Information and Collective Will Against Environmental Harms: Experimental Evidence from Ghana's *Galamsey*

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Abstract

Information can spur community collective action against environmental harms, but its effectiveness depends on how it is delivered and by whom. Local leaders can legitimize and transmit new information, or distort and suppress it when incentives misalign. I study these trade-offs in the context of artisanal and small-scale gold mining (*galamsey*) in Ghana. I conduct a cluster randomized controlled trial across 99 *galamsey* communities, stratified by leaders' conflicts of interest, comparing two information diffusion strategies: seeding, in which a documentary on mercury's health risks is screened privately to leaders (traditional local chiefs), and broadcasting, in which the same documentary is screened publicly to both leaders and community members. Seeding improved health-risk learning among chiefs but had no detectable effects on community learning, preferences over local mining regulation, or community engagement. Broadcasting, in contrast, increased community learning and engagement, as reflected in higher sign-ups for regular assembly meetings and more frequent community discussion of *galamsey*. When paired with non-conflicted chiefs, broadcasting shifted community preferences toward stricter local mining regulation; under conflicted chiefs, broadcasting instead polarized these preferences. Taken together, the results suggest that while broad public information can mobilize community engagement on its own, building consensus over local mining regulation requires both an informed public and non-conflicted leadership; neither alone is sufficient.

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1. Introduction

Resource extraction is among the largest human interventions in natural systems. While the benefits are immediate and concentrated among resource system users, the degradation accumulates silently across atmospheres, watersheds, food chains, and generations. These negative externalities represent a canonical violation of the First Welfare Theorem, a case where decentralized market transactions among atomistic agents fail to yield an efficient equilibrium. Addressing such market failures requires environmental regulation. While this function is conventionally assigned to the state, state capacity is often limited in the rural areas of developing regions where resource extraction is concentrated. This institutional vacuum highlights the importance of understanding community collective action, in which local leaders and community members jointly define and enforce rules for managing natural resources.

This paper studies community collective action in the artisanal and small-scale gold mining sector (ASGM), which employs 14-19 million miners across more than 80 countries. ASGM is the largest source of mercury pollution worldwide, responsible for 38 percent of annual human-caused emissions. The problem is especially severe in developing regions: in South America and Sub-Saharan Africa, ASGM accounts for over 80 percent of mercury emissions (UNEP, 2019). In Ghana, where this study takes place, ASGM is known as *galamsey*.[1] In response to the environmental and health harms *galamsey* causes, the Government of Ghana has launched repeated crackdowns, including multiple waves of military operations and a two-year national ban on small-scale mining, yet these efforts have not produced sustained reductions in environmental damage.

Collective action to mitigate environmental harms from *galamsey* has emerged in some communities. In the farming community of Jema, located in the Western North Region, traditional leaders and community members established a community mining regulation, in the form of a customary bylaw, that banned mining and introduced regular assembly meetings to monitor compliance and coordinate responses. This local initiative has proven effective: Jema successfully repelled multiple attempts by *galamseyers* to begin mining within its territory and remains free of *galamsey*. As the only unaffected community in its district, the case of Jema is widely cited as a success story.

Yet such successes remain rare. What prevents community collective action from taking shape in more communities? A natural starting point is economic incentives. Mining provides an important source of livelihood in many *galamsey* communities. In my baseline survey, 36

[1] *Galamsey* derives from the phrase "gather and sell" in the local Twi language. Because more than 80 percent of ASGM operations are unlicensed, and even licensed ones often violate environmental regulations, the term *galamsey* is also commonly used in media and public discourse to refer to illegal mining.

percent of randomly sampled households report having at least one member engaged in mining. In settings with limited alternative employment opportunities and high marginal utility of consumption, communities may therefore be unwilling to restrict an activity that underpins household income, even when it generates substantial local externalities. This explanation alone, which implicitly assumes that communities accurately weigh mining income against its environmental and health consequences when forming collective choices, is likely incomplete, particularly in low-information developing-country settings. Even when an environmental hazard imposes severe and persistent harms that are directly experienced, individuals are often deeply misinformed about their causes and long-term consequences.

This paper therefore turns attention to a precondition for collective action: information about the severity of the problem.[2] The health risks associated with mercury exposure are often long-term, diffuse, and difficult to attribute directly to mining activities. Field interviews indicate that community members often misattribute such chronic health conditions to spiritual or supernatural causes. Baseline survey data quantify this information gap: fewer than 40 percent of households linked *galamsey* to long-term conditions such as miscarriage, birth defects, kidney or liver disease, or neurological disorders, significantly lower than the 75 percent recognition rate of immediate and visible risks such as malaria or mercury use. This internality — manifested as the underestimation of gradual, cumulative health harms — can dampen motivation for collective action, as individuals may not perceive its urgency or necessity. These facts motivate my focus on information dissemination as a potential catalyst for collective action.

In our setting, a key choice to turn information into learning and action is the delivery channel: whether it is seeded through local leaders via leader-mediated delivery, or broadcast directly to the public through community-wide dissemination. As influential local leaders with deep contextual understanding, traditional chiefs could play a crucial mediating role, legitimizing new information and translating technical concepts into language that resonates with their communities. On the other hand, the very authority that positions chiefs as effective intermediaries also gives them opportunities to extract private gains from the resource system that produces environmental harm. This conflict of interest may leave them reluctant to spread information that goes against their vested interest. These trade-offs give rise to three research questions. First, in the absence of leader conflicts of interest, does seeding information through leaders generate community learning and spur collective action? Second, does broadcasting information publicly overcome the barriers posed by conflicted leadership? Or, instead, does broadcast-

[2] Classic explanations for weak collective action point to free-riding, whereby individuals can benefit from others' efforts without contributing themselves (Olson, 1965), and coordination failures arising from uncertainty about others' actions (Schelling, 1960). While these forces are undoubtedly relevant, they implicitly assume that individuals hold accurate beliefs about the underlying harm. My focus is on information because it is the margin of experimental variation in this study, though the research design and findings also speak to these classic mechanisms.

ing induce learning and collective action only when paired with non-conflicted leadership?

I address these questions through a cluster randomized controlled trial in 99 ASGM-affected communities in Ghana. The intervention delivered a professionally produced documentary film, *Poisoned for Gold*, created by a prominent Ghanaian journalist independent of this study. The film directly targets the information gap documented above: scientists, physicians, and affected residents bring to light the cumulative health consequences of long-term heavy-metal exposure, explicitly linking them to the very chronic medical conditions that community members had failed to associate with *galamsey* in the baseline survey. Communities were randomly assigned to one of three groups: a control group with no screening, seeding, in which the documentary was screened privately to traditional chiefs, or broadcasting, in which the same documentary was screened publicly to both chiefs and community members. I pre-registered the stratified treatment randomization by the baseline share of mining households in each community and, importantly, whether the chief has a conflict of interest. Conflicts of interest were measured using household perceptions elicited through a randomized response module and were validated via correlation with chiefs' self-reports to carefully worded questions about their rent-seeking behavior.

To trace the causal chain from information exposure and chiefs' efforts in information dissemination and mobilization to learning and collective action, I collected data at multiple levels. On the same day the information was delivered, field officers convened structured town halls in all 99 communities. These gatherings, locally known as durbars, are a customary setting for community deliberation and decision-making, making the meeting itself a familiar event for community members. The study measures outcomes both during and after the town hall events. During the town halls, field officers documented several outcomes. First, to assess chiefs' efforts in information dissemination and mobilization, field officers documented their speeches and observable actions.[3] Second, enumerators separately measured learning and actual follow-up discussion by surveying leaders and community members again three weeks after the town hall. Third, as illustrated in the Jema example, collective action in a traditional communal setting typically culminates in community-level decisions that are socially binding for all members. Although such actions are formally enacted by the chief on behalf of the community, they are grounded in a broader participatory process in which community members deliberate and express their collective will in durbars, exert bottom-up pressure on local leadership to uphold that will, and help self-enforce collective decisions through sustained engagement.[4] To cap-

[3] In cases where they excused themselves from the town hall and sent a delegate from the traditional council to represent them, field officers record the speeches and actions of the delegate instead.

[4] This collective process constrains the chief's authority and ensures accountability, as legitimacy depends on community consent and participation. Chiefs who neglect communal welfare or violate their duties risk destoolment — the traditional mechanism for removing a chief from office — which serves as a powerful check aligning leadership with the community's collective interests (Arhin, 1985; Baldwin, 2015).

ture key dimensions of this collective action process, I embedded several familiar local activities within our town halls. First, I measured collective will through a secret-ballot vote on prospective customary mining bylaws, allowing participants to choose among options of varying regulatory stringency. Second, I measured community engagement, the behavioral dimension of collective action, through volunteer sign-ups for regular follow-up meetings, enrollment in an NGO-moderated WhatsApp group to capture reliance on external coordination channels, and a group bidding exercise to elicit financial contributions toward hosting an NGO workshop. These approaches mirror practices common to successful grassroots initiatives in the region, which rely on durbars to deliberate, build consensus, and mobilize participation. Importantly, the activities had real-world consequences: bylaws voted on could be carried forward for adoption, and volunteer lists served as the foundation for organizing subsequent community meetings.

Turning to the experimental results, I find three key patterns. First, the documentary produced strong learning effects among chiefs in both the seeding and broadcasting groups. Using a standardized index of health knowledge on long-term health conditions *galamsey* can cause, chiefs in both seeding and broadcasting communities scored 0.48–0.57 standard deviations higher than those in control communities.

Second, although chiefs' own learning was similar across arms, the effects on communities differed and depended on whether chiefs had conflicts of interest. Under seeding, 95 percent of non-conflicted chiefs made an effort to disseminate the information, whereas conflicted chiefs were 39 percentage points less likely to do so. Despite these dissemination efforts, neither type of leader generated improvements in community members' health-risk learning or detectable shifts in bylaw preferences. I also find no effects on follow-up engagement under conflicted leadership; the impact stops at the chief's palace, where the private screening took place. In communities with non-conflicted leadership, participation in follow-up engagement was significantly lower despite greater mobilization efforts by chiefs during the town hall, suggestive of a crowding-out effect where unilateral leader action dampens individual initiative.

Third, when the information was shared publicly with both chiefs and community members (broadcasting), conflicted chiefs were 41 percentage points less likely to attend the town hall themselves, instead sending a delegate — a 60 percent decrease relative to the 68 percent chief attendance rate in control communities. No such pattern is observed among conflicted chiefs in the seeding treatment, consistent with conflicted leaders seeking to avoid accountability pressures created by public dissemination. Despite this, exposure to the public documentary screening increased community learning by 0.50 standard deviations relative to control communities, regardless of leader type. Learning effects under broadcasting are statistically indistinguishable between town hall attendees and non-attendees, pointing to substantial horizontal information

diffusion among community members.[5]

Turning to collective action, under non-conflicted leadership, broadcasting shifted community preferences toward stricter mining bylaws: the vote share for one of the most stringent bylaw options, namely banning mining in forest reserves and river bodies as well as amalgam burning near homes, increased by 21.3 percentage points. On follow-up engagements, sign-ups for regular community meetings increased by 0.40 standard deviations. In line with this pattern, the endline survey three weeks later shows more frequent discussions about *galamsey* among community members.

Under conflicted leadership, broadcasting generated comparable levels of follow-up engagement but polarized mining bylaw preferences without a level shift: the dispersion of bylaw preferences increased by about 19 percent relative to control communities. This increase in dispersion is driven by movements at both extremes of the preference distribution. At one end, the vote share for the least stringent option, maintaining the status quo, increased by 4.5 percentage points (a 79 percent increase relative to control communities with conflicted chiefs). This shift is explained by a lack of buy-in from conflicted chiefs, as evidenced by two behaviors: their absence from town hall meetings and their active attempts to counteract the broadcasting effect. Specifically, conflicted chiefs (or their delegates) were 40.7 percentage points more likely than conflicted chiefs in control communities to advocate for maintaining the status quo. At the other end of the preference distribution, the share of community members supporting the most stringent option, banning all mining activities, increased by 12.6 percentage points (a 58 percent increase relative to control communities with conflicted chiefs). This shift is consistent with strong learning among community members from direct exposure to the documentary.

Although broadcasting did not generate consensus on mining bylaws under conflicted leadership, it strengthened community demand for accountability from chiefs. In the endline survey, community members were 42 percent less likely to express unconditional respect for their chiefs and 56 percent more likely to state that they should both respect and question their role—echoing the lower town hall attendance of conflicted chiefs during public screenings. I also find that when local leadership is compromised, an informed public redirects collective action efforts toward external channels that substitute for local initiatives, as reflected in a 39 percent increase in enrollment in the NGO-moderated WhatsApp group.

Together, these results suggest that the conditions for collective action depend on the margin of interest. Building consensus over local mining regulation requires both an informed public and non-conflicted leadership; neither alone is sufficient. By contrast, sustaining community engagement—such as participation in meetings and discussion—can be achieved through

[5]This stands in contrast to the lack of community learning under seeding, which suggests weak vertical transmission through leaders.

broad public information alone, even when local leadership is conflicted. Despite the overall gains in engagement and accountability, broadcasting also fostered pessimism: respondents reported lower perceived efficacy of collective action and reduced willingness, both personally and in their beliefs about others, to engage in collective community efforts. In the conclusion, I discuss the external validity and policy implications of both the key takeaway and the seemingly paradoxical pessimism result.

This paper contributes to three strands of literature. First, it adds to the research on how information influences responses to environmental problems. A large empirical literature has causally identified the effects of information on private adaptation to environmental hazards (Madajewicz et al., 2007; Bennear et al., 2013; Barwick et al., 2024). In contrast, studies examining information and collective action are mostly conceptual or descriptive (Ostrom, 1990; Baland and Platteau, 2000), and the few well-identified studies rely primarily on lab experiments. This paper moves beyond private adaptation at the individual level and provides field-experimental causal evidence on how information affects collective will and community engagement to address environmental harms at the community level.

Second, I contribute to the political economy of leadership. This paper adds to studies of leadership in environmental contexts (Jack and Recalde, 2015; Kosfeld and Rustagi, 2015). A closely related paper, Armand et al. (2020), shows in the context of Mozambique's natural gas discovery that when information reaches citizens, it can discipline leaders' rent-seeking and reduce violence, whereas information confined to elites can exacerbate capture. This paper extends this evidence by explicitly measuring and stratifying treatments by leaders' conflicts of interest, an underexplored source of heterogeneity. Through the lens of our information intervention and a detailed data collection design that captures both the words and actions of leaders, I demonstrate how conflicts of interest shape their responses to interventions. These findings have implications for future programs that engage local leaders — not only for information interventions, but for development strategies more broadly. This contribution is particularly timely given the growing interest in involving traditional chiefs as agents of development (Acemoglu et al., 2014; Henn, 2023; Balán et al., 2022; Basurto et al., 2020). I add to this expanding literature by examining chiefs' roles in collective responses to environmental harms, a policy domain where they play a particularly prominent yet understudied role.

Third, I extend research on video-based information interventions. Most existing studies evaluate impacts on individual outcomes: knowledge, attitudes, and private behavior (Hussam et al., 2023; Banerjee et al., 2019; Riley, 2021). Recent work shows that documentaries can also foster cooperation across group lines (Siddique et al., 2024). Natural experiments from the U.S. and China suggest that environmental documentaries can shift demand for environmental quality (Jacobsen, 2011; Tu et al., 2020). In terms of information content, a survey experiment shows

that videos focusing solely on climate impacts fail to raise support for climate policy, while those that also clarify policy mechanisms succeed in doing so (Dechezleprêtre et al., 2025). I build on this literature by embedding a documentary within a field experiment that pairs information about long-term environmental and health harms with a concrete, locally relevant template for action. Specifically, the documentary screening is integrated into a structured town hall that introduces a successful community bylaw as a salient example of feasible regulation and invites participants to deliberate and vote on local mining rules. This design demonstrates the potential of video-based information interventions not only to convey complex, long-term risks that are otherwise difficult to communicate, but also to test when such information, combined with a clear mechanism for action, translates into community collective action.

2. Setting and Intervention

2.1 Artisanal and Small-Scale Gold Mining

Artisanal and small-scale gold mining (ASGM) provides livelihoods for an estimated 14–19 million miners in more than 60 countries, indirectly supporting about 100 million people worldwide (UNEP, 2019). Unlike large-scale industrial mining — which is capital intensive, mechanized, and often foreign owned, ASGM is labor intensive, technologically rudimentary, and deeply embedded in rural community economies (Hilson, 2002).

Gold extraction methods in ASGM also differ fundamentally from those in industrial operations. Rather than using cyanidation or gravity separation, small-scale miners apply mercury to amalgamate gold from ore. The amalgam is then heated to vaporize the mercury and recover purified gold, releasing toxic vapors and leaving residual mercury in water and soil (UNEP, 2019). The Minamata Convention on Mercury obliges countries with significant ASGM activity to reduce, and where feasible, eliminate mercury use through National Action Plans (UNEP, 2013). Despite these commitments, mercury use remains widespread because it is inexpensive, quick to apply, and requires little capital or technical training (UNEP, 2012). As a result, it is widely recognized that eliminating mercury use in ASGM in the short term is infeasible. However, the most severe mercury exposure from amalgam burning is highly localized: within a few kilometers of emission sites, mercury concentrations can reach levels two to four orders of magnitude above background (Szponar et al., 2025). For this reason, policy recommendations emphasize restricting amalgam burning in residential areas, enforcing minimum setback distances of at least 500 meters from homes (UNEP, 2012).

Globally, artisanal and small-scale gold mining (ASGM) is the largest source of anthropogenic

mercury emissions, responsible for 38 percent of total human-caused releases. In South America and Sub-Saharan Africa, its share exceeds 80 percent (UNEP, 2019). Chronic exposure to mercury causes severe, long-term health consequences, including neurological and kidney damage, cardiovascular disease, and developmental disorders in fetuses and infants (Esdaile and Chalker, 2018).

In Ghana, gold deposits are concentrated in the Ashanti, Central, Eastern, Western, and Western North Regions. Historically, mining in these areas was conducted manually along riverbeds. Beginning around 2006, however, the introduction of heavy machinery by Chinese miners—including excavators, bulldozers, and floating dredges known locally as *changfa*—dramatically expanded gold production while accelerating environmental degradation (Crawford et al., 2015). These mechanized operations have polluted rivers, stripped forests, and contaminated soils through improper tailings disposal. Because mercury is typically applied in fixed proportion to gold output, increases in production have mechanically translated into higher mercury use and emissions.

ASGM in Ghana is deeply local in both organization and impact. Mining operations are embedded in customary land tenure systems and community networks that regulate access, labor, and dispute resolution (Hilson and Maconachie, 2017). The resulting environmental and health harms, such as reduced farm yields and fish stocks, river siltation, and mercury exposure, are borne primarily by those same local communities. This close alignment between cause and consequence highlights why community collective action is essential: where state enforcement capacity is limited, sustainable resource management depends on local coordination and leadership to internalize environmental costs and mitigate damage.

2.2 Study Community Selection and Household Sampling

The study was conducted in six districts spanning the Ankobra River Basin, which runs through Ghana's Western and Western North Regions. The Ankobra is among the country's most mercury-contaminated river systems, reflecting the high intensity of artisanal and small-scale gold mining (ASGM) activity in its watershed. To identify *galamsey* communities, research assistants conducted phone interviews with local politicians to identify rural communities that (i) have ongoing ASGM operations or (ii) face imminent pressure from nearby mining expansion. Applying population eligibility criteria between 400 and 3,000 residents and excluding communities too close to others, I selected 99 communities as my study sites. Appendix A provides additional details on the community selection process, including screening criteria and geographic mapping.

I conducted a baseline survey with 16 households per community in February 2025. Enumerators used a standardized random walk method with a pre-specified skip pattern to en-

sure spatial coverage. In each selected household, enumerators interviewed the member most knowledgeable about income, expenditure, and household decision-making. Eligible respondents were current residents who intended to remain in the community for at least six months following the baseline. Each household received a 20 GHS airtime top-up (approximately 1.3 USD) as compensation for completing the interview. Baseline data indicate that approximately 36 percent of households had at least one member engaged in small-scale mining, with substantial heterogeneity across communities.[6] In parallel, I conducted a baseline survey with each community's traditional chief.

The baseline surveys establish two defining features of the study setting: (i) limited public awareness of the long-term health consequences of mercury exposure, and (ii) the central, often decisive, role of traditional chiefs in shaping community responses to *galamsey*. These contextual features motivate the subsequent information intervention design.

2.3 Key Feature 1: Imperfect Information — Limited Awareness of Long-Term Health Risks

To measure awareness of health risks, the baseline household survey listed a series of health conditions and asked respondents whether they believed each was related to *galamsey*.[7] Figure 1 summarizes the share of households associating each health condition with *galamsey*. The pattern reveals that communities possess imperfect information in a specific form. Most households recognize the immediate and visible health risks of mining. For example, 74 percent link *galamsey* to malaria, reflecting awareness that shallow pits left by mining operations collect stagnant water that breeds mosquitoes, the malaria vector. Respondents are also aware that mercury is used in gold extraction and that it is poisonous (75 percent) and accumulates in the food chain (78 percent).

In contrast, far fewer households associate *galamsey* with long-term health conditions. Fewer than half link mining to miscarriage, birth defects, kidney or liver disease, neurological disorders, or respiratory conditions. This pattern suggests that imperfect information takes the form of under-recognition of gradual, cumulative harms rather than general ignorance. Two placebo conditions, diabetes and HIV/AIDS, serve as checks on indiscriminate attribution. Their low association rates reinforce that the observed pattern reflects genuine informational gaps about mercury-related illnesses rather than indiscriminate attribution of diseases to mining.

[6] Appendix Figure A1 shows that the interquartile range spans from 13 percent at the 25th percentile to 56 percent at the 75th percentile.

[7] Piloting indicated that asking directly whether *galamsey causes* a health condition led to confusion between the extensive margin (whether it can possibly lead to it) and the intensive margin (the magnitude of its effects). I therefore used a less causal framing: whether each condition is "related to" *galamsey*, which sets a lower bar for identifying awareness.

Field interviews suggest this unawareness often stems from *misattribution*: individuals often attribute long-term health conditions to spiritual causes or unrelated illnesses rather than prolonged mercury exposure. Figure 2 presents chiefs' responses to the same set of health knowledge questions, showing a similar pattern of limited awareness of long-term health risks, albeit with less precise estimates due to the smaller sample size.

While some of these conditions may be low-probability events, the lack of understanding matters because it diminishes perceived urgency and weakens motivation to act. When health risks are invisible, delayed, and poorly understood, community leaders and members have little incentive to coordinate preventive or regulatory action. Whether improving information about these long-term harms can shift beliefs and stimulate collective responses is therefore an empirical question that motivates our information intervention.

2.4 Key Feature 2: Traditional Local Chiefs in *Galamsey*

The second defining feature of the study context is the pivotal role of traditional local chiefs in community governance and land management.[8] Understanding chiefs' authority and incentives is therefore central to determining how information can be delivered effectively.

Traditional chiefs in Ghana are legally recognized as the custodians of communal lands, known as stool or skin lands, which constitute about 80 percent of the country's land area (Kasanga and Kotey, 2001; Goldstein and Udry, 2008; Ubink and Amanor, 2008). Under Article 267 of the 1992 Constitution, chiefs hold these lands in trust for their communities: they cannot sell them for personal gain but retain substantial discretion over their allocation and use. In contrast, the right to all minerals in their natural state is vested in the President of Ghana in trust for the people of Ghana under the Minerals and Mining Act, 2006 (Act 703). This means that even when gold or other minerals are found on stool land, ownership of those minerals legally resides with the state rather than the land custodians. To legally commence mining, individuals or entities must obtain a mining license granted by the Minister of Lands and Natural Resources through the Minerals Commission, but this process is often lengthy and administratively cumbersome (Hilson et al., 2022). In practice, many miners bypass formal licensing and seek approval directly from chiefs to operate on stool land, despite chiefs' lack of *de jure* authority to grant mineral rights. Our baseline survey reveals that 93 percent of mining households work in unlicensed sites, underscoring the gap between legal requirements and on-the-ground practice. In effect,

[8] There is a vast literature in political science and a growing literature in political economy examining the roles of chiefs (Acemoglu et al., 2014). Mamdani (1996) and Baldwin (2015) provide influential qualitative and quantitative accounts, respectively, of how chieftaincy institutions interact with citizens and the state across Sub-Saharan Africa. I focus specifically on the role of chiefs in Ghana as it relates to mining land access and the coordination of community responses.

chiefs often act as *de facto* gatekeepers for granting or withholding access to land for mining, shaping how local mineral resources are used even in the absence of formal legal authority.

This dual role, as both custodians of collective resources and potential rent seekers, places chiefs at the center of the *galamsey* problem. Their legitimacy and reach make them natural conduits for community information dissemination and coordination. Indeed, in my baseline survey, 48 percent of households identified the traditional chief as the actor best positioned to manage *galamsey*, compared to only 21 percent who named government agencies and 3 percent who mentioned security services.

At the same time, chiefs' control over land and mining access creates strong opportunities for private extraction. Some chiefs receive private payments from miners seeking to operate within their jurisdiction, generating potential conflicts of interest that can undermine collective action. Survey evidence underscores the prevalence of these incentives: 42 percent of chiefs report that they would accept knocking fees — a form of introductory payments made by miners to establish a working relationship with the chief — and 37 percent report receiving ongoing royalties in the form of a share of mining revenues.[9] To summarize, chiefs have the authority to regulate and mobilize collective responses against environmental harms, but the private income creates a disincentive.

To document these leadership incentives empirically, I collected data on chiefs' conflicts of interest three weeks prior to the information intervention. In each of the 99 study communities, I implemented a randomized response (RR) survey with 12 randomly selected community members.[10] The respondents were drawn independently from the baseline household sample. Because the topic is sensitive, the RR method provides a privacy-preserving way to estimate the community-level prevalence of perceptions that the chief would accept money to allow *galamsey*.[11] Respondents privately drew one card from a shuffled deck of four playing cards without revealing it to the enumerator. If the card was a heart, they were instructed to answer "Yes" regardless of their true belief; otherwise, they answered truthfully. Adjusting for the 25 percent forced "Yes" probability yields an unbiased estimate of the true affirmative share within each community.[12]

To validate that the RR measure captures meaningful variation in community members' per-

[9] These questions were designed with NGO partner input for cultural sensitivity, but given the illicit nature of these mining activities, responses are likely subject to downward reporting bias; these figures should therefore be interpreted as lower bounds.

[10] Randomized response is a technique designed to elicit more truthful answers to sensitive questions by providing respondents with plausible deniability. In addition, to protect respondent anonymity, enumerators collected no personally identifying information (e.g., name, age, gender).

[11] Enumerators were trained to ensure that respondents understood that the payments in question referred to private transfers to chiefs, rather than formal mining taxes that would be redistributed to the community.

[12] Formally, the true share equals $(p_{\text{obs}} - 0.25)/0.75$, where p_{obs} is the observed proportion of "Yes" responses.

ceptions, I also construct a complementary index based on carefully worded, directly asked questions measuring perceptions of chiefs' conflicts of interest in mining. The RR and directly asked measures are strongly correlated, with correlations of 0.41 at the individual level and 0.65 at the community level. Details on the direct-ask approach and validation results are provided in Appendix B.

Across all communities, the randomized response measure indicates that 52 percent (mean) of households believe their chief would take money to permit *galamsey*. Figure 3 plots the distribution of these estimates across communities. In the median community, 53 percent of households hold this view. I classify communities with estimated shares above the median as having *conflicted chiefs*, and those below as *non-conflicted chiefs*. The median conflicted community has an estimated share of 77 percent, compared to 27 percent among non-conflicted ones.

Figure 4 plots the relationship between the share of mining households and chiefs' conflicts of interest. Consistent with expectations, chiefs' conflicts of interest are positively correlated with the prevalence of small-scale mining in their communities: chiefs in more mining-intensive areas are more likely to be perceived as accepting payments to permit *galamsey*. However, the figure also reveals considerable variation in perceived chief conflicts with similar levels of mining activity. This heterogeneity underscores that leadership incentives are not mechanically determined by mining prevalence alone. It also mitigates a key identification concern that heterogeneous treatment effects might simply reflect differences in community mining intensity rather than in leaders' incentives. To address this potential confound, I incorporate both measures, chiefs' conflicts of interest and mining prevalence, into the experimental stratification procedure, ensuring balanced assignment across their combinations. All regression specifications control for baseline mining prevalence to isolate variation driven by leadership incentives.

To assess whether my randomized-response (RR) measure captures chiefs' actual vested interests, rather than merely community perceptions, I examine its correlation with chiefs' self-reported rent extraction, including whether they receive "knocking fees" or royalties from miners. Chiefs who reported accepting "knocking fees" were perceived by 13.5 percentage points more community members as willing to take money to allow *galamsey* ($p = 0.026$). In contrast, self-reported receipt of royalties is associated with a much smaller and statistically insignificant effect of 3.9 percentage points ($p = 0.53$). The RR association with knocking fees remains robust after controlling for the share of mining households, suggesting that community members infer chiefs' vested interests through channels beyond simply observing the extent of mining activity in the community.

Chiefs in Ghana ascend to power through lineage and customary selection rather than popular election. Succession is typically determined within royal families, with kingmakers or coun-

cils of elders nominating and enstooling a candidate based on matrilineal or patrilineal descent, moral character, and community standing (Rattray, 1929). Because chiefs are appointed for life and not electorally selected, this system limits formal downward accountability to citizens (Mamdani, 1996; Acemoglu et al., 2014).

Once installed, however, chiefs are constrained by a set of informal and customary accountability mechanisms rooted in communal consensus and traditional councils (Bamfo, 2000; Ayittey, 2010). Their legitimacy depends on maintaining peace, justice, and the welfare of their people. Chiefs who abuse power, mismanage communal resources, or act against community interests face strong social and institutional sanctions, including public shaming, withdrawal of allegiance by elders and sub-chiefs, and, in extreme cases, destoolment (removal from office). Consistent with the view of chiefs as "stationary bandits" embedded within their communities, these diffuse sanctions, such as gossip, reputational loss, and withheld tribute, serve as potential deterrents and can discipline behavior even in the absence of electoral accountability (Arhin, 1985; Baldwin, 2015).

2.5 Intervention: The *Poisoned for Gold* Documentary

The information intervention is based on the first 29 minutes of an 81-minute educational documentary, *Poisoned for Gold*, produced by investigative journalist Erastus Asare Donkor. For field implementation, this segment was translated and voice-dubbed in Twi, the predominant local language across study sites.[13]

The film adopts an investigative and evidence-based narrative style. It combines on-site footage of polluted rivers, farmland, and fish habitats with laboratory analyses demonstrating contamination from mercury, lead, arsenic, and cyanide. Scientists, physicians, and affected residents discuss the cumulative health consequences of long-term heavy-metal exposure, linking these to concrete medical outcomes such as miscarriage, birth defects, neurological disorders, kidney and liver damage, and respiratory illnesses. The documentary refrains from advocating specific policy actions or political positions; its objective is purely informational, conveying scientific evidence of mining-related environmental and health risks in an accessible way.

The documentary's credibility and production quality are nationally recognized. Donkor, who received Ghana's 2023 Journalist of the Year Award for a separate investigative film, *Destruction for Gold*, produced *Poisoned for Gold* with journalistic rigor. The film has circulated widely through television, radio, and social media, reaching urban and peri-urban audiences. However, its penetration into rural mining communities remains limited: nearly half of the study villages

[13]The corresponding English version is publicly available online: https://www.youtube.com/watch?v=wrhPscbb_Cc&t=636s.

lack reliable mobile phone or television signal. Consistent with this, baseline data show that 26 percent of households had heard of the film or its producer, and only 16 percent had watched any portion of it. This limited prior exposure underscores the low baseline information environment into which the intervention was introduced.

3. Research Design

The field experiment was conducted in 99 *galamsey* communities. Randomization was conducted at the community level, stratified along two key dimensions: (i) the prevalence of small-scale mining, measured by whether the baseline share of mining households was above or below the sample median of 0.32, and (ii) the presence of conflicted leadership, defined by whether the share of households believing their chief would take money to allow mining exceeded the median of 0.53 (as described in Section 2.4). Within each of the four resulting strata, communities were randomly assigned in equal proportions to one of three experimental arms, yielding 33 communities per arm.

The first treatment arm, seeding, involved a private viewing of the documentary *Poisoned for Gold* by the traditional chief and elders in the palace. The second treatment arm, broadcasting, received the same private palace screening for chiefs and elders as in seeding, but added a community-wide showing of the documentary at the beginning of a structured town hall meeting, which invited chiefs and was open to all community members. The control group received no screening prior to or during the town hall. In both treatment arms, screenings occurred on the same day as the town hall.

Town halls, referred to locally as *durbars*, serve as familiar community assemblies where local leaders and community members discuss public issues and coordinate collective tasks. In this study, they provide a natural setting for the information intervention and for measuring short-run collective action responses. All screenings were facilitated by trained field officers who maintained strict neutrality throughout the process. Officers were instructed not to express personal opinions or recommend specific actions, but to refer participants back to the documentary whenever questions arose, ensuring consistency and minimizing experimenter demand effects. Leader-only screenings were held privately in chiefs' palaces, whereas town halls took place in central venues such as churches, schools, or community centers.

The overall study design, timeline, and survey sequence are summarized in Figure 5. Baseline surveys were completed in February 2025, followed by randomized response surveys to collect information on chief conflicts of interest in June 2025, and the information intervention and town halls were implemented in July. Endline surveys were conducted three weeks later to

measure learning, attitudinal, and behavioral outcomes.

4. Data

This section details the outcome data collection and measurement points, which are summarized in Figure 6.

4.1 Town Hall – Structured Community Activities

Town halls were planned in all 99 study communities as the main venue for collective action activities. These town halls brought together traditional leaders and community members to deliberate on local mining issues and participate in structured activities. Each town hall followed a standardized sequence: documentary screening (only in communities assigned to the broadcasting arm), a moderated community discussion, chief's address to the crowd, two ballots capturing demand for community mining regulation and commitment to follow-up engagements, and a concluding announcement of results. Implementation details and field protocols are provided in Appendix C.

Importantly, the public screenings in broadcasting communities came as a surprise to participants. All communities received identical, neutrally worded invitations that mentioned a discussion on *galamsey* but made no reference to the documentary. This design aimed to ensure comparable participation across treatment arms and minimized the risk that attendance reflected prior attitudes toward mining.

The first ballot measured participants' demand for community regulation of *galamsey*, in the form of a customary bylaw. Such bylaws are recognized under Ghana's constitution, giving chiefs both legislative and enforcement authority. The Jema case, remarkably the only town unaffected by *galamsey* in its district, demonstrates the potential of this approach. Importantly, broad-based community support is seen as essential: 76.4 percent of baseline households believe a bylaw requires majority community backing to be effective, highlighting the importance of community buy-in.

Before voting, field officers introduced the "Jema Template", a locally recognized case in which a community adopted a customary bylaw to successfully prevent mining.[14] Officers then emphasized that each community has its own priorities and asked participants: "If your community were to create a *galamsey* bylaw, what should its focus be?" Participants chose one of five

[14] Appendix Figure A2 presents the Jema bylaw template, which outlines the rationale and clauses of the regulation, accompanied by the fingerprints of the chiefs and clan heads who endorsed it.

policy options, grouped into three categories: (A) *No mining* — stopping all current and future mining; (B) *Safer and cleaner mining* — B1/ banning mining in forest reserves and water bodies, B2/ banning amalgam burning near homes, or B3/ both; and (C) *No change* — maintaining the status quo. Following the design of ballot used in political elections in Ghana, our ballot includes simple symbols to facilitate participation among low-literacy attendees. This first ballot is anonymous. A sample first ballot is shown in Appendix Figure A3.

The second ballot captured participants' revealed commitment to contribute time and resources toward sustained collective action beyond the meeting. Three real-stakes activities measured different dimensions of engagement. First, participants could volunteer to attend or organize regular community meetings on *galamsey* to track what is working, identify gaps, and organize responses. Second, they could opt to join a WhatsApp group moderated by the Ghana Environmental Advocacy Group (GEAG), an NGO that supports local environmental initiatives. Third, participants took part in a crowd-bidding activity, allocating part of a potential 50 GHS prize (approximately 5 USD) between themselves and a communal fund to host an NGO workshop. The latter measure captures individuals' financial willingness to invest in local collective action. This second ballot is not anonymous. A sample second ballot is shown in Appendix Figure A4.

Before the ballots, chiefs were invited to address the assembly. The chief can designate a delegate from the traditional council to represent them.[15] Two field officers independently coded their speeches using pen and paper structured checklists, recording whether the chief (or delegate) referred to the documentary, mentioned benefits or harms of *galamsey*, or expressed verbal or behavioral support for collective action. For example, a chief could endorse stricter bylaws, encourage meeting attendance by committing to provide logistical support, or contribute to the NGO fund from his personal 50 GHS endowment. Chiefs were informed earlier in the day that they would be invited to speak to avoid surprise. These behavioral and verbal indicators serve as my measures of chiefs' information dissemination and mobilization efforts. Further details on checklist items and coding procedures are provided in Appendix C.

Out of 99 study communities, I encountered noncompliance in five communities. In four communities, two assigned to broadcasting and two in the control group, the town hall could not be organized.[16] In one additional community, the chief neither attended nor sent a delegate, leaving 94 observations available for analyses on chief efforts in information dissemination and

[15] Common reasons cited include sickness or not living in the community. I will present results on heterogeneous treatment effect by chief conflict of interest.

[16] In one broadcasting community, the chief passed away a few days before the scheduled town hall, and, under local custom, no public gatherings or visits by outsiders are permitted until after the funeral. Two other communities (one broadcasting and one control) were deemed unsafe for field officers due to strong *galamsey*-related tensions. Finally, one control community was experiencing an unresolved chieftaincy dispute involving multiple claimants to the stool.

mobilization.

In total, among the 95 town halls, I have 4,588 first ballots on the community regulation and 4,505 second ballots on the revealed commitment of time and resources. On average, 41 percent of the participants are from mining households, slightly higher than the 38 percent mining households share estimated from the randomly selected baseline household sample.[17] Turnout rates varied across treatment arms and chief types; I discuss these differences and robustness checks in the result section.

4.2 Household Surveys

Recall that my hypothesized causal chain begins with information exposure — through either chiefs' dissemination efforts in the seeding arm or direct exposure to the documentary in the broadcasting arm — and proceeds to subsequent learning and collective action responses. The household surveys measure learning through a series of questions testing health-related knowledge and capture collective action behaviors three weeks after the town halls.[18]

The survey also captures a set of secondary outcomes designed to shed light on mechanisms. These include perceptions of *galamsey*, accountability attitudes toward chiefs, willingness (and perceived willingness of others) to participate in community collective action, and attitudes toward mining and non-mining households. For respondents who attended the town hall, a dedicated module asks whether the chief mentioned specific health risks or referenced the documentary, allowing triangulation with the chief speech checklist.

The endline survey was administered in all 99 study communities, including the four where town halls could not be held. Of the 1,586 baseline households, 1,368 were successfully reinterviewed, yielding an attrition rate of 13.7 percent, with no differential attrition across treatment arms. Among endline respondents, 82.1 percent reported awareness of the town hall, and 49.6 percent reported having attended. At the community level, these correspond to an average of 13.8 tracked households out of 16 baseline respondents, 11.3 aware of the event, and 6.9 attending, equivalent to a 43 percent attendance rate for study households.[19] All analyses using household survey data are estimated as intention-to-treat effects.[20]

[17] Because some town halls were held outdoors, formal registration at entry was infeasible. As a result, individuals who attended but chose not to cast a ballot, for example, if they perceived the activities as threatening, are not captured in our attendance count.

[18] Due to logistical constraints, no exit survey was conducted immediately after the town halls. The measured health learning effects therefore reflect knowledge that persists for three weeks rather than short-term recall.

[19] Common reasons for officers failing to reach a household included temporary absence from the community or being occupied at farms or mining sites during the day.

[20] Split-sample analyses in Section 5.3 suggest that treatment effects on learning among non-attendees are comparable to those among attendees, implying meaningful horizontal spillovers among community members.

4.3 Chief Surveys

The chief survey parallels the household survey in structure and content, capturing leaders' knowledge, attitudes, and post-intervention actions. It includes measures of health-risk learning, views on mining, as well as questions designed to document chiefs' motivations and engagement in mobilization following the intervention.

In cases where a chief designated a delegate from the traditional council to represent them at the town hall, enumerators interviewed the delegate instead. Among the 96 endline respondents, 79 percent are the substantive chiefs of their communities, and 21 percent are officially designated delegates.[21]

5. Results

This section begins with the empirical specification. I then present the experimental results by tracing the causal chain from information exposure to chiefs' dissemination and mobilization efforts, learning among chiefs and community members, and subsequent collective action outcomes measured in the town halls and surveys. The final two subsections examine effects on accountability toward chiefs and the emergence of pessimism about collective action.

5.1 Empirical Specification

I estimate treatment effects using ordinary least squares (OLS), restricting the sample to observations from the town halls and the endline household and chief surveys. For household or chief i living in community c, the outcome variable is denoted by Y_{ic}. My main estimating equation is:

$$\begin{aligned} Y_{ic} = \alpha &+ \beta_1 \textit{Seeding}_c + \beta_2 \textit{Broadcasting}_c \\ &+ \phi_1 \textit{Conflicted Chief}_c + \phi_2 \textit{High Mining Comm}_c + \delta \textit{Mining HH}_{ic} + \lambda_D + \varepsilon_{ic} \end{aligned} \tag{1}$$

where $\textit{Seeding}_c$ and $\textit{Broadcasting}_c$ are indicator variables for assignment to the seeding and broadcasting treatments, respectively, with the control group omitted. $\textit{Conflicted Chief}_c$ is an

[21] Three chiefs are missing from the endline sample: two from broadcasting communities (one due to the chief's passing before the town hall and one deemed unsafe for fieldwork) and one from a control community experiencing a chieftaincy dispute. Of the endline respondents, 71 percent are the same individuals interviewed at baseline. In cases where a different person was interviewed, this typically reflects that a delegate attended the town hall and therefore was selected to complete the endline survey, while the chief had completed the baseline interview.

indicator for communities where the share of households perceiving the chief would accept money to allow *galamsey* is above the sample median. *High Mining Comm*$_c$ is an indicator for communities with an above-median share of mining households at baseline. *Mining HH*$_{ic}$ is a household-level indicator for whether any household member is engaged in mining. λ_D denotes district fixed effects, and the error term ε_{ic} is clustered at the community level to account for within-community correlation. The coefficients of interest β_1 and β_2 capture the average treatment effects of seeding and broadcasting relative to the control group.

To examine heterogeneity by leadership incentives, I extend the specification as follows:

$$\begin{aligned} Y_{ic} = \alpha &+ \beta_1 \textit{Seeding}_c + \beta_2 \textit{Broadcasting}_c \\ &+ \gamma_1 \big(\textit{Seeding}_c \times \textit{Conflicted Chief}_c\big) + \gamma_2 \big(\textit{Broadcasting} \times \textit{Conflicted Chief}_c\big) \\ &+ \kappa_1 \big(\textit{Seeding}_c \times \textit{High } \widehat{\textit{Mining}}\textit{ Comm}_c\big) + \kappa_2 \big(\textit{Broadcasting} \times \textit{High } \widehat{\textit{Mining}}\textit{ Comm}_c\big) \\ &+ \phi_1 \textit{Conflicted Chief}_c + \phi_2 \textit{High } \widehat{\textit{Mining}}\textit{ Comm}_c + \delta \textit{Mining HH}_{ic} + \lambda_D + \varepsilon_{ic} \end{aligned} \tag{2}$$

Here, $\widehat{\text{HighMiningComm}}_c$ is the demeaned version of the high-mining-community indicator, obtained by subtracting its sample mean. This centering ensures that the estimated treatment effects are evaluated at the average level of mining prevalence. The coefficients β_1 and β_2 capture the treatment effects of seeding and broadcasting in non-conflicted communities (those with below-median share of households perceiving the chief would accept money to allow *galamsey*). The interaction terms γ_1 and γ_2 measure how these effects differ in communities with conflicted leadership versus non-conflicted leadership, such that $\beta_1 + \gamma_1$ and $\beta_2 + \gamma_2$ represent the corresponding treatment effects in conflicted-chief communities. As in the average treatment effect specification, all standard errors are clustered at the community level.

5.2 Leaders as Information Gatekeepers

I begin the analysis by examining the first step in the causal chain: how chiefs themselves responded to the information treatment through their attendance, communication, and information-sharing efforts during the town halls. Table 1 reports the results.

Column (1) shows that when the documentary was screened publicly to both leaders and community members (broadcasting), conflicted chiefs were 41 percentage points less likely to attend the town hall in person ($\beta_2 + \gamma_2$), a 60 percent decline relative to the control mean of 68 percent chief attendance rate. No such pattern appears among conflicted chiefs in the seeding arm. This behavioral avoidance is consistent with conflicted leaders seeking to evade the

accountability pressures created by public information dissemination. In Section 5.6, I provide survey evidence corroborating this interpretation.

Column (2) examines whether chiefs who attended made an effort to disseminate the information received. In both the seeding and broadcasting treatments, over 95 percent of non-conflicted chiefs referenced the *Poisoned for Gold* documentary during their speech, indicating broad engagement with the intervention content. In contrast, conflicted chiefs were 30–39 percentage points less likely to make any reference to the film (γ_1 and γ_2), demonstrating a relative reluctance to share the information they received.

Column (3) considers the intensity of information dissemination, measured by the number of distinct health conditions mentioned by the chief or delegate.[22] Chiefs in the seeding treatment who were non-conflicted mentioned significantly more health conditions than those in the control group, while chiefs in the broadcasting treatment also showed a positive, albeit statistically insignificant, increase. In both treatments, conflicted chiefs mentioned fewer health conditions than non-conflicted chiefs. Although the estimates for differential treatment effects are imprecise, the direction of effects closely aligns with theoretical predictions that vested interests reduce information sharing.

I also examine the broader content of chiefs' speeches. In supplementary analyses (to be included in the online appendix), I report results on whether chiefs mentioned the perceived benefits of *galamsey*, its environmental harms, and mercury exposure pathways.

5.3 Community Learning

I next examine the second step in the causal chain: whether information exposure translated into greater awareness of health risks from *galamsey*. Data for this analysis come from endline surveys three weeks after the intervention. The endline household survey listed a series of health conditions and asked respondents whether they believed each was related to *galamsey*.[23] For each condition, responses were standardized, and a composite health-knowledge index was constructed using generalized least-squares weighting following Anderson (2008).[24]

Figure 7 presents results for chiefs' own learning. The documentary produced strong learning effects among chiefs in both the seeding and broadcasting groups, with increases of 0.48 and

[22] The enumerator checklist included the same set of health conditions as shown in Figure 1, excluding placebo items, with space for additional conditions mentioned.

[23] Responses were recorded on a five-point scale ranging from "strongly believe unrelated" to "strongly believe related." Unlike the binary (yes/no) format used at baseline, this scale increases measurement precision and statistical power.

[24] This method combines several related outcomes into a single index in a way that maximizes statistical power to detect a treatment effect.

0.57 standard deviations on the health-knowledge index, respectively, relative to control.

Turning to community members, Figure 8 shows that despite the information dissemination efforts made by chiefs documented in Table 1, there were no detectable improvements in health-risk learning among community members in seeding communities, regardless of leader type.[25] In contrast, broadcasting led to substantial learning gains: community members scored 0.50 standard deviations higher on the health-knowledge index relative to control communities.

The learning effect was similar across communities led by conflicted and non-conflicted chiefs, suggesting that direct exposure to the documentary, rather than leader mediation, was crucial for community learning. This pattern lends support to the growing literature on video-based information interventions, which emphasizes the effectiveness of visual and narrative formats for conveying complex technical information. In this context, video delivery substantially enhanced learning beyond what local chiefs could transmit, highlighting the limits of relying on these leaders — who often lack the communicative capacity due to age and lower formal education — to convey complex technical knowledge.[26] While the external validity of this result is context-dependent, it underscores the importance of assessing information complexity and the communicative capacity of local intermediaries when designing delivery channels.

These results are reported as intention-to-treat estimates and include both town hall attendees and non-attendees.[27] The estimated effects therefore capture both information acquired during the town hall through direct exposure to the documentary and indirect post–town hall spillovers from attendees to non-attendees. Appendix Figure A5 splits the sample by attendance status and shows similar learning effects for attendees and non-attendees. The presence of learning among non-attendees points to horizontal information diffusion through post–town hall interactions among community members. By simultaneously informing a critical mass of residents, broadcasting generated shared knowledge that facilitated peer-to-peer discussion and reinforced learning beyond the formal meeting. Consistent with this mechanism, I show in Section 5.5 that broadcasting significantly increased the frequency of community discussions about *galamsey*, providing a natural channel through which information spread beyond those directly exposed to the documentary.

[25] Appendix Table A1 presents results on heterogeneous treatment effects on learning.

[26] Because it is considered inappropriate to ask chiefs about their age or education, I lack systematic data to conduct subsample analyses. However, the near-zero effects in seeding suggest that leader-mediated transmission was largely ineffective across the sample.

[27] This approach accounts for potential differential selection into town hall participation, which I examine in the next subsection.

5.4 Collective Action I: Community Consensus On Mining Regulation

Before turning to how information shaped preferences for community mining regulation, I first examine participation in the town hall ballots, which provide the data for the community mining regulation analysis. In the control group, the average attendance was 51.7 participants per community. Control communities with conflicted chiefs saw 13.6 fewer attendees on average. Broadcasting communities also experienced lower attendance, about 9.8 fewer participants than control communities, partially due to lower participation among mining households. By contrast, seeding communities with conflicted chiefs saw 10.0 more attendees than control communities with conflicted chiefs, largely due to increased participation among non-mining households.[28]

In subsequent analyses, I address these participation differences by estimating robustness checks that (i) separate results by occupation and (ii) reweigh voters in treatment communities to match the mining versus non-mining household composition observed in control communities.[29]

Table 2 examines how the information treatments influenced collective decision-making on community mining regulation, the first dimension of collective action measured during the town halls. Specifically, I analyze voting outcomes from the ballot where participants selected their preferred bylaw governing local mining activities.

The dependent variable in Columns (1) and (2) is a binary indicator equal to one if a town hall attendee voted for one of the two most stringent bylaw options — either banning all mining activities or jointly banning mining in forest reserves and water bodies together with amalgam burning near homes. Column (1) shows that seeding had virtually no effect on preferences for stricter mining regulation ($\beta_1 = 0.026$), while broadcasting increased the share voting for these stringent options by 10 percentage points (β_2). Column (2) investigates the heterogeneity by chief type. The positive average effect of broadcasting is concentrated in communities led by non-conflicted chiefs: an estimated 16.5 percentage point increase (β_2). In contrast, the effect is near zero in communities with conflicted leadership ($\beta_2 + \gamma_2 = 0.029$, $p = 0.51$).

Columns (3) and (4) analyze preference dispersion to capture whether information reduced or widened disagreement within communities. The outcome measures the absolute distance between an individual's preferred bylaw stringency and the community mean stringency.[30] Col-

[28] Appendix Table A2 reports detailed estimates of turnout differences across treatment arms and leader types.

[29] These weighting estimators allow treatment effects on voting choices (intensive margin), conditional on participation, to vary by occupation, while assuming homogeneous treatment effects within each occupational group. I also plan to conduct sensitivity analyses to assess how strong any differential intensive-margin effects across occupations would need to be to overturn the main result; these analyses will be included in a later version of the paper.

[30] Bylaw intensity is coded as: 3 = ban all mining, 2 = ban both mining in forests/river and amalgam burning near homes, 1 = ban one of these, and 0 = no change.

umn (3) shows no average effect of either treatment. Column (4) reveals that in communities with conflicted chiefs, broadcasting increased polarization by roughly 19 percent relative to control communities ($\beta_2 + \gamma_2 = 0.125$, $p = 0.038$). Measure-by-measure analyses in Appendix Table A3 indicate that this divergence reflects movements at both extremes of the preference distribution: the share voting for the least stringent option, maintaining the status quo, increased by 4.5 percentage points (79 percent relative to control communities), while the share voting for the most stringent option, banning all mining activities, increased by 12.6 percentage points (58 percent relative to control communities).

Analyses of chiefs' persuasive efforts during the town halls provide additional insight into these patterns. In control communities, 84 percent of chiefs (or their delegates) supported a stringent bylaw.[31] Appendix Table A4 shows that conflicted chiefs in broadcasting communities (or their delegates) attempted to counteract the broadcasting effect: they were 40.7 percentage points more likely than conflicted chiefs in control communities to advocate for maintaining the status quo. ($p = 0.005$). This pattern mirrors the attendance results in Section 5.2, where conflicted chiefs were significantly less likely to attend town halls when the documentary was shown publicly.

Taken together, evidence from chiefs' persuasive efforts and community voting suggests the presence of two distinct types of community members: those whose votes reflect their own evaluation of the net benefits of *galamsey*, and those whose choices are influenced by their beliefs about the chief's stance. The latter group may have voted for maintaining the status quo upon observing — or inferring from the chief's absence — that the leader did not endorse the bylaw initiative. The high baseline rate of chiefs supporting stringent bylaws limits my ability to detect whether non-conflicted chiefs changed their own policy preferences or whether their choices directly influenced constituents. Overall, the findings indicate that conflicted chiefs can impede consensus formation by signaling opposition to stricter regulation, while there is no clear evidence that non-conflicted chiefs' persuasive efforts amplified support for regulation.[32]

Overall, these results suggest that information disseminated publicly can shift community preferences toward stricter environmental regulation when delivered under non-conflicted leadership, but may instead deepen divisions when leadership incentives are misaligned. These findings are robust to occupation-specific estimations (Appendix Table A6), weighting to balance voter composition (Appendix Table A7), and a "donut" specification that excludes 33 com-

[31] Chiefs and delegates used the same ballot as community members but were informed that their ballot choices would be announced publicly before the audience, framed as an opportunity to demonstrate leadership and shape community preferences.

[32] In seeding communities, non-conflicted chiefs were 22.9 percentage points more likely to support a stringent bylaw ($p = 0.028$; Appendix Table A4), and their communities were 8.1 percentage points more likely to vote for one ($p = 0.186$; Table 2). These results suggest, albeit weakly, that chiefs' persuasion may have modestly influenced community regulation preferences.

munities in the middle tercile of the conflict-of-interest distribution (Appendix Table A8).

5.5 Collective Action II: Sustained Community Engagement

I now turn to the second dimension of collective action: whether the information treatments fostered continued engagement beyond the initial deliberation on mining regulations. I measure community engagement along two complementary dimensions: (i) stated time commitments made during the town halls, and (ii) actual engagement in follow-up discussions as reported in endline surveys conducted three weeks later.

Figure 9 presents the results.[33] The first outcome is participants' decision to join an NGO-moderated WhatsApp group, which provides an external communication channel for coordinating community responses to *galamsey*. The second outcome is an index combining commitments to attend and organize regular follow-up community meetings, as measured from ballots cast at the town halls. The third outcome, constructed from endline survey data, is an index of actual post-event engagement, combining the frequencies with which respondents discussed *galamsey* with mining and non-mining community members. All outcomes are standardized.

Three key patterns emerge. First, in seeding communities with non-conflicted chiefs, follow-up engagement declined across all measures. Yet these same chiefs appeared more proactive during the town hall, with large point estimates for encouraging regular meetings (14.8 percentage points), offering logistical support (22.5 percentage points), and encouraging WhatsApp participation (17.4 percentage points). While only the effect on logistical support is statistically distinguishable from zero, the consistently positive magnitudes across these actions suggest increased leader initiative, albeit measured imprecisely (Appendix Table A5). Thus, a plausible interpretation is that when community members have limited understanding of the problem's urgency, chiefs' unilateral mobilization efforts backfired, crowding out rather than encouraging participation, as community members perceive leaders' actions as a strategic substitute for their own.

Second, broadcasting significantly increased commitments to attend and organize regular follow-up meetings, as well as actual post-event engagement, regardless of the chief's conflict status. This pattern holds despite conflicted chiefs (or their delegates) being 53.5 percentage points less likely to encourage meetings and 31.9 percentage points less likely to provide logistical support during the town hall ($\beta_2+\gamma_2$ in Appendix Table A5). Thus, for sustaining engagement, informing the broader public alone appears sufficient — unlike building consensus, which re-

[33] The heterogeneous treatment specification is reparameterized in all coefficient plots so that effects by leadership type (conflicted vs. non-conflicted) can be directly read from the figure. The underlying regressions remain identical to the main specification. Appendix Tables A9 and A10 reports the corresponding results using non-standardized outcome measures.

quires both an informed public and non-conflicted leadership.

Third, broadcasting also increased enrollment in the NGO-moderated WhatsApp group, but only in communities with conflicted leaders, by 11.6 percentage points (a 39 percent increase relative to the 30.1 percent control mean). This pattern suggests that when local leadership credibility is compromised, an informed public may seek alternative coordination channels beyond the realm of traditional authority.

For completeness, I also examine the financial contribution measure elicited during the town halls in Appendix Table A9. I find no significant average or heterogeneous treatment effects on this outcome. Nonetheless, the level of voluntary contribution is notable: on average, participants allocated 26.8 GHS out of a 50 GHS endowment to bring our NGO partner to their community for an additional workshop.

5.6 Accountability and Perceptions of Leadership

While the previous sections focus on short-run town hall and follow-up engagement outcomes, this section examines community members' attitudes toward holding traditional leaders accountable, an outcome with potentially longer-term implications for local governance dynamics. To measure demand for accountability, respondents were presented with two statements and asked which reflected their views.[34] The two statements are: (1) "When it comes to *galamsey*, community members should be more active in questioning the actions of local chiefs." and (2) "When it comes to *galamsey*, we should have more respect for the authority of local chiefs." Respondents chose one of four mutually exclusive options: "question only," "respect only," "both question and respect," or "neither".

Figure 10 presents the results. Seeding had no detectable effect on accountability attitudes. In broadcasting communities with non-conflicted chiefs, respondents were 7.6 percentage points less likely to say that people should question their chiefs' actions (relative to the 49.7 percent control mean), though this difference is statistically insignificant ($p = 0.14$), suggesting no erosion of authority legitimacy. In contrast, under conflicted leadership, broadcasting strengthened accountability norms: respondents were 12.3 percentage points less likely to express unconditional respect for chiefs (relative to the 33.2 percent control mean; $p = 0.006$) and 10.9 percentage points more likely to choose the balanced position that communities should both respect and question their chiefs (relative to the 15.9 percent control mean; $p = 0.077$).

Self-reports from the endline survey with chiefs paint a consistent picture: chiefs in broadcasting communities rated pressure from community members significantly higher as a motiva-

[34] The design of this question follows Acemoglu et al. (2014), modified to focus on *galamsey* and to reference local chiefs explicitly rather than "leaders" or "authorities."

tion to participate in collective action (Appendix Figure A6). These patterns echo earlier findings in Section 5.2 that conflicted chiefs were less likely to attend the town hall with a public screening — consistent with their attempts to avoid the accountability pressures that public information dissemination can generate.

5.7 Pessimism About Collective Action

Despite the overall positive effects of broadcasting, information interventions that convey "bad news" may also have unintended consequences. In the endline survey I measure pessimism in collective action in two ways. Column (1) of Table 3 reports responses to the question: "Comparing the two approaches — community collective action and top-down government intervention — which do you think is more promising or effective in addressing the *galamsey* issue?" Columns (2)–(6) measure willingness to take part in a collective community effort, both for the respondent personally and for their perceptions of others' willingness, including their close friends or neighbors, non-mining households, mining households, and the local chief.

The results reveal a consistent pattern. Seeding has small and statistically insignificant effects across all but one outcome. By contrast, broadcasting has statistically significant negative effects across all outcomes.[35]

Respondents in broadcasting communities were 10.8 percentage points less likely to view collective community action as more effective than government intervention. This seems paradoxical given the positive collective action results documented in Sections 5.4 and 5.5. A plausible interpretation is that while the information shock was strong enough to prompt initial engagement, it also reinforced the perception that *galamsey* is an intractable problem beyond local capacity to solve.

Respondents in broadcasting communities were also 11.2 percentage points less willing to participate themselves (albeit from a high control mean of 91.6 percent), and perceived others as substantially less willing to engage. The magnitude of this perceived decline ranges from 11.9 to 15.8 percent relative to control means, depending on the reference group considered. This result helps distinguish between two distinct Bayesian updating mechanisms. In one model, individuals who know others were also exposed to the documentary may positively update their expectations about others' future actions — believing that others' increased awareness of the risks will spur greater collective effort. In the alternative model, individuals interpret the documentary's portrayal of environmental degradation as evidence of others' past inaction and, assuming path dependence, infer that such inaction will persist. My findings align with the latter:

[35] Appendix Table A11 shows that these pessimistic responses do not vary systematically by chief type.

exposure to vivid evidence of environmental harm led to more pessimistic beliefs about others' willingness to act. This result sheds light on the rapidly growing literature on misperception, much of which elicits and models the causes and consequences of second-order beliefs (Bursztyn and Yang, 2022). I revisit the policy implications of the pessimism results in the concluding section.

5.8 Additional Results and Robustness Checks

Before concluding, I document several additional results and robustness checks. First, using a set of dictator games, I find no evidence of backlash or social exclusion between mining and non-mining households, nor any evidence on perceived backlash (Appendix Table A12). This provides reassurance that increasing awareness of the harms of *galamsey* did not generate social divisions or stigmatization of miners, a potential unintended consequences that could undermine community cohesion.

Second, I examine whether the intervention affected individuals' willingness to engage in collective action at the national level (Appendix Table A13). Respondents were asked (i) whether they would like to add their name to a petition opposing a pro-mining legislative instrument, and (ii) how much of a 20 GHS survey incentive they wished to donate to an NGO supporting grassroots anti-*galamsey* activism.[36] I find no significant treatment effects on either outcome, suggesting that while the intervention influenced local preferences and actions, it did not spill over into broader, national-level collective action.

6. Conclusion

An extensive literature shows that when individuals receive new information about environmental hazards or their health impacts, they often respond through private adaptation and by revising their policy preferences toward state intervention. Yet there remains limited field evidence that information can causally jump-start community collective action.

In this setting, traditional chiefs serve as the *de facto* local governance authority, filling the vacuum left by weak state institutions. This stands in contrast to much of the recent literature, which randomizes chiefs' involvement in policy domains where the state remains the dominant governance actor. Although randomizing chiefs directly is infeasible in our setting, I exploit experimental variation in information dissemination channels to examine how leadership charac-

[36] The petition, part of an ongoing effort by the Ghana Coalition Against Galamsey, called on the President to revoke Legislative Instrument 2462, which permits mining in forest reserves under certain conditions. In December 2025, four months after the study concluded, the Ghanaian government repealed this legislative instrument.

teristics, particularly conflicts of interest, shape collective responses to new information.

Specifically, I randomize two channels for delivering a documentary on the health impacts of artisanal and small-scale gold mining: seeding the information through chiefs and broadcasting the same information directly to both chiefs and community members. Which channel performs better is theoretically ambiguous. The seeding approach leverages chiefs' local authority and network centrality, which could legitimize information and facilitate diffusion. The broadcasting approach, by contrast, bypasses potentially conflicted leaders who might suppress or distort information. The experiment thus reveals how the interaction between dissemination channels and leader incentives shapes both learning and community collective action.

On information transmission, while non-conflicted chiefs exerted greater effort in passing on information than conflicted chiefs, these differences did not translate into differences in community learning. Instead, learning depended primarily on the dissemination channel: I observe null learning under seeding but strong health-risk learning under broadcasting. In this context, the information was likely too complex to be accurately transmitted by traditional chiefs, many of whom are older and less formally educated, and more effectively conveyed through direct, video-based communication. Although the external validity of this result must be assessed on a case-by-case basis, it brings to light several underappreciated factors critical to designing effective information interventions: message complexity, the capacity of information conduits, and the technology used for transmission.

On collective action, broadcasting communities, regardless of leader conflicts of interest, showed higher commitment to and actual participation in follow-up engagements. However, conflicts of interest critically shaped how learning translated into demand for stricter local environmental regulation. An informed public increased support for stricter community mining bylaws only when leaders were non-conflicted; where leaders were conflicted, it polarized preferences. The findings point to an important distinction between consensus and engagement. Sustaining community engagement does not depend on leader alignment and responds strongly to broad public information. In contrast, reaching agreement on stricter local mining rules requires both an informed public and non-conflicted leadership; neither alone is sufficient. Although an informed public failed to build consensus under conflicted leadership, the emergence of accountability pressures, where informed citizens begin to question their chiefs, suggests that the arc of collective action may eventually bend toward community welfare.

Finally, the pessimism findings offer a nuanced lesson for the design of information campaigns. Information not only raises awareness but also exposes structural barriers to collective action. "Bad news" campaigns that reveal the extent of environmental harm can reduce ignorance but risk inducing fatalism unless paired with concrete pathways for action. In our setting,

while the intervention included real avenues for collective action, such as bylaw ballots and volunteer sign-ups for follow-up meetings, these proved insufficient to counteract the rise in pessimism. Future interventions should therefore pair information dissemination with tangible responses, ensuring that information empowers rather than discourages communities.

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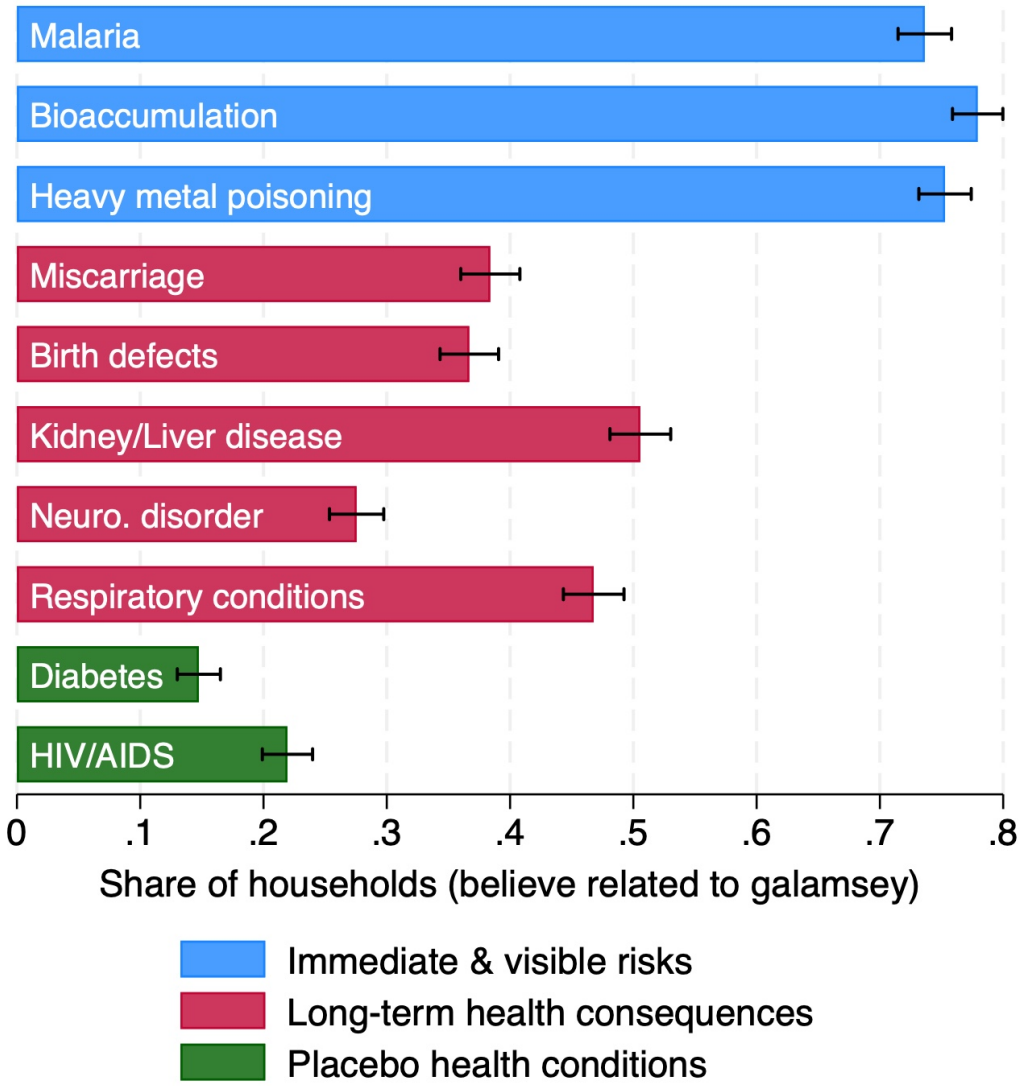
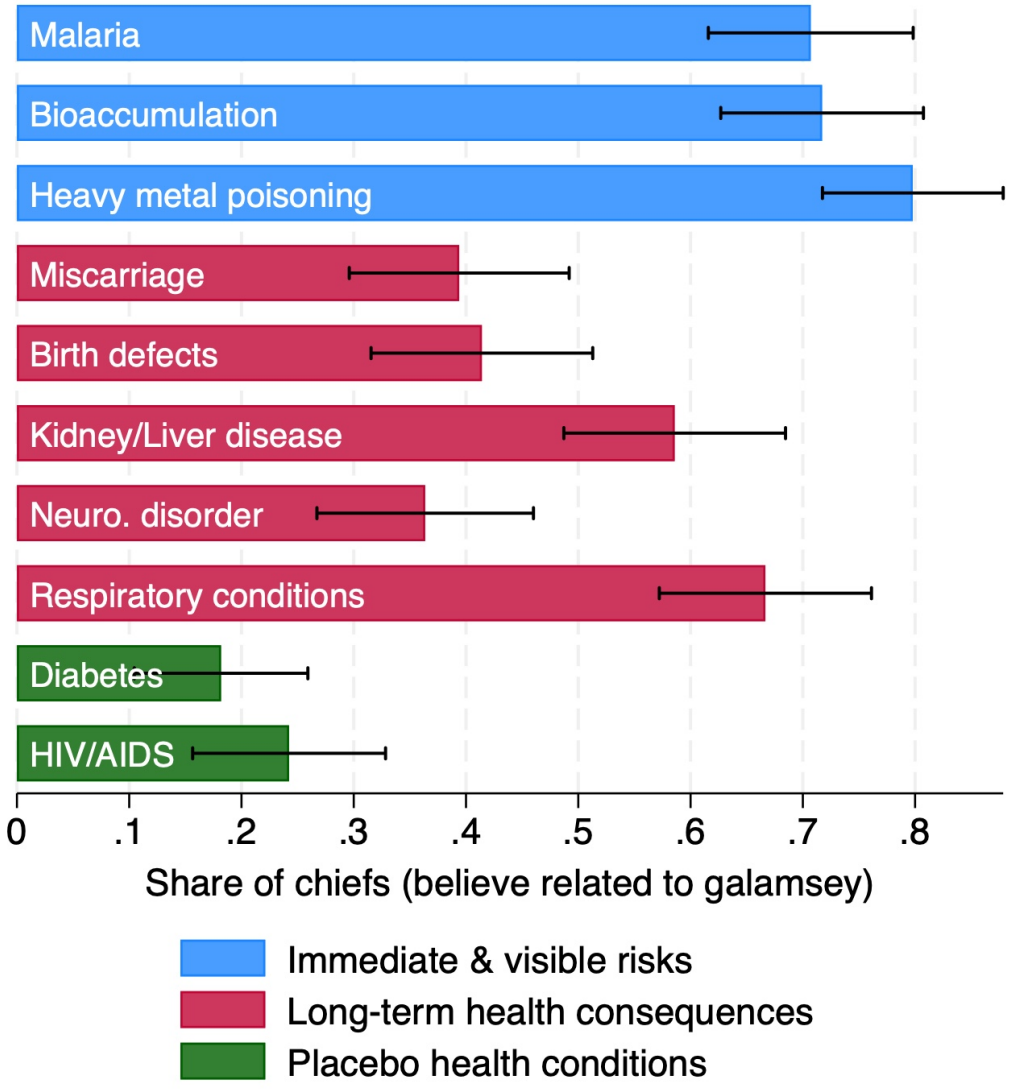
Figures

Figure 1: Baseline Household Awareness of Health Conditions Related to *Galamsey*



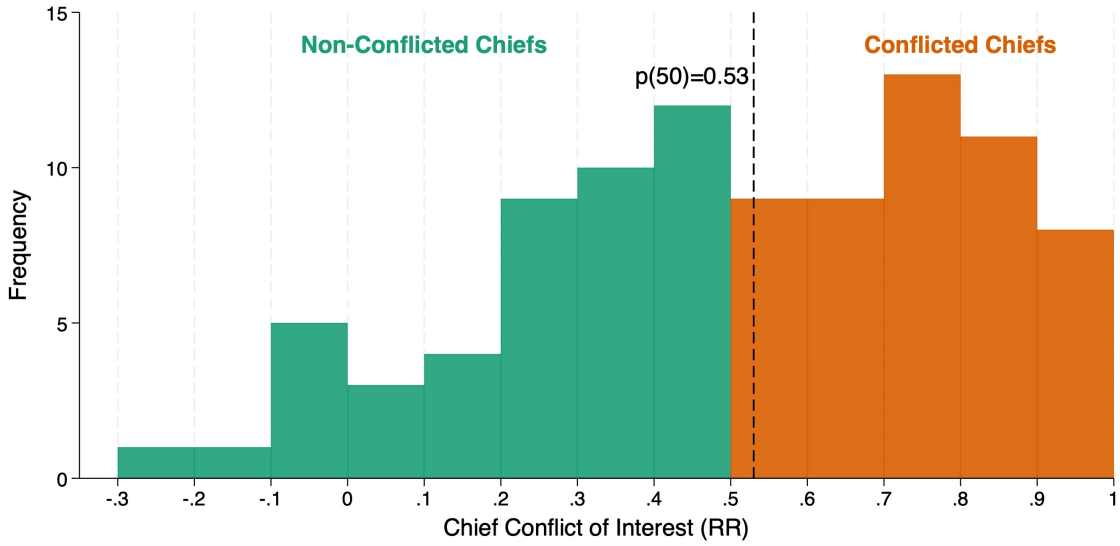
Notes: Figure shows the share of households that believe each health condition is related to artisanal mining activities. Bars indicate 95% confidence intervals. Blue bars denote immediate and visible risks, red bars long-term health consequences, and green bars placebo conditions.

Figure 2: Baseline Chief Awareness of Health Conditions Related to *Galamsey*



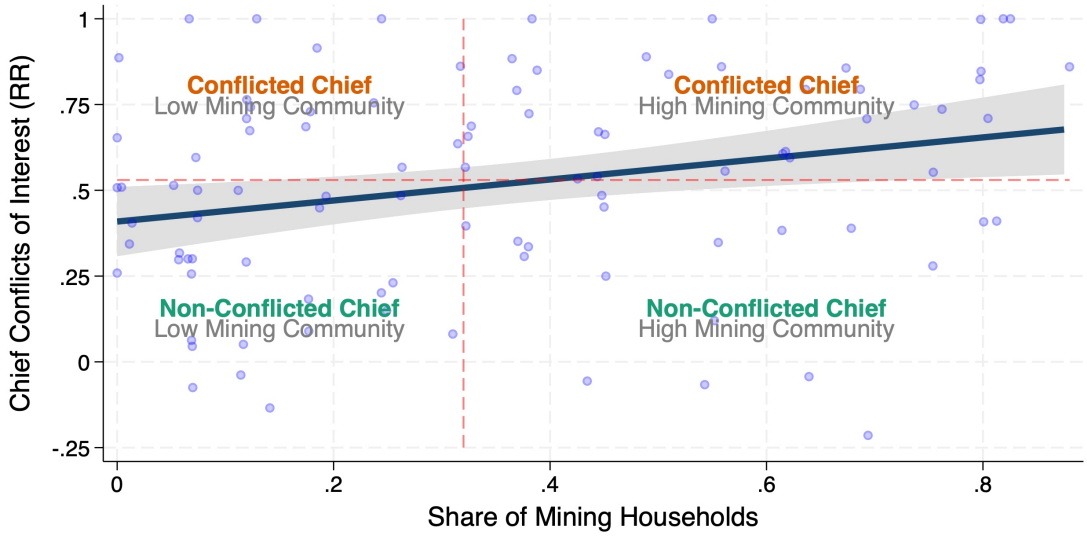
Notes: Figure shows the share of chiefs that believe each health condition is related to artisanal mining activities. Bars indicate 95% confidence intervals. Blue bars denote immediate and visible risks, red bars long-term health consequences, and green bars placebo conditions.

Figure 3: Distribution of Chiefs' Conflicts of Interest Across Communities



Notes: Figure shows the distribution of community-level estimates of chiefs' conflicts of interest, measured using a randomized response protocol. The dashed line indicates the sample median (0.53). Communities with estimated shares above this threshold are classified as *conflicted*, and those below as *non-conflicted*.

Figure 4: Relationship Between Chiefs' Conflicts of Interest and Mining Prevalence



Notes: Each point represents a community. The solid line plots the fitted linear relationship between the share of mining households and chiefs' conflicts of interest, with the shaded band indicating the 95 percent confidence interval. The vertical and horizontal dashed lines mark the sample medians of the share of mining households (0.32) and chiefs' conflicts of interest (0.53, as measured via randomized response), respectively.

Figure 5: Study Flow and Experimental Design

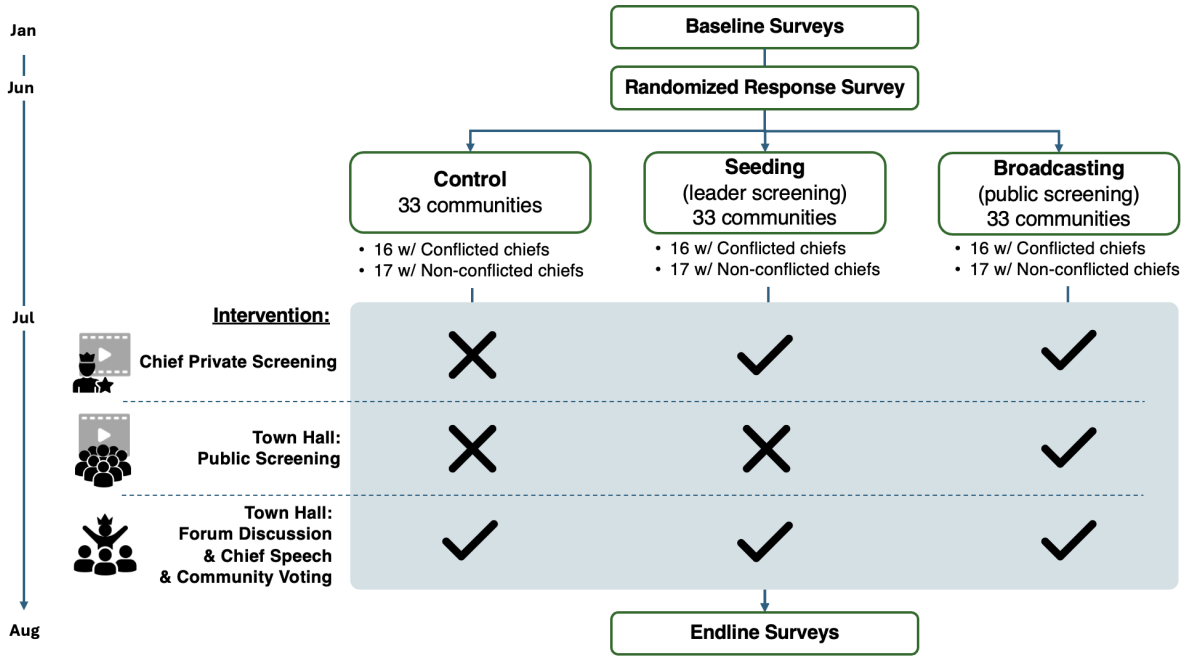


Figure 6: Overview of Data Collection and Measurement Points

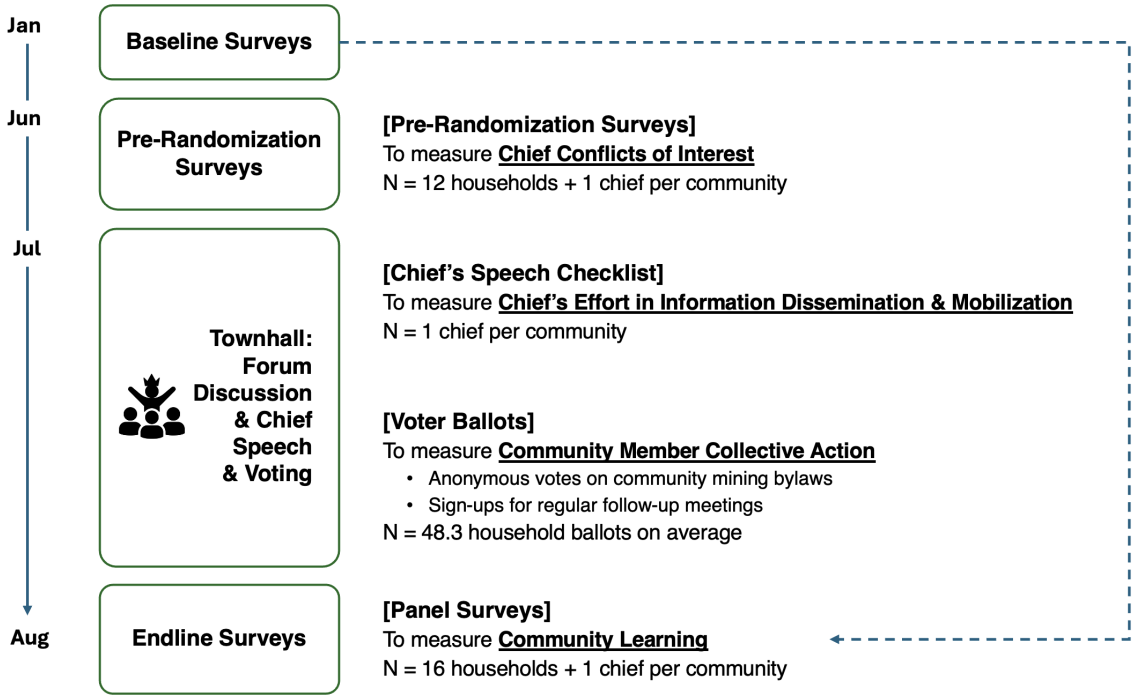
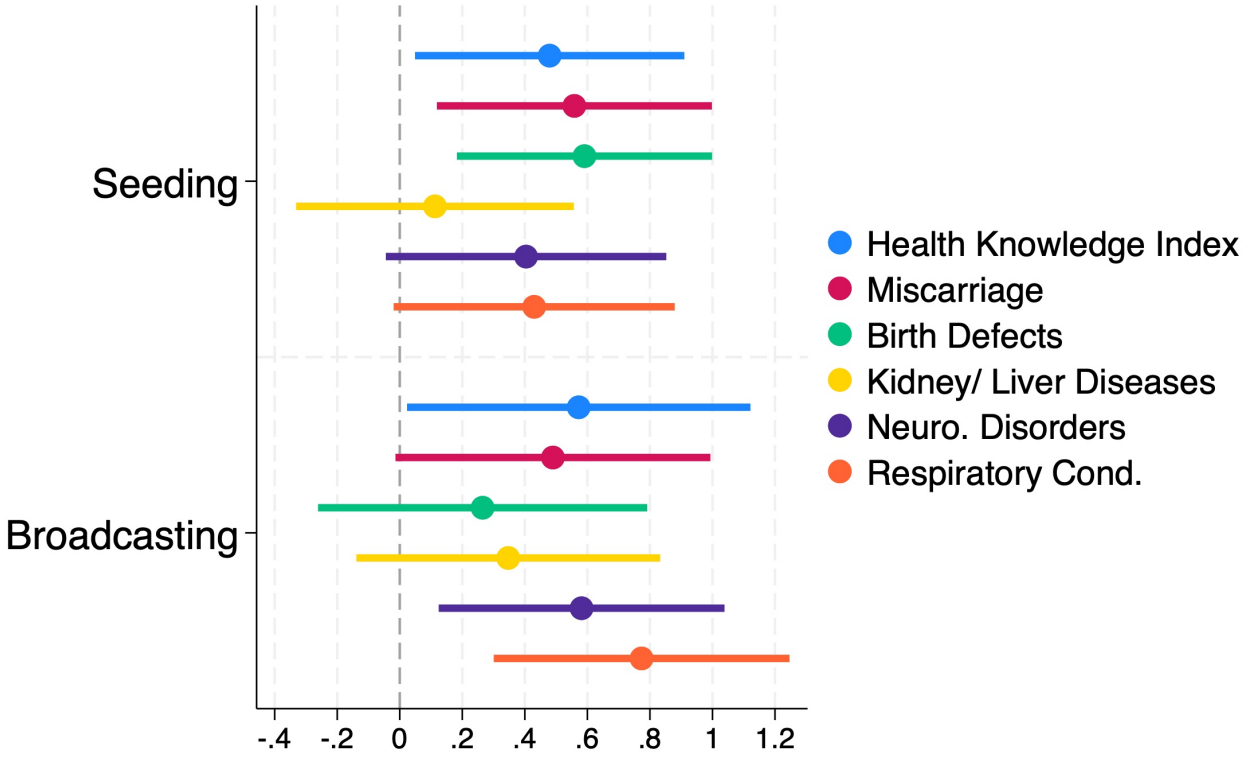
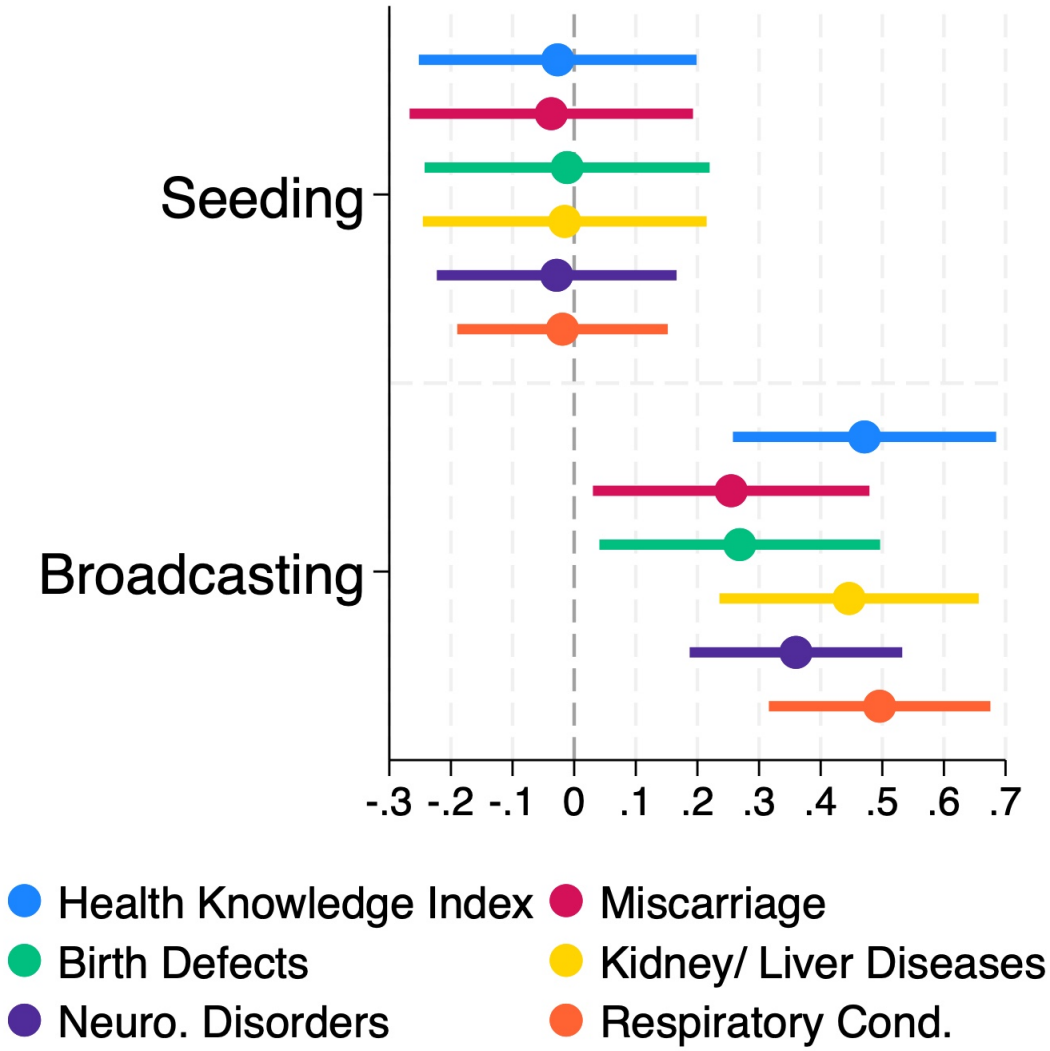


Figure 7: Average Treatment Effects on Chiefs' Learning



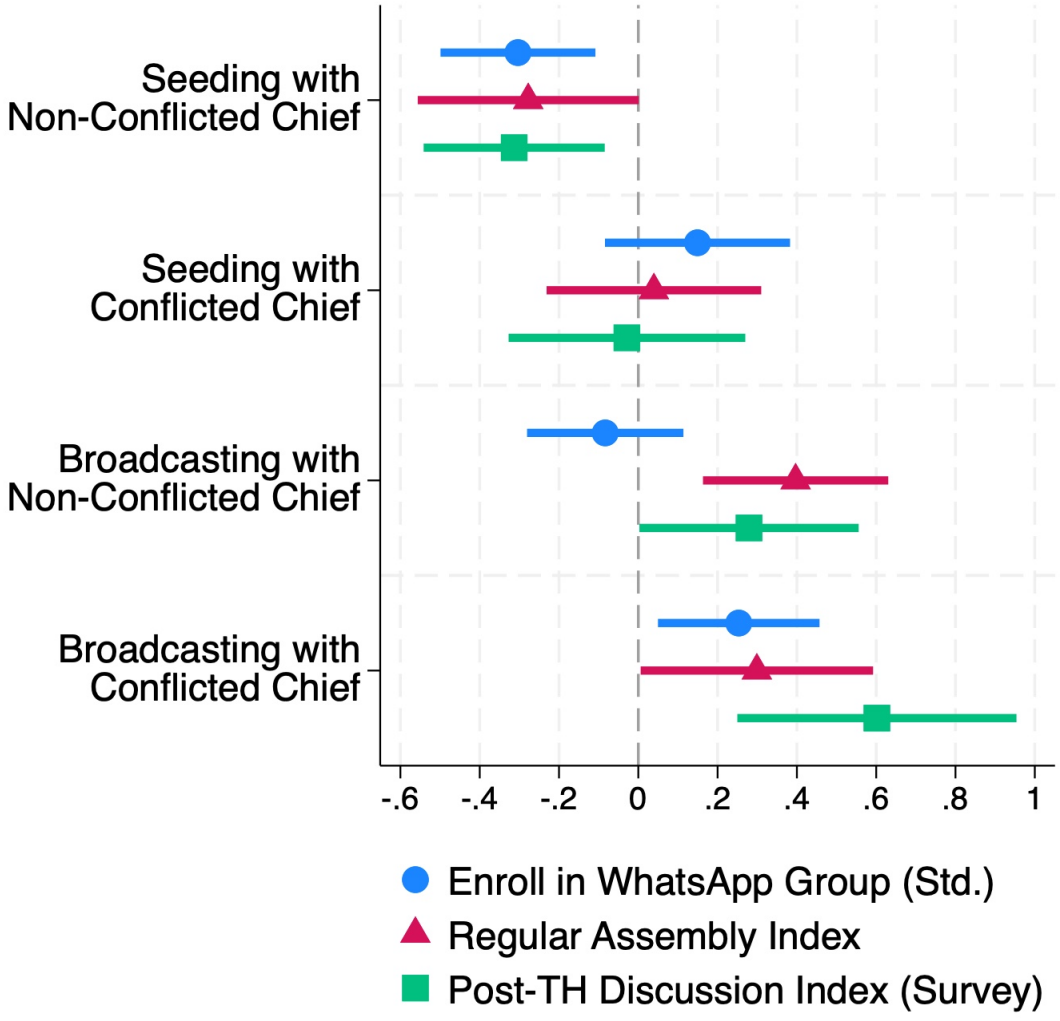
Notes: The unit of observation is a chief. The figure reports intention-to-treat effects of seeding and broadcasting on chiefs' knowledge of long-term health risks from *galamsey*. All specifications control for district fixed effects, Conflicted Chief (above-median share of households perceiving the chief would accept money to allow *galamsey*), and High-Mining Community (above-median share of mining households). Points denote coefficient estimates and bars indicate 95% confidence intervals. Standard errors are robust.

Figure 8: Average Treatment Effects on Community Members' Learning



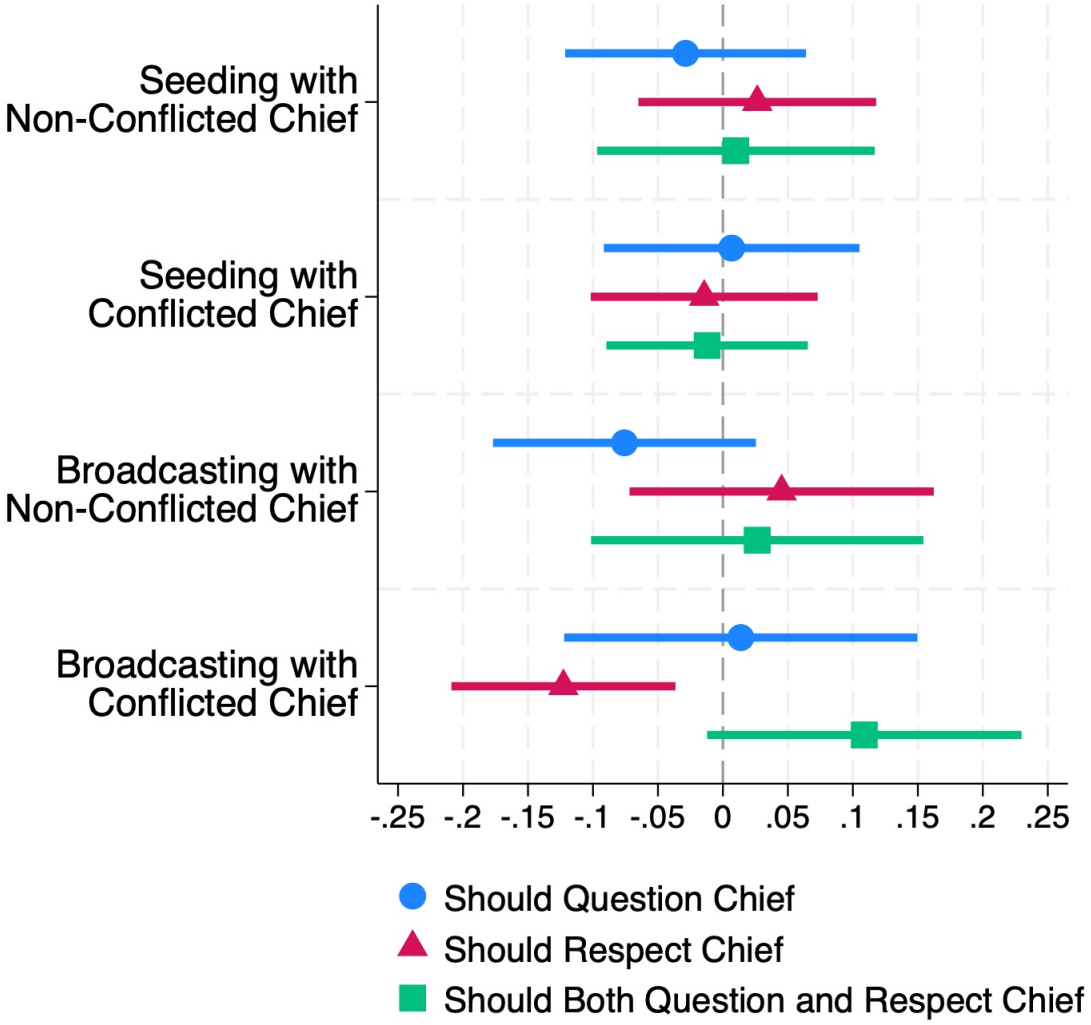
Notes: The unit of observation is a household. The figure reports intention-to-treat effects of seeding and broadcasting on household knowledge of long-term health risks from *galamsey*. All specifications control for district fixed effects, Conflicted Chief (above-median share of households perceiving the chief would accept money to allow *galamsey*), and High-Mining Community (above-median share of mining households). Points denote coefficient estimates and bars indicate 95% confidence intervals. Standard errors are clustered at the community level.

Figure 9: Heterogeneous Treatment Effects on Sustained Community Engagement



Notes: The first two outcomes (joining an NGO WhatsApp group and the regular meeting index) are measured from town hall ballots (n=4,505). The third outcome (discussion index) is measured from the endline household survey (n=1,366). Indexes are standardized using generalized least squares weighting following Anderson (2008). All specifications control for district fixed effects, gender, mining-household status, Conflicted Chief (above-median share of households perceiving the chief would accept money to allow *galamsey*), and interactions between treatment indicators and the demeaned high-mining-community indicator (above-median share of mining households). Points denote coefficient estimates and bars indicate 95% confidence intervals. Standard errors are clustered at the community level.

Figure 10: Heterogeneous Treatment Effects on Accountability Norms Toward Local Chiefs



Notes: The unit of observation is a household. Outcomes correspond to whether respondents agree that community members should question chiefs, respect chiefs, or both in the context of *galamsey*. All specifications control for district fixed effects, gender, mining-household status, Conflicted Chief (above-median share of households perceiving the chief would accept money to allow *galamsey*), and interactions between treatment indicators and the demeaned high-mining-community indicator (above-median share of mining households). Points denote coefficient estimates and bars indicate 95% confidence intervals. Standard errors are clustered at the community level.

Tables

Table 1: Heterogeneous Treatment Effects on Chiefs' Attendance and Dissemination Efforts

	Chief Attended Town Hall (1)	Chief Referenced Documentary (2)	No. Health Conditions Mentioned (3)
β_1 : Seeding	-0.028	0.953***	0.988***
	(0.190)	(0.086)	(0.359)
β_2 : Broadcasting	-0.040	0.987***	0.619
	(0.188)	(0.052)	(0.403)
γ_1 : Seeding $\times$ Conflicted Chief	-0.049	-0.386**	-0.364
	(0.258)	(0.159)	(0.549)
γ_2 : Broadcasting $\times$ Conflicted Chief	-0.374	-0.297**	-0.259
	(0.258)	(0.144)	(0.616)
Conflicted Chief	0.154	-0.062	-0.180
	(0.189)	(0.053)	(0.389)
Ctrl Mean	0.677	0.000	0.871
Ctrl SD	0.475	0.000	0.922
Obs.	94	94	94
R-squared	0.202	0.692	0.231
$\beta_1 + \gamma_1\ (est.)$	-0.076	0.567	0.624
$\beta_1 + \gamma_1 = 0\ (p\,value)$	0.648	0.000	0.131
$\beta_2 + \gamma_2\ (est.)$	-0.414	0.690	0.359
$\beta_2 + \gamma_2 = 0\ (p\,value)$	0.021	0.000	0.424

Notes: The unit of observation is a town hall. Column 1 is an indicator equal to one if the chief personally attended the town hall rather than sending a delegate. Column 2 equals one if the chief (or delegate) referenced the *Poisoned for Gold* documentary during the speech. Column 3 records the number of distinct health conditions mentioned by the chief (or delegate). Conflicted Chief is an indicator for communities where the share of households perceiving the chief would accept money to allow *galamsey* is above the sample median. All regressions include district fixed effects and interactions between treatment indicators and the demeaned high-mining-community indicator (equal to one for communities with an above-median share of mining households at baseline). Robust standard errors are shown in parentheses. The bottom panel reports estimated linear combinations and corresponding p-values for treatment effects in conflicted-chief communities, specifically $\beta_1 + \gamma_1$ for seeding and $\beta_2 + \gamma_2$ for broadcasting.

Table 2: Heterogeneous Treatment Effects on Community Mining Regulation Preferences

	Stringent Measure		Polarization	
	(1)	(2)	(3)	(4)
β_1 : Seeding	0.026	0.081	0.005	-0.052
	(0.043)	(0.061)	(0.043)	(0.063)
β_2 : Broadcasting	0.100**	0.165***	0.052	-0.014
	(0.038)	(0.053)	(0.039)	(0.048)
γ_1 : Seeding $\times$ Conflicted Chief		-0.119*		0.124
		(0.069)		(0.081)
γ_2 : Broadcasting $\times$ Conflicted Chief		-0.136**		0.140*
		(0.065)		(0.077)
Conflicted Chief	0.013	0.098**	0.008	-0.080
	(0.034)	(0.040)	(0.043)	(0.057)
Ctrl Mean	0.590	0.590	0.643	0.643
Ctrl SD	0.492	0.492	0.471	0.471
Obs.	4588	4588	4588	4588
R-squared	0.108	0.113	0.026	0.030
$\beta_1 + \gamma_1\,(est.)$		-0.038		0.072
$\beta_1 + \gamma_1 = 0\,(p\,value)$		0.389		0.183
$\beta_2 + \gamma_2\,(est.)$		0.029		0.125
$\beta_2 + \gamma_2 = 0\,(p\,value)$		0.508		0.038

Notes: The unit of observation is a household ballot from the town hall vote on community mining regulation. Columns 1–2 measure whether respondents voted for a stringent bylaw option (banning all mining or both mining in forest/river areas and amalgam burning near homes). Columns 3–4 measure preference dispersion, defined as the absolute distance between an individual's preferred bylaw stringency and the community mean. Conflicted Chief is an indicator for communities where the share of households perceiving the chief would accept money to allow *galamsey* is above the sample median. All regressions include district fixed effects, voter gender, High Mining Community (equal to one for communities with an above-median share of mining households at baseline), and Mining Household. Columns 2 and 4 demean High Mining Community for its main effect and include interactions between treatment indicators and the demeaned high-mining-community indicator. Standard errors are clustered at the community level. The bottom panel reports estimated linear combinations and corresponding p-values for treatment effects in conflicted-chief communities, specifically $\beta_1 + \gamma_1$ for seeding and $\beta_2 + \gamma_2$ for broadcasting.

Table 3: Average Treatment Effects on Pessimism About Collective Action

		Own or Perceived Willingness				
	Perceived Collective Action Efficacy	Self	3 Closest Friends & Neighbours	10 Other Non-mining Households	10 Other Mining Households	Chief
	(1)	(2)	(3)	(4)	(5)	(6)
Seeding	0.003	-0.024	0.011	-0.066	-0.476**	0.013
	(0.042)	(0.026)	(0.062)	(0.154)	(0.196)	(0.031)
Broadcasting	-0.108**	-0.112***	-0.365***	-1.180***	-0.566*	-0.122***
	(0.042)	(0.032)	(0.081)	(0.200)	(0.305)	(0.041)
Conflicted Chief	-0.038	-0.005	-0.063	-0.275*	-0.064	-0.038
	(0.041)	(0.026)	(0.069)	(0.146)	(0.262)	(0.037)
Ctrl Mean	0.603	0.916	2.310	7.838	4.776	0.791
Ctrl SD	0.490	0.278	0.782	1.886	2.668	0.407
Obs.	1368	1368	1366	1366	1366	1368
R-squared	0.019	0.035	0.069	0.094	0.072	0.055

Notes: The unit of observation is a household. Column (1) reports responses on whether community collective action is perceived as more effective than government intervention. Columns (2)–(6) measure respondents' own willingness and their beliefs about others' willingness to participate in community efforts to address *galamsey*. Conflicted Chief is an indicator for communities where the share of households perceiving the chief would accept money to allow *galamsey* is above the sample median. All specifications include district fixed effects, High Mining Community (equal to one for communities with an above-median share of mining households at baseline), and Mining Household indicators. Standard errors are clustered at the community level.

Appendix

A Community Sampling

Prior to the baseline, research assistants conducted phone interviews with 134 out of 174 elected assemblymen across the six study districts. To ensure cost-effectiveness, I excluded small hamlets with populations below 400. To avoid large communities where group size limits the feasibility of collective action, I also excluded urban areas and communities with populations exceeding 3,000. I focused instead on 241 medium-sized rural communities with populations between 400 and 3,000. Among these, I identified 111 communities where assemblymen reported either (1) ongoing small-scale mining activities or (2) a future threat of irresponsible small-scale mining; this constituted the full set of eligible villages for the baseline survey. 12 of these were later dropped because they were too large or geographically proximate, leaving 99 communities in the final randomization sample to minimize cross-community spillovers.

B Validation of the Randomized Response Measure

After completing the randomized response (RR) protocol, enumerators privately administered a set of direct questions to the same respondents to cross-check perceptions of chiefs' vested interests in mining. These "direct ask" (DA) questions were carefully worded to avoid judgmental framing and to elicit beliefs about whether the chief or elders personally benefit from mining, own or hold stakes in a mining site or concession, or send representatives to collect payments from miners. If respondents reported that no mining was currently occurring in their community, they were instead asked two hypothetical variants: (i) if *galamseyers* offered a *knocking fee* (introductory payment) to begin mining, would the chief and elders accept it? and (ii) if mining commenced and royalties were offered, would they accept them?

I standardized and aggregated responses from these items into a composite DA index of perceived leadership conflicts. The RR and DA measures were strongly correlated, supporting the validity of the RR-based measure used in the main analysis: 0.41 at the individual level ($n = 1,114$) and 0.65 at the community level. These correlations indicate that the RR approach captures meaningful variation in underlying perceptions of leadership incentives while benefiting from the privacy protection necessary for candid responses on sensitive topics. To protect respondent anonymity, no personally identifying information (e.g., name, age, gender) was collected during either the RR or DA modules.

C Town Hall Implementation Details

Field officers organize a town hall meeting in every community, inviting both traditional leaders and community members to participate. These town halls serve as the primary setting for measuring collective action. The detailed sequence of activities is as follows: (1) opening remarks, (2) documentary screening (only in broadcasting communities), (3) moderated forum discussion, (4) chief's address to the crowd, (5) two ballots capturing collective action, and (6) ballot result announcement and closing remarks. No prior registration is required for community members. Both survey and non-survey households are welcome to attend, and the event is structured to encourage broad participation.

To maximize participation, the event is promoted in multiple ways. Announcements are made through the local public address system, and formal invitation letters are delivered to key opinion leaders, such as religious leaders, school headmasters, leaders of farmer-based organizations or cooperatives, and youth representatives. The 16 study households in each community also receive invitation letters. On the day of the event, officers conduct targeted outreach to these study households, going door-to-door to personally invite them to attend.

C.1 Opening Remarks

Field officers begin by welcoming participants, introducing themselves and the purpose of the meeting, and outlining the agenda. Officers emphasize their neutrality and the goal of learning from the community. They explain that the session will cover local environmental issues and collective decision-making processes. To minimize experimenter demand effects, I train officers to maintain a neutral tone throughout.

C.2 Documentary Screening (Broadcasting only)

In broadcasting communities, field officers publicly screen the first 29 minutes of *Poisoned for Gold*. Officers briefly introduce the documentary and emphasize that the documentary is aimed at providing unbiased information about potential health consequences of *galamsey* to help the community make informed decisions.

C.3 Moderated Forum Discussion

Following the introduction (and screening, if applicable), participants remain seated as one large group for an open forum. Officers emphasize that all viewpoints are welcome, whether

in support of or against *galamsey* or any regulation, and that the aim is to foster mutual understanding rather than judge individuals. The discussion guide prompts participants to share: (1) what they know about *galamsey*, (2) perceived benefits to themselves or the community, (3) problems or negative effects caused by *galamsey*, and (4) their views on the best way for the community to address the issue.

A field officer records every turn of the discussion using a structured tally sheet, documenting the age group (young vs. old), gender, whether the speaker is contributing for the first time, and whether their overall position is for or against *galamsey*. These tallies form a secondary outcome dataset, pending further analysis.

C.4 Chief's Address

After explaining both ballots but before participants begin filling them, officers invite the chief to address the community. During the chief's remarks, two enumerators independently complete a structured speech checklist, then cross-check their entries after the event. The reconciled version is used for analysis. To reduce the risk of self-censorship and given the sensitivity of the topic, no audio or video recordings are taken.

For the bylaw voting measure, field officers record whether the chief publicly expressed support for any of the bylaw options. For the in-person *galamsey* meeting and WhatsApp group measures, field officers capture verbal influence if the chief explicitly encouraged or discouraged participation. In the case of the in-person meeting measure, field officers also record behavioral support when the chief offers logistical assistance, such as providing a meeting space or appointing a liaison to gather feedback and report to the chief after each meeting.

For the financial contribution measure, field officers document both verbal and behavioral support. Verbal support is recorded if the chief explicitly urges contributions to the NGO invitation bidding fund. Behavioral support is measured by the amount the chief chooses to contribute from a 50 GHS endowment in the same lottery-based game as other participants. The chief's ticket is treated as an automatic winner, and his contribution decision is publicly announced before participants complete their own tickets.

To ensure that chiefs are adequately prepared and not taken by surprise, they are informed during the re-entry process on the day of the town hall that they will be invited to deliver a speech. In seeding and broadcasting communities, this notification is provided following the private viewing of the documentary for the chiefs in their palace.

C.5 The First Ballot

See the main text.

C.6 The Second Ballot

The second ballot records participants' revealed preferences for engaging in sustained collective action beyond the town hall. Participants have to provide their name and phone number for follow-up.

1. **Attending or Organizing Regular *Galamsey* Meetings:** This measure captures the time commitment participants are willing to make to address the *galamsey* challenge. The first option records willingness to attend regular community meetings focused on monitoring progress, identifying challenges, and discussing solutions. The second option captures willingness to take the more time-consuming role of organizing such meetings, which may involve scheduling, mobilizing participants, and preparing the venue.

2. **Joining an NGO Local WhatsApp Group:** This measure captures willingness to stay engaged via digital communication. Participants are invited to join a WhatsApp group managed by the Ghana Environmental Advocacy Group (GEAG), an NGO that supports communities in protecting land, water, and health from mining-related impacts. This WhatsApp group is exclusive to members of the participant's own community and focuses on the *galamsey* situation in that community, rather than national-level issues.

3. **Crowd-Bidding for an NGO Workshop:** Participants decided how much of a 50 GHS lottery prize to contribute to the community versus keep personally. Participants are informed that GEAG will visit the highest–average-contribution community in each of the six districts to run a planning workshop, introducing case material from Jema. Participants were explicitly told that the relevant "average" would be calculated from only the four randomly drawn winners plus the chief, as opposed to all submitted tickets. Thus, contributing more increases a community's chance of being selected. After choices are made, four winners per community are randomly drawn, and their stated contribution decisions are implemented. Note that the average contribution is computed from the drawn tickets and the chief's ticket. For transparency, the winner's name and contribution amount are announced publicly at the event. Whether this public disclosure creates additional social image costs or benefits depends on local dynamics as perceived by the participants themselves.

C.7 Ballot Result Announcement and Closing Remarks

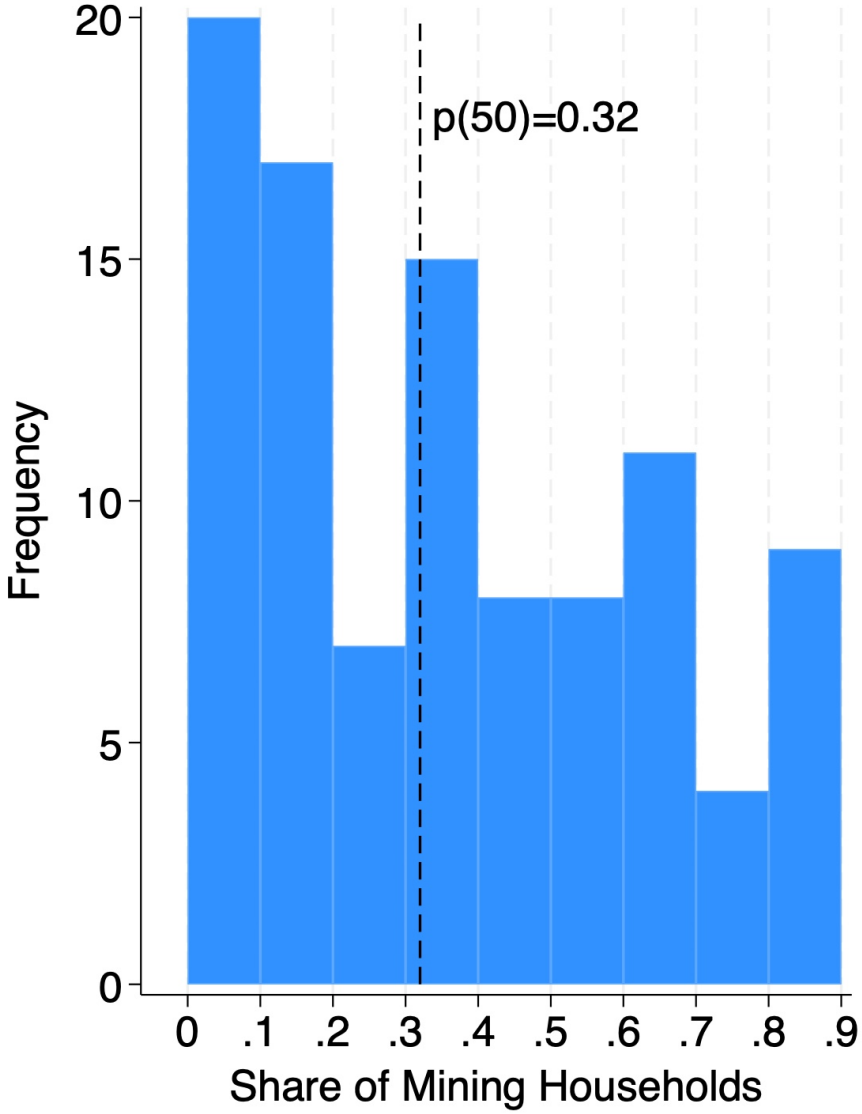
After all participants have cast both ballots, officers immediately count the first ballot and announce the results following a standardized script. For the second ballot, they draw four winners at random, implement the contribution amounts indicated on their tickets, and calculate the community's average contribution based on these four amounts and the chief's automatically winning ticket. The average is announced publicly, along with a reminder that the highest-contributing community in each district will receive a follow-up workshop from GEAG.

In closing, officers thank attendees and invite those interested in forming a local group for regular *galamsey* meetings to remain. They record the number of participants who stay and, among them, the number willing to help organize future meetings.

Full field manuals and procedural details are available upon request.

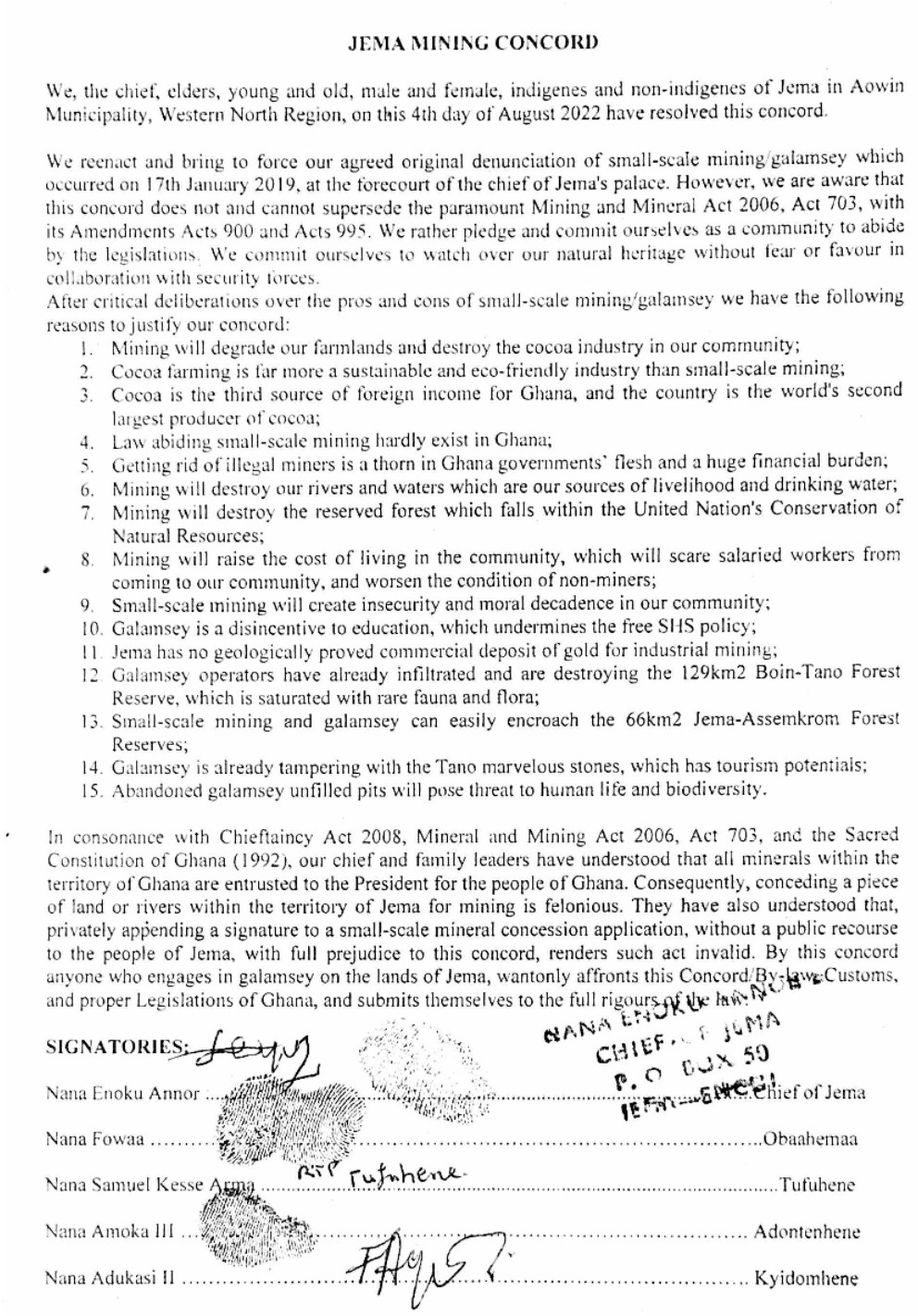
Appendix Figures

Figure A1: Distribution of the Share of Mining Households Across Communities



Notes: Figure shows the distribution of community-level shares of mining households. For each community, the share is calculated as the proportion of 16 randomly sampled households that report having at least one member engaged in small-scale mining. The dashed vertical line indicates the sample median (0.32).

Figure A2: Jema Template — Example of a Customary Bylaw on Small-Scale Mining Regulation



JEMA MINING CONCORD

We, the chief, elders, young and old, male and female, indigenes and non-indigenes of Jema in Aowin Municipality, Western North Region, on this 4th day of August 2022 have resolved this concord.

We reenact and bring to force our agreed original denunciation of small-scale mining/galamsey which occurred on 17th January 2019, at the forecourt of the chief of Jema's palace. However, we are aware that this concord does not and cannot supersede the paramount Mining and Mineral Act 2006, Act 703, with its Amendments Acts 900 and Acts 995. We rather pledge and commit ourselves as a community to abide by the legislations. We commit ourselves to watch over our natural heritage without fear or favour in collaboration with security forces.

After critical deliberations over the pros and cons of small-scale mining/galamsey we have the following reasons to justify our concord:

1. Mining will degrade our farmlands and destroy the cocoa industry in our community;
2. Cocoa farming is far more a sustainable and eco-friendly industry than small-scale mining;
3. Cocoa is the third source of foreign income for Ghana, and the country is the world's second largest producer of cocoa;
4. Law abiding small-scale mining hardly exist in Ghana;
5. Getting rid of illegal miners is a thorn in Ghana governments' flesh and a huge financial burden;
6. Mining will destroy our rivers and waters which are our sources of livelihood and drinking water;
7. Mining will destroy the reserved forest which falls within the United Nation's Conservation of Natural Resources;
8. Mining will raise the cost of living in the community, which will scare salaried workers from coming to our community, and worsen the condition of non-miners;
9. Small-scale mining will create insecurity and moral decadence in our community;
10. Galamsey is a disincentive to education, which undermines the free SHS policy;
11. Jema has no geologically proved commercial deposit of gold for industrial mining;
12. Galamsey operators have already infiltrated and are destroying the 129km2 Boin-Tano Forest Reserve, which is saturated with rare fauna and flora;
13. Small-scale mining and galamsey can easily encroach the 66km2 Jema-Assemkrom Forest Reserves;
14. Galamsey is already tampering with the Tano marvelous stones, which has tourism potentials;
15. Abandoned galamsey unfilled pits will pose threat to human life and biodiversity.

In consonance with Chieftaincy Act 2008, Mineral and Mining Act 2006, Act 703, and the Sacred Constitution of Ghana (1992), our chief and family leaders have understood that all minerals within the territory of Ghana are entrusted to the President for the people of Ghana. Consequently, conceding a piece of land or rivers within the territory of Jema for mining is felonious. They have also understood that, privately appending a signature to a small-scale mineral concession application, without a public recourse to the people of Jema, with full prejudice to this concord, renders such act invalid. By this concord anyone who engages in galamsey on the lands of Jema, wantonly affronts this Concord/By-laws/Customs, and proper Legislations of Ghana, and submits themselves to the full rigours of the law.

SIGNATORIES:

NANA ENOKU ANNOR
CHIEF OF JEMA
P. O. BOX 59
JEMA - GHANA

Nana Enoku Annor ..... Chief of Jema

Nana Fowaa ..... Obaahemaa

Nana Samuel Kesse Ayma ..... Tufuhene

Nana Amoka III ..... Adontenhene

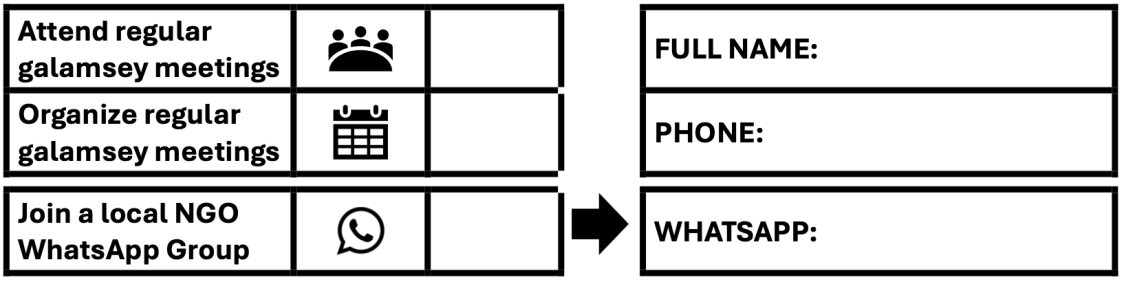
Nana Adukasi II ..... Kyidomhene

Notes: The "Jema Mining Concord" was developed by traditional leaders and community members in Jema to ban all forms of mining. It provides the reference template used in our town hall bylaw voting exercise.

Figure A3: Sample First Ballot on Community Mining Regulation

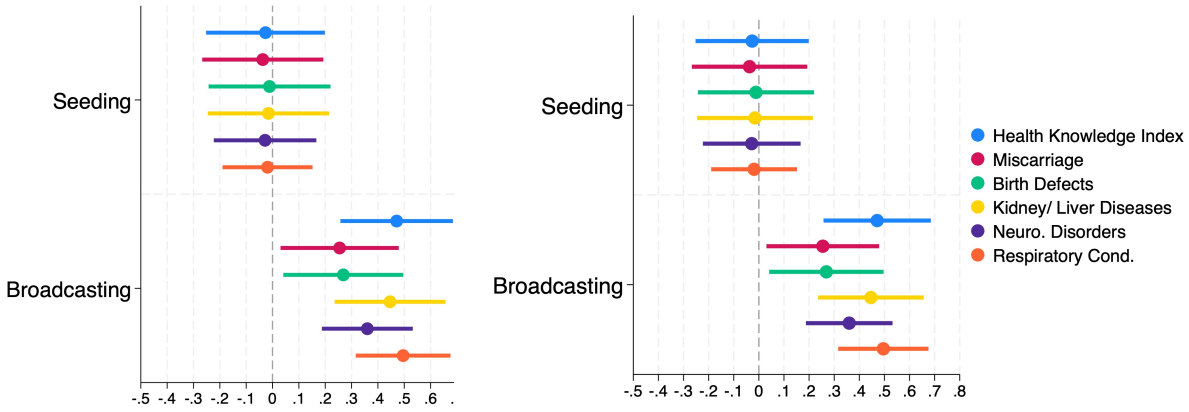
OBJECTIVE	MEASURE	SYMBOL	CHECK ONE BOX BELOW
A. NO MINING	*Stopping existing mining and future entries*		
B. SAFER AND CLEANER MINING	***B1:** Ban mining in forest reserves and water bodies*		
	***B2:** Ban amalgam burning near homes*		
	***Both:** B1 AND B2*		
C. NO CHANGE	*NONE*		

Figure A4: Sample Second Ballot on Commitment to Sustain Collective Action



KEEP (GHS)	0	10	20	30	40	50
GIVE (GHS)	50	40	30	20	10	0
CHECK ONE BOX ON THE RIGHT						

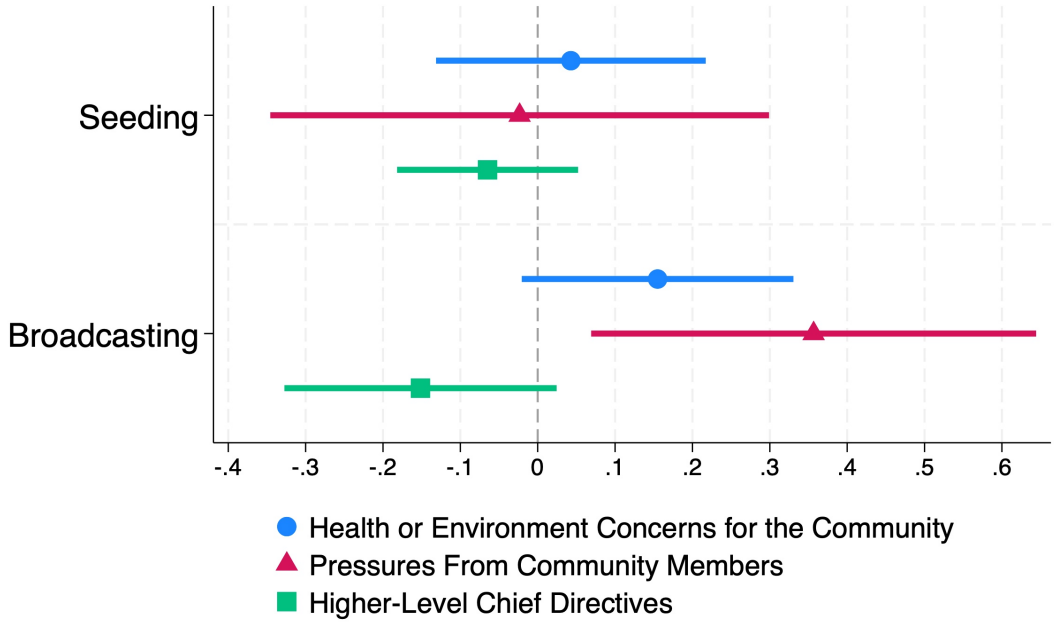
Figure A5: Treatment effects on Health Learning by Town Hall Attendance



(a) Attendees **(b)** Non-attendees

Notes: Panels report intention-to-treat estimates of treatment effects on the health knowledge index and its components, separately for town hall attendees (left) and non-attendees (right). Points denote coefficient estimates and horizontal bars indicate 95% confidence intervals. Standard errors are clustered at the community level.

Figure A6: Average Treatment Effects on Chiefs' Reasons to Take Part in Collective Action



Notes: The unit of observation is a chief. All specifications district fixed effects, Conflicted Chief (above-median share of households perceiving the chief would accept money to allow *galamsey*), and High Mining Community (above-median share of mining households at baseline). Points denote coefficient estimates and bars indicate 95% confidence intervals. Standard errors are robust.

Appendix Tables

Table A1: Heterogeneous Treatment Effects on Community Members' Learning

	Health Knowledge Index	Miscarriage	Birth Defects	Kidney/ Liver Diseases	Neuro. Disorder	Respiratory Cond.
	(1)	(2)	(3)	(4)	(5)	(6)
β_1 : Seeding	-0.049	-0.065	-0.031	-0.007	-0.109	-0.109
	(0.119)	(0.204)	(0.195)	(0.210)	(0.187)	(0.154)
β_2 : Broadcasting	0.303***	0.288	0.323*	0.535***	0.415**	0.502***
	(0.109)	(0.185)	(0.176)	(0.176)	(0.180)	(0.169)
γ_1 : Seeding $\times$ Conflicted Chief	0.045	0.019	0.022	-0.040	0.111	0.146
	(0.187)	(0.344)	(0.327)	(0.311)	(0.287)	(0.239)
γ_2 : Broadcasting $\times$ Conflicted Chief	0.156	0.179	0.146	0.164	0.200	0.342
	(0.164)	(0.311)	(0.293)	(0.274)	(0.245)	(0.233)
Conflicted Chief	-0.126	-0.204	-0.125	-0.176	-0.163	-0.212
	(0.131)	(0.252)	(0.227)	(0.228)	(0.192)	(0.165)
Ctrl Mean	-0.085	3.599	3.601	3.614	3.371	3.545
Ctrl SD	0.817	1.495	1.518	1.403	1.476	1.418
Obs.	1367	1367	1367	1367	1367	1367
R-squared	0.154	0.112	0.123	0.140	0.096	0.090
$\beta_1 + \gamma_1\,(est.)$	-0.004	-0.046	-0.009	-0.048	0.002	0.038
$\beta_1 + \gamma_1 = 0\,(p\,value)$	0.975	0.868	0.974	0.840	0.992	0.830
$\beta_2 + \gamma_2\,(est.)$	0.459	0.467	0.469	0.699	0.614	0.844
$\beta_2 + \gamma_2 = 0\,(p\,value)$	0.001	0.085	0.083	0.003	0.001	0.000

Notes: The unit of observation is a household. The dependent variables include a standardized health knowledge index (Column 1) and Likert scales from 1 to 5 for recognizing specific long-term health risks associated with *galamsey* (Columns 2–6). Conflicted Chief is an indicator for communities where the share of households perceiving the chief would accept money to allow *galamsey* is above the sample median. All regressions include district fixed effects, voter gender, and Mining Household, and interactions between treatment indicators and the demeaned high-mining-community indicator (above-median share of mining households at baseline). Standard errors are clustered at the community level. The bottom panel reports estimated linear combinations and corresponding p-values for treatment effects in conflicted-chief communities, specifically $\beta_1 + \gamma_1$ for seeding and $\beta_2 + \gamma_2$ for broadcasting.

Table A2: Voter Turnout at Town Halls by Treatment and Leader Type

	All Households		Mining Households		Non-Mining Households	
	(1)	(2)	(3)	(4)	(5)	(6)
β_1 : Seeding	3.0	-4.5	-3.5	-4.0	6.5	-0.5
	(4.2)	(6.5)	(3.0)	(5.0)	(4.0)	(6.9)
β_2 : Broadcasting	-9.8***	-16.1***	-8.3***	-10.0**	-1.5	-6.0
	(3.1)	(5.2)	(2.5)	(4.4)	(3.2)	(5.4)
γ_1 : Seeding $\times$ Conflicted Chief		14.4		0.4		14.1*
		(8.9)		(5.9)		(8.4)
γ_2 : Broadcasting $\times$ Conflicted Chief		11.6*		2.9		8.7
		(6.9)		(5.1)		(7.3)
Conflicted Chief	-4.6	-13.6**	-0.8	-2.2	-3.7	-11.3**
	(3.5)	(5.7)	(2.0)	(4.5)	(3.5)	(5.4)
Ctrl Mean	51.7	51.7	23.3	23.3	28.4	28.4
Ctrl SD	14.2	14.2	15.1	15.1	18.7	18.7
Obs.	95	95	95	95	95	95
R-squared	0.298	0.344	0.475	0.504	0.497	0.527
$\beta_1 + \gamma_1$ $(est.)$		10.0		-3.6		13.6
$\beta_1 + \gamma_1 = 0$ $(p\,value)$		0.074		0.265		0.003
$\beta_2 + \gamma_2$ $(est.)$		-4.5		-7.1		2.6
$\beta_2 + \gamma_2 = 0$ $(p\,value)$		0.246		0.006		0.534

Notes: The unit of observation is a town hall. The dependent variable measures the number of ballots cast during community regulation voting. Columns 1–2 report overall turnout; Columns 3–4 restrict to mining households; and Columns 5–6 to non-mining households. *Conflicted Chief* is an indicator equal to one in communities where the share of households perceiving the chief would accept money to allow *galamsey* is above the sample median. All regressions include district fixed effects and interactions between treatment indicators and the demeaned high-mining-community indicator (equal to one for communities with an above-median share of mining households at baseline). Standard errors are robust. The bottom panel reports estimated linear combinations and corresponding p-values for treatment effects in conflicted-chief communities, specifically $\beta_1 + \gamma_1$ for seeding and $\beta_2 + \gamma_2$ for broadcasting.

Table A3: Heterogeneous Treatment Effects on Community Mining Bylaw Measures

	No. Measures				
	Zero	One	Two	Three	No Change/ Full Ban
	(1)	(2)	(3)	(4)	(5)
β_1 : Seeding	-0.018	-0.063	0.210***	-0.129**	-0.147**
	(0.045)	(0.054)	(0.066)	(0.055)	(0.066)
β_2 : Broadcasting	-0.069*	-0.096**	0.213***	-0.048	-0.117**
	(0.040)	(0.045)	(0.062)	(0.054)	(0.055)
γ_1 : Seeding $\times$ Conflicted Chief	0.040	0.079	-0.236**	0.117	0.157*
	(0.053)	(0.069)	(0.090)	(0.085)	(0.090)
γ_2 : Broadcasting $\times$ Conflicted Chief	0.114**	0.022	-0.311***	0.175**	0.289***
	(0.048)	(0.059)	(0.087)	(0.087)	(0.084)
Conflicted Chief	-0.072**	-0.026	0.197***	-0.098	-0.171**
	(0.033)	(0.046)	(0.060)	(0.060)	(0.065)
Ctrl Mean	0.100	0.310	0.324	0.266	0.366
Ctrl SD	0.300	0.463	0.468	0.442	0.482
Obs.	4588	4588	4588	4588	4588
R-squared	0.067	0.048	0.044	0.155	0.080
$\beta_1 + \gamma_1\,(est.)$	0.022	0.016	-0.027	-0.012	0.011
$\beta_1 + \gamma_1 = 0\,(p\,value)$	0.420	0.724	0.692	0.867	0.873
$\beta_2 + \gamma_2\,(est.)$	0.045	-0.074	-0.098	0.126	0.172
$\beta_2 + \gamma_2 = 0\,(p\,value)$	0.131	0.056	0.114	0.073	0.010

Notes: The unit of observation is a household ballot from the town hall vote on community mining regulation. The dependent variable in Columns 1–4 is an indicator for voting for bylaws with the corresponding number of regulatory measures: 0 = no change (option C), 1 = ban mining in forests/rivers or amalgam burning near homes (option B1 or B2), 2 = ban both (option B3), and 3 = ban all mining (option A). Column 5 captures the most lenient and most stringent options, taking the value one if a town hall attendee voted for either no change or ban all mining (option A or C). Conflicted Chief is an indicator for communities where the share of households perceiving the chief would accept money to allow *galamsey* is above the sample median. All regressions include district fixed effects, voter gender, and Mining Household, and interactions between treatment indicators and the demeaned high-mining-community indicator (above-median share of mining households at baseline). Standard errors are clustered at the community level. The bottom panel reports estimated linear combinations and corresponding p-values for treatment effects in conflicted-chief communities, specifically $\beta_1 + \gamma_1$ for seeding and $\beta_2 + \gamma_2$ for broadcasting.

Table A4: Heterogeneous Treatment Effects on Chiefs' Persuasive Efforts

	No. Measures					
	Zero	One	Two	Three	No Change /Full Ban	Stringent Measure
	(1)	(2)	(3)	(4)	(5)	(6)
β_1 : Seeding	-0.175*	-0.054	0.389**	-0.160	-0.335**	0.229**
	(0.088)	(0.069)	(0.149)	(0.135)	(0.148)	(0.102)
β_2 : Broadcasting	-0.123	0.165	0.097	-0.138	-0.262	-0.041
	(0.109)	(0.129)	(0.198)	(0.147)	(0.164)	(0.162)
γ_1 : Seeding $\times$ Conflicted Chief	0.157*	0.043	-0.433*	0.233	0.390*	-0.200
	(0.085)	(0.136)	(0.224)	(0.200)	(0.205)	(0.149)
γ_2 : Broadcasting $\times$ Conflicted Chief	0.531***	-0.192	-0.514*	0.175	0.706***	-0.339
	(0.180)	(0.165)	(0.273)	(0.207)	(0.239)	(0.236)
Conflicted Chief	-0.160*	0.047	0.357**	-0.244	-0.404**	0.112
	(0.091)	(0.109)	(0.174)	(0.162)	(0.163)	(0.133)
Ctrl Mean	0.097	0.065	0.645	0.194	0.290	0.839
Ctrl SD	0.301	0.250	0.486	0.402	0.461	0.374
Obs.	94	94	94	94	94	94
R-squared	0.301	0.119	0.232	0.169	0.266	0.244
$\beta_1 + \gamma_1\,(est.)$	-0.018	-0.011	-0.044	0.073	0.055	0.029
$\beta_1 + \gamma_1 = 0\,(p\,value)$	0.512	0.918	0.787	0.599	0.694	0.785
$\beta_2 + \gamma_2\,(est.)$	0.407	-0.027	-0.417	0.037	0.445	-0.380
$\beta_2 + \gamma_2 = 0\,(p\,value)$	0.005	0.781	0.018	0.750	0.007	0.024

Notes: The unit of observation is a chief's (or delegate's) ballot from the town hall vote on community mining regulation. The dependent variable in Columns 1–4 is an indicator for voting for bylaws with the corresponding number of regulatory measures: 0 = no change (option C), 1 = ban mining in forests/rivers or amalgam burning near homes (option B1 or B2), 2 = ban both (option B3), and 3 = ban all mining (option A). Column 5 captures the most lenient and most stringent options, taking the value one if the chief voted for either no change or ban all mining (option A or C). Column 6 measures whether the chief voted for a stringent bylaw option of banning all mining or both mining in forest/river areas and amalgam burning near homes (option A or B3). Conflicted Chief is an indicator for communities where the share of households perceiving the chief would accept money to allow *galamsey* is above the sample median. All regressions include district fixed effects and interactions between treatment indicators and the de-meaned high-mining-community indicator (equal to one for communities with an above-median share of mining households at baseline). Robust standard errors are shown in parentheses. The bottom panel reports estimated linear combinations and corresponding p-values for treatment effects in conflicted-chief communities, specifically $\beta_1 + \gamma_1$ for seeding and $\beta_2 + \gamma_2$ for broadcasting.

Table A5: Heterogeneous Treatment Effects on Chiefs' Mobilization Efforts

	Encourage Regular Meetings	Provide Meeting Logistics	Encourage Local WhatsApp Group	Support NGO Workshop	Bid NGO Workshop (GHS)
	(1)	(2)	(3)	(4)	(5)
β_1 : Seeding	0.148	0.225*	0.174	0.023	0.558
	(0.173)	(0.123)	(0.173)	(0.127)	(4.760)
β_2 : Broadcasting	0.004	-0.026	-0.221	-0.023	4.204
	(0.191)	(0.079)	(0.188)	(0.162)	(5.762)
γ_1 : Seeding $\times$ Conflicted Chief	-0.244	-0.043	-0.121	0.058	5.327
	(0.225)	(0.209)	(0.249)	(0.184)	(6.689)
γ_2 : Broadcasting $\times$ Conflicted Chief	-0.539**	-0.294*	-0.491*	-0.393	-5.362
	(0.255)	(0.159)	(0.252)	(0.247)	(9.091)
Conflicted Chief	0.197	0.112	0.166	-0.041	-3.108
	(0.157)	(0.148)	(0.204)	(0.164)	(5.433)
Ctrl Mean	0.774	0.161	0.613	0.742	34.839
Ctrl SD	0.425	0.374	0.495	0.445	16.906
Obs.	94	94	94	94	94
R-squared	0.152	0.337	0.352	0.241	0.274
$\beta_1 + \gamma_1\,(est.)$	-0.096	0.182	0.054	0.082	5.885
$\beta_1 + \gamma_1 = 0\,(p\,value)$	0.473	0.296	0.745	0.556	0.211
$\beta_2 + \gamma_2\,(est.)$	-0.535	-0.319	-0.712	-0.416	-1.158
$\beta_2 + \gamma_2 = 0\,(p\,value)$	0.001	0.020	0.000	0.023	0.870

Notes: The unit of observation is a town hall. Columns 1–4 are indicators coded from the speech checklist for whether the chief encouraged regular meetings (col. 1), offered meeting logistics (col. 2), encouraged joining the local WhatsApp group (col. 3), or expressed support for an NGO workshop (col. 4). Column 5 records the amount (GHS) the chief allocated in the lottery-based bidding game from a 50 GHS endowment to bring an NGO workshop to the community. Conflicted Chief is an indicator for communities where the share of households perceiving the chief would accept money to allow *galamsey* is above the sample median. All regressions include district fixed effects and interactions between treatment indicators and the demeaned high-mining-community indicator (equal to one for communities with an above-median share of mining households at baseline). Robust standard errors are shown in parentheses. The bottom panel reports estimated linear combinations and corresponding p-values for treatment effects in conflicted-chief communities, specifically $\beta_1 + \gamma_1$ for seeding and $\beta_2 + \gamma_2$ for broadcasting.

Table A6: Effects on Community Mining Regulation Preferences (Split-Sample by Occupation)

	Stringent Measure					
	All Households		Mining Households		Non-Mining Households	
	(1)	(2)	(3)	(4)	(5)	(6)
β_1 : Seeding	0.026	0.081	0.055	0.108	0.006	0.043
	(0.043)	(0.061)	(0.056)	(0.074)	(0.046)	(0.070)
β_2 : Broadcasting	0.100**	0.165***	0.127**	0.207**	0.088**	0.139***
	(0.038)	(0.053)	(0.056)	(0.088)	(0.037)	(0.051)
γ_1 : Seeding $\times$ Conflicted Chief		-0.119*		-0.174*		-0.062
		(0.069)		(0.099)		(0.075)
γ_2 : Broadcasting $\times$ Conflicted Chief		-0.136**		-0.197**		-0.071
		(0.065)		(0.099)		(0.069)
Conflicted Chief	0.013	0.098**	0.031	0.145**	0.002	0.053
	(0.034)	(0.040)	(0.047)	(0.059)	(0.037)	(0.045)
Weighted	No	No	No	No	No	No
Ctrl Mean	0.590	0.590	0.442	0.442	0.712	0.712
Ctrl SD	0.492	0.492	0.497	0.497	0.453	0.453
Obs.	4588	4588	1866	1866	2722	2722
R-squared	0.108	0.113	0.063	0.072	0.054	0.056
$\beta_1 + \gamma_1\,(est.)$		-0.038		-0.067		-0.019
$\beta_1 + \gamma_1 = 0\,(p\,value)$		0.389		0.417		0.645
$\beta_2 + \gamma_2\,(est.)$		0.029		0.010		0.068
$\beta_2 + \gamma_2 = 0\,(p\,value)$		0.508		0.886		0.199

Notes: The unit of observation is a household ballot from the town hall vote on community mining regulation. The outcome is whether respondents voted for a stringent bylaw option (banning all mining or both mining in forest/river areas and amalgam burning near homes). Columns 1–2 report overall results; Columns 3–4 restrict to mining households; and Columns 5–6 to non-mining households. Conflicted Chief is an indicator for communities where the share of households perceiving the chief would accept money to allow *galamsey* is above the sample median. All regressions include district fixed effects, voter gender, and interactions between treatment indicators and the demeaned high-mining-community indicator (above-median share of mining households at baseline). Standard errors are clustered at the community level. Columns 1-2 also control for Mining Household. The bottom panel reports estimated linear combinations and corresponding p-values for treatment effects in conflicted-chief communities, specifically $\beta_1 + \gamma_1$ for seeding and $\beta_2 + \gamma_2$ for broadcasting.

Table A7: Effects on Community Mining Regulation Preferences (Weighted)

	Stringent Measure		Polarization	
	(1)	(2)	(3)	(4)
β_1 : Seeding	0.026	0.080	0.005	-0.048
	(0.043)	(0.060)	(0.043)	(0.062)
β_2 : Broadcasting	0.101**	0.165***	0.055	-0.016
	(0.039)	(0.055)	(0.039)	(0.048)
γ_1 : Seeding $\times$ Conflicted Chief		-0.118*		0.116
		(0.069)		(0.081)
γ_2 : Broadcasting $\times$ Conflicted Chief		-0.136**		0.156**
		(0.066)		(0.076)
Conflicted Chief	0.013	0.098**	0.007	-0.080
	(0.035)	(0.040)	(0.043)	(0.057)
Weighted	Yes	Yes	Yes	Yes
Ctrl Mean	0.590	0.590	0.643	0.643
Ctrl SD	0.492	0.492	0.471	0.471
Obs.	4588	4588	4588	4588
R-squared	0.107	0.112	0.026	0.031
$\beta_1 + \gamma_1\,(est.)$		-0.038		0.068
$\beta_1 + \gamma_1 = 0\,(p\,value)$		0.409		0.219
$\beta_2 + \gamma_2\,(est.)$		0.029		0.140
$\beta_2 + \gamma_2 = 0\,(p\,value)$		0.499		0.020

Notes: The unit of observation is a household ballot from the town hall vote on community mining regulation. Observations in treatment communities are weighted to match the share of mining households in control communities. Columns 1–2 measure whether respondents voted for a stringent bylaw option (banning all mining or both mining in forest/river areas and amalgam burning near homes). Columns 3–4 measure preference dispersion, defined as the absolute distance between an individual's preferred bylaw stringency and the community mean. Conflicted Chief is an indicator for communities where the share of households perceiving the chief would accept money to allow *galamsey* is above the sample median. All regressions include district fixed effects, voter gender, and interactions between treatment indicators and the demeaned high-mining-community indicator (above-median share of mining households at baseline). Standard errors are clustered at the community level. The bottom panel reports estimated linear combinations and corresponding p-values for treatment effects in conflicted-chief communities, specifically $\beta_1 + \gamma_1$ for seeding and $\beta_2 + \gamma_2$ for broadcasting.

Table A8: Effects on Community Mining Regulation Preferences (Robust to Misclassification)

	Stringent Measure		Polarization	
	(1)	(2)	(3)	(4)
β_1 : Seeding	0.019	0.130	0.011	-0.034
	(0.060)	(0.081)	(0.052)	(0.078)
β_2 : Broadcasting	0.108**	0.217***	0.094*	0.014
	(0.053)	(0.073)	(0.049)	(0.069)
γ_1 : Seeding $\times$ Conflicted Chief		-0.223**		0.085
		(0.103)		(0.100)
γ_2 : Broadcasting $\times$ Conflicted Chief		-0.218**		0.186**
		(0.091)		(0.087)
Conflicted Chief	0.010	0.171**	-0.028	-0.128*
	(0.053)	(0.066)	(0.056)	(0.074)
Ctrl Mean	0.633	0.633	0.591	0.591
Ctrl SD	0.482	0.482	0.473	0.473
Obs.	2948	2948	2948	2948
R-squared	0.111	0.120	0.026	0.032
$\beta_1 + \gamma_1\,(est.)$		-0.093		0.051
$\beta_1 + \gamma_1 = 0\,(p\,value)$		0.164		0.422
$\beta_2 + \gamma_2\,(est.)$		-0.002		0.199
$\beta_2 + \gamma_2 = 0\,(p\,value)$		0.980		0.002

Notes: The unit of observation is a household ballot from the town hall vote on community mining regulation. The regression specifications are the same as Table 2, with the only change being the exclusion of communities in the middle tercile of the conflict-of-interest distribution. Columns 1–2 measure whether participants voted for a stringent bylaw option (banning all mining or both mining in forest/river areas and amalgam burning near homes). Columns 3–4 measure preference dispersion, defined as the absolute distance between an individual's preferred bylaw stringency and the community mean. Conflicted Chief is an indicator for communities where the share of households perceiving the chief would accept money to allow *galamsey* is above the sample median. All regressions include district fixed effects, voter gender, and interactions between treatment indicators and the demeaned high-mining-community indicator (above-median share of mining households at baseline). Standard errors are clustered at the community level. The bottom panel reports estimated linear combinations and corresponding p-values for treatment effects in conflicted-chief communities, specifically $\beta_1 + \gamma_1$ for seeding and $\beta_2 + \gamma_2$ for broadcasting.

Table A9: Heterogeneous Treatment Effects on Commitment to Sustain Collective Action

	Regular Meeting Index (1)	Attend Regular Meetings (2)	Organize Regular Meetings (3)	Join Local WhatsApp Group (4)	Bid NGO Workshop (GHS) (5)
β_1 : Seeding	-0.278*	-0.133**	-0.054	-0.139***	-1.450
	(0.140)	(0.062)	(0.057)	(0.045)	(1.869)
β_2 : Broadcasting	0.397***	0.187***	0.081	-0.038	-0.757
	(0.118)	(0.052)	(0.053)	(0.046)	(2.733)
γ_1 : Seeding $\times$ Conflicted Chief	0.317	0.085	0.127	0.208***	4.651
	(0.197)	(0.079)	(0.083)	(0.072)	(2.872)
γ_2 : Broadcasting $\times$ Conflicted Chief	-0.098	-0.096	0.028	0.155**	-2.934
	(0.181)	(0.072)	(0.078)	(0.064)	(4.337)
Conflicted Chief	0.027	0.058	-0.038	-0.108**	1.146
	(0.144)	(0.057)	(0.063)	(0.049)	(2.638)
Ctrl Mean	0.000	0.663	0.300	0.301	27.058
Ctrl SD	1.000	0.473	0.458	0.459	17.651
Obs.	4505	4505	4505	4505	4505
R-squared	0.129	0.119	0.048	0.070	0.124
$\beta_1 + \gamma_1\,(est.)$	0.039	-0.048	0.073	0.069	3.201
$\beta_1 + \gamma_1 = 0\,(p\,value)$	0.773	0.339	0.252	0.207	0.174
$\beta_2 + \gamma_2\,(est.)$	0.299	0.091	0.109	0.116	-3.692
$\beta_2 + \gamma_2 = 0\,(p\,value)$	0.046	0.110	0.067	0.015	0.258

Notes: The unit of observation is a household ballot from the town hall activities measuring revealed commitment to sustained collective action. Columns 1–3 capture time commitments: Column 1 reports a standardized index combining willingness to attend and organize regular community meetings on *galamsey*; Columns 2 and 3 report these components separately. Column 4 measures participants' enrollment in a local NGO-moderated WhatsApp group. Column 5 records participants' financial contributions in a crowd-bidding activity, where individuals allocated part of a potential 50 GHS prize between themselves and a communal fund to host an NGO workshop. Conflicted Chief is an indicator for communities where the share of households perceiving the chief would accept money to allow *galamsey* is above the sample median. All regressions include district fixed effects, voter gender, and Mining Household, and interactions between treatment indicators and the demeaned high-mining-community indicator (above-median share of mining households at baseline). Standard errors are clustered at the community level. The bottom panel reports estimated linear combinations and corresponding p-values for treatment effects in conflicted-chief communities, specifically $\beta_1 + \gamma_1$ for seeding and $\beta_2 + \gamma_2$ for broadcasting.

Table A10: Heterogeneous Treatment Effects on Post-Town Hall Discussion

	Freq. Discuss Galamsey w/ Other		
	Non-mining Community Members	Mining Community Members	Chief Organized Gathering
	(1)	(2)	(3)
β_1 : Seeding	-0.458***	-0.716**	-0.090
	(0.163)	(0.316)	(0.056)
β_2 : Broadcasting	0.441**	0.595	0.059
	(0.207)	(0.384)	(0.086)
γ_1 : Seeding $\times$ Conflicted Chief	0.353	0.735	0.019
	(0.274)	(0.474)	(0.075)
γ_2 : Broadcasting $\times$ Conflicted Chief	0.555	0.627	-0.018
	(0.356)	(0.585)	(0.109)
Conflicted Chief	0.002	-0.064	-0.025
	(0.209)	(0.389)	(0.073)
Ctrl Mean	1.070	1.460	0.136
Ctrl SD	1.800	2.448	0.343
Obs.	1366	1366	1368
R-squared	0.081	0.154	0.041
$\beta_1 + \gamma_1\,(est.)$	-0.105	0.019	-0.071
$\beta_1 + \gamma_1 = 0\,(p\,value)$	0.644	0.960	0.202
$\beta_2 + \gamma_2\,(est.)$	0.996	1.222	0.040
$\beta_2 + \gamma_2 = 0\,(p\,value)$	0.001	0.007	0.583

Notes: The unit of observation is a household. Columns 1 and 2 measure the frequency with which respondents report discussing *galamsey* with others after the town hall, separately for non-mining and mining community members. Column 3 reports whether the chief organized a follow-up community gathering on *galamsey*. All regressions include district fixed effects, and interactions between treatment indicators and the demeaned high-mining-community indicator (equal to one for communities with an above-median share of mining households at baseline). Standard errors are clustered at the community level. The bottom panel reports estimated linear combinations and corresponding p-values for treatment effects in conflicted-chief communities, specifically $\beta_1 + \gamma_1$ for seeding and $\beta_2 + \gamma_2$ for broadcasting.

Table A11: Heterogeneous Treatment Effects on Pessimism About Collective Action

		Own or Perceived Willingness				
	Perceived Collective Action Efficacy	Self	3 Closest Friends & Neighbours	10 Other Non-mining Households	10 Other Mining Households	Chief
	(1)	(2)	(3)	(4)	(5)	(6)
β_1 : Seeding	-0.028	-0.002	0.010	-0.137	-0.518**	0.041
	(0.058)	(0.039)	(0.081)	(0.240)	(0.250)	(0.034)
β_2 : Broadcasting	-0.134**	-0.137***	-0.438***	-1.266***	-0.544	-0.106*
	(0.060)	(0.050)	(0.126)	(0.300)	(0.469)	(0.054)
γ_1 : Seeding $\times$ Conflicted Chief	0.059	-0.051	-0.009	0.076	0.061	-0.057
	(0.075)	(0.048)	(0.124)	(0.288)	(0.380)	(0.069)
γ_2 : Broadcasting $\times$ Conflicted Chief	0.029	0.035	0.129	0.051	-0.089	-0.038
	(0.080)	(0.059)	(0.161)	(0.362)	(0.553)	(0.079)
Conflicted Chief	-0.076	-0.004	-0.107	-0.355	-0.070	-0.009
	(0.049)	(0.031)	(0.100)	(0.217)	(0.303)	(0.050)
Ctrl Mean	0.603	0.916	2.310	7.838	4.776	0.791
Ctrl SD	0.490	0.278	0.782	1.886	2.668	0.407
Obs.	1368	1368	1366	1366	1366	1368
R-squared	0.034	0.047	0.072	0.109	0.074	0.058
$\beta_1 + \gamma_1\,(est.)$	0.030	-0.053	0.002	-0.062	-0.456	-0.016
$\beta_1 + \gamma_1 = 0\,(p\,value)$	0.548	0.093	0.987	0.710	0.128	0.766
$\beta_2 + \gamma_2\,(est.)$	-0.105	-0.102	-0.309	-1.215	-0.633	-0.144
$\beta_2 + \gamma_2 = 0\,(p\,value)$	0.038	0.003	0.003	0.000	0.058	0.012

Notes: The unit of observation is a household. Column (1) reports responses on whether community collective action is perceived as more effective than government intervention. Columns (2)–(6) measure respondents' own willingness and their beliefs about others' willingness to participate in community efforts to address *galamsey*. Conflicted Chief is an indicator for communities where the share of households perceiving the chief would accept money to allow *galamsey* is above the sample median. All regressions include district fixed effects, and interactions between treatment indicators and the demeaned high-mining-community indicator (equal to one for communities with an above-median share of mining households at baseline). Standard errors are clustered at the community level. The bottom panel reports estimated linear combinations and corresponding p-values for treatment effects in conflicted-chief communities, specifically $\beta_1 + \gamma_1$ for seeding and $\beta_2 + \gamma_2$ for broadcasting.

Table A12: Heterogeneous Treatment Effects on Attitudes Toward Other Community Members

	Give To		Expect From	
	Non-mining Households	Mining Households	Non-mining Households	Mining Households
	(1)	(2)	(3)	(4)
β_1 : Seeding	-1.0	3.6	-2.3	0.8
	(1.6)	(2.4)	(2.1)	(2.6)
β_2 : Broadcasting	0.2	0.2	2.3	-1.9
	(1.7)	(2.5)	(2.3)	(2.7)
γ_1 : Seeding $\times$ Conflicted Chief	2.5	-2.5	4.3	2.1
	(2.8)	(3.6)	(2.9)	(4.0)
γ_2 : Broadcasting $\times$ Conflicted Chief	-0.6	2.7	3.2	7.9*
	(2.9)	(3.7)	(3.0)	(4.2)
Conflicted Chief	-1.1	-0.1	-4.1*	-8.9***
	(2.1)	(2.6)	(2.5)	(2.8)
Ctrl Mean	41.9	17.8	26.4	37.6
Ctrl SD	19.7	21.3	17.6	32.5
Obs.	1366	1366	1366	1366
R-squared	0.029	0.112	0.041	0.125
$\beta_1 + \gamma_1\,(est.)$	1.5	1.2	2.0	2.9
$\beta_1 + \gamma_1 = 0\,(p\,value)$	0.492	0.652	0.308	0.274
$\beta_2 + \gamma_2\,(est.)$	-0.5	2.9	5.6	6.0
$\beta_2 + \gamma_2 = 0\,(p\,value)$	0.837	0.289	0.004	0.045

Notes: The unit of observation is a household. Column (1)-(2) how much of 100 GHS endowment respondents were willing to give to a randomly selected non-mining and mining households from their community respectively. Column (3)-(4) how much of 100 GHS endowment respondents expected to receive from a randomly selected non-mining and mining households from their community respectively. Conflicted Chief is an indicator for communities where the share of households perceiving the chief would accept money to allow *galamsey* is above the sample median. All regressions include district fixed effects, and interactions between treatment indicators and the demeaned high-mining-community indicator (equal to one for communities with an above-median share of mining households at baseline). Standard errors are clustered at the community level. The bottom panel reports estimated linear combinations and corresponding p-values for treatment effects in conflicted-chief communities, specifically $\beta_1 + \gamma_1$ for seeding and $\beta_2 + \gamma_2$ for broadcasting.

Table A13: Heterogeneous Treatment Effects on National Civic Action

	Petition Letter	NGO Donation (GHS)
	(1)	(2)
β_1 : Seeding	0.063	0.214
	(0.050)	(0.456)
β_2 : Broadcasting	0.076	0.395
	(0.053)	(0.538)
γ_1 : Seeding $\times$ Conflicted Chief	-0.083	-0.693
	(0.080)	(0.724)
γ_2 : Broadcasting $\times$ Conflicted Chief	-0.069	-0.741
	(0.075)	(0.775)
Conflicted Chief	0.067	0.093
	(0.053)	(0.541)
Ctrl Mean	0.787	6.675
Ctrl SD	0.410	5.394
Obs.	1368	1366
R-squared	0.024	0.015
$\beta_1 + \gamma_1\,(est.)$	-0.020	-0.479
$\beta_1 + \gamma_1 = 0\,(p\,value)$	0.745	0.349
$\beta_2 + \gamma_2\,(est.)$	0.007	-0.346
$\beta_2 + \gamma_2 = 0\,(p\,value)$	0.906	0.508

Notes: The unit of observation is a household. Column (1) captures signing a petition opposing a pro-mining legislative instrument. Column (2) captures how much of a 20 GHS survey incentive respondents wished to donate to an NGO supporting grassroots anti-*galamsey* activism. Conflicted Chief is an indicator for communities where the share of households perceiving the chief would accept money to allow *galamsey* is above the sample median. All regressions include district fixed effects, and interactions between treatment indicators and the demeaned high-mining-community indicator (equal to one for communities with an above-median share of mining households at baseline). Standard errors are clustered at the community level. The bottom panel reports estimated linear combinations and corresponding p-values for treatment effects in conflicted-chief communities, specifically $\beta_1 + \gamma_1$ for seeding and $\beta_2 + \gamma_2$ for broadcasting.