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Corruption can cause healthcare deprivation: Evidence from 29 sub-Saharan African countries

Chei Bukari [a,1,*], Suman Seth [a,b], Gaston Yalonetkzy [a,b,c]

[a] *Economics Department, Leeds University Business School, University of Leeds, UK*
[b] *Oxford Poverty & Human Development Initiative (OPHI), University of Oxford, UK*
[c] *International Inequalities Institute, London School of Economics and Political Science, UK*

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ABSTRACT

The WHO estimates that nearly half of the world's population lacks access to essential healthcare, and that the proportion of the population with catastrophic out-of-pocket health spending (10% or more of the household budget) is on the rise. Meanwhile, the United Nations' General Assembly has recently identified corruption as a vital factor undermining efforts to accomplish universal health coverage. We examine how corruption may lead to healthcare deprivation in the context of 29 sub-Saharan African countries, employing the fifth, sixth and seventh waves of the Afrobarometer survey spanning 2011–2018. Applying an instrumental variable framework, we find that the experience of corruption in the form of bribe payments as well as the frequency of bribe payments within the healthcare sector increases the likelihood of healthcare deprivation. Moreover, corruption experienced in other sectors, such as education, the police, public utilities and identification authorities, have spill-over effects affecting healthcare deprivation adversely. Further analysis reveals that the experience of corruption in multiple sectors simultaneously worsens healthcare deprivation. Our findings suggest that mitigating corruption in the healthcare sector alone may not be sufficient to end the adverse effect of corruption on effective healthcare access in SSA countries. Finally, through mediation analysis, we show that loss of income and loss of trust are two channels through which corruption influences healthcare deprivation.

1. Introduction

Globally, nearly four billion people lack essential access to healthcare and, annually, over 250 million are pushed near or below the World Bank's extreme poverty line due to healthcare costs including unexpected healthcare expenses (World Health Organization (WHO), 2017). Studies suggest that households should not spend more than 10–25 % of their annual total consumption expenditure or income to pay for healthcare because exceeding such thresholds could be catastrophic (Wagstaff et al., 2018). Yet, recent 2019 projections show that the world's population facing such catastrophic healthcare payments (i.e., 10 % of household total consumption or income) to have been one billion in 2020 and will remain high at 984 million in 2030 (WHO, 2020). Furthermore, approximately four million people die every year from healthcare deprivation, which can be described as a situation whereby an individual goes without medical care when they need it, in developing countries (Kruk et al., 2018). The welfare loss from

healthcare deprivation is also well documented (see e.g., Olken, 2006), where, in 2015 alone, for instance, the economic loss from healthcare deprivation accounted for over 15 % of the Gross Domestic Product (GDP) in sub-Saharan Africa (SSA hereafter) (Kruk et al., 2018).

Among different factors affecting healthcare deprivation, corruption is scantly researched. Yet there is evidence that one in every four persons in developing countries is coerced to pay a bribe to access healthcare and education services (Transparency International, 2019, p.5), where medical staff demand bribes and charge higher than formal fees from patients for rendering public healthcare services (Lewis, 2006; Lindelow & Serneels, 2006; Mostert et al., 2015). Out of the $7.5 trillion annual allocation to the health sector worldwide, around $500 billion is lost to corruption and, regrettably, this amount is more than enough to achieve universal health coverage by 2030 (García, 2019; Transparency International, 2021). Corruption, in general, is considered one of the most pervasive barriers to sustainable political, economic and social development (Wang & You, 2012; OECD, 2018). In developing countries,

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* Corresponding author at: Leeds University Business School, University of Leeds, Leeds LS2 9JT, UK.
E-mail addresses: bncbu@leeds.ac.uk (C. Bukari), s.seth@leeds.ac.uk (S. Seth), g.yalonetkzy@leeds.ac.uk (G. Yalonetkzy).
[1] ORCID ID: https://orcid.org/0000-0002-3872-4050.

corruption presents the poor with harsh trade-offs. The poor constantly need to choose between paying bribes to access public goods and services (e.g., healthcare, the police, school authorities, civil registry authorities, licenses/permits) and forgoing other necessities, such as food, rent, water, electricity etc. Corruption is more pronounced within African countries due to insubstantial regulation and oversight of public officials (Collier, 2000; Pelizzo et al., 2016; International, 2019; Bukari & Anaman, 2020).

In this paper, we are primarily interested in examining whether, and how, corruption leads to healthcare deprivation, especially in the context of SSA countries. We provide robust evidence on the nexus between corruption and healthcare deprivation using the fifth, sixth and seventh waves of the Afrobarometer survey spanning the period of 2011–2018 and covering 132,165 sample individuals across 29 SSA countries.

Our study contributes to the literature in two additional ways. First, studies examining the effect of corruption can be divided into two broad categories: macro-level and micro-level. Macro-level studies on the effect of corruption on poverty and inequality abound and date back to the 1990s (see, Mauro, 1995 Treisman, 2000; Gupta, Davoodi & Tiongson, 2001; Aidt, 2003) whereas micro-level studies are comparatively more recent (Hunt, 2007; Mocan, 2008; Reinikka & Svensson, 2011; Justesen & Bjørnskov, 2014; Olabiyi, 2021). Our study contributes to the micro-level strand of the literature for the SSA countries. Second, most of the micro-level studies on corruption have focused on the reasons why people and firms bribe government officials.[2] By contrast, much less is known about how corruption affects ordinary citizens' access to basic public services and deprivation in different dimensions of well-being. We study the consequences of corruption rather than the causes of corruption, especially on the less privileged as they struggle to meet the necessities of life. We contribute by directly examining how actual experiences of different types of corruption, separately as well as collectively, have implications for healthcare deprivation. To the best of our knowledge, we are the first to empirically show the spillover effects as well as multisectoral effects of corruption experience on healthcare deprivation in the context of SSA countries.

The estimation of the effect of corruption on healthcare deprivation may be hampered by different sources of endogeneity, such as omitted variable bias, reverse causality and measurement error. To mitigate the potential endogeneity in our estimation, we justify and use 'police roadblocks' as an instrumental variable (henceforth IV) for bribe payments – the variable that we use as an indicator of individuals' corruption experience. We first show that the experience of corruption in the healthcare sector itself has a deleterious effect on healthcare deprivation. The likelihood of encountering healthcare deprivation increases significantly whenever individuals experience corruption at least once compared to never experiencing corruption at all. We further observe that the frequency of bribe payments also intensifies the likelihood of healthcare deprivation. For individuals that often experience healthcare sector corruption, their likelihoods of experiencing healthcare deprivation *several times*, *many times*, and *always* increase by 9.0, 15.6, and 36.3 percentage points, respectively, relative to those that *never* experience healthcare sector corruption.

Second, we show that the experiences of corruption in four other sectors, other than the healthcare sector, have negative spill-over effects on healthcare deprivation, thereby signalling that mitigating corruption in the healthcare sector alone may not be sufficient to reduce corruption's effect on healthcare deprivation. Specifically, we find that the likelihood of healthcare deprivation increases by 9.0–36.3 percentage points among people paying bribes *often* to medical staff compared to those who have *never* paid bribes. Likewise, the magnitudes for the

likelihood of healthcare deprivation increase for paying bribes to school authorities, to the police, to the public utility sector (e.g., water, sanitation, electricity services) officials and to the identification authorities (e.g., for driver's licenses, passports, permits) are 1.4–26.8, 4.2–14.2, 9.0–27.6 and 3.1–21.0 percentage points, respectively. Third, using a counting measure of multisectoral corruption experiences, we observe that the likelihood of healthcare deprivation increases with multisectoral corruption experiences. We further examine potential channels through which corruption experience affects health deprivation. In particular, we probe the mediating roles of income loss (captured in terms of running out of cash) and loss of trust in public institutions. We find strong evidence that corruption experience influences healthcare deprivation through these two channels in SSA countries.

The rest of the paper proceeds as follows. Section 2 discusses about the data and the key variables for corruption and healthcare deprivation that we employ for our analysis. Section 3 demonstrates the conceptual framework and hypotheses for the corruption and healthcare deprivation nexus. Section 4 introduces the methodological framework in terms of econometric specifications and outlines the empirical strategy. Section 5 presents the empirical findings on how corruption experience in the healthcare sector, corruption experiences in other sectors and multisectoral corruption experiences lead to healthcare deprivation. Section 6 conducts mediation analyses to explore how corruption affects healthcare deprivation through two key channels: loss of income and loss of trust on public institutions. The final section provides concluding remarks.

2. Data and key variables

We employ the well-known Afrobarometer surveys conducted in more than 30 African countries. Afrobarometer collects public opinion information in Africa on key political, social, and economic issues (Bratton & Gyimah-Boadi, 2015). Between 1999 and 2018, seven waves of surveys have been completed. Afrobarometer employs a two-stage stratified sampling with a nationally representative sample of 1,200–2,400 adult individuals (18 years and above) in each wave and for each country.[3] Afrobarometer surveys contain information on two key variables of our interest: experience of corruption in the form of paying bribes and lack of access to basic healthcare services.

For the corruption part, respondents are asked about their experiences with paying bribes in return for obtaining public services in five sectors. Specifically, they are asked: *In the past 12 months, how often, (if ever) did you have to pay a bribe, give a gift, or do a favour to a government official in order to get (a) basic household services like water, sanitation and electricity services, (b) admission or service for a child into a school, (c) identity documents like birth certificates, passport, voter's ID, driver's license or a permit of any kind, (d) medical care in a hospital or clinic, and (e) assistance from the police or avoid a problem like being arrested, fined or freely passing a checkpoint.* For each of the five questions, respondents are required to answer from five options: (i) *never*, (ii) *once/twice*, (iii) *a few times*, (iv) *often*, and (v) *no experience with this in the past year*. For the healthcare deprivation part, the respondents are specifically asked: *Over the past year, how often, if ever, have you or anyone in your family gone without medicines or medical treatment?* Respondents are again required to answer from five options: (i) *never*, (ii) *just once/twice*, (iii) *several times*, (iv) *many times*, and (v) *always*.

For our purposes, we only employ the fifth, sixth and seventh waves, spanning the period 2011–2018 and covering 34, 34, and 36 SSA countries, respectively. We are unable to use the first four waves because, in addition to covering fewer countries, they contain insufficient information on corruption experience compared to waves five to seven. The Afrobarometer surveys, in addition, provide detailed

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[2] For the case of firms, see Svensson (2003) and Sequeira (2016). For the case of individuals, see Reinikka and Svensson (2004), Bertrand et al. (2007) and Olken (2007).

[3] Further details about the surveys are available from https://www.afrobarometer.org/surveys-and-methods/.

information on the respondents' demographic characteristics, health, income, education, and other economic indicators as well as information on how the governments of African nations perform on a set of governance indicators. After accounting for missing observations across all three waves, we have a usable sample size of 132,165 individuals from 29 SSA countries that are covered by all three waves.[4] Table A1 and Table A2 in the Appendix provide detailed information on the definitions and measurement of our key variables including other control variables and their descriptive statistics, respectively.

3. Corruption and healthcare deprivation nexus: Concepts and hypotheses

Universal healthcare coverage strives to ensure that all citizens, irrespective of their socio-economic situation, have access to the healthcare they need, when and where they need them, and most crucially, without incurring undue financial hardship from illness or informal payments (WHO, 2021). A key challenge arises when public officials ask for informal payments or *bribes* in exchange for healthcare services that are otherwise free, or they charge prices in excess of formal fees. Corruption may emerge in different forms, thus defying one particular definition; but, in this paper we refer to public sector corruption which manifests through *the abuse of delegated power in public office for private gains* (Jain, 2001; Aidt, 2003; Rose-Ackerman, 2007). Corruption, some argue, is the biggest threat to ensuring good health and well-being under the third Sustainable Development Goal (SDG) (García, 2019, p.1) and can be a matter of life or death, especially for the poor and the vulnerable (Hussmann, 2010; Transparency International, 2019). Bribes, in developing countries, rank among the top four most prevalent forms of corruption in the health sector (see, Onwujekwe et al., 2019).

Conceptually, there are two competing views on how corruption could influence healthcare deprivation: *grease-the-wheels* and *sand-the-wheels*. According to the former (Lui, 1985: Huntington, 1968; Leff, 1964), public institutions are poor and weak, induced by deep-rooted and needless bureaucratic procedures in the provision of critical services. Thus, the able-to-do individuals (i.e., 'the haves') use corruption to circumvent bureaucratic barriers and speed up processes to their advantage, engendering efficiency and correcting market failures in public institutions (Leff, 1964; Aidt, 2003). The grease-the-wheel view may be beneficial for the able-to-do individuals but may be detrimental to the poor. Public goods and services are essential for the poor (i.e., 'the have-nots'), who do not have readily available market alternatives, and corrupt public officials leverage the situation, imposing illegal demands in exchange for those public goods and services (Misangyi et al., 2008; Méon & Weill, 2010; Dreher & Gassebner, 2013).

The sands-the-wheels view (Rose-Ackerman, 1975; Mauro, 1995; Bardhan, 1997; Mo, 2001), in contrast, posits that corruption causes misallocation of resources (Acemoglu & Verdier, 1998; Bertrand et al., 2007; Liu & Mikesell, 2014) and increases the cost of accessing public services (see, e.g., Gupta, Davoodi & Tiongson, 2001; Matsushima & Yamada, 2016; World Bank, 2021), and they both, in turn, aggravate deprivations. A bribe-taking public health official may decide to prioritise bribe-paying patients over the 'have-not' patients who may be in more urgent need of those services but are unable to compete against the briber-payers due to limited financial resources. Anecdotal evidence confirms that hospital beds in Ethiopia are given to patients with corrupt links over those who are in more dire need (Lindelow & Serneels, 2006, pp. 2229).

Corruption can also exacerbate deprivation on certain practical grounds. First, public healthcare institutions are known to be underfinanced in developing countries accompanied by often low quality of healthcare (Gaál et al., 2010; Habibov et al., 2017). Underfinanced health systems compel poor patients to finance their healthcare constantly, even for those covered by national health insurance policy (e.g., national health insurance in some developing economies, such as Ghana, does not cover all hospital bills). Simultaneously, most developing economies are non-digitalized, which creates a fertile ground for an 'underground economy' wherein healthcare workers either charge extra or request informal payments in exchange for enabling or dealing favourably with the patient's healthcare. Finally, although some patients are fully aware that the health services offered to them ought to be free, the medical staff insists on bribing them for executing their formal duties, such as registering patients, giving injections, and changing bed linen (Lewis, 2006; Vian, 2008). Regrettably, patients may not have a choice under such circumstances: either they comply with the bribes demanded or medical care is refused (Mostert et al., 2015).

Table 1 shows the simple association between the experience of corruption and healthcare deprivation among adults in the three waves of the Afrobarometer surveys covering all 29 countries, using the set of variables on corruption and healthcare deprivation presented in Section 2. We divide the sample individuals in each wave into a group of those who have paid bribes and those who have not. A respondent is deemed to have 'paid bribe' if they claim to have experienced paying bribes in a sector at least once (i.e., once/twice, a few times or often). Otherwise, a respondent is considered to have 'paid no bribe' if they claim to have never paid a bribe or have had no experience of paying bribes in the past year. Each cell of Table 1 shows the incidence of healthcare deprivation or the percentage of individuals experiencing healthcare deprivation for two groups (i.e., those who paid bribe and those who did not) by sectors across the three waves. We first look at the correlation between the experience of corruption in the healthcare sector and healthcare deprivation. We observe that the incidences of deprivation range between 67.4 % and 73.4 % across three waves among those that have paid bribes, whereas the same range between 48.5 % and 51.6 % among those that have not paid bribes. Clearly, the experience of paying bribe in the healthcare sector is associated with higher incidence of healthcare deprivation.

We thus hypothesize that *bribe payment in the health sector and its frequency decrease the bribe-payer's access to healthcare and, consequently, cause healthcare deprivation*. Note that we not only aim to examine whether bribe payment matters but we additionally aim to examine whether its frequency (i.e., once/twice, a few times or often) matters. The corresponding null hypothesis requires that both the incidence and the frequency of bribe payments in the healthcare sector are

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Table 1

Incidences of healthcare deprivation by corruption across sectors and across waves.

	2011/13 (wave 5)		20014/15 (wave 6)		2016/18 (wave 7)	
	Paid bribe	Paid no bribe	Paid bribe	Paid no bribe	Paid bribe	Paid no bribe
Healthcare sector	73.4 %	51.6 %	67.4 %	48.5 %	70.2 %	51.4 %
Education sector	71.3 %	53.0 %	65.6 %	49.1 %	67.3 %	52.1 %
Police	64.2 %	53.3 %	64.0 %	49.1 %	61.4 %	52.1 %
Public utility	67.0 %	53.6 %	61.4 %	49.5 %	62.1 %	52.6 %
Identification authorities	64.9 %	53.0 %	62.6 %	48.9 %	61.8 %	52.3 %
Multisectoral corruption	65.1 %	50.5 %	61.0 %	47.6 %	62.7 %	50.3 %

Source: Authors' own computations based on the fifth, sixth and seventh waves of Afrobarometer surveys.

uncorrelated to the bribe-payer's healthcare deprivation.

Of course, corruption in developing countries is also prevalent in other sectors outside healthcare (e.g., police, education, identity card applications and many others) and it may have spill-over effects influencing healthcare deprivation (United Nations Office on Drugs and Crime, 2019; Ferrari & Salustri, 2020), which is also supported by the figures in Table 1. There, we also present the incidences of deprivation by bribe payments to four other sectors, namely, to the education sector, to the police, to the public utility sector and to the identification authorities. Incidences of healthcare deprivation range between 48.9 % and 53.6 % among those who have not paid bribes, whereas the incidences of healthcare deprivations consistently range between 61.4 % and 71.3 % among those who have paid bribes at least once in the past 12 months. In the final column, we report the incidences of healthcare deprivation by dividing the individuals into a group of those who have not experienced corruption in any of the five sectors and a group of those who have experienced corruption at least once in at least one of the five sectors (i.e., the multisectoral corruption). Notably, the association persists at the multisectoral level. We therefore aim to further examine whether and how corruption in the form of paying bribes in these sectors, separately as well as collectively, affect the bribe-payer's healthcare deprivation, hypothesizing that *bribe payments in exchange for public services in sectors outside healthcare, have a negative spillover effect on healthcare deprivation and the intensity of multisectoral corruption experience cause higher healthcare deprivation.*

4. Empirical strategy and econometric specification

Given that our key dependent variable (i.e., healthcare deprivation) of interest is ordered categorical in nature, we use an ordered probit model to specify the link between corruption experience and healthcare deprivation, as follows:

$$
\begin{aligned}
\Pr(H_{ijw} = h) &= \Pr(k_{h-1} < \alpha C_{ijw} + X_{ijw}\beta + v_{ijw} \leq k_h) \\
&= \Phi(k_h - \alpha C_{ijw} - X_{ijw}\beta) - \Phi(k_{h-1} - \alpha C_{ijw} - X_{ijw}\beta).
\end{aligned}
\tag{1}
$$

In Equation (1), H_{ijw} is our ordered categorical outcome variable (healthcare deprivation) for individual i in country j and in wave w, having five categories: never ($= 1$), just once/twice ($= 2$), several times ($= 3$), many times ($= 4$), and always ($= 5$) so that $h \in \{1, 2, 3, 4, 5\}$ where 'never' is used as the baseline category. The following restriction applies to k_h's: $-\infty = k_0 < k_1 < k_2 < k_3 < k_4 < k_5 = \infty$. On the right-hand side of Eq. (1), C_{ijw} is an ordered categorical variable with four categories: (i) *never paid a bribe*, (ii) *paid bribe once/twice*, (iii) *paid bribe a few times*, and (iv) *paid a bribe often*, where those who 'never paid a bribe' is used as the baseline category. Variable C_{ijw} aims to capture, albeit imperfectly, the frequency of bribe payment of individual i in country j in wave w. The coefficient of interest α, consisting of three coefficients with respect to one reference category, measures the effect of the incidence of bribe payment and the frequency of bribe payments on healthcare deprivation. Finally, X_{ijw} is a vector of control variables with parameter vector β, and v_{ijw} is the error term that follows a standard normal distribution.

We note that the corruption experience variable C_{ijw} in Eq. (1) may suffer from some sources of endogeneity. One such source is omitted variable bias. For example, it is difficult in our context to control for people's attitudes and innate abilities and so they remain unobserved. These unobserved factors may affect both deprivation (Blank, 2003) and corruption experience (Truex, 2011; Gatti et al., 2003). Positive attitudes and abilities may be associated with less tolerant attitudes toward corruption and thus less exposure to corruption experience, whereas negative attitudes and abilities may be associated with the converse. Unobserved factors may lead to either underestimation (downward bias) or overestimation (upward bias) of the corresponding coefficient. In a multivariate regression framework, it is difficult to rule out more than one omitted variable so it is not possible to predict the direction of the overall bias (Forbes, 2000). A second source of endogeneity could be the existence of reverse causality, which may manifest as follows. Paying bribes may drive individuals into healthcare deprivation, but then people lacking access to healthcare may be more susceptible to paying bribes to access such healthcare services. Reverse causality may also result in either overestimation or underestimation, again rendering the prediction of the overall direction of bias difficult (Forbes, 2000). Finally, corruption is a delicate issue where both the bribe-givers and bribe-takers may be punishable by law. It is thus possible that some respondents may underreport their actual levels of corruption experience for fear of self-incrimination (Heywood & Rose, 2014). Thus, such measurement error may lead to a third potential source of endogeneity.

To overcome the foregoing sources of endogeneity, we pursue an instrumental variable (IV) estimation strategy. We use *police roadblocks* as an IV for corruption experience. What are police roadblocks? Most road network systems in SSA countries are non-digitised, i.e., they lack street cameras, digital tollbooths, and other modern monitoring equipment. It is thus likely that some road users may easily get away with crimes, such as not fastening their seat belts and possessing illegal driving licenses and fake registration cards. In order to guard against such deviance, the police in these countries often erect roadblocks or tollbooths, primarily as checkpoints, to check citizens' identity, to authenticate the legalities of licenses and car registrations as well as verify compliance with seatbelt usage. In the Afrobarometer survey, the information on police roadblocks is collected using a two-step approach. Besides asking the respondents about their knowledge of the existence of police roadblocks in their enumeration areas in the first step, the enumerators cross-validate the presence of such roadblocks by themselves in the second step to reconcile any inconsistencies.

In the context of SSA countries, police roadblocks can engender corruption experience through the following mechanism. The non-digitized nature of the roads requires the physical presence of the police at the roadblocks for them to be effective, which enables face-to-face interactions between the police and road-users. Such interactions provide the police with the leverage to enter into bargains with the road-users to enforce road traffic laws, and roadblocks are frequently used by the police to extort bribes, and in some cases goods, from the road-users. Such bribe-extorting behaviour by police can be justified by Bourdieu's (1991) sociological theory of the state, where the elites, wealthy, politically connected individuals as well as public officials may exercise both 'symbolic power' and 'symbolic violence' over the relatively less privileged people. The corruption experienced from the police themselves may easily transmit to other sectors and embolden the culture of corruption – manifesting in norms, values, and beliefs – in endemically corrupt societies (Smith, 2010).[5] A culture of corrupt practices and other criminal behaviours, which people learn by observing and imitating, changes people's preferences and economic behaviour (Guiso et al., 2006; Fernández, 2011) and sustains across generations. Moreover, most people in such societies easily condone corruption because they have been brought up seeing it as *cultural normality*.[6]

Empirically, numerous studies document how police roadblocks influence corruption in general and particular in SSA. For instance, in a field experiment, Robinson and Seim (2018) studied how roadblocks drive corruption in Malawi where the researchers observed that roadblocks not only generally influence bribe payment but crucially, the police make strategic decisions by disproportionately targeting the

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[5] Such transmission mechanism is supported by social-psychological learning theories (Boyd & Richerson, 1996; Meltzoff et al., 2009) as well as in sociological theories (Bourdieu, 1991).

[6] Such phenomenon is well-established in the criminology literature in general (Thornberry, 2009; Van de Rakt et al., 2009; Besemer & Farrington, 2012) and in the corruption literature in particular (Fisman & Miguel, 2007; Barr & Serra, 2010).

politically powerless in their course of extortions. In Kenya, Onyango (2022) observes that in almost every 10–20 km on most highways, police create roadblocks and extort money from the public (Transparency International, 2020). Roadblocks are so notoriously corrupt in Zimbabwe that the police even demand money from pregnant women and sick people trying to access health facilities (Transparency International, 2020). Owing to widespread bribe payments at roadblocks, the Zimbabweans refer to the ten United States dollar currency note as the 'national identity card' to pass a roadblock (Dube, 2021). Similar cases have been reported in South Africa where police officers at roadblocks had not only forcefully demanded bribes but also stolen money from vehicles (Transparency International, 2020). In 2010, Ghana implemented an unprecedented policy experiment by doubling police salaries as a corruption-mitigating strategy. Instead of the anti-corruption objective though, the salary-boost prompted the police to take more bribes at roadblocks. While Shleifer and Vishny (1993) offer conceptual insights into how police roadblocks generally promote corruption, Olabiyi (2021) shows empirically that police roadblocks significantly influence corruption in SSA countries.

Although we provide arguments and evidence in support of police roadblocks being a strong predictor of corruption experience, we still need to demonstrate that our IV satisfies two crucial conditions: (a) relevance and (b) validity. The relevance condition requires that our IV should be statistically significant in explaining variation in our endogenous variable. Meanwhile, in implementing the two-stage least squares model, if there is significant evidence that our IV is uncorrelated with the error term in the second stage, then the validity condition is achieved. However, note that while the relevance condition can be easily established, the validity condition, cannot be easily ascertained and thus requires some additional testing. For example, using the F-statistics (or the Wald chi-squared in probit estimations) from the first stage and/or the p-value for the coefficient of the IV, we can easily ascertain its relevance or otherwise. By contrast, the validity condition requires that our IV should be independent of the error term in the second stage and only affect the outcome variable through the endogenous variable. Table A3 in the Appendix demonstrates empirically how this criterion is achieved, above and beyond literature citations. Further, we argue that our IV is exogenous since none in the dataset can influence it, and it affects the response variable (health deprivation) only through the endogenous variable as shown in Table A3.

We estimate the predicted values of the endogenous variable using the first stage reduced form equation in Eq. (2):

$$\Pr(C_{ijw} = c) = \Pr(l_{c-1} < \gamma R_{ijw} + X_{ijw}\delta + \varepsilon_{ijw} \leq l_c) \\ = \Phi(l_c - \gamma R_{ijw} - X_{ijw}\delta) - \Phi(l_{c-1} - \gamma R_{ijw} - X_{ijw}\delta) \quad (2)$$

where C_{ijw} is our endogenous variable (experience of corruption) and it is ordered categorical with four outcomes: *never* and *no experience with this in the past year* (= 1), *once/twice* (= 2), *a few times* (= 3), *often* (= 4). The following restriction applies to l_c's: $-\infty = l_0 < l_1 < l_2 < l_3 < l_4 = \infty$. Variable R_{ijw} is our binary IV (roadblock) with γ as its coefficient, X_{ijw} is the same vector of control variables as in Eq. (1) but with parameter vector δ and ε_{ijt} is the error term that follows a standard normal distribution. Equations (1) and (2) are estimated for the experience of corruption in the health sector, the education sector, the police, the public-utility sector, and the identification authorities using the conditional (recursive) mixed process (CMP) estimation.[7]

The same framework may be used for estimating the effect of multisectoral corruption. We measure the multisectoral corruption experience using the following counting procedure.[8] First, we dichotomise the corruption experience in each sector by assigning a value of '1' whenever an individual pays bribe at least once and a value of '0' whenever an individual never pays bribe. Then, we simply count the number of sectors where an individual faces corruption. If an individual does not pay bribes in any sector, then the corruption experience count is equal to zero and if an individual pays bribes simultaneously in all sectors, then the corruption experience count is 5. Therefore, there are six possible corruption experience counts: never pay bribe in any sector (= 1); pay bribe in one sector (= 2); pay bribes in two sectors (= 3); pay bribes in three sectors (= 4); pay bribes in four sectors (= 5); and pay bribes in all five sectors (= 6). We treat the corruption experience counts as an ordinal variable by assuming that a higher count represents higher exposure to corruption. In this case, C_{ijw} becomes the endogenous variable capturing corruption count and the following restriction applies to l_c's: $-\infty = l_0 < l_1 < l_2 < l_3 < l_4 < l_5 < l_6 = \infty$.

5. Empirical findings: Corruption experience leads to healthcare deprivation

In this section, we present our empirical findings. We first present the effect of healthcare sector corruption experience on healthcare deprivation. We then examine and present the effect of corruption experience in other sectors on healthcare deprivation. Finally, we explore the multisectoral effect of corruption experience or the joint distribution of corruption experience in all five sectors on healthcare deprivation.

5.1. Corruption experience in the healthcare sector

Table 2 presents the marginal effect of corruption in the healthcare sector on healthcare deprivation. In Panel A of the table, we report the ordered probit estimates, where in its five columns we present the marginal effects of healthcare sector corruption on five healthcare deprivation categories. In Panel B, we report the instrumental variable (IV) ordered probit estimates for the five healthcare deprivation categories, where our IV is *roadblocks*; and in Panel C, we report the first stage result of the relation between the endogenous variable and the IV. We find strong evidence of endogeneity in healthcare sector corruption (e.g., the endogeneity test in Panel C) and a comparison of the results in Panel A and Panel B shows downward biases in the estimated impacts on healthcare deprivation as the marginal effects in Panel A are relatively smaller than the corresponding estimates in Panel B. For example, Panel A indicates that paying bribe once/twice in the healthcare sector are associated with reducing the likelihood of never experiencing healthcare deprivation by 9.3 percentage points compared never paying such bribes, but the corresponding marginal effect is 30.9 percentage points in Panel B. Thus, IV ordered probit estimates in Panel B are preferred over the ordered probit estimates in Panel A. The first stage results in Panel C confirms that roadblocks (i.e., the IV) positively significantly influence corruption and hence satisfy the relevance condition. Specifically, we find that the existence of roadblocks reduces the likelihood of never experiencing corruption by three percentage points but increases the likelihood of experiencing corruption *once/twice*, *a few times* and

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[7] We use the CMP command in Stata. For more details on how the command is implemented in Stata, see Roodman (2011).

[8] For conceptual discussions and application of counting framework in poverty measurement, see Alkire et al. (2015). For an application of the axiomatic counting framework to measure corruption, see Foster et al. (2012).

Table 2
Marginal effect of healthcare sector corruption on healthcare deprivation.

Panel A: Ordered Probit Estimates

	(1)	(2)	(3)	(4)	(5)
	Never	Once/twice	Several-times	Many-times	Always
Paid bribe once/twice	−0.093***	0.000*	0.025***	0.039***	0.028***
	(0.005)	(0.000)	(0.001)	(0.002)	(0.002)
Paid bribe a few times	−0.125***	−0.002***	0.032***	0.053***	0.041***
	(0.006)	(0.000)	(0.001)	(0.003)	(0.002)
Paid bribe often	−0.177***	−0.007***	0.040***	0.077***	0.067***
	(0.007)	(0.001)	(0.001)	(0.003)	(0.004)
Observations	128,659	128,659	128,659	128,659	128,659

Panel B: Instrumental Variable (IV) Ordered Probit Estimates

	(1)	(2)	(3)	(4)	(5)
	Never	Once/twice	Several-times	Many-times	Always
Paid bribe once/twice	−0.309***	−0.025***	0.047***	0.130***	0.157***
	(0.010)	(0.002)	(0.001)	(0.004)	(0.010)
Paid bribe a few times	−0.366***	−0.044***	0.032***	0.150***	0.227***
	(0.010)	(0.003)	(0.003)	(0.003)	(0.014)
Paid bribe often	−0.435***	−0.075***	0.090	0.156***	0.363***
	(0.009)	(0.004)	(0.006)	(0.002)	(0.021)
Observations	129,034	129,034	129,034	129,034	129,034

Panel C: Instrumental Variable First-Stage Estimates

	(1)	(2)	(3)	(4)	
	Never	Once/twice	Few times	Often	
Roadblock	−0.030***	0.012***	0.010***	0.009***	
	(0.003)	(0.001)	(0.001)	(0.001)	
Wald chi-square[†]	24674.64***				
Endogeneity test[‡]	−0.461***				

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

[†] The Wald chi-square (χ^2) tests the joint significance of our first-stage model under the null hypothesis that all the coefficients including our IV are simultaneously zero.

[‡] The endogeneity test is carried out with the null hypothesis that the IV is uncorrelated with the error term (i.e., the IV is exogenous).

Notes: Dependent variable is healthcare deprivation ranked into five categories as follows: (1) never deprived, (2) deprived just once/twice, (3) deprived several times, (4) deprived many times and (5) deprived always. The key independent variable of interest is corruption, or the frequency of bribe payment, also ordered into four categories as follows: (i) *never*, (ii) *once/twice*, (iii) *a few times*, and (iv) *often*. The base category for corruption experience is *never*. We control the following variables: rural/urban locations, availability of health facility, household size, gender of respondent, age of respondent (logarithm), employment status, and levels of educational attainment. Definitions of variables and descriptive statistics are available in Table A1 and Table A2. Details on the marginal effects for these control variables are available in appendix Table A4. All models control for country- and wave specific fixed effects. Standard errors are reported in parentheses.

often by 0.9–1.2 percentage points.[9]

We now highlight two key findings of our baseline results presented in Panel B of Table 2. First, we find that the healthcare sector corruption experience increases the incidence of healthcare deprivation. Consider the marginal effects in the first column of Panel B. The experience of paying bribes *once or twice* in the past 12 months reduces the probability of never facing healthcare deprivation by an individual by 30.9 percentage points compared to the experience of *never* paying bribes. An alternative interpretation is that an individual never paying bribe in the healthcare sector is 30.9 percentage points more likely to never face healthcare deprivation compared to an individual paying bribe *once or twice*. Similarly, the experience of paying bribes *a few times* and *often* in the past 12 months reduces the probability of never facing healthcare deprivation by an individual by 36.6 percentage points and 43.5 percentage points, respectively, compared to the experience of never paying bribes. Focusing on the second column in Panel B, we observe a similar pattern where the likelihood of facing healthcare deprivation *once or twice* in the last 12 months decreases when an individual experiences corruption at least once compared to never experiencing any corruption. In contrast, consider the results in Columns 3, 4 and 5 of Panel B, where the likelihoods of encountering healthcare deprivation *several-times*, *many-times* and *always* increase whenever an individual experience corruption at least once compared to never experiencing corruption at all.

Second, we observe that not only the incidence of corruption raises the likelihood of healthcare deprivation, but the frequency of payment intensifies it. For instance, comparing the differences in marginal effects across groups (i.e., those who *often* pay bribes vis-à-vis those that pay bribes *once/twice* or *a few times*), we note that the size of the effect is greater for those that paid bribes *often* compared both to those that pay bribes either *once/twice* or *a few times*. Precisely, for individuals who *often* experience healthcare sector corruption, the likelihood of facing healthcare deprivation *several times*, *many times*, and *always* increases by 9.0, 15.6, and 36.3 percentage points, respectively, relative to those that never experience healthcare sector corruption. We test the differences in marginal effects (e.g., pay bribes *often* against pay bribes *once/twice*) and observe that those experiencing corruption more frequently endure higher marginal effects of corruption experience on healthcare deprivation. For example, those who *often* bribe consistently have higher probability of facing healthcare deprivation *several times*, *many times* and *always* compared to those who bribe *once/twice*.[10] Hence, our IV analysis establishes a causal link between the incidence as well as the intensity of experiencing healthcare sector corruption and healthcare deprivation.

5.2. Corruption experience in other sectors: the spillover effects

Can corruption experience in other sectors also affect healthcare deprivation through spillover effects? As we discussed earlier, we specifically look at the corruption experiences in four sectors other than the healthcare sector: the education sector, the police, public utilities and identification authorities. Table 3 shows the marginal effects of corruption experiences in these four sectors on healthcare deprivation. Our

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[9] We carry out some further empirical examinations on the IV validation criterion by simply running an ordered probit regression with all existing covariates including the IV as an additional control variable based on the idea as follows. If the IV only affects the outcome variable through the endogenous variable, then the coefficient of the IV should be insignificant. However, if the IV has a statistically significant effect on the outcome variable, then it is hard to claim that the instrument affects the outcome variable through the endogenous variable only. Table A1 in the Appendix reports these results. We observe that, overall, whether or not corruption is controlled for, our IV does not influence the response variable (health deprivation). Thus, roadblocks is both a relevant and valid instrument in the context of SSA countries for our sample. Our findings support the findings of Olabiyi (2021).

[10] Results available upon request.

Table 3
Spillover marginal effect of corruption experience in other sectors on healthcare deprivation.

Panel A: IV Ordered probit estimates (education sector corruption)

	(1) Never	(2) Once/ twice	(3) Several- times	(4) Many- times	(5) Always
Paid bribe once/twice	−0.259***	−0.019***	0.044***	0.112***	0.122***
	(0.016)	(0.003)	(0.001)	(0.007)	(0.013)
Paid bribe a few times	−0.318***	−0.035***	0.036***	0.136***	0.182***
	(0.016)	(0.005)	(0.003)	(0.006)	(0.019)
Paid bribe often	−0.376***	−0.058***	0.014*	0.152***	0.268***
	(0.016)	(0.006)	(0.008)	(0.003)	(0.028)
Observations	129,148	129,148	129,148	129,148	129,148

Panel B: IV Ordered probit estimates (police corruption)

	(1) Never	(2) Once/ twice	(3) Several- times	(4) Many- times	(5) Always
Paid bribe once/twice	−0.176***	−0.005**	0.041***	0.075***	0.066***
	(0.023)	(0.002)	(0.003)	(0.010)	(0.012)
Paid bribe a few times	−0.226***	−0.013***	0.044***	0.097***	0.097***
	(0.026)	(0.004)	(0.001)	(0.011)	(0.017)
Paid bribe often	−0.281***	−0.025***	0.042***	0.121***	0.142***
	(0.029)	(0.007)	(0.003)	(0.012)	(0.027)
Observations	129,354	129,354	129,354	129,354	129,354

Panel C: IV Ordered probit estimates (public utility sector corruption)

	(1) Never	(2) Once/ twice	(3) Several- times	(4) Many- times	(5) Always
Paid bribe once/twice	−0.249***	−0.019***	0.042***	0.108***	0.118***
	(0.016)	(0.003)	(0.001)	(0.007)	(0.013)
Paid bribe a few times	−0.311***	−0.035***	0.034***	0.133***	0.179***
	(0.016)	(0.005)	(0.004)	(0.006)	(0.019)
Paid bribe often	−0.375***	−0.060***	0.090***	0.150***	0.276***
	(0.015)	(0.006)	(0.008)	(0.002)	(0.028)
Observations	129,354	129,354	129,354	129,354	129,354

Panel D: IV Ordered probit estimates (identification authorities' corruption)

	(1) Never	(2) Once/ twice	(3) Several- times	(4) Many- times	(5) Always
Paid bribe once/twice	−0.205***	−0.008***	0.044***	0.087***	0.082***
	(0.018)	(0.002)	(0.002)	(0.008)	(0.011)
Paid bribe a few times	−0.277***	−0.022***	0.044***	0.119***	0.137***
	(0.020)	(0.004)	(0.001)	(0.008)	(0.017)
Paid bribe often	−0.341***	−0.042***	0.031***	0.143***	0.209***
	(0.021)	(0.006)	(0.006)	(0.006)	(0.027)
Observations	129,267	129,267	129,267	129,267	129,267

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

Notes: Dependent variable is healthcare deprivation ranked into five categories as follows: (1) never deprived, (2) deprived just once/twice, (3) deprived several times, (4) deprived many times and (5) deprived always. The key independent variable of interest is corruption, or the frequency of bribe payment, also ordered into four categories as follows: (i) *never*, (ii) *once/twice*, (iii) *a few times*, and (iv) *often*. The base category for corruption experience is *never*. We control the following variables: rural/urban locations, availability of health facility, household size, gender of respondent, age of respondent (logarithm), employment status, and levels of educational attainment. Definitions of variables and descriptive statistics are available in Table A1 and Table A2.All models control for country- and wave specific fixed effects. Standard errors are reported in parentheses. Details of the marginal effects of the first-stage estimates and tests for the IV ordered probit models and the marginal effects of the simple ordered probit model are available in appendix Tables A5 and A6, respectively.

findings confirm the existence of adverse causal spillover effects of corruption in these sectors on healthcare. The marginal effects in all four sectors display a similar pattern to that observed for the causal effect of the healthcare sector corruption experience on healthcare deprivation.

Besides the incidences of corruption experience, the frequencies of corruption experience also affect healthcare deprivation. We further observe that the marginal effects of corruption experience in the education sector and in public utilities are larger in magnitudes than those in the other two sectors. For example, the likelihoods of *always* encountering healthcare deprivation are much larger in magnitude when an individual experiences corruption compared to never experiencing corruption, whereas the likelihoods of never encountering healthcare deprivation are also larger in magnitude, but negative, when an individual experiences corruption compared to never experiencing corruption.

5.3. Multisectoral corruption experience

Given that the corruption experiences in the healthcare sector and in the four other sectors causally affect healthcare deprivation, it is natural to examine how the compound multisectoral corruption experience affects healthcare deprivation. We have already introduced our approach of capturing multisectoral corruption experience in Section 4.

Table 4 presents the causal estimates of the effect of the multisectoral corruption experience on healthcare deprivation using a two-stage IV ordered probit model. We find that the multisectoral corruption increases healthcare deprivation. Let us first consider the marginal effects in the first two columns of Table 4. Both the likelihood of *never* encountering healthcare deprivation and the likelihood of encountering deprivation *once/twice* gradually decrease as the multisectoral corruption experience increases (e.g., from paid bribe in *one sector* to paid bribe in *all five sectors*) compared to the base category of never paying bribe in any sector and the differential effects between the groups (e.g., pay bribes in *one sector* against pay bribe in *all the five sectors*) are significant at five percent alpha level.[11] Similarly, when we focus on the marginal effects in the final three columns of Table 4, we observe that both the likelihood of encountering healthcare deprivation *several times* and *many-times* and the likelihood of encountering healthcare deprivation *always* gradually increase as the multisectoral corruption experience increases from one sector to five sectors compared to the base category of never paying bribes in any sector. Further, we test the differences in marginal effects between the groups (e.g., pay bribes in *one sector* against pay bribe in *all the five sectors*) and observe that those experiencing corruption in multiple sectors have higher healthcare deprivation outcomes. For example, those who paid bribes *in all five sectors* have higher probability of facing healthcare deprivation *many times* and *always* by 8.5 percentage points and 17.4 percentage points respectively

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[11] Results available upon request.

Table 4

IV ordered probit marginal effect of the multisectoral corruption experiences on healthcare deprivation.

	(1) Never	(2) Once/ twice	(3) Several- times	(4) Many- times	(5) Always
Have paid bribe in one sector	−0.180***	0.001	0.047***	0.073***	0.059***
	(0.019)	(0.001)	(0.004)	(0.008)	(0.008)
Have paid bribes in two sectors	−0.252***	−0.008***	0.055***	0.106***	0.100***
	(0.022)	(0.002)	(0.002)	(0.009)	(0.014)
Have paid bribes in three sectors	−0.294***	−0.017***	0.055***	0.124***	0.131***
	(0.025)	(0.004)	(0.001)	(0.010)	(0.019)
Have paid bribes in four sectors	−0.344***	−0.030***	0.049***	0.145***	0.181***
	(0.025)	(0.006)	(0.003)	(0.009)	(0.025)
Have paid bribes in all five sectors	−0.384***	−0.044***	0.037***	0.158***	0.233***
	(0.027)	(0.007)	(0.007)	(0.007)	(0.035)
Observations	130,136	130,136	130,136	130,136	130,136

*** p < 0.01, ** p < 0.05, * p < 0.1.

Notes: Dependent variable is healthcare deprivation ranked into five categories as follows: (1) never deprived, (2) deprived just once/twice, (3) deprived several times, (4) deprived many times and (5) deprived always. The key independent variable of interest is the multisectoral corruption, which is ordered into six categories as follows: (1) never have paid bribe in any sector (2) have paid bribe in one sector (3) have paid bribe in two sectors (4) have paid bribe in three sectors (5) have paid bribe in four sectors and (6) have paid bribe in all five sectors. The base category for multisectoral corruption is *never have paid bribe in any sector*. We control the following variables: rural/urban locations, availability of health facility, household size, gender of respondent, age of respondent (logarithm), employment status, and levels of educational attainment. Definitions of variables and descriptive statistics are available in Table A1 and Table A2. All models control for country- and wave specific fixed effects. Standard errors are reported in parentheses. Details of the marginal effects of the first-stage estimates and tests for the IV ordered probit models and marginal effects of the simple ordered probit models can be found in appendix Tables A7 and A8, respectively.

compared to those who paid bribe *in one sector*.[12]

6. From corruption to healthcare deprivation: Mediating mechanisms

Having examined the role of corruption experiences in healthcare and other sectors in inducing healthcare deprivation in the previous section, we now explore two specific channels through which corruption may affect healthcare deprivation; namely: (a) loss of income and (b) loss of trust in public institutions.

Bribing presents hard choices, especially for those with lower incomes, as pecuniary losses could entail forgoing basic necessities of life (e.g., food, water, health etc). Both cross-country studies (Gupta, Davoodi, & Alonso-Terme, 2002; Tebaldi & Mohan, 2010) and micro-level studies (Hunt, 2007; Justesen & Bjørnskov, 2014) endorse that corruption increases income inequality and poverty. Field experiments also corroborate that corrupt public officials strategically exploit the poor due to their lack of political connections (Robinson & Seim, 2018) and symbolic power (Bourdieu, 1991). We thus hypothesize that

bribes are associated with a higher likelihood of payers running out of cash, which, in turn, increases the likelihood of healthcare deprivation. The Afrobarometer dataset does not collect information on respondents' incomes, but it asks: *Over the past year, how often, if ever, have you or anyone in your family gone without a cash income?* Respondents are required to answer from five options: (i) *never*, (ii) *just once/twice*, (iii) *several times*, (iv) *many times*, and (v) *always*. We create an indicator of income loss by combining the two responses: *many times* and *always*. In other words, a respondent is considered to experience a significant loss of income whenever the respondent reports going without cash income *many times* or *always* over the past year.

The link between corruption and trust (or social capital in broader sense) has been studied extensively both at the experimental level (Rothstein & Eek, 2009; Banerjee, 2016) and at the non-experimental level (Anderson & Tverdova, 2003; Štulhofer, 2004; Richey, 2010; Morris & Klesner, 2010). Contemporary studies show that, even though corruption and trust can be reinforcing (e.g., Morris & Klesner, 2010), corruption generally influences trust (Anderson & Tverdova, 2003; Štulhofer, 2004; Richey, 2010; Banerjee, 2016). In fact, corruption erodes people's trust in public institutions.[13] Empirical studies also document that individuals experiencing corruption report less trust towards public institutions (Seligson, 2002; Chang & Chu, 2006). For instance, Chang and Chu (2006) found a negative effect of corruption on trust in public institutions, such as the courts, police, and local governments, consistently in Thailand, Taiwan, South Korea, Philippines and Japan. We thus hypothesize that *corruption experience is associated with having less trust in public institutions, which in turn decreases people's proclivity to access public services including public healthcare services, thereby increasing the likelihood of healthcare deprivation.* To capture loss of trust in public institutions, we focused on four key institutions: the courts, police, presidency, and local government.[14] The Afrobarometer survey specifically asks: *How much do you trust each of the following: courts of law, president, police, local government authorities?* The respondents are required to answer one of the four options: (i) *not at all*, (ii) *just a little*, (iii) *somewhat*, and (iv) *a lot*. We create four binary variables where an individual is considered to reflect loss of trust on an institution whenever the respondent answers *not at all* to the question.

Our mediation analysis involves two steps as standard in the economics literature (Alesina & Zhuravskaya, 2011; Churchill & Smyth, 2022). The first step shows that each mediator is statistically significantly correlated with corruption experience. Table 5 presents the results for the effects of corruption experiences in and outside the healthcare sector, respectively, on the two mediators: loss of income and loss of trust in public institutions. First, we look at the corruption experience in the healthcare sector (see Panel A). The first column of Table 5 reports the effect of corruption on loss of income. We observe that paying bribes is positively associated with a greater likelihood of a respondent reporting running out of cash. Precisely, individuals that paid bribes *once/twice, a few times* or *often* are more likely to run out of cash by 4.9, 7.2 and 13.0 percentage points, respectively, compared to those that have never paid bribes. In the final four columns, we report the effect of corruption on loss of trust in courts, the police, the president

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[12] Results available upon request.

[13] According to World Bank (1997, p. 102), "corruption violates the public trust and corrodes social capital…Unchecked, the creeping accumulation of seemingly minor infractions slowly erodes political legitimacy." Most recently, the World Health Organisation (2023, p. 1) reiterated this concern by stating that "corruption not only causes severe financial waste……., but also undermines the trust that underpins effective, accountable and inclusive health systems and national institutions".

[14] We consider these four public institutions for their roles in fighting corruption and maintaining trust in public institutions in general. While the police are responsible for arresting corrupt government officials, the courts are entrusted with prosecuting criminal offences. Meanwhile, the presidency and the local governments must have the 'political will' to fight corruption in government/state institutions.

Table 5

Marginal effect of corruption experience on loss of income and loss of trust in public institutions.

	(1)	(2)	(3)	(4)	(5)
	Loss of income	Loss of trust in public institutions			
		Courts	Police	Presidency	Local Govts.
Panel A: Healthcare sector corruption					
Paid bribe once/twice	0.049***	0.013***	0.034***	0.026***	0.035***
Paid bribe a few times	0.072***	0.041***	0.046***	0.057***	0.051***
Paid bribe often	0.130***	0.104***	0.136***	0.118***	0.137***
LR test	23156.310***	6140.500***	8378.330***	5807.420***	6184.030***
Pseudo R2	0.132	0.055	0.060	0.048	0.047
Observations	128,772	123,550	126,815	124,291	129,174
Panel B: Education sector corruption					
Paid bribe once/twice	0.042***	0.018***	0.031***	0.045***	0.041***
Paid bribe a few times	0.060***	0.035***	0.038***	0.057***	0.053***
Paid bribe often	0.115***	0.099***	0.095***	0.096***	0.111***
LR test	22990.950***	6008.00***	8111.060***	5724.350***	6036.860***
Pseudo R2	0.1309	0.053	0.058	0.048	0.046
Observations	128,887	123,669	126,943	124,410	129,289
Panel C: Police corruption					
Paid bribe once/twice	0.006	0.018***	0.050***	0.040***	0.030***
Paid bribe a few times	0.043***	0.048***	0.074***	0.072***	0.060***
Paid bribe often	0.090***	0.100***	0.173***	0.110***	0.113***
LR test	22975.780***	6169.390***	8697.570***	5929.930***	6150.290***
Pseudo R2	0.131	0.055	0.062	0.049	0.047
Observations	129,097	123,858	127,173	124,595	129,492
Panel D: Public utility sector corruption					
Paid bribe once/twice	0.004	0.002	0.028***	0.030***	0.012*
Paid bribe a few times	0.039***	0.021**	0.042***	0.050***	0.030***
Paid bribe often	0.097***	0.097***	0.096***	0.130***	0.120***
LR test	22866.990***	5977.810***	8159.510***	5721.560***	5964.380***
Pseudo R2	0.130	0.053	0.059	0.048	0.045
Observations	129,100	123,865	127,157	124,604	129,496
Panel E: Identification authority corruption					
Paid bribe once/twice	0.020***	0.028***	0.051***	0.035***	0.038***
Paid bribe a few times	0.067***	0.049***	0.073***	0.077***	0.051***
Paid bribe often	0.109***	0.108***	0.130***	0.123***	0.128***
LR test	22985.570***	6123.720***	8410.700***	5868.460***	6131.740***
Pseudo R2	0.131	0.054	.060	0.049	0.047
Observations	129,007	123,772	127,061	124,527	129,410
Panel F: Multisectoral corruption					
Paid bribes in one sector	0.028***	0.034***	0.059***	0.040***	0.043***
Paid bribes in two sectors	0.061***	0.051***	0.091***	0.067***	0.070***
Paid bribes in three sectors	0.068***	0.062***	0.101***	0.087***	0.085***
Paid bribes in four sectors	0.091***	0.052***	0.065***	0.084***	0.082***
Paid bribes in all five sectors	0.093***	0.071***	0.093***	0.119***	0.089***
LR test	23193.57***	6220.86***	8756.90***	6100.17***	6340.45***
Pseudo R2	0.131	0.055	0.063	0.050	0.048
Observations	129,856	124,535	127,852	125,313	130,280

*** p < 0.01, ** p < 0.05, * p < 0.1.

Notes: The indicator of the dependent variable *loss of income* is a dichotomous variable, which is equal to 1 if the respondent reports running out of cash *many times* or *always* in the past year and 0 otherwise. The dependent variables in columns (2), (3) (4), and (5) are the respondent's trust in the *courts*, *police*, *the president*, and *the local government*, respectively. Each is dichotomized and is equal to 1 if the respondent does not at all trust the courts, police, the president and local government, respectively, and 0 otherwise. The key independent variable of interest is corruption ordered into four categories: *never paid bribe, paid bribe once/twice, paid bribe a few*

times, and *paid bribe often*. The multisectoral corruption is ordered into six categories as follows: (1) never have paid bribe in any sector (2) have paid bribe in one sector (3) have paid bribe in two sectors (4) have paid bribe in three sectors (5) have paid bribe in four sector and (6) have paid bribe in all five sectors. The base category for multisectoral corruption is *never have paid bribe in any sector*. All marginal effects are estimated using probit models. The control variables include respondents' characteristics, such as age, gender, employment status, educational attainment, and rural–urban place of residence as well as controls for country- and wave fixed effects. Definitions of variables and descriptive statistics are available in Table A1 and Table A2. The marginal effect is the average marginal effect of individuals who have faced varying degrees of corruption compared to those who never faced corruption holding all covariates fixed.

and the local government, respectively, showing positive associations between corruption and the increased likelihood of loss of trust on these four institutions. Specifically, for individuals that paid bribes *often* in the healthcare sector are more likely to show no trust at all on the courts, the police, the president and the local government by 10.4, 13.6, 11.8 and 13.7 percentage points, respectively, compared to those that have reported never paid bribes.

We observe similar associations between the corruption experiences in other sectors presented in Panels B-E (i.e., the education sector, the police, the public utility sector and the identification authorities) and the likelihoods of income loss and loss of trust in public institutions. Finally, the higher intensity of multisectoral corruption experience (see Panel F) is also associated with greater likelihoods of a respondent reporting running out of cash as well as increased likelihood of loss of trust on four institutions. Specifically, the likelihoods of running out of cash and a complete lack of trust on the institution gradually increase as respondents experience a larger number of corruptions in multiple sectors. Thus, our overall findings confirm that loss of income and loss of trust in public institutions are channels through which corruption influences healthcare deprivation. Our finding that corruption erodes trust in public institutions is also consistent with existing studies (Seligson, 2002; Chang & Chu, 2006). Likewise, our finding that corruption pushes people into monetary poverty by running out of cash is also well documented (see, e.g., Hunt, 2007; Justesen & Bjørnskov, 2014; Robinson & Seim, 2018).

Now that the first step is successfully accomplished (i.e., corruption is significantly correlated with each mediator), the second step requires that the mediators be significantly correlated with healthcare deprivation after controlling for corruption. Most importantly, the inclusion of the mediators in the model linking corruption to healthcare deprivation should result in a lower effect size for corruption. Therefore, in our two-stage ordered probit model estimating the link between corruption and healthcare deprivation, we include each of the mediators as shown in Table 6. Both mediators (income and trust) are significantly correlated with healthcare deprivation for all forms of corruptions. Precisely, running out of cash many times/always decreases the probable risk of experience healthcare sector corruption, the probability that individuals will never experience healthcare deprivation by 24.1 percentage points, compared to never running out of cash many times or always. In contrast, for those who have run out of cash many times/always and experience healthcare sector corruption, the probability of experiencing healthcare deprivation *always* increases by 7.2 percentage points, compared to those who never run out of cash. Likewise, the marginal effects of our trust variables have the expected signs for healthcare deprivation. Precisely, Table 6 shows that the inclusion of trust as mediators reduces the size of the main coefficient on corruption, when we compare the corresponding marginal effects in Tables 2 and 3, which confirms that income and trust are important channels (mediators) linking corruption to healthcare deprivation. These results are also consistent across all Panels (B-F) in Table 6 which focus on corruption in other sectors including multisectoral corruption.

7. Concluding remarks

A burgeoning literature shows that the poor are more likely than the rich to fall prey to corruption in the form of bribe extortions in exchange for public services from public officials. However, there is a dearth of research on how the undue financial cost of corruption borne by the poor affects their access to healthcare. We contribute to the scant literature by

examining the effect of corruption on healthcare deprivation with a focus on SSA. We find that while bribe payment generally affects access to healthcare negatively, healthcare deprivation is more intense among those who have experienced corruption more frequently compared to those who have experienced such encounters less frequently or not at all. Policy efforts should not merely aim at detecting and punishing corruption but, most importantly, putting institutional checks in place to prevent such acts from reoccurring.

We make two further observations. First, we find evidence of negative spillover effects of corruption in other sectors on healthcare deprivation. We specifically consider corruption experience in four other sectors namely education, the police, public utilities and identification authorities. Generally, corruption experienced in each of these four sectors affects healthcare deprivation adversely. Second, we construct an indicator of multisectoral corruption experience by simply counting the number of sectors (healthcare and the other four sectors) in which an individual has experienced corruption. We observe that a larger intensity of multisectoral corruption experience also increases healthcare deprivation. Both these findings suggest that mitigating corruption in the healthcare sector alone may not be sufficient to end the adverse effect of corruption on effective healthcare access in the SSA countries.

Finally, we find that the effect of bribes on healthcare deprivation operates through at least two key channels: income depletion and loss of trust in public institutions. Arguably, these findings highlight the compounded consequences of corruption. Not only do they set people back financially, but they may further deter them from seeking needed public services due to diminished trust. And in turn, both channels are bound to have knock-on effects on people's health. Our findings warrant additional attention to the multi-layered consequences of bribing in many SSA countries and extra efforts to design and implement effective anti-corruption policies.

However, our study is not without its limitations. First, although we look at how paying bribes to public officials affects people's ability to access healthcare, our data do not contain information on how much is paid in those encounters and what that proportion represents relative to the payer's budget. Second, our study is observational rather than the experimental 'gold standard'. However, we note that difficult ethical and logistical challenges may render an externally valid experimental study on corruption and healthcare deprivation prohibitive. Moreover, we have addressed the endogeneity concern with a relevant and valid instrumental variable estimation strategy.

Finally, to the best of our knowledge, we are the first to examine public sector corruption and healthcare deprivation nexus in SSA countries. However, caution should be taken in any attempt to generalise our findings for the entire SSA region because our sample contains data for only 29 of its 48 countries. Therefore, future studies should revisit this subject to capture all countries in the SSA region as and when data becomes available. Further, future studies could also consider a comparative analysis of SSA and other sub-regions of, say, Asia, where the presence of corruption is also concerning.

CRediT authorship contribution statement

Chei Bukari: Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing. **Suman Seth:** Conceptualization, Supervision, Writing – original draft, Writing – review & editing. **Gaston Yalonetkzy:** Conceptualization, Supervision, Writing – original draft, Writing – review & editing.

Table 6
IV ordered probit marginal effects of the mediators (income and trust) on healthcare deprivation.

	Never	Once/twice	Several times	Many times	Always
Panel A: Healthcare sector corruption					
Paid bribe once/twice	−0.264***	−0.013***	0.049***	0.106***	0.108***
Paid bribe a few times	−0.316***	−0.025***	0.047***	0.128***	0.152***
Paid bribe often	−0.383***	−0.046***	0.030***	0.151***	0.234***
Run out of cash many times/always	−0.241***	0.011***	0.069***	0.090***	0.072***
Not at all trust the police	−0.015***	0.001***	0.004***	0.005***	0.004***
Not at all trust the courts	−0.019***	0.001***	0.005***	0.007***	0.006***
Not at all trust the president	−0.019***	0.001***	0.005***	0.007***	0.006***
Not at all trust the local Government	−0.020***	0.001***	0.006***	0.007***	0.006***
Observations	129,034	129,034	129,034	129,034	129,034
Panel B: Education sector corruption					
Paid bribe once/twice	−0.207***	−0.009***	0.044***	0.088***	0.085***
Paid bribe a few times	−0.262***	−0.020***	0.044***	0.112***	0.125***
Paid bribe often	(0.021)	(0.004)	(0.001)	(0.009)	(0.017)
Run out of cash many times/always	−0.311***	−0.033***	0.038***	0.132***	0.174***
Not at all trust the police	−0.250***	0.010***	0.073***	0.096***	0.071***
Not at all trust the courts	−0.017***	0.001***	0.005***	0.007***	0.005***
Not at all trust the president	−0.019***	0.001***	0.006***	0.007***	0.005***
Not at all trust the local Government	−0.020***	0.001***	0.006***	0.008***	0.006***
Observations	119,561	119,561	119,561	119,561	119,561
Panel C: Police corruption					
Paid bribe once/twice	−0.145***	−0.002	0.036***	0.060***	0.050***
Paid bribe a few times	−0.180***	−0.005*	0.041***	0.076***	0.069***
Paid bribe often	−0.216***	−0.011**	0.044***	0.092***	0.091***
Run out of cash many times/always	−0.253***	0.010***	0.074***	0.098***	0.070***
Not at all trust the police	−0.015***	0.001***	0.004***	0.006***	0.004***
Not at all trust the courts	−0.019***	0.001***	0.006***	0.008***	0.005***
Not at all trust the president	−0.021***	0.001***	0.006***	0.008***	0.006***
Not at all trust the local Government	−0.021***	0.001***	0.006***	0.008***	0.006***
Observations	119,787	119,787	119,787	119,787	119,787
Panel D: Public utility sector corruption					
Paid bribe once/twice	−0.226***	−0.013***	0.043***	0.096***	0.099***
Paid bribe a few times	−0.282***	−0.025***	0.041***	0.120***	0.146***
Paid bribe often	−0.333***	−0.041***	0.030***	0.139***	0.206***
Run out of cash many times/always	−0.251***	0.010***	0.073***	0.097***	0.071***
Not at all trust the police	−0.017***	0.001***	0.005***	0.006***	0.005***
Not at all trust the courts	−0.019***	0.001***	0.005***	0.007***	0.005***
Not at all trust the president	−0.020***	0.001***	0.006***	0.008***	0.006***
Not at all trust the local Government	−0.022***	0.001***	0.006***	0.008***	0.006***
Observations	119,765	119,765	119,765	119,765	119,765
Panel E: Identification authority corruption					
Paid bribe once/twice	−0.157***	−0.002	0.038***	0.065***	0.056***
Paid bribe a few times	−0.214***	−0.010**	0.044***	0.091***	0.089***
Paid bribe often	−0.263***	−0.019***	0.045***	0.112***	0.125***
Run out of cash many times/always	−0.250***	0.010***	0.073***	0.097***	0.071***
Not at all trust the police	−0.016***	0.001***	0.005***	0.006***	0.004***
Not at all trust the courts	−0.019***	0.001***	0.006***	0.007***	0.005***
Not at all trust the president	−0.020***	0.001***	0.006***	0.008***	0.006***
Not at all trust the local Government	−0.021***	0.001***	0.006***	0.008***	0.006***
Observations	119,668	119,668	119,668	119,668	119,668
Panel F: Multi-sectoral corruption					
Paid bribes in one sector	−0.139***	0.002***	0.038***	0.056***	0.042***
Paid bribes in two sectors	−0.196***	−0.002	0.048***	0.081***	0.069***
Paid bribes in three sectors	−0.232***	−0.007**	0.052***	0.097***	0.090***
Paid bribes in four sectors	−0.278***	−0.015***	0.053***	0.117***	0.123***
Paid bribes in all five sectors	−0.316***	−0.025***	0.050***	0.133***	0.158***

Table 6 (*continued*)

	Never	Once/twice	Several times	Many times	Always
Run out of cash many times/always	−0.246***	0.010***	0.070***	0.094***	0.072***
Not at all trust the police	−0.013***	0.001***	0.004***	0.005***	0.004***
Not at all trust the courts	−0.019***	0.001***	0.005***	0.007***	0.006***
Not at all trust the president	−0.019***	0.001***	0.005***	0.007***	0.005***
Not at all trust the local Government	−0.019***	0.001***	0.006***	0.007***	0.006***
Observations	130,268	130,268	130,268	130,268	130,268

*** p < 0.01, ** p < 0.05, * p < 0.1.

Notes: Dependent variable is healthcare deprivation ranked into five categories as follows: (1) never deprived, (2) deprived just once/twice, (3) deprived several times, (4) deprived many times and (5) deprived always. The key independent variable of interest is corruption, or the frequency of bribe payment, also ordered into four categories as follows: *never*, *once/twice*, *a few times*, and *often*. The multisectoral corruption is ordered into six categories. The base category for multisectoral corruption is *never paid bribe in any sector*. The mediators are loss of income and loss of trust. The indicator variable *loss of income* is a dichotomous variable, which is equal to 1 if the respondent reports running out of cash *many times* or *always* in the past year and 0 otherwise. The indicator variables *loss of trust* are the respondent's trust in the *courts*, *police*, *the president*, and *the local government*, respectively. Each is dichotomized and is equal to 1 if the respondent does not at all trust the courts, police, the president and local government, respectively, and 0 otherwise. We control the following variables: rural/urban place of residence, availability of a health facility, household size, gender of respondent, age of respondent (logarithm), employment status, and levels of educational attainment. Definitions of variables and descriptive statistics are available in Table A1 and Table A2. All models control for country- and wave specific fixed effects.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Although the authors do not have permission to share the data, I have shared a link to the publicly available data and also uploaded the STATA Codes (do file) for replication

Appendix

Table A1
Definition and measurement of variables used in the study.

Variable	Definition
I. Healthcare deprivation	Categorical: number of times the individual goes without medicines/medical care (never = 0, just once/twice = 1, several = 2, many = 3, always = 4)
II. Corruption types	
Health sector corruption	how often the respondent pays a bribe to health officials in exchange for medical care (never = 0, once/twice = 1, a few times = 2, often = 3)
Police corruption	how often the respondent pays a bribe to the police in order to avoid being arrested, passing a checkpoint (never = 0, once/twice = 1, a few times = 2, often = 3)
Public utility sector corruption	how often does the respondent pay a bribe to a public official in order a get basic household services like sanitation, water, and electricity problem fixed (never = 0, once/twice = 1, a few times = 2, often = 3)
Identification authority corruption	how often the respondent pays a bribe to a public official in order a get an identity document like a birth certificate, license, or permit (never = 0, once/twice = 1, a few times = 2, often = 3)
Education sector corruption	how often the respondent pays a bribe to a school official in order for a school service like placement for a child (never = 0, once/twice = 1, a few times = 2, often = 3)
Multisectoral corruption	Count variable ranging from 0 to 5 representing the number of times the respondents pay a bribe to public official across all the five dimensions (medical, police, school, household, and ID documents or permit) (0 = never paid bribe in any sector, 1 = have paid bribe in one sector, 2 = have paid bribe in two sectors, 3 = have paid bribe in three sectors, 4 = have paid bribe in four sectors, 5 = have paid bribe in all the five sectors)
III. Control variables	
Health Clinic	Dummy with value 1 if the health clinic in the respondent's community is a walking distance and 0 otherwise
Household size	Total members of the household
Urban	Respondent's place of residence (0 = urban, 1 = rural)
Female	Gender of the respondent (0 = male, 1 = female)
Age	Age of the respondent in years
Employment status	Employment status of the respondents (employed full-time = 0, employed part-time = 1, unemployed but searching = 2, unemployed not searching = 3)
Education	Educational attainments of the respondents (0 = no formal education, 1 = primary, 2 = secondary, 3 = tertiary
Wave	A period in which the data was collected (2011/12 = 0, 2014/15 = 1, 2016/18 = 2)
GDP	GDP per capita income
IV. Mediators	
Run out of cash many/always	Dummy: it takes a value of 1 if the respondent goes without cash income many times or always and 0 otherwise.
Not at all trust the courts	Dummy with a value of 1 if the respondent does not at all trust the courts

Table A1 (*continued*)

Variable	Definition
Not at all trust the police	Dummy with a value of 1 if the respondent does not at all trust the Police
Not at all trust the president	Dummy with a value of 1 if the respondent does not at all trust the President
Not at all trust the local government	Dummy with a value of 1 if the respondent does not at all trust their local government authorities

Table A2
Descriptive statistics.

	2011/13 (Wave 5)		2014/15 (Wave 6)		2016/18 (Wave 7)		Pooled	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Healthcare deprivation (binary)	0.549	0.498	0.501	0.500	0.530	0.499	0.527	0.499
Health sector corruption type (binary)	0.147	0.354	0.086	0.281	0.081	0.273	0.106	0.308
Police corruption type (binary)	0.141	0.348	0.069	0.253	0.091	0.288	0.101	0.301
ID/Permits corruption type(binary)	0.157	0.364	0.091	0.288	0.066	0.248	0.106	0.308
Household utilities corruption (binary)	0.085	0.278	0.048	0.214	0.035	0.183	0.056	0.231
Education sector corruption (binary)	0.101	0.302	0.063	0.243	0.055	0.228	0.074	0.261
Grand corruption (all types)	0.301	0.459	0.190	0.392	0.221	0.415	0.238	0.426
Health facility (binary)	0.594	0.491	0.597	0.491	0.582	0.493	0.591	0.492
Income (binary)	0.211	0.408	0.238	0.426	0.199	0.399	0.217	0.412
Household size	3.615	2.511	4.056	2.823	3.788	2.709	3.820	2.690
Urban (binary)	0.774	0.418	0.745	0.436	0.591	0.492	0.707	0.455
Female (binary)	0.500	0.500	0.504	0.500	0.501	0.500	0.502	0.500
Age (in years)	45.741	92.405	41.714	67.392	37.917	31.820	41.924	69.533
Employment status (binary)	0.330	0.470	0.392	0.488	0.351	0.477	0.358	0.479
No formal education (binary)	0.197	0.397	0.192	0.394	0.209	0.406	0.199	0.399
Basic education (binary)	0.317	0.465	0.295	0.456	0.285	0.451	0.300	0.458
Secondary education (binary)	0.367	0.482	0.369	0.482	0.364	0.481	0.367	0.482
Tertiary education (binary)	0.119	0.324	0.144	0.351	0.142	0.349	0.135	0.341
GDP per capita (in international $)	1831.790	1860.34	1946.545	1995.054	2025.211	2158.430	1931.370	2004.500
Countries	29		29		29		29	
Observations	45,597		45,543		41,025		132,165	

Source: Author's computation based on the Afrobarometer survey waves 5–7 for 29 SSA countries.

Table A3
Test of exogeneity/validity of the instrumental variable (i.e., effect of roadblock on the outcome variable healthcare deprivation).

Variables	(1)	(2)	(3) Health sector corruption	(4) Education sector corruption	(5) Police corruption	(6) Public utility corruption	(7) Identification authority	(8) Aggregate corruption
Roadblock	0.054	0.029	0.024	0.029	0.027	0.026	0.024	0.020
	(0.072)	(0.033)	(0.027)	(0.029)	(0.026)	(0.028)	(0.028)	(0.031)
Paid bribe once/ twice			0.264***	0.214***	0.140***	0.153***	0.149***	0.064***
			(0.030)	(0.052)	(0.042)	(0.028)	(0.002)	(0.000)
Paid bribe a few times			0.361***	0.327***	0.230***	0.280***	0.282***	
			(0.025)	(0.026)	(0.044)	(0.062)	(0.015)	
Paid bribe often			0.521***	0.428***	0.302***	0.409***	0.391***	
			(0.050)	(0.035)	(0.017)	(0.021)	(0.014)	
Individual characteristics	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects?	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	131,435	129,603	128,519	128,636	128,840	128,838	128,750	129,603

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; Robust standard errors clustered at the enumeration areas in parentheses.

Notes: Dependent variable is healthcare deprivation ranked into five categories as follows: Never deprived, deprived just once/twice, deprived several times, deprived many times and deprived always. The key independent variable of interest is corruption also ordered into four categories as follows: never paid a bribe, paid a bribe once/twice, paid a bribe a few times, and paid a bribe often. Roadblock is a dummy variable equal to 1 if there is a police roadblock in the enumeration area and 0 otherwise. In all models, we controlled for the individual's income, age, gender, educational attainment, employment status, household size, rural–urban location, presence of a health facility, region, country- and year fixed effects. Definitions of variables and descriptive statistics are available in Table A1 and Table A2.

Table A4
Marginal effect of health sector corruption on healthcare deprivation (Oprobit estimates).

Variables	(1) Never	(2) Once/Twice	(3) Several times	(4) Many times	(5) Always
Paid bribe once/twice	−0.093***	0.000*	0.025***	0.039***	0.028***
	(0.005)	(0.000)	(0.001)	(0.002)	(0.002)
Paid bribe a few times	−0.125***	−0.002***	0.032***	0.053***	0.041***
	(0.006)	(0.000)	(0.001)	(0.003)	(0.002)
Paid bribe often	−0.177***	−0.007***	0.040***	0.077***	0.067***
	(0.007)	(0.001)	(0.001)	(0.003)	(0.004)
Rural	−0.088***	0.003***	0.026***	0.035***	0.024***
	(0.003)	(0.000)	(0.001)	(0.001)	(0.001)
Health facility	0.044***	−0.002***	−0.013***	−0.017***	−0.012***
	(0.002)	(0.000)	(0.001)	(0.001)	(0.001)
Household size	−0.006***	0.000***	0.002***	0.003***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Female (ref = male)	0.013***	−0.000***	−0.004***	−0.005***	−0.004***
	(0.002)	(0.000)	(0.001)	(0.001)	(0.001)
Age (in logarithm)	−0.063***	0.002***	0.019***	0.025***	0.017***
	(0.003)	(0.000)	(0.001)	(0.001)	(0.001)
Unemployed not searching	−0.037***	0.001***	0.011***	0.014***	0.010***
	(0.003)	(0.000)	(0.001)	(0.001)	(0.001)
Unemployed but searching	−0.079***	0.003***	0.024***	0.031***	0.021***
	(0.003)	(0.000)	(0.001)	(0.001)	(0.001)
Employed (part-time)	−0.052***	0.002***	0.015***	0.020***	0.014***
	(0.004)	(0.000)	(0.001)	(0.002)	(0.001)
No formal education	−0.167***	0.006***	0.050***	0.066***	0.045***
	(0.005)	(0.000)	(0.001)	(0.002)	(0.001)
Basic education	−0.127***	0.005***	0.038***	0.050***	0.034***
	(0.004)	(0.000)	(0.001)	(0.002)	(0.001)
Secondary education	−0.075***	0.003***	0.022***	0.030***	0.020***
	(0.004)	(0.000)	(0.001)	(0.002)	(0.001)
Country fixed effects?	Yes	Yes	Yes	Yes	Yes
Year fixed effects?	Yes	Yes	Yes	Yes	Yes
Observations	128,659	128,659	128,659	128,659	128,659

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors are reported in parentheses.
Notes: Dependent variable is healthcare deprivation ranked into five categories as follows: (1) never deprived, (2) deprived just once/twice, (3) deprived several times, (4) deprived many times and (5) deprived always. The key independent variable of interest is corruption, or the frequency of bribe payment, also ordered into four categories as follows: *never*, *once/twice*, *a few times*, and *often*. We control the following variables: rural/urban regions, availability of health facility, household size, gender of respondent, age of respondent (logarithm), employment status, and levels of educational attainment. Definitions of variables and descriptive statistics are available in Table A1 and Table A2. All models control for country- and wave specific fixed effects.

Table A5
IV ordered probit first-stage marginal effect of roadblocks on various corruption types.

Panel A: Corruption experience in the education sector

	(1)	(2)	(3)	(4)
	Never	Once/twice	A few times	Often
Roadblock	−0.013***	0.006***	0.004***	0.003***
	(0.003)	(0.001)	(0.001)	(0.001)
Wald chi-square[†]	23129.15***			
Endogeneity test[‡]	−0.343***			
Observations	129,148	129,148	129,148	129,148

Panel B: Corruption experience with police

	(1)	(2)	(3)	(4)
	Never	Once/twice	Few times	Often
Roadblock	−0.017***	0.006***	0.005***	0.006***
	(0.003)	(0.001)	(0.001)	(0.001)
Wald chi-square[†]	24313.19***			
Endogeneity test[‡]	−0.237***			
Observations	129,354	129,354	129,354	129,354

Panel C: Corruption experience in the public utility sector

	(1)	(2)	(3)	(4)
	Never	Once/twice	Few times	Often
Roadblock	−0.012***	0.005***	0.004***	0.003***
	(0.002)	(0.001)	(0.001)	(0.001)
Wald chi-square[†]	23317.61***			
Endogeneity test[‡]	−0.350***			
Observations	129,354	129,354	129,354	129,354

Panel D: Corruption experience with identification authorities'

	(1)	(2)	(3)	(4)
	Never	Once/twice	Few times	Often
Roadblock	−0.018***	0.009***	0.005***	0.004***
	(0.003)	(0.001)	(0.001)	(0.001)
Wald chi-square[†]	25312.41***			
Endogeneity test[‡]	−0.287***			
Observations	129,267	129,267	129,267	129,267

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors are reported in parentheses.

[†] The Wald chi-square (χ^2) tests the joint significance of our first-stage model under the null hypothesis that all the coefficients including our IV are simultaneously zero.

[‡] The endogeneity test is carried out with the null hypothesis that the IV is uncorrelated with the error term (i.e., the IV is exogenous).

Notes: The dependent variable is corruption ordered into four categories as follows: (1) *never* paid a bribe, (2) paid a bribe *once/twice*, (3) paid a bribe *a few times*, and (4) paid a bribe *often*. The multisectoral corruption has five categories as follows: never paid bribe in any sector, paid bribe in one sector, two sectors, three sectors, four sectors and all the five sectors. Roadblock is a dummy and set equal to 1 if there is police roadblock in the enumeration area and 0 otherwise. We control the following variables: rural/urban regions, availability of health facility, household size, gender of respondent, age of respondent (logarithm), employment status, and levels of educational attainment. Definitions of variables and descriptive statistics are available in Table A1 and Table A2. All models control for country- and wave specific fixed effects.

Table A6
Ordered probit marginal effect of corruption in other sectors on healthcare deprivation.

Panel A: Corruption experience in the education sector

	(1)	(2)	(3)	(4)	(5)
	Never	Once/twice	Several-times	Many-times	Always
Paid bribe once/twice	−0.075***	0.001***	0.021***	0.031***	0.023***
	(0.005)	(0.000)	(0.001)	(0.002)	(0.002)
Paid bribe a few times	−0.113***	−0.001***	0.029***	0.048***	0.038***
	(0.007)	(0.000)	(0.001)	(0.003)	(0.003)
Paid bribe often	−0.147***	−0.004***	0.035***	0.063***	0.054***
	(0.008)	(0.001)	(0.001)	(0.004)	(0.004)
Observations	129,148	129,148	129,148	129,148	129,148

Panel B: Corruption experience with police

	(1)	(2)	(3)	(4)	(5)
	Never	Once/twice	Several-times	Many-times	Always
Paid bribe once/twice	−0.050***	0.001***	0.014***	0.020***	0.014***
	(0.005)	(0.000)	(0.001)	(0.002)	(0.002)
Paid bribe a few times	−0.082***	0.000	0.022***	0.034***	0.025***
	(0.006)	(0.000)	(0.001)	(0.003)	(0.002)
Paid bribe often	−0.106***	−0.001**	0.027***	0.044***	0.035***
	(0.006)	(0.000)	(0.001)	(0.003)	(0.003)
Observations	129,354	129,354	129,354	129,354	129,354

Panel C: Corruption experience in the public utility sector

	(1)	(2)	(3)	(4)	(5)
	Never	Once/twice	Several-times	Many-times	Always
Paid bribe once/twice	−0.054***	0.001***	0.015***	0.022***	0.016***
	(0.006)	(0.000)	(0.002)	(0.003)	(0.002)
Paid bribe a few times	−0.099***	−0.001	0.026***	0.041***	0.032***
	(0.008)	(0.000)	(0.002)	(0.003)	(0.003)
Paid bribe often	−0.143***	−0.004***	0.034***	0.061***	0.052***
	(0.009)	(0.001)	(0.001)	(0.004)	(0.005)
Observations	129,354	129,354	129,354	129,354	129,354

Panel D: Corruption experience with identification authorities'

	(1)	(2)	(3)	(4)	(5)
	Never	Once/twice	Several-times	Many-times	Always
Paid bribe once/twice	−0.053***	0.001***	0.015***	0.022***	0.015***
	(0.005)	(0.000)	(0.001)	(0.002)	(0.001)
Paid bribe a few times	−0.099***	−0.000	0.026***	0.041***	0.032***
	(0.006)	(0.000)	(0.001)	(0.003)	(0.003)
Paid bribe often	−0.135***	−0.003***	0.033***	0.058***	0.048***
	(0.008)	(0.001)	(0.001)	(0.003)	(0.004)
Observations	129,267	129,267	129,267	129,267	129,267

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors are reported in parentheses.
Notes: Dependent variable is healthcare deprivation ranked into five categories as follows: (1) never deprived, (2) deprived just once/twice, (3) deprived several times, (4) deprived many times and (5) deprived always. The key independent variable of interest is corruption, or the frequency of bribe payment, also ordered into four categories as follows: *never*, *once/twice*, *a few times*, and *often*. The multisectoral corruption has five categories as follows: never paid bribe in any sector, paid bribe in one sector, two sectors, three sectors, four sectors and all the five sectors. We control the following variables: rural/urban regions, availability of health facility, household size, gender of respondent, age of respondent (logarithm), employment status, and levels of educational attainment. All models control for country- and wave specific fixed effects. Definitions of variables and descriptive statistics are available in Table A1 and Table A2.

Table A7

IV ordered probit first-stage marginal effect of roadblocks on multisectoral corruption.

	(1)	(2)	(3)	(4)	(5)	(6)
	Never	One sector	Two sectors	Three sectors	Four sectors	Five sectors
Roadblock	−0.029***	0.011***	0.007***	0.005***	0.003***	0.003***
	(0.004)	(0.002)	(0.001)	(0.001)	(0.000)	(0.000)
Wald chi-square[†]	17725.33***					
Endogeneity test[‡]	−0.261***					
Observations	130,136	130,136	130,136	130,136	130,136	130,136

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors are reported in parentheses.

[†] The Wald chi-square (χ^2) tests the joint significance of our first-stage model under the null hypothesis that all the coefficients including our IV are simultaneously zero.

[‡] The endogeneity test is carried out with the null hypothesis that the IV is uncorrelated with the error term (i.e., the IV is exogenous).

Notes: Dependent variable is multisectoral corruption ordered into six categories as follows: (1) *never paid bribe in any sector* as the base category, (2) *paid bribe in one sector*, (3) *paid bribe in two sectors*, (4) *paid bribe in three sectors*. (5) *paid bribe in four sectors*, (6) *paid bribe all five sectors*. Our IV (roadblock) is a dummy and set equal to 1 if there is police roadblock in the enumeration area and 0 otherwise. We control the following variables: rural/urban locations, availability of health facility, household size, gender of respondent, age of respondent (logarithm), employment status, and levels of educational attainment. All models control for country- and wave specific fixed effects. Definitions of variables and descriptive statistics are available in Table A1 and Table A2.

Table A8

Ordered probit marginal effect of multisectoral corruption on healthcare deprivation.

	(1)	(2)	(3)	(4)	(5)
	Never	Once/twice	Several-times	Many-times	Always
Paid bribe in one sector	−0.058***	0.002***	0.017***	0.023***	0.016***
	(0.003)	(0.000)	(0.001)	(0.001)	(0.001)
Paid bribe two sectors	−0.100***	0.001***	0.028***	0.041***	0.030***
	(0.005)	(0.000)	(0.001)	(0.002)	(0.002)
Paid bribe in three sectors	−0.120***	−0.000	0.032***	0.050***	0.038***
	(0.006)	(0.000)	(0.001)	(0.003)	(0.003)
Paid bribe in four sectors	−0.158***	−0.003***	0.039***	0.067***	0.055***
	(0.008)	(0.001)	(0.001)	(0.004)	(0.004)
Paid bribe in all five sectors	−0.173***	−0.005***	0.041***	0.074***	0.063***
	(0.009)	(0.001)	(0.001)	(0.004)	(0.005)
Observation	130,136	130,136	130,136	130,136	130,136

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors are reported in parentheses.

Notes: Dependent variable is healthcare deprivation ranked into five categories as follows: (1) never deprived, (2) deprived just once/twice, (3) deprived several times, (4) deprived many times and (5) deprived always. The key independent variable of interest is the multisectoral corruption, which is ordered into six categories. The base category for multisectoral corruption is *never paid bribe in any sector*. We control the following variables: rural/urban locations, availability of health facility, household size, gender of respondent, age of respondent (logarithm), employment status, and levels of educational attainment. Definitions of variables and descriptive statistics are available in Table A1 and Table A2. All models control for country- and wave specific fixed effects.

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