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Working Paper Self-medication under uncertainty: Insights on drug quality and consumer behavior in Burkina Faso

Ruhr Economic Papers, No. 1110

Provided in Cooperation with: RWI – Leibniz-Institut für Wirtschaftsforschung, Essen

Suggested Citation: Bocoum, Fadima; Hartwig, Renate; Koala, Moumouni; Merkel, Lena; Ouedraogo, Salfo (2024) : Self-medication under uncertainty: Insights on drug quality and consumer behavior in Burkina Faso, Ruhr Economic Papers, No. 1110, ISBN 978-3-96973-288-5, RWI - Leibniz-Institut für Wirtschaftsforschung, Essen, https://doi.org/10.4419/96973288

This Version is available at: https://hdl.handle.net/10419/306840

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#1110

Imprint

Ruhr Economic Papers

Published by

RWI – Leibniz-Institut für Wirtschaftsforschung Hohenzollernstr. 1-3, 45128 Essen, Germany Ruhr-Universität Bochum (RUB), Department of Economics Universitätsstr. 150, 44801 Bochum, Germany Technische Universität Dortmund, Department of Economic and Social Sciences Vogelpothsweg 87, 44227 Dortmund, Germany Universität Duisburg-Essen, Department of Economics Universitätsstr. 12, 45117 Essen, Germany

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Ruhr Economic Papers #1110

Responsible Editor: Ansgar Wübker

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ISSN 1864-4872 (online) - ISBN 978-3-96973-288-5

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Ruhr Economic Papers #1110

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Bibliografische Informationen der Deutschen Nationalbibliothek

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available on the Internet at http://dnb.dnb.de

RWI is funded by the Federal Government and the federal state of North Rhine-Westphalia.

https://dx.doi.org/10.4419/96973288 ISSN 1864-4872 (online) ISBN 978-3-96973-288-5 Fadima Y. Bocoum, Renate Hartwig, Moumouni Koala, Lena Merkel, and Salfo Ouedraogo*

Self-Medication Under Uncertainty: Insights on Drug Quality and Consumer Behavior in Burkina Faso

Abstract

Do consumers change their self-medication practices when drug quality changes? We present experimental evidence on this question in the context of Burkina Faso, where self-medication with antibiotics is a prevalent practise. We conduct chemical quality testing of antibiotics and find that one in three products on the market is substandard or counterfeit, exposing consumers to significant risk and uncertainty. Survey data and experiments show that consumers are aware of the risk posed by substandard antibiotics. However, they are not sufficiently able to judge quality based on visual cues and market information. Our experimental data suggest that self-medication increases as drug quality becomes more certain. The results suggest that measures to improve drug quality in the market might be accompanied by increased self-medication.

JEL-Codes: D11, D81, I12, I15

Keywords: Antibiotics; decision-making; health care; uncertainty; Burkina Faso

October 2024

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1 Introduction

Self-medication, defined as the use of pharmaceuticals to address self-diagnosed symptoms without a valid prescription or professional medical supervision (WHO 2000), is a prevalent practice globally. In cases of minor ailments, and when supported by a robust system of regulatory oversight and control of medications intended for self-medication, this practice can relieve pressure on healthcare systems, thereby reducing consultation times and treatment costs. However, in contexts where access to professional healthcare is constrained or prohibitively expensive, and where regulatory oversight is deficient, self-medication is regarded as a suboptimal and often risky alternative (Fullman et al. 2018; WHO 2023a). The risks associated with self-medication stem from an increased likelihood of inappropriate, incorrect, or excessive treatment, missed diagnoses, delays in receiving appropriate care, the development of pathogen resistance, and heightened morbidity (Bennadi 2013; Morgan et al. 2011; Mehmood et al. 2016; Ruiz 2010).

Despite its global prevalence, the true extent of self-medication remains largely understudied. Systematic reviews examining self-medication with antimicrobials, particularly antibiotics, report a broad spectrum of self-medication rates. Outside of Europe and North America, these rates vary between 1.2% and 100% (Do et al. 2021; Morgan et al. 2011; Ocan et al. 2015).¹ Additionally, there is a limited insight into the factors influencing self-medication behaviors and their associated outcomes, particularly in settings where regulatory oversight and drug control are insufficient (Cockburn et al. 2005).

An important and rare contribution to the understanding of self-medication is provided by Chang and Trivedi (2003). They theoretically demonstrate that uncertainty regarding the quality of self-medication influences both the demand for formal healthcare services and the use of self-medication. Their empirical analysis then examines the influence of income and health insurance on self-medication in Vietnam. The authors find that, in

¹Self-medication with antibiotics is notably widespread in Vietnam (55.2% of antibiotics dispensed without a prescription), Bangladesh (45.7%), and Ghana (36.1%), but less common in Mozambique (8.0%), South Africa (1.2%), and Thailand (3.9%) (Do et al. 2021). In Sudan, the rate reaches 100% (Morgan et al. 2011).

their study context, self-medication is an inferior good at higher income levels and as a normal good at lower income levels. Moreover, they identify a strong negative correlation between self-medication and health insurance enrollment (Chang and Trivedi 2003).

While the work of Chang and Trivedi (2003) makes a seminal contribution to the economics of self-medication, it obscures several factors related to the practice, such as access to diagnostics, treatment recommendations and adherence, and drug quality. Moreover, their empirical investigation provides only cross-sectional evidence regarding the relationships between income and insurance, on one hand, and the use of self-medication, on the other. In this article, we extend the existing research by isolating one of the aforementioned factors, namely the quality of drugs and its interaction with self-medication usage, while controlling for other variables. We accomplish this through a lab-in-the-field experiment, which enables us to present causal evidence on the relationship between drug quality and self-medication usage. Understanding consumer responses to drug quality in the market is critical from a public health perspective. Furthermore, this knowledge is essential for the formulation of effective policies. While studies have focused on the supply-side consequences of various measures aimed at improving drug quality (see, for example, Bennett and Yin 2019; Björkman-Nyqvist et al. 2023), researchers have largely overlooked the consumer response to such measures.

Our study is set in Burkina Faso, a country in West Africa where access to healthcare remains limited (WHO 2023a), and the consumption of non-prescriptive drugs of uncertain quality, particularly antibiotics, is pervasive (Tinto and o. Rouamba 2020; Valia et al. 2022; Valia et al. 2023). Our empirical data focus on the urban context, specifically the capital city of Ouagadougou. Data from the latest *Enquête Harmonisée sur les Conditions de Vie des Ménages* (Living Standards Measurement Survey, LSMS), conducted in 2021 and 2022, suggest that self-medication rates in the Centre region – where Ouagadougou is situated – are approximately 30% (see Figure A1 in the Appendix), representing one of the highest prevalence rates in the country (World Bank 2022).²

²This refers to adults experiencing respiratory symptoms such as sore throat, fever, and cough in the months preceding the survey. Unfortunately, the survey data do not allow for estimating self-medication rates beyond the second administrative level. The prevalence of self-medication practices varies substan-

In this study, we concentrate on self-medication with antibiotics, specifically using selfmedication with amoxicillin as our case study.³ Our study proceeds as follows: First, we demonstrate that substandard drugs are present in the market and quantify the extent of their prevalence. To achieve this, we utilize a mystery shopper approach, in which we purchase samples of amoxicillin 500 mg – the standard dosage for adults – from both formal and informal vendors in Ouagadougou. Subsequently, we test the drug quality using thin-layer chromatography (TLC), an established method for separating and quantifying the active pharmaceutical ingredients in the drugs.

Secondly, the study examines the perceptions of drug quality held by the general public. The subsequent stages of the study unfold in two parts. First, we establish that individuals are aware of the existence of substandard pharmaceuticals in the market. Second, we demonstrate that individuals understand the sources from which they can obtain higherquality drugs. While conventional market indicators, such as price, are inconsequential, respondents accurately identify that drugs from formal vendors are, on average, of superior quality.

Finally, a novel lab-in-the-field experiment was implemented. The experiment provides causal evidence that the prevalence and relative share of low-quality drugs affect the decision to self-medicate. By varying the probability of encountering low-quality drugs in the market within our incentivized lab-in-the-field experiment, we demonstrate that self-medication increases as drug quality becomes more certain. Specifically, a 10% increase in the probability of purchasing quality drugs correlates with a six-percentage-point rise in self-medication.

The hypotheses that we tested in the lab-in-the-field experiment are derived from the model of self-medication behaviour introduced by Chang and Trivedi (2003). The au-

tially between survey rounds, with rates reaching as high as 40% in the Centre region during the 2018/19 wave.

³We chose to focus on antibiotics for two reasons: First, in many parts of the world, healthcare professionals do not oversee the sale and use of antibiotics, which often occur without prescriptions. Second, self-medication, particularly with antibiotics, has significant externalities. It increases the use and overuse of antibiotics, which, in turn, contributes to the spread of antimicrobial resistance (Holmes et al. 2016). Therefore, controlling and reducing self-medication with antibiotics is crucial for slowing the development of resistance. However, our findings, especially those from the lab-in-the-field experiment, may hold relevance beyond this specific case.

thors develop a static model of decision-making under uncertainty, where self-medication is modeled as a risky investment in health capital. In their model, the consumer makes a choice to allocate her budget between risk-fee professional care and risky self-medication. Both, professional care and self-medication are modeled as substitutes by the authors. Following from this set-up the model predicts that the demand for professional care increases if self-medication becomes riskier. In other words, the demand for self-medication is lowered if self-medication becomes riskier. This in turn implies that reducing the uncertainty of pharmaceutical products would encourage more self-medication (Chang and Trivedi 2003). Our empirical findings directly speak to this proposition.

In addition to testing the theoretical prediction put forward by Chang and Trivedi (2003), our findings also contribute to other strands of literature. They enhance the understanding of healthcare choices under uncertainty. At a theoretical level, we build on models of healthcare demand that incorporate uncertainty, stemming from the foundational work by Grossman (1972) on health capital. For instance, Asano and Shibata (2011) extend the Grossman model by incorporating Knightian uncertainty about healthcare efficacy. They demonstrate that uncertainty can lead individuals to refrain from investing in health when the cost of care falls within a certain range, particularly as uncertainty increases. Similarly, Nocetti and Smith (2010) examine uncertainty surrounding the incidence of illness and treatment efficacy, showing that higher uncertainty can lead to precautionary savings and increased demand for preventive care, thereby linking uncertainty to both curative and preventive healthcare demand.

Furthermore, this study contributes to the literature on credence goods. Antibiotics are credence goods, meaning their quality is unknown to the consumer upon consumption and may remain only partially known afterward.⁴ In the case of self-medication – i.e., medication without consulting a health professional – the underlying disease might also be unknown, compounding the inference problem (Adhvaryu 2014; Cohen et al. 2015). Adhvaryu (2014) studies this issue in relation to self-medication with antimalarial drugs in Tanzania. He finds that misdiagnosis and the resulting misconceptions about the

⁴This latter aspect distinguishes credence goods from experience goods.

efficacy of a drug based on previous use slow down learning about treatment efficacy and, consequently, use. Hence, consumers may struggle to attribute drug quality to vendors and might not penalize sellers of low-quality products. As a result, low-quality products persist in the market, maintaining a suboptimal equilibrium. Björkman-Nyqvist et al. (2023) study the market for antimalarial drugs in Uganda and show that drug quality improves when a vendor offering a superior product enters the market. Björkman-Nyqvist et al. (2023) focus on the supply side and provide novel insights into how the drug market functions when quality becomes observable. On a larger scale, Bennett and Yin (2019) examine the effects of a pharmacy chain entering the market in India, finding improvements in drug quality and prices. However, the demand side – how consumers respond to changes in drug quality – has not been studied in detail, yet.

By demonstrating how consumers navigate complex market environments, we provide insights into the effectiveness of market-based signals in contexts with poor regulatory oversight. In doing so, we contribute to the literature that examines the signaling value of observable information, focusing primarily on prices, advertising, and reputation, both theoretically and empirically. Milgrom and Roberts (1986) and Shapiro (1982) explore how prices can signal unobservable quality in markets where consumers lack complete information. Other theoretical work challenges these predictions. Wolinsky (1983) illustrates that while prices can serve as effective signals of quality, this relationship depends on the nature of the information available to consumers. He finds that as the quality of information available to consumers declines, sellers increase markups on prices, taking advantage of consumers' limited ability to discern quality (see also Metrick and Zeckhauser 1999). Empirical studies have also examined the extent to which prices signal quality. For example, in healthcare markets, Das and Hammer (2014) show that in poorly regulated environments, prices fail to adequately signal quality due to the absence of liability or verifiability mechanisms, which weakens the market's ability to correct for poor quality. In the drug market, Bate et al. (2015) provides evidence that substandard drugs are generally cheaper than high-quality generics across 18 LMICs, leading consumers to suspect their inferior quality based on price. However, falsified drugs are more challenging to detect, as they mimic high-quality, locally registered products in both price and packaging, making it difficult for consumers to distinguish them before purchase. In our study context, we find that price is a poor predictor of drug quality, aligning with the work of Das and Hammer (2014).

This paper is structured as follows. Section 2 provides some background and describes important features of the antibiotic market and self-medication in Burkina Faso. Section 3 describes the empirical design and data. Section 4 presents the results. Further analyses are discussed in Section 5. Section 6 concludes.

2 Background: Access to and Use of Antibiotics in Burkina Faso

This section provides an overview of the drug market and its key actors in Burkina Faso, along with a synopsis of prevailing antibiotic use practices.

The Medicine Market in Burkina Faso. Similar to numerous other countries in West Africa, Burkina Faso employs a three-tier system for the distribution of medical products. In the formal sector, consumers can purchase pharmaceuticals at both private and public pharmacies. Public pharmacies are located within or as part of the local public health facility infrastructure.⁵ These public pharmacies primarily receive supplies from the *Centrale d'Achats des Médicaments Essentiels Génériques et de Consommables Médicaux* (Central Purchasing Office for Essential Generic Medicines and Medical Consumables, CAMEG), along with private suppliers and donors as needed (Santé (MoS) 2019). In urban areas such as Ouagadougou, private pharmacies predominantly source their products from private suppliers and are typically managed by licensed pharmacists. In contrast, pharmacies in rural areas, designated as *dépôt pharmaceutique* (community drugstores),

⁵Burkina Faso has five levels of health facilities. The lowest level is the *Centre de Santé et de Promotion Sociale* (CSPS). The second level is the *Centre Médical*. The third level is the *Centre Médical avec Antenne Chirurgicale* (CMA), or district hospital, found in every health district. The highest levels are the *Centre Hospitalier Régional* (CHR) and the *Centre Hospitalier National* (CHN), with the latter located only in Ouagadougou and Bobo-Dioulasso, the country's two largest cities.

are operated by community health workers.

In addition to regulated public and private pharmacies, unregulated informal vendors also offer drugs. These vendors include street sellers who circulate through various neighborhoods, as well as those with fixed market stalls in local marketplaces. The drugs sold at these outlets range from standard painkillers like paracetamol and ibuprofen to antimalarials and antibiotics.

Antibiotic Use in Burkina Faso. As previously stated in the introduction, selfmedication is prevalent in Burkina Faso. However, rates vary considerably depending on the data source. The 2021/22 LSMS data indicate that regional self-medication rates range from 12% to 30% (see Figure A1 in the Appendix). Facility-based studies show that at least one-third of patients self-medicate with antibiotics before visiting a health facility (Valia et al. 2022; Valia et al. 2023). These facility-based figures represent a lower-bound estimate of the prevalence of self-medication, as they do not account for individuals who engage in self-medication but do not subsequently seek healthcare. Our data reveal that the self-medication rate among those who reported being sick in the past month is slightly lower compared to the 2021/22 LSMS and facility-based studies. In our sample, 19% of those who were ill reported self-medicating with antibiotics (see Table 1 below).

This study uses self-medication with amoxicillin as a point of reference. Amoxicillin is listed on the World Health Organization (WHO) List of Essential Medicines (WHO 2023b) and serves as a widely used first-line antibiotic for treating respiratory infections in Burkina Faso (Valia et al. 2022; WHO 2021). Amoxicillin exhibits high efficacy against a broad range of bacteria with minimal side effects (Kaur et al. 2011). While these properties make amoxicillin a popular choice, antibiotic resistance poses a significant public health concern in Burkina Faso. Studies have documented a prevalence of amoxicillin-resistant bacteria exceeding 75% in the country (Konaté et al. 2017; Simpore et al. 2008).

This study employs the case of self-medication with amoxicillin as a point of reference. Amoxicillin is included on the World Health Organization (WHO) List of Essential Medicines (WHO 2023b). It is a widely used first-line antibiotic for the treatment of respiratory infections in Burkina Faso (Valia et al. 2022; WHO 2021). Amoxicillin demonstrates high efficacy against a broad range of bacteria with minimal side effects (Kaur et al. 2011). While these properties make amoxicillin a popular choice, antibiotic resistance represents a significant public health concern in Burkina Faso. Studies have documented a prevalence of amoxicillin-resistant bacteria in Burkina Faso exceeding 75% (Konaté et al. 2017; Simpore et al. 2008).

3 Design, Measurement, and Data

This study integrates data from a household survey and a lab-in-the-field experiment with a dataset on drug quality collected prior to the household and individual data. The quality testing establishes a factual benchmark for the quality of amoxicillin products available on the market during the study period in Ouagadougou. The household survey and the lab-in-the-field experiment provide insights into consumers' prior expectations regarding drug quality and allow for the experimental elicitation of their responses to changes in drug quality. In the following section we describe the design and measurement of each component in turn.

3.1 Drug Quality Testing

We employed a mystery shopper approach to purchase samples of 500 mg amoxicillin products from both formal and informal vendors in six randomly selected districts (*arrondissements*) of Ouagadougou. The mystery shopper directly inquired with the vendor about the availability of amoxicillin and proceeded to purchase three blisters of the product on offer. The blisters were collected without any accompanying paper packaging or leaflets, which is common practice for the sale of pharmaceuticals in this context. Following the purchase, the mystery shoppers completed a brief questionnaire that included details about the price, the interaction with the vendor, and a description of the product's and vendor's main characteristics. Subsequently, we transported the samples to the laboratory of the *Institut de Recherche en Sciences de la Santé* (IRSS), also located in Ouagadougou, for further examination and laboratory analysis.

To measure drug quality, we performed content analysis using thin-layer chromatography (TLC). We chose TLC because it is a relatively cost-efficient analytical technique for separating, identifying, and quantifying components, and it is the standard technique available in Burkina Faso. Upon receipt at the IRSS, the drugs underwent physical inspection by a trained pharmacist. Packaging irregularities and inconsistencies in batch numbers and expiration dates were recorded. Additionally, we examined the capsules for undamaged, unaltered surfaces and color uniformity. For the content analysis, we tested ten capsules from each sample. We considered a product substandard if the amoxicillin content was less than 75% or greater than 125% of the average content of all capsules tested.⁶ If no amoxicillin content could be identified, we classified the product as falsified.

It is important to note that chemical content analysis cannot identify the reasons behind a sample's poor quality. Several potential causes can lead to a sample being classified as low quality. These include degradation along the supply chain due to inadequate storage or transportation conditions, such as exposure to extreme temperatures, which may compromise the stability of the molecule. Another possibility is substandard manufacturing, where inferior ingredients are used in the production process. Since the cause of poor quality is not observable to consumers, we will refer to all samples that are degraded, substandard, or falsified as poor-quality samples in the following.

3.2 Perceptions about Drug Quality

Subsequent to the completion of the drug quality testing, a household survey was conducted with 400 randomly selected households in the same six districts from which the drug sample was drawn.

Beliefs about Drug Quality. To elicit consumers' subjective expectations regarding the purchase of a poor-quality antibiotic, we employ widely used methods for eliciting

⁶Our definition diverges from global pharmacopoeias, which establish quality thresholds for specific markets, as Burkina Faso has not officially adopted any national quality guidelines for pharmaceutical substances (USAID and USP 2018). For example, the USP (43–NF 38) employs a stricter definition of substandard quality, i.e., less than 90% or greater than 120% (USP 2018).

probabilistic expectations using visual cues in low-income settings (for a detailed discussion of the methodology, see Delavande et al. 2011; Delavande 2014).⁷ In particular, we ask participants to select a number from a set of ten plastic chips to indicate their probabilistic belief that they will purchase a poor-quality drug from a pharmacy or street vendor during their next antibiotic purchase.

Observability of Drug Quality. To systematically test consumers' ability to infer quality based on visual cues and market information, we presented respondents with images displaying the front and back of three distinct blister packages of amoxicillin acquired for quality testing purposes. Through visual inspections, respondents could gather information such as the product name, manufacturer information (or the absence thereof), country of origin, color, packaging condition, and expiration date.⁸ Each sample was presented individually to the participant, who was then asked to determine whether they perceived the displayed sample to be of good or poor quality. Furthermore, we randomly assigned respondents to either a group that received additional market information (price and vendor type) or a control group that did not receive this information. Both price and vendor type were provided as composite information, as they are typically available to consumers simultaneously before making a purchase decision.⁹ The samples included in the choice sets were selected to reflect the actual proportion of failed samples (30% overall, 20% from pharmacies, and 50% from informal vendors).

3.3 Self-medication under Uncertainty

The lab-in-the-field experiment is grounded in the model initially proposed by Chang and Trivedi (2003). We provide a brief description of the model setup and its principal predictions, followed by an outline of the experimental design. This section concludes with an examination of the modeling choices and their implications.

Conceptual Framework. The starting point is a consumer with a utility function

⁷The experimental protocol is included in the Online Appendix E.

⁸Pictures of all products, as shown to the respondents, are included in the Online Appendix E.

⁹Testing the signaling value of price and vendor type separately was not feasible due to budget constraints. Power calculations indicate that we can still detect a minimum effect size of 0.14 using standard assumptions of p=0.8 and alpha=0.05.

U(c, h). The utility function has standard properties and is strictly increasing and concave in both c (consumption) and h (health status). The consumer is endowed with income y and initial health h_0 . The consumer can improve their health status by two means: professional care and self-medication. Professional care is obtained by visiting a healthcare facility, denoted by V, while self-medication involves buying medicine from a drug vendor, denoted by Q. Self-medication may be cheaper, less effective, and generally riskier. To account for this and to make the model tractable, Chang and Trivedi (2003) model professional care as deterministic (risk-free). The consumer's problem thus becomes one of portfolio choice.

The budget constraint is given by:

$$y = c + V + pQ \iff c = y - V - pQ \tag{1}$$

The consumer decides how much income is allocated to consumption (c), professional care (V), and self-medication (Q). While the price for professional care is set to 1, the price for self-medication is p. Hence, p represents the relative price of self-medication compared to professional care. For self-medication to be cheaper than professional care, p < 1.

Since professional care is risk-free, the return to professional care is always positive, i.e., R > 0. Self-medication, on the other hand, is risky due to uncertainty about drug quality, which translates into the risk that self-medication may not improve the health status. Therefore, the return to self-medication is given by $R - \varepsilon$, where ε is a random variable with $E[\varepsilon] > 0$. Consequently, self-medication is, on average, less effective than professional care.

Based on these features, the health status is determined by

$$h = h_0 + RV + (R - \varepsilon)Q \tag{2}$$

Thus, the consumer faces the following maximization problem:

$$\max_{V,Q} E[U(y - V - pQ, h_0 + RV + (R - \varepsilon)Q)]$$
(3)

The effects of increased uncertainty are given by:

$$\frac{\partial V}{\partial \sigma^2} = \frac{-Qh_{VQ}}{D} > 0 \text{ and } \frac{\partial Q}{\partial \sigma^2} = \frac{-Qh_{VV}}{D} < 0 \tag{4}$$

Two predictions can be derived from these terms. The first term says:

Prediction 1: The demand for professional care increases when self-medication becomes more risky.

The second term says:

Prediction 2: The demand for self-medication increases if self-medication becomes less risky.

This latter prediction implies that, if uncertainty about drug quality decreases, the demand for self-medication will increase (see Online Appendix A for further details).

Experimental Design. We test the model predictions regarding self-medication using a lab-in-the-field experiment. The experiment comprises a repeated, incentivized decision task conducted over five rounds. In each round, the disease environment and the probability of purchasing poor-quality pharmaceuticals are exogenously varied.





Notes: The figure shows a simplified representation of the structure of the decision task. The gray boxes represent items for which the respondent makes a random draw. For "Random Draw: Disease Environment", the respondent draws a card to determine whether they are in the healthy or sick scenario. For "Random Draw: Drug Quality", the respondent draws a plastic chip from a bag to determine the quality of the medicine they purchased. The blue boxes represent the stage where the respondent decides whether to seek professional care or to self-medicate. A detailed overview (including payouts) is provided in the experimental protocol in Appendix B.

The experiment commences with the respondent receiving the same initial endowment. The respondent is then informed about the environment in which they operate; specifically, they are informed about the probability of falling sick and the probability of purchasing a poor-quality drug. The incentivized experiment then commences with the respondent drawing a card to determine whether they would be sick in that round.¹⁰ In the event of illness, the respondent must decide whether to seek professional care or to self-

¹⁰To determine whether the subject falls sick, they draw a card from a deck that indicates their health status: "healthy" is represented by a smiling face and "sick" by a sad face. If the probability of falling sick is 70% in a round, the stack of cards consists of 7 "sick cards" and 3 "healthy cards."

medicate, taking into account the probability of purchasing poor-quality drugs associated with each round. Professional care is a more costly option, requiring the use of the entire endowment, but it is a risk-free alternative that results in a high fixed monetary payout (P_2) . Self-medication is a more cost-effective and convenient option, allowing respondents to achieve a higher payout if they purchase a good quality product (P_3) . Conversely, purchasing a poor quality product would result in the lowest payout (P_4) .¹¹ If respondents choose to self-medicate, they draw a chip from a bag to determine the quality of the medicine and whether it will be effective. The proportion of green chips (representing effective medicine) and red chips (representing no curative effect) thus reflects the probability of purchasing a poor-quality drug in a given round.¹² This setup allows us to directly test the predictions of the model presented above. In particular, we are interested in examining the decisions of respondents with regard to self-medication, or the absence thereof, in the context of an experimentally modified risk of purchasing a poor-quality drug. Our experimental design is consistent with that of other choice experiments and healthcare decision-making studies (see for example List and Samek 2015; De Vries et al. 2021).

It could be argued that those responsible for making decisions are faced with a plethora of risks. The response to the primary risk of purchasing a substandard drug is contingent upon the secondary risk associated with the efficacy of the drug in question. For a detailed examination of this concept see Harrison et al. (2007). Ideally, we would have been able to additionally elicit respondents' beliefs about the curative efficacy of poor-quality drugs. The relationship between quality and efficacy is currently poorly understood, and the situation is further complicated by the presence of misdiagnosis and misattribution in real-world settings, which impede effective learning (Adhvaryu 2014). Consequently, it is not feasible to devise incentives that align with the actual experiences of respondents in real-life scenarios, thereby facilitating the utilisation of any developed heuristics in making

¹¹For ethical considerations, respondents would still receive a positive payout even if they received poor quality.

¹²If the probability of buying a drug of poor quality is 40%, respondents see 4 red chips and 6 green chips. In the round in which respondents choose to self-medicate, the enumerator places the chips in the bag, shuffles them, and lets the subject draw a chip.

their decisions. Therefore, we deliberately opted to endogenously control the secondary risk channel by establishing an equivalence between quality drugs and effective treatments while associating poor-quality drugs with ineffective treatment.

The remuneration was determined by a random draw for each experimental round, with the respondents subsequently receiving the actual remuneration as mobile money at the conclusion of the experiment. A linear incentive structure was employed, whereby $P_1 > P_3 > P_2 > P_4$. In the event of illness, the highest remuneration is received if the subject self-medicates with a high-quality medicine (FCFA 3,000, = USD 5.1), followed by the scenario in which they seek medical attention (FCFA 2,000, = USD 3.4), and then the case where they self-medicate with a low-quality medicine (FCFA 1,000, = USD 1.7). Therefore, the remuneration offered was consistently positive, ensuring that no financial loss was incurred by the respondent.

Modelling and Design Choices. A fundamental assumption of the theoretical model and, consequently, the experiment is that professional care is genuinely deterministic. The model is predicated on the assumption that professional care is free from risk. However, a substantial body of literature demonstrates that there are notable disparities in healthcare quality across diverse levels of healthcare systems and between countries (Das and Hammer 2014; Das et al. 2016). Moreover, even consumers who initially seek professional care and receive a prescription drug must still purchase the drug in the same market as those who self-medicate initially. Consequently, they would be exposed to the same risk with regard to drug quality. A further issue is that consumers may decide to self-medicate even after having sought professional care. The reasons for this can be manifold, including patient-level preferences and beliefs, lack of satisfaction with the consultation, lack of improvement in symptoms, or health-system-related factors such as the availability and affordability of (prescription) drugs. In light of the aforementioned considerations, the primary objective of our study is to ascertain whether uncertainty regarding drug quality influences the decision to self-medicate. It can be argued that self-medication is of a lower quality than professional care, as the latter reduces the risk of adverse effects by minimising diagnostic uncertainty. In other words, professional care should reduce the overuse of drugs and thus also minimise the risk of using poor-quality drugs, provided that rates of diagnostic and treatment errors are low (Hodkinson et al. 2020; Panagioti et al. 2019).¹³ As this is a supply-side problem, it is beyond the scope of our study, which is focused on the demand side.¹⁴

With regard to the second aspect of self-medication even after seeking professional care, this is not represented in the model and therefore also not in the lab-in-the-field experiment. This is due to the fact that the model is static in nature and does not take into account sequential or inter-temporal choices. To address these considerations, the model would require an extension to encompass a more comprehensive range of literature examining provider satisfaction, access to medical products, and (non-)compliance with medication therapy. This would necessitate the incorporation of studies such as those by Cohen and Saran (2018), Gravert et al. (2022), Koulayev et al. (2017), Mann et al. (2019), and Osterberg and Blaschke (2005). This is beyond the scope of the present study.

Finally, the decision to self-medicate may be shaped by individual factors, including the value placed on travel time, the cost of medications, and confidence in the ability to identify substandard products. The model does not explicitly incorporate these elements. However, we can assess their effect on choices by integrating our survey data with the data from the lab-in-the-field experiment.

3.4 Data

The study timeline is illustrated in Figure 2. The collection of amoxicillin products took place in the beginning of June, while the laboratory-based testing procedure continued until the beginning of August. The household survey and the lab-in-the-field experiment were conducted subsequently, in November 2023.

¹³Of course, there is literature on the global over-prescription of antibiotics. Sulis et al. (2020), for example, provide a systematic review of this literature. While rates of over-prescribing are substantial in some contexts, we do not have information on the extent of over-prescription in our context.

¹⁴The supply side, or the determinants of prescriber behavior, has been studied elsewhere. Using primarily audit study data, prescribing practices and the adequacy of case management have been studied in various contexts, including China (Currie et al. 2011; Currie et al. 2014), India (Miller et al. 2018), and Uganda (Fitzpatrick 2020). See also Currie et al. (2024) for a systematic review.





Drug Quality Data. The data collection process was conducted in six randomly selected districts (*arrondissements*) of Ouagadougou. The sampling of the districts was based on two criteria: population size and the presence of the three main antibiotic outlets in the city, namely private pharmacies, public pharmacies, and informal vendors.¹⁵ A total of 50 outlets were randomly selected for the study, distributed as follows: 18 samples were obtained from private pharmacies, 16 from public pharmacies, and 16 from informal vendors.

The price of the purchased products ranged from FCFA 1,050 (equivalent to approximately USD 1.75) to FCFA 2,100 (USD 3.49), with the lowest price observed at public pharmacies and the highest price paid at private pharmacies (Table A1 in the Appendix). The mean prices paid by vendor type are as follows: FCFA 1,209 (USD 2.01) at public pharmacies, FCFA 1,331 (USD 2.21) at street vendors, and FCFA 1,525 (USD 2.54) at private pharmacies.¹⁶ All blisters included information on batch numbers and expiry dates. None of the samples with available information had exceeded their expiration dates. A quarter (26%) of the samples lacked information on the manufacturer, while 70% lacked information on the date of manufacture.

Household and Experimental Data. The household survey and lab-in-the-field experiment, covers 400 urban residents randomly selected from the six districts of Ouagadougou, from which drug samples were also collected.¹⁷ Prior to conducting the experiment, an

¹⁵We utilized data from the fifth population census conducted in 2019 to assess the population size of each district. Additionally, we compiled a list of formal and informal antibiotic outlets in Ouagadougou using data from the Ministry of Health, the *Ordre National des Pharmaciens du Burkina Faso* (ONPBF), and a census of informal vendors conducted by the research team.

¹⁶Exchange rate as of July 15th, 2024: FCFA 1 = USD 0.0017. Price data from the LSMS suggest that average prices for three blisters of amoxicillin 500 mg are comparable across regions in Burkina Faso, with an average price of FCFA 834 (USD 1.42) in the Centre Ouest and FCFA 1,313 (USD 2.21) in Sud Ouest; the average price in the Centre region was FCFA 1,150 (USD 1.95). The prices in our sample are thus representative of the amoxicillin market in the country.

¹⁷Households were selected using a random walk starting at the antibiotic outlets visited for drug sample

individual survey was administered to all respondents to gather information on the socioeconomic characteristics of the household and the respondent, including health status and health-seeking behavior over the past month.¹⁸

Table 1 presents the descriptive statistics of our respondents. Our sample comprises a slightly higher proportion of women than men (59% vs. 41%). The sample, given its urban background, is relatively well educated, compared to the national average. Approximately 20% of respondents have completed secondary education, while 18% have obtained a tertiary qualification. The majority of respondents in our sample are self-employed (41%), followed by wage workers (18%) and public servants (4%). Additionally, 36% of respondents were unemployed.

Overall, 96% of our respondents have used antibiotics previously, and 57% report having self-medicated with antibiotics. Among those who were sick in the month prior to the interview, 19% self-medicated (10% of the complete sample).¹⁹ A closer examination of the data revealed substantial variation in self-medication across different illnesses. The practice of self-medication is significantly more prevalent when individuals experience symptoms associated with common colds. Our findings also indicate a notable prevalence of antibiotic overuse, with reports of their use for conditions that are not amenable to antibiotic treatment. These conditions include general aches and pains (13.1%), stomach problems (12.7%), and headaches (9.7%; see Figure A2 in the Appendix).

Our measures of self-medication may be influenced by social desirability bias, potentially resulting in an underestimation of the true prevalence of self-medication. Firstly, antibiotics are legally classified as prescription-only drugs in Burkina Faso. Secondly, the Ministry of Health initiated a public awareness campaign in response to an outbreak of dengue fever, discouraging self-medication among individuals with chronic illnesses and

collection.

¹⁸We also asked respondents about their past experiences with health-care services, their self-medication behavior, their decision-making process when purchasing antibiotics, their beliefs and knowledge about antibiotics, as well as social preferences, including risk and time preferences, locus of control, patience, and trust.

¹⁹At the outset of the interview, we asked respondents about their familiarity with antibiotics using common terminology. This was complemented by a visual aid depicting amoxicillin, a medication commonly recognized by its white and orange color scheme. However, it is possible that respondents may not recall or whether they have used an antibiotic previously or may simply be unaware of the usage.

Variable	Mean	$^{\mathrm{SD}}$	Min	Max	Ν
Household characteristics					
Household size	5.39	2.74	1	20	400
Number of children	2.38	1.80	0	10	400
Individual characteristics					
Female	0.59	0.49	0	1	400
Age	41.08	14.31	19	98	400
Married	0.73	0.44	0	1	400
Christian	0.40	0.49	0	1	400
Muslim	0.60	0.49	0	1	400
Wealth quintile	3.00	1.42	1	5	400
No education	0.24	0.43	0	1	400
Primary education	0.27	0.44	0	1	400
Secondary education	0.31	0.46	0	1	400
Tertiary education	0.18	0.39	0	1	400
Currently working	0.64	0.48	0	1	400
Self-employed	0.41	0.49	0	1	400
Wage worker	0.18	0.38	0	1	400
Public servant	0.04	0.20	0	1	400
Health in past 28 days					
Has been sick in past 28 days	0.51	0.50	0	1	400
Has self-medicated with antibiotics	0.19	0.39	0	1	203
Has a consulted doctor	0.71	0.45	0	1	203
Use of health care services					
Has a chronical illness	0.24	0.43	0	1	400
Has a health insurance	0.05	0.22	0	1	400
Ever been to a health care facility	0.97	0.16	0	1	400
Satisfied with health care services	0.48	0.21	0	1	400
Use of antibiotics and self-medication					
Ever used antibiotics	0.96	0.20	0	1	400
Ever self-medicated with antibiotics	0.57	0.50	0	1	400
Only buys from formal vendor	0.75	0.43	0	1	400
Also buys from informal vendor	0.13	0.34	0	1	400
Personal preferences					
Trust	6.20	2.36	0	10	400
Risk aversion	5.12	2.72	0	10	400
Patience	6.95	2.22	0	10	400
Time preference	6.09	2.61	0	10	400
Locus of control	8.51	1.59	1	10	400

TABLE 1: Participant characteristics

Notes: This table shows the characteristics of the 400 respondents included in our sample. With the exception of household characteristics, age, satisfaction with health-care services, and basic preferences, the mean represent the proportion of respondents. Variable definitions are provided in Table A2 in the Appendix.

those exhibiting symptoms of dengue. Consequently, respondents may be inclined to underreport instances of self-medication.

The objective of our study is to examine the relationship between the decision to selfmedicate and the probability of purchasing a poor-quality drug in a given scenario, as indicated by our experimental data. Consequently, our analysis is limited to experiment rounds where respondents reported experiencing illness. We recorded a total of 2,000 decisions (five per subject), with the occurrence of illness reported in 59.9% (N=1,199) of the decision rounds.²⁰ The probability of falling sick varied between 0.7 and 0.9. We set

²⁰Thus, we are sufficiently powered to detect a minimum effect size of 0.08 using 0.19 as the null mean, which corresponds to our baseline measure of self-medication preferences.

these probabilities high to ensure an adequate number of observations when respondents faced the decision to self-medicate. The probability of purchasing a poor-quality drug ranged from 0 to 0.9. Consequently, each subject encountered one or two disease environments on multiple occasions while being exposed to only a subset of the probabilities for purchasing a good-quality medicine.

4 Results

4.1 Drug Quality

Do poor-quality drugs exist in the market, and if so, to what extent? Out of the 50 samples tested, 30% failed the chemical content analysis. Of the samples purchased from informal vendors, 50% failed the quality test, while 20% of samples purchased from formal vendors, both public and private, also failed (Figure 3).²¹ Additionally, seven samples, all purchased from informal vendors, were found to contain no amoxicillin and were therefore classified as falsified. This indicates a prevalence of falsified products of 14% across all samples collected and 44% of all samples collected from informal vendors.

To better understand whether drug quality is correlated with any additional observable characteristics of the product, we compare passed and failed samples with respect to various observable characteristics in Table A3 in the Appendix. Despite considerable variation in mean amoxicillin content, we do not find a significant price difference. This observation is consistent with the findings of previous studies, such as Bate et al. (2011), which also demonstrated that price is an inadequate indicator of quality in medicine markets, as evidenced by a sample of 17 countries. In our sample, low quality is most commonly associated with a lack of information on the manufacturer; that is, a higher proportion of samples without manufacturer information failed the quality testing.²²

 $^{^{21}}$ Applying the stricter USP standard, which requires that only products with an average content of 90-120% pass quality testing, the proportion of poor-quality amoxicillin rises to 81.3% for informal and 73.5% for formal vendors.

 $^{^{22}}$ We do not find any mystery shopper effects in Table A3 in the Appendix.



FIGURE 3: Test results

In the absence of a correlation between quality and price, consumers may be severely constrained in their ability to infer quality. The data indicate that the absence of manufacturer information is the sole observable indicator that consumers can utilise to infer quality and avoid purchasing poor-quality antibiotics. It is important to note, however, that even among the samples that passed quality testing, some lacked manufacturer information. Consequently, uncertainty persists, particularly given that all falsified samples did contain information on the manufacturing date on the blister packaging. This indicates a certain level of sophistication among counterfeiters and a willingness to manipulate information by adding falsified details regarding the manufacturer.²³

Notes: The figure shows the results from the quality testing of 50 samples of amoxicillin 500 mg collected from formal and informal vendors in Ouagadougou.

²³Given the paucity of data on the prevalence of poor-quality drugs, particularly in the Global South, our results add to a growing body of evidence on their prevalence. A meta-analysis by Ozawa et al. (2018), which synthesized results from over 90 studies and more than 60,000 drug samples tested, estimated that 18.7% of antimalarial and antibiotic drugs sold on the African continent are of substandard quality or falsified. The results of our quality testing are also comparable to several studies that have conducted quality testing of amoxicillin marketed in other African countries. Comparability to the results of these studies is, however, limited due to the use of different technologies for testing and the application of different pharmacopoeia content thresholds. Our results are most comparable to a study by Fadeyi et al. (2015), which used the same technology (TLC) and found that 25% of amoxicillin samples collected from formal and informal vendors in Kintampo, Ghana, were of substandard quality. Other studies using a more rigorous method, namely high-performance liquid chromatography (HPLC), found the prevalence of substandard amoxicillin to range between 0% and 37.7% (Aman et al. 2021; Bizimana et al. 2022; Koech et al. 2020; Lehmann et al. 2018; Yaméogo et al. 2023). Similar to our findings, Bekoe et al. (2020) also report substantial differences between formal and informal vendors in Ghana.

4.2 Perceptions and Observability of Drug Quality

Perceptions about Drug Quality Figure 4 illustrates the distribution of beliefs regarding the probability of purchasing poor-quality antibiotics from both formal and informal vendors in Ouagadougou. A comparison of the distribution of beliefs with the benchmark established by quality testing reveals that 17.5% (N=70) of respondents hold accurate beliefs about the risk at formal vendors. The remainder of the respondents are distributed equally between those who overestimate the risk (40.0%, N=160) and those who underestimate it (42.5%, N=170).

In case of informal vendors, the distribution is skewed to the right, with the majority of respondents overestimating the risk (71.0%, N=284). Furthermore, 9.5% (N=38) of the respondents hold accurate beliefs, while the remainder (19.5%, N=78) underestimate the risk. In summary, contrasting distributions for the vendor types are observed. On average, respondents believe the risk of buying poor quality is 29% at formal vendors and 72% at informal vendors (Panel A in Table A4 in the Appendix).



FIGURE 4: Distribution of beliefs over probability of buying poor-quality antibiotics

Notes: We asked respondents to choose a number from a set of 10 plastic chips to express their probabilistic belief about the likelihood of buying a poor-quality drug at a pharmacy or street vendor the next time they want to buy an antibiotic. The bars represent the share of the 400 respondents who believe that the probability of buying poor-quality antibiotics corresponds to the value shown on the x-axis. Since respondents choose a number from 10, the beliefs are expressed in increments of 0.1. The dashed vertical line indicates the benchmark from the quality testing for formal and informal vendors, respectively. The belief distribution is robust to anchoring, meaning that we tested whether respondent beliefs were first elicited for formal or informal vendors (see Figure A3 in the Appendix). We also check for differences among respondents based on the order of belief elicitation (before or after the lab-in-field experiment) and find some evidence that respondents who completed the lab-in-field experiment first report higher probabilistic beliefs for both vendor types (see Figure A4 in the Appendix).

Consumers recognize the risks associated with poor-quality drugs in the market. They hold more pessimistic expectations regarding the quality of products from informal vendors, yet they demonstrated a tendency to underestimate the risk of purchasing poorquality drugs from formal vendors. Although there is some variation in beliefs about quality, it is noteworthy that consumer perceptions exhibit a remarkable degree of homogeneity across various dimensions (Panel B in Table A4 in the Appendix). In Panel B of Table A4 in the Appendix, we also observe that individuals who purchase from street vendors possess significantly different and more precise beliefs compared to those who exclusively buy from pharmacies. While street vendor customers face higher risks, they demonstrate a strong awareness of these dangers, suggesting that their decisions are not solely driven by rational heuristics based on risk awareness.

Our qualitative data provides further insight into this behavior. When respondents who purchase antibiotics from informal vendors were asked for the rationale behind their decisions, the most frequently cited reasons were lower prices, convenience, and past positive experiences. However, our market data indicates that this perception of lower prices may be misleading, as street vendors can actually be more expensive than pharmacies. Overall, these factors align with findings from a study conducted in the Nanoro district of Burkina Faso. Valia et al. (2023) report that decisions to seek healthcare from informal providers stem from constraints related to finances and convenience, as well as dissatisfaction with the perceived poor quality of formal healthcare, particularly regarding unprofessional and non-empathic attitudes. Similar conclusions were reached by Das et al. (2016), who found that patients preferred informal clinics due to the perceived higher quality of interactions with healthcare workers, where doctors spent more time and asked more detailed questions about the patients' conditions.

Observability of Drug Quality The data from our drug sample analysis suggest that market signals, particularly prices, are poor predictors of product quality. As a subsequent step, we are interested in assessing consumers' ability to infer quality and determining whether observable product characteristics, either alone or in combination with market information, effectively signal quality.



Notes: Panel A shows the mean total score for the total sample, along with the two groups: one that received additional market information (price and vendor type) and one that did not. Panel B displays our outcome measure, specifically the share of respondents who correctly identified the failed sample. In Panel B, the p-value corresponds to the χ^2 -test.

Panel A of Figure 5 illustrates the mean number of amoxicillin samples correctly identified by respondents in the full sample and in each group over three rounds.²⁴ No significant differences were observed between groups, with respondents correctly identifying the quality of a product in approximately half of the cases.²⁵ Panel B, which depicts on the ability to correctly identify poor-quality products, reveals that respondents who receive market information in addition to the product pictures are significantly more likely to correctly infer poor quality. Nevertheless, the extent of the discrepancy is relatively modest. In general, respondents are able to accurately detect poor-quality antibiotics in approximately half of the instances, indicating that the observability of quality may be constrained.²⁶

 $^{^{24}}$ We report the balance table in Table A5 in the Appendix.

²⁵To assess whether the mean total score in the treatment and control groups significantly differs from random chance, we compute the average success rate as the percentage of correct answers. Subsequently, we employ a one-sample t-test to determine if this success rate significantly deviates from the expected 50%. This entails constructing a 95% confidence interval (CI) around the mean total score and checking if 50% falls within this interval. If 50% lies outside the 95% CI, we conclude that the observed mean success rate is statistically distinguishable from random guessing at a 5% significance level. From this exercise, we find the mean score is statistically different from random guessing for both treatment (success rate 58.19%, 95% CI: 54.00-62.04) and control groups (success rate 55.97%, 95% CI: 52.00-59.67).

²⁶We ask respondents about their confidence in each decision they made. These measures are coarse (see Figure A5 in the Appendix) and primarily elicit confidence in singular judgments rather than confidence in the ability to infer quality. Furthermore, it is not trivial to differentiate between confidence in assessing symptoms, thus deciding to self-medicate (medical uncertainty), and confidence in assessing drug quality (quality uncertainty). While this goes beyond the scope of this study, the former is very large; even if consumers hold knowledge about symptoms and treatment choices, there is still a high risk of misdiagnosis by non-experts.

4.3 Self-medication

Finally, we turn to the results of our lab-in-the-field experiment. The model predicts that as the risk associated with self-medication increases, the demand for self-medication will decline, while the demand for professional healthcare will rise. The graphical representation of the experimental data in Figure 6, demonstrates that this relationship follows a linear function: an increase in the risk of purchasing a poor-quality drug is associated with a decrease in the proportion of respondents who choose to self-medicate. Consequently, our experimental findings align with the model's predictions.



FIGURE 6: Preference for self-medication and risk of buying poor quality

Notes: The figure shows the share and 95% confidence interval of respondents who fell sick (N = 1,199) and who decided to self-medicate when faced with the probability of obtaining a poor-quality medicine, as shown on the x-axis. The dashed line represents the fitted linear model.

In addition to the graphical representation, we estimate a linear probability model in which the dependent variable is the preference for self-medication, as expressed in the experimental rounds in which respondents were sick. Two distinct models are specified. In the initial three columns, the probability is defined as a continuous variable. In the remaining columns, we introduce the probability levels are categorised using 0.3 as the reference category, which corresponds to the market prevalence of poor-quality (amoxicillin) drugs established by quality testing. The baseline model, without individual controls, but with standard errors clustered at the individual level, is presented in columns (1) and

(4) of Table 2. Columns (2) and (5), on the other hand, employ individual fixed effects. In the final stage of the analysis, the predefined set of individual and experimental design controls are applied in columns (3) and (6), with standard errors clustered at the individual level. The results demonstrate a linear relationship that is consistent with the predictions of the theoretical model. The preference for self-medication is significantly inversely correlated with the probability of purchasing poor-quality medicine: an increase in probability by 10% is associated with a decrease in self-medication by 5.69-5.99 percentage points. Columns (4) to (6) indicate that respondents are significantly less likely to engage in self-medication when the probability of purchasing poor quality is equal to or exceeds 0.5, across all model specifications. Conversely, when the risk is minimal, we observe a significant increase in the likelihood of self-medication. These associations are consistent across model specifications.²⁷

²⁷When fitting a probit model to our data, we find similar coefficients, although the results are less stable across model specifications.

	Dependent variable: Decision to self-medication					
	(1)	(2)	(3)	(4)	(5)	(6)
Probability (cont.)	-0.569^{***} (0.045)	-0.584^{***} (0.044)	-0.599^{***} (0.039)			
Probability $= 0.0$				0.280***	0.298***	0.333***
Probability $= 0.1$				$(0.055) \\ 0.042$	(0.054) 0.121^{**}	$(0.047) \\ 0.070$
Probability $= 0.2$				$(0.057) \\ 0.067$	$(0.056) \\ 0.072$	$(0.049) \\ 0.072$
Probability $= 0.3$				$\begin{array}{c} (0.057) \\ \text{Ref.} \end{array}$	$\begin{array}{c} (0.057) \\ \text{Ref.} \end{array}$	$\begin{array}{c} (0.050) \\ \text{Ref.} \end{array}$
Probability $= 0.4$				-0.064	-0.042	-0.096^{**}
Probability $= 0.5$				$(0.057) -0.129^{**}$	$(0.057) \\ -0.093^*$	(0.049) -0.141^{***}
Probability = 0.6				(0.054) -0.160***	(0.054) -0.164***	(0.047) -0.167***
Probability = 0.7				(0.055) -0.256***	(0.055) -0.226***	(0.047) -0.247***
Prehek iliter = 0.8				(0.056)	(0.055)	(0.048)
Probability $= 0.8$				(0.055)	(0.055)	(0.047)
Probability $= 0.9$				-0.297^{***}	-0.269^{***}	-0.276^{***}
Constant	0.582^{***}	0.489^{**}	0.634^{***}	(0.037) (0.039)	(0.030) 0.265 (0.220)	(0.030) 0.419^{***} (0.129)
Individual controls	No	No	Yes	No	No	Yes
Fixed Effects	No	Yes	No	No	Yes	No
\mathbb{R}^2	0.119	0.560	0.361	0.129	0.566	0.377
Adjusted \mathbb{R}^2	0.118	0.350	0.345	0.123	0.351	0.357
Observations	1,199	1,199	1,199	1,199	1,199	1,199

TABLE 2: Regression analysis: Preference for self-medication

Notes: The table presents the results of the linear probability model, with the binary variable for selfmedication as the dependent variable and the probability of buying poor quality as the independent variable. Columns (1) to (3) use a continuous variable representing the risk of poor-quality medicine, while columns (4) to (6) show the results for all probability levels, using 0.3 as the reference category. We use a model specification without controls in columns (1) and (4), with individual fixed effects in columns (2) and (5), and with individual and round-specific controls in columns (3) and (6). Individual controls include age, gender, education, wealth quintiles, antibiotic knowledge, antibiotic use in the past 28 days, whether the individual has ever self-medicated, their preference for informal vendors, their prior beliefs about drug quality elicited in Survey Experiment 2, and basic preferences (risk preference, locus of control, trust, patience, and time preference). We include additional controls for the experimental design, including round dummies, previous round outcomes, and the order of the experiments. We include the latter because we find a significantly, yet small, difference in the slopes (see Figure A6 in the Appendix). Categorical variables are introduced as level dummies in the estimation equation. Standard errors are clustered at the individual level for all regressions except for the fixed effects specification in columns (2) and (5). Marginal effects are reported in Table A6 in the Appendix. $p < 0.1; \ p < 0.05; \ ^*p < 0.01.$





Notes: The figure shows the strategies adopted by respondents across all experimental rounds.

When examining the individual decisions made over the repeated rounds, we observe that some respondents exhibit a high degree of consistency in their decision patterns. Figure 7 illustrates that 10.5% (N=42) of the respondents consistently choose to selfmedicate, irrespective of the probability of obtaining poor-quality medicine. A greater proportion, 43.5% (N=174), consistently opt for the 'safe' choice of consulting a doctor. Approximately 46% (N=184) of the respondents employ a mixed strategy, alternating between different approaches.

4.4 Heterogeneity of Self-medication

In the following section, we undertake a more detailed examination of the heterogeneous effects observed across all subgroups, as outlined in our pre-registered analysis plan. To achieve this, we follow the methodology set out by Athey and Wager (2019) and Athey et al. (2021), estimating 4,000 causal forests using our data to estimate the conditional average treatment effect (CATE). Subsequently, the data is divided into subgroups with low and high CATE based on the median CATE observed in the full sample. The CATE is

estimated to be -0.595 (SD = 0.044) with a median of -0.608. By splitting individuals into groups below and above the median, we are able to compare those who react relatively 'strongly' to an increase in the risk of buying poor-quality drugs to those who react relatively 'weakly'. The results are presented in Table 3. The average treatment effect (ATE) is -0.483 (SD = 0.063) in the low CATE group and -0.708 (SD = 0.059) in the high CATE group. Thus, for a 10 percentage point increase in the probability of buying poor-quality drugs, individuals in the low CATE group, on average, reduce self-medication by 4.8 percentage points. In contrast, the reduction is steeper in the high CATE group, where self-medication decreases by 7 percentage points.²⁸

	Low CATE Subgroup	High CATE Subgroup	Difference (p-value)
	(1)	(2)	(3)
Female	0.47(0.50)	0.70(0.46)	-0.232 (0.000***)
Antibiotic knowledge score[=0]	0.06(0.23)	0.03(0.16)	$0.031 \ (0.315)$
Antibiotic knowledge $score[=1]$	0.53(0.50)	0.43(0.50)	0.098(0.168)
Antibiotic knowledge score $[=2]$	0.39(0.49)	0.51 (0.50)	-0.113(0.103)
Antibiotic knowledge score[=3]	0.03(0.16)	0.04(0.20)	-0.015(0.623)
Health care satisfaction	0.51 (0.50)	0.49(0.50)	0.015(0.813)
Chronic illness	0.27(0.45)	0.20(0.40)	0.072(0.264)
No education	0.29(0.45)	0.20(0.40)	0.093(0.118)
Primary education	0.24(0.43)	0.29(0.45)	-0.052(0.481)
Secondary education	0.27(0.45)	0.34(0.48)	-0.067(0.348)
Tertiary education	0.20(0.40)	0.18(0.38)	$0.026\ (0.662)$
Wealth quintile[=1]	0.21(0.41)	0.20(0.40)	0.005 (0.900)
Wealth quintile $[=2]$	0.19(0.39)	0.22(0.41)	-0.031(0.639)
Wealth quintile[=3]	0.21(0.41)	0.19(0.39)	0.015(0.799)
Wealth quintile [=4]	0.21(0.41)	0.18(0.38)	$0.036\ (0.623)$
Wealth quintile $[=5]$	0.19(0.39)	0.22(0.41)	-0.026(0.662)
Income > FCFA $100,000$	0.34(0.48)	0.40(0.49)	-0.062(0.434)
Risk aversion	4.16 (3.09)	6.20(1.74)	$-2.041 \ (0.000^{***})$
Trust	6.25(2.50)	6.19(2.22)	0.067(0.813)
Locus of control	9.01(1.47)	7.98(1.56)	$1.026 \ (0.000^{***})$
Patience	7.27(2.26)	6.59(2.11)	$0.686 \ (0.011^*)$
Time preference	5.99(3.02)	6.19(2.11)	-0.196(0.639)
Self-medicated in past 28 days	0.08 (0.28)	0.11(0.31)	-0.026(0.623)
Used antibiotic in past 28 days	0.20(0.40)	0.19(0.39)	0.015(0.799)
Ever self-medicated	0.49(0.50)	0.65~(0.48)	-0.16 (0.009**)

TABLE 3: Subgroup analysis: Preference for self-medication

Notes: In the table, we compare the means of the individual characteristics of interest for the heterogeneity analysis between the subgroups. This comparison helps us understand which individuals responded more strongly to changes in the risk of buying poor quality. A negative significant difference in column (3) indicates that the average value of the covariate is higher for the high CATE group. Standard errors are shown in parentheses. We report p-values for the test of between-group differences using the Benjamini-Hochberg correction for multiple hypothesis testing. Twelve respondents never participated in the sick round and are therefore not included in this analysis.

From this analysis, we observe that respondents with a more internal locus of control

²⁸As an alternative subgroup analysis, we split our sample into subgroups based on each individual characteristic discussed in Subsection A.1. We also check for differences in the share of strategies adopted. We find significant differences among those who are more satisfied with the healthcare services they received in the past and those who have self-medicated before with antibiotics. For both subgroups, a larger share adopted a mixed strategy, and fewer respondents always sought professional care.

and those who are more patient react less strongly to an increase in the risk of buying poor-quality drugs.²⁹ Both traits – internal locus of control and patience – may reflect greater resilience to uncertainty. Individuals with an internal locus of control tend to believe they have personal control over outcomes, which may lead them to feel more confident in dealing with uncertain situations, such as the risk of buying poor-quality drugs. Similarly, patient individuals may be better able to cope with the discomfort of uncertainty and may be more willing to wait for better information or results before making decisions. Together, these traits could help reduce the stress or perceived risk associated with uncertainty, making these individuals less reactive to potential dangers in the marketplace.

In contrast, female respondents, individuals who are more risk-seeking, and those with prior experience of self-medication respond more strongly to changes in risk, reducing their self-medication practices to a greater extent. The relationship between risk aversion and behaviour can be interpreted in two ways. Firstly, it may be posited that those who are innately risk-loving are more responsive to changes in risk, which could explain the more precipitous decline in self-medication practices. Conversely, and contrary to the prevailing view on risk preferences, individuals who are more inclined to take risks may be more likely to opt for safer options when faced with uncertainty surrounding a potentially risky choice. Although they typically engage in riskier behaviour, the uncertainty or ambiguity of outcomes may prompt them to adopt a more cautious approach when the risk becomes less predictable or controllable. This reaction is consistent with the predictions of behavioural theories that suggest risk-seeking individuals may still prefer calculated risks. However, when the probability of success is low or the outcome is unpredictable, they may shift towards safer choices in order to maintain control (Andreoni and Sprenger 2012).

The association between our findings and factors such as risk preferences, patience, and locus of control contributes to the ongoing literature on how underlying preferences influence

²⁹To elicit locus of control, we ask respondents to indicate how much they agree with the statement, "My life is determined by my own actions", on a scale from 0 (I strongly disagree) to 10 (I strongly agree). Thus, a higher locus of control score is interpreted as indicating a more internal locus of control.
health decision-making. Despite the considerable body of research, the implications are not always straightforward, and often contradictory results are observed. To illustrate, in the context of risky sexual behavior, Thomas et al. (2024) identify that behaviors increasing the risk of HIV-infection are linked to altruism in women and social closeness in men. These traits are associated with a higher tendency to underestimate infection risks, while risk preferences do not play a significant role. Conversely, Björkman Nyqvist et al. (2022) find that individuals with a greater inclination to engage in risk-taking behaviors were more likely to be HIV positive in Lesotho. In both studies, no significant association was found between time preferences and the outcome variables. Although engaging in risky sexual behavior differs from self-medicating with drugs of uncertain quality, these findings illustrate the intricate role of individual traits in influencing health-related decisions.

One potential explanation for our mixed findings is that our risk preference measure, which was designed in a manner similar to that of Falk et al. (2023), may be domain-specific and insufficient for capturing risk-taking in health-related decisions such as self-medication (Barseghyan et al. 2018; Galizzi et al. 2016; Galizzi and Miraldo 2017). Furthermore, additional components of risk preferences, such as probability weighting, loss aversion, or ambiguity aversion, may exert a more pronounced influence in this context. However, these factors may be inadequately captured by our current measure (Starmer 2000; Vieider et al. 2015).

In contrast with the findings of Chang and Trivedi (2003), our results indicate that selfmedication is not an inferior good for individuals in high-income brackets.³⁰ Furthermore, our findings suggest that there is no evidence of heterogeneity in self-medication practices based on education level or knowledge about antibiotics.

³⁰We also do not find a significantly smaller share of respondents who always self-medicate among those with incomes higher than FCFA 100,000, as shown in Table A10 in the Appendix. The proportions of individuals who either consistently seek professional care or adopt a mixed strategy are similar. Therefore, we can rule out the possibility that wealthier individuals simply avoid self-medication altogether.

5 Robustness and Validity

This section presents a discussion of the robustness of the results, together with additional information and evidence pertaining to the external validity of the findings.

Robustness The robustness of the results obtained from the lab-in-field experiment is evaluated through two distinct approaches. Firstly, we evaluate whether the experimental outcomes are primarily influenced by the linear incentive structure. To this end, we conduct a simulation exercise, presented in Figure A8 in the Appendix. The results indicate that, for the modeled rational consumers, self-medication becomes the optimal choice only when the likelihood of acquiring a high-quality product is equal to or exceeds 0.6. From our model specification with probability dummies, we observe that subjects are significantly less likely to engage in self-medication when the risk of acquiring a poorquality product is 0.5 or higher; however, we do not observe a kink at this level in the graphical depiction in Figure 6. These findings suggest that the results are not contingent on the incentive structure.

Secondly, in order to gain a deeper insight into the influence of prior beliefs about drug quality on decision-making, we compare the responses of individuals who faced a risk that was higher or lower than their prior belief, as elicited in the belief elicitation task. Please refer to Figure A7 in the Appendix for a visual representation of the results. The results suggest that individuals who encounter scenarios in which the risk of purchasing poor-quality pharmaceuticals is lower than their prior expectation may engage in selfmedication to a greater extent, although this difference is not statistically significant.

Internal Validity The endogenous control for secondary background risks may have introduced a bias in respondents' choices. In practical situations, those who make decisions frequently have to consider a number of different types of risk at the same time. They use mental shortcuts and learned behaviours from previous experience of different risk environments to help them make sense of the situation. The extent to which our estimates of self-medication preferences are biased is contingent upon how participants perceive the interaction between primary and secondary risks, specifically whether they view them as complementary or independent, and the risk preferences they assign to secondary risks (Harrison et al. 2007; Quiggin 2003). A limitation of our study is that we were unable to explore this relationship in greater depth, which raises the possibility that participants' real-world risk attitudes may differ from those measured in our controlled environment.

A further potential threat to the internal validity of our findings is the presence of experimenter demand effects. Experimenter demand occurs when respondents, either consciously or unconsciously, alter their behaviour in a manner that is perceived to align with the expectations or desires of the experimenter. This concept has been previously discussed in the literature, for instance, by De Quidt et al. (2019) and Zizzo (2010). Such deviations from true preferences have the potential to compromise the accuracy of our results (Haaland et al. 2023). In order to mitigate this risk, a number of measures were taken with regard to the design and administration of the experiments. Primarily, instructions were meticulously devised to be impartial and non-suggestive, thus minimising any potential cues that might influence participants' choices. Secondly, the order in which participants completed different experimental tasks was randomised in order to control for any learning or priming effects and to ensure that such effects were distributed evenly across experimental conditions.

External Validity To test the external validity of our results, we conducted two tasks. The first involved administering a small-scale online survey with healthcare professionals in Burkina Faso. This survey compared non-expert consumers' expectations about drug quality on the market with those of expert consumers. The second task was to replicate the lab-in-field experiment in Accra, the capital of Ghana. This allowed us to assess the robustness of our findings in a different context.

To ascertain whether expert consumers – defined as individuals possessing a greater perceived propensity to validate quality – are better equipped to infer quality based on subtle cues or knowledge of production processes, a small-scale online survey was conducted with 46 participants from backgrounds in pharmacology, medicine, and related disciplines. The results are presented in Online Appendix D. In conclusion, the findings from the expert sample closely resemble those of the non-expert consumers. The data indicate that experts are more cognizant of the potential risks associated with formal vendors, and perceive these vendors as a relatively secure option to a lesser extent. Regarding the second observability of quality, the proportion of experts who accurately identified the poor-quality sample in both groups was comparable to that of the non-expert sample. Overall, these results suggest that experts share a similar awareness of the potential for poor-quality antibiotics but exhibit a markedly constrained capacity to assess quality based on visual cues, whether in isolation or in conjunction with market data, akin to their non-expert counterparts.

A significant aspect of our study is the examination of the external validity of our findings. While this question can only be fully addressed through replication, we can provide some suggestive evidence. In advance of our investigation in Ouagadougou, we conducted a preliminary study with 52 participants in Accra, Ghana. The results from the Accra sample exhibited a striking similarity to those obtained from Ouagadougou. Although consumers in Accra are exposed to a greater risk of purchasing substandard antibiotics, they also demonstrate an accurate understanding of the elevated risk. With regard to the lab-in-field experiment, we also observe a linear increase in the decision to self-medicate, accompanied by highly comparable regression results. A comprehensive account of the pilot study's implementation and outcomes is presented in the Online Appendix C.

6 Conclusion

To the best of our knowledge, this study represents the first comprehensive examination of how uncertainty regarding drug quality influences consumers' self-medication behavior. The present investigation draws upon data from a combination of mystery shopper audits, drug quality assessments, and a survey conducted among urban residents in Ouagadougou, the capital of Burkina Faso. Our findings indicate that the quality of drugs, particularly amoxicillin (500 mg), available on the market is substandard. Specifically, one in five products purchased from licensed pharmacies (formal vendors) was found to be of inadequate quality upon analysis. In the informal market, the situation is even more dire, with every second product failing the quality test. Moreover, nearly half of the samples purchased in this market lacked the active antibiotic ingredient.

Additionally, our findings suggest that consumers possess a limited capacity to ascertain quality based on market information and visual cues. Notably, price is an unreliable indicator of quality. This observation contradicts the predictions of economic theory but aligns with the results of other studies in this field, such as that conducted by Bate et al. (2011). In conclusion, our findings indicate a significant risk of purchasing substandard or falsified antibiotics in Ouagadougou, a risk that consumers are aware of, as evidenced by the results of our survey.

Against this background, and building upon the work of Chang and Trivedi (2003), we further investigate how consumers respond to changes in drug quality, specifically regarding the risk of purchasing poor-quality medications. This is accomplished through the utilization of a lab-in-the-field experiment. Our research indicates that a reduction in uncertainty surrounding drug quality may lead to an increase in self-medication, suggesting a potential trade-off whereby enhanced drug quality could facilitate this practice.

Our work serves as a complementary addition to the studies conducted by Björkman-Nyqvist et al. (2023) and Bennett and Yin (2019), further elucidating the dynamics of drug quality and consumer behavior in low-income settings. In contrast to the focus of our study, both studies concentrated on the supply side. As demonstrated by Björkman-Nyqvist et al. (2023), the introduction of a non-governmental organization selling highquality antimalarial medicines in Uganda resulted in a significant reduction in the prevalence of fake drugs, a decrease in prices, and an increase in market demand, which in turn led to improved health outcomes. Similarly, Bennett and Yin (2019) found that the entry of a large pharmacy chain in Hyderabad, India, enhanced drug quality and reduced prices at incumbent retailers.

While our study shares the common objective of understanding how market interventions

can improve drug quality or lay the groundwork for such interventions, it specifically focuses on consumer responses. Although we emphasize the necessity of regulatory measures, our findings also underscore the potential for unintended consequences. Enhancing drug quality through improved supply chains, new market entrants, and/or more effective regulation of over-the-counter sales may inadvertently result in increased self-medication. A back-of-the-envelope calculation based on the findings of Björkman-Nyqvist et al. (2023) suggests that the entry of a trusted seller may have increased the probability of purchasing high-quality drugs by 15–17 percentage points. This increase could correspondingly result in a rise in self-medication rates by approximately 9–10.2 percentage points. The implications for welfare remain unclear, presenting several avenues for future research.

Further research is required to gain a deeper understanding of the complex factors that influence consumer choices and behaviours in markets where the quality of drugs is uncertain. Although our study and participants operated in a stylised environment, it would be beneficial to conduct further research on consumer choice in a real-world setting. While our study provides a comprehensive overview of consumer beliefs and self-medication practices in Ouagadougou, further investigation is required to explore the socio-economic determinants that compel consumers to purchase antibiotics from informal vendors despite the known risks. Moreover, an examination of the efficacy of diverse information campaigns and educational interventions in enhancing consumer awareness and modifying purchasing behaviors would be advantageous. Another significant avenue of inquiry is the impact of technological solutions, such as mobile authentication services (MAS), on drug quality and consumer trust (see Hamilton et al. 2016). In conclusion, further research is required to ascertain the impact of regulatory frameworks and enforcement mechanisms on drug quality and market transparency.

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Appendix A Additional Figures and Tables





Notes: The figure shows the regional variation in the proportion of respondents with flu-like symptoms of a who self-medicated in the 30 days prior to the interview. We use data from 22,537 respondents of the "Enquête Harmonisée sur le Conditions de Vie des Ménages" (Living Standards Measurement Survey, LSMS) conducted in 2021 and 2022 in Burkina Faso who are 18 years or older. Our study site, Ouagadougou, is located in the Centre region. The region borders are marked in red.



FIGURE A2: Health case choice across symptoms

Notes: The figure shows the health care choices for the main symptoms reported. We use data from the household roster in which we elicited past health and health care choices for the main respondent and up to two additional household members of 18 years. The total sample is comprised of 970, of whom 431 (44.4%) were sick in the 28 days prior to data collection. Because we collapse the data at the symptom level, individuals who report multiple symptoms are included multiple times.

Variable	Mean	SD	Min	Max	Non-missing
Vendor Type					
Formal: Private pharmacy	0.32	0.47	0	1	50
Formal: Public pharmacy	0.36	0.48	0	1	50
Informal: Street vendor	0.32	0.47	0	1	50
Arrondissement					
District 3	0.20	0.40	0	1	50
District 4	0.16	0.37	0	1	50
District 7	0.14	0.35	0	1	50
District 9	0.16	0.37	0	1	50
District 10	0.18	0.39	0	1	50
District 11	0.16	0.37	0	1	50
Amoxicillin product information					
Price in FCFA	1362.00	213.94	1050	2100	50
Country of origin: Asia	0.56	0.50	0	1	34
Country of origin: Africa	0.44	0.50	0	1	34
Manufacture date (year)	2022.47	0.52	2022	2023	15
Expiration date (year)	2025.18	0.48	2024	2027	50
Information missing					
Missing: Manufacturer	0.26	0.44	0	1	50
Missing: Country of origin	0.32	0.47	0	1	50
Missing: Batch number	0.00	0.00	0	0	50
Missing: Manufacture date	0.70	0.46	0	1	50
Missing: Expiration date	0.00	0.00	0	0	50
Mystery shopper					
Mystery shopper 1	0.47	0.50	0	1	49
Mystery shopper 2	0.53	0.50	0	1	49

TABLE A1: Sample characteristics

Notes: The table shows the characteristics of the 50 amoxicillin 500mg samples collected for quality testing at the IRSS using thin layer chomatography (TLC). With the exception of price, manufacturer year, and expiration year, the mean represents the proportion of samples. Missing information on manufacturer and country of origin is mostly overlapping. However, for one manufacturer, we were unable to verify the country of origin (none of the samples tested from this company failed quality testing, indicating that the company is not a front for illicit drug production). Hence the prevalence of missing information on country of origin is slightly higher. We miss information on the mystery shopper who bought one sample.

Variable	Description	Coding
Female	Is 1 if the respondent is female and 0 otherwise.	Dummy
Age	Age of the main respondent	Continuous
Education	Educational attainment (levels: no schooling, primary, secondary, tertiary or higher).	Categorical / dummy
	In subgroup analysis included as dummy which is 1 if respondent has at least secondary education and 0 otherwise.	
Wealth quintile	We estimate the socio-economic status using wealth quintiles based on a principal component analysis (PCA) from assets owned by the household and housing conditions. We use the first principal component to construct the wealth quintiles as it explains the largest proportion of the total variance (levels 1-5).	Categorical / dummy
	In subgroup analysis included as decile based on the distribution of the PCA score.	
Antibiotic knowledge	Number of correct answers given to a total of three knowledge questions (levels 0-3).	Categorical / dummy
	In subgroup analysis included as dummy which is 1 if respondent answered two or more questions correctly and 0 otherwise.	
Self-medicated with antibiotics in past 28 days	Is 1 if the respondent has self-medicated with antibiotics (as stand-alone treatment or before consulting health care services) in the past 28 days and 0 otherwise.	Dummy
Used antibiotics in past 28 days	Is 1 if the respondent used antibiotics (self-medicated or prescribed) in the past 28 days and 0 otherwise.	Dummy
Ever self-medicated with an- tibiotics	Is 1 if the respondent has ever self-medicated with antibiotics and 0 otherwise.	Dummy
Preference for informal vendor	Is 1 if the respondent has answered that she would buy antibiotics from an informal vendor as first or second choice and 0 otherwise.	Dummy
Risk aversion	Scale from 0 to 10 where a higher value is associated with a risk seeking preference. See Falk et al. (2023) for further instructions.	Continuous / dummy
	In subgroup analysis included as decile based on the distribution of the scale.	
Locus of control	Scale from 0 to 10 whether respondents agreed with the statement "My life is determined by my own actions." where a higher value is associated with a more external locus of control.	Continuous / dummy
	In subgroup analysis included as decile based on the distribution of the scale.	
Trust	Scale from 0 to 10 where a higher value is associated with higher trust levels. See Falk et al. (ibid.) for further instructions.	Continuous / dummy
	In subgroup analysis included as decile based on the distribution of the scale.	

TABLE A2: Variable definition

Variable	Description	Coding
Time preference	Scale from 0 to 10 where a higher value is associated with a future preference. See Falk et al. (2023) for further instructions.	Continuous / dummy
	In subgroup analysis included as decile based on the distribution of the scale.	
Patience	Scale from 0 to 10 where a higher value is associated with more patience. See Falk et al. (ibid.) for further instructions.	Continuous / dummy
	In subgroup analysis included as decile based on the distribution of the scale.	
Order of experiments	Is 1 if the respondent did the Lab-in-the-Field experiment after Survey Experiment 1 and 0 otherwise.	Dummy
Belief about risk to buy poor- quality at formal vendor	Belief about risk to buy poor-quality at formal vendor elicited in Survey Experiment 1.	Continuous
Belief about risk to buy poor- quality at informal vendor	Belief about risk to buy poor-quality at informal vendor elicited in Survey Experiment 1.	Continuous
Lab-in-field experiment: Round	Round played (levels 1-5).	Categorical
Lab-in-field experiment: Out- come medicine draw previous round	Is 1 if the respondent drew chip indicating poor-quality medicine in the previous round and 0 otherwise.	Dummy
Lab-in-field experiment: Sick in previous round	Is 1 if the respondent was sick in previous round and 0 otherwise.	Dummy
Has a chronical illness	Is 1 if the respondent needs regular medical consultation and/or medicine and 0 otherwise.	Dummy
Satisfaction with health care services	Normalized composite index from three questions in our questionnaire asking about health care provider's medical knowledge and skills during the last visit and whether the provider was able to explain the illness diagnosis and treatment in a good way to the patient. A higher score corresponds to higher satisfaction levels.	Continuous / dummy
	In subgroup analysis included as decile based on the distribution of the score.	

TABLE A2: Variable definition (continued)

Notes: The table describes all variables included as covariates in the analyses.

	Passed s	amples	Failed s	amples		
	Mean	SD	Mean	SD	p-value	Ν
Average amoxicillin content	77.28	7.02	41.12	40.43	0.000***	50
Price in FCFA	1350.00	195.91	1390.00	256.49	0.672	50
Country of origin: Asia	0.61	0.50	0.33	0.52	0.495	34
Country of origin: Africa	0.39	0.50	0.67	0.52	0.495	34
Missing: Manufacturer	0.11	0.32	0.60	0.51	0.019^{*}	50
Missing: Country of origin	0.20	0.41	0.60	0.51	0.019^{*}	50
Storage condition at the pharmacy:						
On the floor	0.26	0.45	0.00	0.00	0.019^{*}	34
In a shelf	0.74	0.45	1.00	0.00	0.019^{*}	34
Ventilator	0.96	0.19	1.00	0.00	0.568	34
Air conditioner	0.30	0.47	0.43	0.53	0.672	34
Storage condition at the street vendor:						
On the floor	0.50	0.53	0.12	0.35	0.340	16
In a shelf	0.12	0.35	0.25	0.46	0.672	16
In a bag	0.25	0.46	0.50	0.53	0.568	16
In a suitcase	0.12	0.35	0.12	0.35	1.000	16
Exposure to sunlight	0.12	0.35	0.25	0.46	0.672	16
Mystery shopper:						
Mystery shopper 1	0.46	0.51	0.50	0.52	0.841	49
Mystery shopper 2	0.54	0.51	0.50	0.52	0.841	49

TABLE A3: Market correlates of quality

Notes: The table reports the mean, standard deviation, and p-value of the t-test statistic accounting for whether or not variances are equal for samples which failed and passed quality testing. We correct for multiple hypothesis testing using the Benjamini-Hochberg correction.





Notes: The figure compares the distribution of beliefs for participants who were first asked about the probability of buying poor quality from a pharmacy (gray bars) versus a street vendor (white bars), to control for anchoring of beliefs in the type of vendor from whom belief was first elicited.



FIGURE A4: Distribution of beliefs controlling for order of experiments

Notes: The figure compares the belief distribution for participants who completed the decision task before and after the belief elicitation to control for ordering effects and priming. Panel A shows the belief distribution for pharmacies, while Panel B shows the belief distribution for street vendors.

	Risk at		Risk at		
	pharmacies	p-value	Street vendor	p-value	Ν
	(1)	(2)	(3)	(4)	(5)
Dan al A. Oronall as mula	(1)	(2)	(0)	(1)	(0)
Partiel A: Overall sample Reliefe about the pick of huving near quality antibiotic	0.20 (0.20)		0.72(0.97)		400
Panel B: Sub group analysis	0.29(0.30)		0.12(0.21)		400
Conden					
Male	0.27(0.20)	Pof	0.78 (0.25)	Pof	163
Famala	0.27 (0.29) 0.20 (0.21)	0.560	0.78(0.23)	0.002**	105
Female	0.30(0.31)	0.509	0.08(0.27)	0.002	237
No on primary education	0.20(0.21)	Def	0.70 (0.28)	Def	205
No or primary education	0.29(0.31) 0.20(0.20)	0.008	0.70(0.28) 0.74(0.26)	nei. 0.257	205
Secondary of higher education	0.29(0.29)	0.908	0.74(0.20)	0.257	195
Detter 50%	0.22 (0.20)	D-f	0.70(0.97)	D-f	200
Dottom 50%	0.28(0.30)	Rel.	0.70(0.27) 0.74(0.27)	Rel. 0.172	200
Top 50%	0.30(0.31)	0.698	0.74(0.27)	0.173	200
Income:	0.94 (0.99)	D	0.00.000	D	050
Less than FCFA 100,000	0.34(0.33)	Rei.	0.69(0.28)	Rei.	252
More than FCFA 100,000	0.21(0.24)	0.000^{***}	0.78(0.25)	0.002***	148
Chronic illness:	0.00 (0.00)	D (Ð	005
No chronic illness	0.26 (0.29)	Ref.	0.72(0.27)	Ref.	305
Has a chronic illness	0.37(0.34)	0.029^{*}	0.73(0.26)	0.803	95
Antibiotic knowledge:		5.4	0.01 (0.00)	5.4	
Low AKS	0.24(0.25)	Ref.	0.81(0.22)	Ref.	208
High AKS	0.35(0.34)	0.003^{**}	0.63(0.28)	0.000***	192
Health care satisfaction:	(>		(>		
Unsatisfied	0.25(0.31)	Ref.	0.75(0.27)	Ref.	200
Satisfied	0.33 (0.29)	0.029*	0.69(0.27)	0.036*	200
Used antibiotic in past 28 days:					
No recent antibiotic use	0.30(0.31)	Ref.	0.72(0.27)	Ref.	323
Recent antibiotic use	0.26 (0.27)	0.438	0.74(0.26)	0.645	77
Self-medicated with antibiotic in past 28 days:					
No recent self-medication	0.30(0.31)	Ref.	0.73(0.29)	Ref.	165
Recent self-medication	0.26 (0.27)	0.696	0.72(0.27)	0.824	38
Ever self-medicated with antibiotics:					
Never self-medicated	0.27 (0.29)	Ref.	0.76 (0.25)	Ref.	172
Ever self-medicated	0.30(0.31)	0.438	0.69(0.28)	0.036^{*}	228
Vendor preference:					
Only buys from pharmacy	0.27 (0.30)	Ref.	0.76(0.26)	Ref.	302
Also buys from street vendor	0.27 (0.28)	0.908	$0.60 \ (0.25)$	0.001^{**}	52
Risk aversion:					
Risk averting	$0.31 \ (0.32)$	Ref.	0.73 (0.27)	Ref.	215
Risk seeking	0.26(0.28)	0.347	0.72(0.27)	0.803	185
Time preference:					
Present preference	0.29(0.31)	Ref.	0.71(0.28)	Ref.	260
Future preference	0.28(0.30)	0.698	0.74(0.25)	0.628	140
Patience:					
Inpatient	0.31(0.31)	Ref.	0.72(0.27)	Ref.	204
Patient	0.27(0.30)	0.347	0.73(0.27)	0.803	196
Trust:					
Less trusting	0.28(0.29)	Ref.	0.72(0.27)	Ref.	260
More trusting	0.30(0.33)	0.668	0.73(0.27)	0.803	140
Locus of control:	× /		× /		
Internal locus of control	0.32(0.32)	Ref.	0.67(0.27)	Ref.	256
External locus of control	0.23(0.25)	0.008^{**}	0.81(0.24)	0.000^{***}	144

	TABLE A4: Su	mmary of beliefs	about risk	at a formal	and a	informal	vendor
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Notes: The tables shows the mean belief about the risk of buying poor quality Amoxicillin medicine across all respondents at pharmacies in column (1) and street vendors in column (3). Column (2) and (4) report the adjusted p-value of the t-test statistic of the difference in beliefs between the subgroups for beliefs about the risk at pharmacies and street vendors respectively. We use the Benjamini-Hochberg correction for multiple hypothesis testing. The standard deviation is given in parentheses. Vendor preference was elicited by asking participants what their preferred option was and what their alternative option would be if the first option was closed. We exclude 46 individuals who state that they buy also buy antibiotics at NGOs or traditional healers. p < 0.1; **p < 0.05; ***p < 0.01.

	Price and (visual $+ r$	rice and vendor information Pictures only (visual) isual + market information		Pictures only (visual)	
	Mean	SD	Mean	$^{\mathrm{SD}}$	
Age	41.24	14.60	40.90	13.99	0.814
Female	0.57	0.50	0.62	0.49	0.292
Married	0.74	0.44	0.72	0.45	0.676
Christian	0.38	0.49	0.42	0.50	0.342
Muslim	0.62	0.49	0.58	0.50	0.342
No education	0.26	0.44	0.25	0.43	0.746
Primary education	0.25	0.44	0.27	0.45	0.614
Secondary education	0.30	0.46	0.30	0.46	0.896
Tertiary education	0.18	0.39	0.18	0.39	0.956
Working	0.66	0.48	0.61	0.49	0.343
Self-employed	0.41	0.49	0.41	0.49	0.973
Wage work	0.18	0.38	0.18	0.38	0.936
Public servant	0.06	0.23	0.02	0.15	0.082
Wealth quintile	3.08	1.45	2.88	1.38	0.151
Chronic illness	0.24	0.43	0.24	0.43	0.958
Ever self-medicated	0.56	0.50	0.58	0.49	0.648
Antibiotic knowledge score	1.47	0.62	1.47	0.64	0.999
Satisfaction with health services	0.57	0.23	0.55	0.23	0.372
Trust	6.13	2.39	6.27	2.32	0.565
Risk aversion	4.92	2.76	5.36	2.66	0.110
Patience	7.04	2.28	6.84	2.15	0.378
Time discounting	5.94	2.75	6.26	2.42	0.212
Locus of control	8.67	1.50	8.33	1.67	0.037^{*}
N	218		182		

TABLE A5: Balance test

Notes: The table shows the balance test of means and the t-test statistics for participants assigned to treatment and control groups in Survey Experiment 2.



FIGURE A5: Confidence in quality judgements

Notes: The figure shows the stated confidence levels of participants in the treatment (bars in blue shade) and control group (bars in grey shade) under consideration of whether or not they correctly identified the quality.

Level	Predicted marginal effect	SE	95%-CI
0	0.563	0.220	[0.131, 0.996]
0.1	0.386	0.223	[-0.052, 0.824]
0.2	0.337	0.223	[-0.101, 0.776]
0.3	0.265	0.220	[-0.168, 0.698]
0.4	0.223	0.223	[-0.215, 0.661]
0.5	0.172	0.220	[-0.261, 0.604]
0.6	0.101	0.223	[-0.336, 0.539]
0.7	0.039	0.223	[-0.399, 0.476]
0.8	0.049	0.223	[-0.387, 0.486]
0.9	-0.004	0.224	[-0.443, 0.434]

TABLE A6: Marginal effects

Notes: The table reports the predicted marginal effects for the regression analysis in column 1 of Table 2. In the context of a linear probability model, these marginal effects represent the change in the predicted probability of the dependent variable for a one-unit change in the respective independent variable, holding all other variables constant.

A.1 Subgroup Analysis: Lab-in-Field Experiment

		Dependent variable: Decision to self-medication						
		Male			Female			
	(1)	(2)	(3)	(4)	(5)	(6)		
Probability (cont.)	-1.384^{***}	-2.910^{***}	-2.185^{***}	-1.951^{***}	-3.616^{***}	-2.723^{***}		
	(0.209)	(0.389)	(0.274)	(0.199)	(0.359)	(0.252)		
Constant	0.084	1.451^{*}	-0.329	0.400***	0.386	1.153^{*}		
	(0.105)	(0.838)	(1.048)	(0.094)	(0.840)	(0.654)		
Individual controls	No	No	Yes	No	No	Yes		
Fixed Effects	No	Yes	No	No	Yes	No		
Mc Fadden's R	0.071	0.591	0.359	0.122	0.611	0.381		
Mixed strategy		0.53			0.59(0.330)			
Always professional care		0.42			0.34(0.178)			
Always self-medication		0.05			0.07(0.459)			
Observations	520	520	520	679	679	679		

TABLE A7: Subgroup analysis: Gender

Notes: The table reports the results of the linear probability function using decision to self-medicate as the dependent variable for the subgroup as specified in the table. We use a model specification without controls in columns (1) and (4), with individual fixed effect in columns (2) and (5), and individual control in columns (3) and (6). The complete set of individual controls includes age, gender, education, wealth quintiles, antibiotic knowledge, antibiotic use in past 28 days, ever self-medicated, preference for street vendors, prior belief about drug quality elicited in survey experiment 2, and basic preferences (risk aversion, locus of control, trust, patience and time preference). Specific models did not include the respective subgroup variable, e.g., when looking at differential effects by gender, we did not include a control for gender. Additional controls in each specification are round dummies, low medicine quality in previous round, number of low medicine quality in past rounds. Standard errors are clustered at the individual level for all regressions expect the fixed effect specification in columns (2) and (5). p < 0.1; **p < 0.05; ***p < 0.01.

TABLE A8:	Subgroup	analysis:	Education
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	Dependent variable: Decision to self-medication					
	No o	r primary educ	ation	Second	ary or higher ed	ucation
	(1)	(2)	(3)	(4)	(5)	(6)
Probability (cont.)	-1.416^{***}	-2.580^{***}	-1.983^{***}	-1.999^{***}	-4.316^{***}	-2.815^{***}
	(0.206)	(0.337)	(0.253)	(0.203)	(0.446)	(0.265)
Constant	0.032	0.163	0.918	0.505^{***}	-3.654	0.142
	(0.098)	(0.799)	(0.700)	(0.101)	(6,609.105)	(0.841)
Individual controls	No	No	Yes	No	No	Yes
Fixed Effects	No	Yes	No	No	Yes	No
Mc Fadden's R	0.07	0.526	0.329	0.134	0.682	0.389
Mixed strategy		0.59			0.54(0.399)	
Always professional care		0.37			0.38(0.976)	
Always self-medication		0.04			0.09(0.102)	
Observations	601	601	601	598	598	598

		Depende	ent variable: D	ecision to self-r	nedication	
		Bottom 50%			Top 50%	
	(1)	(2)	(3)	(4)	(5)	(6)
Probability (cont.)	-1.425^{***}	-2.748^{***}	-2.227^{***}	-1.989^{***}	-3.987^{***}	-2.648^{***}
	(0.197)	(0.346)	(0.253)	(0.212)	(0.414)	(0.269)
Constant	0.115	0.200	1.669**	0.414***	-3.527	-0.052
	(0.097)	(0.805)	(0.652)	(0.101)	(2,530.540)	(0.952)
Individual controls	No	No	Yes	No	No	Yes
Fixed Effects	No	Yes	No	No	Yes	No
Mc Fadden's R	0.071	0.584	0.374	0.131	0.628	0.366
Mixed strategy		0.55			0.58(0.628)	
Always professional care		0.4			0.35(0.469)	
Always self-medication		0.05			0.07 (0.647)	
Observations	623	623	623	576	576	576

TABLE A9: Subgroup analysis: Wealth (SES)

	Dependent variable: Decision to self-medication								
	Less	than FCFA 10	0,000	Mor	More than FCFA 100,000				
	(1)	(2)	(3)	(4)	(5)	(6)			
Probability (cont.)	-1.710^{***}	-3.651^{***}	-2.300^{***}	-1.701^{***}	-2.854^{***}	-2.835^{***}			
	(0.184)	(0.361)	(0.224)	(0.232)	(0.386)	(0.341)			
Constant	0.216**	0.393	0.844	0.347***	1.310^{*}	-0.259			
	(0.087)	(0.842)	(0.622)	(0.117)	(0.711)	(1.235)			
Individual controls	No	No	Yes	No	No	Yes			
Fixed Effects	No	Yes	No	No	Yes	No			
Mc Fadden's R	0.098	0.645	0.336	0.102	0.534	0.444			
Mixed strategy		0.54			0.61 (0.286)				
Always professional care		0.38			0.37(0.912)				
Always self-medication		0.08			$0.02 (0.022)^{*}$				
Observations	759	759	759	440	440	440			

TABLE A10:	Subgroup	analysis:	Income
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Notes: See table notes above. p < 0.1; **p < 0.05; ***p < 0.01.

	Dependent variable: Decision to self-medication								
	N	lo chronic illnes	38		Chronic illness				
	(1)	(2)	(3)	(4)	(5)	(6)			
Probability (cont.)	-1.573^{***}	-3.236***	-2.286***	-2.149^{***}	-3.524^{***}	-3.271***			
	(0.161)	(0.303)	(0.200)	(0.320)	(0.534)	(0.468)			
Constant	0.195^{**}	0.305	0.962^{*}	0.491^{***}	1.609^{*}	-3.483			
	(0.079)	(0.822)	(0.542)	(0.151)	(0.853)	(398.537)			
Individual controls	No	No	Yes	No	No	Yes			
Fixed Effects	No	Yes	No	No	Yes	No			
Mc Fadden's R	0.088	0.625	0.338	0.139	0.525	0.464			
Mixed strategy		0.53			0.66(0.083)				
Always professional care		0.39			0.33(0.374)				
Always self-medication		0.08			$0.02 (0.016)^{*}$				
Observations	923	923	923	276	276	276			

TABLE A11: Subgroup analysis: Chronic illness

		Dependent variable: Decision to self-medication							
		Unsatisfied			Satisfied				
	(1)	(2)	(3)	(4)	(5)	(6)			
Probability (cont.)	-1.879^{***}	-3.928^{***}	-2.847^{***}	-1.645^{***}	-2.901^{***}	-2.286^{***}			
	(0.223)	(0.449)	(0.311)	(0.195)	(0.327)	(0.238)			
Constant	0.079	0.450	1.533^{*}	0.452***	1.448*	-0.367			
	(0.101)	(0.857)	(0.798)	(0.098)	(0.834)	(0.865)			
Individual controls	No	No	Yes	No	No	Yes			
Fixed Effects	No	Yes	No	No	Yes	No			
Mc Fadden's R	0.121	0.667	0.414	0.091	0.541	0.332			
Mixed strategy		0.49			$0.64 \ (0.019)^*$				
Always professional care		0.47			0.29 (0.003)**				
Always self-medication		0.04			0.08(0.250)				
Observations	584	584	584	615	615	615			

TABLE A12: Subgroup analysis: Health care satisfaction

	TABLE A13:	Subgroup	analysis:	Antibiotic	knowledge
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	Dependent variable: Decision to self-medication							
	Low	v level of knowl	edge	Hig	High level of knowledge			
	(1)	(2)	(3)	(4)	(5)	(6)		
Probability (cont.)	-1.505^{***}	-2.797^{***}	-2.200^{***}	-1.894^{***}	-3.914^{***}	-2.697^{***}		
	(0.200)	(0.344)	(0.250)	(0.207)	(0.411)	(0.271)		
Constant	0.133	0.211	0.365	0.390***	0.391	0.881		
	(0.098)	(0.807)	(0.665)	(0.100)	(0.912)	(0.676)		
Individual controls	No	No	Yes	No	No	Yes		
Fixed Effects	No	Yes	No	No	Yes	No		
Mc Fadden's R	0.082	0.589	0.355	0.116	0.619	0.369		
Mixed strategy		0.57			0.50 (0.559)			
Always professional care		0.37			0.45(0.493)			
Always self-medication		0.06			0.05(0.822)			
Observations	1,109	1,109	1,109	90	90	90		

Notes: See table notes above. p < 0.1; **p < 0.05; ***p < 0.01.

TABLE A14:	Subgroup	analysis:	Used	antibiotic	in past	28 days
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		Dependent variable: Decision to self-medication							
	No r	ecent antibioti	c use	Re	Recent antibiotic use				
	(1)	(2)	(3)	(4)	(5)	(6)			
Probability (cont.)	-1.608^{***}	-3.130***	-2.267^{***}	-2.141^{***}	-4.361^{***}	-3.460^{***}			
	(0.156)	(0.282)	(0.194)	(0.369)	(0.737)	(0.568)			
Constant	0.225^{***}	0.283	0.873	0.426^{**}	2.019**	1.621			
	(0.077)	(0.818)	(0.544)	(0.166)	(0.956)	(1.610)			
Individual controls	No	No	Yes	No	No	Yes			
Fixed Effects	No	Yes	No	No	Yes	No			
Mc Fadden's R	0.091	0.593	0.349	0.137	0.652	0.458			
Mixed strategy		0.55			0.62(0.403)				
Always professional care		0.4			0.25(0.060)				
Always self-medication		0.05			0.12(0.172)				
Observations	986	986	986	213	213	213			

		Dependent variable: Decision to self-medication							
	No re	cent self-medic	ation	R	Recent self-medication				
	(1)	(2)	(3)	(4)	(5)	(6)			
Probability (cont.)	-1.624^{***}	-3.091^{***}	-2.324^{***}	-2.301^{***}	-5.896^{***}	-12.850^{***}			
	(0.222)	(0.393)	(0.278)	(0.553)	(1.423)	(3.879)			
Constant	0.268**	1.519^{*}	0.183	0.448**	0.590	0.589			
	(0.113)	(0.848)	(0.838)	(0.228)	(0.955)	(21, 254.720)			
Individual controls	No	No	Yes	No	No	Yes			
Fixed Effects	No	Yes	No	No	Yes	No			
Mc Fadden's R	0.093	0.589	0.366	0.139	0.725	0.723			
Mixed strategy		0.54			0.63(0.476)				
Always professional care		0.38			0.21(0.118)				
Always self-medication		0.07			0.16(0.364)				
Observations	489	489	489	106	106	106			

TABLE A15: Subgroup analysis: Self-medicated with antibiotic in past 28 days

TABLE A16: Subgroup analysis: Eve	er self-medicated with antibiotics
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		Dependent variable: Decision to self-medication							
	Ne	ver self-medica	ted		Ever self-medicated				
	(1)	(2)	(3)	(4)	(5)	(6)			
Probability (cont.)	-1.465^{***}	-2.681^{***}	-2.169^{***}	-1.824^{***}	-3.737^{***}	-2.629^{***}			
	(0.220)	(0.396)	(0.285)	(0.192)	(0.355)	(0.240)			
Constant	0.007	0.185	0.818	0.424***	1.769^{**}	0.826			
	(0.110)	(0.804)	(0.755)	(0.091)	(0.881)	(0.746)			
Individual controls	No	No	Yes	No	No	Yes			
Fixed Effects	No	Yes	No	No	Yes	No			
Mc Fadden's R	0.079	0.623	0.386	0.109	0.585	0.338			
Mixed strategy		0.47			$0.65 (0.007)^{**}$				
Always professional care		0.49			$0.27 (0.000)^{***}$				
Always self-medication		0.03			0.08(0.094)				
Observations	522	522	522	677	677	677			

Notes: See table notes above. p < 0.1; **p < 0.05; ***p < 0.01.

		Dependent variable: Decision to self-medication								
		Risk averting			Risk seeking					
	(1)	(2)	(3)	(4)	(5)	(6)				
Probability (cont.)	-1.560^{***}	-2.724^{***}	-2.145^{***}	-1.830^{***}	-4.140^{***}	-2.786^{***}				
	(0.202)	(0.334)	(0.247)	(0.205)	(0.442)	(0.277)				
Constant	0.149	0.195	1.582**	0.371^{***}	1.507^{**}	-0.437				
	(0.098)	(0.804)	(0.703)	(0.100)	(0.745)	(1.010)				
Individual controls	No	No	Yes	No	No	Yes				
Fixed Effects	No	Yes	No	No	Yes	No				
Mc Fadden's R	0.085	0.568	0.335	0.112	0.643	0.402				
Mixed strategy		0.57			0.56(0.915)					
Always professional care		0.41			0.33(0.221)					
Always self-medication		0.02			$0.11 (0.010)^{*}$					
Observations	608	608	608	591	591	591				

TABLE A17: Subgroup analysis: Risk aversion

		Depende	ent variable: D	ecision to self-	medication	
	Present preference			Future preference		
	(1)	(2)	(3)	(4)	(5)	(6)
Probability (cont.)	-1.789^{***}	-3.393^{***}	-2.487^{***}	-1.509^{***}	-3.105^{***}	-2.317^{***}
	(0.179)	(0.318)	(0.223)	(0.242)	(0.472)	(0.322)
Constant	0.300***	0.339	1.065	0.183	1.525^{*}	1.212
	(0.087)	(0.829)	(0.664)	(0.117)	(0.854)	(1.371)
Individual controls	No	No	Yes	No	No	Yes
Fixed Effects	No	Yes	No	No	Yes	No
Mc Fadden's R	0.111	0.593	0.366	0.077	0.62	0.387
Mixed strategy		0.61			$0.48 (0.047)^*$	
Always professional care		0.35			0.42(0.258)	
Always self-medication		0.04			0.10(0.099)	
Observations	779	779	779	420	420	420

TABLE A18: Subgroup analysis: Time preference

	Dependent variable: Decision to self-medication					
	Inpatient			Patient		
	(1)	(2)	(3)	(4)	(5)	(6)
Probability (cont.)	-1.775^{***}	-3.770^{***}	-2.562^{***}	-1.604^{***}	-2.933^{***}	-2.287^{***}
	(0.199)	(0.411)	(0.263)	(0.208)	(0.344)	(0.261)
Constant	0.343***	1.782**	0.381	0.164	0.240	-0.064
	(0.096)	(0.887)	(0.666)	(0.101)	(0.811)	(1.249)
Individual controls	No	No	Yes	No	No	Yes
Fixed Effects	No	Yes	No	No	Yes	No
Mc Fadden's R	0.103	0.654	0.4	0.093	0.541	0.351
Mixed strategy		0.55			0.58(0.574)	
Always professional care		0.37			0.38(0.974)	
Always self-medication		0.08			0.04(0.215)	
Observations	643	643	643	556	556	556

TABLE A19:	Subgroup	analysis:	Patience
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Notes: See table notes above. p < 0.1; **p < 0.05; ***p < 0.01.

		Depende	ent variable: D	ecision to self-r	nedication	
	Less trusting			More trusting		
	(1)	(2)	(3)	(4)	(5)	(6)
Probability (cont.)	-1.654^{***}	-3.228^{***}	-2.363^{***}	-1.771^{***}	-3.480^{***}	-2.753^{***}
	(0.176)	(0.315)	(0.223)	(0.249)	(0.480)	(0.336)
Constant	0.229***	-5.402	2.025***	0.318***	0.357	-1.418
	(0.086)	(1, 461.643)	(0.619)	(0.121)	(0.837)	(1.635)
Individual controls	No	No	Yes	No	No	Yes
Fixed Effects	No	Yes	No	No	Yes	No
Mc Fadden's R	0.096	0.576	0.368	0.104	0.651	0.412
Mixed strategy		0.62			$0.47 (0.028)^*$	
Always professional care	0.33 $0.45(0.071)$					
Always self-medication		0.05			0.08(0.412)	
Observations	784	784	784	415	415	415

TABLE A20: Subgroup analysis: Trust

	Dependent variable: Decision to self-medication					
	Internal locus of control			External locus of control		
	(1)	(2)	(3)	(4)	(5)	(6)
Probability (cont.)	-1.998^{***}	-4.042^{***}	-2.954^{***}	-1.052^{***}	-1.903^{***}	-1.606^{***}
	(0.176)	(0.346)	(0.231)	(0.256)	(0.433)	(0.327)
Constant	0.468^{***}	-5.308	0.656	-0.203	0.012	-0.123
	(0.085)	(1, 414.351)	(0.646)	(0.126)	(0.782)	(0.851)
Individual controls	No	No	Yes	No	No	Yes
Fixed Effects	No	Yes	No	No	Yes	No
Mc Fadden's R	0.129	0.619	0.398	0.043	0.582	0.343
Mixed strategy	0.61 0.48 (0.067)					
Always professional care		0.33		0.47 (0.035)*		
Always self-medication		0.07			0.05(0.579)	
Observations	841	841	841	358	358	358

TABLE A21: Subgroup analysis: Locus of control



FIGURE A6: Preference for self-medication controlling for order of experiments

Notes: To better understand whether the priming of participants played a role in the decision, we plot the relationship between the probability of buying good quality medicine on the x-axis and the decision to self-medicate on the y-axis. The results suggest that those whose beliefs were elicited prior to the lab-in-field experiment and who could be primed have a slightly steeper increase in preference to self-medicate as quality increases: the proportion of participants who decide to self-medicate is slightly smaller for higher uncertainty levels and larger for lower uncertainty levels. The difference is however small and confidence intervalls overlap.



FIGURE A7: Preference for self-medication controlling for order of questions

Notes: The figure shows the share of subjects who decide to self-medicate when the risk of buying poor quality medicine which is lower or higher than their belief as elicited in Survey Experiment 1. We used the prior belief as a benchmark, depending on their first-choice vendor of antibiotics elicited in the survey.



FIGURE A8: Simulation of lab-in-field experiment

Notes: The figure shows the outcomes of the simulation conducted over 5,000 iterations, based on the decision and incentive framework detailed in Appendix B. The findings indicate that for consumers behaving as rational agents, self-medication becomes utility-maximizing only when the probability of purchasing a good-quality product is 60% or higher.

B Complete experimental protocol of lab-in-field experiment

B.1 Instructions

I will now introduce you to the next task, which we will play for six rounds; each round will represent one week. I will explain the task to you in more detail. You can follow my instructions in this booklet. [give booklet to participant, see Figure A9]



FIGURE A9: Showcard decision tree

Notes: Summary of decision structure in the lab-in-field as shown to the participant.

At the beginning of each round, two things will happen: First, you will receive an endowment of FCFA 1,500 from me. You will keep this money for the entire round but might need to use it to pay for additional expenses. Second, you will draw a card [*show stack of cards, see Figure A10*], which will determine whether you will be healthy or fall sick. If you draw a card that looks like this [*show healthy card*], you will be healthy; if you draw a card that looks like that [*show sick card*], you will fall sick. Your disease status will determine which decisions you can make in this round. In rounds in which you are healthy, nothing will happen; just like in real life, you will be able to go to work and earn money. In these rounds, I will pay you a fixed income of FCFA 3,000. Together with the endowment, you will earn FCFA 4,500 in this round.



It can also happen that the draw of the card will determine that you fall sick. In this case, if you fall very sick, you will not be able to work for the entire week and thus will not earn any money. To recover faster and return to work this week to earn money, you need to choose one of two options.

First, you can decide to go to the doctor. Going to the doctor will cost you all your endowment, which is FCFA 1,500; however, she will give you medicine and tell you to rest for three days. Following the doctor's instructions, you will feel much better and can work for the remainder of the week. You will thus earn FCFA 2,000 this round. While you had to spend all the money you had at the beginning, you will receive a total payout of FCFA 2,000 this round.

Alternatively, you can decide to buy medicine. Nevertheless, you have heard on the radio that there are some concerns about the quality of medicine in your district lately. Buying medicine will cost you FCFA 1,000, and you will need to draw a chip from this bag [show bag and chips] to determine whether you will buy good-quality medicine or medicine of questionable quality. The good-quality medicine [show green chip] will make you feel better after some time, and you can still go to work for the remaining days, which will result in a total payout of FCFA 3,000. The poor-quality medicine [show red chip] has no curative effect, and you will need to stay in bed for the whole week, during which time you will not earn any money. Because you paid for the medicine from your endowment, you will receive a total payout of FCFA 500.

B.2 Recapitulating and testing of respondents' comprehension

Interviewer Instructions: The interviewer should go through the decision-making structure depicted in the booklet again, emphasizing the achievable payouts in each scenario.

Let's go through the different steps again; for this, we have prepared this booklet. So, recapitulating, each round you will start here [*point at top*] with an endowment of FCFA 1,500. First, you will draw a card from this stack, which will determine whether you are going to be healthy or sick for the round. In a round in which you fall sick, you will decide whether you want to go to the doctor and recover for sure or whether you want to buy medicine and draw a chip from this bag, which will determine whether you recover or not.

Please remember, you will not carry over any money you have left at the end of one round to the next. Instead, every round, you will start with an endowment of FCFA 1,500. At the end of the interview, you will randomly draw which of the rounds you have played will be paid out by me to you.

Interviewer Instructions: The interviewer should verify that the respondent understands the decision-making structure:

Can you please tell me what the total payout is in a round in which you are...

- 1. ... healthy?
- 2. ... fall sick and decide to buy medicine and draw a green chip?
- 3. ... fall sick and decide to go to the doctor?
- 4. ... fall sick and decide to buy medicine and draw a red chip?

B.3 Instructions: Changes in scenarios

Finally, while you will always face the same choices in each round, two things will change:

First, each round you will face a different probability of falling sick. This is evident in the number of healthy and sick cards in the deck. There are a total of 10 cards in the deck. In one round, you might be, for example, as likely to fall sick as to be healthy; then the chance to fall sick is 50:50. This means I will put 5 healthy and 5 sick cards in the deck [show this step to the respondent]. If you are more likely to fall sick than to be healthy, I will exchange healthy cards for sick cards. In scenarios where the opposite is true—where you are more likely to be healthy than to fall sick—I will exchange sick cards for healthy cards.

Second, the quality of medicine will change. Each round, you will face a different probability of buying good-quality medicine. This is also reflected in the number of green and red chips in the bag that I will prepare before you can draw. There are a total of 10 chips in the bag. In one round, your chance of buying good-quality medicine is the same as that of buying questionable quality. In that case, there will be 5 green and 5 red chips in the bag [*show this step to the respondent*]. If you are more likely to buy good-quality medicine, I will exchange red chips for green chips. In scenarios where the opposite is true—where you are more likely to buy questionable medicine than good-quality medicine—I will exchange green chips.

At the beginning of each round, I will show you how many cards of each type I will put in the deck. I will also tell you the number of green and red chips, which indicates the likelihood you will buy good-quality medicine, and I will show you the chips on this plate before I put them in the bag.

Please keep in mind that the task is not a test. There is no correct answer. You make your choice based on your personal preferences. What we want to know is what choice you make when you face different scenarios. Again, in each round, you have the chance to earn real money, so think carefully about the choices you want to make.

Interviewer to verify if the respondent has followed so far or has questions: Is everything I told you so far clear, or do you have any questions?

Interviewer Instructions: The interviewer should begin with a test round: Let's begin with a test round.

Are you sick or healthy this round?	Healthy
	Sick
If sick, what do you want to do?	Go to doctor
	Buy medicine
If buy medicine, what is the color of the	Green
ball you drew from the bag?	Red

Interviewer to begin with experiment rounds: Let's begin with the task. This time, we will play for 5 rounds, all of which will count toward your payout from this experiment at the end of the interview.

Interviewer Instructions: Repeat the task for each scenario and write down the payouts on the tablet.

Online Appendix

Self-medication under Uncertainty: Insights on Drug Quality and Consumer Behavior in Burkina Faso

Fadima Yaya Bocoum, Renate Hartwig, Moumouni Koala, Lena Merkel, Salfo Ouedraogo
A Conceptional Framework

To make the model tractable Chang and Trivedi (2003) use a mean-variance formulation, where the consumer seeks to maximize the expected return while minimizing the risk. Let the expected return to self-medication be given by $\mu = E[R - \varepsilon]$. Further, let the associated risk be given by $\sigma^2 = E[(R - \varepsilon - \mu)^2]$, which captures the spread or dispersion of the returns from self-medication around their mean value μ .

They further assume that U(c, h) = u(c) + v(h), where

$$v(h) = \frac{-(b-h)^2}{2}$$
, with $0 \le h \le b$ (5)

To account for the uncertainty in self-medication, Chang and Trivedi (ibid.) introduce the expected return and risk terms into the utility function. The problem formalized in Equation 3 thus becomes:

$$\max_{V,Q} \left\{ u(c) - \underbrace{\frac{(b-h_0 - RV - \mu Q)^2}{2}}_{\substack{\text{disutility caused by the deviation}\\ \text{of the health status from the}\\ \text{maximum attainable level } b\\ \text{weighted by the expected}\\ \text{return } \mu} - \underbrace{\frac{\sigma^2 Q^2}{2}}_{\substack{\text{risk associated}\\ \text{with self-medication}}} \right\}$$
(6)

The first order conditions with respect to V and Q are consequently given by:

$$\frac{\partial}{\partial V} = -u'(c) + (b - h_0 - RV - \mu Q)R = 0$$
(7)

$$\frac{\partial}{\partial Q} = -u'(c)p + (b - h_0 - RV - \mu Q)\mu - \sigma^2 Q = 0$$
(8)

Chang and Trivedi (2003) derive the Hessian matrix to determine whether the critical points found from the first-order conditions correspond indeed to a maximum point. In their case, the Hessian matrix is given by:

$$H = \begin{bmatrix} h_{VV} & h_{VQ} \\ h_{QV} & h_{VV} \end{bmatrix} = \begin{bmatrix} u''(c) - R^2 & pu''(c) - R\mu \\ pu''(c) - R\mu & p^2 u''(c) - \mu^2 - \sigma^2 \end{bmatrix}$$
(9)

Further, the determinant of the Hessian Matrix is given by

$$D = ((u''(c) - R^2)(p^2u''(c) - \mu^2 - \sigma^2) - (pu''(c) - R\mu)^2$$
$$D = [(\mu - Rp)^2 + \sigma^2](-u''(c)) + R^2\sigma^2$$
(10)

To verify that the eigenvalues of the Hessian Matrix are all negative and the determinant is positive, Chang and Trivedi (ibid.) provide further insights into the parameters of the model. Given the presence of diminishing marginal returns u'' < 0, as well as the assumption that returns to professional care are always positive (R > 0), they deduce that three out of the four elements of the Hessian matrix $(h_{VV}, h_{VQ}, \text{ and } h_{QV})$ are less than zero.

For h_{QQ} to be greater than zero, the expected return to self-medication μ needs to exceed $u''(c)p^2 - \sigma^2$. It is reasonable to assume that $\mu \ge 0$ therefore ensuring that all eigenvalues are less than zero and the determinant D > 0. Consequently, the first derivatives in Equation 7 and Equation 8 indeed signify a maximization problem.

From Equation 7 and Equation 8 follows that consumers must solve the following problem:

$$(b - h_0 - RV - \mu V)(\mu - pR) = \sigma^2 Q$$
(11)

The effects of increased uncertainty are then given by

$$\frac{\partial V}{\partial \sigma^2} = \frac{-Qh_{VQ}}{D} > 0 \text{ and } \frac{\partial Q}{\partial \sigma^2} = \frac{-Qh_{VV}}{D} < 0$$
(12)

B Questionnaire

The survey was programmed using the software SurveyCTO and conducted before the experiments. Basic preferences are measured using the validated survey instruments introduced by Falk et al. (2023).

[0] SELECTION AND IDENTIFICATION

- 1. Does the person meet the additional inclusion criteria:
 - 1. Respondents must be 18 years of age or older,
 - 2. Physically and mentally capable of responding to the survey, and
 - 3. Either the head of household, male or female (alternate).
 - 01.Yes
 - 02. No
- 2. Have you obtained informed consent?
 - 01.Yes 02.No

Interviewer ID:	Interviewer Name:							
Please select the district in which the household is located [drop down menu]								
Please describe the location of the household. This may include the address and additional landmark information that helps identify the household:								
Name of main respondent:								
Mobile phone number to contact:	Contact another number:							

[A] LIST OF HOUSEHOLDS

In this section we collect information about household members. This includes information on gender, age, education level, occupation and health over the past 28 days.

1. How many people live in your household? Household members are all members who have lived in this house continuously for six months and who also sleep there and eat the main meals there.

_____ Number of household members

2. How many of them are under 18?

_____ Number of children living in the household

					If age ≥ 5 years If age ≥ 5 If yes If yes		If yes			
						youro				
No.	What is the gender of (NAME)? <i>[FM]</i>	How old is (NAME)? [age in years]	What is (NAME)'s marital status ? 01 = never married, 02 = cohabitating, 03 = Married (monogram), 04 = Married (polygram), 05 = separated/di vorced/wido wed 06 = other	What religion does (NAME) practice? 01 = Christian, 02 = Traditional religion, 03 = Muslim, 04 = Non- religious, 98 = other	What is the highest level of education completed by (NAME)? 01 = no formal schooling, 02 = primary, 03 = secondary, 04 = vocational/technic al education, 05 = college/university, 98 = other	Is (NAME) currently working? [Y/N]	What is (NAME)'s main occupation? 01 = self-employed agriculture, 02 = non- agricultural self- employed, 03 = salaried work in agriculture, 04 = non- agricultural salaried work, 05 = salaried health worker (private), 06 = public servant (health worker) 06 = public servant (other) 98 = other	Does (NAME) suffer from a chronic illness that requires regular medication or frequent visits to the doctor? [Y/N]	What chronic illness(es) does (NAME) suffer from? 01 = high blood pressure 02 = diabetes, 03 = heart disease 04 = epilepsy, 05 = mental illness, 06 = Chronic back/arm/leg/arthritis pain, 98 = Other, specify	NTINUE ON THE NEXT PAGE
1 (Main										S
We will now re questions for	epeat the ro one house!	ster questic	ons for househo r above. Let's c	old members a continue with t	bove the age of 18 ye he next household m	ears. Let's be lember.	gin with the first hou	sehold membe	er. Please answer all	
2										
3 (only if A1 > 2)										

All members	If yes		If yes				If yes	If 01 /friend or 02 /family member	
Has (NAME) been sick in the past 28 days? [Y/N]	What symptoms did (NAME) experience? [multiple choice] 01 = Headache / migraine, 02 = Faint, 03 = Runny nose, 04 = Sneezing, 05 = Shievering, 06 = Ear pain, 07 = Mouth ulcer, 08 = Dental pain, 09 = Cough, 10 = Sore throat, 11 = Difficulty swallowing, 12 = Difficulty breathing, 13 = Stomache, 14 = Vomitting, 15 = Nausea, 16 = Diarrhea, 17 = Rash, 18 = Fever, 19 = Pain in joints, 20 = Muscle pain, 21 = Wounds, 22 = Menstrual problems, 23 = Urination problems, 98 = Other, specify	Did (NAME) go to a health care facility when experiencing these symptoms? [Y/N]	Did the health worker prescribe antibiotics for you? [Y/N / DK]	If yes , did (NAME) take antibiotics before (NAME) went for consultation? [Y/N / DK] If no , did (NAME) take antibiotics? [Y/N / DK]	Where did (NAME) get the antibiotic? 01 = friend, 02 = family member, 03 = community health worker, 04 = public pharmacy of a health establishment or CSPS, 05 = private pharmacy, 06 = street vendor or at the market, 07 = traditional healer, 08 = health center of an NGO, 98 = other, specify	Did (NAME) consult anyone before using antibiotics? [Y/N]	Who gave (NAME) advice about taking antibiotics? [multiple choice] 01 = friend, 02 = family member, 03 = community health worker, 04 = pharmacist/medicine seller, 05 = traditional healer, 98 = other, specify	Does this person work in the healthcare field? [Y/N]	Modern medicine or traditional medicine? 01 = modern medicine, 02 = traditional medicine

[B] INCOME AND ASSETS

The next section asks about the current financial situation of the respondent himself or herself and of the household.

1. How much in FCFA would you charge for a day of work based on your skills?

- 2. In your community, would you say that you are...
 - a. Less well off than the average household in the neighborhood
 - b. About the same (in terms of wealth) as the average household in the neighborhood
 - c. Richer than the average household in the neighborhood
- 3. Can you give an estimate of the average monthly household income if I read you some options?
 - a. <40000
 - b. >40000, < 100 000
 - c. > 100,000, < 160,000
 - d. > 160,000, < 220,000
 - e. > 220,000

[C] HOUSEHOLD ASSETS

The next section asks about your current housing situation and the assets your household owns.

- 1. What is the occupancy status of your accommodation?
 - 01. Owner02. Tenant03. Hosted by the employer04. Hosted by relatives/friends05. Other, give details
- 2. What is the roof made of?
 - 01.Tole
 - 02. Betin
 - 03. Wood/straw
 - 04. Other

3. What are the walls in the main room made of?

- 01. Cement brick
- 02. Banco brick
- 03. Stone blocks
- 04. Wood
- 05. Other
- 4. Does the house have glass windows?
 - 01.Yes 02.No

_ ___

- 5. How many fully covered rooms do you have in the house? *Fully covered rooms involve rooms with 4 walls and a ceiling.*
- 6. What is the main source of lighting in the household?
 - 01. Battery-powered torch
 - 02. Electrical network (SONABEL)
 - 03. Solar energy
 - 04. Batteries
 - 05. Other
- 7. What is the household's main source of drinking water?
 - 01. Piped water
 - 02. Well or borehole in the house
 - 03. Public fountain
 - 04. Surface water
 - 05. Rainwater
 - 06. Bottled or sachet water
 - 07. Other

- 8. What is the main fuel used for cooking in the household?
 - 01. Electricity
 - 02. LPG / Butane gas
 - 03. Biogas
 - 04. Wood/coal
 - 05. Other
- 9. Does the household have toilets/latrines? [observation]
 - 01.Yes
 - 02. No

03. Don't know

10. Which of the following assets does the household own and which are in good condition? Read the list of articles to the respondent:

Item	Available	Not Available
Car	0	0
Bike	0	0
Motorcycle/scooter	0	0
Mobile without internet	0	0
Smart phone (with internet)	0	0
Tablet computer	0	0
Laptop	0	0
Radio	0	0
Television	0	0
Electric Fan	0	0
Fridge	0	0

[D] SATISFACTION AND PAST EXPERIENCE WITH HEALTH CARE FACILITIES

The next section is about past experience and satisfaction with visits to health care facilities.

1. Are you currently covered by an insurance plan that covers health care costs if you become ill or injured?

01.Yes 02.No

- 2. [*If respondent has not been ill in the past 28 days or has been ill but has not consulted a doctor*] Have you ever gone to a health care facility to receive care yourself?
 - 01.Yes 02.No
- 3. If not, why have you never visited a health care facility? [multiple choice]
 - 01. Was not sick
 - 02. Prefer to see a traditional healer
 - 03. Don't trust the staff
 - 04. Too expensive
 - 05. Too far / unable to find transportation
 - 06. Waiting time too long
 - 07. Other, specify

The next questions are about how you felt during your last visit to a healthcare facility.

- 4. What do you think about the healthcare provider's health knowledge and skills?
 - 01. Excellent
 - 02. Alright
 - 03. Good
 - 04. Poor
- 5. How well was the provider able to explain your illness, diagnosis, and treatment in a way that you could understand?
 - 01. Excellent
 - 02. Alright
 - 03. Good
 - 04. Poor

6. Thinking about your last visit overall, please rate how well the care you received met your health needs. In other words, how much did the visit help you resolve your health problem or make you feel better?

Did not needs a	: meet tl at all	ne						Nee	eds com	pletely met
0	1	2	3	4	5	6	7	8	9	10

[E] ANTIBIOTICS

1. Antibiotics: Self-medication

The next section asks about past experience with antibiotics.

- 1. [If respondent has not been sick in the past 28 days or self-medicated with antibiotics] Have you ever used antibiotics?
 - 01.Yes 02.No
- 2. If not, why not?
 - 01. Does not know about antibiotics
 - 02. Never had been in need to use
 - 03. Does not trust
 - 04. Too expensive
 - 05. Not available
 - 06. Quality concerns
 - 07. Ineffective treatment
 - 08. Uses only traditional/herbal medicine
 - 09. Other, specify
- 3. [*If respondent has ever used but has not been ill in the past 28 days or selfmedicated with antibiotics*] Have you ever used antibiotics without a prescription or prior consultation with a doctor?
 - 01.Yes 02.No
- 4. [*If the respondent indicated self-medication in the roster or the previous question*] Why did you choose to take antibiotics? Please choose the three most relevant reasons. [*read list to participant*]
 - 01. Lower costs
 - 02. Less time consuming
 - 03. More convenient
 - 04. Faster recovery
 - 05. Lack of access to health services
 - 06. Knowledge of medications from past experience with similar symptoms
 - 07. General knowledge of medications
 - 08. Advice from family or friends is enough
 - 09. Advice from pharmacists/medication sellers is enough
 - 10. Lack of trust/dissatisfaction with health care services
 - 11. Lack of trust/dissatisfaction with doctors
 - 12. Other, specify

2. Beliefs about antibiotics

The next section asks about beliefs about the effectiveness of antibiotics.

- 5. In general, do you believe antibiotics have a positive effect on your health?
 - 01. Yes always
 - 02. Yes, most of the time
 - 03. Sometimes
 - 04. No, rarely
 - 05. No never
- 6. Have you ever had doubts about using antibiotics?
 - 01. Always
 - 02. Often
 - 03. Sometimes
 - 04. Rarely
 - 05. Never
- 7. Have you ever experienced an adverse reaction or health problem after using an antibiotic medication?
 - 01. Yes
 - 02. No
- 8. If yes, what was it? [multiple choice]
 - 01. Rash (raised and itchy like hives or hives)
 - 02. Cough
 - 03. Difficulty breathing
 - 04. Nausea (feeling like vomiting)
 - 05. Abdominal pain
 - 06. Diarrhea
 - 07. Vomiting
 - 08. Loss of appetite
 - 10. Other, specify
- 9. If yes, did you stop using antibiotics after the experience?
 - 01. Yes
 - 02. No

3. Antibiotics: Storage

The next section asks about antibiotics stored at home.

- 10. Do you currently have antibiotics at home?
 - 01.Yes
 - 02. No
- 11. If yes, when did you purchase them?
 - 01. Over the past two weeks
 - 02. Between 2-4 weeks

03.1-2 months ago 04.3-6 months ago 05.over 6 months ago 06.1 don't know

12. If yes, under what conditions are they stored?

Temperature	Hot Cool/cold (refrigerated)				
The atmosphere	Dry Wet				
The light	Dark Exposed to the sun				

- 13. If yes, do you regularly check the medications you store at home to see if they are still in good condition for consumption?
 - 01.Yes 02.No

4. Antibiotics: Procurement

The next section asks questions about purchasing antibiotics.

- 14. Have you ever bought antibiotics yourself?
 - 01.Yes 02.No
- 15. If not, where did you get antibiotics?
 - 01. Friend/neighbor
 - 02. Household member/relative
 - 03. Community Health Worker
 - 04. NGO
- 16. If this is a friend/neighbor or household member/relative, does this person work in healthcare?
 - 01.Yes 02.No
 - 02. NO
- 17. If so, where do you typically purchase your antibiotics from?
 - 01. Public pharmacy at the hospital or CSPS
 - 02. Private pharmacy
 - 03. Street vendor or at the market
 - 04. Traditional healer
 - 05. Other, specify

- 18. If your preferred provider is not open/available, where will you get your antibiotic medication?
 - 01. Public pharmacy at the hospital or CSPS
 - 02. Private pharmacy
 - 03. Street vendor or at the market
 - 04. Traditional healer
 - 05. Other, specify
- 19. Why do you prefer to buy medicines from a street vendor? [multiple choice]
 - 01. Reduced price
 - 02. Near my home
 - 03. Relationship with supplier
 - 04. Positive experience in the past
 - 05. Recommendation from a family member, friend or neighbor
 - 06. Other, specify
- 20. For you when buying antibiotics, what are the most important aspects? Please choose the three most important aspects.
 - 01. Price
 - 02. Packaging
 - 03. Manufacturer
 - 04. Country of origin
 - 05. Relationship with the supplier/ trust in the supplier
 - 06. Type of vendor
 - 07. Distance to vendor
 - 08. Verification, for example, the package has a hologram or barcode
 - 10. Positive experience in the past
 - 11. Recommendation from a family member, friend or neighbor
 - 12. Seller recommendation
 - 13. Quality of medicine
 - 14. rescription
 - 15. Other, specify
 - 16. None of these matters
- 21. The last time you bought an antibiotic, how much did you spend (FCFA)?

22. How many blisters did you buy?

_ ___ ___ ___ ___ ___ ___

- 23. If you had the choice to buy antibiotics from different countries, which products would you prefer to buy? Products from... 01. Local or other African countries

 - 02. Indian
 - 03. Chinese
 - 04. Europeans
 - 05. American
 - 06. Indifferent

[F] KNOWLEDGE AND BELIEFS ABOUT ANTIBIOTICS

1. Knowledge

1. I will now read you three statements about antibiotics and ask you to say whether you think the statement is true or false. I will also ask you if you are sure of your answer.

	True	False	Are you sure of your answer?
If you feel better after a few days, you can stop taking antibiotics before finishing the treatment.			Completely sure Sure Not sure I am just guessing
There are different causes of illness for which different antibiotics are needed.			Completely sure Sure Not sure I am just guessing
If antibiotics are taken in excess, they may stop working when you really need them in the future.			Completely sure Sure Not sure I am just guessing

- 2. Have you ever received specific information about the use and effectiveness of antibiotics?
 - 01. Yes
 - 02. No
- 3. If yes, from where?
 - 01. Doctor
 - 02. Nurse or midwife
 - 03. Community Health Worker
 - 04. Health worker
 - 05. school teacher
 - 06. College or higher education teacher
 - 07. Other, specify

4. If you suffer from the following conditions, would you treat them with antibiotics?

Condition	Always	Most of the time	Sometimes	Rarely	Never
Headache					
Malaria					
Diarrhea					
Common cold					

2. Beliefs about quality

- 1. If you store your vegetables in poor conditions, they will become damaged or start to rot. Do you think antibiotics can also degrade?
 - 01. No never
 - 02. Yes, but only in a few cases
 - 03. Yes, often
 - 04. Yes always
- 2. If yes, in your opinion, what are the reasons that lead to the degradation of antibiotics? [multiple choice]
 - 01. High temperature
 - 02. Humidity
 - 03. Long transport
 - 04. Poor storage at the seller
 - 05. Improper storage at home
 - 06. Long storage at the supplier
 - 07. Long storage at home
 - 08. Storage in improper packaging
 - 09. Frequent opening of the package
 - 10. Exposure to sunlight
 - 11. Exposure to wind
 - 12. Exposure to cold/refrigeration
 - 13. Exposure to water
 - 14. Exceeding the expiration date
- 3. Will you take antibiotics if you are unsure of their quality?
 - 01.Yes
 - 02. No

- 4. If yes, why? [multiple choice]
 - 01. Lack of money to give myself a best quality
 - 02. Better than no treatment
 - 03. No other products are available
 - 04. Positive past experience
 - 05. There is no difference compared to premium quality
 - 06. Other, give details

[G] PERSONAL CHARACTERISTICS

In the last part of the survey, I would like to talk more specifically about you as a person and how you would decide for yourself.

Trust: How well does the following statement describe you as a person: "Until I am convinced otherwise, I assume people have only the best intentions." Please use a scale of 0 to 10, where 0 means "does not describe me at all" and 10 means "describes me perfectly". You can also use the middle values to indicate where you are on the scale.

Don't describe me at all									Desc	ribes me perfectly
0	1	2	3	4	5	6	7	8	9	10

Risk aversion: How do you see yourself: are you a person generally willing to take risks, or do you try to avoid taking risks? Please use a scale of 0 to 10, where 0 means you are "absolutely not willing to take risks" and 10 means you are "very willing to take risks." You can also use the middle values to indicate where you are on the scale.

Very unwilling to take risks								Ve	ery willir	ng to take risks
0	1	2	3	4	5	6	7	8	9	10

Patience: Are you generally an impatient person or someone who always has a lot of patience?". Responses are coded on a 10-point scale, with 0 meaning "very impatient" and 10 meaning "very patient."

Very imp	atient								Ve	ry patient
0	1	2	3	4	5	6	7	8	9	10

Time Preferences: Compared to others, are you a person generally willing to give up something today to benefit from it in the future or are you not willing to do so? Please use a scale of 0 to 10, where 0 means you are "definitely not willing to give up anything today" and 10 means you are "very willing to give up anything today." You can also use the middle values to indicate where you are on the scale.

I definitely don't want to give up on anything today									y ready sometł	to give up ning today
0	1	2	3	4	5	6	7	8	9	10

Locus of control: To what extent do you agree with the following statement: "My life is determined by my own actions." Please use a scale of 0 to 10, where 0 means "I strongly disagree" and 10 means "I strongly agree". You can also use intermediate values to indicate where you are on the scale.

l absolutely do not agree							I completely agre			
0	1	2	3	4	5	6	7	8	9	10

[H] END OF INTERVIEW

Thank you very much for participating and taking the time to answer our questions.

Variable	Mean	SD	Min	Max	Ν
Household characteristics					
Household size	2.85	2.29	0	8	52
Individual characteristics					
Female	0.48	0.50	0	1	52
Age	40.25	13.83	20	80	52
Married	0.65	0.48	0	1	52
Christian	0.75	0.44	0	1	52
Muslim	0.25	0.44	0	1	52
Socio-economic status	3.00	1.46	1	5	52
No education	0.10	0.30	0	1	52
Primary education	0.13	0.34	0	1	52
Secondary education	0.46	0.50	0	1	52
Tertiary education	0.10	0.30	0	1	52
Currently working	0.77	0.43	0	1	52
Self-employed	0.58	0.50	0	1	52
Wage worker	0.15	0.36	0	1	52
Public servant	0.04	0.19	0	1	52
Health in past 28 days					
Has been sick in past 28 days	0.46	0.50	0	1	52
Has self-medicated with antibiotics without consulting doctor	0.00	0.00	0	0	24
Has self-medicated with antibiotics before consulting doctor	0.08	0.28	0	1	24
Has consulted doctor	0.46	0.51	0	1	24
Vendor Preference					
Preference for street vendor	0.29	0.46	0	1	52
Preference for pharmacy	0.88	0.32	0	1	52
Personal preferences					
Trust	4.58	2.87	0	10	52
Risk preference	6.06	2.75	0	10	51
Patience	7.18	2.94	0	10	50
Time preference	6.76	2.64	0	10	49
Locus of control	4.62	1.17	1	6	52

TABLE B1: Participant characteristics: Accra sample

Notes: The table shows the characteristics of the 52 respondents samples in Accra in July 2023.

C Pilot and Validation Study in Accra, Ghana

C.1 Methodology

We conducted the validation study in collaboration with the University of Ghana before implementing our main study in early August 2023. We interviewed a total of 52 individuals residing across four districts in Accra (sample characteristics are presented in Table B1). Although we did not perform quality testing of the antibiotic samples, we relied on a recent antibiotic quality assessment conducted by Bekoe et al. (2020). In their paper, the authors examined 348 antibiotic products containing various molecules³¹ procured from both formal and informal drug outlets across four Ghanaian regions. Unlike Burkina Faso, Ghana also has chemical shops licensed to sell certain prescription-only medicines, including antibiotics. Consequently, the formal drug outlets comprised health centers, pharmacies, and chemical shops, while the informal vendors resembled the street vendors in our study.

For chemical content analysis, the authors employed High-Performance Liquid Chromatography (HPLC) testing and established more rigorous quality determination thresholds. A product was classified as substandard if it contained either less than 90% or more than 110% of the active ingredient. Overall, 66.38% of the samples failed the quality assessments, with differentiation by vendor type, as performed in our study: 69.11% of the

³¹The study evaluated products with 14 different molecules, with amoxicillin emerging as the most prevalent active pharmaceutical ingredient, accounting for 93 samples.

products procured from formal vendors and 90.54% of those obtained from street vendors failed the tests. We incorporated this information into our experimental design. Since we did not perform quality testing ourselves, we could not conduct Survey Experiment 2; however, we successfully replicated Survey Experiment 1 using the information from Bekoe et al. (2020) and the Decision Task.

C.2 Results

C.2.1 Perceptions about Drug Quality

Analyzing the distribution of beliefs regarding the risk of purchasing poor-quality antibiotics, we find that a substantial proportion of consumers underestimate the risks associated with purchasing antibiotics from both formal and informal vendors in Accra. Our results in Figure B1 indicate that the majority of consumers in Accra underestimate the risk at formal vendors (76.9%), while 23.1% either hold acute beliefs or overestimate the risk. At informal vendors, consumers underestimate and overestimate the risk in similar proportions, at 42.3% and 38.5%, respectively, with 19.2% possessing accurate beliefs. Compared to consumers in Ouagadougou, we observe a heightened level of (accurate) distrust regarding the quality of antibiotics at formal vendors, with an average belief score of 0.41 in the Accra sample versus 0.29 in the Ouagadougou sample.

The results from the subgroup analysis in Table B2 are also similar to the results from Ouagadougou. We find no support for our hypothesis that beliefs about quality are heterogeneous along educational attainment or recent exposure to antibiotics.



FIGURE B1: Accra Sample: Distribution of beliefs over probability of buying poor-quality antibiotics

Notes: The bars present the share of the 52 respondents with beliefs about the probability to buy poor-quality medicine equal to the value shown on the x-axis. The dashed vertical line indicates the benchmark from Bekoe et al. (2020) for pharmacy and street vendor respectively. Instead of plastic chips we used beans for belief elicitation.

	Risk at		Risk at		
	pharmacies	p-value	Street vendor	p-value	Ν
	(1)	(2)	(3)	(4)	(5)
Panel A: Overall sample					
Belief about the probability to buy low-quality medicine	0.41(0.23)		0.84(0.18)		52
Panel B: Sub-group analysis	()		()		
Gender:					
Male	0.40(0.22)	Ref.	0.86(0.17)	Ref.	27
Female	0.42(0.24)	0.996	0.83(0.19)	0.874	25
Education:	· · · ·		· · · ·		
No or primary education	0.41(0.21)	Ref.	0.83(0.18)	Ref.	44
Secondary or higher education	0.39(0.32)	0.996	0.89(0.17)	0.874	8
Wealth:	. ,		. ,		
Bottom 50%	0.38(0.21)	Ref.	0.85(0.17)	Ref.	26
Top 50%	0.43(0.25)	0.996	0.83(0.18)	0.874	26
Income:	. ,				
Less than 3,000 GHS	0.43(0.24)	Ref.	0.84(0.19)	Ref.	38
More than 3,000 GHS	0.34(0.19)	0.996	0.86(0.13)	0.874	14
Antibiotic knowledge:	· · · ·		· · · ·		
Low AKS	0.44(0.24)	Ref.	0.87(0.16)	Ref.	38
High AKS	0.30(0.15)		0.78(0.20)	0.874	14
Used antibiotic in past 28 days:					
No recent antibiotic use	0.41(0.23)	Ref.	0.84(0.18)	Ref.	49
Recent antibiotic use	0.30(0.20)	0.996	0.87(0.15)	0.874	3
Self-medicated with antibiotic in past 28 days:					
No recent self-medication	0.48(0.21)	Ref.	0.79(0.21)	Ref.	22
Recent self-medication	0.30(0.28)	0.996	0.85(0.21)	0.874	2
Risk aversion:					
Risk averting	0.37(0.23)	Ref.	0.86(0.20)	Ref.	27
Risk seeking	0.45(0.23)	0.996	0.82(0.15)	0.874	25
Time preference:					
Present preference	0.40(0.24)	Ref.	0.87(0.17)	Ref.	29
Future preference	0.41(0.22)	0.996	0.81(0.19)	0.874	23
Patience:					
Inpatient	0.42(0.24)	Ref.	0.84(0.19)	Ref.	30
Patient	0.39(0.22)	0.996	0.84(0.17)	0.961	22
Trust:					
Less trusting	0.41 (0.23)	Ref.	0.88(0.15)	Ref.	34
More trusting	0.41 (0.22)	0.996	0.77(0.21)	0.732	18
Locus of control:					
Internal locus of control	0.45(0.22)	Ref.	0.83(0.18)	Ref.	38
External locus of control	0.29(0.21)		0.88(0.16)	0.874	14

TABLE B2: Accra Sample: Summary of beliefs about risk at a formal and a informal vendor

Notes: The tables shows the mean belief about the risk to buy poor-quality medicine across all respondents at pharmacies in column (1) and street vendors in column (3). Column (2) and (4) show the p-value of the t-test statistic of the difference in beliefs between the subgroups for beliefs about the risk at pharmacies and street vendors respectively. We use the Benjamini-Hochberg correction for multiple hypothesis testing. The standard deviation is given in parentheses.

 $p < 0.1; \ ^{**}p < 0.05; \ ^{***}p < 0.01.$

C.2.2 Preference for Self-medication

In the decision task, we observe a strikingly similar linear relationship in the Accra data, as illustrated in Figure B2. Although a slightly higher proportion of individuals consistently engage in self-medication, the distribution across strategies remains comparable to that of the Ouagadougou sample (Figure B3). Notably, we find that subjects are significantly more likely to self-medicate when the probability is 0.4 or lower, in contrast to the baseline probability of 0.6. While the estimates are less precise due to the smaller sample size compared to our Ouagadougou sample, the slope coefficients derived from a continuous measure of the probability (risk) of purchasing poor quality are comparable in magnitude across all three specifications (Table B3).



FIGURE B2: Preference for self-medication and risk of buying poor-quality

Notes: The figure shows the share of respondents in sick rounds in the Accra sample (N = 260) and the Ouagadougou sample (N = 1,199) who decided to self-medicate when faced with the probability to use poor-quality medicine as shown on the x-axis. The line represents the fitted linear model with a 95% confidence interval.



Notes: The figure depicts the strategies adopted by subjects who played two or more sick rounds.

	Dependent variable: Decision to self-medication					
	(1)	(2)	(3)	(4)	(5)	(6)
Probability (cont.)	-0.536^{***}	-0.745^{***}	-0.548^{***}			
	(0.146)	(0.143)	(0.122)			
Probability = 0.0				0.415^{***}	0.432^{***}	0.487^{***}
				(0.146)	(0.141)	(0.122)
Probability $= 0.1$				0.079	0.342^{**}	0.277^{*}
				(0.169)	(0.162)	(0.141)
Probability $= 0.2$				0.151	0.218	0.144
				(0.152)	(0.147)	(0.127)
Probability $= 0.3$				0.354^{**}	0.270^{*}	0.334^{**}
				(0.156)	(0.151)	(0.132)
Probability $= 0.4$				0.056	0.106	0.040
				(0.158)	(0.152)	(0.132)
Probability $= 0.5$				0.038	-0.072	0.138
				(0.156)	(0.149)	(0.131)
Probability $= 0.6$				Ref.	Ref.	Ref.
Probability $= 0.7$				0.022	0.048	0.054
•				(0.154)	(0.158)	(0.132)
Probability = 0.8				-0.178	-0.295	0.006
·				(0.187)	(0.184)	(0.163)
Probability = 0.9	0.664^{***}	1.596^{***}	1.229^{***}	0.278^{**}	0.952^{**}	0.693^{*}
-	(0.078)	(0.416)	(0.396)	(0.112)	(0.435)	(0.404)
Individual controls	No	No	Yes	No	No	Yes
Fixed Effects	No	Yes	No	No	Yes	No
\mathbb{R}^2	0.076	0.548	0.495	0.121	0.564	0.528
Adjusted \mathbb{R}^2	0.071	0.344	0.396	0.076	0.325	0.405
Observations	165	165	165	165	165	165

TABLE B3: Accra Sample: Regression analysis: Preference for self-medication (marginal effects)

Notes: The table shows the results for the linear probability function with decision to self-medicate as dependent variable. Columns (1) to (3) show the results for all probability levels to buy poor quality with 0.6 as reference category. We choose 0.6 as a reference category because it reflects the benchmark established by Bekoe et al. (2020). Columns (4) to (5) use a continuous probability to buy poor quality variable as predictor of interest. Individual controls include age, gender, education, wealth quintiles, antibiotic knowledge, antibiotic use in past 28 days, preference for street vendors, prior belief about drug quality elicited in survey experiment 2, and basic preferences (risk aversion, locus of control, trust, patience and time preference). We include additional controls for the experimental design including round dummies, and low medicine quality in previous round. We also control for the order of the experiments, i.e., whether we first elicited beliefs or conducted the decision task. We do so as we find some significantly but small difference in the slopes (Figure A6). Standard errors are clustered at the individual level for all regressions expect the fixed effect specification in columns (2) and (5). Marginal effects are reported in Table A6. p < 0.1; **p < 0.05; ***p < 0.01.

D Expert Benchmark

D.1 Methodology

Utilizing our professional networks, we replicated the elicitation of expectations and observability of drug quality with 48 experts from diverse fields, including pharmacology $(25\%)^{32}$, medicine (20.8%), and other related disciplines such as biochemistry, biology, chemistry, physics, public health, and health economics using an online survey (Table B4).

³²We lack information regarding the current workplace of 40% of the pharmacologists in the sample; 24% are employed by pharmaceutical companies, and 16% work in government institutions, including the *Directeur Général de l'Accès au Produit de Santé* (DGAP) and the *Laboratoire National de Santé Publique* (ANSSEAT).

CD CD	Min	Marr	N
ean SD	IVIIII	Max	1
			10
.44 0.50	0	1	48
2.21 7.59	21	53	48
.42 0.50	0	1	48
.60 0.49	0	1	48
.04			2
.02			1
.08			4
.21			10
.52			25
.02			1
.06			3
.04			2
19.81 3.46	2012	2023	27
18.96 4.83	2004	2024	26
.42 4.30	1	12	26
.78 0.42	0	1	27
.08			4
.02			1
.02			1
.02			1
.02			1
.12			6
.10			5
.17			8
.04			2
.68 2.29	1	10	19
24.71 2.82	2016	2031	17
.00 0.00	1	1	48
.90 0.31	0	1	48
.00 0.00	0	0	48
.00 0.00	1	1	48
	-	-	10
42 3.19	0	11	48
.29 2.78	1	11	48
23 3 10	1	11	48
27 2.96	1	11	48
.48 1.71	6	11	48
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	ean SD Min Max .44 0.50 0 1 2.21 7.59 21 53 .42 0.50 0 1 .60 0.49 0 1 .04 .02 .08 .21 .52 .02 .06 .04 .04 .21 .52 .02 .06 .04 .202 .06 .04 .21 .202 .02 .06 .04 .21 .202 .06 .04 .202 .202 .06 .04 .202 .202 .02 .02 .02 .02 .02 .02 .22 .01 .00 .02 .22 .2016 .2031 .04 .21 .20 .2031 .00 .000 .1 .1 .90 0.31 0 1 .90 <t< td=""></t<>

TABLE B4: Participant characteristics: Expert survey

Notes: Sample characteristics of 48 respondents to our online survey conducted in January 2024.

D.2 Results

D.2.1 Beliefs about Drug Quality

By comparing the results from the non-expert consumer survey and the expert survey, we find that experts, in general, underestimate the risk at pharmacies to a lesser degree and evaluate the risk of poor quality at street vendors similarly to non-experts. Specifically, only 10.4% of experts underestimate the risk at pharmacies, in contrast to 42.5% of non-experts; instead, a larger proportion of experts (64.7%) overestimate the risk compared to 40.0% in the non-expert sample (Figure B4). This discrepancy may indicate a heightened awareness of the quality uncertainty surrounding antibiotics in the market in Ouagadougou. Regarding beliefs about quality uncertainty at street vendors, we observe that 18.8% of experts underestimate and 81.2% overestimate the risk.

Furthermore, we find that the mean belief of risk at pharmacies is 0.41 (standard deviation of 0.27), which is higher than the mean of the non-expert sample. In contrast, the mean belief for street vendors is 0.74 (standard deviation of 0.31). In essence, experts – individuals with greater biomedical knowledge and experience – demonstrate a heightened awareness of the risks associated with pharmacies and, to a lesser extent, regard them as a safer option. Notably, none of the experts reported purchasing antibiotics from a street vendor.





Notes: The bars present the share of the 48 respondents with beliefs about the probability to buy poor-quality medicine equal to the value shown on the x-axis. The dashed vertical line indicates the benchmark from antibiotic quality testing for pharmacy and street vendor respectively.

D.2.2 Observability of Drug Quality

The results from Survey Experiment 2 suggest that expert consumers are not better able to infer quality than non-expert consumers. In Figure B4 we do not find a significant difference in the total score outcome and the share of subjects who correctly identifying the failed sample.



Notes: Panel A shows the mean total score of the total sample, and the two groups of which one received additional market information (price and vendor type) while the other did not. Panel B shows our outcome measure, i.e. the share of subjects who correctly identified the failed sample. In Panel B, the p-value corresponds to the χ^2 test.

E Experimental Instructions for Survey Experiment 1 and 2

E.1 Survey Experiment 1: Beliefs about Drug Quality

For this task, I ask you a question about the chance or probability of certain events happening. There are 10 chips in the cup (Figure B6). I would like you to choose a few chips from these 10 chips and put them on the plate to express what you think is the probability or chance of a specific event happening. A chip represents a chance in 10. If you do not put any chips, this means that you are sure that the event will not take place. As you add more chips, it means you think the probability of the event happening increases. For example, if you put one or two chips, it means that you think the event is unlikely to happen but is still possible. If you choose 5 chips, that means it's equally likely to happen or not (fifty-fifty). If you choose 6 chips, this means the event is slightly more likely to occur than not to occur. If you put 10 chips on the plate, it means that you are sure that the event will take place.

FIGURE B6: Plastic chips of different colors used in Survey Experiment 1 and the Experiment



Test Round 1: I would like you to choose the number of chips which represents the chance that you will recharge your mobile phone credit tomorrow going to the market tomorrow:

Number of chips

Test Round 2: Now, I would like you to choose the number of chips that represents the chance that you will recharge your mobile phone's credit over the next two weeks:

Number of chips

If the number of chips remains the same or the respondent put fewer chips for the second test round, the instructions were repeated.

Let us discuss another topic. In real life, unfortunate events can occur, such as suddenly falling ill and seeking medication to feel better. In some cases, you may require antibiotics. However, it is important to recognize that the antibiotics you obtain may not be of the quality you expect, potentially rendering them ineffective.

For instance, if you are taking an antibiotic for your illness, the tablets or capsules you consume may not effectively alleviate your symptoms. One reason for this could be that the capsule does not contain the correct active ingredient due to intentional adulteration. Alternatively, the pill may lack the appropriate dosage of the active ingredient because it has deteriorated due to improper storage or transportation—similar to how vegetables spoil when not stored under proper conditions. In either scenario, the medication may lack the potency needed to combat the illness, resulting in a prolonged recovery or, in some cases, no recovery at all. In other words, the antibiotic is of questionable quality (fr. *douteuse*) because it does not meet the necessary standards.

Quality is determined by the presence of the active ingredient in sufficient quantities, which allows for the laboratory testing of antibiotics. This is precisely what we undertook. We collected antibiotic samples not only from local pharmacies but also from street

vendors in your neighborhood during the month of June, and subsequently had them tested in a laboratory in Ouagadougou to assess their quality.

Now, I will ask you once again to distribute the chips on the plate to represent the risk you associate with obtaining antibiotics of questionable quality. I encourage you to consider this matter very carefully.

Question 1: Think about a situation in which you want to buy antibiotics at a pharmacy. Please select the number of chips that you think represents the likelihood that you are purchasing antibiotic medications of questionable quality:

Number of chips

Question 2: Think about a situation in which you want to buy antibiotics at a street vendor. Please select the number of chips that you think represents the likelihood that you are purchasing antibiotic medications of questionable quality:

Number of chips	

E.2 Survey Experiment 2: Observability of Drug Quality

I will now introduce you to various samples of antibiotic drugs across three rounds. In each round, I will present photographs (examples of the showcards are displayed in Figure B7 and Figure B8) of the antibiotic amoxicillin that we purchased in Ouagadougou and subsequently tested in a laboratory. You will see two photographs: one depicting the blister pack from the front and the other from the back.

We aim to gather your insights regarding the appearance of the drugs and their perceived quality. While certain visual characteristics may indicate poor quality, it is important to note that the true quality of medications cannot be determined with certainty without appropriate laboratory testing and control.







In each round, I want you to take a look at the sample and tell me whether you think it is of good quality or questionable quality.

Information treatment group only: In each round I will also give you information on the price we paid and where we bought the medicine that is whether we bought it at a pharmacy or street vendor.

Interviewer Instructions: Show test showcard (Figure B7): Could you please tell me what I want you to do now?

If the respondent could not repeat the task, the instructions were repeated. If respondents could repeated the task correctly, the interviewer checked to see if the respondent had any additional questions, and continue with the task rounds.

Do you think the antibiotic you see is	Questionable quality
good or of questionable quality?	Good quality
Are you sure of your answer?	Completely safe
	Of course
	Not sure
	I have no idea, I'm just guessing
Why do you think this is a version of	
questionable quality?	

E.3 Showcards

We randomly allocate participants to two sets of amoxicillin samples that are representative of the market, as sampled during our quality testing.³³ We include this second factor because it is *a priori* unclear whether any of the visual aspects of the samples signal quality more effectively to consumers.

To mitigate respondent fatigue given the number of experiments and the complementary individual survey, we limited the number of samples shown to three. Despite this limitation, we aimed for our sample sets to be representative of the market included in our quality testing. The samples included in the sets were selected based on the determined proportion of failed samples (30%), the proportion of different vendor types surveyed (34% purchased from street vendors), and the proportion of failed samples by vendor type (20% at pharmacies and 50% at street vendors). Consequently, the composition of the sets was as follows: one in three samples was a failed sample; one in three samples was purchased from street vendor; one in two samples from street vendors failed quality testing; and one in four samples from pharmacies failed quality testing.

Based on these criteria, we constructed Set A and Set B. We first identified the failed samples in each set. In Set A, the failed sample was purchased at a pharmacy for FCFA 1,500 and contained information on the manufacturer (showcard A2). The failed sample in Set B was acquired from a street vendor, also for FCFA 1,500, and lacked manufacturer information (showcard B2). The remaining two samples in Set A comprised one passed sample purchased from a street vendor and one obtained from a pharmacy. In Set B, we included two passed samples sourced from pharmacies. The composition of the sets is further detailed in Table B5.

³³Randomization was conducted prior to data collection using a list of randomized IDs that were assigned to participants in the field. Additionally, we randomized the order in which the samples were presented to the subjects. Before the commencement of the experiment, all subjects completed a test round in which the same sample was shown to them.

Sample ID	Price in FCFA	Vendor type	Quality testing results
A1	1200	Street vendor	Passed
A2	1500	Pharmacy	Failed
A3	1200	Pharmacy	Passed
B1	1500	Pharmacy	Passed
B2	1500	Street vendor	Failed
B3	1350	Pharmacy	Passed

 TABLE B5:
 Composition of sample sets



A1





A2


A3





B1





B2



B3





F Defriefing Script

F.1 Directly after the experiments and before the end of the interview

Thank you very much for your time today and for sharing your views with us. We greatly appreciate the time and effort you dedicated to completing the tasks and providing us with valuable information. Your contribution is invaluable to the advancement of our research, and we're grateful for your involvement.

Before we pay you for your participation in the tasks today, I want to emphasize that the tasks you participated in were designed solely for research purposes and may not necessarily reflect how decisions should be made in the real world. While the study aimed to gather insights into certain aspects related to medication decision-making, it is crucial to understand that any decisions regarding medication and dosage should always be made in consultation with a qualified healthcare professional.

Medication and dosage decisions are complex and can vary greatly depending on an individual's specific medical condition, medical history, and other factors. It is essential to consult with a doctor or a licensed pharmacist who possesses the necessary expertise to provide accurate and tailored guidance based on your unique circumstances.

Furthermore, when it comes to self-medicating with antibiotics, the quality of the medicine plays a vital role. It is important to note that not all antibiotics available without a prescription may be safe or effective. Inappropriate use of antibiotics, including selfmedication without proper medical guidance, can contribute to the development of antibiotic resistance, a significant global health concern where antibiotics available to use as mankind are no longer effective in fighting pathogens.

It is essential to recognize that only through proper laboratory testing can the quality of an antibiotic or medicine be accurately determined. These tests involve comprehensive analyses of the chemical composition, purity, potency, and other critical factors that contribute to the overall quality and efficacy of the medication. Therefore, it is crucial to rely on trusted regulatory authorities, healthcare professionals, and licensed pharmacies when obtaining antibiotics or any medication. They adhere to strict quality control measures and regulations to ensure that the medicines they provide are safe, effective, and of the highest quality. Obtaining antibiotics from reliable and legitimate sources, such as a qualified healthcare professional or a licensed pharmacy, ensures that you receive medications of appropriate quality and potency. These sources prioritize your health and adhere to regulations and guidelines to maintain the integrity and safety of the medications.

The study you participated in serves to contribute to our understanding of certain aspects related to medication decision-making. However, it should not replace the guidance and expertise of healthcare professionals. We encourage you to seek professional advice when making decisions about your health and medication needs, particularly when it comes to self-medicating with antibiotics, and to obtain medications from trustworthy sources to ensure their quality.

F.2 Task debriefing

Before continuing with the payment and ending the interview, I would like to present to you the results of the quality tests we carried out in Ouagadougou in June this year.

In one task , I asked you to select the number of chips that you think represents the chance of receiving an amoxicillin drug of questionable quality when you go to a pharmacy or street vendor.

- The laboratory drug testing showed that the probability of purchasing amoxicillin of questionable quality in a pharmacy was 2 in 10.
- The laboratory drug testing showed that the probability of purchasing amoxicillin of dubious quality from street vendors was 5 in 10.

In another task , I showed you pictures of a moxicillin and asked you if you thought their quality was good or questionable. Before concluding, I would like to highlight an important aspect regarding the quality of antibiotics or any medicine: visual cues, price or the seller from whom a medicine is purchased are not reliable indicators of its quality. Only professionally performed laboratory tests can accurately determine the quality of an antibiotic or medication.

The quality of an antibiotic or medication is not determined solely by its appearance, its cost, or where it was purchased. Other factors such as storage and transportation conditions can have a significant impact on its quality. A specific antibiotic drug may therefore be of good quality in one location but of poor quality in another due to variations in storage and transportation practices.

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