Mentioning anosmia improves how community pharmacies handle phone call requests 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 to register 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 past experience with symptoms from the common condition would make harder to provide adequate recommendations in endemic areas, we did not find differences in behavior supporting this hypothesis.

Keywords: diagnosis; information; simulated clients; standardized patients; Latin America

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1 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). Moreover, their role might also be extended to 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 et al., 1996; Kamat and Nichter, 1998; Mwabu, 1989). Moreover, during the COVID-19 pandemic, consultations with community pharmacies might increase due to the risk of contagion from visiting a healthcare center, and the congestion of dedicated emergency lines.

The *de iure* role of community pharmacies is limited to the delivery of pharmaceutical products, most of them with prescription. However, the limited capacity of the healthcare system in LMICs and the lack of enforcement of delivering products with prescription only, grant a more ample *de facto* role to community pharmacies. During the pandemics, the WHO guidelines indicate that reports of COVID-19 symptoms must be centralized throughout national or local emergency lines¹ (World Health Organization, 2020). The purpose of this study is to explore the pharmacists' compliance with these guidelines, which limit their role to refer clients to the dedicated lines; and to study whether this compliance results affected by relevant COVID-19 information.

We conducted a telephone audit study, by calling to 262 community pharmacies located in seven municipalities, from three *Departamentos* (states) in Colombia. In each call, the auditor mentioned that her brother was feeling sick and listed a group of symptoms. Subsequently, the auditor asked the pharmacist "What would she (or he) recommends." We coded whether the pharmacist: (i) recommended to call the emergency line, (ii) recommended to visit a medical doctor or visit a healthcare center, (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 "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 a particular symptom associated to COVID-19, which is not typically associated with the common flu or with dengue for individuals without conditions such as asthma

¹The recommendation reads: "If you have a fever, cough and difficulty breathing, seek medical attention, but call by telephone in advance if possible and follow the directions of your local health authority. Why? National and local authorities will have the most up to date information on the situation in your area. Calling in advance will allow your health care provider to quickly direct you to the right health facility. This will also protect you and help prevent spread of viruses and other infections." - See: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public>

or allergic rhinitis. This olfactory dysfunction was present in 79.6% of COVID-19 patients in an European sample, even those otherwise asymptomatic (Lechien et al., 2020).

Adding anosmia to the listed symptoms allowed us to check whether novel, or “rare,” information triggered different responses from the pharmacists. Whereas studies measuring behavioral responses to information typically provide such information as a direct stimuli (Bhargava et al., 2017; Chemin, 2018; Kolstad, 2013), we rely on the pharmacists *recent* acquisition of information relating anosmia as a COVID-19 symptom; or alternatively, in its “rareness” in accompanying other, more common, symptoms. We emphasize on the recency of information, since 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 et al., 2020; Giacomelli et al., 2020; Lüers et al., 2020). Hence, reactions to our treatment might shed light on the rapid diffusion of scientific findings into more consumer-friendly sources of information.

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

Since Colombia is a dengue endemic zone (Padilla et al., 2012; Villar et al., 2015), we exploit the regional variation of dengue incidence to study whether pharmacists that are more used to deal with the common symptoms react differently to mentioning anosmia as an additional symptom. To study this issue, 64 percent of the pharmacies from our original sample are located in municipalities that had at least 390 dengue cases per 100,000 inhabitants during 2019, whereas the remaining 36 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 faced the COVID-19 pandemic, and a high number of dengue cases, simultaneously.²

We find that in 20% of the calls with the common symptoms, pharmacists recommend the auditor referring the case to the emergency line. This low compliance increases to 32% when we mention anosmia as an additional symptom. Moreover, the *COVID* treatment yields two additional, and positive, results. Recommendations to get medical help, either by getting an appointment with a doctor or by visiting a healthcare center, increase from 32% to 51% when mentioning anosmia. Moreover, recommendations to take a pharmaceutical product decrease from 70% to

²In 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.

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 main purpose with this study is to shed some 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, on the use of audit studies, or simulated client studies as they are known in the Public Health domain (Madden et al., 1997; Watson et al., 2006; Kwan et al., 2019), to study the interplay between norm compliance and information. Audits have been employed to study antibiotic delivery without prescription, and the knowledge and management of diseases (e.g., STDs and diarrhoea) in community pharmacies (Smith, 2009; Currie et al., 2011; Wafula et al., 2012; Currie et al., 2014; Miller and Goodman, 2016). The results evidence poor compliance with the request of prescriptions, as well as poor knowledge of the studied diseases, in particular in LMICs. For instance, in South America, 78% of antibiotics are delivered without prescription (Auta et al., 2019), and the non-compliance rate is worse in Colombia, according to a study conducted in Bogotá (Vacca et al., 2011).

In line with this literature, 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.

Second, this study is also related to the behavioral and cognitive components of information processing in medical decision-making. Systematic errors are grouped according to the underlying psychological biases. The most common are related to the estimation of probabilities and the synthesis of information (Dawson and Arkes, 1987; Mamede et al., 2010; Blumenthal-Barby and Krieger, 2015; Lambe et al., 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 who serve on pharmacy and therapeutic committees, showing a systematic underestimation of risk when it is displayed in relative terms (Mezzio et al., 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.

2 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 et al., 2019). 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). We describe below the protocol employed in the calls, as well as our sampling design.

2.1 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 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."

This opening line in the script is the only difference between treatments. We do not provide any other information at the beginning of the call, since questions made by the pharmacists would give us clues on their reasoning for diagnosis. The responses to potential questions from the pharmacist were identical between treatments. The main description of the simulated patient was memorized by the auditors: 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, specially 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, its phone number, and a password to be entered in an online server where all the data coded from the call was registered. By entering the password, the auditor

confirmed the pharmacy’s phone number, 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 balancing 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 again the failed calls at the end of the batch of calls. Failed calls were attempted up to four times.

2.2 Sample

We employed web-scraping to collect unique phone numbers of 396 community pharmacies,³ from seven different municipalities in Colombia. Selected municipalities were located in the regions of Santander or Norte de Santander, dengue endemic areas; or in the neighboring region of Boyacá. 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 are around 400 to 500 (see table SM.1 in the Supplementary Material). We argue that, in dengue endemic municipalities, the list of symptoms in the *common* treatment are typically associated to dengue. Pharmacists in these areas will be more likely to recall the pre-pandemic recommendations given to clients, and 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 identity of the infected person. There were eight auditors 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.

³We dropped from our sample pharmacies sharing a phone number, meaning that delivery services are centralized at the chain store level.

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

VARIABLES	(1) Pr(Call COVID Line)	(2)	(3) Pr(Medical Attention)	(4)	(5) Pr(Visit Pharmacy)	(6)	(7) Pr(Prescription)	(8)
COVID treatment	0.125** (0.0536)	0.136** (0.0552)	0.187*** (0.0600)	0.187*** (0.0612)	0.0407* (0.0228)	0.0329 (0.0200)	-0.182*** (0.0595)	-0.176*** (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
Observation	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. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

3 Results

3.1 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. Recall that the recommendation to call and report the case in the COVID dedicated line is the only behavior aligned with the guidelines from the WHO and the Colombian Ministry of Health. We observe that in the *common* treatment, in which headache, sore throat, and fever are listed, this recommendation occurs in 19.7% of the calls. In the *COVID* treatment, mentioning anosmia as an additional symptom, increases the probability of being recommended to register the case in the dedicated line in 13.6 pp (percentage points). In relative terms, it represents an increase of 69% in the probability of receiving the most desirable recommendation. This effect is robust to the introduction of auditor and municipality fixed effects.

The recommendation to seek medical attention, either by visiting a medical center or by looking for a physician, occurred in 32% of the calls in the *common* treatment. The *COVID* treatment, the probability of receiving this recommendation increased in 18.7 pp (or 58%). 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 in 17.6 pp (or 25%).

The recommendation to visit the pharmacy, undesirable for going against confinement poli-

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

VARIABLES	(1) Pr(Call COVID Line)	(2) Pr(Call COVID Line)	(3) Pr(Medical Attent.)	(4) Pr(Medical Attent.)	(5) Pr(Visit Pharmacy)	(6) Pr(Visit Pharmacy)	(7) Pr(Prescription)	(8) Pr(Prescription)
COVID treatment [1]	0.203** (0.0992)	0.198* (0.103)	0.145 (0.114)	0.150 (0.116)	0.0971 (0.0600)	0.0911 (0.0559)	-0.243** (0.112)	-0.249** (0.116)
Dengue Area	0.0399 (0.0807)	-0.0625 (0.157)	-0.0181 (0.0995)	0.291* (0.166)	-0.0225 (0.0348)	-0.0486 (0.0517)	-0.00435 (0.0972)	-0.0686 (0.164)
Treatment $\times$ Dengue [2]	-0.112 (0.118)	-0.0852 (0.122)	0.0611 (0.135)	0.0518 (0.136)	-0.0867 (0.0628)	-0.0810 (0.0584)	0.0904 (0.133)	0.102 (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. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

cies, rarely occurred in the *common* treatment (1.6%) and the effect of the *COVID* treatment, although positive, is marginally significant (and insignificant once we add auditor and municipality fixed effects).

3.2 Differences between dengue endemic and non-endemic areas

Table 2 reports a similar regression 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 the COVID treatment on recommendations. While the interaction term increase 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.⁴

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.

⁴The last row of the table presents a linear test of the sum of coefficients for the COVID treatment and its interaction with dengue.

Table 3: Correlations of COVID treatment and dengue endemic areas with recommended pharmaceutical products.

VARIABLES	(1) Hydratant	(2) Analgesic	(3) Antibiotic	(4) Anti inflammatory	(5) Antiseptic	(6) Complement
COVID treatment [1]	-0.0150 (0.0560)	-0.0291 (0.111)	-0.266** (0.107)	-0.307*** (0.110)	0.0859 (0.0548)	0.00763 (0.0459)
Dengue Area	0.226*** (0.0840)	0.142 (0.162)	-0.0169 (0.161)	-0.0469 (0.165)	0.189** (0.0875)	0.0222 (0.0680)
Treatment $\times$ Dengue [2]	-0.0215 (0.0758)	-0.103 (0.134)	0.187 (0.130)	0.195 (0.130)	-0.129* (0.0768)	-0.0144 (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 “Supplement” 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.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Column (1) in Table 3 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 risk of hospitalization for dengue fever (Harris et al., 2000; Padilla et al., 2012). A less obvious practice of dengue endemic areas is to recommend antiseptics for sore throat (column 5), which are not affected by the mention of anosmia as an additional symptom.⁵

We observe that the recommendations to take antibiotics and anti-inflammatory decrease (-26.6 pp. and -30.7 pp.), without differences between dengue endemic and non-endemic areas. These recommendations were usual in the *common* treatment (41.8% and 37.7% for antibiotics and anti-inflammatory medicines, respectively), but they dramatically fall in the COVID treatment. Analgesics are less recommended in dengue areas (-13 pp.) under the COVID treatment, but the effect is relatively small, since they were prescribed in roughly half of the calls. We do not observe correla-

⁵The last row of the table presents a linear test of the sum of coefficients for the COVID treatment and its interaction with dengue. While the interaction coefficient (-12.9 pp) is significant; the sum of coefficients (4.31 pp), measuring the net impact, is not.

tions for the treatment, nor the endemic area, with the probability of recommending supplements such as Vitamin C pills, transfer factors and dietary supplements.

4 Discussion and conclusions

4.1 The role of information in the pharmacists' recommendations

Results from Table 1 reveal that mentioning anosmia induces more conservative recommendations provided by the pharmacists. However, we are unable to disentangle two potential mechanisms: openness to acquire information and rareness of information. Information connecting anosmia with COVID-19 was available for only two or three weeks before our study took place. One possible mechanism is that pharmacists' response to this symptom is implicitly revealing their openness to acquire information that is relevant for treating customers during the pandemic. This does not mean that pharmacists are directly consuming scientific literature, but that media coverage of these findings is being disseminated fast enough. The second possible mechanism is the "rareness" of anosmia as a listed symptom. If anosmia is an infrequent symptom, it may trigger a more cautious behavior among pharmacists. Given the lack of differences in responses between dengue endemic and non-endemic areas, we cannot associate this result to the availability bias (Wallsten, 1981) and the neglect of anosmia as a "rare" piece of information. Although this is speculative, the lack of a differential effect for dengue endemic areas gives more support to willingness of pharmacists to acquire relevant information during the pandemic.

4.2 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. Cadogan and Hughes (2020) argue that pharmacies can be part of the global response to the pandemic providing health advice, education, and making referrals based on symptoms. This role is even more important in LMICs, where dedicated emergency lines are more prone to congestion, and because pharmacies are the first line of contact with the healthcare system for a good share of households.

Our audit study reveals that, at least for the *Departamentos* in our sample, pharmacists are not only able to help, but also willing to do so. Although our script aimed at keeping low the pharmacists' inference of an immediate purchase, all the pharmacists replied to our request. Moreover, most of the pharmacists provided recommendations that would not have involved a direct gain for their business. In only one call the pharmacist asked if the auditor was a regular customer, and in six calls the pharmacist offered a delivery of the recommended medicines.

Guidelines that neglect the role of pharmacies in the pandemics impose a dilemma. If the current guidelines are followed, there is a lost opportunity to articulate and enhance the diagnosis ability of pharmacists, specially in areas with poor health infrastructure. On the other hand, dismissing these guidelines can lead to coordination problems, such as repeated diagnosis for a same case (initially throughout the pharmacy, and then throughout the healthcare system).

We faced a similar dilemma, albeit at a much lower scale, by preparing an infographic for the debriefing of pharmacies that took part in this study. A strict compliance to the current guidelines would limit our message to remind pharmacists to ask their clients to report any suspicious symptoms by calling the dedicated line. On the other hand, encouraging the pharmacists to ask clients whether they lost their sense of smell would induce a violation of the established protocols. We opted for making the recommendation to call the emergency line very salient, but including a less noticeable message saying “If a client reports having lost the sense of smell, try to make sure they report the case in the emergency line.”

4.3 Final remarks

Audit studies on community pharmacies typically reveal dismal results (e.g., delivering antibiotics without prescription or poor knowledge about a specific disease). Although we also find that antibiotics are recommended in roughly one third of our calls, our study reveals a bright side on how pharmacists react to 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 revealed a promising effect of information despite the small scale of our intervention. Large-scale studies in this direction will shed light on how to articulate community pharmacies with the governmental protocols, profiting from the pharmacies capacities and connections with the community.

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Supplementary Material

SM.1 Ethical considerations

This protocol was approved by the Ethics Committee at Universidad de Los Andes.

Including documentation on the ethical considerations of the project is not common. Nonetheless, we believe that in the case of this study is useful because some methodological decisions were tightly connected to the ethical implications of this project.

In audit studies, or simulated client 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, commissioned by the Department of Health and Human Services in the United States, on the required conditions for a simulated client study to obtain ethics clearance. First, if there is not any other method able to yield scientifically valid conclusions obtained with the simulated client methodology (SCM). Second, if the risks for the simulated client and for 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 in case of 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 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 et al., 2009), and 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 po-

tential 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 stop the study if, according to the daily reports of the Health Ministry, 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 (15th April 2020).

Regarding the third condition, we argue that the social value of the study 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.

For the debriefing to pharmacists we created an infographic. 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.

SM.2 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 information from the pharmacy you are about to call matches the information in the list of pharmacies. 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 advance to the following page very fast, 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:
 - Municipalities in Santander and Norte de Santander: +037
 - Municipalities in Boyacá: +038
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 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 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 specific residential area predefined for each city]⁶

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.

⁶For each city, we did some research to identify residential areas or neighborhoods that were sufficiently large and from intermediate socio-economic status.

- 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 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.

SM.3 Additional tables

Table SM.1: Reported cases of dengue in the selected Departments and Municipalities

	Total Cases			Cases per 100,000 inhabitants		
	2018	2019	2020 ^a	2018	2019	2020 ^a
<i>Dengue endemic Departments (in bold) and Municipalities</i>						
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
<i>Non-endemic Department (in bold) and Municipalities</i>						
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 (http://portalsivigila.ins.gov.co/sivigila/documentos/Docs_1.php).

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