

PHARMACEUTICAL INDUSTRY PARTNERSHIPS AND PRESCRIBING PRACTICES
IN MALI: A MIXED-METHODS STUDY OF INFLUENCE ON CLINICAL DECISIONS
AND CARE PROTOCOLS

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ABSTRACT

Objectives: To assess how pharmaceutical industry partnerships influence prescribing practices and the development of clinical care protocols in Mali, where out-of-pocket health expenditures reach nearly 40% of total health spending. **Methods:** We conducted a sequential mixed-methods study from January to December 2026 in Commune III of Bamako. The quantitative phase surveyed 331 health professionals, 90 patients, and 94 pharmaceutical industry representatives using electronic questionnaires. The qualitative phase involved semi-structured interviews with protocol drafters and health decisionmakers. We used descriptive statistics, Spearman correlations, and multivariate regressions to analyze associations between industry exposure and prescribing outcomes. **Results:** Partnerships were intense and nearly universal. All professionals (100%) reported receiving promotional gifts, 87.3% received free samples, and 52.9% received offered meals. Medical representatives averaged 17.4 professional contacts per day. Brand-name prescribing dominated: professionals prescribed brand-name specialties in 73.2% of prescriptions on average, and 68.7% did so in 7 or more of every 10 prescriptions (Figure 1). We found no significant correlation between industry exposure score and brand-name prescribing ($r = 0.13$; $P = .535$). Being a physician was the only factor significantly associated with increased brand-name prescribing ($\beta = 1.57$; $P < .001$; Table 1). All patients (100%) were aware of medical representatives' influence, and 42.2% had forgone care because of cost (Table 2). One-third of protocol drafters considered industry participation in guideline development unacceptable. **Conclusions:** Pharmaceutical partnerships in Mali are intense and coexist with high rates of brand-name prescribing an indicator of irrational prescribing. Although exposure to industry benefits was not directly correlated with brand-name prescribing in this study, the normalization of these practices and their financial impact on patients demand urgent, context-adapted regulation.

KEYWORDS: Pharmaceutical industry, prescribing, Mali, conflicts of interest, care protocols, public health.

INTRODUCTION

In Mali, falling ill can mean financial ruin. Out-of-pocket health expenditures account for nearly 40% of total health spending^[1], forcing families to choose between

medicine and meals, between treatment and school fees. Every prescription, then, is not just a clinical decision, it is an economic one with immediate consequences for household survival.

Against this backdrop, the pharmaceutical industry occupies an ambivalent position. It supplies essential medicines, funds continuing medical education, and supports scientific conferences.^[2,3] But its primary obligation is to generate profit, creating what the World Health Organization calls an "inherent conflict of interest between the legitimate business goals of manufacturers and the social, medical and economic needs of providers and the public".^[4] This tension plays out in thousands of daily interactions between medical representatives and health professionals visits, samples, gifts, meals, sponsored training.

The international evidence on these interactions is unambiguous. A meta-analysis by Brax and colleagues found that physicians exposed to pharmaceutical industry benefits were more than twice as likely to prescribe irrationally favoring brand-name drugs over equally effective generics, prescribing promoted medications with no clear advantage.^[5] In France, Goupil and colleagues demonstrated a dose-dependent relationship: physicians receiving gifts worth more than €100 annually prescribed medications costing €5.33 more per consultation than those receiving nothing.^[6] In Pakistan, Khan and colleagues documented a system of "sales-target-linked prescribing" where incentives included kickbacks, payment of personal bills, and clinic renovations tied to prescription quotas.^[7]

Yet nearly all of this evidence comes from high-income countries. Only 17.2% of studies in our recent systematic review were conducted in low- or middle-income countries, and just one study (3.4%) came from sub-Saharan Africa.^[8] We know remarkably little about how these dynamics operate in Mali, where the pharmaceutical market has grown rapidly imports increased by more than 30% between 2019 and 2024, largely driven by the private sector^[9] and where regulatory oversight remains weak.

Three gaps motivated this study. First, the nature, scale, and mechanisms of industry-physician interactions in Mali remain largely unknown. Second, no empirical study has examined whether industry influence extends upstream to the development of clinical protocols and therapeutic guidelines documents that shape the practice of thousands of clinicians. Third, patients, who bear the ultimate clinical and financial consequences of prescribing decisions, are rarely included in research on this topic.

We designed a mixed-methods study to address these gaps. Our objective was to assess how pharmaceutical industry partnerships influence prescribing practices and the development of care protocols in Commune III of Bamako, Mali.

METHODS

Study setting and design

We conducted this study in Commune III of Bamako, Mali's capital. This commune offered a diverse mix of public and private health facilities community health centers (CSCoM), a reference health center (CSRef), private clinics, and approximately 50 retail pharmacies. It also hosts professional associations and academic institutions involved in developing national treatment guidelines, making it a representative setting for urban medical practice in Mali.

We used a sequential mixed-methods design with three phases: an exploratory qualitative phase to understand mechanisms and perceptions, a quantitative phase to measure prevalence and test associations, and an integrative phase to triangulate findings.^[10] Data collection ran from January to December 2026.

Participants and sampling

Qualitative phase

We conducted semi-structured interviews with five categories of participants: prescribing physicians and retail pharmacists; medical representatives and pharmaceutical managers; protocol drafters and health decisionmakers; and adult patients who had consulted a physician in the past six months and received at least one prescription. We used purposive sampling, initially selecting participants known for relevant experience (e.g., physicians with frequent industry interactions, protocol drafters identified through national committees). We then employed snowball sampling, asking each participant to recommend others. Recruitment continued until thematic saturation. The final qualitative sample included 15 participants.

Quantitative phase

The target population comprised prescribing physicians and retail pharmacists practicing in Commune III for at least one year, plus patients consulting in local health facilities. We calculated the required sample size using the formula for proportions^[11]: $n = Z^2 \cdot p(1-p)/d^2$, with $p = 0.5$ (estimated prevalence of exposure to industry partnerships), $Z = 1.96$ (95% confidence interval), and $d = 0.05$ (5% margin of error). This yielded $n = 385$, adjusted to 480 for an anticipated 20% non-response rate. We ultimately included 331 health professionals, 90 patients, and 94 industry representatives, 515 participants in total.

Table 1 presents the characteristics of all three samples. Among health professionals, physicians in training (residents and interns) comprised the majority (63.8%), reflecting the youthful composition of the medical workforce in Bamako. The public sector dominated (75.5%), and men outnumbered women by roughly two to one. Patients were predominantly women (64.4%) aged 18–45 years (88.9%), and more than half (57.8%) lacked health insurance. Industry representatives were

mostly medical representatives (76.6%) working for international laboratories (58.5%).

Table 1: Sample characteristics (n = 515).

Characteristic	Category	n	%
Health Professionals (n = 331)			
Profession	Residents (DES)	136	41.1
	Interns	75	22.7
	General practitioners	38	11.5
	Pharmacists	25	7.6
	Specialists	22	6.6
	Nurses	15	4.5
	Midwives	14	4.2
	Students	6	1.8
Practice sector	Public	250	75.5
	Mixed	50	15.1
	Private	31	9.4
Sex	Male	224	67.7
	Female	107	32.3
Age, years	Mean (SD)	31.3 (6.2)	—
Experience, years	Mean (SD)	6.9 (4.4)	—
Patients (n = 90)			
Sex	Female	58	64.4
	Male	32	35.6
Age group	18–30 years	43	47.8
	31–45 years	37	41.1
	46–60 years	8	8.9
	>60 years	2	2.2
Education level	None/Alphabetization	6	6.7
	Primary	21	23.3
	Secondary	25	27.8
	Higher	38	42.2
Health coverage	No	52	57.8
	Yes	38	42.2
Facility type	Private pharmacy	47	52.2
	CSRef/Public hospital	43	47.8
Industry Representatives (n = 94)			
Company type	International laboratory	55	58.5
	Medical promotion agency	21	22.3
	Regional/African laboratory	9	9.6
	Distributor/Wholesaler	6	6.4
	Local Malian laboratory	3	3.2
Function	Medical representative	72	76.6
	Sector manager	10	10.6
	Medical manager	10	10.6
	Marketing manager	2	2.1
Product portfolio	Brand-name specialties	46	48.9
	Branded generics	30	31.9
	Mixed	18	19.1

Note: CSRef = Centre de Santé de Référence; DES = Diplôme d'Études Spécialisées; SD = standard deviation.

We stratified sampling by facility type (public/private) and randomly selected participants proportionally within each stratum. Inclusion criteria were age 18 years or older, active practice in a Commune III health facility, and informed consent. For patients, we additionally required a physician consultation within the past six months and at least one prescription.

Data collection

Qualitative data

We developed separate semi-structured interview guides for health professionals, industry representatives, and patients. Guides covered the nature of interactions, perceived influence, regulatory mechanisms, and coping strategies. Patients received a simplified guide focusing

on their consultation experience, prescription costs, trust in their physician, and awareness of commercial influences. Interviews were conducted in French or Bambara, audio-recorded with consent, and transcribed verbatim. Average duration was 45 minutes for professionals and industry representatives, 20 minutes for patients.

Quantitative data

We administered electronic questionnaires via KoboToolbox on tablets or smartphones. The health professional questionnaire covered five domains: (A) socio-demographic and professional characteristics; (B) exposure to industry partnerships in the past 12 months; (C) prescribing and dispensing practices; (D) care protocols and conflicts of interest; and (E) general perceptions. The patient questionnaire covered four domains: (P1) socio-demographic characteristics; (P2) consultation and pharmacy experience; (P3) perception of prescription and cost; and (P4) cost-related behaviors and consequences. The industry questionnaire covered four domains: (I) respondent and company profile; (II) engagement strategies and tools; (III) perceptions of regulation and conflicts of interest; and (IV) field relations and challenges.

We also conducted a documentary review of official care protocols in force in Mali and promotional materials distributed by pharmaceutical companies in the study area.

Variables and measures

The primary independent variable was an exposure score calculated from the frequency of medical representative visits and the number of types of incentives received (gifts, samples, meals, congress funding, logistical support, kickbacks, etc.). The score ranged from 0 to 7, with each type of benefit counting as one point.

Dependent variables included brand-name prescribing (proportion of prescriptions containing at least one brand-name specialty when a generic equivalent exists), antibiotic prescribing (proportion of prescriptions containing at least one antibiotic), and conformity with national recommendations. We measured these by self-report for health professionals and by direct observation of prescriptions for patients.

Data analysis

Qualitative analysis

We performed thematic analysis following Braun and Clarke's six-step approach^[12]: familiarization, initial

coding, theme search, theme review, theme definition, and report production. We used R packages RQDA, tidytext, and quanteda for coding and visualization. Two researchers independently coded 20% of interviews and compared results; disagreements were resolved through discussion.

Quantitative analysis

We analyzed data using R version 4.3.0. Descriptive statistics (frequencies, percentages, means, standard deviations, medians) characterized the sample. We used χ^2 tests for categorical variables and t-tests for continuous variables. Multivariate linear and logistic regression models assessed associations between industry exposure and prescribing quality, controlling for age, sex, seniority, practice sector, and patient volume. We constructed a Spearman correlation matrix to explore relationships among continuous variables (Figure 2).

Integration

We triangulated qualitative and quantitative findings to identify convergences, divergences, and gaps.

Ethical considerations

The study received approval from the Ethics Committee of the Faculty of Medicine and Odontostomatology (FMOS) at the University of Sciences, Techniques and Technologies of Bamako (approval no. 2026/97/CE/USTTB, April 14, 2026). We obtained written informed consent from all participants; for non-literate patients, we obtained oral consent witnessed by an independent observer. We assigned each participant a unique code (e.g., MED-001, PAT-003) and stored the correspondence table separately under lock. Audio recordings were destroyed after transcription (maximum three months). The principal investigator declared no financial relationship with the pharmaceutical industry.

RESULTS

Intensity and nature of industry partnerships

The pharmaceutical industry's presence in Commune III is not occasional it is woven into the fabric of daily practice. Table 2 details the promotional activities companies use to engage health professionals. Free sample distribution (83.0% of companies) and individual promotional visits (78.7%) were the most common strategies, followed by support for patient events (71.3%) and distribution of promotional gifts (68.1%). Approximately one-third of companies (34.0%) used volume-based incentives, a practice that creates a direct conflict of interest.

Table 2: Promotional activities used by pharmaceutical companies (n = 94).

Activity	% of companies using
Distribution of free samples	83.0
Individual promotional visits	78.7
Support for patient events	71.3
Distribution of promotional gifts	68.1
Funding for national congresses	40.4

Organization of medical training	39.4
Funding of scientific meals	37.2
Volume-based incentives	34.0
Funding for international congresses	21.3
Research support	0.0

Figure 1 illustrates the prevalence of benefits received by health professionals. The results are striking in their uniformity: every professional (100%) reported receiving promotional gifts, 87.3% received free samples, and 52.9% received offered meals. More substantial benefits participation in international congresses (36.6%) and training support (11.5%) were less frequent but still

affected by a meaningful minority. Kickbacks were rarely reported (3.3%), though this may reflect underreporting rather than true rarity. The mean exposure score was 3.43 out of 7, indicating that professionals received 3 to 4 types of benefits out of 7 possible.

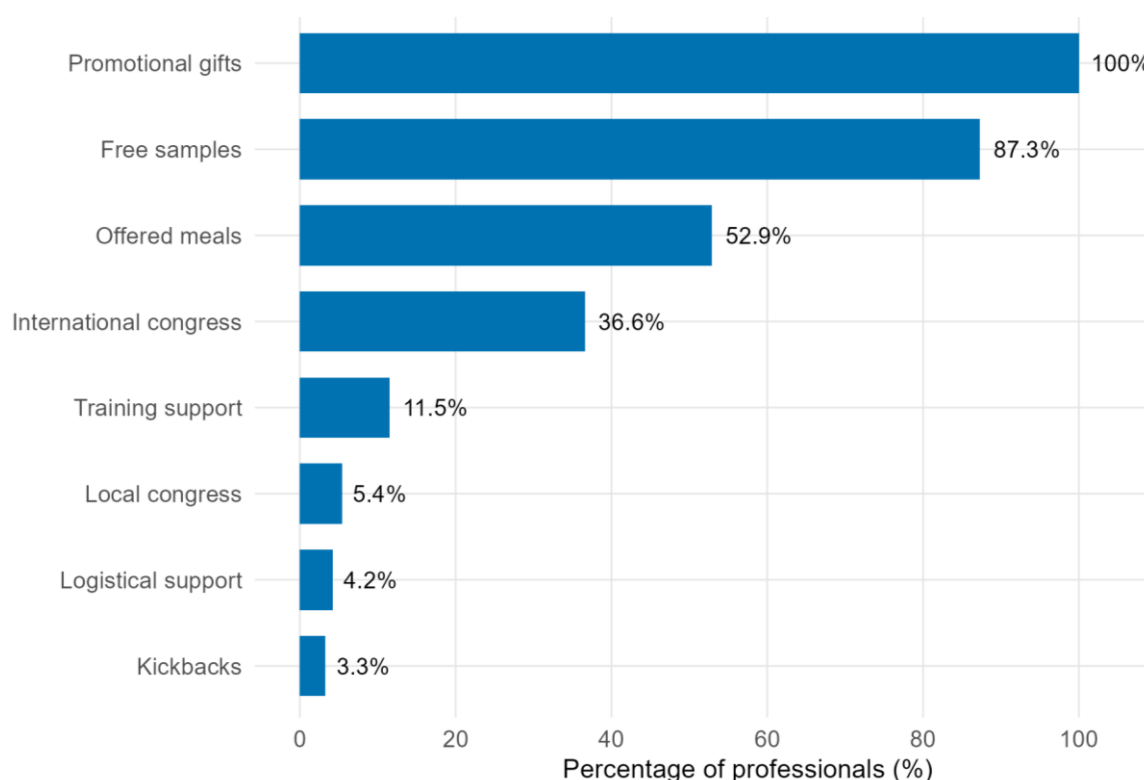


Figure 1: Prevalence of benefits received by health professionals (n = 331).

Horizontal bar chart showing: Promotional gifts 100%, Free samples 87.3%, Offered meals 52.9%, International congress participation 36.6%, Training support 11.5%, Local congress participation 5.4%, Logistical support 4.2%, Kickbacks 3.3%.

Medical representatives were equally active. On average, each representative contacted 17.4 health professionals per day (median = 16.0; range = 10–25). This volume of contact, roughly one interaction every 25 minutes in an eight-hour day leaves little room for reflection on the commercial nature of the exchange.

Perceptions of influence

How do professionals and patients perceive this influence? Figure 2 compares their responses, and the contrast is revealing.

Among professionals, 86.7% considered industry interactions useful or very useful. Nearly 70% believed these interactions influenced physicians' prescribing in general to an important or very important degree. Yet only 30.8% acknowledged such influence on their own practice. This gap between perceived influence on others and on oneself is the classic "optimism bias" documented in the literature.^[15,16] One general practitioner captured the tension with disarming frankness: "I know it can influence, but I prescribe what's good for the patient. Gifts are just courtesy."

Patients, by contrast, were unequivocal. All (100%) were aware that medical representatives could influence prescribing decisions; 64.4% believed this influence was important. None reported being unaware or uncertain. This awareness, however, did not translate into action only 3.3% of patients returned to the physician to question a prescription.

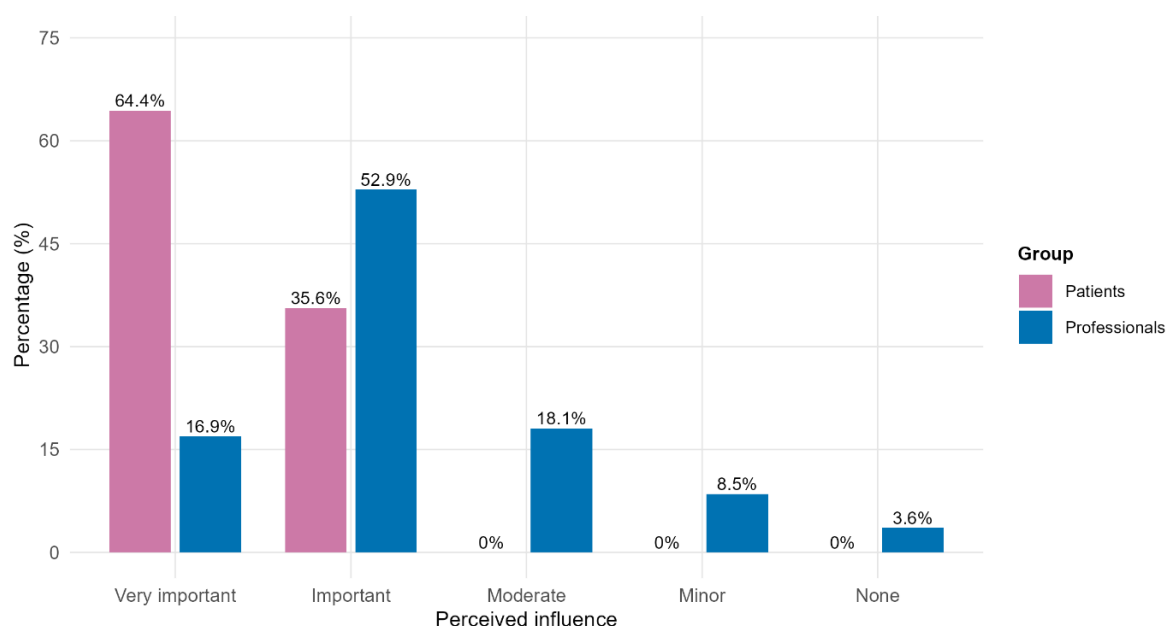


Figure 2: Perception of medical representatives' influence: Professionals vs. Patients.

Grouped bar chart comparing professionals and patients across influence categories: Very important, Important, Moderate, Minor, None. Patients show higher proportions in "Very important" (64.4% vs. 16.9%) and "Important" (35.6% vs. 52.9%). Professionals show responses across all categories; patients show none in Moderate, Minor, or None.

Prescribing practices

The most concerning finding of this study is the prevalence of brand-name prescribing. Figure 3 shows the distribution: on average, professionals prescribed a brand-name specialty in 7.3 of every 10 prescriptions when a generic equivalent existed. The median was 8 out

of 10 confirming that most professionals prescribed brands in the majority of prescriptions. Nearly 70% prescribed brands in 7 or more of 10 prescriptions (40.2% for 7–8 out of 10; 28.5% for 9–10 out of 10).

Antibiotic prescribing followed a more symmetric distribution, centered on 5 out of 10 (mean = 5.31; median = 5.00). Prescriptions contained an average of 4.8 medications; more than 60% included an antibiotic or injection. The mean medication cost was 12,364 FCFA (approximately €19), a substantial sum in a country where monthly household income often falls below 50,000 FCFA.

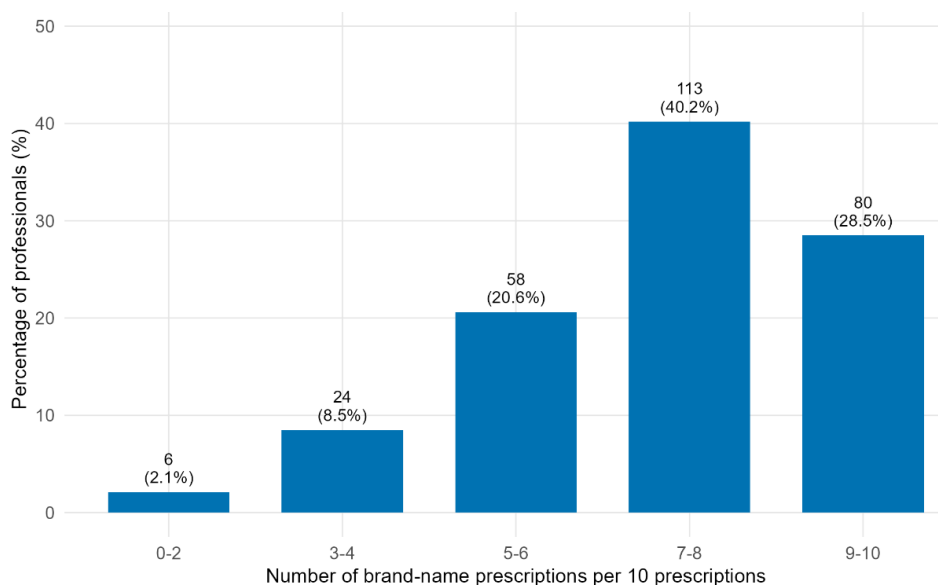


Figure 3: Distribution of brand-name prescribing (n = 281 professionals).

Bar chart showing number of brand-name prescriptions per 10 prescriptions: 0–2 (2.1%), 3–4 (8.5%), 5–6 (20.6%), 7–8 (40.2%), 9–10 (28.5%). Mean = 7.32/10; Median = 8/10.

Factors associated with brand-name prescribing

What drives this pattern? Table 3 presents the results of a linear regression model. The model explained 7.6% of variance in brand-name prescribing. The only significant variable was being a physician: physicians prescribed an

average of 1.57 more brand-name medications than non-physicians ($\beta = 1.57$; 95% CI = 0.93, 2.22; $P < .001$). Neither the exposure score ($\beta = 0.13$; $P = .144$) nor kickbacks ($\beta = -0.44$; $P = .555$) nor practice sector ($\beta = -0.04$; $P = .876$) reached statistical significance.

Table 3: Linear regression: Factors associated with brand-name prescribing.

Variable	B	95% CI	P value
Constant	5.28	4.35, 6.21	< .001
Is physician	1.57	0.93, 2.22	< .001
Exposure score	0.13	-0.05, 0.32	.144
Kickback	-0.44	-1.88, 1.01	.555
Public sector	-0.04	-0.57, 0.49	.876
Experience	0.04	-0.01, 0.09	.164

Note: $R^2 = 0.093$; adjusted $R^2 = 0.076$; $F = 5.34$; $P < .001$; $n = 281$. CI = confidence interval.

Figure 4 presents the Spearman correlation matrix for key variables. The correlation between exposure score and brand-name prescribing was weak and non-significant ($r = 0.13$; $P = .535$). Moderate correlations emerged between exposure and experience ($r = 0.23$),

exposure and patients per day ($r = 0.25$), and experience and patients per day ($r = 0.27$). A weak negative correlation appeared between patients per day and visits per month ($r = -0.18$).

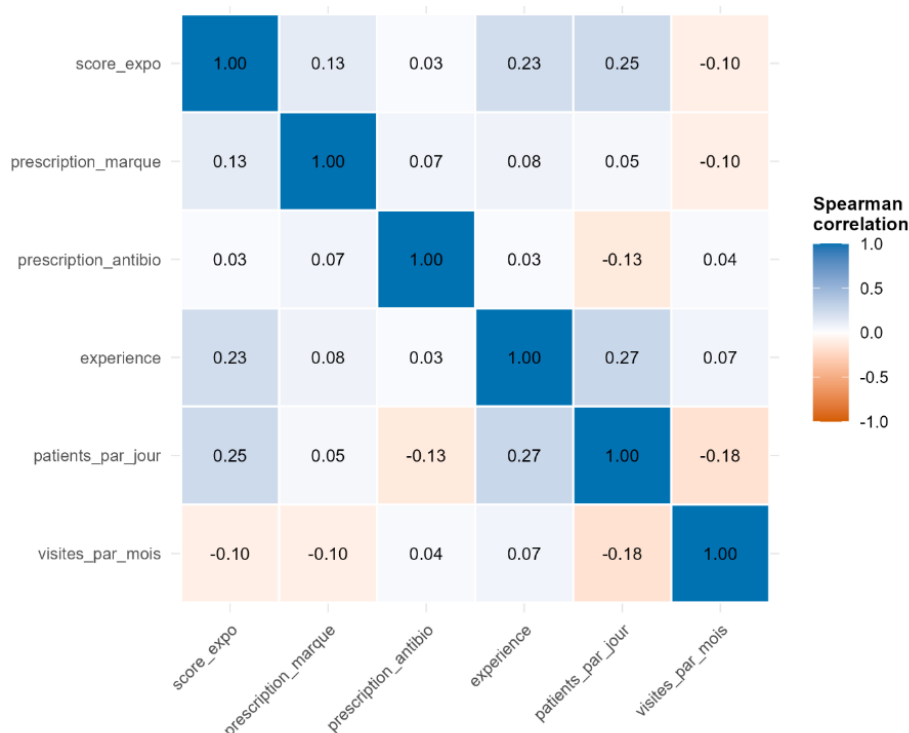


Figure 4: Spearman correlation matrix of key variables.

Heatmap showing correlations among exposure score, brand-name prescribing, antibiotic prescribing, experience, patients per day, visits per month. Key correlations: exposure score vs. experience ($r = 0.23$), exposure score vs. patients per day ($r = 0.25$), experience vs. patients per day ($r = 0.27$), patients per day vs. visits per month ($r = -0.18$), exposure score vs. brand-name prescribing ($r = 0.13$, not significant).

The financial burden on patients

High brand name prescribing has direct consequences for patients. Table 4 documents their experiences. More than

four in ten patients (42.2%) reported forgoing care because of cost 13.3% repeatedly. Faced with an expensive prescription, 53.3% requested cheaper alternatives from the pharmacist; 16.7% bought only the medications they deemed most important; and 16.7% bought everything, even if it meant going into debt. Only 3.3% returned to the physician to request a modification.

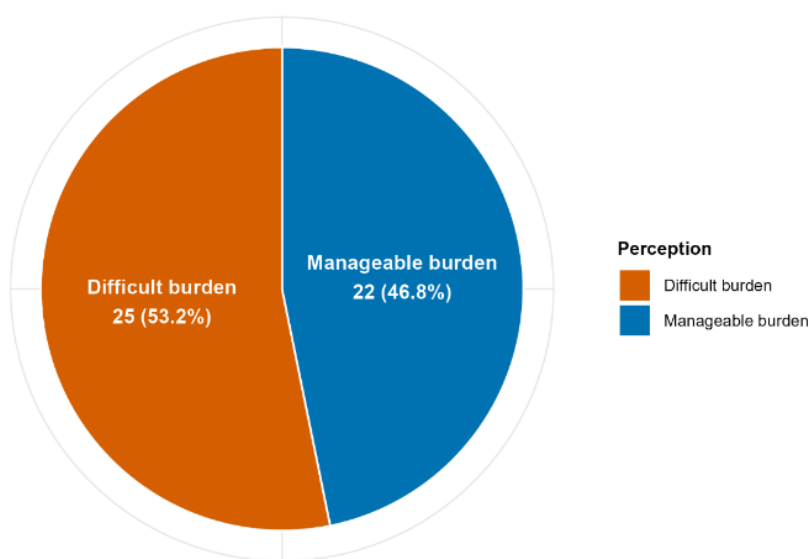
Table 4: Patient perceptions of financial burden and cost-coping behaviors (n = 90).

Indicator	n	%
Perceived financial burden (n = 47 respondents)		
Difficult burden	25	53.2
Manageable burden	22	46.8
Non-respondents	43	—
Reaction to expensive prescription (n = 90)		
Request cheaper alternatives from pharmacist	48	53.3
Buy only the most important medications	15	16.7
Buy everything, even if it means debt	15	16.7
Return to physician to modify prescription	3	3.3
Not specified	9	10.0
Forgone care because of cost (n = 90)		
No, never	39	43.3
Yes, once or twice	26	28.9
Yes, several times	12	13.3
Not specified	13	14.4

Note: For perceived financial burden, percentages are calculated among the 47 patients who responded to this specific question. The 43 non-respondents are shown for transparency but excluded from the percentage calculation.

Perceptions of financial burden, shown in Figure 5, reveal that among the 47 patients who responded to this question, 53.2% considered medication costs a difficult burden, while 46.8% found them manageable. The high

non-response rate (47.8%) itself is telling it suggests either reluctance to discuss financial hardship or difficulty in assessing it.

**Figure 5: Perceived financial burden of medications (n = 47 respondents).**

Pie chart showing: Difficult burden 53.2% (n = 25), Manageable burden 46.8% (n = 22). Note: 43 patients (47.8%) did not respond to this question.

One patient expressed the reality with heartbreaking simplicity: "When the prescription is too expensive, I choose the medications that seem most important. Sometimes I don't take everything. Sometimes I borrow money. But I don't say anything to the doctor."

Trust in health professionals

Despite these challenges, trust in health professionals remained high. Figure 6 shows trust levels by education.

Patients with primary and higher education expressed the highest levels of "complete trust" (57.1% and 57.9%, respectively). Those with secondary education showed high "rather trust" (72.0%). Mistrust was more pronounced among patients without education (16.7%) and those with higher education (5.3%). Overall, more than 90% of patients expressed complete or rather complete trust in their physician.

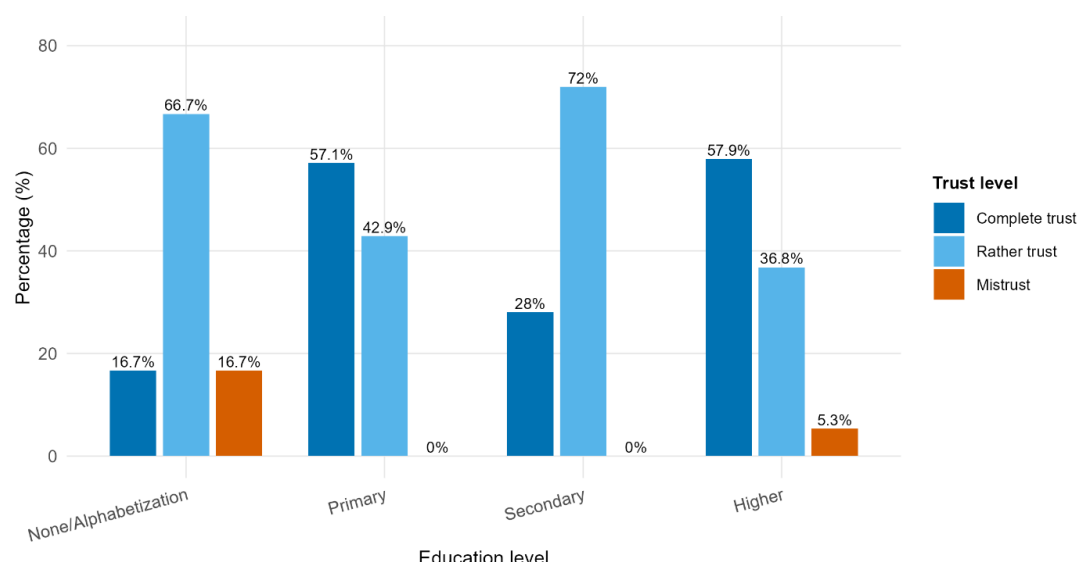


Figure 6: Trust in health professionals by education level (n = 90).

Grouped bar chart showing trust levels across education categories: None/Alphabetization (Méfiance 16.7%, Plutôt confiance 66.7%, Tout à fait confiance 16.7%), Primary (Méfiance 0%, Plutôt confiance 42.9%, Tout à fait confiance 57.1%), Secondary (Méfiance 0%, Plutôt confiance 72.0%, Tout à fait confiance 28.0%), Higher (Méfiance 5.3%, Plutôt confiance 36.8%, Tout à fait confiance 57.9%).

Care protocol development

The analysis of care protocol development reveals a zone of potential vulnerability. One-third of drafters (33.3%) considered industry participation in guideline development unacceptable; others viewed it as necessary given insufficient public funding. This finding is particularly concerning because our systematic review identified a complete scientific void on this topic: no empirical study has analyzed how the pharmaceutical industry influences the development of national or local clinical protocols.^[8]

A protocol drafter interviewed for this study expressed the tension with candor: "We don't have the means to fund our meetings. So, when a laboratory offers to pay for lunch or cover travel costs, it's hard to refuse. But afterward, you always wonder if you've been influenced, even unconsciously."

DISCUSSION

The first finding of this study is the deep and nearly universal penetration of the pharmaceutical industry into the daily practice of health professionals in Commune III of Bamako. That 100% of professionals reported receiving promotional gifts, and that medical representatives averaged 17.4 contacts per day, speaks to a relationship that is structural rather than occasional. This is not unique to Mali similar patterns have been documented across low- and middle-income countries, where pharmaceutical marketing often fills the void left by underfunded continuing medical education.^[13,14]

What stands out, however, is the normalization of these practices. Professionals do not view these interactions as problematic; 86.7% consider them useful or very useful. This perception aligns with qualitative findings from Pakistan, where acceptance of industry benefits has become a professional norm, justified by economic necessity and the conviction that "everyone does it".^[7] In Mali, this normalization is reinforced by a health system where public resources for continuing education are limited, and industry appears as an indispensable even inevitable partner.

This normalization coexists with a well-documented psychological phenomenon: optimism bias. Nearly 70% of professionals believed industry interactions influenced physicians' prescribing in general, but only 30.8% acknowledged such influence on their own practice. This gap between perceived influence on others and on oneself is a classic finding.^[15,16] It allows professionals to continue accepting benefits while preserving their self-image.

The most concerning result is the high prevalence of brand-name prescribing. On average, professionals prescribed a brand-name specialty in 7.3 of 10 prescriptions when a generic equivalent existed a clear indicator of irrational prescribing, as defined by WHO, because it favors more expensive products when effective, affordable generic alternatives exist.^[4]

This finding is troubling because international evidence has established a causal link between industry exposure and brand-name prescribing. Our systematic review pooled data from 29 studies and found that physicians exposed to industry were more than twice as likely to prescribe irrationally (pooled OR = 2.52; 95% CI = 1.82–3.50).^[8] The French study by Goupil and colleagues showed that physicians receiving gifts worth more than €100 annually prescribed medications costing €5.33 more per consultation.^[6] In the United States,

DeJong and colleagues found that a single sponsored meal significantly increased the probability of prescribing the promoted medication.^[17]

In our study, high brand-name prescribing had a direct impact on patients' financial burden. The mean prescription cost was 12,364 FCFA, a substantial sum in a country where monthly household income often falls below 50,000 FCFA. More than four in ten patients (42.2%) reported forgoing care because of cost, and one-third made painful choices: buying only the medications they deemed most important or borrowing money to purchase the full prescription.

That silence is itself a finding. Only 3.3% of patients returned to the physician to request a modification of the prescription. This suggests that patients do not feel entitled to question medical decisions, or that they fear compromising the therapeutic relationship. This power asymmetry between physician and patient is a major obstacle to rational prescribing.

One of the most intriguing results is the absence of a significant correlation between industry exposure score and brand-name prescribing ($r = 0.13$; $P = .535$). This appears paradoxical given the robust international evidence. Several explanations are possible.

The first is the ceiling effect. Brand-name prescribing is already so high among all professionals that it is statistically difficult to detect a difference linked to exposure. If nearly all prescribers rely predominantly on brands, the variation attributable to industry exposure becomes marginal.

The second is diffuse and indirect influence. The pharmaceutical industry does not only influence immediate prescribing decisions; it shapes professional norms, habits acquired during initial training, and prescribing culture. As qualitative studies suggest, influence operates through subtle mechanisms of reciprocity, cognitive dissonance, and social conformity.^[7,18,19] The exposure score captures only the most visible and recent interactions, not their intensity, quality, or duration.

The third is social desirability bias. Professionals may underreport their use of brand-name drugs, either because they know it is considered irrational or because they are not fully aware of their own prescribing patterns. Qualitative interviews revealed that some professionals had inaccurate perceptions of their own practice: they believed they prescribed fewer brands than they actually did.

The fourth is the multiplicity of prescribing determinants. The decision to prescribe a brand rather than a generic depends on many factors initial training, generic availability, confidence in quality, patient

demand, economic constraints. Industry exposure is only one determinant among others.

Finally, industry influence may operate more on the choice of therapeutic class or molecule than on the choice between brand and generic. A physician may be influenced to prescribe one statin over another while choosing indifferently between brand and generic.

Patients are not naive. All patients (100%) were aware that medical representatives can influence prescribing decisions, and 64.4% believed this influence is important. This awareness aligns with international studies showing that patients perceive physician-industry relationships and that these perceptions affect their trust.^[20,21]

Yet this awareness does not protect them from financial burden. Their trust in health professionals remains high: more than 90% expressed "complete" or "rather complete" trust in their physician. This trust, while legitimate, renders them vulnerable. Many resign themselves to painful choices: 53.3% request cheaper alternatives, but 16.7% buy only the medications they deem most important, and 16.7% buy everything, even if it means going into debt.

This vulnerability underscores the need for regulatory policies that protect not only the physician-patient relationship but also the patient's right to affordable, quality care. The demand for transparency clearly expressed in international studies should be a pillar of such policies. An Australian survey found that 84% of patients wanted financial ties between physicians and industry disclosed.^[22] A US study found that the perception of frequent gifts diminished trust in physicians.^[20] In Mali, no study has yet explored this demand for transparency, but our results suggest it exists and merits attention.

The analysis of care protocol development reveals a zone of potential vulnerability. That one-third of drafters considered industry participation unacceptable, coupled with a lack of transparency about funding sources, suggests a real risk of systemic bias. This finding is particularly concerning because our systematic review identified a complete scientific void on this topic: no empirical study has analyzed how the pharmaceutical industry influences the development of national or local clinical protocols.^[8]

Yet the stakes are considerable. Care protocols and good practice guidelines shape the practice of thousands of health professionals. If industry influences their content, the impact is systemic far exceeding the decision of a single prescriber. A protocol that favors a particular drug class, at the expense of older, cheaper, or more context-appropriate options, can have major consequences for public health and health expenditures. Norris and colleagues noted that guideline development is

vulnerable to industry influence because experts serving on drafting committees often have financial relationships with manufacturers.^[23] Even when these links are declared, their management is often lax.

The AGREE II tool the international standard for assessing guideline quality includes a specific domain on editorial independence and conflict-of-interest disclosure.^[24] Yet no study has systematically evaluated compliance with this domain in low- or middle-income countries. In Mali, a preliminary study conducted by our team found that national protocol drafting committees often lack transparency about funding sources and that

conflict-of-interest declarations are rare or non-existent.^[25]

Table 5 synthesizes the principal convergences and divergences between our findings and international literature. Mali shares with other low- and middle-income countries an intense exposure to the pharmaceutical industry and a high prevalence of brand-name prescribing. However, it presents specificities that call for adapted responses: high patient awareness but low capacity to act, direct financial impact on households, and vulnerability of care protocols to industry influence.

Table 5: Comparison of study findings with international literature.

Theme	Study findings (Mali)	International literature	Convergence/Divergence
Intensity of partnerships	100% receive gifts; 17.4 contacts/day	Frequent and normalized in LMICs ^[13]	Convergence
Kickbacks	3.3% report receiving	Common in Pakistan ^[7]	Divergence (possible underreporting)
Brand-name prescribing	73.2% on average	68% in Nigeria ^[28] ; >80% in India ^[29]	Convergence
Exposure-prescription correlation	Not significant ($r = 0.13$)	Pooled OR = 2.52 ^[8]	Divergence (ceiling effect, measurement bias)
Patient awareness	100% aware	34% in US ^[20] ; 84% in Australia ^[22]	Divergence (higher awareness in Mali)
Financial impact on patients	42.2% forgone care	Less documented in high-income countries	Malian specificity
Influence on protocols	33% of drafters consider participation unacceptable	No empirical study identified ^[8]	Global gap, Malian urgency

Note: LMIC = low- and middle-income country; OR = odds ratio.

These results have important implications for health policy in Mali.

First, it is urgent to strengthen the regulatory framework governing interactions between the pharmaceutical industry and health professionals. This framework should clearly define permitted and prohibited interactions and equip regulatory authorities with sufficient enforcement capacity. WHO has published guidelines for managing conflicts of interest in health policy and practice, recommending transparency of financial ties, prohibition of gifts of significant value, and separation between promotional activities and continuing medical education.^[26] These guidelines should inform regulation adapted to the Malian context.

Second, transparency must be elevated to a fundamental principle. Establishing public disclosure mechanisms for conflicts of interest modeled on the US Sunshine Act would allow patients and the public to know the relationships between their physicians and industry. This transparency is a prerequisite for trust and accountability.

Third, training for health professionals both initial and continuing must integrate modules on ethics and conflict-of-interest management. These modules should draw on

concrete examples from the local context and sensitize professionals to the psychological mechanisms that render them vulnerable.

Fourth, independent sources of drug information should be promoted such as academic detailing, which tasks independent professionals with providing evidence-based prescribing information free of commercial influence. This approach has demonstrated effectiveness in several countries.^[27]

Fifth, patients must be informed and empowered. Awareness campaigns could help them understand the issues at stake, know their rights, and feel entitled to ask about generic alternatives. Patient associations and civil society have a crucial role to play.

Finally, research must continue to fill the gaps we have identified. Longitudinal studies are needed to establish causality between industry exposure and prescribing practices. Qualitative research will deepen our understanding of influence mechanisms in the Malian context. Research on industry influence in protocol development is urgent. And studies on the clinical impact of irrational prescribing would quantify consequences for patient health.

This study has several limitations. First, reliance on self-reported data exposes the study to recall and social desirability bias, both for exposure to industry benefits and for prescribing practices. Second, sample size for certain analyses, particularly those involving kickbacks was insufficient for robust statistical testing. Third, the study focused on a single commune of Bamako, limiting generalizability to all of Mali. Fourth, the cross-sectional design of the quantitative phase does not permit causal inference. Finally, the study did not measure final clinical outcomes such as mortality or quality of life. These limitations are inherent to the study design and do not invalidate the findings, but they should inform interpretation.

CONCLUSION

Pharmaceutical partnerships in Mali are intense, normalized, and coexist with high rates of brand-name prescribing an indicator of irrational prescribing. Although exposure to industry benefits was not directly correlated with brand-name prescribing in this study, the normalization of these practices and their financial impact on patients demand urgent, context-adapted regulation.

These results, viewed alongside our international systematic review, argue for action at multiple levels. The regulatory framework must be strengthened by clearly defining permitted and prohibited interactions and equipping authorities with effective enforcement tools. Transparency must be elevated to a fundamental principle, with public disclosure mechanisms modeled on the US Sunshine Act. Training for health professionals must integrate ethics and conflict-of-interest management. And research must continue to fill the gaps we have identified particularly regarding industry influence in care protocol development and the clinical impact of irrational prescribing. The ultimate goal is to protect the therapeutic relationship and ensure that every prescription in Mali is truly made in the patient's interest.

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Declarations

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Competing Interests. The authors declare no conflicts of interest related to this work.

Ethics Approval. The study received approval from the Ethics Committee of the Faculty of Medicine and Odontostomatology (FMOS) at the University of Sciences, Techniques and Technologies of Bamako (approval no. 2026/97/CE/USTTB, April 14, 2026).

Consent to Participate. Written informed consent was obtained from all participants; for non-literate patients, oral consent was witnessed by an independent observer.

Data Availability. The data supporting this study are available from the corresponding author upon reasonable request.

Author Contributions

AAC conceptualized and designed the study, collected and analyzed data, and drafted the manuscript. AD contributed to study design, data analysis, and critical revision. HG, MD, TYA, and YSS contributed to data collection and critical revision. KK supervised the study and critically revised the manuscript. All authors approved the final version.

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