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## The Effects of Independent Local Radio on Tanzanian Public Opinion: Evidence from a Planned Natural Experiment --Manuscript Draft--

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<b>Additional Information:</b>	
<b>Question</b>	<b>Response</b>

# The Effects of Independent Local Radio on Tanzanian Public Opinion: Evidence from a Planned Natural Experiment

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## Abstract

We describe a natural experiment occasioned by an abrupt increase in the transmission range of an independent Tanzanian radio station whose broadcasts emphasize current affairs and gender equality. Some villages that formerly lay outside the catchment area of this radio station could now receive it, while nearby villages remained outside of reception range. Prior to the change in transmitter range in 2018, we conducted a baseline survey in both treated and untreated villages and found them to be similar in terms of prevailing social attitudes and political interest. An endline survey conducted in 2020 shows that respondents in areas that received the new radio signal were substantially more likely to listen to the station, and their levels of political interest and knowledge about domestic politics were significantly higher than their counterparts in villages where the signal could not reach. Attitude change on a range of gender issues, however, was sporadic.

**Key Words:** Natural Experiment, Media, Radio, Political Knowledge, Political Participation, Gender

**Short Title:** Local Radio on Tanzanian Public Opinion

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†Pre-Analysis Plan available [here](#). Online Appendix available in the online edition and [here](#). Replication files are available in the JOP Dataverse (<https://dataverse.harvard.edu/dataverse/jop>). The empirical analysis has been successfully replicated by the JOP replication analyst. This study was supported by the Wellspring Philanthropic Fund. This research was reviewed and approved by Columbia University's Institutional Review Board (protocol AAAR5582) and Tanzania's Commission of Science and Technology (protocol 14528).

More than 44,000 radio stations currently reach over 5 billion listeners worldwide. Radio is the dominant medium in rural, low-income communities where newspaper, television, and digital media are costly and relatively rare. In Sub-Saharan Africa, for example, approximately two-thirds of citizens report listening to the radio more than once per week, and 43% report listening to the radio every day (Conroy-Krutz and Kone 2020). Radio content in low-income countries is increasingly disseminated by independent media, which have proliferated over the last three decades in response to technological development and easing government restrictions (Conroy-Krutz 2018).

To what extent does radio shape political interest and knowledge, two aspects of public opinion that are thought to be crucial for democratic accountability? And does a radio station’s substantive focus influence its listeners’ social attitudes? The present study exploits a unique research opportunity to assess the influence of independent radio. The local public affairs radio station Pangani FM, run by a Tanzanian NGO, increased the power of its transmitter in April 2018, expanding its broadcast range. This change in wattage “treated” certain villages in the Usambara Mountains that could not formerly receive Pangani FM. Due to idiosyncrasies of topography and distance, other villages in the Usambara Mountains continued to lie outside Pangani FM’s range; these comprise our control group.

Unlike most natural experiments, the present study was planned and registered in advance. Before the transmitter became operative, we mapped the new transmission boundary and conducted a baseline survey to verify that treated and control locations were similar in terms of background attributes, media consumption, and social attitudes. This paper reports the results of re-interviews conducted eighteen months after the transmitter became operational, at the end of 2020.

This research design has the advantage of unobtrusiveness. Respondents who owned a radio at baseline, on whom the present study focuses, were not encouraged to listen to Pangani FM. Nevertheless, we find a strong statistical relationship between treatment status and endline respondents’ reported exposure to Pangani FM. Treatment and control regions

were similar at baseline in terms of the rates at which they listened to news or discussed politics, but eighteen months later the treatment areas emerged with significantly higher levels of interest in politics and higher levels of knowledge about certain domestic political figures and issues, though we see no concomitant increase in self-reported political participation. Although much of Pangani FM’s programming during the treatment period focused on issues related to gender equality — intimate partner violence, shared responsibilities for child-rearing, and early and forced marriage — we find mixed evidence of attitude change on gender-related issues.

The sections that follow situate the present study in the literature on media effects, describe the methodological novelty of our research design, and present results.

## **Prior Research**

The extent to which exposure to mass media changes what people think or think about has long been a central but contested question in the social sciences. Gradually, however, scholars have become more sanguine about media’s influence on public opinion. Media may convey information ([Holmes 1990](#)); persuasive “frames” may highlight certain aspects of controversial issues ([Leeper and Slothuus 2020](#)); and sustained news coverage may raise the salience of specific topics ([Iyengar and Kinder 1987](#)).

A growing body of research attempts to gauge the influence of mass media in low-income countries, but these studies often confront the challenge of extracting reliable causal inferences from observational data. The emergence and spread of media stations is often tied to economic, social, and political conditions that themselves influence public opinion. Media content may reflect audience opinions rather than shape them ([Chaffee and Metzger 2001](#)), and audiences may select stations that appeal to their tastes and convictions ([Arceneux and Johnson 2013](#)). A correlation between outcomes and media exposure is open to conflicting interpretations.

One way around this impasse is to experimentally assign exposure to media programs. Building on the path-breaking research by [Paluck \(2009, 2010\)](#), a growing number of experi-

mental studies have assessed the extent to which radio talk shows, public service campaigns, and dramas influence attitudes, beliefs, and behaviors (Conroy-Krutz and Moehler 2015; Banerjee et al. 2019; Blair et al. 2019; Green et al. 2020). These experiments are well-suited to identify the impact of specific media programs but are limited in their ability to assess the effects of sustained exposure to a given radio or television channel. While a number of recent studies have sought to randomize exposure to entire radio, TV, or print media outlets, this approach has the drawback of being quite obtrusive. Randomized control trials either encourage uptake of a particular media source (Gerber et al. 2009; Aker et al. 2017; Chen and Yang 2019; Broockman and Kalla 2022) or present a station’s content in a forced exposure setting (Conroy-Krutz and Moehler 2015; Green et al. 2022). This approach sidesteps important questions about whether certain types of media outlets attract and retain audiences in the first place.

A parallel body of research attempts to address these limitations by leveraging natural variation in the establishment and reach of television, radio, and print media outlets to assess their aggregate effects in real-world settings. These studies have identified mass media influence on a broad range of outcomes, including fertility and divorce rates (Chong and La Ferrara 2009; La Ferrara et al. 2012), voting intentions and behaviors (Gentzkow 2006; DellaVigna and Kaplan 2007; Durante et al. 2019; Foos and Bischof 2022; Hopkins and Ladd 2014), politicians’ accountability (Besley and Burgess 2002; Stromberg 2004), politicians’ attitudes (Clinton and Enamorado 2014), beliefs about crime (Mastrorocco and Minale 2018), national identification and prejudice (Della Vigna et al. 2014; Blouin and Mukand 2018), and ethnic violence (Yanagizawa-Drott 2014; Adena et al. 2015; Armand et al. 2020). While geographic and temporal comparisons allow researchers to investigate the aggregate effects of media in real-world settings, this research design hinges on the assumption that the location or timing of media exposure is exogenous. The uncertainty surrounding this assumption is compounded by the fact that most natural experiments are conceived and implemented after the exposure period they study. Ex post research designs are susceptible to bias because

they increase the “degrees of freedom” available to researchers, including decisions about outcome measures, sampling and estimation strategies, and whether to pursue and publish null findings.

In sum, researchers seeking to estimate media effects typically face a trade-off between identifying an unobtrusive treatment arising in nature and reducing researcher degrees of freedom through prior planning and preregistration. Our review of 45 prominent studies in the media effects literature reaffirms this point (see Online Appendix A10): we find few natural experiments on media effects that were both planned and preregistered.<sup>1</sup>

This study thus contributes to the rapidly evolving empirical literature on the influence of mass media in a number of ways. Substantively, we focus on an increasingly prevalent but understudied source of mass media exposure: independent local radio stations. Methodologically, our study is like other natural experiments in that our ability to identify causal effects is driven by topography and distance, allowing for a naturalistic and unobtrusive treatment; however, our innovation is that our natural experiment was planned in advance, and therefore the posited comparability between treated and untreated areas could be verified empirically before outcomes were known.

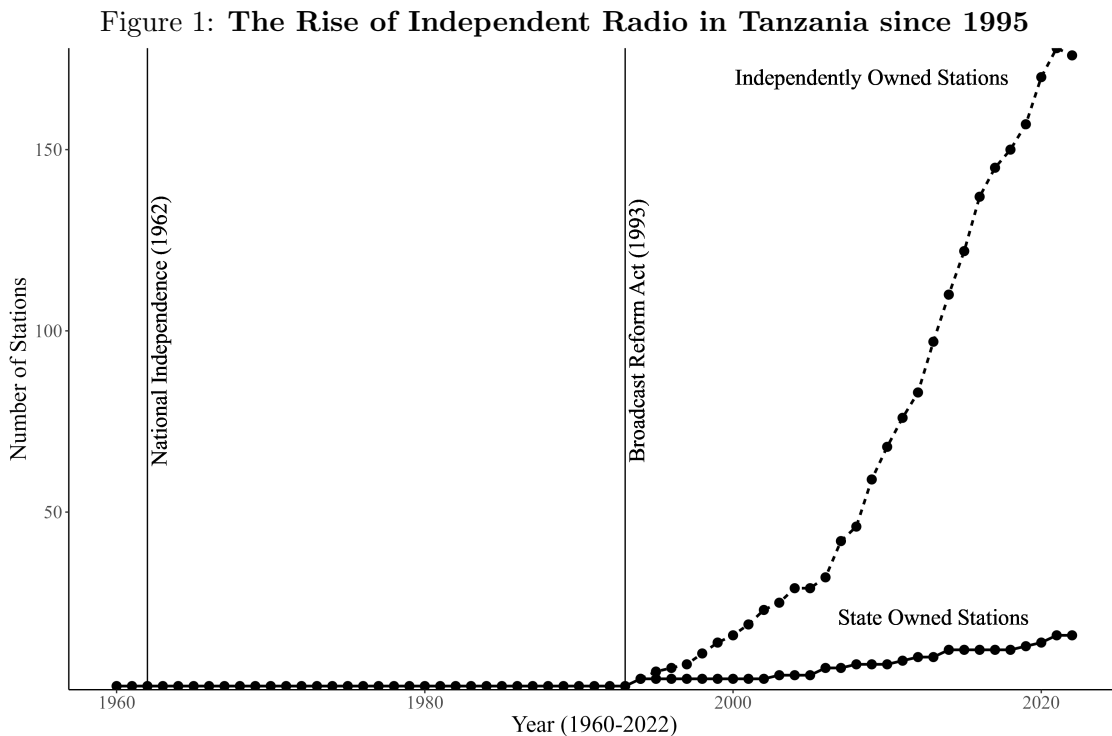
## **Case Background: FM Radio in Tanzania and Pangani FM**

For decades following independence, many post-colonial governments maintained tight restrictions on independent mass media ([Bourgault 1995](#)). However, during the early 1990s

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<sup>1</sup>We assembled a list of studies that, like our own, seek to estimate the effect of sustained exposure to a TV, radio, or print media outlet on political and social attitudes, beliefs, or behaviors. Overall, we find only two instances of preregistered studies with unobtrusive treatments: a pair of field experiments conducted in Burkina Faso in which researchers worked directly with radio stations to randomize exposure to public health programming across media markets ([Sarrassat et al. 2018](#); [Glennester et al. 2021](#)). Notably, we find no comparable study that explores the outcomes of political interest, knowledge, and participation or politically-relevant attitudes.

political liberalization triggered a rapid rise in independent media (Voltmer 2013; Nyamnjuh 2005). Tanzania offers a useful example: from independence in 1962 until 1993, Tanzanians were able to access just one radio channel, the state-owned *Radio Tanzania Dar es Salaam* (Sturmer 1998). After political liberalization in 1993, the number of independent radio stations climbed from 3 in 1995 to 11 in 2005, 125 in 2015, and 203 in 2022. While many independent radio stations focus on music and entertainment, an increasing number of media outlets use radio to broadcast messages about political and social issues (Katunzi and Spurk 2019; Spurk and Dingerkus 2017; Ng’atigwa 2014).



The growth of independent media was particularly pronounced for FM radio, which offered a cost-effective platform to reach rural areas, where limited access to electricity inhibited the spread of television and low rates of literacy that of newspapers (Conroy-Krutz 2018). The rise of independent radio stations enabled non-governmental and religious organizations to broadcast their messages to new audiences, often with financial and technical support from international donor organizations (UNESCO 2014; USAID 2015).

Pangani FM 107.7 was established in 2006, during the Tanzania radio sector’s era of rapid growth. It is owned and operated by a community development organization centered in Pangani. According to the *Tanzania Media Yearbook*, which grades radio stations according to their programming quality, Pangani FM ranks highly among community-based radio stations in Tanzania, receiving praise for its engagement with policy and governance (Katunzi and Spurk 2019). While Pangani FM’s programs cover a wide array of current events and social issues, the station’s primary focus during the study period (April 2018-December 2020) was “to effectively address gender violence, intimate partner violence, and violence against children.” Pangani FM’s annual program logs during this period indicate two focal messaging strategies: influencing audience attitudes by highlighting the prevalence and negative impact of intimate partner violence, early and forced marriage, and violence against children, and encouraging community members to report violent incidents to community leaders or police. Pangani FM delivered these messages via three types of programs: talk-radio shows focused on local social issues, edutainment programs such as radio dramas, and national and local news programs.

## Research Design

The present study exploits a research opportunity that arose when Pangani FM received a more powerful transmitter.<sup>2</sup> Pangani FM temporarily activated the transmitter at full wattage, allowing a research team to travel to the projected transmission boundary and verify the reach of the transmitter. Excluding communities that already received Pangani FM before the transmission boundary was expanded, the signal verification team detected

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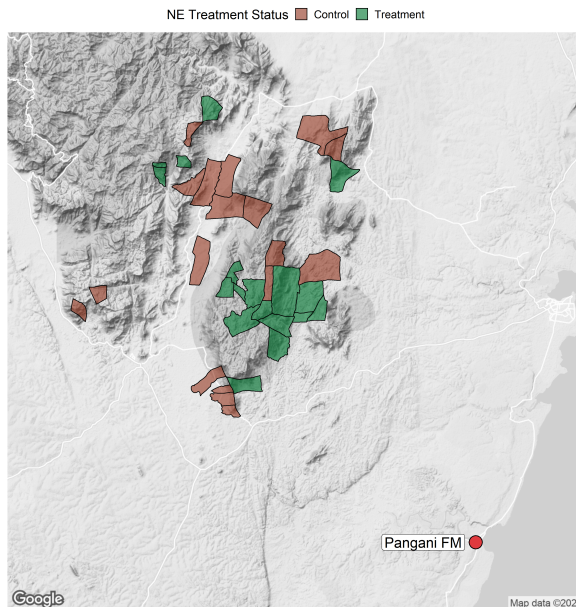
<sup>2</sup>UNESCO donated this transmitter as part of a five year program supporting community radio stations in Tanzania. No other radio stations in Tanga received a transmitter from UNESCO, so the increased transmission boundary was not correlated with the extension of any other radio station’s transmission range. The exact timing of the transmitter upgrade was itself haphazard; the original goal was to increase the transmission boundary in 2017, but installation of the transmitter was delayed because of faulty components.



a strong signal in 18 villages; no signal was detected in 74 villages. Online Appendix Figure A2 shows the signal strength detected, and Figure A3 classifies each village according to whether it would be treated once the transmitter became active.

Using the GenMatch package in R, we matched villages that received no signal to villages in which we found a strong signal on a variety of socio-economic measures collected during the scoping exercise,<sup>3</sup> leading to the final assignment depicted in Figure 2.

Figure 2: **Treatment and Control Villages in Natural Experiment**



The viability of the treatment-control comparison depends on close pre-treatment similarity between treatment and control villages. Although matching based on socio-economic characteristics helps, we took the further step of conducting a baseline survey about social and political opinions in March 2018, four weeks before the new transmitter became operational. In each village, we surveyed 20 men and 20 women using the sampling procedure

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<sup>3</sup>The measures used for matching were village area, number of subvillages, estimated village population, cell phone service availability, number of cell phone bars, time travel from main road, availability of electricity, number of mosques, number of churches, availability of the village executive, reachable-by-road subvillage, non-Pangani FM radio stations available in the main village, and non-Pangani FM radio stations available in the subvillage.

described in Online Appendix A5. Baseline survey responses from treatment and control villages proved to be similar (see Online Appendix Table A3): of 60 pre-treatment covariates, just four covariates show differences that are significant at  $p < 0.05$ . This level of covariate balance is what one would expect had the groups been formed by random assignment.

The resulting sample displays the demographic and opinion profile of rural Northeastern Tanzania (see Online Appendix Table A1). Slightly more than half of the radio-owning respondents are Muslim, about half have electricity in their village, three-quarters have finished primary school, more than half the respondents are men, and the average age is 40. The sample’s media consumption, political participation, and social attitudes are similar to rural respondents in both Tanzania and Sub-Saharan Africa generally, as measured by recent Afrobarometer surveys (see Online Appendix Table A2).

The endline survey was fielded from November to December 2020. 83% of baseline respondents completed the endline survey, and the rate of respondent replacement was 13% in both treatment and control villages (see Online Appendix A5 for details).

## **Compliance with Assigned Treatment**

The self-reported rate of Pangani FM listenership in control villages at endline was low (6%). By comparison, when we asked respondents in villages that gained access to Pangani FM what radio stations they listened to, they were 23.1 percentage points more likely to volunteer that they listened to Pangani FM, and they were 27.5 percentage points more likely to report having listened to Pangani FM when asked directly about the station, as shown in [Table 1](#). The F-statistics of this “first-stage” relationship are 56.86 (unprompted question) and 78.22 (prompted question), with  $p$ -values of 7.773e-09 and 1.902e-10, respectively.

Table 1: **Uptake of Pangani FM** as a function of treatment assignment

	Pangani FM	
	Unprompted	Prompted
Pangani-FM	0.231	0.275
Standard Error	0.031	0.031
<i>p</i> -value	0.000	0.000
Hypothesis	+	+
Control Mean	0.06	0.21
Village SD (control)	0.09	0.15
DV Range	[0-1]	[0-1]
Matched Pair FE	Yes	Yes
Covariates	No	No
Adj- $R^2$	0.17	0.11
Observations	790	790

**Note:** All regressions present standard errors clustered at the village level and wild bootstrapped *p*-values. Missing [covariates] values were replaced with the mean value of the respondent’s village. Adjustment for LASSO-selected covariates does not significantly alter the coefficient or standard error of the estimates. *Unprompted* refers to the question “What radio stations do you mainly listen to?” and *Prompted* refers to the question, “Have you ever listened to the radio station Pangani FM?”

Detailed questions about radio listening patterns confirmed that respondents in treated villages listened to a broad cross-section of Pangani FM programming, including edutainment, news, and discussion programs. We also find suggestive evidence that Pangani FM’s increased audience share came at the expense of Tanzanian government and ruling party radio stations and popular music entertainment programs (see Online Appendix Table A11). This pattern of results reminds us that net media effects are composed of both the direct effects of exposure and the substitution effects of displacing exposure to other media content (Della Vigna and La Ferrara 2015). Our results might thus be more precisely thought of as the effect of listening to independent public affairs radio *instead of* state-captured stations and music entertainment. One final observation about the audience for Pangani FM is that baseline attitudes about gender and other social issues are very weakly predictive of who

listens in treated villages. It does not appear that listeners select Pangani FM on account of its substantive focus.

## Statistical Model

We use regression to estimate the effects of access to Pangani FM. The pool of relevant subjects is restricted to respondents who reported owning a radio in the baseline survey.<sup>4</sup> Let  $y_j$  denote the survey outcome for subject  $j$ , and  $d_j$  denote subject’s treatment. The treatment variable is coded 1 if a village was determined to be within the extended Pangani FM range during baseline scoping, and 0 otherwise. The regression model for each outcome is

$$y_j = \beta d_j + \gamma_1 pair_{1j} + \gamma_2 pair_{2j} \dots + \gamma_k pair_{kj} + \alpha r_j + \lambda_q LASSO_q + u_j,$$

where  $u_j$  represents unobserved causes of  $y_j$ . The indicator  $r_j$  refers to whether respondent  $j$  was surveyed at baseline or was a replacement for a missing baseline respondent. The indicator variables designate each village pair  $k$  from the matching exercise described above.

In keeping with our pre-analysis plan, the LASSO procedure selects prognostic covariates from the variables collected at the baseline survey, denoted in the regression models as  $LASSO_q$ . The number of LASSO-selected covariates varies depending on which outcome is being modeled. Neither estimates nor standard errors are substantially altered by covariate adjustment.

The key parameter of interest is  $\beta$ , which represents the average effect of exposure to Pangani FM. All outcome variables are coded so that a positive value reflects support for our preregistered hypotheses. We conduct one-tailed tests for statistical significance in a positive direction. Because the villages are the unit at which treatments are “assigned,” we cluster

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<sup>4</sup>We included respondents who replaced a missing baseline respondent if they reported owning a radio at endline (see Online Appendix A5 for details). The validity of this replacement approach relies on the plausible assumption that Pangani FM did not affect radio ownership. Excluding replacement respondents does not materially affect our results.

the standard errors for  $\hat{\beta}$  at the village level, and generate p-values using a conservative wild-bootstrap procedure (see Online Appendix A6 and A7 for details).

## Results

### Political Interest

Pangani FM devotes substantial airtime to reporting on local and national news, and their call-in talk shows often feature public officials. Reporters from Pangani FM have won national news awards for their reporting on local government and social issues. How did access to this station affect political interest, knowledge, and views about political participation?

We asked respondents, “How interested would you say you are in politics and government?” Response options ranged from not at all interested (0) to very interested (1). The control mean is high (0.79), implying that respondents typically express considerable interest. Exposure to Pangani FM seems to raise political interest even further. The apparent effect (coefficient = 0.044, clustered SE = 0.007,  $p$ -value = 0.001) constitutes almost a full village-level standard deviation and remains significant at the 0.05 level even after correction for multiple comparisons (see Online Appendix A6 for details).

Bear in mind that this estimate reflects the intent-to-treat effect of receiving a Pangani FM signal in one’s village. If we assume that those who do not listen to this station are unaffected by it (an assumption supported by evidence that non-radio owners were unaffected by treatment, see Online Appendix Figure A7), the effect among “compliers” (i.e., those who listen if and only if their village received the signal) would be approximately four times as large. The same multiplier applies to all of the results reported below.

### Political Knowledge

As for knowledge of domestic politics, respondents with access to Pangani FM were more likely to correctly answer the question: “Do you happen to know what job or political office is now held by Kassim Majaliwa” [the prime minister]. The correct answer was widely known

among the control group (76%), yet the share of correct answers increases by 8.4 percentage points in the treatment group (clustered SE = 0.034,  $p = 0.006$ ). The same question about the vice president, who was known to 73% of the control group, showed a positive treatment effect, albeit one that falls short of statistical significance (5.9 percentage points, clustered SE = 0.034,  $p = 0.38$ ). No effect whatsoever is found for the chief justice, who was known to only 19% of the control group. Apparently, exposure to public affairs programming made it easier for people to become familiar with prominent political figures.

Respondents in treated villages also demonstrated more awareness of two prominent news stories that appeared during the research period: a ruling by the Tanzania's Court of Appeals striking down religious exemptions to marriage before the age of 18 in 2019 and the emergence of COVID-19 in 2020. Pangani FM reported on the early marriage case before and after the Court's decision, including an interview with the primary litigator and featuring regular discussions about the ruling's impact on marriage practices in the region. It also reported on risks and appropriate responses to COVID-19 in the early stages of the pandemic. Our findings suggest that both messages left an imprint. Respondents in treated villages were 3.5 percentage points more likely to say that they were aware of the court's ruling on early marriage (clustered SE = 0.013,  $p = 0.043$ ) and 18.6 percentage points more likely to accept personally protective equipment (PPE) when offered by the surveyor (clustered SE = 0.040,  $p = 0.007$ ), indicating greater awareness of the threat posed by the virus. In both cases, the estimates are greater than one-half of a village-level standard deviation.

Although respondents in treated villages became more knowledgeable about domestic political figures and current events, the same was not true of international political figures. Respondents in treated areas were no more likely to correctly identify Donald Trump, Joe Biden, and Uhuru Kenyatta. The weakly negative estimates are somewhat surprising given that Pangani FM's news programming included reports on foreign politics. However, it is possible that since foreign politics was not Pangani FM's primary focus, listening to this station instead of others made respondents less likely to hear about major foreign figures. In

a similar vein, Pangani FM exposure *decreased* knowledge of popular culture: respondents were 11.9 percentage points less likely to correctly identify a famous national musician in Tanzania (Diamond Platnumz), which is consistent with evidence (see Online Appendix Table A11) that Pangani FM substituted for listening to music programs.

## **Political Participation**

Because Pangani FM’s programming so often focuses on gender equality and women’s empowerment, our pre-analysis plan specifies that our primary participatory orientations measure concerns willingness to support women’s involvement in politics. The question reads, “Would you encourage your daughter or niece to run for for political office, or would you say there are better things for them to do with their time?” Respondents living in treated villages were 6.4 percentage points more likely to say they would be encouraging (clustered SE = 0.015,  $p = 0.003$ ), a significant effect of more than half a village-level standard deviation. On the other hand, behavioral measures of participation (not in our pre-analysis plan) showed no treatment effect. Twelve different actions such as voting or attending village meetings were unchanged by radio reception, perhaps because they were not the focus of the station’s messaging (see Online Appendix Table A13 for more details). Yet the very lack of messaging on participation makes the lack of behavioral effect theoretically interesting. Although interest and participation are correlated, an increase in the former evidently did not precipitate an increase in the latter, at least not within the first eighteen months of exposure.

## **Gender-Related Attitudes and Perceived Norms**

In the previous section, we saw some indications that exposure to Pangani FM increased support for gender equality insofar as it led respondents to become more supportive of daughters running for public office. However, evidence of attitude change becomes mixed as we review the extensive array of gender-related outcome that we measured at endline (see Online Appendix Table A13). In several instances, the treatment had no apparent effect. For example, an index of attitudes on gender equality renders a tightly estimated effect near

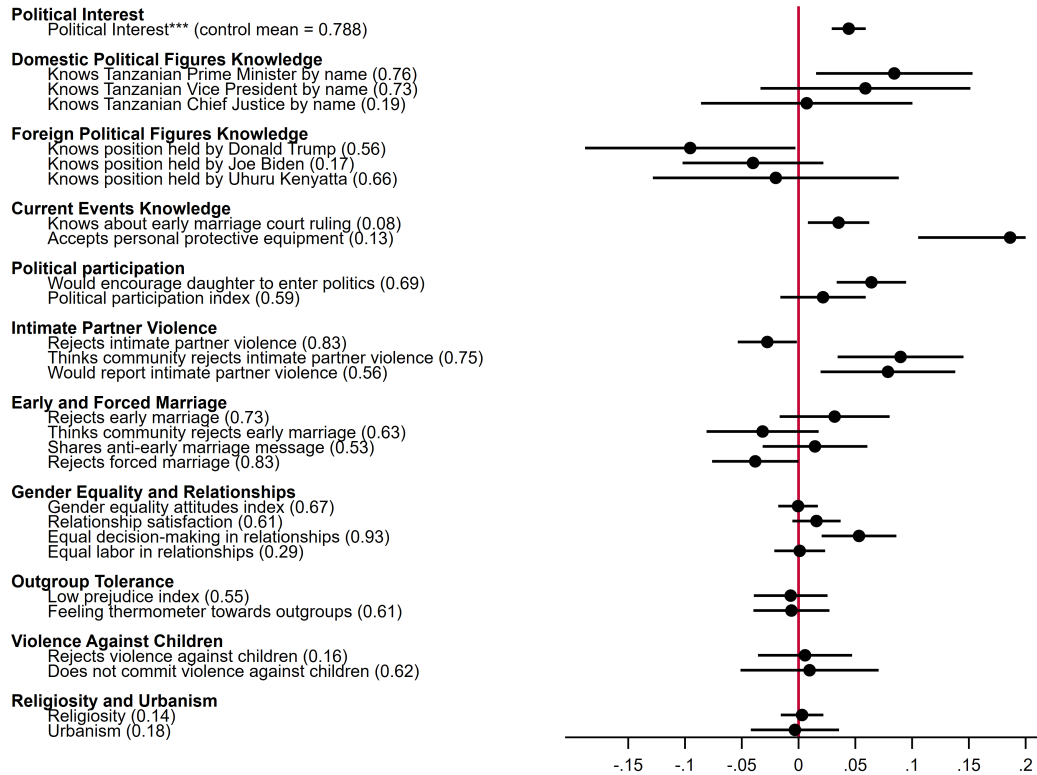
zero, and the same goes for single-question measures on topics such as whether a husband is justified in beating a wife who disobeys him or whether husbands and wives should share household chores. We find mixed evidence that exposure to the treatment led audiences to change their perception of prevailing norms on topics such as early marriage and intimate partner violence. Only the latter seems to move appreciably. On the other hand, outcome measures that focus on taking action—willingness to report intimate partner violence to authorities or to record a message denouncing the practice of marrying off girls under 18—seem to elicit more positive treatment effects, consistent with other studies that find that mass media effectively communicates norms about how people should behave (Green et al. 2020). That said, we hasten to add that these positive estimates fall short of statistical significance when one corrects for multiple comparisons.

## **Other Social Attitudes and Behaviors**

Our pre-analysis plan specified other outcomes that exposure to treatment might plausibly influence. Much of Pangani FM’s programming during the treatment period focused on discouraging violence against children. However, we see little change in attitudes toward corporal punishment, although there are some hints that behavior may have become less violent. We see no indication that exposure to a radio station from a distant town increased villagers’ aspirations to move to a city, nor did the station’s appreciation for diversity lead to greater warmth toward ethnic or other outgroups. In sum, the progressive social outlook that suffuses Pangani FM’s programming seems not to have influenced audiences’ broad orientations. We also find no evidence of spillover effects for any outcomes, based on comparisons between non-radio owners in treatment and control villages.



Figure 3: Impact of Pangani-FM Radio



**Note:** Control means reported in parenthesis. 95% confidence intervals reported. \*\*\* = statistically significant at the 5% level after Benjamini-Hochberg multiple hypothesis correction (see Online Appendix A6 for details). Note that for “Accepts personal protective equipment” the interval is [0.105,0.267]. For details on question wording and variable coding see Online Appendix A8. For full results tables see Online Appendix A9.

## Discussion

The present study assesses the effects of a sudden change in exposure to Pangani FM in rural areas in northern Tanzania. Unlike other natural experiments that track changes after the introduction of a new media source (La Ferrara et al. 2012; Della Vigna and Kaplan 2007; Armand et al. 2020), ours was planned and registered in advance. This ex ante approach enabled us to conduct a survey to verify the baseline equivalence of soon-to-be treated and untreated villages *before* Pangani FM’s new transmitter became operational.

This empirical strategy has not been used previously but has much to recommend it. In addition to verifying the comparability of treated and untreated villages, our research

design places important restrictions on researcher discretion, increasing confidence in the unbiasedness of results. At the same time, the design retains the advantages of natural experiments. The intervention is deployed unobtrusively and over an extended time period. This approach is quite different from lab-in-the-field studies of media ([Banerjee et al. 2019](#)), which convene audiences and later interview them. Given the unobtrusive design, the intent-to-treat effect we estimate reflects both the extent to which people listen to the newly-available programs and the treatment’s effects on listeners. Unlike lab or lab-in-the-field evaluations that assess impact among those who agree to listen or watch, the intent-to-treat effects reported here credit Pangani FM for airing content that attracts news listeners or draws them away from other stations. In addition, this approach lends itself to follow-up research: researchers may draw new samples from treatment or control villages in order to assess other hypotheses or evaluate programs on new topics that are about to air.

Moving to the main findings, we find support for the hypothesis that independent media exposure shapes the audience’s level of political interest and, in certain domains, knowledge. Although treatment and control areas were very similar at baseline, eighteen months of exposure to public affairs programming piqued the interest of those living in treated areas and made them more familiar with prominent political figures and issues. On the other hand, the mixed effects on political participation contrast with both the pessimistic finding that mass media consumption undermines participation in public life in Indonesia ([Olken 2009](#)) as well as the optimistic finding that exposure to mass media promotes political participation in Uganda ([Conroy-Krutz 2018](#)).

Our findings also speak to the literature on media’s effects on attitudes concerning gender equality. In some ways, our findings echo [Jensen and Oster \(2009\)](#), which found that the rollout of cable TV in India influenced audiences’ attitudes on issues such as women’s autonomy and the acceptability of intimate partner violence. We find strong evidence that Pangani FM increased respondents’ proclivity to encourage daughters to run for political office. Respondents from treated villages also expressed greater willingness to report intimate

partner violence to authorities. However, we do not find across-the-board changes in attitudes about gender equality, despite Pangani FM's recurrent messaging on this topic. The same may be said for other focal topics, such as violence against children. It may be that core attitudes about gender and parenting are especially resistant to persuasive messaging.

Other scope conditions come to mind as well. Our study assessed opinion change after eighteen months, and it may be that more profound changes in political behavior and attitudes require longer periods of exposure. We also are quick to acknowledge that our study gauges the effect of exposure to a specific radio station, and it remains to be seen whether an analogous design would find different effects if the treatment were political propaganda or apolitical entertainment. By the same token, extrapolation based on our findings must take into account whether other settings have greater or lesser access to competing media sources.

Despite these limitations, the results have important implications for understanding the evolving role of media in Sub-Saharan African politics. While easing government restrictions have engendered a rise in independent media, it remains unclear whether local outlets emphasizing political news and social issues can effectively compete with nationwide state broadcasters and entertainment conglomerates. Our results demonstrate not only that independent local channels attract and retain audiences in developing countries, but also that their programming can meaningfully influence political knowledge and interest. These findings are of special relevance given the central role that an informed and politically engaged citizenry plays in theories of electoral accountability.

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# Online Appendix

## *The Effects of Independent Local Radio on Tanzanian Public Opinion: Evidence from a Planned Natural Experiment*

Donald P. Green, Dylan W. Groves, Constantine Manda, Beatrice Montano, Bardia Rahmani

December 20, 2022

### Contents

<b>A1 Case Background: Pangani FM</b>	<b>A3</b>
<b>A2 Ethics</b>	<b>A4</b>
A2.1 COVID-19 . . . . .	A4
<b>A3 Timeline</b>	<b>A6</b>
<b>A4 Research Design</b>	<b>A7</b>
A4.1 Scoping exercise . . . . .	A7
A4.2 Projected Transmission Boundary . . . . .	A8
A4.3 Transmission Boundaries of Competing Radio Stations . . . . .	A9
<b>A5 Survey Sampling Procedures</b>	<b>A10</b>
<b>A6 Adjustment for Multiple Comparisons</b>	<b>A11</b>
<b>A7 Clustered Standard Errors</b>	<b>A11</b>
<b>A8 Question wording and variable construction</b>	<b>A12</b>
A8.1 Political Interest, Knowledge, and Participation . . . . .	A12
A8.2 Gender Attitudes and Perceived Norms Outcomes . . . . .	A13
A8.3 Social Attitudes and Behaviors Outcomes . . . . .	A16

<b>A9 Tables</b>	<b>A18</b>
A9.1 Sample Summary Statistics . . . . .	A18
A9.2 Balance on Individual Covariates . . . . .	A20
A9.3 Main Outcome Tables . . . . .	A21
A9.3.1 Main Outcome Tables - without LASSO selected controls . . . . .	A23
A9.4 Supplementary Outcome Tables . . . . .	A25
A9.5 Alternative Specifications . . . . .	A26
A9.6 Spillovers . . . . .	A28
<b>A10 Literature Review Table</b>	<b>A29</b>
<b>References</b>	<b>A32</b>

**Links to other relevant materials:**

- Pre-Analysis Plan available [here](#).
- Replication files are available in the JOP Dataverse ([here](#)).

## Appendix A1 Case Background: Pangani FM

One pillar of Pangani FM’s messaging strategy is talk-radio shows focused on locally-relevant social issues. These 1-2 hour programs usually feature a presenter who guides discussion, an invited guest from the community who shares his or her perspective or expertise, and a call-in segment during which listeners can pose questions or share their opinions. For some programs, Pangani FM journalists visit nearby areas to record villagers’ views on a topic of an upcoming program, and radio presenters play and respond to the prerecorded opinions. In addition to a morning talk-radio program, Pangani FM has four weekly talk-radio programs focused on specific themes. *Busati la wenza* focuses on relationships and marriage and often features couples from Pangani District who discuss their relationships and answer audience questions. *Sauti ya mwanamke* focuses on a range of issues from the perspective of women, including business and entrepreneurship, household work, political participation, and relationships. *Kona ya mtoto* targets youth and mixes music and entertainment with progressive messages about gender equality and violence against children. Finally, the public affairs program *Uongozi wa mguso* often includes a village chairperson or ward councilor who comments on social issues and addresses community concerns.

Pangani FM’s talk-radio messages were reinforced by twice-weekly airing of serial radio soap-operas produced by Pangani FM staff. From 2018 to 2019, Pangani FM aired the award-winning radio soap opera *Tamapendo*, which dramatized the deleterious effects of and modelled effective community responses to intimate partner violence and early and forced marriage.<sup>1</sup>

In addition to serialized radio dramas, Pangani FM regularly produces 2-minutes radio spots that dramatize specific issues around gender hierarchy and violence. For example, shortly before endline data collection Pangani FM aired a spot using a comedy sketch to highlight the risks of “choba” (voyeurism), as well as a spot highlighting the role that young motorcycle drivers can play identifying and reporting gender based violence in their communities. These radio spots play regularly throughout the week and are usually designed to reinforce messages presented in talk-radio and soap operas.

Finally — and our primary focus here — Pangani FM features daily programs focused on national and local news and politics. *Asabuhi Leo* and *Makutano* present daily news updates as well as 15-30 minute “magazine” programs

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<sup>1</sup>*Tamapendo* follows the story of Fatuma, a young girl whose father abuses her and her mother and arranges a marriage between her and an older man from outside of town. With the support of other members of her community, Fatuma and her mother move from passive acceptance of her father’s actions to active defiance, culminating in her rejection of the forced marriage. *Tamapendo* was evaluated by a field experiment [citation redacted] and is shown to influence audiences’ attitudes about the acceptability of forced marriage as well as its importance as a community issue.

that zero in on a specific local social issues.<sup>2</sup> Like Pangani FM's talk radio programs, *Asabuhi Leo* and *Makutano* cover a variety of topics but principally focus on Pangani FM's targeted thematic areas: intimate partner violence, early and forced marriage, and violence against children. For example, during the research period Pangani FM ran news stories about a Pangani District-wide campaign to increase reporting on violence against children, the Tanzanian Court of Appeals' decision to ban marriage before the age of 18, and a series on the risks associated with young girls dropping out of school. These targeted stories are embedded in news programs that include broader coverage of national politics, business, sports, weather, and cultural issues.

## **Appendix A2 Ethics**

The research design was developed in collaboration with the local non-governmental organization UZIKWASA and deployed by a local research team trained and supervised by Innovations for Poverty Action. The intervention under study - the installation of Pangani FM's new radio transmitter - would have been implemented with or without the research collaboration. Survey participation was voluntary and respondents were not compensated. Although we only report results of radio-owning respondents, respondents were randomly sampled within each village, which produced diversity across religious, economic, and ideological dimensions (the sample is also evenly split between male and female participants). The sample did not target any groups that are commonly considered marginalized in Tanzanian culture, nor did the intervention or surveys differentially benefit any specific group.

In addition to taking COVID-related precautions described below, every effort was made to ensure that the autonomy and well-being of participants were respected. Interviewers were matched with respondents of the same sex to lessen the sensitivity of gender-related questions, and interviews were conducted in private to ensure the privacy of respondents.

### **A2.1 COVID-19**

This project was implemented and data were collected in the midst of the COVID-19 pandemic. The research team took special precautions to protect subjects and staff. We obtained approval from [redacted] University and Innovations for Poverty Action COVID-19 review board to carry out the data collection, and designed transportation and data collection procedures with COVID-19 risks in mind. During endline data collection, special precautions were taken by enumerators, staff, and drivers to prevent the spread of COVID-19. Data collection teams lived and ate in isolated quarters and took daily temperature readings. Interviewers wore masks during interviews, which were conducted outside at appropriate distances. Respondents were offered masks but not required to use them. Before moving between Districts, the survey team spoke with District officials and health care workers to find out whether COVID-19 cases had been identified in the area; on one occasion, data collection was paused and the data collection

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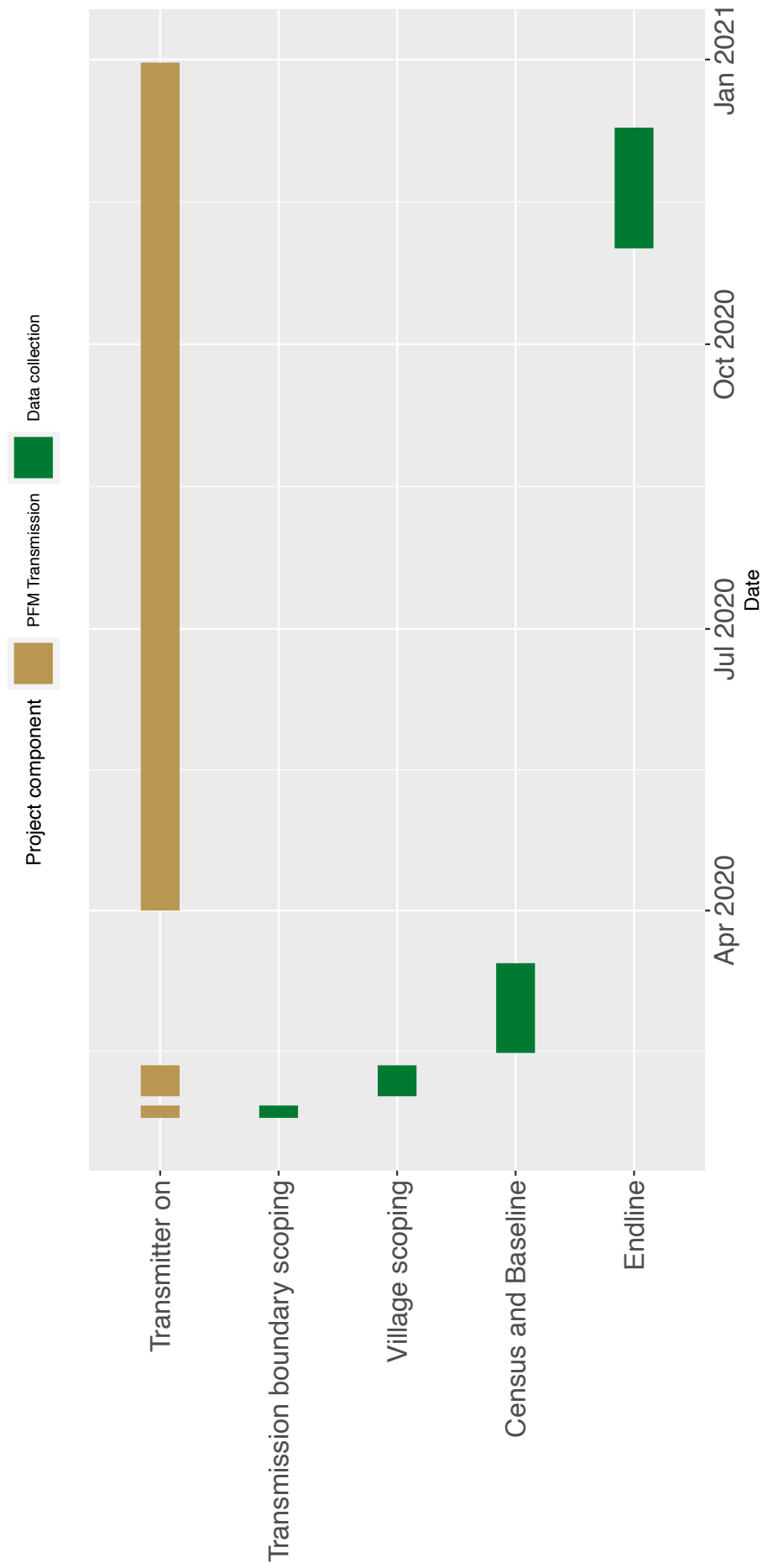
<sup>2</sup>Radio magazine programs are news items that feature a mixture of presentation forms, including narrative storytelling, in-depth interviews, live discussions with guests or callers, and dramas.

schedule was re-organized to respond to concerns of a potential COVID outbreak. Thankfully, no cases of COVID-19 were reported among survey staff or in participating villages during the data collection period.



# Appendix A3 Timeline

Figure A1: Research Timeline



# Appendix A4 Research Design

## A4.1 Scoping exercise

Figure A2: Stage 1: Motorcycle-based Scoping of Pangani FM Range

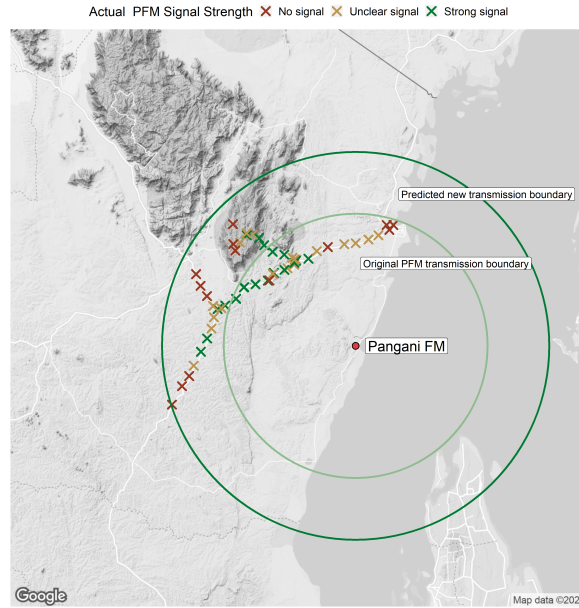
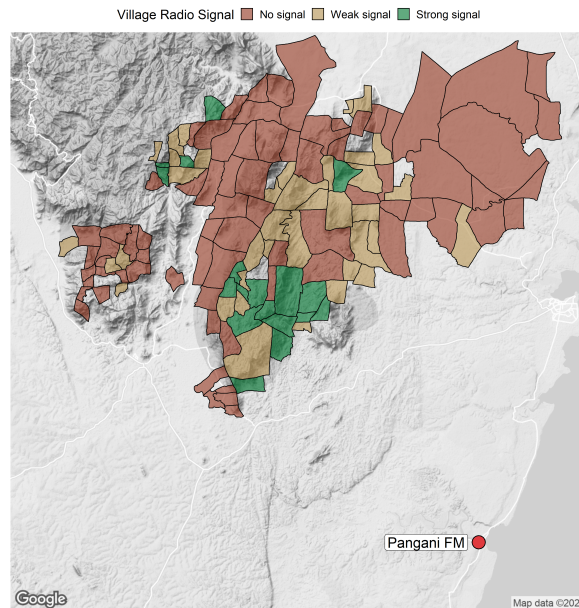


Figure A3: Stage 2: Village-based Scoping of Pangani FM Range

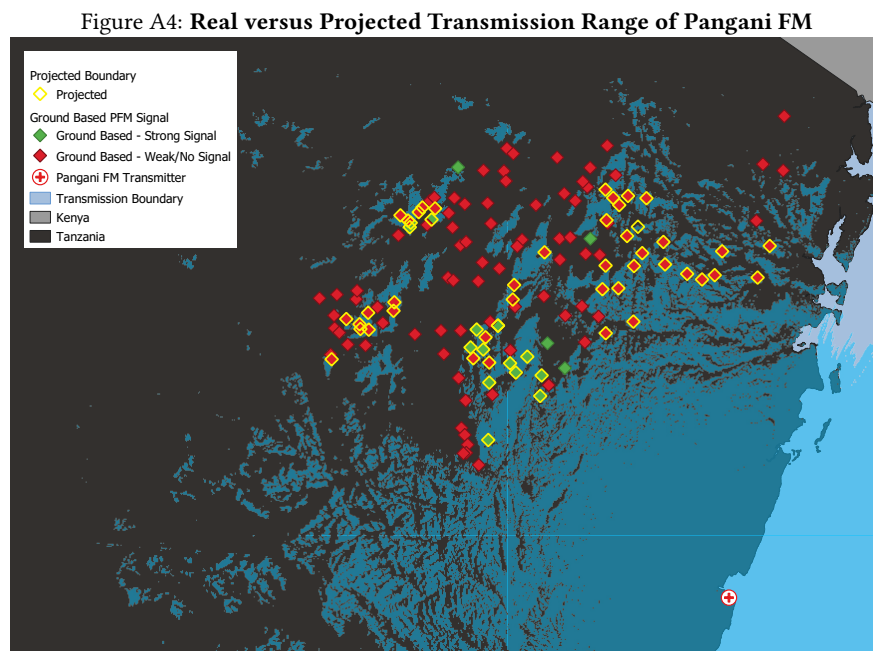


## A4.2 Projected Transmission Boundary

Figure A4 shows the projected transmission range of Pangani FM using an Irregular Terrain Model (also known as the Longley–Rice Model) as well as the centroids of all villages visited during the scoping exercise. The Irregular Terrain model incorporates information about the location of the radio transmitter, the transmitter’s technical characteristics (height, transmission power, and frequency), and topographic information (Kern 2011).

The green diamonds represent villages that received strong signal at the village center according to ground-based measures, while red diamonds represents villages that received little or no signal when measured directly. Villages with a yellow border are villages that the ITM model predicts would receive Pangani FM. As Figure A4 makes clear, the ITM model-based transmission boundary is correlated with ground-based measures of Pangani FM signal, but the overlap is imperfect. Out of 92 villages in the scoping sample where either a clear signal or no signal was detected, 25% are incorrectly classified by the ITM model. Out of 59 villages the ITM model predicts will not receive Pangani FM, 4 (8%) in fact receive Pangani FM. Out of 33 villages the ITM model predicts *will* receive Pangani FM, over half (19, or 57%) do not receive Pangani FM.

Within the 36 villages that were included in the final sample, 8 (30%) were incorrectly classified. If we had used the algorithm-produced transmitter boundary instead of ground based measured, the first stage estimate of Pangani FM listening would have been reduced by 5.3 percentage points, or 19%. Note that this figure dramatically underestimates the extent of the problem with the ITM estimate, since the village selection itself was predicated on ground-based measures.



### A4.3 Transmission Boundaries of Competing Radio Stations

Figure A5 shows the ITM-estimated transmission boundaries Tanga Kunani (TK FM) and Figure A6 for Voice of Africa FM (VOA) alongside the treatment and control sample generated by ground-based measures of Pangani FM signal. 17 of 18 villages that receive Pangani FM and 15 of 18 villages that do not receive Pangani FM also receive Voice of Africa according to ITM estimates (correlation = 0.17,  $p$ -value = 0.30). Similarly, 18 of 18 villages that receive Pangani FM also receive TK FM, while 16 of 18 villages that do not receive Pangani FM receive TK FM (correlation = 0.24,  $p$ -value = 0.15). The other major competing radio stations (TBC, Radio One, Uhuru, Clouds, and Radio Free Africa) are national broadcasters and are receivable in all 36 villages.

Figure A5: Projected Range of TK FM

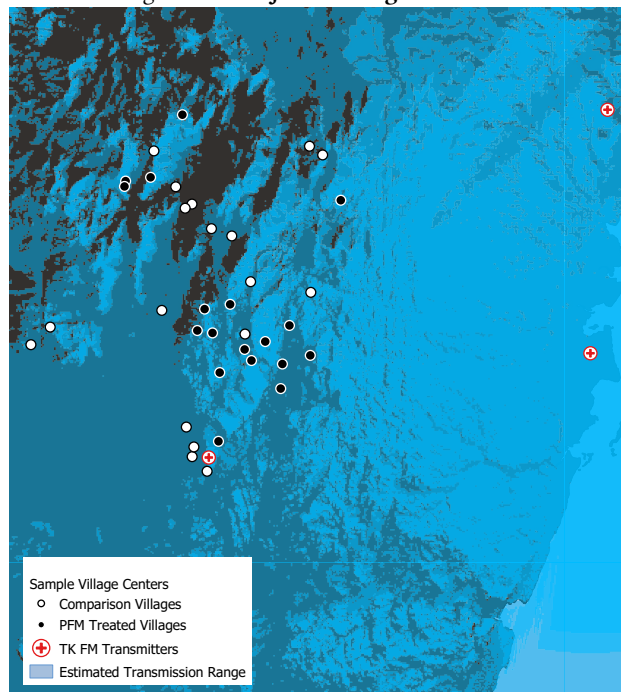
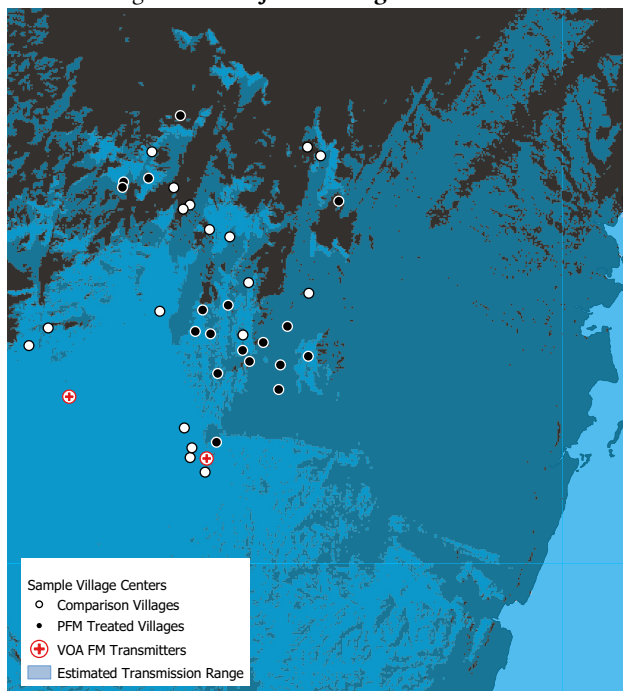


Figure A6: Projected Range of VOA FM



## Appendix A5 Survey Sampling Procedures

In each selected village, we employed a four-step strategy to sample study participants. First, the research team used satellite maps to identify the approximate village radius as 200, 400, 600 or 800 meters from the village center. Second, a census team identified all households located within the village radius, as well as the age and gender of household members between 18 and 65. Third, the census team's survey software randomly selected 20 households for the female respondent group and 20 households for the male respondent group, and randomly selected a household member of the targeted gender. Female respondents were interviewed by women, and male respondents were interviewed by men. Fourth, if an individual of the targeted gender and age range was not available from the household during the census phase, the household was dropped and a replacement household was randomly selected.

During the endline survey, if a respondent was not available to complete the endline survey during the two days that the survey team visited their village, they were replaced with one randomly selected community member of the same gender from a pool of potential replacements. The pool of potential replacements is constructed starting from step three above: we randomly selected a household member of the targeted gender from the pool of all randomly selected male and female households (same as step four above) not used at baseline to be interviewed at endline, and then used this respondent as replacements if they reported owning a radio in the endline survey. 83% of baseline respondents completed the endline survey, the rest are replacement respondents.

The baseline survey was conducted during February and March of 2018, and the endline survey was in the field

from November to December 2020. (Figure A1 reports the timeline of the surveys and the intervention in more detail).

## Appendix A6 Adjustment for Multiple Comparisons

Our pre-analysis plan specifies 21 distinct hypothesis. One way to address the problem of multiple comparisons is to apply the commonly-used Bonferroni correction with Holm’s step-down procedure. The procedure adjusts the  $\alpha$ -level, which describes how willing a researcher is to make a Type I error. To apply the Holm procedure, we first set  $\alpha$  (typically 0.05). We then rank the  $p$ -values associated with each of the  $n$  pre-specified hypotheses from smallest to largest, and determine the  $\alpha$ -level for each  $i$  outcome using the following equation:

$$\alpha_i = \alpha / (n - rank + 1)$$

In the present study, the target  $\alpha$  for the effect with the smallest  $p$ -value, political interest ( $p = 0.001$ ) is  $\alpha_i = 0.05 / (21 - 1 + 1)$ , or 0.002. Because the  $p$ -value is lower than the targeted  $\alpha$ -level, the result is statistically significant under the step-down adjustment procedure. On the other hand, the outcome with the second smallest  $p$ -value, support for women’s political participation ( $p = 0.003$ ), does not survive the adjustment ( $0.05 / (21 - 2 + 1) = 0.002$ ). We therefore regard the apparent effect on political interest as the most robust of our statistical conclusions.

## Appendix A7 Clustered Standard Errors

Our pre-analysis plan specifies that we will estimate treatment effects using least squares regression and clustered standard errors, with fixed effects for each village pair. We clustered standard errors at the village level because that is the level at which treatment was measured and assigned in the data (note that true treatment “assignment” – variation in the reception of *Pangani FM* – may have occurred at a more granular or more general level than the village). Given well-documented problems with the STATA default “HC1” setting for estimating robust clustered standard errors when the number of clusters is small (Young 2019), we report  $p$ -values from the bootstrap procedure described in Roodman et al. (2019) (see also Davison (1997)). The basic approach is to calculate test statistics from many samples resembling the true sample, then to compare the original test statistic to those generated from bootstrapped samples. The  $p$ -values generated using the wild cluster bootstrap are more conservative than those obtained using the standard HC1 setting. We included results from the bootstrap-t which is described in Cameron et al. (2008). Cameron et al. (2008) show with simulations that the bootstrap-t procedure is appropriate when the number of clusters is small (near or below 30 clusters). The bootstrap-t procedure may be compared to the standard wild cluster bootstrap standard error procedure discussed in section 3.2 of Cameron et al. (2008).

## Appendix A8 Question wording and variable construction

### A8.1 Political Interest, Knowledge, and Participation

#### Political Interest

- *Question:* How interested would you say you are in politics and government?
- *Answer Options* (read out loud): (3) Very Interested (2) Somewhat interested, (1) Not very interested, (0) Not at all interested.
- *Coding:* 1 if very interested, 0.66 somewhat interested, 0.33 if not very interested, 0 if not at all interested
- *Direction:* Positive (One-tailed)

#### Know National Politics

- *Question:* Do you happen to know what job or political office is now held by [Randomly select: Majaliwa Kassim Majaliwa / Samia Suluhu / Ibrahim Hamis Juma]?
- *Answer Options* (not read out loud): President, Prime Minister, Vice President, Head of Supreme Court, Don't Know.
- *Coding:* Coded 1 if answer is correct, 0 if incorrect or don't know.
- *Direction:* Positive (One-tailed)

#### Know Foreign Politics

- *Question:* In your understanding, who is [Randomly select: Joe Biden, Donald Trump, Uhuru Kenyatta]?
- *Answer Options* (not read out loud): U.S. President / politician, Kenyan president / politician, Don't Know.
- *Direction:* Coded 1 if answer is correct, 0 if incorrect or don't know.
- *Direction:* Positive (One-tailed)

#### Know Early Marriage Law

- *Question:* Are you aware of the recent decision by Tanzania's Court of Appeal on the legal age of marriage?
- *Answer Options* (not read out loud): Yes, No, Don't Know.
- *Direction:* Coded 1 if answer is yes, 0 if no or don't know.
- *Direction:* Positive (One-tailed)

#### Accept Personal Protective Equipment

- *Question:* (asked to surveyor) Is the respondent wearing personally protective equipment? (Note that surveyor offered mask prior to interview.)
- *Answer Options:* Yes, No.
- *Direction:* Coded 1 if answer is yes, 0 if no.
- *Direction:* Positive (One-tailed)

#### Daughter in Politics

- *Questions:* Would you encourage your daughter or niece to run for for political office, or would you say there are better things for them to do with their time?
- *Answer Options* (not read out loud): Yes, No, Don't Know.

- *Coding*: Coded 1 if answer is yes, 0 if no or don't know.
- *Direction*: Positive (One-tailed)

### Political Participation Index

- *Questions*: (All respondents randomly assigned to answer 4 questions) During the past year, have you... (1) Registered to vote (2) Voted in the national election (3) Voted in last year's local election (4) Talked to others in your community to persuade them how to vote in an election (5) Worked for a party or candidate during the election season (6) Attended a political rally for a party or candidate (7) Shared your views at a village meeting (8) Attended a village meeting (9) Attended a ward meeting (10) Contacted a District, Regional, or National government official about some issue or problem (11) Worked with others to try to solve a community problem (12) Created a group or organization to attempt to solve a local community problem.
- *Answer Options* (not read out loud): Yes, No, Don't Know.
- *Coding*: Coded 1 if answer is yes, 0 if no or don't know. The political participation index was created by averaging outcomes for the four randomly assigned questions.
- *Direction*: Positive (One-tailed)

## A8.2 Gender Attitudes and Perceived Norms Outcomes

### IPV Attitude

- *Question*: First question: In your opinion, does a man have good reason to hit his wife if she disobeys him? Second question: (if yes) Should she be slapped or should more force be used than that? (If not) What if she persists in disobeying the husband? Does he then have good reason to hit her?
- *Answer Options* (not read out loud): First question: Yes, No, Don't Know.
- *Coding*: Coded 3 if answer is No to both, 2 if answer is No to first but Yes to second, 1 if the answer is Yes to first and Slapped to second, and 0 if the answer is Yes to first, and More Force to second.
- *Direction*: Positive (One-tailed)

### IPV Norm

- *Question*: In some of the villages we have visited, people think that a man has good reason to hit his wife if she disobeys him, while people in other communities do not think this is a good reason to hit one's wife. In your community, do most people think a man has a good reason to hit his wife if she disobeys him?
- *Answer Options* (not read out loud): Yes, No, Don't Know.
- *Coding*: Coded 1 if answer is no, 0 if yes or don't know.
- *Direction*: Positive (One-tailed)

### IPV Report

- *Questions*: Suppose you visit your cousin and she tells you that her husband beat her severely and asks you for help. Suppose there are only two actions that you can take. Please tell us which one you would prefer to take...[Randomly assigned between four scenarios]
  - (a) I would accompany her to the police to report the incident.(b) I would calm her down and tell her that the situation is bound to get better unity, do most people think a man has a good reason to hit his wife if she disobeys him?
  - (a) I would express my sympathy for her but would tell her that every couple has to work it out for themselves (b) I would get the village chairperson involved
  - (a) I would talk to her parents and ask them to come by to help the couple find a peaceful solution (b) I would advise her to try harder to please her husband and things will likely improve.



- (a) I would tell her that beating is often a sign of love and that she should try to work it out with her husband (b) I would notify a female village leader and ask her to mediate the dispute.
- *Answer Options* (not read out loud): Option a, Option b, Don't Know.
- *Coding*: Coded 1 if answer is to report, 0 if answer is not to report or don't know.
- *Direction*: Positive (One-tailed)

### Early Marriage Attitude

- *Questions*: Now, I am going to provide some situations in which families in Tanzania sometimes allow their daughters to marry before they are 18. Please tell me if the situation makes marriage before 18 always acceptable, rarely acceptable, or never acceptable. In your opinion, could the girl's marriage be acceptable if...
  - If the marriage is allowed by her religion and tradition?
  - If the daughter has dropped out of school and is difficult to control at home?
  - If the daughter family fears the daughter is at risk of getting pregnant?
  - If the family is facing economic hardship and the marriage will help the family with money issues?
  - If the family fears the daughter will not find another husband?
- *Answer Options* Always Acceptable, Sometimes Acceptable, Never Acceptable.
- *Coding*: Coded 1 if answer is "never acceptable", 0 "otherwise".
- *Direction*: Positive (One-tailed)

### Early Marriage Norm

- *Question*: Now I would like to ask you about other members of your community. Do you think others in your community think that the family should never allow her daughter to be married before she is 18?
- *Answer Options* Yes, No, Only in Some Circumstances.
- *Coding*: Coded 1 if answer is Yes, 0 otherwise.
- *Direction*: Positive (One-tailed)

### Early Marriage Share

- *Question*: We are collecting statements from the community what people think is the right age for girls to get married. We can keep your message completely anonymous if you would like. Would you be willing to record a message?...[If yes, record message and randomly select between two follow up messages]
  - If you would like, we can share your message along with other messages from your community with the District Councilor of your District, so she knows how her community feels about this issue. Would you like us to include your message?
  - The radio station Pangani FM would like to share the opinions of some citizens on its programs. If you want, we can give them your recording and they might select your recording to share on the radio. Would you like us to share your message with Pangani FM?
- *Answer Options* (not read out loud): Yes, No.
- *Coding*: Coded 1 if answer is yes, 0 if no.
- *Direction*: Positive (One-tailed)

### Forced Marriage

- *Question*: A girl should not have a say in who she marries; it is best if her father selects a suitable husband for her.

- *Answer Options* (not read out loud): Agree, Disagree.
- *Coding*: Coded 1 if answer is Disagree, 0 if Agree.
- *Direction*: Positive (One-tailed)

### Gender Equality

- *Questions*: Do you agree or disagree with the following statements? There is no right or wrong answer – We are simply interested in your views on this issue. [Randomly select 6 questions]
  - A husband and wife should share equally in raising children such as preparing their food, washing their clothes, and keeping them safe"
  - (Reversed) If a woman earns more money than her husband, it's almost certain to cause problems
  - (Reversed) It is more important that a boy goes to school than a girl
  - In general, women are just as able to run a successful business as men
  - (Reversed) A woman should have approval from her husband to go to the clinic or the market
  - A wife is right to punish her husband if he brings home another woman.
  - A woman should be able to leave her husband if he mistreats her
  - (Reversed) Even if a woman has her own money, she should tell her husband before she spends it
- *Answer Options* Agree, Disagree.
- *Coding*: Coded 1 if answer is in favor of gender equality, 0 otherwise.
- *Direction*: Positive (One-tailed)

### Satisfaction

- *Question*: How happy are you with your [marriage / relationship]?
- *Answer Options* (read out loud): 1 Very much, 3 Somewhat, 4 Little, 5 Not at all.
- *Coding*: Coded 1 if answer is between 1 and 3, 0 otherwise.
- *Direction*: Positive (One-tailed)

### Equal Decision-making

- *Question*: In your family, who is makes the final decision about how much the family should spend on...[Randomly select: household repairs, children's education]
- *Answer Options* (read out loud): Mother, Father, Both, Other woman in household, Other man in household.
- *Coding*: Coded 1 if answer is woman or equal decision-making, 0 otherwise.
- *Direction*: Positive (One-tailed)

### Equal Labor

- *Question*: Think about your own family. Who in the family is most responsible for...[Randomly select two: Carrying water / Doing laundry / Taking care of children / Earning money for the family / Make decisions about childrens health and education / Make decisions about households spendings]
- *Answer Options* (read out loud): Mother, Father, Both mother and father, Sons, Daughters, Both sons and daughters.
- *Coding*: Coded 1 if answer is equal or cuts against traditional gender roles, 0 otherwise.
- *Direction*: Positive (One-tailed)

## A8.3 Social Attitudes and Behaviors Outcomes

### Prejudice

- *Questions:* Do you agree or disagree with the following statements? There is no right or wrong answer – We are simply interested in your views on this issue.
  - (Reversed, and averaged) On this list are various groups of people. Could you please mention any that you would not like to have as neighbors...[Average: HIV positive people, Unmarried couple, Homosexuals]
  - (Reversed, and averaged) If your son or daughter were being married, would you accept if they married...[Average: Someone who is not your tribe / Someone who is not your religion / Someone who is not Tanzanian / Someone from the city]
- *Answer Options* Yes, No.
- *Coding:* Average of the two questions.
- *Direction:* Positive (One-tailed)

### Like Outgroups

- *Questions:* I'd like to get your feelings toward some different groups of people. I'll read the name of a group of people and I'd like you to rate that person using this scale [SHOW SCALE]. Ratings between above 50 mean that you like and feel good towards the group. Ratings between 0 degrees and 50 degrees mean that you don't like or feel good toward the group. Ratings around 50 mean you don't like or dislike the group. For example, if I was asked to give my rating of Tanzanians, I like Tanzanians a lot, so I might point to 80, 90, or even 100. If we come to a group whose name you don't recognize, you don't need to rate that group. Just tell me and we'll move on to the next one. Now, please point to the thermometer to show how much you like the following groups [Out Ethnic Group].
- *Answer Options* 0-100
- *Direction:* Positive (One-tailed)

### Violence Against Children Attitude

- *Question:* Some people think that children must never be beaten, others think that parents must physically punish their children in order to educate them. Which statement do you agree with more?
- *Answer Options* (read out loud): Children must never be beaten, Hitting a child is sometimes justified.
- *Coding:* Coded 1 if answer is children must never be beaten, 0 otherwise.
- *Direction:* Positive (One-tailed)

### Violence Against Children Behavior

- *Question:* All adults use certain ways to teach children the right behavior or address a behavior problem. I will read various methods that are used and I want you to tell me if you or anyone else in your household has used this method with your children in the past month.
  - Spanked, hit, or slapped him her with a bare hand;
  - Hit with a stick or other object.
- *Answer Options* (read out loud): Yes, No.
- *Coding:* Coded 1 if answered no, 0 otherwise.
- *Direction:* Positive (One-tailed)

## Religiosity

- *Question:* In a typical week, how many times a week do you attend a religious service in a mosque or church?
- *Answer Options:* 0-35.
- *Direction:* Positive (One-tailed)

## Pro-Urban

- *Question:* Now I will give you a few pairs of statements. Please tell me with which of the statements you agree more, even if you do not agree with either one completely. Statement 1: After they finish Standard 7, a young (boy or girl) moving to the town or city is a good opportunity. Statement 2: After they finish Standard 7, a young (boy or girl) should work to support the family in the village.
- *Answer Options* (read out loud): Statement 1, Statement 2.
- *Coding:* Coded 1 for Statement 1, 0 for Statement 2.
- *Direction:* Positive (One-tailed)

## Appendix A9 Tables

### A9.1 Sample Summary Statistics

Table A1: **Sample Summary Statistics** (Baseline radio owners)

Variable	Villages receiving Pangani FM		Villages not receiving Pangani FM	
	(n = 18)	(n = 18)	(n = 18)	min-max
Village Level Covariates				
Village population	1351.00	1662.56	(391 - 3743)	
Village travel time to nearest town	63.72	74.28	(1 - 240)	
Village num. of mosques	2.72	1.94	(0 - 11)	
Village num. of churches	2.67	3.33	(0 - 8)	
Village cell phone access (bars)	2.72	2.28	(0 - 4)	
Village has electricity	0.44	0.56	(0 - 1)	
Individual Demographic Covariates	(n = 396)	(n = 396)		
Female	0.44	0.40	(0 - 1)	
Muslim	0.57	0.55	(0 - 1)	
Finished standard 7	0.74	0.82	(0 - 1)	
Age	40.89	39.61	(18 - 66)	
Individual Political Interest and Political Participation	(n = 396)	(n = 396)		
Listened to radio yesterday	0.64	0.58	(0 - 1)	
Listened to radio news (dummy)	0.83	0.82	(0 - 1)	
Listened to radio w/ community	0.64	0.58	(0 - 1)	
Spend free time on radio, TV, or cellphone	0.32	0.31	(0 - 1)	
Discussed politics (two weeks)	0.40	0.38	(0 - 1)	
Didn't discuss issues (two weeks)	0.20	0.22	(0 - 1)	
Listened to radio news	3.73	3.71	(1 - 5)	
Joined others to request gov. action (last year)	0.28	0.31	(0 - 1)	
Contacted government official (last year)	0.27	0.37	(0 - 1)	

**Note:** Missing values were replaced with the mean value of the respondent's village. The sample only includes respondents who reported that their household owned a radio.

Table A2: Afrobarometer Comparisons

Variable	Sample		Afrobarometer - Rural		Afrobarometer - TZ Rural	
	Mean	N	Mean	N	Mean	N
<b>Demographics</b>						
Education: Completed Primary School	0.78	689	0.78	20,364	0.86	834
Running water pumped to village	0.72	330	0.81	20,243	0.76	832
Village connected to electrical grid	0.55	396	0.92	20,467	0.94	840
<b>Media</b>						
Personally owns radio	0.61	792	0.61	20,414	0.71	840
Listens to radio for news at least once a month	0.83	792	0.80	20,481	0.91	840
Television in household	0.20	792	0.60	20,374	0.54	838
Mobile phone with internet access	0.19	686	0.61	17,917	0.41	769
<b>Political Participation</b>						
Contacted government official in past year	0.32	687	0.19	20,379	0.18	839
Joined with others to raise an issue in past year	0.30	687	0.42	20,360	0.38	834
Voted in national election in past year	0.91	123	0.63	20,356	0.77	835
<b>Attitudes</b>						
Women have equal right to inherit land	0.70	689	0.76	20,242	0.84	835
Women have equal right to jobs	0.64	231	0.61	20,309	0.63	837
Never justified for men to beat wives	0.78	792	0.75	20,322	0.94	839
Women are as good as men as political leaders	0.91	792	0.76	20,293	0.77	835
National ID at least as strong as Tribal ID	0.96	396	0.88	17,370	0.97	784
Would be ok with homosexuals as neighbors	0.22	303	0.26	19,996	0.06	825

**Note:** Sample refers to the overall sample selected. When the same question was asked both at baseline and endline, the table reports the baseline mean; when the question was only asked at endline, the table reports the endline mean for controls. The Afrobarometer surveys used are between 2016 and 2018.

## A9.2 Balance on Individual Covariates

Table A3: Full set of individual covariates collected at baseline  
(Balance for radio owners)

Variable	Pangani FM	Non-Pangani FM	<i>p</i> - value	Observations
Values - support change	0.791	0.862	0.015	792
Have contacted gov. official	0.268	0.367	0.015	792
Doesn't know ptix	0.006	0.016	0.027	792
Values - technology good	0.956	0.977	0.037	792
Rejects IPV (index)	0.742	0.796	0.052	792
Free time - community	0.383	0.481	0.053	792
Female	0.442	0.396	0.062	792
Assets - chair	0.788	0.680	0.074	792
Assets - cell	0.777	0.832	0.075	792
Listen to radio - sports	0.360	0.286	0.087	792
Finished standard 7	0.736	0.820	0.091	792
Church/Mosque attendance per week	3.254	4.480	0.100	792
Free time - rest	0.700	0.605	0.104	792
Values - money good	0.052	0.026	0.111	792
Assets - TV	0.167	0.235	0.119	792
Can read and write	0.786	0.858	0.119	792
Listen to radio - news	0.459	0.382	0.134	792
Older persons in HH	0.664	0.776	0.159	792
Reject early marriage (vignette)	0.938	0.917	0.204	792
Age	40.891	39.614	0.205	792
Values - individualism	0.386	0.448	0.224	792
Assets - motorcycle	0.138	0.175	0.232	792
Values - respect elders	0.847	0.794	0.234	792
Assets - radio number	1.168	1.124	0.316	792
Listen to radio - romance	0.026	0.049	0.340	792
Listen to radio w/ community	0.641	0.577	0.346	792
Listened to radio yesterday	0.641	0.577	0.346	792
Gender Equality (index)	0.744	0.762	0.361	792
Free time - radio	0.527	0.494	0.406	792
Gender equality - childcare	0.802	0.829	0.408	792
Free time - play sports	0.061	0.085	0.451	792
Gender equality - leadership	0.900	0.920	0.465	792
Have participated in collective action	0.279	0.313	0.474	792
Married	0.812	0.788	0.524	792
Discussion - IPV	0.055	0.068	0.526	792
Discussion - teachers	0.162	0.186	0.574	792
Discussion - election	0.723	0.691	0.584	792
Discussion - water	0.499	0.539	0.596	792
Younger persons in HH	3.878	3.748	0.599	792
Gender equality - kid pref	0.712	0.733	0.625	792
Discussion - politics	0.397	0.378	0.637	792
Speaks swahili	0.997	0.994	0.687	792
Free time - sports	0.184	0.202	0.703	792
Community rejects IPV	0.782	0.768	0.748	792
Adults in HH	3.176	3.203	0.773	792
Kids in HH	2.366	2.321	0.780	792
Assets - table	0.751	0.734	0.784	792
Listen to radio news	3.735	3.706	0.788	792
Free time - cell	0.224	0.240	0.794	792
Listen to radio news (dummy)	0.830	0.822	0.808	792
Free time - uses media	0.316	0.312	0.820	792
Free time - drinking	0.020	0.020	0.843	792
Listen to radio - religion	0.175	0.182	0.848	792
Assets - sofa	0.147	0.142	0.852	792
Listen to radio - music	0.105	0.112	0.878	792
Muslim	0.569	0.551	0.900	790
Free time - TV	0.197	0.204	0.911	792
Wife would report IPV	0.599	0.596	0.912	792
Values - respect authority	0.385	0.388	0.912	792
No community discussion	0.197	0.220	0.913	792
Listen to radio - social	0.082	0.078	0.921	792
Discussion - voting	0.070	0.065	0.946	792
Gender equality - school access	0.137	0.133	0.955	792
Reject forced marriage	0.770	0.775	0.964	792
Gender equality - earning	0.564	0.563	0.983	792
Persons in HH	5.494	5.482	0.996	792
Discussion - discrimination	0.048	0.046	0.997	792

Note: All regressions present standard errors clustered at the village level and wild bootstrapped p-values. Missing values were replaced with the mean value of the respondent's village.

### A9.3 Main Outcome Tables

Table A4: Impact of Pangani-FM Ratio on Political Interest and Knowledge

Interest	Know National Politics				Know Foreign Politics				Know Current Events				Political Participation	
	Interest	Prime Minister	Vice President	Chief Justice	Trump	Biden	Kenyatta	Know EM Law	Accept PPE	Daughter in Ptitx	Index			
Pangani-FM	0.044***	0.084	0.059	0.007	-0.095	-0.040	-0.020	0.035	0.186	0.064	0.022			
Standard Error	0.007	0.034	0.046	0.046	0.046	0.031	0.053	0.013	0.040	0.015	0.019			
<i>P</i> -value	0.000	0.007	0.377	0.458	0.956	0.857	0.636	0.047	0.007	0.002	0.200			
Hypothesis	+	+	+	+	+	+	+	+	+	+	+			
Control Mean	0.79	0.76	0.73	0.19	0.56	0.17	0.67	0.09	0.13	0.69	0.57			
Village SD (control)	0.05	0.20	0.17	0.17	0.22	0.17	0.24	0.07	0.18	0.10	0.06			
DV Range	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]			
Matched Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Controls	16	23	0	32	29	5	10	18	67	12	29			
Adj- <i>R</i> <sup>2</sup>	0.12	0.35	0.00	0.36	0.44	0.18	0.26	0.12	0.43	0.10	0.14			
Observations	792	262	273	257	241	280	271	790	790	787	790			

Note: Each respondent was asked one randomly selected question about popular culture, national politics, and foreign policy. All regressions present standard errors clustered at the village level and wild bootstrapped *p*-values. \*\*\* indicates statistically significant at the 5% level after Benjamini-Hochberg multiple hypothesis correction (see Appendix A6 for details). Missing values were replaced with the mean value of the respondent's village. Adjustment for LASSO-selected covariates does not significantly alter the coefficient or standard error of the estimates. For details on question wording and variable coding see Appendix A8.

Table A5: Impact of Pangani-FM Ratio on Gender Outcomes

IPV	Early Marriage				Forced Marriage				Gender Equality				Relationships			
	Attitude	Norm	Report	Share	Attitude	Attitude	Share	Attitude	Attitude	Satisfaction	Eq. Decisions	Eq. Labor				
Pangani-FM	-0.028	0.090	0.079	0.032	-0.032	0.014	-0.038	-0.000	0.016	0.053	0.001					
Standard Error	0.013	0.027	0.029	0.024	0.024	0.023	0.019	0.009	0.010	0.016	0.011					
<i>P</i> -value	0.933	0.014	0.074	0.224	0.808	0.322	0.946	0.563	0.171	0.009	0.506					
Hypothesis	+	+	+	+	+	+	+	+	+	+	+					
Control Mean	0.85	0.68	0.48	0.63	0.48	0.85	0.67	0.59	0.90	0.90	0.30					
Village SD (control)	0.07	0.13	0.10	0.11	0.14	0.19	0.12	0.04	0.07	0.10	0.11					
DV Range	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]					
Matched Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
Controls	47	11	0	49	10	39	9	23	9	21	23					
Adj- <i>R</i> <sup>2</sup>	0.22	0.13	-0.01	0.29	0.07	0.26	0.18	0.06	0.19	0.25	0.22					
Observations	792	783	792	790	792	790	789	792	661	792	790					

Note: All regressions present standard errors clustered at the village level and wild bootstrapped *p*-values. \*\*\* indicates statistically significant at the 5% level after Benjamini-Hochberg multiple hypothesis correction. Missing values were replaced with the mean value of the respondent's village. Adjustment for LASSO-selected covariates does not significantly alter the coefficient or standard error of the estimates. For details on question wording and variable coding see Appendix A8.



Table A6: Impact of Pangani-FM Radio on Social Values

	Prejudice			VAC			Other		
	No Prej.	Like Outgroups	Attitude	Behavior	Religiosity	Urbanism			
Pangani-FM	-0.007	-0.006	0.006	0.010	0.003	-0.003			
Standard Error	0.016	0.017	0.020	0.030	0.009	0.019			
<i>p</i> -value	0.607	0.618	0.843	0.416	0.369	0.543			
Hypothesis	+	+	+	+	+	+			
Control Mean	0.55	0.62	0.16	0.59	0.15	0.19			
Village SD (control)	0.08	0.06	0.09	0.11	0.08	0.09			
DV Range	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]			
Matched Pair FE	Yes	Yes	Yes	Yes	Yes	Yes			
Controls	17	23	0	41	32	28			
Adj- <i>R</i> <sup>2</sup>	0.09	0.10	0.01	0.21	0.30	0.10			
Observations	792	736	792	746	789	789			

**Note:** All regressions present standard errors clustered at the village level and wild bootstrapped *p*-values. \*\*\* indicates statistically significant at the 5% level after Benjamini-Hochberg multiple hypothesis correction. Missing values were replaced with the mean value of the respondent's village. Adjustment for LASSO-selected covariates does not significantly alter the coefficient or standard error of the estimates. For details on question wording and variable coding see [Appendix A8](#).

A9.3.1 Main Outcome Tables - without LASSO selected controls

Table A7: Impact of Pangani-FM Ratio on Political Interest and Knowledge

Interest	Know National Politics				Know Foreign Politics				Know Current Events				Political Participation	
	Interest	Prime Minister	Vice President	Chief Justice	Trump	Biden	Kenyatta	Know EM Law	Accept PPE	Daughter in Pix	Index			
Pangani-FM	0.048	0.087	0.059	-0.002	-0.050	-0.059	-0.023	0.045	0.155	0.073	-0.003			
Standard Error	0.009	0.040	0.046	0.039	0.041	0.037	0.051	0.017	0.064	0.017	0.016			
<i>P</i> -value	0.000	0.065	0.184	0.488	0.808	0.848	0.646	0.045	0.056	0.004	0.550			
Hypothesis	+	+	+	+	+	+	+	+	+	+	+			
Control Mean	0.79	0.76	0.73	0.19	0.56	0.17	0.67	0.09	0.13	0.69	0.57			
Village SD (control)	0.05	0.20	0.17	0.17	0.22	0.17	0.24	0.07	0.18	0.10	0.06			
DV Range	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]			
Matched Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Controls	No	No	No	No	No	No	No	No	No	No	No			
Adj- <i>R</i> <sup>2</sup>	0.02	0.05	0.00	0.01	0.04	0.02	0.03	0.03	0.12	0.03	0.00			
Observations	792	262	273	257	241	280	271	792	792	787	792			

Note: Each respondent was asked one randomly selected question about popular culture, national politics, and foreign policy. All regressions present standard errors clustered at the village level and wild bootstrapped *p*-values. \*\*\* = statistically significant at the 5% level after Benjamini-Hochberg multiple hypothesis correction. Missing values were replaced with the mean value of the respondent's village. For details on question wording and variable coding see Appendix A8.

Table A8: Impact of Pangani-FM Ratio on Gender Outcomes

IPV	Early Marriage				Forced Marriage				Gender Equality				Relationships			
	Attitude	Norm	Report	Attitude	Norm	Share	Attitude	Attitude	Attitude	Satisfaction	Eq. Decisions	Eq. Labor				
Pangani-FM	-0.021	0.070	0.079	0.044	0.005	0.049	-0.012	-0.007	0.021	0.038	-0.007					
Standard Error	0.019	0.038	0.029	0.025	0.029	0.042	0.025	0.009	0.013	0.023	0.024					
<i>P</i> -value	0.788	0.089	0.038	0.122	0.446	0.220	0.643	0.723	0.137	0.145	0.578					
Hypothesis	+	+	+	+	+	+	+	+	+	+	+					
Control Mean	0.85	0.68	0.48	0.68	0.63	0.48	0.85	0.67	0.59	0.90	0.30					
Village SD (control)	0.07	0.13	0.10	0.11	0.14	0.19	0.12	0.04	0.07	0.10	0.11					
DV Range	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]					
Matched Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes					
Controls	No	No	No	No	No	No	No	No	No	No	No					
Adj- <i>R</i> <sup>2</sup>	-0.00	0.01	-0.01	0.02	0.01	0.03	0.01	-0.01	0.06	0.01	0.01					
Observations	792	783	792	792	792	792	791	792	661	792	792					

Note: All regressions present standard errors clustered at the village level and wild bootstrapped *p*-values. \*\*\* = statistically significant at the 5% level after Benjamini-Hochberg multiple hypothesis correction. Missing values were replaced with the mean value of the respondent's village. For details on question wording and variable coding see Appendix A8.

Table A9: Impact of Pangani-FM Radio on Social Values

	Prejudice			VAC			Other		
	No Prej.	Like Outgroups	Attitude	Behavior	Religiosity	Urbanism			
Pangani-FM	-0.001	-0.018	0.006	0.033	-0.012	-0.011			
Standard Error	0.018	0.016	0.020	0.024	0.014	0.024			
<i>p</i> -value	0.506	0.764	0.440	0.173	0.725	0.739			
Hypothesis	+	+	+	+	+	+			
Control Mean	0.55	0.62	0.16	0.59	0.15	0.19			
Village SD (control)	0.08	0.06	0.09	0.11	0.08	0.09			
DV Range	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]			
Matched Pair FE	Yes	Yes	Yes	Yes	Yes	Yes			
Controls	No	No	No	No	No	No			
Adj- <i>R</i> <sup>2</sup>	0.00	-0.00	0.01	0.01	0.03	-0.01			
Observations	792	736	792	746	791	789			

**Note:** All regressions present standard errors clustered at the village level and wild bootstrapped *p*values. \*\*\* = statistically significant at the 5% level after Benjamini-Hochberg multiple hypothesis correction. Missing values were replaced with the mean value of the respondent's village. For details on question wording and variable coding see [Appendix A8](#).

## A9.4 Supplementary Outcome Tables

Our pre-specified outcome of interest was an index of twelve indicators of political participation (each respondent was asked four randomly selected questions out of twelve available). We also divided the indicators into three sub-indices based on principal-components analysis (village meeting attendance/participation, voting/electoral participation, and collective action), although these sub-indices were not pre-specified.

Table A10: **Impact of Pangani-FM Radio Political Participation**

	Index	Village Meetings	Voting	Collective Action
Pangani-FM	0.022	-0.060	0.002	0.116
Standard Error	0.019	0.032	0.020	0.031
<i>p</i> -value	0.201	0.909	0.922	0.005
Hypothesis	+	+	+	+
Control Mean	0.57	0.69	0.71	0.18
Village SD (control)	0.06	0.12	0.08	0.14
DV Range	[0-1]	[0-1]	[0-1]	[0-1]
Matched Pair FE	Yes	Yes	Yes	Yes
Controls	29	7	0	26
Adj- $R^2$	0.13	0.06	0.01	0.21
Observations	790	610	750	445

**Note:** Refer to [Appendix A8](#) for the question wording of the individual items of the reported indices. Index includes all 12 questions. Village Meetings averages questions (7), (8), and (9). Voting averages questions (1),(2),(3),(5), and (6). Collective Action averages questions (10),(11), and (12).

All regressions present standard errors clustered at the village level and wild bootstrapped *p*values. \*\*\* indicates statistically significant at the 5% level after Benjamini-Hochberg multiple hypothesis correction. Missing values were replaced with the mean value of the respondent's village. Adjustment for LASSO-selected covariates does not significantly alter the coefficient or standard error of the estimates.

Table A11: **Radio Listening** (Non-Pangani FM Programs and Content Types)

	Radio Stations					Radio Types				
	TBC	Uhuru fm	TK fm	VOA fm	Radio One	Music	Sports	News	Culture	Religious
Pangani-FM	-0.061	-0.055	-0.060	-0.003	-0.020	-0.056	-0.005	-0.042	-0.007	0.000
Standard Error	0.039	0.042	0.047	0.040	0.031	0.014	0.030	0.033	0.033	0.027
<i>p</i> -value	0.324	0.476	0.382	0.943	0.661	0.004	0.917	0.400	0.939	0.939
Hypothesis	Two	Two	Two	Two	Two	Two	Two	Two	Two	Two
Control Mean	0.37	0.19	0.24	0.14	0.17	0.14	0.37	0.68	0.23	0.16
Village SD (ctl)	0.14	0.25	0.19	0.19	0.17	0.07	0.11	0.16	0.15	0.10
DV Range	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]	[0-1]
Matched Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	No	No	No	No	No	No
Adj- $R^2$	0.04	0.20	0.07	0.15	0.07	0.02	0.00	0.03	0.02	-0.01
Observations	790	790	790	790	790	790	790	790	790	790

**Note:** The lower sample size for Pangani FM programs is the result of the question about programs being introduced to the survey after endline surveys in two endline villages had already been completed. TBC is the Tanzanian Broadcasting Corporation, the state-owned news station. Uhuru FM is the news station owned and controlled by the ruling party CCM. TK FM is a regional station focused on entertainment and music. VOA is Voice of Africa, another local radio stations based in the District bordering Pangani. Radio One is a national entertainment news station.

All regressions present standard errors clustered at the village level and wild bootstrapped *p* values. \*\*\* indicates statistically significant at the 5% level after Benjamini-Hochberg multiple hypothesis correction. Missing values were replaced with the mean value of the respondent's village. Adjustment for LASSO-selected covariates does not significantly alter the coefficient or standard error of the estimates.

## A9.5 Alternative Specifications

Table A12: **Comparison of Specifications**, Early and Forced Marriage Attitudes

	Reject Early Marriage				Reject Forced Marriage			
	Basic	LASSO	Baseline Ctl.	Diff-in-Diff	Basic	LASSO	Baseline Ctl.	Diff-in-Diff
Pangani-FM	0.044	0.032	0.040	0.017	-0.012	-0.038	-0.013	-0.019
Standard Error	0.025	0.024	0.025	0.027	0.025	0.019	0.024	0.067
<i>p</i> -value	0.122	0.224	0.150	0.354	0.643	0.946	0.644	0.567
Hypothesis	+	+	+	+	+	+	+	+
Matched Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	49	Baseline	No	No	9	Baseline	No
Adj- $R^2$	0.02	0.29	0.03	0.03	0.01	0.18	0.13	0.02
Observations	792	790	792	792	791	789	791	791

**Note:** Refer to [Appendix A8](#) for the question wording of the individual items. Basic regression includes matched-pair controls and a dummy variable for replacements. LASSO includes the same covariates in addition to LASSO-selected covariates. Baseline controls includes the original covariates and a control for the outcome variable as measured at baseline. Diff-in-diff uses an outcome defined as the endline outcome minus the baseline measure of the same outcome.

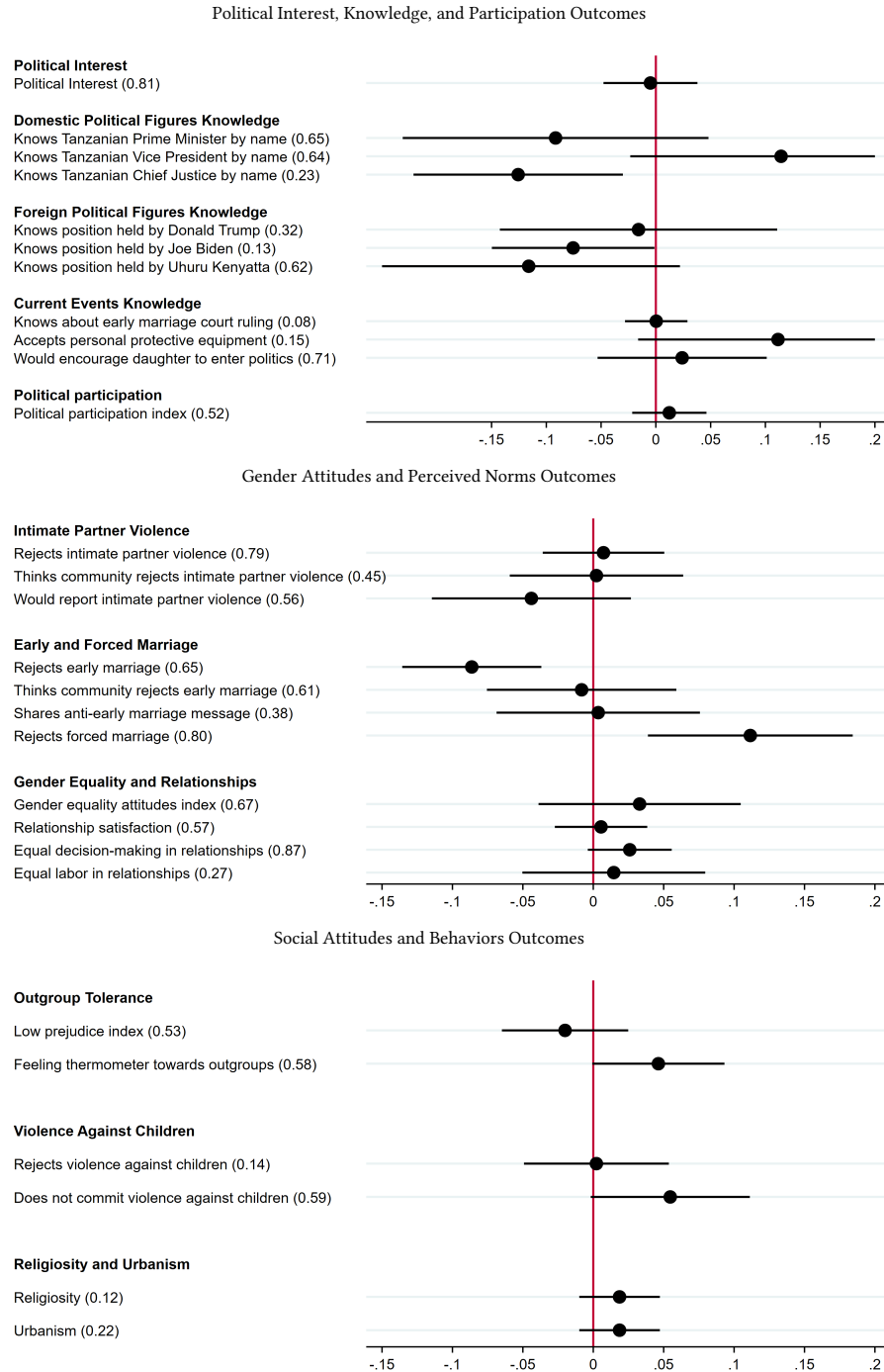
Table A13: **Comparison of Specifications**, Intimate Partner Violence Attitudes and Norms

	IPV Reject				IPV Norm			
	Basic	LASSO	Baseline Ctl.	Diff-in-Diff	Basic	LASSO	Baseline Ctl.	Diff-in-Diff
Pangani-FM	-0.041	-0.026	-0.025	0.025	0.070	0.090	0.068	0.041
Standard Error	0.027	0.028	0.026	0.029	0.038	0.027	0.036	0.056
<i>p</i> -value	0.855	0.743	0.762	0.279	0.089	0.014	0.089	0.344
Hypothesis	+	+	+	+	+	+	+	+
Matched Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	44	Baseline	No	No	11	Baseline	No
Adj- $R^2$	0.00	0.19	0.05	0.02	0.01	0.13	0.04	0.02
Observations	792	792	792	792	783	783	783	783

**Note:** Refer to [Appendix A8](#) for the question wording: Norm is exactly as described, instead IPV Reject is only the answer to the first question (as this is the one we can provide a baseline variable for the DiD). Basic regression includes matched-pair controls and a dummy variable for replacements. LASSO includes the same covariates in addition to LASSO-selected covariates. Baseline controls includes the original covariates and a control for the outcome variable as measured at baseline. Diff-in-diff uses an outcome defined as the endline outcome minus the baseline measure of the same outcome.

## A9.6 Spillovers

Figure A7: Impact of Pangani-FM Radio, non-radio owners



**Note:** 95% confidence intervals reported. Basic regression presented, which include matched-pair controls and a dummy variable for replacements. All regressions present standard errors clustered at the village level. For details on question wording and variable coding see [Appendix A8](#).

## Appendix A10 Literature Review Table

Author(s)	Year	Country	Medium	Treatment	Outcome	Identification	Unobtrusive	Pre-registered
Adena et al.	2015	Germany	Radio	All media	Nazism	Observational	Yes	No
Aker et al.	2017	Mozambique	Newspaper	Outlet	Voter turnout	Randomized	No	Yes
Besley and Burgess	2002	India	Newspaper	All media	Government responsiveness	Observational	Yes	No
Bleck and Micheliitch	2017	Mali	Radio	All media	Knowledge, public opinion	Randomized	Yes	No
Bloin and Mukand	2019	Rwanda	Radio	Outlet	Social attitudes	Observational	Yes	No
Blumenstock et al.	2022	Pakistan	Radio	All media	Attitudes	Observational	Yes	No
Braga	2007	Albania	Radio	Outlet	Migration	Observational	Yes	No
Broockman and Kalla	2022	United States	TV	Outlet	Beliefs and attitudes	Randomized	No	Yes
Cagé	2020	France	Newspapers	Outlet	Electoral outcomes	Observational	Yes	No
Casey	2015	Sierra Leone	Radio	All media	Knowledge, public opinion, government responsiveness	Observational	Yes	No
Cho et al.	2017	South Korea	Newspaper / radio	All media	Public opinion	Observational	Yes	No
Chong and La Ferrara	2009	Brazil	TV	Outlet	Divorce	Observational	Yes	No
Clinton and Enamorado	2014	United States	TV	Outlet	Politician behavior	Observational	Yes	No
Conroy-Krutz	2018	Uganda	Radio	All media	Political participation	Observational	Yes	No
Conroy-Krutz and Moehler	2015	Ghana	Radio	Outlet	Public opinion	Randomized	No	No
Crabtree et al.	2018	Germany	Radio	Outlet	Collective action	Observational	Yes	No



Dahi and DellaVigna	2009	United States	Movies	All media	Crime	Observational	Yes	No
Della Vigna and Kaplan	2007	United States	TV	Outlet	Voting	Observational	Yes	No
Della Vigna et al.	2014	Croatia	Radio	Outlet	Social attitudes	Observational	Yes	No
Durante et al.	2019	Italy	TV	Outlet	Voting	Observational	Yes	No
Enikolopov et al.	2011	Russia	TV	Outlet	Public opinion	Observational	Yes	No
Farre and Fasani	2013	Indonesia	TV	All media	Migration	Observational	Yes	No
Fos and Bischof	2022	UK	Newspaper	Outlet	Public opinion	Observational	Yes	No
Gentzkow	2006	United States	TV	All media	Voter turnout	Observational	Yes	No
Gentzkow and Shapiro	2008	United States	TV	All media	Education	Observational	Yes	No
Gentzkow et al.	2011	United States	Newspaper	All media	Political participation, electoral outcomes	Observational	Yes	No
Gigliarducci et al.	2020	Italy	Radio	Outlet	Political violence	Observational	Yes	No
Glennerster et al.	2021	Burkina Faso	Radio	Outlet	Public health	Randomized	Yes	Yes
Grossman et al.	2022	Israel	Newspaper	Outlet	Electoral outcomes	Observational	Yes	No
Hennighausen	2015	Germany	Television	All media	Beliefs and attitudes	Observational	Yes	No
Hopkins and Ladd	2013	United States	TV	Outlet	Vote intentions	Observational	Yes	No
Jensen and Oster	2009	India	TV	All media	Social attitudes	Observational	Yes	No
Keefer and Kientani	2016	Benin	Radio	All media	Government responsiveness	Observational	Yes	No

Kern	2011	Germany	TV	Outlet	Protest	Observational	Yes	No
Kern and Hainmueller	2009	Germany	TV	Outlet	Public opinion	Observational	Yes	No
La Ferrara et al.	2012	Brazil	TV	Outlet	Fertility	Observational	Yes	No
Martin and Yurukoglu	2017	United States	TV	Outlet	Public opinion	Observational	Yes	No
Mastorocco and Minale	2018	Italy	TV	Outlet	Crime perceptions	Observational	Yes	No
Olken	2009	Indonesia	TV / Radio	All media	Social capital	Observational	Yes	No
Peisakhin and Rozenas	2018	Ukraine	TV	Outlet	Electoral outcomes	Observational	Yes	No
Sarasvat et al.	2018	Burkina Faso	Radio	Outlet	Public health	Randomized	Yes	Yes
Stromberg	2004	United States	Radio	All media	Government responsiveness	Observational	Yes	No
Wang	2021	United States	Radio	Outlet	Political participation	Observational	Yes	No
Wang	2021	United States	Radio	Outlet	Electoral outcomes	Observational	Yes	No
Yanagizawa-Drott	2014	Rwanda	Radio	Outlet	Violence	Observational	Yes	No

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**The Effects of Independent Local Radio on Tanzanian Public Opinion:  
Evidence from a Planned Natural Experiment**

Donald P. Green, Dylan W. Groves, Constantine Manda, Beatrice Montano, Bardia Rahmani

**Revision Memo**

**1. Final Files**

- All the files necessary to compile the pdf of the article have been uploaded. Please note that the file that should be compiled is **pfm\_ne\_jop\_final.tex** - which inputs the 3 figures (**pfm\_ne\_map.png**, **pfm\_ne\_radiogrowth.png**, and **f2\_coefplot\_all\_lasso.png**), the table (**pfm\_ne\_replication\_t1\_uptake.tex**), and the references (**pfm\_ne.bib** with the bibliography formatting style **apalike\_fullname.bst**).
- As requested, we uploaded the Figures also as .tiff files.
  - Note that we add also a “\_larger” version of these which have a larger font size should that be needed or preferred.
- We will only have an Online Appendix (**pfm\_ne\_jop\_final\_onlineappendix.pdf**), and no Appendix section is needed in print.
- **One completed and signed Publication Agreement has been uploaded, as Donald P. Green signs on behalf of all co-authors.**

**2. Formatting**

- To the best of our knowledge, all typos have been corrected.
- **Font:** The current files present the entirety of the paper in 12pt standard serif typeface font, with the exception of the title page which is smaller.
- **Structure:** The paper includes a title page with a full title, a short title of less than 50 characters, the name and contact info for every author, the abstract of exactly 150 words, the keywords, and the requires statements at the bottom of the page (which include links to Pre-Analysis Plan, the Online Appendix and the JOP Replication files as well as IRB and Funding information -- all in the order and manner instructed). The paper includes sections and subsections only, which are not numbered.
- **Spacing and other:** Every line is double spaced, including the references. All pages are numbered and new paragraphs are identified by indenting the first line without adding extra space. Footnotes are presented and formatted as requested.
- **Citations and References:** All citations in the text are done according to the APA style, and are listed in the “References” section -- which contains each author’s full name. Note that all references used have all the information in the .bib file to be formatted in any other format preferred.

- **Figures:** All figures have been included as .tiff files and they follow the Artwork Instructions, such as they do not have backgrounds and they are readable when converted to black and white. Note that now the multi-paneled coefficient plot is now one unique figure (the replication files have been approved as making three different figures, but only its compilation into the one figure that has changed to comply with the instructions given).
- **Statistical and Technical Information:** No variable name is used in the text nor in the tables / figures presented, and coefficient estimates always include standard errors.
- **Appendix:** This paper does **not** include an Appendix for print publication, but it does have an online only appendix which is widely referenced throughout the paper. We have provided a link to it in the statements at the bottom of the title page, and we have uploaded it in the Editorial manager as **pfm\_ne\_jop\_final\_onlineappendix.pdf**.

### 3. Length

- Note that the number of pages is at 27 [title page + 18 pages + acknowledgements + 6 references pages + bios]. This page limit exceeds the limit of a research note, but extra length was approved by Vera Troeger in her instructions for our revise-and-resubmit.
- Note that the article type has now been changed to **Research Article** as agreed upon.

### 4. Online Appendix

- An Online Appendix is available to be added to the online version of the paper: **pfm\_ne\_jop\_final\_onlineappendix.pdf**
- Note that this pdf is also publicly available on OSF at the following link <https://osf.io/vrhyp/files/osfstorage/63a1bb57175ccb007e32a9f6>, which is cited in the bottom section of the title page as well as instructed.
- The Online Appendix has numbered page numbers that start from 1, and references to it in the main text have been hard coded in order to avoid errors.
- The Online Appendix complies to the JoP style and naming conventions.

### 5. Data and Replication Materials

- The recommended statement has been added to the bottom section of the title page as instructed.

### 6. Research Involving Human Participants

- As our research did involve human participants and has received IRB approval, a statement to this effect has been included as a sentence at the bottom of the title page below the supplementary-materials statement and the data/replication statement.

**7. Financial Support**

- As we have received financial support, a statement to this effect has been included as a final sentence at the bottom of the title page.

**8. Acknowledgements**

- An “Acknowledgment” section has been added as instructed immediately preceding the “Reference” section.

**9. Bio statements**

- Statements of the required form have been added immediately following the “Reference” section.

**10. Publication Agreement**

- One completed and signed Publication Agreement has been uploaded, as Donald P. Green signs on behalf of all co-authors.