher (almost a twofold increase) in dengue-endemic areas. Moreover, this probability is not affected by the *COVID* treatment. We interpret this result as a validation check of the differences between dengue-endemic and non-endemic areas: fluid intake is recommended to reduce the risk of hospitalization for dengue fever (Harris, Videa, Pérez, Sandoval, Téllez, Perez, Cuadra, Rocha, Idiaquez, Alonso, et al. 2000, Padilla, Rojas, and Sáenz 2012).

The remaining five columns in Table 4 reveal treatment differences in the pharmacists' prescriptions of other pharmaceutical products. It is worth mentioning that a less obvious practice in dengue-endemic areas is to recommend antiseptics for sore throat (column 5). This practice is not affected by the *COVID* treatment.

[5] The last row of the table presents a linear test of the sum of coefficients for the *COVID* treatment and its interaction with dengue.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Pr(Call COVID Line)		Pr(Medical Attention)		Pr(Visit Pharmacy)		Pr(Prescription)	
COVID treatment [1]	0.203**	0.198*	0.145	0.150	0.0971	0.0911	-0.243**	-0.249**
	(0.0992)	(0.103)	(0.114)	(0.116)	(0.0600)	(0.0559)	(0.112)	(0.116)
Dengue Area	0.0399	-0.0625	-0.0181	0.291*	-0.0225	-0.0486	-0.00435	-0.0686
	(0.0807)	(0.157)	(0.0995)	(0.166)	(0.0348)	(0.0517)	(0.0972)	(0.164)
Treatment × Dengue [2]	-0.112	-0.0852	0.0611	0.0518	-0.0867	-0.0810	0.0904	0.102
	(0.118)	(0.122)	(0.135)	(0.136)	(0.0628)	(0.0584)	(0.133)	(0.136)
Auditor FE	No	Yes	No	Yes	No	Yes	No	Yes
Municipality FE	No	Yes	No	Yes	No	Yes	No	Yes
Mean of dep. at control	0.197		0.32		0.0160		0.697	
Observations	262	262	262	262	262	262	262	262
R-squared	0.0238	0.0524	0.0369	0.0830	0.0507	0.117	0.0381	0.0778
$p-$val test [1]+[2] = 0	0.153	0.088	0.004	0.006	0.575	0.550	0.032	0.040

The test in the last line of the table corresponds to whether the impact of COVID treatment on Dengue areas is equal to 0. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 2. Effect of COVID treatment (i.e., mentioning anosmia) on recommendations made by pharmacists across dengue endemic and non-endemic areas.

Discussion

The role of information in the pharmacists' recommendations

Mentioning anosmia induces more conservative recommendations provided by the pharmacists. However, we cannot disentangle two potential mechanisms: openness to acquiring information and rareness of information. Information connecting anosmia with COVID-19 was available for at most three weeks before our study took place (Bagheri, Asghari, Farhadi, Shamshiri, Kabir, Kamrava, Jalessi, Mohebbi, Alizadeh, Honarmand, et al. 2020, Giacomelli, Pezzati, Conti, Bernacchia, Siano, Oreni, Rusconi, Gervasoni, Ridolfo, Rizzardini, et al. 2020, Lüers, Klußmann, and Guntinas-Lichius 2020). Openness to acquire information does not mean that pharmacists are directly consuming scientific literature, but that media and social networks' coverage of these findings is being disseminated fast enough and with sufficient credibility.

Alternatively, anosmia is an infrequent symptom, and its rareness may trigger a more cautious behavior among pharmacists. However, it is not evident that "rare" information enhances diagnosis abilities: it may enter in conflict with information that is recalled more quickly, according to the availability bias (Dawson and Arkes 1987, Klein 2005). For instance, pharmacists in endemic areas might be more likely to associate symptoms in the *common* treatment with dengue. Although this is speculative, the lack of a differential effect for dengue endemic areas gives more support to the willingness of pharmacists to acquire relevant information during the pandemic.

What should be the role of community pharmacies during the pandemics?

Neither the WHO nor the Colombian Health Ministry guidelines are explicit on what should be the role of community pharmacies in the pandemic, even though pharmacies can be part of the global response to the pandemic providing health advice, education, and making referrals based on symptoms (Cadogan and Hughes 2020). Neglecting the role of pharmacies in the pandemics translates into a lost opportunity to articulate and enhance pharmacists' diagnosis ability, especially in areas with poor health infrastructure. This role is even more critical in LMICs due to the limited capacities of the health systems.

Our audit study reveals that pharmacists can help, and are willing to do so. Although our script aimed to keep the pharmacists' inference of immediate purchase low, all the pharmacists replied to our request, even if their recommendations did not involve a direct gain for their business.[6] This revealed willingness to help, combined with the responsiveness to information, opens the door for interventions based on the delivery of guidelines that improve the pharmacists' diagnosis abilities.

Final remarks

Audit studies on community pharmacies typically reveal dismal results. Although we also find antibiotic prescription, our study reveals a bright side on how pharmacists react to

[6] In only one call, the pharmacist asked if the auditor was a regular customer, and in six calls, the pharmacist offered delivery of the recommended medicines.

relevant information in times of pandemic. By mentioning anosmia, an additional symptom that enhances the ability to discriminate COVID-19 from other potential diseases, the pharmacists engage in more cautious behavior by increasing the recommendations to call the emergency line and reducing the likelihood of a prescription.

Our intervention, despite its small scale, revealed a promising effect of information. Larger interventions may shed light on articulating community pharmacies with the governmental protocols, profiting from the pharmacies' capabilities, and closer connections with the community. Indeed, the adaptation of norms and behaviors to the COVID-19 pandemic requires that communities have a voice, are engaged and participatory, and are informed (Habersaat, Betsch, Danchin, Sunstein, Böhm, Falk, Brewer, Omer, Scherzer, Sah, et al. 2020). A lesson from the Ebola outbreak is how Community Care Centers in Sierra Leone were determinant to reduce fears about Western medicine and encourage reporting (Christensen, Dube, Haushofer, Siddiqi, and Voors 2020). More generally, patients' trust in providers is determinant to the resilience of health systems (Kruk, Gage, Arsenault, Jordan, Leslie, Roder-DeWan, Adeyi, Barker, Daelmans, Doubova, et al. 2018). Community pharmacies might look as close, accessible and trustworthy in areas where other types of healthcare provision are low.

Another implication, from the behavioral lens, is how pharmacists receive and transmit information. The use of guidelines aimed at improving the pharmacists' diagnosis abilities might result in stronger correlations between perceived and actual risks among the general population, a necessary condition to trigger preventive changes of conduct (Rubin, Amlôt, Page, and Wessely 2009, Reintjes, Das, Klemm, Richardus, Keßler, and Ahmad 2016, Betsch, Wieler, and Habersaat 2020).

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Supplementary Material

Ethical considerations

A detailed discussion of the ethical considerations of the project is not common. Nonetheless, in our study, some methodological decisions are tightly connected to the ethical implications of this project.

In audit studies, it is not possible to obtain consent from the audited pharmacists, since it would compromise the main advantage of this methodology: the ability to measure behavior in a natural setting while minimizing the observer effect. (Miller and Goodman 2016) present a discussion on the required conditions for a simulated client study to obtain ethics clearance. First, if there is no other method able to yield scientifically valid conclusions obtained with the simulated client methodology (SCM). Second, if the risks for the simulated client and the audited person (i.e., the pharmacist) are minimal. Third, if the social value of the study is large enough to overrule the autonomy principle while "simulating" a client or patient.

Regarding the first condition, we argue that it is imperative to eliminate the "observer effect" that would emerge by requesting consent. Since the pharmacists do not know we are coding their recommendations, their behavior is similar to how they would respond when receiving a call concerning an actual medical consultation. Our audit study grants the ecological validity of the observed behavior (Lahey and Beasley 2018). More importantly, it reduces the more cautious behavior that we would have observed by announcing to the pharmacist, in an informed consent, that we were studying their responses to a list of symptoms during the pandemics.

Regarding the second condition, we argue that this research protocol involves minimal risk both for the auditor making the call and the audited pharmacist. Calls were made from the auditor's home to prevent an increase in the risk of contagion. Moreover, calls were short to avoid fatigue. For the pharmacists, the incoming call from our study does not differ from other calls that they might receive during the day, since the medical consultations to pharmacists are prevalent in Colombia (Lopez, Dennis, and Moscoso 2009). Therefore our call is not affecting the risk of the pharmacist. Moreover, the protocol was designed to minimize the call duration and the chances to realize that the call was part of a study, minimizing the discomfort that discovering about being involved in the study may entail. Besides, we are not registering any characteristic that would allow us to identify the pharmacist who received the call (e.g., name, presumed gender inferred from her voice). Finally, the debriefing process with the pharmacies was carried one month after the study.

This study might increase the risk of congestion of the pharmacies' phone lines, affecting potential customers. We took multiple cautions to minimize this risk: the average duration of the calls was 90 seconds, calls were performed after 9:00 a.m. and before 6:00 p.m., calls on hold were kept for at most 3 minutes, and all the call attempts were completed within a week. We committed to stopping the study if, according to Health Ministry's daily reports, the number of reported contagions in any of the three regions selected for the study surpassed the one-hundred cases. By the time we completed the calls, there were 31, 57, and 30 registered cases in Boyacá, Norte de Santander and Santander, respectively (15^{th} April 2020).

Regarding the third condition, we argue that the study's social value is high compared to the involved risks, given its contribution to better understand the pharmacists' recommendations during the COVID-19 pandemics. The social value of the study required a rapid dissemination of our findings, so we committed to write a brief report within the ten days after we completed the data collection, and to deliver this brief, electronically, to the Health Offices of the three *Departamentos*, and the seven municipalities that took part in our study. We created an infographic for the debriefing to pharmacists. One month later we called the pharmacies again, and offered to the pharmacists to send an electronic version of this infographic, which has two main messages. First, pharmacists should refer clients with symptoms to the dedicated emergency line. Second, pharmacists should pay special attention to calls in which anosmia is mentioned.

Full protocol

The following are the instructions to auditors:

1. Open the file with the list of pharmacies and filter by your name.

2. Open the LimeSurvey webpage and write the token (password) corresponding to the indicated pharmacy. Verify that the name and address from the pharmacy you are about to call matches the information in the list. Recall that at this point, you do not know whether you will call and report the symptoms in the *common* or the *COVID* treatment. For this reason, once the call comes in, you must report it in the form and swiftly advance to the following page, so you can be aware of the symptoms you have to list.

3. Recall that you must add the regional prefixes to the phone number.

4. Follow the script (only the corresponding text appear in each treatment):

    - **Common treatment:** *"Good morning/afternoon, I am calling because my brother is complaining*

about a sore throat, headache, and fever. I would like to ask what do you recommend me to do."

- **COVID treatment:** *"Good morning/afternoon, I am calling because my brother is complaining about a sore throat, headache, fever, and says that he feels as if he had lost the sense of smell. I would like to ask what do you recommend me to do."*

The following are common questions that the pharmacist may ask you. Note that the responses are the same, regardless of the treatment.

- **How old is your brother?** Thirty years old.
- **When started the symptoms?** Yesterday morning.
- **Does your brother reported any other symptoms?** No. Only those I just mentioned. `[Repeat the symptoms.]`
- **Has your brother already taken some medicines?** No.
- **Is your brother allergic to any medicine?** Not, as far as I know.
- **Where does your brother live?** `[The response is a predefined residential area in each city]`[7]

The following are common situations that may occur during the call. If one of these situations emerge, you have to finish the call as soon as possible.

- **If you are asked to visit the pharmacy:** Thank you. You know that leaving home with the current situation is quite complicated. Let me speak to my brother, and either him or me will call back to confirm the address.
- **If the pharmacist offers to make home delivery:** Thank you. My sister `[A third sibling appears]` lives nearby the pharmacy, so I will talk to her and see if she can pick up the medicines.
- **If you are requested to put your brother on the call:** Excuse me. He asked me to make the call on behalf of him, but we do not live together. Let me tell you to call directly, so he can directly speak to you.
- **If the call is interrupted, you should only call again if you have not collected all the relevant information. If, by contrast, the pharmacist is explaining to you the dosage of a suggested medicine, or giving you additional recommendations, do not call again.**
- **If a particular medicine is recommended, do not ask about the dosage to minimize the duration of the call.**

[7] For each city, we did some research to identify residential areas or neighborhoods that were sufficiently large and from intermediate socio-economic status.

Additional tables

Tables 3 and 4 are reported in this subsection.

	Total Cases			Cases per 100,000 inhabitants		
	2018	2019	2020[a]	2018	2019	2020[a]
Dengue endemic Departments (in bold) and Municipalities						
Norte de Santander	4830	6570	496	323.8	419.7	30.6
Cúcuta	2669	3538	200	375.0	472.2	25.7
Santander	2630	9757	1261	120.4	436.1	55.3
Bucaramanga	597	2517	231	102.7	422.6	38.0
Floridablanca	348	1298	160	119.2	431.6	52.0
Girón	178	653	120	111.0	391.4	69.8
Non-endemic Department (in bold) and Municipalities						
Boyacá	91	939	183	7.5	76.3	14.7
Duitama	0	3	0	0.0	2.4	0.0
Sogamoso	0	3	0	0.0	2.3	0.0
Tunja	0	0	0	0.0	0.0	0.0

[a] Cases reported during the first eight weeks in 2020 (January and February).

Source: National Health Institute - INS (portalsivigila.ins.gov.co/Paginas/Vigilancia-Rutinaria.aspx).

Population projections obtained from the National Department of Statistics - DANE (dane.gov.co/index.php/estadisticas-por-tema/demografia-y-poblacion/proyecciones-de-poblacion)

Table 3. Reported cases of dengue in the selected Departments and Municipalities.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Hydration	Analgesic	Antibiotic	Anti inflammatory	Antiseptic	Complement
COVID treatment [1]	-0.0150	-0.0291	-0.266**	-0.307***	0.0859	0.00763
	(0.0560)	(0.111)	(0.107)	(0.110)	(0.0548)	(0.0459)
Dengue Area	0.226***	0.142	-0.0169	-0.0469	0.189**	0.0222
	(0.0840)	(0.162)	(0.161)	(0.165)	(0.0875)	(0.0680)
Treatment × Dengue [2]	-0.0215	-0.103	0.187	0.195	-0.129*	-0.0144
	(0.0758)	(0.134)	(0.130)	(0.130)	(0.0768)	(0.0603)
Mean of dep. at control	0.123	0.467	0.418	0.377	0.139	0.0740
Observations	262	262	262	262	262	262
R-squared	0.0576	0.0837	0.0606	0.0621	0.0624	0.0852
$p-$val test [1] + [2] = 0	0.475	0.078	0.284	0.109	0.424	0.864

The category "Complement" includes Vitamin C pills, transfer factors and dietary supplements. Auditor and municipality fixed effects are included in all regressions. The test in the last line of the table corresponds whether the impact of COVID treatment on Dengue areas is equal to 0.

Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4. Correlations of COVID treatment and dengue endemic areas with recommended pharmaceutical products.